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CCICED Annual General Meeting 2008

Tentative Program

November 12 Wednesday

Morning

08:00-14:00 **Registration**

09:00-11:00 **Task Force Co-chairs Coordination Meeting**

Chaired by CCICED Chief Advisors

Participants: Task Force Co-chairs and assistants

11:00-12:00 **Bureau Meeting**

Chaired By CCICED Executive Vice Chairpersons

Participants: CCICED Bureau Members and invited observers

Afternoon **Plenary Session**

15:00 Opening

Chaired by: Zhou Shengxian CCICED Executive Vice Chairperson

Minister, Ministry of Environmental Protection

1. Welcome Remark Zhou Shengxian

Adoption of Meeting Program

2. Opening Remark Margaret Biggs

CCICED Executive Vice Chairperson, CIDA President, Canada

3. Keynote Speech Li Keqiang

Vice Premier, the State Council, China; CCICED Chairperson

16:00 Coffee/Tea Break

16:20 Special Speeches and General Debate

Chaired by: Margaret Biggs CCICED Executive Vice Chairperson

1. Remarks by CCICED Vice Chairpersons

Xie Zhenhua, Vice Chairperson, NDRC Vice Chairman

Klaus Töpfer, Vice Chairperson, Former UNEP Executive Director

Børge Brende, Vice Chairperson, Managing Director WEF

2. Special Remarks Zhou Shengxian, Minister, MEP China

3. Presentation on CCICED Issues Paper

Shen Guofang, Arthur Hanson, CCICED Chief Advisors

4. Special Remarks Julia Marton-Lefèvre, Director General, IUCN

5. General Debate and Comments

18:00 Adjourn

18:30 Reception (All participants invited)

November 13 Thursday

Morning Plenary Session

09:00 Task Force Reports and Policy Recommendations

Chaired by: Xie Zhenhua CCICED Vice Chairperson

1. Innovation and Environment-friendly Society (25min)

Task Force Co-chairs: David Strangway Feng Zhijun

2. Environment and Health (25min)

Task Force Co-chairs: Guo Xinbiao Seiji Ikkatai

3. General Debate and Comments

10:20 Coffee/Tea Break

10:40 (Cont.)

4. Economic Instruments for Energy Efficiency and Environment (15min)

Task Force Co-chairs: Ernst Ulrich von Weizsäcker Ye Ruqiu

5. Energy Efficiency and Urban Development (15min)

Task Force Co-chair: Laurence Tubiana

6. Pathways towards a Low Carbon Economy (15min)

   Task Force Co-chair: Liu Shijin

7. Introduction of the Draft AGM Policy Recommendations (15min)

   CCICED Chief Advisor: Shen Guofang

8. General Debate and Comments

12:30 Buffet Lunch

Afternoon

Courtesy Call on State Leader of the Chinese Government

(Participants: International Council Members, TF Co-Chairs, invited special guests)

18:00 Buffet Dinner

November 14 Friday

Morning Parallel Group Discussion

09:00 Parallel Group 1 *(in Chinese language)*

Chaired by: Zhu Guangyao CCICED Secretary General

1. Leading Speaker Wang Jirong, Vice Chairwoman, Environment Protection and Resources Conservation Committee, National People's Congress
2. Debate and Comments on Task Force Reports

10:20 Coffee/Tea Break

10:40 (Cont.)

1. Debate and Comments on Policy Recommendations
2. Wrap-up

12:30 Buffet Lunch

09:00 Parallel Group 2 *(in English Language)*

Chaired by: Børge Brende CCICED Vice Chairperson

1. Leading Speaker Hans van der Vlist, Vice Minister, Ministry of Housing, Spatial Planning and the Environment, the Netherlands

2. Debate and Comments on Task Force Reports

10:20 Coffee/Tea Break

10:40 (Cont.)

1. Debate and Comments on Policy Recommendations

2. Wrap-up

12:30 Buffet Lunch

Afternoon Plenary Session

14:00 Discussion and Adoption of AGM Policy Recommendations to GOC

Chaired by: Børge Brende CCICED Vice Chairperson

1. Briefing Report on Parallel Group Discussions

2. Introduction of the Revised Draft of AGM Policy Recommendations

CCICED Chief Advisors

3. General Debate

4. Adoption of the Final Policy Recommendations to the Chinese Government

15:20 Coffee/Tea Break

15:40 Closing Session

Chaired by Margaret Biggs CCICED Executive Vice Chairperson

1. Introduction of CCICED Work Plan in 2009

Zhu Guangyao, CCICED Secretary General

2. Closing Debate and Discussion

16:30 Closing Remarks by the Vice Chairpersons

16:40 Conclusion Remarks by Minister Zhou Shengxian

17:00 Closing of the Meeting

18:00 Buffet Dinner

Speech at Opening Ceremony

Li keqiang, Vice Premier of the State Council, Chairperson of CCICED

All Members, experts, ladies & gentlemen,

CCICED 2008 Annual General Meeting is held in Beijing today. As the Chairperson of the CCICED Phrase IV, I am very happy to have this opportunity to meet you. The theme of this AGM is "Harmonious Development through Innovation". On behalf of the Chinese Government and in my own name, I extend my warm welcome to each Member and guest attending 2008 AGM and heartfelt thanks to the experts who have made unremitting efforts and presented many policy recommendations to the cause of environment and development of China over the past years.

At present, international financial and economic situation is having dramatic change right now. Continuous turmoil of financial market gives a big impact on global economy with evident downturn that brings about serious influence on economic growth of many countries and life of the people. Addressing this global challenge requires that all countries in the world jointly strengthen cooperation to safeguard steady development of world economy.

For China, this year is very unique. We have successfully met the challenges of devastating natural disasters and the impact of adverse international economic environment. The Chinese economy continues the momentum of steady and fast growth with no change of fundamental situation. However, there are many difficulties and much pressure ahead of us. Facing the adverse impacts of the change of global economic environment, the Chinese Government has made major adjustment of macro economic policy in time, carried out active financial policy and appropriately loose monetary policy and taken a series of important measures to stimulate economic growth. In the fourth quarter of 2008, the Chinese Government will add 100 billion Yuan central budget for the promotion of public welfare, infrastructure and eco environment; accelerate the reconstruction in the quake hit regions; try every means to increase the income of residents in particular that of the low-income groups; make more efforts to expand consumption and keep on steady & fast economic growth.

Current international financial crisis is a key challenge. However, if we actively respond with appropriate transformation and strong action, we can turn this crisis into a good opportunity for the shift of development mode and economic restructuring.

The Chinese Government has taken the improvement of eco environment as a key agenda for the promotion of our economic growth. This shows the determination of the Chinese Government on continuous promotion of the scientific outlook on development and harmonious development. As China is the biggest developing country in the world, its steady & fast economic growth itself is an important contribution to global economy. Meanwhile, the government has made such efforts as improving the quality & efficiency of economic growth, facilitating technological progress and economic restructuring, which may continuously improve people's living standard and life quality.

Environmental protection has close relations with development and people's life. In our efforts of expanding domestic demand and facilitating growth, we have taken the enhancement of ecological environment as a key work, this shows the determination of China in pushing forward the scientific development and promoting harmonious society. Judging from the practical situations of China, the increase of domestic demand also requires the strengthening of weak links in social development like environmental protection, energy saving and ecological conservation and cultivating new growth points with those as the focus. Under the new situation, we will combine the expansion of domestic demand with the efforts in raising living standard and strengthening of eco environment protection. We will put environmental protection at more pre-eminent strategic position and take energy saving & emission reduction as an important aspect for expanding domestic demand. Facing the challenge, we will seize the opportunity and develop a new development mechanism from the new starting point. This is conducive to both economic growth and the addressing of present pre-eminent environmental problems, thus facilitating comprehensive, coordinated and sustainable development.

This year is the 30th anniversary of China's reform and opening up. Over the past 30 years, the Chinese Government has attached great importance to environmental protection. It takes environmental protection as one of the basic national policies and sustainable development as a national strategy. There has been an important transformation of environmental protection in terms of both understanding and practice over the past years. We have taken a series of measures to prevent and control pollution and protect the environment with active outcomes. With fast economic growth, we have slowed the degradation trend of environmental pollution and ecological damage with certain improvements of the environmental quality in some regions and cities. Therefore, China has made huge efforts in the protection of the environment.

In 2007, it is the first time for China to have the reduction of both COD discharge and SO2 emission, a historic breakthrough. Environmental protection in China faces a grave challenge in particular this year. Facing the rare and devastating earthquake in Wenchuan of Sichuan Province, relevant departments of China promptly set up and initiated the environmental emergency response system to prevent the occurrence of environmental disasters in Sichuan, which indeed ensured the safety of drinking water and environmental safety for the people in the quake-hit regions. During the 2008 Beijing Olympic Games attracting world attention, government departments including Ministry of Environmental Protection and relevant local governments cooperated with each other and spared no efforts in carrying out the measures to ensure environmental quality during the period of the Olympic Games, honoring the commitment of the Chinese Government to international communities.

Of course, we also clearly understand that China still belongs to developing world and is in the accelerated process of modernization, industrialization and urbanization. Urban, regional and economic & social development in China is still not in balance with living standard not high and development of economy very important but difficult. At the same time, while environmental problems accumulated

in the past have not been addressed, new environmental problems are emerging, some of them directly affect human health. So the task of environmental protection is very formidable. Protecting the environment and improving environmental quality not only matters the welfare of 1.3 billion Chinese people, but also is an important contribution to global sustainable development.

In the future, China will firmly adhere to the path of scientific development. It will protect the environment during economic growth and develop economy with environmental considerations in order to facilitate harmonious development of economy, society, natural resources and the environment. We will adhere to the development of ecological culture, accelerate the development of industrial structure, production & consumption modes conducive to energy saving & environmental protection so as to achieve the harmony between man and nature. We will adhere to reform and innovation, establish & improve the institutions and mechanisms conducive to comprehensive coordination of sustainable development and mobilize the initiatives of many stakeholders. We will stick to the policies of people first and environmental protection for the people; make more efforts in addressing outstanding environmental problems affecting public health; and enable Chinese people enjoy rising living standard during economic growth and better life during environmental protection.

The promotion of environmental protection requires continuous innovation of system and mechanisms. We will continuously employ improved method to address environmental problems. When fulfilling well government responsibility for environmental protection, we will focus on the application of market mechanism to facilitate pollution treatment and ecological development. We will identify appropriate price relations for important energy and resource products; set up a pricing mechanism that reflects the supply and demand relations, scarcity of resources and cost of environmental loss; gradually set up eco compensation mechanism and facilitate enterprises and the whole society to reduce energy consumption and emissions and protect the environment.

To protect the environment, we need to strengthen our efforts in the development of environment and ecology. We will further increase the input in energy saving and environmental protection; speed up the construction of urban sewage treatment facilities, garbage treatment facilities, sewage pipe & network and the development of the projects on the prevention and control of water pollution in key river basins; enhance the development & protection of key shelter forests and natural forests; strengthen the development of 10 national key projects on energy saving, circular economy projects and industrial pollution control projects in key river basins in order to obtain new achievements in environmental protection.

To strengthen environmental protection capacity, we need more efforts in the development of environment and energy-saving industry. There is big demand potential in the field of resources and environment. Energy saving and environmental protection industries are sun-rise industries with vigor and vitality. We will enhance policy support by the government, encourage corporate self-innovation, vigorously develop environmental technology and promote the application of advanced technologies. We will accelerate the development of energy saving and

environmental protection equipment & service industry and cultivate a group of such enterprises with competitive force in the market, raise environmental protection efficiency and level to drive investment and consumption, forming new engines for economic growth.

Energy saving and environmental protection involve every household and matter the immediate interests of people. They require the participation of every one. China is promoting the development of ecological culture, carrying out energy saving campaigns aiming at the conservation of oil, electricity and water resources. We will continuously put more efforts in social mobilization so that each citizen enhance their awareness in energy conservation; energy saving & environmental protection become the voluntary action of each unit, household and resident who have the idea of ecological culture deep in their mind. In doing so, we will build a resource-saving and environment-friendly society in an all round way.

Opening up is a basic national policy of China and an effective way for environmental protection. We will adhere to the opening strategy with win-win situation and mutual benefit, actively carry out international environmental cooperation in more areas, and raise cooperation level to achieve common development. With environmental cooperation and exchange, we will introduce advanced foreign management experience, talents and necessary funds. Based on the principle of win-win situation, mutual benefits, practical & effective cooperation, we will actively take part in international environment affairs and jointly meet environmental challenges. Climate change is a key global issue with common concern of international communities. Adhering to the principle of common but differentiate responsibility, China will adhere to the principle of common but differentiate responsibilities and make unremitting efforts with other countries of the world to address climate change.

With 17-year history since its establishment in 1992, CCICED has become an important environmental arena opening up to the outside world and key platform for enhancing environmental cooperation and exchanges. CCICED has gathered experts, scholars, government officials and famous people from many countries who have both international perspectives and rich theory and practical experience. I hope that all participants here continue making full use of your advantages and pay close attention to key issues of environment and development in China as before. Based on Chinese national conditions and introduction of advanced international experience, CCICED Members should put forward appropriate policy recommendations targeting key issues, promote the materialization of those recommendations so as to contribute your wisdom and force to environmental protection cause of China.

It is common desire and responsibilities of all countries in the world to protect global eco environment and achieve sustainable development. Let us take active action with mutual help and sincere cooperation to jointly facilitate & maintain the stability and prosperity of world economy and care the Earth — home on which mankind depends.

Finally, I wish a complete success of CCICED 2008 Annual General Meeting!

Special Speech

Zhou Shengxian, Executive Vice Chairperson

Respected Chairman, dear Council Members, experts, ladies and gentlemen,

First, I'd like to inform all of you of a piece of good news. According to preliminary statistics, the discharge volume of COD and SO_2 of China during the first three quarters of this year witnessed 2.7% and 4.2% decline respectively compared with that of the same period of last year, further maintaining the sound development trend of "double fall". These achievements are obtained against the background of the first ever "turning point" for pollution reduction in last year, the efforts made in coping with the continual disasters of low temperature, sleet and snowstorm in the south and devastating earthquake in Wenchuan County this year as well as the current complex and volatile global financial and economic situation. All these have fully demonstrated that the environmental protection efforts in China are under steady enhancement, and the coordination between the environment and economy is improving.

As you all know, coordination in development is one of the basic requirements for the scientific outlook on development, which encompasses the coordination of development quality (growth rate, structure and profit), the coordination of development elements (population, resources and the environment), the coordination of the development momentum (investment, consumption and export) as well as the coordination of development mode (urban area, rural area and different regions). In specific, the coordination of development elements aims to realize the coordination between the people, resources and the environment. The human society has undergone historical process of expanding and deepening practice and improving understanding from recognizing environmental problems to resolving them. We gradually realize that the ultimate root cause of environmental pollution rests with the imbalance among the three major development elements: population, resources and the environment, and the history of environmental protection exactly represents the history of proper handling of the relationship between the environment and economic development.

Air constitutes a major environmental element. Human beings can not live without air and can not have good health without clean air. The threat of air pollution to human society has long become the nightmare during the process of social modernization and civilization. In 1948, the small town of Donora in Pennsylvanian of the US had been enveloped in smog for several days, leading to the affliction of diseases of over 5,000 local residents. In the midwinter of 1952, London city of the GB was deeply enshrouded by heavy frog, and over 4,000 people died due to the dirty air. Among the global top 8 public environmental incidents shocking the whole world, 5 are caused by air pollution. Both retrospection of the past and serious utilization of the present

are for the building of a better future. Environment is the fundamental condition for the survival and development of human kind, and improving the environment is a key issue concerning people's livelihood. While meeting with the International Members of the CCICED in last November, Premier Wen Jiabao noted that he would serve as an "environment-oriented" Premier, and the State Council should become an "environment-oriented" State Council. He will not only strive to maintain sound economic development of China, but also build a sound environment.

Dear Members,

The work for guaranteeing the environmental quality for 2008 Beijing Olympic Games has provided developing countries with a case worthy study and learning in the field of air pollution prevention and control. The holding of the Olympic Games is the dream of the Chinese nation for a whole century, while the convocation of a first-class Olympic Games with Chinese feature is the solemn commitment made by the Chinese people to the international community. Viewed from natural conditions, Beijing is surrounded by stretching mountains. With the Taihang Mountains lying to its west and Yanshan Mountains to the north, the atmospheric circulation of the city is blocked, amazingly resembling that of the cities experiencing public pollution incidents. Therefore, Beijing faces unprecedented and tremendous challenges in fully fulfilling its environmental commitment during the Olympic Games. Under this background, there were some unharmonious voices from the international community. Some people employed the environmental issue to make false accusation, and even slander, over the Beijing Olympic Games. In fact, we are fully aware that the work for guaranteeing environmental quality for the Olympic Games is a systematic project with many and jumble tasks, and the prominent conflict between environment and development of China made a concentrate reflection in this unprecedented project.

In an effort to tackle air pollution problem in Beijing, starting from 1998, the Beijing Municipal Government has ushered in over 200 measures for the control of air pollution in 14 consecutive phases under the leadership of the Central Committee of the CPC and the State Council with total investment of over 100 billion Yuan for the purpose of creating a "Green Olympic Games". The energy mix of Beijing has shifted from heavily relying on coal to a cleaner one, and the consumed volume of natural gas has grown by 3.5 times in the last 7 years; the pillar enterprises like Shougang Steel Corp. were moved out of Beijing. Many heavy-polluting enterprises were closed or transformed to other business. The Phase IV Standard for the Emission of Vehicle Exhaust has put into effect, and over 60,000 old or used taxies and buses were eliminated. More than 400 pieces of bare land have undergone the treatment of dust removal with grass cover. All waterways within the 6th Ring Road of the city have been treated, and the crystal clear water zigzags through urban areas like jade belts. At the same time, the concept of "Green Olympics" has gradually entered into tens of thousand of household: more and more residents are self-consciously put their garbage into classified garbage bins; energy-saving light bulbs and water tags are used in ordinary families. The initiatives of building green community, green school and

green enterprises are warmly echoed by all social sectors.

In a bid to honor the solemn commitment of holding a “Green Olympics”, the State Council approved the establishment of the Coordination Group for Guaranteeing the Air Quality for the 2008 Olympic Games led by the Beijing Municipal Government and the Ministry of Environmental Protection and participated by five provinces (autonomous region and municipalities) of Tianjin, Hebei, Shanxi, Inner Mongolia and Shandong. The Coordination Group conducted special study over the situation and tasks for guaranteeing the air quality of the Olympic Games, gathered the measures proposed by six provinces (autonomous region and municipalities), organized experts and academicians to make relevant studies and held many meetings for analysis and documentation. Based on all those, the Group compiled the Measures for Guaranteeing the Air Quality of Beijing for the IXXX Olympic Games. The Ministry of Environmental Protection and other six provinces (autonomous region and municipalities) earnestly implemented the Measures, launched joint prevention and control work and seriously promoted the work for guaranteeing the environmental quality for the Olympic Games. The installed capacity of all the thermal power generation units in operation equipped with desulphurization facilities in the six provinces (autonomous region and municipalities) before the Olympic Games reached over 26 GW. A number of major industrial pollution treatment projects have been completed, and a batch of outdated production and techniques have been eliminated or moved.

Following unremitting efforts, the air quality of Beijing has been improved during the past several years. In 2007, Beijing experienced 246 days of clean blue skies, 146 more than that of 1998. During the Olympic and Paralympics, the up-to-the-standard rate for air quality of Beijing hit 100%, among which 10 days and 2 days were up to Standard I respectively, and the daily average concentration of various pollutants including SO_2, CO, NO_2 and inhalable particulates dropped by about 50% than the same period of last year, reaching the level of advanced cities across the world and the best in history for the last 10 years. Beijing residents say that the sky is becoming higher in sunny days while rain drops are cleaner in rainy days. Meanwhile, the air quality of all the co-host cities has basically hit the required standards, fully fulfilling the commitments to environmental protection of green Olympics.

Dear Council Members,

Environmental quality guarantee during the Olympics not only provided strong support for a successful Olympic Games but also presented a brand new case that a big developing country is managing to improve regional environmental quality and promote coordinated development between environmental protection and economic development. In the seven years to prepare for the Olympic Games, Beijing has witnessed an annual average economic growth rate of 12.4% and over 70% of output value and employment in service sector, achieving notable improvement of people’s living standard and better environmental quality year on year. This is a win-win deal

for both the environment and the economy. The practice of Green Olympics has led to economic restructuring, shift of the development pattern and balanced development in Beijing. The success of Beijing's Green Olympics fully demonstrates the significance of balanced growth for seeking a fundamental solution to environmental problems and improvement of environmental quality. An important experience for reviewing and promoting the achievement of Green Olympics is to strengthen environmental protection in an all-round way, accelerate the nurture of ecological civilization, promote harmony between man and nature and man and the society and further reinforce the coordination of the quality, driving forces, pattern and factors of development so as to create a virtuous circle for improved environmental quality and quality of economic growth and build a resource-saving and environment-friendly society.

Enhance the balance of quality development entails strengthened environmental protection in the whole process of reproduction. Production, circulation, distribution and consumption are the four links of economic operation. We must build a comprehensive pollution control system in each of the four links to balance the need for rapid development with rational industrial structure and good economic benefit and achieve coordinated and sound development. We will actively promote clean production by developing a sound mechanism combined with mandatory requirement and incentives under which enterprises obtain more competitive force in the market due to their overall good performance in energy conservation, consumption reduction, pollution reduction and benefit increment in the whole production process. To facilitate the development of circular economy, we will develop and promote best available technologies conducive to conservation, alternative technology, reuse and pollution reduction, advance the building of eco-friendly industrial parks and industrial clusters and raise the efficiency of energy and resources. We must strengthen law enforcement, curb polluting enterprises, phase out backward productivity with a firm hand and optimize industrial structure, hence leading the traditional industries to the new industrialization path featuring high-tech, good economic benefit, low consumption of resources and minimum environmental pollution.

Strengthening the coordination of the driving forces of development calls for active support to environmental industry. Investment, export and consumption are three engines driving economic development. As the world economy is under marked slowdown with dramatic reduction of the demand from foreign countries, only by expanding domestic demand, particularly consumption can we sustain a fast and steady development. We should make environmental industry an essential part for expanding domestic demand, turn emerging industries that use new energy sources and develop renewable energy, conserve energy, water and timber and control pollution into new engines of economic growth. Focus will be on the improvement of people's environmental well-being. We will develop and perfect strategies, policies and standards promoting the development of environmental industry, establish

technology innovation system and upgrade the technologies of environmental industry. More investment will be channeled to the creation of diversified conditions for industrial investment. Efforts will be made to develop environmental service industry and accelerate its commercialization and industrialization. We need to foster key enterprises and guide small-and-medium enterprises to work on specialized and sophisticated areas that are new and special. Regulation will be strengthened to set up a unified, open, fair and orderly market for the industry. Meanwhile, grasping the opportunity that the concept of Green Olympics has been rooted deep in people's mind, we will continue environmental publicity and raise public awareness, which will help continued growth of demand for environment-friendly products and drive rapid development of environmental industry.

To further balance the development pattern, we must promote environmental protection in both rural and urban areas and at regional scale. Unbalanced economic development and environmental protection in urban and rural areas and at regional scale is a long-standing issue in China, which has to be incorporated into the overall picture. As for some notable regional environmental problems like haze in the Pearl River and the Yangtze River deltas, we need to extend our regional cooperation activities in pollution control during the Olympics and speed up the improvement of regional environmental quality. We should observe the law of nature and implement the supporting policies for national zoning of eco function areas. In line with the requirement of regional development that classify all regions into different functions suited for optimized development, principal development, restricted development and prohibition from development, regions should develop in a rational way to form a pattern with different characteristics. Meanwhile, urban and rural environment are an integral whole. Without sound solutions to rural environmental problems, temporary improvement of urban environment will not last. We should treat environmental protection in rural areas and urban areas as equal and stick to synchronized development. We will focus our attention on drinking water safety and prevention of pollution from agricultural and industrial production in rural areas to promote steady progress of the overall improvement of rural environment and facilitate comprehensive amelioration of environmental quality in both rural and urban areas.

To strengthen the coordination of development factors, we must mobilize all social forces to cultivate ecological civilization. Population, resources and the environment are three major elements for development. People are the dominant element for their initiative. They can be consumers of resources and the environment as well as protectors of them. To evolve from the consumer into the protector, people must have strong awareness in environmental protection and entrenched idea of ecological civilization. Therefore, we need to mobilize all social forces to promote environmental protection and cultivate ecological civilization. The essence of cultivating ecological civilization is to build a resource-conserving and environment-friendly society based on the carrying capacity of resources and the environment and the law of nature as well as the target of sustainable development.

We must put environmental protection at the foremost position of the strategy for industrialization and modernization and make it a principle for every organization and household in a bid to deliver the kind of production and consumption mode suitable to ecological civilization. We will develop institutions for sustainable development, improve and implement the system of compensated use of resources, eco compensation system and strict target responsibility for environmental protection. We will focus on overall improvement of water environment in key river basins and rehabilitate overloaded rivers and lakes. We will make unremitting efforts to promote the idea of ecological civilization and create an atmosphere where every one cares for the environment and support to and participate in environmental protection. Every Chinese citizen with green consciousness will embrace the flower of ecological civilization.

Dear Council Members,

Through the long process of human civilization, countries in the world have never been connected so closely as today. Now the whole world is facing increasingly daunting environmental challenges. All countries should view these environmental problems from an integral perspective. The subconscious that to help others is to help ourselves should run deep and actions taken to enhance more pragmatic international cooperation and exchanges in the field of environmental protection. Only in this way can we have a bright future. Under the background of more complicated and unstable international economy with dramatic downturn, developed countries should maintain their official environmental grants to developing countries. Meanwhile, we need to break down the barriers to environmental technology cooperation; establish a rational mechanism for technological transfer and promote more rational distribution and flow of technology and funds; strive for coordinated development of the environment and economy in all countries and play a positive role in stabilizing global economy.

This phase of CCICED is a critical period for China’s cause of environment and development. I believe, with strong leadership of the Chinese Government, wide support from international communities and joint efforts of all Council Members and experts, the Council is bound to achieve bumper harvest and make greater contributions to the promotion of the cause of China’s sustainable development. Finally I wish a complete success of the 2008 Annual General Meeting, and wish all guests a pleasant stay in Beijing.

Thank you!

Speech at the Opening Ceremony

Margaret Biggs, Vice Executive Chairperson of CCICED

Honorable Vice Premier Mr. Li Keqiang and Minister Zhou Shengxian, and colleagues and friends. Let me express first that we are honored to have the Vice Premier with us today to share his thoughts and guidance as our Chair. Like our new Chair, the Vice Premier, this is my first Council meeting. I am privileged to join the Council with such a successful history. It brings the best Chinese and international expertise here on China's pressing problems. I am struck by the dedication of Council Members and the complexity of the issues the Council addresses. As many of you may know the Council has been in existence since 1992, throughout history, it has enjoyed wide international support, reflecting awareness that problems affecting the environment know no borders. And meaning solutions can only flow from international cooperation. Over the past 16 years, the Council has become a unique forum for collaboration between policy makers, scientists, academics experts, and practitioners in China and internationally. It demonstrates not only international commitments to cooperation in addressing environmental challenges, but also China's determination to meet these challenges to the benefits of its people and global community. I believe the work of the Council this year is relevant and important for China and the world as it has been many times in the history. And it comes at an important moment when the global community is facing a historic economic and financial crisis.

Our agenda over the coming days covers remarkably interesting and challenging set of topics, including the consideration of pressing challenges that threaten economic progress in China and elsewhere, issues like sustainability and environmental innovation that can improve health, rural and urban development and economic opportunity in China's future. These are practical and urgent matters for our consideration. And I hope we can produce sound recommendations to the government of China. I wish to provide some concrete example of the task ahead us. Let me start with the most pressing matter. The serious situation of global recession and the need of new strategy of economic grow. As we know, the world economy and ecology are interlinked. We face the potentially grim situation of letting economic downtown getting the way of environmental progress. If it happens, we will add to our environmental debt. And that will burden future economy of China and others all. Alternatively it can be used as an opportunity to make a paradigm shift toward a model of economic development that is conducive to the environment with sustainability and stability.

Our task Force on Innovation for an Environment-Friendly Society calls for national environmental action plan and program that can move innovative technology from the lab into widespread application more quickly. These technologies will help prevent elusion and environmental degradation and will help China to be highly competitive in tomorrow's economy.

The thought innovation and ideas compares unless market develops.

Our recommendation will have to deal with how this market can be developed and where international cooperation can be most effective in bring them about. We will also discuss the link between environment and health in China. Our Task Force on this topic takes the picture of a considerable uncertainty despite the welcome joint announcement by the Ministry of Environmental Protection and Ministry of Health of an action plan. The damage to human health in China from environmental sources is still unknown, although it is a clearly major concern for both urban and rural areas. We will be examining recommendations for providing a much stronger and publicly available information base on toxic substances, and mechanism required to make the action plan effective. We will also consider relevant experience of other countries on how the issue of compensation for damage to health can be addressed.
This year we are giving early consideration to work as an important progress by several Task Forces on the issues of environment and energy. We are doing do because we recognize the topic of critical importance to China, domestically and internationally. Over the past two years, the CCICED has been exploring the subject of low carbon economy, drawing upon experience from a number of countries and the experience of leading economists and energy expert in China. Our Task Force on the topic has put preliminary recommendation urging further research on policy development on China's part and suggesting consideration of low circular economy target in the planning for the 12th Five-Year Plan.

The financial crises has hit the world in the past months and leading to dramatic shift of regulations and the role of market. I understand strong regulation and the use of market based instruments have been the by-line of this Council's work for many years. And we will continue discussion in this meeting with the new figure.

In closing, this meeting opens the opportunity to plant the seed of innovation, the product of mechanisms of which exploration of decades ahead. By helping China safeguarding the sustainability achievement, such as the advancement of development goal, the restoration of forests and grassland and environment sanitation, the China Council also helps the rest of the world to move closer to our mutual concern expressed by China as ecological civilization. We have been impressed with the seriousness and determination with which China is facing its environmental and development challenges and measures taking to address them. Among these measures, was the creation of the Ministry of Environmental Protection this year. And we offer our assurance of cooperation and support to Mr. Zhou and his colleagues. It is our responsibility now on the Council to come forward with sound advice and well considered and constructive recommendations. Through this collaborative process, we all get profits. China has complex and far-reaching impacts on the rest of the world on global environmental issues and on economic development. Part of the measures taken by China will benefit us all. Because we learn from your new approaches and techniques and we all gain from international cooperation.

Therefore, it is a great pleasure that I join and welcoming you to what promises to be

a valuable meeting at a timely moment for us all.

Thank you.

Speech at the Opening Ceremony

Xie Zhenhua, Vice Chairperson

Respected Vice Premier Li Keqiang, Vice Chairs of CCICED，
Members and experts:

Good afternoon. I am very happy to attend CCICED 2008 AGM and discuss with new and old friends of CCICED about relevant issues on environment and development in China. I witness the development process of CCICED over the past 17 years that adheres to providing recommendations on sustainable development of China, and I feel it an honor to continue CCICED work under the leadership of Vice Premier Li Keqiang. Just amoment ago, Vice Premier Li gave us an important speech, which analyzes domestic and international situation confronting China and identifies the requirement for the promotion of the environment & development cause of China. He expounded the basic principle on enhancing international cooperation in the field of environment & development and presented higher requirement for the future work of CCICED. We will seriously implement his instructions in the future work.

Next, I briefly introduce to all Members the information about energy saving and emission reduction this year in China and preparation for the Copenhagen conference on climate change.

In the first six months of 2008, responding to complex domestic & international situation and severe natural challenge, China has won great victory in fighting against heavy snow storm and sleet disaster in southern part of China early and the devastating earthquake in Wenchuan of Sichuan Province. It has made more efforts in energy saving and emission reduction when successfully holding Beijing 2008 Olympic Games with new progress in each activity of energy saving and emission reduction.

There is an evident progress in the development of laws & regulations in the field of resources and environment in China. Now we begin the implementation of the newly amended the Law of the People's Republic of China on the Conservation of Energy. The new law on energy saving in legal level identifies the conservation of resources as a basic national policy of China. It stipulates that the State carries out a series of systems like energy saving target responsibility and accountability system as well as energy saving assessment & review system for construction projects.

The Standing Committee of NPC passed and promulgated the Law on the Promotion of Circular Economy, which will be put into effect on January 1, 2009. This law identifies 6 basic institutions for circular economy and lays a legal foundation for the promotion of circular economy across China.

The State Council has issued the Regulations on Energy Saving in Public Institutions, which regulates energy saving of all government departments and institutions and organizations wholly or partly use national financial funds. At the same time, the State Council has issued the *Regulations on Energy Saving of Civil*

Buildings, which requires gradual control and reduction of the energy consumption in civil and public buildings that account for significant proportion of energy consumption. It unveiled the Circular on Further Enhancement of the Conservation of Oil and Electricity. The circular requires focusing on key equipment and products like automobiles, boilers, electric machinery, air conditioners and lighting devices with wide application, big potential and fast outcomes; applying comprehensive supporting measures; developing effective incentive & constraint mechanism to accelerate the application & extension of high-efficiency energy saving products and technologies and raising oil and electricity efficiency.

To achieve the target of energy saving and emission reduction, the State Council has made the arrangements of 12 key tasks such as enhancement of the examination of target responsibility, firm curbing of rapid development of the industries with high energy consumption and emissions, acceleration of phrasing out of lag-behind productivity, more efforts in the implementation of energy saving and emission reduction projects, doing well energy saving in key fields, acceleration of the development & extension of energy saving and emission reduction technologies, acceleration of the development of circular economy, enhancement of supervision on key pollution sources, the implementation of economic policies conducive to energy saving and emission reduction, improvement of relevant regulations & standard, strengthening of supervision, inspection and administrative law enforcement on energy saving and emission reduction as well as the organization of “national public campaign on energy saving and emission reduction”. At the same time, it requires that over 80% new buildings by the end of 2008 across China shall comply with compulsory energy saving standard during construction stage. In addition, 100% of main environmental indicators of the concentrated surface drinking water source areas of 113 key cities on environmental protection meet national standard.

Remarkable outcome of energy saving and emission reduction. In 2006 and 2007, the accumulated energy saving reached 147 million t of coal equivalent under rapid economic growth. Up to 2007, the desulphurized coal-fueled power generation sets with a total capacity of 120 million kW across China had been put into operation. Newly added capacity in urban sewage treatment was 13 million ton per day. The total COD discharge of China reached 13.818 million t, down by 3.2% compared with that in 2006; total SO2 emission was 24.681 million t, down by 4.7% compared with that of 2006. On this basis, COD discharge went down by 3.96% and SO2 by 2.48% in the first 6 months of 2008. Energy consumption per unit GDP in the first 3 quarters of 2008 went down by 3.46% compared with that of the same period last year.

The Chinese Government will keep on promoting and improving all economic policies conducive to energy saving and emission reduction. **In industrial policies,** first, we will carry out strict management on fixed asset investment projects in industries with high energy consumption and emission to control too fast growth of these industries at source. Second, we will establish the mechanism that phases out lag-behind productivity to accelerate the phasing out of such industries as power, iron & steel, building material, electrolytic aluminum, iron alloy, calcium carbide and sheet glass. Third, we will develop incentive policy to speed up the development of

service and high-technology industry. **In price policy,** we will actively facilitate the reform on the price of resource products and environmental protection charge. We will improve the staircase electricity pricing policy and canceled the favorable power policy for enterprise with high energy consumption, lower the price for the electricity from small hydropower stations and carried out incentive power policy on such energy sources as biomass, wind and solar energy as well as the electricity generated in landfill facilities. We have issued the measures on the management of the price of electricity from desulphurized coal-fueled generation sets and operation of desulphurization facilities; we have also pushed gradual shift of urban heat charge calculated from area to heat. **In financial policy,** we have issued the *Provisional Measures on the Management of Financial Reward Fund on Energy Saving Technical Reform* to award the enterprises according to real amount of energy conservation in the energy saving technological reform projects. In addition, we have issued the *Provisional Measures on the Management of Financial Subsidy on the Extension of High-efficiency Lighting Produces*, which, by employing government subsidy, supports big users and residents using high-efficiency lighting products in place of in-service incandescent bulbs and other low-efficiency products. We have promulgated the *Provisional Measures on the Management of Special Fund for Government Office Buildings and Large Public Buildings* to support the establishment of energy saving supervision and management system for such buildings. We have issued the *Measures on the Management of Special Fund of Central Budget for Emission Reduction of Major Pollutants* to strengthen the capacity building in three systems, i.e. pollution indicators, pollution monitoring and examination. **In taxation policy,** we have adjusted the export tax refund rate of the products with high energy consumption or emission or resource oriented. We have issued favorable policies such as reduction and exemption of the income tax of enterprise based on its energy saving and environmental protection projects and the investment in energy saving and environmental protection equipment compensating for income tax. We have carried out such favorable policies such as reduction of income tax and value-added tax for recycle and reuse products; raised the consumption tax for high emission vehicles and lowered the tax for low emission vehicles. Also, we have studied and designed environmental tax program. **In Monetary Policy,** we have released the *Guidance on the Improvement and Enhancement of Monetary Service in the Field of Energy Saving and Environmental Protection* and Guidance on Credit Granting for Energy Saving and Emission Reduction. We have unveiled the *Suggestions on the Implementation of Environmental Protection Policy and Prevention of Credit Risk*s and *Guidance on the Insurance of Environmental Pollution Liability*. We support the issuing of enterprise bond by qualified enterprises in the field of energy saving and emission reduction and actively carry out trial work on profit bond of sewage treatment projects. We also have studied and developed the *Provisional Measures on the Management of Energy saving and Emission Reduction Fund in Operation Budget of National Owned Assets*. The implementation of the above policy measures to facilitate energy saving and emission reduction enables enterprises have more consciousness and initiatives in saving energy and reducing emission.

Although there are some progress on energy saving and emission reduction in China, on general however, there is no fundamental change of the extensive growth mode with too big cost of resources and environment for economic growth. With population increase and accelerated industrialization and urbanization, the contradiction between economic growth and resource & environment is increasingly serious and become a pre-eminent problem for China to achieve sustainable development. To achieve the energy saving and emission reduction target during the "11^{th} Five-Year Plan" period, we must make more efforts in the long term.

To address international financial crisis, the Chinese Government has recently adopted active financial and appropriately relax monetary policies. It has taken ten measures such as accelerating the improvement of living standard, strengthening the construction of rural infrastructure, post-disaster reconstruction, improving ecological environment, adjusting industrial structure, saving energy and reducing emissions to expand domestic demand and sustain growth momentum, which are conducive to long-term development. When addressing the international financial turbulence, we still pay high attention to and actively address climate change. Apart from saving energy and raising energy efficiency, the Chinese Government has made further efforts in optimizing energy mix and investing the development of renewable energy. In 2007, the total application amount of renewable energy was about 220 million t of coal equivalent. At present, renewable energy accounts for around 8.3% of the total primary energy in China. It is expected that it will reach 10% in 2010 and 15% in 2020. Up to now, the total installed capacity is 10 million kW for wind generation sets and 163 million kW for hydropower. In addition, more efforts have been made in the development of nuclear energy. The total installed capacity of nuclear power has increased from 2.1 million kW in 2000 to 8.85 million kW in 2008. In 2006 and 2007, China reduced 835 million t CO2 emission with the help of the implementation of each measure on energy saving, higher efficiency and development of renewable energy sources.

The Chinese Government has taken active measures to address climate change and made proactive contributions to facilitate the carrying out of Bali Roadmap by all parties and the success of Copenhagen meeting. China unveiled its White Paper on Climate Change in October. It in cooperation with United Nations held the "Beijing High-Level Conference on Climate Change –Technology Development and Technology Transfer" on November 7-8, 2008. Over 800 participants including more than 30 ministers and representatives from 70 countries attended the meeting. The meeting approved the "Beijing Declaration". In August, 77 plus China submitted to UNFCCC Secretariat the initiative on the establishment of relevant mechanisms in terms of technological transfer and funds. In October, China put forward a proposal on adaptation to climate change at the East Asia Summit on Climate Change. At APEC Meeting in last September, Chinese President Hu Jintao put forward the initiative on setting up Asian-Pacific Forest Restoration and Sustainable Development Network. With the above efforts, the Chinese Government has made active and very constructive role in jointly addressing climate change with other countries in the world.

During this meeting, I would like to listen to the comments & suggestions of each Member and expert on such aspects as energy saving and emission reduction, development of circular economy, higher energy and resource efficiency and climate change in China.

As an international high-level policy advisory body, CCICED has unique expert and resource advantages with growing team and vitality. Past experience shows that CCICED policy recommendations have played an active role in the development and adjustment of relevant national policies in China. As a Vice Chair of CCICED, I am willing to work with you to study these issues, explore new methods, do well the work and promote scientific development in China.

Thank you ！

Speech at the Opening Ceremony

Klaus Töpfer, Vice Chairperson

Madam Chairperson, friends, Vice Chairman, ladies and gentlemen, dear friends and dear colleagues,

I'm indeed an old person in these meetings of CCICED. But I can inform you this meeting is really in a very critical time, if you don't want to use the word "too inflational", it is really a historic time. And I believe it is very good to know that what was prepared for this meeting by the task forces, senior experts is hanging up to this challenge. It's really a world-class basis for our discussions for the advice to the Chinese government.

It's really a critical historic time. On the one side, and I underline what was mentioned in one of those papers, these past twelve months has been the most active ever the year for China in terms of improving the relationship for environment and development, and that we need all. If you see, the speech of his Excellence President Hu Jintao at the 17th CPC Congress, then you see there is something like a paradigmatic shift, there's a change in the overall development, which it's important for this country, but I believe for the whole world.

Indeed, this is to measure, and I'm very happy that my good old friend, Minister Xie underlines those figures, that we know, that this is not only some think in the blue as a vision, it's going more and more implementation. Of course, we know, there is still a long way to go. You never can change in a forthright what was developed for some years. But if you see the basic laws in this field, the law on promoting circular economy, the law on renewable energy, the law on urban planning, then you know, this is a great basis, and we have to underline that, there is noble objective of a harmonized harmonious society of ecological civilization, which is not lip service, but has consequences for the development of this country, and of this world.

Therefore, this is a historic, we need caution. I'm a little bit afraid that this paradigmatic shift is not yet very well known to the world. Maybe that we can contribute as Members of this meeting, and of this CCICED process, to make it better known.

A caution a historic time is not only of positive think, of course, we are challenged by dramatically destabilized global economy. It is mentioned again and again, and you can not discuss in those days environment topics, sustainability topics without being aware of those framework condition. We see inflation of imports, we see recessions, we see drops going be precaution on the social fabric, the social pillars of sustainable development, we see stagnation. And let's very clear, the consequences of this

destabilized global economy is mainly within developing countries, they are the poorest of the poor, we are restoring some process we could positively see in the last years.

It's good to know, that in this very moment, China proves to be, again, a responsible global citizen. And I want to underline only three topics, which I believe, are very important in this very field.

First, you'll know we have to develop a new architecture for global economy and global society. If we are not using this crisis to bring this new architecture, some people name it two systems to a success. We are only programming the next crisis with all its negative consequences. So we have to plot wherever China is leading and constructive actor in this development of a new architecture. And we know, that this must integrate much more the topic of fighting poverty, the topic of environment degradation in this new architecture.

I learned with great pleasure with my friend and my successor, my son in this office, Achim Steiner, develop very clearly this green economic structure. I believe we should consider a little bit also here about these, what are the, let's say, the integration in this reform process quite now, I'm happy that quite a number of recommendations are in the papers. And I sincerely believe, that this is also a good chance to prove that this new global structure has a totally as dimensional fairness for developing countries and fairness for those coming now to overcome poverty to make globalization an instrument for overcome poverty, first pillar. We must be interested in and stimulating the Chinese government to play a leading role in the development of this architecture, and this is not a far-reaching topic they start in this weekend, and therefore it is high time to be aware of this.

Second, I think it was more than a marginal event, China decided, on a pillar, to stabilize the economic development to fight global recession by this stimulation program. I learned for the first two years, 600 billion US$. If you see it for the time to come, there is much more. This is really a good chance to implement what Premier Wen Jiabao mentions that we need transformations, much more concentrated to the domestic market and to consumption, much more concentrated to energy and resource saving and efficiency.

And finally, third, this white paper on China's policy and action for adverse climate change can only congratulate our friend—he presented this paper only some days before. It gives a clear signal that climate change and the assessment of China is not a victim of the financial crisis. Quite the contrary, that's financial crisis can be used in making a boost for climate policy. To integrate all 600 billion and more for energy efficiency, for the development of new infrastructure, especially the raiway system and a lot of others. Yes these topics are architecture, investment program, and the White Paper, they belong together, and I think we have a good chance to make a

contribution also to the Copenhagen Process.

Finally, ladies and gentlemen, I believe we should be aware of the success of China in organizing the Green Olympics. Not only in organizing it, but also being on the medal table No. 1. Minister, I can inform you, that at least in my country, this was a wonderful experience, and this is possible.

The next big meeting here in China will be in two years time ——Expo 2010 in Shanghai. The title of this is “Better city, better life”. And whenever we have cross-cutting topics with all the all activities, we must be aware sustainable development will be successful or not successful in cities. China goes to urban population of over 60% as the year 2000 earlier. What can be contribute in this field, I’m very happy that one of our task forces delivered a very respective paper in this field, and we should be aware that this is really high on the agenda as a cross-cutting topic, of course, as this is for the whole region as well. And if you go to cities, you will see very concrete possibilities.

Let me finalize this, I know that I speak too long, Madam Chairperson. But I was just in Shanghai, and I was invited to go to the central landfill. I never saw a landfill of this capacity, incredible. But they developed the CDM project, and they are now collecting the methane gas and make this a contribution to climate change: investment, job creation, technology transfer and environment benefits, a wonderful experience. Then you go to the huge sewage water treatment plant 2 million tons a day, and there still the question what we are doing is the largest. So we can see a lot of those investment projects very clearly, and I believe that it’s a great endeavor. And it is a good chance we have this paradigmatic shift.

The visible, not only symbolic, but visible signal is, we have a Ministry for Environmental Protection. Congratulations, Minister, you are the first environment minister of China. I mentioned this morning in the Bureau Meeting, you see, I was once the first environment minister at home. That is a great chance. If you are the first, you are always mentioned later. You are the most important person. Therefore, all good luck for your work, for Ministry of Environmental Protection, which needs more staff, but needs not more commitment. You have been doing it already, and all our best wishes for you. You know, this CCICED, more than once, recommended to upgrade SEPA to a ministry. Now, we can celebrate it. And I’m happy. That later on, we have a reception, maybe we come back to this wonderful development.

And thank you very much.

Speech at the Opening Ceremony

Børge Brend, Vice Chairperson

Chairperson, Dear friend Minister Zhou, Dear friend Minister Xie, Secretary General Zhu, Colleges in CCICED,

In his speech last weekend Premier Wen Jiabao took a leader role on behalf of China as the worldwide financial crisis is spreading into the real economy. The physical package that the Premier launched was very brave and timely. I'm also pleased that the package includes important environmental measures and even more pleased that the Premier warned that climate change must be addressed despite economic slowdown. I would like to underline the urgency to addressing environmental matters in the context of the new economic realities facing the world.

Past economic downturns have led, unfortunately, to increased environmental disruptions. For example, effects on forest lands and etc. This time we can't afford this. China has demonstrated that it is an innovator on economic development and it will be an innovator on environment and development. The path taken by 1.3 billion people cannot fail to have an impact on the world.

The global financial crisis is indeed the right time for China to make a move to a low carbon growth path including investments in low carbon infrastructure and renewable technology. Developed countries have to take the lead, but I'm glad that China has shown willingness to commit commits. During the World Economic Forums Summit this weekend in Dubai, there were two lessons learned highlighted from the current financial crisis. One, the longer you delay mitigating risk, the bigger the crisis will be; second, the world will need a growth engine to come out of the current slowdown, which could come from investments in low carbon infrastructure and energy efficiency.

There will be enormous global markets for climate-friendly technologies and products in the not too distant future. China, with its competitive advantage in manufacturing, with its skilled labor force and a larger domestic market, is well placed to produce and try out new climate-friendly products. In some cases these products can be developed by China alone. In other cases industrialized countries should cooperate with China on research and initial development, while China can demonstrate the products on a commercial scale. The opportunity for cooperation and development and demonstration of new climate-friendly technologies also offer a complementary track to the on-going international climate change negotiations, which is hampered by mutual distrust between developing and developed countries. Technology transfer and an offensive way of looking at that is a prerequisite for a successful outcome of COP15 in Copenhagen. A low carbon economy will put greater emphasis on high

efficiency and conservation as well as recycling of materials and will, therefore, reduce also the threats of resource shortages. More and more industrialized countries are also introducing measures against greenhouse gas emissions. Also, consumers in these countries have an increasing awareness of the carbon footprints, of goods and services they are consuming.

Another promising sign in these states are coming from the US Administration that already has announced initiatives on how to transform blue-collar labor into green-collar opportunities. And also as my colleague, as Vice Chair Klaus Topfer underlined, also complements to UNEP and new Executive Director Achim Steiner, not so new any more, but any way with a new initiative a global green new deal to get the global markets back to work. Can you think of a more timely initiative?

Friends, I find this year's AGM agenda very timely, well prepared. And I'm really looking forward to a candid and open discussion air in the coming days. Thank you!

Summary Speech at the Closing Ceremony

Zhou Shengxian, Executive Vice Chairperson

Members，experts and guests,
Under the joint efforts of all Members and experts, CCICED 2008 AGM has successfully finished each agenda with great achievements.

Yesterday afternoon, Premier Wen Jiabao met with International Members. In view of the spread and worsening of current international financial crisis and slowdown of global economy, Premier Wen asked two questions of common concern at the beginning: 1) Should we still adhere to environmental protection and sustainable development? 2) What is the relationship between the current promotion of steady fast economic growth and long-term socio-economic development? After further exchange of opinions, Premier Wen pointed out that China should take this financial crisis as an opportunity for both economic growth and the promotion of environmental protection cause. Hearing this, we are encouraged with higher spirit and stronger confidence for doing well environmental protection work under new situation. On the first day of AGM, Mr. Li Keqiang, Vice Premier of the State Council and Chairman of CCICED attended the opening ceremony and gave us an important speech. He clearly said, China will continuously put environmental protection at a pre-eminent strategic position and enhancement of the development of eco-environment as an important measure for expanding domestic demand, facilitate the improvement of welfare and shift of growth pattern, maintain steady and fast economic growth in order to achieve comprehensive, coordinated and sustainable development of the economy and society.

Centering on the theme “Innovation and harmonious development”, Chinese and International Executive Vice Chair and Vice chairperson of the Council gave us their speech or remarks. Ms. Julia Marton-Lefevre, Director General of IUCN presented a special speech 特邀发言. The meeting listened to the reports and policy recommendations of five task forces, i.e. Task Force on Innovation and Environment-Friendly Society, Task Force on Environment and Health, Task Force on Market-based Instruments for Energy and Resource Efficiency, Task Force on Improving Energy Efficiency in Building and Transportation Sectors in Urban Development and Task Force on Road Map for a Low Carbon Economy in China. To raise efficiency, this AGM arranged group discussions. Chinese Member Ms. Wang Jirong and International Member Mr. Hans van der Vlist had a speech respectively at the beginning of the group discussion. In free discussions, Members talked about wide topics covering climate change, green procurement, environment & health, low carbon economy, resource productivity, environmental industry, green Olympics, Shanghai Expo, urban development, rural environmental protection, environmental protection regulations and standards, disclosure of information and public participation, etc.. With heated discussion at the general meeting, Members have

presented many valuable comments and suggestions. In the group discussion, Members and experts had in-depth discussions about the Policy Recommendations to the Chinese Government. Absorbing all these comments and suggestions, the Policy Recommendation Team improved the Policy Recommendations of 2008 AGM, which has been passed in principle by our Members after review. After the AGM, CCICED Secretariat will present the Policy Recommendations to the Chinese Government.

Members and experts,

The year 2008 is unusual for both China and the world. Just as Premier Wen said, this AGM has different meaning & significance compared with the past AGMs. During the 2008 AGM, we have reviewed the past, analyzed current situation and projected the future. After three-day in-depth discussions, we have fully exchanged our views and reached the following important common understanding on how to enhance environmental protection and achieve sustainable development during current international financial crisis. This is the achievement different from past AGMs.

First, firmly adhere to environmental protection and facilitate sustainable development.

Chinese and international experience shows that protecting the environment is the protection of productivity; saving resources is the enhancement of the staying power for development. Members believe that economic development at the price of the environment could work for some period, but is not sustainable. The slower economic growth is, the more important to correctly handle the relations between environment and economy. We must not use economic downturn as an excuse for loosening environmental protection and shaking of the determination of sustainable development.

Second, turn current economic crisis into an opportunity for environmental protection and economic growth.

Ancient Chinese said, we could see the ability & capacity of a person when he is facing big difficulties. CCICED Members believe that current international financial and economic crisis is bringing about grave challenge to economic growth and environmental protection. However, we should see the crisis in a dialectical way and be good at seeking opportunity during crisis and try to turn the crisis into an opportunity. As long as we take initiative to shift growth mode with strong measures and seize this good opportunity for the adjustment of economic structure and shift of growth mode, we can turn this economic crisis into a dual opportunity for both economic development and environmental protection.

Third, energy saving and environmental protection is a new engine for economic growth.

There is huge demand potential in the field of resource and environment. Members believe that we could turn energy saving and environmental protection into an important driving force for steady & fast economic growth by such measures as actively adjusting investing policies, taking energy saving & emission reduction as a

focus of investment, and environmental protection & resource saving as an important aspect for expanding domestic demand, resolutely phasing out lag-behind productivity of the industries with high energy consumption and heavy pollution or resource-oriented, supporting energy saving and environmental protection industries and R&D of their products as well as driving the consumption.

Fourth, institutional innovation is an effective approach for the promotion of the cause of environment and development.

Reform and innovation is the eternal driving force to promote the cause of environment and development. Members believe that China is at the critical stage of reform and opening up. The Chinese Government should closely combine institutional innovation with the summarizing of historical experience and deepening the development of market economy. For example, summarizing the successful experience of the green Olympics could facilitate the improvement of regional ambient air quality. Price leverage is the core of market mechanism. The Chinese Government should actively and properly facilitate pricing reform, and raise resource productivity. This will not damage economic growth. Instead, it will be conducive to environmental protection and conservation of resources.

Fifth, addressing global crisis needs sincerer and more practical international cooperation.

Members take the view that each country in the world is facing the challenges imposed by global economic crisis. No country in the world can maintain good development without being influenced by world economy. Avoiding retrogression of environmental protection along with economic downturn is an important topic for each country to further facilitate the cause of environment and development. In particular under tight financial conditions, developed countries should at least maintain their environmental aid level to developing countries, otherwise leaving a hidden risk to the development of human civilization. The Chinese Government will adhere to the principle of “mutual benefit, win-win situation with practical and effective spirit”, actively carry out international environmental cooperation, introduce advanced management experience, talents and funds, proactively promote the establishment of appropriate technology transfer mechanism, facilitate more rational distribution of fund and technology at global level so as to make due contribution to addressing the environment and development issue confronting mankind.

This is the summary of the main achievements of 2008 AGM. There might be some omission due to time limit and I hope you understand. If you think that I miss something important, we can make addition before the end of this AGM.

Members and experts,

Experience 17 years, CCICED has witnessed important transformations of both knowledge and practice of environmental protection in China. It will witness the historic transformation process in which environmental protection gradually integrates

into economic development. Mr. Li Keqiang, Vice Premier of the State Council and member of Political Bureau of CCCPC takes chair of CCICED beginning from this year, this fully demonstrates the high attention of the Chinese Government to CCICED and is a shining point of this AGM. We believe that under the leadership of Vice Premier Li, CCICED Phrase IV will continue its innovative, industrious and scientific spirit and play more active role in raising living standard of 1.3 billion people and improving environmental quality during economic growth in China.

At the end of CCICED 2008 AGM, please allow me, on behalf of the Bureau, to pay our high tribute to each Member and expert attending the AGM and relevant departments, social organizations, universities and scientific institute for their strong support and active participation! We also express our sincere thanks to CCICED Secretariat and all other staff providing services to 2008 AGM!

Finally, I wish all International Members and experts a smooth journey back home!

Policy Recommendations to the Government of China

The Second Annual General Meeting of Phase IV of the China Council for International Cooperation on Environment and Development (CCICED 2008 AGM) was held in Beijing from 12-14 November 2008 with the theme of "Harmonious Development through Innovation". This meeting occurred at a time of great turmoil in the world's financial markets, with the threat of severe global recession, but also a call for "re-regulation." This year is also a time of celebration of tremendous achievement in China—30 years after the *Reform and Opening Up*, and after the very successful Beijing Olympics.

These events, and also China's remarkable efforts during the snowstorm and earthquake disasters, and in response to the melamine contamination and other public health incidents have focused our discussions on how environment and development can play a stronger role in China's future harmonious relationships.

The 17th Party Congress of the CPC specified that scientific development, Harmonious Society, and promoting an *Ecological Civilization* should guide China's social values and progress. Now, a year after this historic meeting, there is growing evidence that transformative action is taking place towards building a resource conserving and environment friendly society in China.

It is particularly significant that progress is being made on the 11th Five Year Plan program for energy conservation and pollution reduction, that China leads the world on achieving many of the Millennium Development Goals, and that many of China's science and technology innovation goals are for sustainable development. Also, that necessary institutional strengthening including the formation of the Ministry of Environmental Protection (MEP) is taking place. CCICED applauds this evidence of domestic progress and also China's expanding role on international environment and development.

Despite these praiseworthy efforts and achievements, China's domestic program for environment and development still faces many challenges, and much corrective action before its full contribution to a Harmonious Society can be realized. The action taken at the 3rd Plenary Session (October 2008) of the 17th CPC Party Congress to reduce the imbalances between urban and rural development is an important opportunity where increased environmental efforts will lead a more harmonious society. The CCICED members are aware that public health problems induced directly or indirectly by pollution remain a serious factor for social advancement in China. This has been a priority area for CCICED research on harmonious development.

CCICED believes that an appropriate mix of incremental and transformative

changes is needed to build a new relationship of environment and development in China and globally. It is fortunate that China is well positioned for carrying out these changes. Environmental progress should intensify over time, first through incremental improvements, and later by leaps and bounds, as the investments now being made in sustainable development innovation produce better technical solutions. CCICED has examined how environment and sustainable development innovations could be fast tracked, since it is unlikely that incremental change alone will satisfy China's ambitious environmental targets and longer term needs.

Nowhere is this need for innovation greater than in addressing environment and energy relationships and the global need to address reductions in greenhouse gases. CCICED has started several task forces and other activities on these topics. While the main results will not be reported until the 2009 AGM, a few preliminary recommendations are provided in this document.

The global environmental situation continues to decline, with direct effects on China through trade, climate change and in other ways. The Beijing Olympics has created a level of awareness around the world of China's environmental problems and its capacity to address them. How China chooses to go about its efforts to promote an *Ecological Civilization* at a global level is therefore a significant matter, with implications for trade, market supply chains, and action on pressing concerns such as climate change. But China's domestic and international environment and development efforts could be threatened if the credit and financial crisis turns into a worse situation of recession.

The worsening global economic situation threatens social, economic and environmental progress of all nations, including China. This topic received special attention from both Chinese and international members. The CCICED AGM occurred just as China announced its substantial economic recovery package. Therefore there was a substantive basis for considering how China can turn the economic crisis into an opportunity for strengthening economic growth.

In the period of global crisis ahead there will be many opportunities where China and a few other major developing countries have advantages not found in more established industrial economies. This is particularly the case for sunrise industries and for green products, which will become of increasing significance in the second decade of this new century. In fact there may be a historic shift in leadership on environment and sustainable development from Europe and North America towards Asia. Trade and investment will be drivers for this to happen. Real solutions for global sustainable development are now as likely to arise from action in China as they are from other parts of the world.

Council members appreciated the Chinese position that the global economic

slowdown therefore must not be allowed to stand in the way of environmental progress. And that the economic stimulus package developed by China has incorporated environmental aspects. During this time of rebuilding the world's financial system and new economic growth paths, China could benefit by positioning its investments towards activities that will allow it to shape the nature of future world growth, for example as a supplier of renewable energy products and services. These are examples of what CCICED's Chairman, Vice Premier Li Keqiang, noted are actions that "promote development of the economy while taking good care of the earth that we share."

At the 2008 AGM CCICED reviewed final recommendations from Task Forces on *Innovation and an Environmentally Friendly Society*, and on *Environment and Health.* In addition, the Council received interim reports with some recommendations from three energy and environment Task Forces that will submit final recommendations in 2009 (*Pathway toward Low Carbon Economy, Economic Instruments for Energy Efficiency and Environment, Energy Efficiency and Urban Development).* In addition, the CCICED Issues Paper prepared for the 2008 AGM identified a number of urgent challenges facing China, in part the result of the international economic and environmental situation. Our three key recommendation topics draw upon these reports as well as on the views of Council members.

The Council's reports and discussions again underscore the need for effective implementation and enforcement of strong environmental legislation, greater use of credible economic instruments, and a more scientific approach to the development and dissemination of reliable environment and development information as means to build confidence and public trust in China's environmental decision making. Of these points, the first and last deserve particular attention. Enforcement of regulations at a level that will change behavior is absolutely essential in order to foster innovative technologies and to improve environmental health conditions. But it is also vital to stress the need for public data that can be trusted by citizens and can become benchmarks for positive change via good standards.

RECOMMENDATION TOPICS

1. Transform Challenges into Opportunities for Further Implementation of a Scientific Development Approach.

2008 will surely be viewed as an exceptional year for China because of the

devastating natural disasters, international financial turbulence, food safety incidents, successful Olympic and Paralympics Games as well as the 30th anniversary of the introduction of *Reform and Opening Up*. The year on the one hand gave rise to a number of new problems and challenges for China in the field of the environment and development, on the other hand, the great success and joy of the year left a precious legacy for China as well. As the year of 2008 draws to its end, it is now important for the Chinese government to face up to the problems and challenges, identify opportunities and potentials, review experiences and lessons, take positive actions and look into the future.

Therefore we recommend that China:

(1) Seek Opportunities in the Wake of the Financial Crisis, and Advance "Sound and Rapid" Environment and Development Initiatives.

To find a remedy for the financial market and achieve stable economic growth are undoubtedly the top priorities for the world right now. However, we must remain alert to prevent the environment from becoming the next victim of the financial crisis, as may occur in some parts of the world. Once it becomes a trend to neglect environmental factors, the world's sustainable development will take a significant step backward. Thus, China must work with unwavering determination to reduce emissions, improve energy efficiency and fight climate change. The Chinese government has recognized the risk from the current crisis and has integrated environmental protection in the domestic stimulus package. It must now transform the challenges to opportunities for sound and rapid sustainable development.

The stimulus package should follow four principles with respect to environment and development. First, do no harm to the environment in the implementation of the package. Second, take a systems perspective that will identify positive relationships for environment and economy. Third, highlight labour-intensive activities operating at an appropriate scale to help poor people while protecting local environmental conditions, especially in the countryside. And, fourth, seek co-benefits, especially for improving health and ecological restoration, as a consequence of energy improvements, disaster relief and reconstruction, and pollution reduction.

It is recommended that the Chinese government should be fully aware of risks and opportunities, and take the following actions:

1) Strengthen supervision and environmental management in the execution of the domestic stimulus plan, so as to prevent regions from boosting economic growth at the expense of environment in their response to the financial crisis.

2) Consider not only environmental protection as one of the investment priorities of the stimulus package, but also carry out examination of supply chain environmental consequences and strengthen green procurement policies. These steps will boost the development of environmental protection industries and convey the strong determination of the government that environmental protection can be maintained even in the wake of the financial crisis

3) Take advantage of the opportunities arising from the financial crisis in order to advance transformation of the development mode for the domestic economy. This can be done by boosting the development of clean energy and technical innovation, low carbon economy and by strengthening capacities in the area of environmental protection and climate change in the remaining years of the 11th Five Year Plan, and particularly during the 12th Five Year development period.

4) Advance energy price reform and further internalize environmental externalities with the plunge of oil and commodities prices. It is advisable for China to adopt a long term "escalator" approach to gradually raise energy prices. It means small, but periodic and predictable rises of prices or introduction of additional environment or energy taxes, with information transparency to fully prepare the general public and reduce possible resistance.

5) And for the longer-term, develop Low Carbon Economy.

The Chinese government should attach great importance to the development of Low Carbon Economy (LCE) and get prepared for action, particularly in terms of technology options and feasibility analysis. The development of a low carbon economy will benefit China both internally, in terms of addressing resources and environmental problems, and externally by contributing to the fight against climate change and raising international competitiveness. China should consider specifying low carbon economy related targets in the 12th Five Year Plan for economic and social development, and incorporate low carbon economy in current strategies and actions.

(2) Create a Better Mix of Government Regulation and Market-Based Mechanisms, and between Factors Favouring Innovation and Those Favouring Stability.

The world financial crisis and the infant formula incident have shown that excessive reliance on market forces without effective regulation will create huge risks. In fact, market failures such as environmental externalities are often hard to control. The government thus should strengthen its supervision while adopting market-based instruments. China is at the initial stage of a socialist market economy where both

market function and government regulation await improvement. Therefore the government should step up its supervision while giving full play to market-based instruments suitable for environmental protection.

Some of the most important market based approaches will require significant levels of capacity building for adequate management and supervision, including improved emissions monitoring, consolidation and standardizing of emissions data, designating a legal registry for emissions reductions, and enforcing non-compliance with much stiffer penalties.

It is important for the Chinese government to maintain the balance between innovation and stability. Stability is a prerequisite for a harmonious society while innovation often entails reform to avoid unreasonable benefit distribution. Imbalance between the two will give rise to conflicts. But if innovation helps encourage public engagement, promotes fairer benefit distribution and betterment of social welfare, it will help promote the development of a harmonious society. For instance, environmental innovation could help to optimize the relations between the environment and economy, resolve problems in the field of the environment and health, encourage wider public involvement, and give full play to the role of women in building a harmonious society.

(3) Step up Infrastructure Construction and Quality for Optimized Development and Harmonious Society.

In the face of such natural disasters as the snow storm and earthquake in 2008, the foundation for optimized development and harmonious society has proved fairly weak. Such weakness can be found in the relevant mechanisms, urban development patterns, the layout and quality of infrastructure, social security and emergency response. The weaknesses demonstrate that it is urgent for China to shift its growth pattern from quantitative expansion to quality development, and to achieve harmony between people and nature. The infant formula incident served notice that corporate social responsibility should be further stressed. A massive and systematic program is needed to achieve a more balanced development among various social and economic aspects. The foundations for harmonious society should be strengthened, including the moral and cultural basis for scientific development. If environmental factors are built into this more advanced approach to development, the chances for sustainability will be enhanced.

(4) Strengthen Rural Environmental Management and Help Improves Overall Environmental Protection of China.

The rural areas of China not only lag behind the cities in terms of economic and social development but also bear the brunt of environmental pollution and ecological damage. The countryside is thus a weak point in environmental protection and the building of a harmonious society. The central government of China is committed to the integrated development of urban and rural areas. In addition to the strategic goal of building a new socialist countryside, a comprehensive rural reform scheme was passed during the 3rd Plenary Session of the 17th Party Congress. Against this backdrop, China should create a bigger role for environmental protection as part of the overall strategic goal of building a new socialist countryside. The environmental priorities of rural areas should include greater attention to rural environmental management system and capacity building, environmental infrastructure, drinking water safety, soil contamination, indoor air quality management, and exploration of an integrated urban-rural environmental management mechanism and eco-compensation. The eco-compensation policies should be expanded to include climate change mitigation and adaptation needs, and damages cost by air pollution. Efforts on these priorities will improve overall environmental protection throughout China.

(5) Develop Innovative Environmental Management Systems and Mechanisms Based on the Successful Experiences of Green Olympic Games.

The successful Green Olympic Games has left China with valuable environmental legacies, including hardware such as demonstration projects, and infrastructure that help to improve the environment and serve the public, as well as software such as the concept of ecological civilization, improved environmental management, environmental information disclosure and wider public participation. All these may help to bring about deep changes in economic and social development patterns.

In its effort to host a Green Olympic Games, the Chinese government adopted successful measures to promote pollution prevention and control planning, environment friendly buildings and infrastructure, environmental information disclosure, public participation, commercialization of the innovation technologies employed in the Green Olympics, control of trans-boundary emissions through the establishment of a regional environmental management system, tail gas pollution control, the phase out of heavily polluting enterprises, etc. China should review these

successful experiences and develop standardized and long-term mechanisms of environmental management to improve the environmental quality of Beijing and other parts of the country on a continuing basis.

The 2010 Shanghai Expo offers a new opportunity for the implementation of the "Green Olympics" experience, The Government of China should integrate more green measures in the planning and implementation of a "Better city; Better Life" Expo.

Also, China urgently needs to control transboundary emissions via regional environmental management systems operating on total emissions control, emissions trading and with appropriate institutions, such as coordinating groups comprised of the relevant provincial governors. The experience of the Olympics in reducing inflow of pollutants from provinces surrounding Beijing sets a remarkable precedent of cooperation that deserves to be emulated.

(6) Review the Experiences of the Past Three Decades and Continuously Improve the Environmental Management System.

Over the past 30 years, China has tried to keep pace with the international community when dealing with the field of environment and development. In light of its realities, and drawing upon international experiences and expertise, China has developed its own approach with Chinese characteristics to address environmental problems and has made significant progress in creating its environmental management system and, in some locations, for improving environmental quality.

Three decades on, China is now in an important period for strategic transformation of its environment and development relationship. It is now necessary to systematically review the strategic ideas, theories, policies and managerial practices in the field of environmental protection over the past 30 years. Such a review will not only help to consolidate successes achieved so far and further improve the environmental management system of China, but also contribute to the international community by sharing the Chinese experience.

The establishment of the Ministry of Environmental Protection in 2008 was a major step forward for the Chinese environmental management system, and reflects the commitment of the Chinese government to historical transformation in the environmental field. However, we note that environmental management system reform, perhaps leading to a super environment ministry, likely will be a gradualist process. The next step should be further integration of environmental responsibilities of different ministries, which optimizes the central government organization and helps raise capacity and efficiency. For the new environmental ministry, current attention

should be focused on capacity building and financial resources. Responsibility, power, capacity and efficiency should be integrated in this super ministry, which can put people first and better serve the general public.

(7) Make New Contributions to Global Sustainable Development and the Building of a Harmonious World.

China and the world are mutually dependent. Given the large population and economic output as well as the important role of China in the global environment, the international community has higher expectations for China on issues like climate change and the financial crisis. China has made tremendous progress in development and now proposes concepts such as ecological civilization and harmonious society. These efforts should make the world more interested in China's ideas and experiences.

Therefore, it is the right time for China to make a more substantive contribution towards global sustainable development and a harmonious world. Stabilizing the financial system, sustaining rapid economic growth and resolving environmental problems in China are in themselves great contributions to the world. Meanwhile, based upon the principle of common but differentiated responsibility, China should make new contributions to the global fight against climate change and sustainable development; and expand its existing environmental international cooperation into cooperation for sustainable development, with strengthened cooperation between China and other developing countries.

2. Introduce a National Action Plan or Program for Environmental Innovation, 2010-2020.

China's complicated and unprecedented challenges as it works towards becoming an environmentally friendly society open the door to unprecedented innovation opportunities. Yet environmental innovation in China remains at a low level and lags behind innovations in other fields, and falls well short of the needs. There are several reasons for this situation:

- Pollution clean-up rather than pollution prevention still dominates, and the institutions and mechanisms under which environmental protection and economic growth reinforce each other are yet to be established.
- Incentives and enforcement action are still too weak and the command and control approaches still predominate. There is not a mechanism or policy

system in place that encourages enterprises to invest spontaneously in environmental innovation.

- A disconnect exists between research on environmental science and technology and the commercialization of research achievements due to the absence of technological application research institutes and supporting coordinating mechanisms.
- Poorly developed technology and a limited system for collecting and publicizing environmental information accounts for low participation by the general public in environmental innovation and decision making.

China identified innovation as a core national strategy and mapped out the National Innovation Strategy and the Mid-to-long-term Plan for Development of Science and Technology in China 2006-2020. While this strategy and plan can produce some of the necessary indigenous research and technological applications for key environmental problems, there is a need for a specific environmental innovation approach that can ensure the sustained and integrative effort necessary to fully capture benefits and opportunities.

Therefore we recommend that China:

Introduce a *National Action Plan/Program for Environmental Innovation 2010-2020 for China.* The action plan should define the strategic goals, targets, and measures of environmental innovation of China, and address technological, institutional, social and organizational aspects of innovation. The Action Plan/Program should be supported by key projects and increased investment, and consideration should be given to the following two points.

(1) Strengthen Indigenous Innovation Capacity by Setting Up a Special Program for Clean Technology Innovation, National Research Centers for Environmental Innovation, Sectoral Industrial Environment Research Institutes, and a System of Cross-disciplinary Sustainability Innovation Laboratories.

A *Special Program for Clean Technology Innovation* needs to be introduced, and this Program could cover technologies relating to vehicle pollution treatment, clean coal, solar power, wind power, nuclear power, carbon sequestration, energy efficient building, ecological restoration, and clean production. This Special Program would introduce Clean Technology as a major research platform in the same way as other fields such as nanotechnology have been fostered. It should be developed at a level

equivalent to China's space program, with expectations that it will become an important part of China's future economic growth and exports as well as a key component of better environmental protection.

The Government of China should collaborate with relevant parties and jointly establish a number of high-level *National Research Centers for Environmental Innovation* in universities and research institutes. These Centers will bridge the gap between basic research institutes and market needs, and help introduce, absorb and utilize foreign technology. They should link research-intensive industries and China's most renowned research bodies to establish China as a major player for environmental innovation.

Common environmental problems within specific industrial sectors necessitate the establishment of research institutes for specific energy intensive and heavily polluting industries on a cooperative basis among the government, the industries and the industry associations.

Considering the ecological and environmental features of different regions in China, the State should collaborate with local governments, business and civil society to establish cross-disciplinary *Sustainability Innovation Laboratories* designed to demonstrate how to live at a high standard with minimum waste in rural and in urban settings. Their focus should be on practical demonstration of what can be done within the context of local social and economic circumstances and environmental conditions.

(2) Adopt an Integrated Approach to Address Mechanisms, Institutions and Capacity Development Required for Full Application of Environmental Innovation.

The following needs must be met. First, in the field of environmental innovation, the environmental protection authorities should lead the coordination among relevant parties and give full play to the bridging role of industry associations connecting government and the industry. Stronger regulatory rules and standards, incentives and supportive policies should be introduced to help build up innovation capacities of the enterprises, especially small and medium sized enterprises.

Second, to foster a market for environmental products, several measures could be taken: tighten environmental enforcement in order to create a potential demand market; and, where appropriate and for a limited time, subsidize environmental products used by enterprises and consumers so as to foster dissemination and application of environmental technology. Also needed are more effective *Green Public Procurement Regulations* which require government agencies to procure a

certain percentage of environment friendly products will be particularly helpful in creating a sizable market for environmental products; also, action should be taken to raise resource and energy prices to expand the demand for environmental products that increase use efficiency.

Third, to considerably increase financial support for environmental innovation activities, *Environmental Innovation Funds* should be established with a focus on a Special Program for Clean Technology, and other components important for enhancing indigenous environmental and sustainable development technology innovation. The State should devise a financial supporting plan for environmental innovation and adopt financial measures including venture capital investment, preferential listing policies, green credit, and preferential loans etc., to support environmental innovation activities.

Fourth, China needs to strengthen IPR protection and international environmental cooperation and establish an *International Study Network on Environmental Technology* to facilitate learning from abroad and through joint efforts.

Fifth, drawing upon the experiences of OECD countries, China should establish an evaluation system for environmental innovation, covering the whole process from R&D to commercialization as well as such aspects as environmental, safety, health and life cycle impacts.

(3) Set Up an Improved National Information System for Environmental Quality, Environmental Pollution and Environmental Science and Technology Knowledge, with an Expanded Scope for Information Disclosure in order to Encourage Wider Public Involvement in Environmental Innovation Activities.

While China has made progress in environmental monitoring and public information disclosure, much work remains to be done before a full national environmental information system is in place and functioning well. This is a vital component for decision making of government, business, communities and the general public. The system must operate in a very transparent fashion, with regular reporting on key environmental problems and environmental performance. Knowledge access should be as direct as possible and at low cost so that people and institutions throughout China can access the information. Information needs to be packaged in ways that permit comparisons and easy understanding.

Improved information access will promote innovation in several ways: knowledge about environmental options will improve sustainable consumption, better public acceptance of new environmental technologies and environmental measures, place pressure on firms and local governments to improve environmental performance, and provide information helpful to environmental innovators, including SMEs.

3. Expedite the Establishment of a National Management System for Environment and Health.

China is faced with enormous challenges in the field of the environment and human health. First, a large number of its people are exposed to seriously polluted air, water and soil environment, which poses huge health risks. Second, because of the absence of systematic research, monitoring and statistics, there is not yet a clear picture of the full magnitude and range of public health risks posed by pollution. Hence it is extremely difficult to identify targeted measures to address the problem. Third, whether or not the economic growth pattern of China changes fundamentally within the near future, environmental pollution will remain a serious problem for a relatively long period of time, and this may give rise to more substantial health risks. Fourth, as the living standard increases, the general public will have higher expectations for a good and safe environment. Fifth, China has recently issued the National Action Plan for the Environment and Health 2007-2015, but concrete work under the action plan is yet to be carried out.

International experience illustrates that mishandling of environmental and health issues could generate complicated social and political problems that result in harm to public health, impaired government credibility, and heavy social and economic costs. China is currently in a critical period of building a harmonious society and consequently the issue of the environment and health should be given highest attention.

Therefore, we suggest:

On the basis of the National Action Plan for the Environment and Health 2007-2015, that the Government of China should accelerate the development of a national management system for the environment and health as well as an environmental management system based on “putting people first”. In order to achieve this goal, efforts should be made in the following six areas:

(1) Stick to Prevention as the Main Approach and Take Effective Measures to Reduce Environmental and Health Risks.

A risk prevention system can be established by improving the environmental

standards system, introducing a list of priority pollutants and enforcing stricter control of environmental access by harmful substances. The monitoring network for the environment and health should be strengthened, especially in the field of health impact monitoring relevant to human exposure. The government also should gradually set up an early warning system for environment and health, which will help to predict potential environmental and health risks, and will eradicate or reduce health damage by pollution.

(2) The Government Must Bear the Main Responsibility of Environmental and Health Issues. The Government Therefore Should Strengthen its Leadership in the Management System while Encouraging Extensive Public Participation.

Coordination mechanism between the relevant ministries should be strengthened. This could be realized through establishment of a national environment and health administrative coordination mechanism that is under the leadership of the State Council with participation by different ministries. It is also necessary to assess government performance to ensure laws and regulations are properly implemented. Based on their respective responsibilities, the environmental and health authorities should allocate sufficient staff and resources to establish specialized administrative system for managing environmental and health issues.

(3) Establish and Strengthen Legislation for Environment and Health based on the Polluter Pays Principle.

Legislation should address prevention, enforcement, and environmental rights of the Chinese public. A dispute settlement mechanism should be set up to help concerned parties to reach reconciliation over environmental and health disputes through mediation, administrative settlement, arbitration and litigation. The government also should gradually introduce a compensation system for human health damage by pollution so as to protect the environmental rights of the general public.

Improved coordination is needed between central and local authorities so that environmental health issues can be reported and assessed in a timely manner, with more effective action taken.

(4) Increase Financial Investment in Capacity Building for Environmental and

Health Management, Research, and Compensation.

The central and local governments should increase their financial support for capacity building and basic research in the field of the environment and health. An *Environment and Health Fund* could be established to help compensate victims of historical environmental problems, or when the responsible party has no civil compensation capability and when it is hard to identify who should be responsible. The Fund could help victims during their recovery and support education and communications activities. Multi-sourced funding should be sought.

(5) Improve Disclosure and Access to Environmental and Health Information and Encourage Public Participation.

The government should make public environmental and health information available through accessible and comprehensible tools, such as government websites and the mass media. Prevention requires information on risks to be effective. The Government of China should launch a public access data base on pollutants and health risks. The government also should improve the public complaint mechanism and public announcement system, and create smooth channels for the public to participate in environmental and health management. Supervision by the general public, social organizations and the mass media should be strengthened and the reporting of environmental and health violations should be encouraged. Various kinds of hearings and consultation meetings should be held to hear the voices of the public and relevant stakeholders on environmental and health issues.

(6) Undertake Targeted Intervention Measures to Address Prominent Problems in the Field of the Environment and Health

Where pollution has already caused harm to human health or induced diseases, action to reduce harm and risk needs to occur quickly, and health intervention or medical care should routinely be provided to the victims. For the pollutants proved potentially dangerous to human health, the government should issue a catalogue of such pollutants as well as relevant risk evaluation system, environmental access standards and identification criteria. Such pre-intervention measures and health impact monitoring will help eradicate or reduce health risks caused by pollution. For other environmental factors with unclear health impact, China should step up research and adopt preventative measures.

Progress Report of CCICED 2008

Zhu Guangyao, CCICED Secretary General

The year 2008 was the first year of full operations for the Fourth Phase of CCICED, which was officially inaugurated at the November 2007 Annual General Meeting. With continuing strong Chinese Government support, the cooperation of donors and other major domestic and international partners, and the active participation of Council Members, task force co-chairs, Chinese and international experts, and Secretariat staff, the 2008 Work Plan approved by the Council Bureau meeting in November 2007 has, under the leadership of the Bureau, been successfully implemented.

Chinese Government support for CCICED activities was demonstrated during the meeting of international CCICED members with Premier Wen Jiabao in November 2007. The Premier emphasized the Chinese Government's resolve to give highest attention to harmony between economic growth and environmental protection, stating that environmental protection and sustainable development are the Government's top priorities. He placed high value on the Council's work and praised the enthusiasm and commitment that the Council brings to its role of helping China meet the challenges before it.

The Chinese Government approved the appointment of Vice Premier Li Keqiang of the State Council to serve as the CCICED Chairperson in June 2008, indicating that the Chinese Government will continue its strong leadership and support of CCICED.

The National People's Congress of China approved the establishment of the Ministry of Environmental Protection (MEP) in March 2008. This ensures on-going enhancement of the capacity to provide support to CCICED, to follow-up the Council's work, and to provide leadership of the CCICED Secretariat. At the same time, Ministry of Foreign Affairs, NDRC, Ministry of Finance, Ministry of Commerce and other central Chinese government departments provided stronger support to CCICED activities. The Chinese Government will continue its financial support to CCICED operations through its central government budget.

On-going international partner support for the Council is reflected not only in donors' interest in the Council's agenda and on-going work, but also in the magnitude of their financial support for the Council. To date, there are seventeen international donors supporting the Council's operations during Phase IV: Australia, Canada, Denmark, the EU, France, Germany, Italy, Japan, The Netherlands, Norway, Rockefeller Brothers Fund, Shell, Sweden, UK, UNDP, Environmental Defence Fund, and WWF.

Following is a summary of progress in the course of 2008.

I. Council Membership

There have been adjustments to the Council's membership over the past year, reflecting CCICED's development needs as well as the Chinese Government's new term of office.

1) Bureau Members: The new CCICED Chairperson is Vice Premier Li Keqiang of the State Council. Ms. Margaret Biggs, President of CIDA, was invited with the approval of the Chinese Government to serve as the International Executive Vice Chairperson and has taken up her appointment.

2) CCICED Members: Several Chinese Members from government departments no longer serve on the Council due to changes in their assignments resulting from, *inter alia*, the Chinese Government's new term of office. Several Chinese and international experts have been invited to serve as new Council Members.

At present, CCICED has 53 Chinese and International Members. Many members are veterans, who have been involved in the Council's work for many years. Several Members are new to the Council. Members come from a range of backgrounds -- government agencies, international organizations, research institutions, non-governmental organization, the private sector, and universities -- and from many countries; all have broad experience in environment and development.

II. Policy Study Activities

Policy studies constitute the core of CCICED's work in providing policy recommendations to the Chinese Government. CCICED activities related to policy studies in 2008 include the following:

1. Task Force on Innovation and Environment-Friendly Society (2007-2008). It has submitted its final report at the 2008 AGM.

2. Task Force on Environment and Health (2007-2008). It has also submitted its final report at the 2008 AGM.

3. Task Force on Economic Instruments for Energy Efficiency and the Environment (2008-2009). It has submitted its background report to the 2008 AGM.

4. Task Force on Energy Efficiency and Urban Development (2008-2009). A background report has been presented to the 2008 AGM.

5. Task Force on Pathway towards a Low Carbon Economy in China (2008-2009). It has submitted its background report to the 2008 AGM.

6. Task Force on Rural Development and its Energy, Environment and Climate Change Adaptation (2008-2009). Its activities have commenced and are proceeding according to plan.

7. Task Force on Sustainable Use of Coal (2008-2009). The organization of the team and its initial research activities are underway.

8. Task Force on Ecosystem Service and Management Strategy (2009-2010). The organization of the task force team was initiated. It is anticipated that research will begin in 2009.

9. Policy Pilot Project on Energy and Environment Management towards a Low-Carbon Urban Development (2008-2009). Yinchuan City, a medium-sized city and capital of Ningxia Autonomous Region, was chosen as the site of the research.

10. Joint Project on Environment and Development Policy in China and India (2008-2009). With support from CCICED and the Indian Council for Sustainable Development, a joint study was initiated in 2008; its research activities are underway.

11. Joint Project on China's Ecological Footprint Report (2007-2008). A team of Chinese and international experts with joint support from CCICED and WWF completed its work; its Report was released in June 2008.

Council Members or other prominent Chinese and international experts have been invited to co-chair each task force or project. There has been very close cooperation among experts taking part in the research activities; the quality of their work and their dedication hold promise of excellent policy recommendations.

The Secretariat and the Secretariat International Support Office have assisted the task forces and other studies in coordination, administrative and logistic support, and financial management. The Chinese and International Chief Advisors and their supporting expert group have provided comprehensive guidance, suggestions, and often, substantive technical input to task forces. Many Chinese and International Council Members have participated directly in the work of the task forces, and donors and other partners have provided financial and organizational support to policy study activities. The high degree of collegiality and cooperation that exists between the Chinese and international sides is a key element in the smooth implementation of the Council's policy research agenda.

III. CCICED Roundtable Meeting

The Roundtable Meeting, a newly established mechanism, was created by the Council with the aim of disseminating CCICED policy study outputs and findings to a wider audience, of promoting the adoption of improved environmental regulations and practices at the local level, and broadening the impact of the Council's work.

Organized by the Secretariat, the CCICED 2008 Roundtable Meeting was held in Beijing on April 22-23, with the support of Chinese and international partners. During the meeting, an Enterprise Forum was also organized. Participants in the Roundtable Meeting included Chinese and International Council Members, officials from central and local governments, Chinese and international experts and scholars, representatives of domestic and international enterprises, and delegates from donor partner missions in China.

The Roundtable Meeting focused on the discussion of such issues as the Council's policy recommendations, global implications of China's transformation of environment and development, international experience in and policies on promoting the development of low carbon economy, local efforts and actions to address and

adapt to climate change, and the contribution of enterprises to innovation in aspects of environmental management.

The 2008 Roundtable Meeting achieved the objective of disseminating CCICED policy recommendations to local government decision makers and representatives of industry and commerce. It also provided a platform for dialogue and cooperation among Chinese and international decision makers, experts, scholars, and enterprise leaders. The Meeting reached common understanding on the following points:

First, achieving a transformation in environment and development is a long-term focus for future sustainable development. Currently, there are fundamental contradictions between economic growth, resource use, and the environment. China will face serious environmental risk if development and environmental protection are not in harmony; this will have a significant impact on the global environment.

Second, promotion of a low-carbon economy and development presents a significant opportunity for economic transition in China and an important approach to meeting and adapting to the challenge of climate change. The actions of local governments, public participation, and the cooperation of enterprises are all of vital importance.

Third, a key strategic option for China is to build a resource-saving and environment-friendly society through innovation. Partnership among government, enterprises, and the public is vital, and the role of enterprises is central to the initiation, promotion, and achievement of innovational development.

Fourth, while international experience is important in informing policy choices, there is no existing development model elsewhere that is appropriate in itself to China. China must explore its own sustainable development model capable of resolving the many contradictions between environment, resource use, and development.

IV. CCICED Operation and Management

The various components of the CCICED structure – the office of the Secretary General, the Secretariat and its International Support Office, the Chief Advisors and their supporting expert team – have been consolidated in accordance with the updated CCICED Rules of Procedures adopted at 2007 AGM last year. The Secretary General, with the assistance of the Secretariat and Chief Advisors, oversaw daily operations over the past year in accordance with the work plan approved by the Bureau Meeting.

Secretariat and its International Support Office

The following were the principal foci of the Secretariat and its International Support Office over the past year:

- providing support and assistance during the organization and implementation of the work of policy study task forces and other projects; coordinating their activities and the resources required to support these activities;
- maintaining contact with Chinese and International Council Members; acting on their suggestions related to the work of the Council; providing Council members

with relevant information in a timely fashion; providing assistance to facilitate their involvement in Council activities;

- strengthening communications with donors and working to expand the Council's domestic and international partnerships; through cooperation, consultation, and information-sharing, gradually enhancing relations with the central government departments, enterprises and local governments.
- planning, organizing, implementing, and monitoring major scheduled activities; improving capacity to organize a wide variety of events;
- standardizing the management of donor funds and enhancing funds management mechanisms in support of policy study and other activities.
- initiating, with the Secretary General's guidance, the development of a sustainability strategy well in advance of the end of Phase IV for further discussion with Council stakeholders;
- taking steps to ensure the broad domestic and international dissemination and exchange of CCICED policy recommendations and findings; organizing the publication of policy reports, Council proceedings, the CCICED Annual Policy Report, and special issue statements in order to enhance the impact, awareness, and effective use of the Council's work.
- organizing in cooperation with the Chief Advisors group and other partners such special events as the Roundtable Meeting, the launching of the Report on Ecological Footprint in China, and 'scoping' workshops on eco-system services and management, rural energy and environment, and the sustainable use of coal, all of which demonstrated the relevance and timeliness of the Council's work.

Chief Advisors

CCICED's Chinese and International Chief Advisors are responsible for providing scientific and technical suggestions to the Secretary General and the Council's Bureau on the Council's policy study agenda and for organizing, guiding and monitoring the substantive aspects of the work of task forces' and other policy study groups. The work of the Chinese and International Chief Advisors, supported by a Chinese expert group, is central to ensuring the effective operation of the Council's policy study work. More specifically:

- the Chinese and International Chief Advisors have played a key role in providing suggestions and recommendations to the Secretary General on the substantive themes, foci, and sequencing of the Council's work, and on the establishment, membership, and scope of work of task forces and other policy study projects;
- the Chinese Chief Advisor and International Chief Advisor have established effective communication mechanisms to coordinate their work. Quarterly joint coordination meetings between the Chief Advisors and the Secretariat and International Support Office have been held. The Chinese Chief Advisor and

supporting expert group have met on a monthly basis to monitor and coordinate policy work;

- the Chinese Chief Advisor and International Chief Advisor, along with members of the expert group assigned to assist and monitor specific task forces, have provided guidance and advice to task forces in the implementation of their work, ensuring that task force teams are provided with necessary scientific and technical support;
- the Advisors have prepared the draft of the CCICED's policy recommendations and drafted the Issues Paper for the CCICED 2008 AGM, based on the findings and recommendations contained in policy study reports;
- the Advisors and a team of Chinese experts have assumed the important task of seeking to assess the impact of the Council's policy recommendations on policy and practice in China, drafting a survey report on the matter, and developing methodologies for enhanced tracking of recommendations.

Annex: Summary of CCICED Funding in 2008

Annex

China Council for International Cooperation on Environment and Development(CCICED) Phase IV (2007 – 2012)

Report on Funding: 2008

Introduction

Phase IV of the China Council for International Cooperation on Environment and Development (CCICED) was inaugurated at the November 2007 Annual General Meeting. However, during the transition period between Phase III and Phase IV, some Phase III donor funds continued to be expended until October 2007 in order to make optimal use of remaining funds, while some Phase IV expenditures commenced in August 2007, prior to the Annual General Meeting. This report covers Phase IV finances, dating from the first Phase IV expenditures on August 1, 2007, to September 30, 2008.

Phase IV contributions

The Council's operation and activities for Phase IV are being supported financially by the Government of China and a wide range of international donors. Details of donors' contributions or commitments appear in Table 1. Phase IV contributions and commitments currently total US$19,865,880.

Core Funding and Dedicated Funding

As in Phase III, Phase IV funding can be categorized as Core Funding and Dedicated Funding. Generally, Core Funding, which accounts for approximately 80 percent of total funding, can be deployed flexibly to finance the full range of the Council's operations, including the Annual General Meetings, Task Forces/Special Policy Studies, Roundtable Meetings, Chief Advisor Group, and the Secretariat, and thus helps ensure that the Council can respond in an unrestricted and prompt manner to changing priorities and circumstances. Donors of Core Funding include China, Canada, Norway, Australia, and Sweden.

Dedicated Funds are funds that are provided to the Council for a specific purpose, usually to support the work of a particular Task Force, Special Policy Study, or pilot project. Donors contributing Dedicated Funds include Germany, the United Kingdom, the Netherlands, France, Japan, Denmark, the EU, Shell (China) Limited, Rockefeller Brothers Fund, Environmental Defense Fund, WWF, and UNDP. These Dedicated Funds, which account for approximately 20 percent of total contributions, are concentrated on policy studies and help ensure that high-priority policy research

activities have access to sufficient resources.

Management of funds

Most funds are administered by the Council Secretariat (SERI) in Beijing or by the Secretariat International Support Office (SISO) situated at Simon Fraser University in Canada. SISO manages CIDA and AusAID funds and some donors' funds allocated to meet the international costs of specific task forces, representing approximately 40 percent of total funding. In a few instances, donors manage their contributions through their own offices.

During 2008, the Secretariat and SISO issued Guidelines on the use and management of funds used to meet international costs related to task forces. These Guidelines established standards and limits for reimbursable costs, which were based in turn on the regulations and other conditions set by major donors on the use of their funds, and were designed to ensure consistency across all task forces. In addition, a number of procedures and contract and other templates were developed to facilitate task force financial management.

Expenditures August 1 2007 – September 30 2008

Phase IV Expenditures from 1 August, 2007, to 30 September, 2008 (the last month when posted data is available) are summarized, by donor, on Table 2.

Management, Annual General Meeting, Roundtable, and Chief Advisor costs account for a higher proportion of total expenditures during the first year of Phase IV, which was devoted in large degree to organization and planning, than will be the case in future years, when the proportion of expenditures related to task forces and other policy studies will continue to rise.

TABLE 1
CCICED PHASE IV – DONOR CONTRIBUTIONS

Donor	Amount in original currency	Amount in US$	Details
China	19,000,000 RMB	$2,773,844	Core Fund
Canada	6,950,000 CAD	$6,809,720	Core Fund
Norway	13,500,000 NOK	$2,646,850	Core Fund, but partially allocated by donor to Task Force on Low Carbon Economy
Sweden	9,000,000 SEK	$1,501,752	Core Fund, but partially allocated by donor to Task Force on Low Carbon Economy
Australia	1,000,000 AUD	$960,246	Core Fund
Demark (preliminary commitment)	2,000,000 DKK	$421,319	Allocated by donor to Task Force on Coal
EU (preliminary commitment)	500,000 USD	$500,000	Allocated by donor to Task Force on Eco-system management
France	300,000 EUR	$471,253	Allocated by donor to Task Force on Urban Development.
Germany	1,000,000 EUR	$1,570,845	Partially allocated by donor to Task Force on Economic Instruments
Italy (preliminary commitment)	400,000 EUR	$628,338	
Japan	30,000,000 JPY	$280,900	Allocated by donor to Task Force on Environment and Health
Rockefeller Brothers Fund	70,000 USD	$70,000	Allocated by donor to Task Force on Environment and Health
Shell (China) Limited	400,000 USD	$400,000	Allocated by donor to Pilot project on Low Carbon City
The Netherlands	75,000/year EUR	$117,813	Allocated by donor to Task Forces. Only currently committed one-year amount is shown.
UK/DFID (preliminary commitment)	200,000 USD	$200,000	Allocated by donor to Task Force on Low Carbon Economy.
UNDP	378,000 USD	$378,000	Allocated by donor to Task Force on Rural and Climate Change
Environmental Defense Fund	100,000/yea USD	$100,000	Managed by EDF. Only currently committed one-year amount is shown.
WWF	35,000 USD	$35,000	Allocated by donor to Eco-footprint Joint Project
OTAL (USD$)		**$19,865,880**	

CCICED 2009 Work Plan

(For submission to the Bureau Meeting for approval)

November 12, 2008 Beijing

With the support of the CCICED Secretariat and Chief Advisors, the CCICED Secretary General submits the following plan outlining the Council's principal activities in 2009, for the review and approval of the Bureau.

I. Policy Study Activities

1. Continuation of the work of previously-established Task Forces

With the approval of the Bureau Meeting in 2007, five Task Forces and one policy pilot project were established and commenced their work in 2008. Focusing on energy and the environment, they comprise the following:

1) Task Force on Economic Instruments for Energy Efficiency and the Environment (2008-2009)
2) Task Force on Energy Efficiency and Urban Development (2008-2009)
3) Task Force on Pathway to a Low Carbon Economy for China (2008-2009)
4) Task Force on Rural Development and its Energy, Environment and Climate Change Adaptation (2008-2009)
5) Task Force on Sustainable Use of Coal (2008-2009 (estimated))
6) Policy Pilot Project on Energy & Environment Management for Low-carbon Urban Development in Yinchuan City, Ningxia Autonomous Region (2008-2009).

These Task Forces and the Policy Pilot Project will continue their studies in 2009 and will submit their findings, recommendations, and final reports to the CCICED's 2009 Annual General Meeting.

2. Establishment of new Task Forces

It is proposed that the following two Task Forces be established and commence their work in 2009:

1) Task Force on Ecosystem Service and Management Strategy

   (2009-2010, duration: 18 months)
2) Task Force on Sustainable Development Strategy for Oceans

(2009-2010, duration: 18 months)

The two above Task Forces will submit their findings and final reports to the CCICED's 2010 Annual General Meeting.

In addition, the Secretary General will, on the recommendation of the Chief Advisors and the Secretariat and based on requirements and opportunities such as an identified need to follow up the work of current task forces, establish special policy study projects as needed.

The Secretary General will also, based on input from Members and recommendations from the Chief Advisors and the Secretariat and for the approval of the Bureau Meeting in 2009, submit proposals for the Council's work plans for 2010 and 2011, including proposals related to the scope of work of new task forces.

3. Other joint activities on policy studies

1) Joint Study Project on Environment and Development Policy in China and India

This project is jointly supported, organized, and implemented by CCICED and India Council for Sustainable Development (ICSD). Its objective is to review, analyze, and compare environment and development policies in China and India in order to focus the attention of Chinese and Indian policy makers as well as the international community on relevant common issues. Research was initiated in 2008 and the joint study report is planned for 2009.

2) "China Environment and Development Outlook" project

Chinese and International Council Members as well as other partners take the view that CCICED, as a high-profile international policy advisory body, should carry out a regular and comprehensive review and assessment of China's policies on the environment and development for the use of Chinese and international policy makers. Following discussions with the Chinese and International Chief Advisors and Chinese and international partners, the Secretariat proposes the initiation and publication on a regular basis of the "China Environment and Development Outlook". As a CCICED "flagship" publication, this Report will be published in both Chinese and English.

It is proposed that work on the first "China Environment and Development Outlook" commence in 2009 and be completed in 2011. The report will focus on a review and evaluation of policy development in key areas of environment and development in China and identify future challenges and policy priorities, as well as on the global implications of Chinese policies. It is proposed that Chinese and international experts be invited to form a team to produce the report.

In its policy study work in 2009 and 2010, it is anticipated that the Council will seek opportunities to provide inputs into the development of the 12th Five Year Plan.

II. CCICED Roundtable Meeting

With the support of both Chinese and international stakeholders, the First CCICED Roundtable Meeting was held in Beijing in April 2008 and was successful in disseminating the Council's policy recommendations and fostering dialogue and cooperation on a range of policy issues.

It is proposed that the Second CCICED Roundtable Meeting be held in April or May of 2009 and focus on policy study findings and recommendations in the field of energy and environment. Central and provincial level policy makers and Chinese and International Council Members, as well as Chinese and international experts and scholars and representatives of private sector and enterprises will be invited to participate. If appropriate, the Roundtable Meeting will incorporate an Enterprise Forum. CCICED Secretariat and its International Support Office will be responsible for the preparation and organization of the Roundtable Meeting.

III. CCICED 2009 Annual General Meeting

It is proposed that the CCICED 2009 Annual General Meeting be held in Beijing on November 11-13, 2009. The Annual General Meeting will receive and consider reports on the findings of several Task Forces related to including energy, environment, and climate change and their policy recommendations to the Chinese Government. It is suggested that the Theme of the 2009 Annual General Meeting be "Energy, Environment and Development".

IV. Other Arrangements

The CCICED Secretariat will closely cooperate with Council Members, the Chief Advisors, and domestic and international partners to further strengthen the Council's work, to expand networks for cooperation and consultation, and to further the long-term development of CCICED. It will also:

- Continue to strengthen communications and cooperation with policy makers at the local government level and facilitate their understanding of CCICED policy recommendations;
- Expand and intensify contacts with research institutes, industrial associations, and private sector representatives at home and abroad;
- Communicate closely and cooperate with Chinese and international partners and organize various activities, including policy workshops and activities related to different topics, in order to further expand the impact of the CCICED's work;
- Pursue in cooperation with stakeholders the development and implementation of a long-term sustainability strategy for CCICED.

CCICED Policy Recommendations and China's Environment and Development Policies(2007- 2008)

CCICED Chief Advisors & Support Team

INTRODUCTION

The China Council for International Cooperation on Environment and Development (CCICED) has made recommendations to the State Council each year from the Council's start in 1992. Many of these recommendations have been implemented, quickly, or over a period of years. Some recommendations by CCICED require re-emphasis, and, others are not implemented. As the pace of environmental action in China quickens, it is important for CCICED members to have up-to-date information on changes in policies and strategies, and to understand as clearly as possible how CCICED's recommendations and inputs have influenced decisions relating to these changes. This understanding will help CCICED to maintain its unique position as China's senior international advisory body on environment and development by helping to improve the quality and relevance of its recommendations.

With the rising significance of environmental concerns to China's development, improved governmental decision making, rising environmental awareness, and changing corporate management philosophy, CCICED recommendations are being reflected in policies within shorter time frames. In addition, demand for new policies is very significant. Implementation of one policy often entails more supporting policy measures in response to new problems. It is a challenge for CCICED to establish a system for tracking implementation of its recommendations and receiving feedback from implementers.

In Part 1 of this document the recommendations made at the 2007 Annual General Meeting (AGM) by CCICED to the State Council are summarized. Part 2 systematically and comprehensively summarizes the key policy changes on environment and development in China that have taken place during the year following the 2007 AGM. Reading two parts, we will see some of the obvious links of how CCICED recommendations have informed the policy shifts over this past year.

The overall purpose is to provide a basis for understanding the linkages between Chinese policy shifts and the inputs and recommendations of CCICED. Making these links is always a challenge since governments rarely set policies based on any one source of advice, and also since some policy shifts emerge years after the advice is originally provided. CCICED employed several techniques in its 2006 Task Force on Review and Prospects in order to understand the influence of Council over its first 15 years.

We will now shift to an annual examination of CCICED influence, recognizing, of course, that recommendations often take longer to be fully accepted and implemented. This first document is such a trial process, so that suggestions for improvement and identification of possible omissions are very welcome. At the suggestion of the Executive Vice Chair of CCICED, Minister Zhou Shengxian, the Chief Advisors are taking on this new task in the coming year and will develop a robust methodology to produce a concise report at each Annual General Meeting.

PART 1. CCICED RECOMMENDATIONS TO THE STATE COUNCIL – NOVEMBER 2007

At the 2007 China Council for International Cooperation on Environment and Development (CCICED) Annual General Meeting, members reviewed the work of several task forces and other inputs, and produced five key recommendations focused on the theme of Innovation for an Environmentally Friendly Society. It is Council's view that China has entered a Strategic Transformation Period, when many shifts in environment and development policy are needed.

In other countries where rapid transformation of environment and development has occurred, the following four key factors often are present: public participation and involvement of institutions from the whole of society; concern for health and environment galvanize action; need for a progression of changes over a 5 to 10 year period (or longer) is apparent; and, international pressures for action exist.

Over the coming years there will be a need to focus the attention of the whole society and government at all levels to create a new relationship of environment and development that satisfactorily addresses problems at local, national, regional and global levels via the use of a broader range of instruments, and with the active involvement of business enterprises. China needs early warning systems that identify problems at an early stage, and creative approaches to tackle problems that have resisted easy solutions. China is at a stage where its ecological footprint is still relatively low, especially when measured on a per capita basis. But China's overall influence on the world is growing, and globalization has important effects within the country. Therefore environment and development policy choices taken within China to a considerable extent need to be integrated with those elsewhere in the world.

The Council believes that innovations in policy, institutions, choice of regulatory instruments, and technology applications are essential at this point in China's environment and development improvements.

The five recommendations made to the State Council are summarized below. The original wording of each recommendation is provided plus a short summary of important points related to each.[1]

RECOMMENDATION 1. Strengthen and add new policies and mechanisms to achieve emission reduction targets.

(1) Develop a new "Five Shifts" Approach to pollution control by (1) reducing total emissions; reducing pollutants from all industries; moving from total control of single pollutants to coordinated control of many pollutants; shifting

[1] The summary of CCICED recommendations is based on the longer version of recommendations agreed at the AGM and published as Chapter 1 in the proceedings of the AGM (CCICED Annual Policy Report 2007. *Innovation for an Environmentally Friendly Society*) CCICED, Beijing. 208 pp.

emphasis from numbers of environmental protection projects to an emphasis on their quality; moving from administrative to market-based instruments.

(2) Establish an economy-energy-pollutant emissions reduction technology access platform for improved early warning and response for emissions reduction.

(3) Construct a total emissions reduction system focused on resource and energy inputs, and greater efficiency in production and end-treatment of pollutants.

(4) Reform performance assessment of local officials to incorporate a simple to apply, locally appropriate consideration of energy and emissions reduction, and of enterprise compliance.

(5) Improve technical support capacity at central and local govern levels, including a more integrated environmental information system, scientific indicator system, accurate surveillance of emissions reduction, and a more rigid examination and evaluation system for emissions reduction.

(6) Improve operability of COD (Chemical Oxygen Demand) reduction programs for key polluting industries and non-point source pollution.

(7) Examine how pollutant emissions can be further reduced most cost-effectively in the 12th FYP, including environmental taxes, resource pricing, emissions trading, appropriate environmental financing, and through high-performing administration and management with upgrading of laws and regulations.

RECOMMENDATION 2. Integrate chemical environmental strategy into China's overall national environmental and health management systems.

Establish China's "Environmentally Sound and Strategic Management of Chemicals System, focused on environmental testing, evaluation, monitoring and management of chemicals.

(1) Take prevention as the key measure, with strengthened surveillance and regulation, a long-term action plan for risk assessment and give early attention to high risk chemicals, shift to cleaner production and "green chemistry", and be WTO-compliant.

(2) Formulate a special law or regulations on chemical environmental administration, covering classification and labelling, notification of new chemicals, environmental monitoring, right-to-know in release of toxic chemicals, and better environmental accident prevention and emergency response.

(3) Establish a system for release reporting of toxic pollutants and a publication system to inform the Chinese public and to help them become participants in decision-making.

(4) Promote voluntary measures on the part of chemical enterprises, including Responsible Care, product stewardship, and clarify the legal status of

voluntary agreements made under the Cleaner Production Promotion Law.

RECOMMENDATION 3. Seize the opportunity provided by China's strategic transformation of its environment and development mode.

There is a need to solve three problems: move from top down to more inclusive decision-making that builds better support from stakeholders and among all levels of government; provide detailed and effective policies, capacities and plans that are still missing; and get better value from existing funding, while continuing to increase the amount and flow of environmental investments.

(1) Build public awareness and participation of the whole society, including on sustainable consumption, environment and health, monitoring of local development, and direct participation in environmental improvement. Participation of environmental non-governmental organizations (NGOs). Training and education for policy makers and administrators, especially at local levels and within enterprises—capacity building for environment and development.

(2) Accelerate improvements to China's existing environmental protection systems. This effort should include: upgrading SEPA to a full ministry and strengthening local environmental protection bureaus (EPBs) by providing more financial, human and technical resources; rewriting of key laws such as the 1989 Environmental Protection Law; setting stringent standards with enforcement; reforming the penalty systems; providing better enabling mechanisms for sustainable development; and improving the environmental judicial system.

(3) Making full use of market based policies including environmental taxation, resource and energy taxation, green credits, environmental insurance, ecological compensation, emissions trading, etc.

(4) Review current levels of environmental assessment to determine amounts actually spent on high priority activities, and where necessary redirect funds to these priorities. Encourage private sector investment for innovations in the industrial sector, and initiatives that support Circular Economy.

RECOMMENDATION 4. Address the challenges brought on by economic and environmental globalization in a more timely and effective way.

(1) Gradually change the current growth mode of trade to take into account the relationships among resources, environment and trade. Import products and technology with high embodies energy and resource content. Reduce export of goods and commodities with high embodied energy and resources. Substitute goods that require high energy in their production or use. Shift trade towards a mode relying on quality improvement, increase of value-added, and structural optimization.

(2) Optimize regional structure for manufacturing goods for export, with strict

environmental upgrading of industries in eastern areas, and introduction of environmentally friendly processing in the middle and west of China. Levy environmental pollution tax on high energy consumption and pollution industrial sectors, and assign environmental damage costs. Introduce advanced environmental technology, and promote energy saving and emission reduction activities.

(3) Strengthen environmental aspects of trade in recyclable and waste goods, including better management of these aspects within China and with trading partners. Life cycle analysis for imported recyclables. Enforce strict entry standards. Restrict the re-export of raw materials produced from these imported recyclables. Work with other nations to honour international agreements intended to combat illegal trade in toxic wastes.

(4) Develop regulations for environmental impact assessments on key market supply chains for raw products entering China, including agricultural products, wood, biofuels and minerals. Take steps to prevent negative environmental influences in the countries of origin, including illegal timber trade, and activities banned under CITES (Convention on International Trade in Endangered Species of Flora and Fauna).

(5) Strengthen environmental management of Chinese companies that invest or operate overseas, and improve their Corporate Social Responsibility (CSR).

(6) Enhance China's participation in bilateral and multilateral environmental cooperation. Set up more complete implementation mechanisms within China for those agreements which China has signed. Participate more actively in construction of global environmental regimes. Expand technical cooperation on environment and development, especially with developing countries.

(7) Combine energy and pollution emissions reduction to develop an industrial system with relatively low CO_2 emissions, thus moving China on a pathway consistent with a Low Carbon Economy.

RECOMMENDATION 5. Construct a "Conservation Culture" through innovation.

This effort will depend upon setting out the right enabling conditions for "eco-innovation." These conditions include: unleashing creativity within research systems; financial investment oriented to environment and sustainable development innovation (including more venture capital); regulatory frameworks that favour innovation and support development of environmental technology markets; and evaluate/monitor environmental impacts of novel products.

Mobilize both national and local interests to implement eco-innovation. Take enforcement measures, planning, awareness raising and capacity development. Create regional innovation clusters.

(1) Strengthen and popularize environmental technology research and

development, and remove commercialization obstacles.

(2) Take action to overcome market failures. Private enterprise should become the major players for an environmental society. Address limited markets for environmental technologies, weak pricing signals, limited sanctions, and strengthen green procurement. Broader use of preferential loans for activities with use of environmental technologies. and denial of loans for activities that do not.

(3) Raise public quality of environmental science and technology—a scientifically literate public with a social environment where the value of eco-innovation can be demonstrated.

PART 2. CHINA'S ENVIRONMENT AND DEVELOPMENT POLICY CHANGES (2007-2008)

The past year[2] witnessed a turning point in environment and development undertakings in China. In October 2007 the 17th CPC Congress set out guiding principles for handling the relationship between the two, and for future policy making. The year 2008 represents a critical year of transition, in which action for the shift of the economic growth model, and building of an energy-saving, environmentally friendly and well-off society must speed up. Starting from the end of 2007, besides implementation of existing policies and targets in the 11th Five Year Plan, the Chinese government has accelerated energy conservation, and emissions reduction, releasing a series of major policies and measures to address pressing issues.

Guidelines for Development and Environmental Protection

The Communist Party of China (CPC) 17th Congress Report serves as a guiding document for future development in China, including environmental protection. It is pointed out that future development in China needs to be guided by the concept of scientific development, sustainable development and a development approach featuring growth, prosperity and a sound ecological environment. It also stresses the need to build an energy-saving and environment-friendly society, to achieve both growth and structural readjustment, and harmony between people, resources and environment so that people can enjoy a sound and healthy ecological environment and achieve sustainable economic and social development.

The 17th CPC Congress also has indicated that an *Ecological Civilization* is the new requirement for building an all-round well-off society: forming industrial structures and growth and consumption models that save energy and protect the ecological environment. Circular economy needs to be applied on a larger scale, and renewable energy needs to take up a significant proportion in the energy total. Emission of major pollutants needs to be under control, with considerable improvement of the ecological environment. The idea of building an ecologically sound society needs to be firmly established.

The Congress' Report put environmental protection at an unprecedented level of attention, indicating that environmental protection has entered a historical transition period. The idea is to integrate environmental protection into the overall development planning, explore ways to achieve harmonious development and a sound ecological environment; address environmental problems at a macro level, promoting economic development and environmental protection at the same time; extend environmental protection into all aspects of production and establish a comprehensive pollution

[2] The past year in the report refers to the past 12 months instead of the calendar year.

prevention and control system; and align environmental protection and improve living standards.[3]

Framework and Thoughts for Environmental Protection

The State Council released the 11th Five-Year Plan for National Environmental Protection ("the Plan") on Nov 22, 2007. Based on principles of prioritizing, measurable counting, quantitative assessment, the major indicators are reduced from 27 in the 10th Five-year Plan to 15 in the current Plan, including two indicators for aggregate control and three for environmental quality (see Table 1). The Plan centers on the solution to urgent environmental problems that hamper public health and sustainable economic and social development; emphasizes overall planning; targets 10% reduction of all pollutants; stresses pollution prevention and control as top priority; seeks safe drinking water for all residents; and develops overall planning. It proposes objectives, tasks and measures for 8 major concerns, including water, air, solid waste, ecological environment, rural pollution prevention and control, marine environment, nuclear and radiation-related environmental safety, and regulatory capacity.

According to the Plan, an investment of about 1.35% of the GDP is needed to attain the environmental objectives that have been set. The Plan identifies 10 major projects based in the 8 areas of concern: capacity building in environmental regulation, disposal of hazardous and medical waste, chromium residue treatment, urban sewage treatment, urban waste disposal, water pollution prevention and control in major rivers, sintering machine off-gas desulphurization in coal-burning power plants and steel industry, building of major ecological zones and nature reserves, rural environmental protection actions, nuclear safety and radiation.

The Plan requires improving monitoring and analyzing of greenhouse gas emissions, identities emission reduction targets and measures, and encourages adaptation to climate change. The Plan also proposes the following measures to support implementation: coordinating regional development and environmental protection; speeding up economic structural readjustment by institutional improvement, accountability and innovation; increasing investment; strengthening rule of law and regulation; developing environmental industries via technologies; mobilizing social support; and actively engaging in international environmental cooperation. It is also required in the Plan that governments at all levels fully perform their duties and make very real efforts to achieve accountability. Inter-departmental cooperation needs to be strengthened; assessment mechanisms shall be set up, with the information disclosure of major pollutant discharges every 6 months, for mid-term and final assessment of implementation of the Plan; stress shall be laid upon implementation and assessment.

[3] Excerpt of a speech by Zhou Shengxian, Environment Minister, at a meeting of EPB chiefs in 2008.

	Indicators	2005	2010	Increase during the 11th Five-year Plan
1	Total COD emission (10,000 tons)	1414	1270	-10%
2	Total SO2 emission (10,000 tons)	2549	2295	-10%
3	Ratio of surface water in state-controlled sections inferior to water quality Category V (%)	26.1	＜22	-4.1%
4	Ratio of state-controlled sections in 7 major rivers over water quality Category Ⅲ (%)	41	＞43	2%
5	Ratio of major cities with more than 292 days of air quality over Category II (%)	69.4	75	5.6%

Table 1. Indicators of environmental progress in 11th FYP.

The 2008 Government Work Report listed environmental priorities for the year, emphasizing that, in a year critical to attaining the binding reduction targets of the 11th FYP, intensive efforts must be made for better results in the following areas:

(1) Phase out outdated technology/infrastructure in power generation, steel, coal, paper making, while also building advanced capacity in these industries.

(2) Pay special attention to energy conservation in major enterprises and development of major projects; speed up implementation of energy conservation in the 10 major projects; boost urban sewage treatment capacity with an aim to collect and treat all sewers in 36 major cities; raise discharge fees, sewage treatment fees and waste disposal fees; improve and strengthen construction standards, promoting innovation in materials for walls and energy conservation; steadily promote urban heating delivery system and utility reform.

(3) Develop and promote technologies in saving, substituting and re-using energies and controlling pollution; apply key technological breakthroughs and carry out demonstration projects; develop energy-saving service industry and environment-related industry; explore clean and renewable energy such as wind and solar energies.

(4) Improve the prevention and control of pollution in the Three Rivers and Three Lakes, water diversion source areas and downstream areas, the Three Gorges Dam region and the Songhua River region, among other major river basins; implement the Master Environmental Plan for the Bohai Sea; put in place more stringent national discharge standards for major rivers.

(5) Protect sources of drinking water in rural areas; promote control of pollution caused by households and industrial pollution in rural areas; and strengthen control of pollution from animal husbandry and aquatic farming.

(6) Encourage and support developing Circular Economy; promote recycling, reusing, and clean production.

(7) Protect and make intensive and economic use of resources such as land, water, grassland, forest, and minerals; rigorously penalize those illegally exploring mineral resources; protect and properly use marine resources to develop marine economy; invest more in basic research in meteorology, seismology and mapping, and strengthen capacity building in these areas.

(8) Implement national plans to respond to climate change and strengthen capacity building in this aspect.

(9) Improve the incentive system for energy conservation and environmental protection; enforce monitoring and accounting systems for energy conservation and emission reduction, improve auditing and inspection systems; strengthen law enforcement and accountability.

(10) Raise social awareness for preserving a sound ecological environment, and mobilize the public to commit to an energy-saving and environmentally friendly society; recognize the need to persist through generations in order to achieve a green and clean living environment.

On July 1, 2008, Premier Wen Jiabao presided over the State Council working group meeting for energy conservation and emission reduction, at which the following priorities were identified for the attainment of the targets:

(1) Strengthening assessment and appraisal of responsible parties in their accomplishment of targets; disclosing results for public supervision; and, for the parties who fail to attain targets, explaining the reason for failure and proposing corrective measures.

(2) Resolutely containing the rapid growth of industries featuring high energy consumption and emission; enforcing regulations on new projects and strengthening land use review and approval; energy conservation assessment and review and environmental impact assessment; implementing stricter EIA to restrict the number of projects in a given region; strengthening management of production permits; and continuing to restrict the export of products featuring high energy consumption and emissions, and heavy resource reliance.

(3) Accelerating the phase-out of outdated technology/infrastructure. Shutting down small heat and power plants with a total capacity of 13 million KW, and phasing out outdated capacity in such industries as cement, steel, iron, electrolyzed aluminum, iron alloy, small coking, calcium carbide, plate glass, paper making, etc.; implementing regular reporting and checking in the phase-out.

(4) Focusing on key projects on energy conservation and emission reduction. Allocating state funds to support the 10 major energy conservation projects,

including the development of urban sewage treatment facilities and supporting drainage networks, treatment of industrial waste water in major rivers and capacity building in energy conservation.

(5) Stressing key areas to ensure that at least 80% of new construction projects meet the compulsory energy conservation standards by the end of 2008; establishing standards for limiting the fuel consumption of transportation vehicles and vessels.

(6) Speeding up the development and promotion of technologies in treatment and control of water pollution; promoting key technologies with great potential and wide application in major industries and areas.

(7) Facilitating development of circular economy and preparing plans for developing circular economy in key industries and areas; drafting incentive policies, and establishing and improving accounting systems in this area.

(8) Strengthening information management. Making public the list of flue gas desulfurization power plants to be built this year, and releasing information concerning their construction at year end; establishing as soon as possible an information system for urban sewage treatment management, an online monitoring system for urban waste water discharge and treatment facilities, a system for inspection and notification; strengthening the urban water discharge permit system and the waste water treatment licensing system; ensuring that the major 113 cities that adopt centralized supply of drinking water meet all the key requirements for the protection of surface water sources.

(9) Adopting economic policies helpful to energy conservation and emission reduction. Properly pricing resource-reliant products, improving regulations on pricing of power produced by biomass; carrying out discharge fee reform; initiating reform of a user fee in mineral resources.

(10) Further improving rules, regulations and standards regarding energy conservation and emission reduction.

(11) Strengthening supervision and administrative enforcement.

(12) Initiating a campaign of "everyone for energy conservation and emission reduction" throughout the nation.

Major Environmental Policies and Supporting Measures

1. Establishment of Ministry of Environmental Protection, with Enhanced Institutional Capacity Building

The first session of the 11th National People's Congress (NPC) in March 2008 adopted the reform proposal to establish the Ministry of Environmental Protection

(MEP). On April 23, 2008, MEP released its Work Rules of MEP, positioning itself as a State Council agency responsible for environmental protection across the nation. These Work Rules focus on the shift of functions, strengthening macro-regulation, coordination, supervision, and public service. Its functions include planning and coordinating environmental efforts; drafting and implementing environmental plans, laws, regulations, policies and standards; preparing environmental functional zoning and conducting environmental quality monitoring and assessment in prevention and control of pollution, ecological preservation, nuclear and radiation safety; and addressing key environmental problems. On June 25, the Standing Committee of the State Council reviewed and adopted the Rules of Procedures, reorganization and staffing of the new ministry, based on which three new departments of environmental monitoring, aggregate control, and information and education are added, with a total new staff of 50 people.

To ensure the attainment of environmental objectives for the 11th Five-Year Plan, the MEP prepared the Plan for National Environmental Regulatory Capacity Building in the 11th Five-year Period. The Plan was jointly approved by NDRC and the Ministry of Finance and released as Development, Reform and Investment Document No.639 [2008]. The Plan sets aside an investment of RMB 14.959 billion, with 7.847 billion from central budget, for 50 major projects. It focuses on the development of a current environmental monitoring and early-warning system and a sound environmental enforcement and regulation system, coordinating efforts in monitoring and inspection of nuclear and radiation matters, research, information collection and analysis, and education.

The Capacity Building Plan identifies 13 tasks:

Improving environmental quality monitoring network; strengthening regulating capacity for source regulation; enhancing emergency monitoring capacity; stepping up monitoring capacity in nuclear and radiation matters; promoting standardization of environmental inspection agencies; developing automatic monitoring system for major state-controlled sources; improving nuclear and radiation regulation capacity; strengthening regulation capacity in solid waste treatment; enhancing stewardship of nature reserves; improving infrastructure and working conditions in national environmental agencies; developing a research platform; strengthening standardization of environmental information and education agencies; and stepping up capacity building in environmental information collection and analysis.

2. Developing Supporting Measures and Achieving Initial Results in Energy Conservation and Emission Reduction

Environmental protection during the 11th Five--Year-Plan period is centred around energy conservation and emission reduction. In 2007, preliminary achievements were made in this regard, with a 3.27% cut in energy consumption per capita GDP, a reduction of 89.8 million tons of standard coal, and reductions of 4.66% and 3.14% in SO_2 emission and COD, the first time in recent decades.

On Nov 17, 2007, the State Council issued the Scheme for Implementation of Per Unit GDP Energy Consumption Indicator System, the Scheme for Implementation of Per Unit GDP Energy Consumption Monitoring System, and the Scheme for Implementation of Per Unit GDP Energy Consumption Evaluation System (referred to as the *3 Schemes*), the Measure for Calculating Reduction in Aggregate Emission of Major Pollutants, the Measure for Monitoring Reduction in Aggregate Emission of Major Pollutants, and the Measure for Evaluating Reduction in Aggregate Emission of Major Pollutants (referred to as the *3 Measures*); a joint effort by the NDRC, Bureau of Statistics, SEPA and other competent agencies. Energy conservation and emission reduction performances are integrated into the overall assessment system for social and economic development, as a major performance assessment indicator for government officials and enterprise executives. In combination with a stringent accountability system, this should serve as a major basis and institutional guarantee for achieving targets of energy conservation and emissions reduction in the 11^{th} Five-Year-Plan.

On July 7, 2008, in accordance with the State Council rules and regulations on the monitoring and assessment of energy conservation and emission reduction, MEP, together with NDRC, Bureau of Statistics, Ministry of Supervision, completed an assessment of reduction in total major pollutants in all provinces, autonomous regions, municipalities and five major power generation corporations, and made the following decisions: suspending EIA approval of new development projects with COD emissions in Yingtan of Jiangxi Province, Sanya of Hainan Province, Hechi of Guangxi Province and Yuxi of Yunan Province; suspending EIA approval of all thermal power generation projects of Huarun Power Holding Co. Ltd., Guizhou Jinyuan Co. Ltd., and Shanxi Power International; and issuing penalties to 7 power plants including Shajiao B power plant under Shenzhen Energy Group.

Nationwide, coal desulphurization facilities of a total capacity of 120 million kw were put into operation; urban daily sewage treatment capacity rose by 13 million tons; total COD emissions was down by 13.818 million tons, 3.2% lower than that of 2006; SO_2 emissions declined by 4.7% compared with 2006 to 24.681 million tons. SO_2 emissions from the power generation sector decreased by 9.1% from that of 2006, with a 13.2% cut in SO_2 emissions by the five major national power corporations. For the first time, China realized reduction in both emissions.

On July 27, 2008, NDRC released the notice on the assessment result of energy conservation target performance for 2007, disclosing information of 30 provinces, autonomous regions and municipalities: among good performers were Beijing, Tianjin, Liaoning, Shanghai, Jiangsu, Shandong; and poor performers included Shanxi, Inner Mongolia, Hainan, Guizhou, Ningxia and Xinjiang, with the rest in between. For the progress toward achieving conservation targets of the 11^{th} Five-Year-Plan, Beijing and Tianjin acheved 40%; 15 regions including Fujian, Shanghai, Shannxi 30%; 10 regions including Yunnan, Sichuan, Hunan, Chongqing, Hebei, Guizhou, Inner Mongolia, Shanxi, Jilin, Ningxia between 20% and 30%; and Xinjiang, Hainan and Qinghai less than 20%.

To enhance energy efficiency, mitigate pressure from oil and power supply, and promote sustainable development, on Aug 1, 2008 the State Council issued the Notice on Further Promoting Economy in Oil and Electricity Consumption (State Council No.2008[23]). The Notice pointed out that to address China's energy problems, the key lies in conservation, and development with conservation as priority. At present, importance shall be placed in major equipment and products with extensive application, huge potential and immediate results, such as automobiles, boilers, motor systems, air-conditioners, and illumination. Comprehensive supporting measures shall be adopted to form effective incentive and constraint mechanisms, with promotion of energy conserving products and technologies for higher efficiency in oil and electricity use.

Five major measures for motor vehicles have been established:

(1) Strictly enforcing the phase-out mechanism. All motor vehicles in operation shall meet fuel consumption limit standards by 2013;

(2) Encouraging the use of low-fuel-consumption autos and clean-energy autos; further expanding tax rate differences for vehicles of different emissions levels; listing fuel-efficient and environment-friendly vehicles and clean energy vehicles on government procurement list;

(3) Improving standards for fuel economy of vehicles and enforcing compulsory reporting, disclosing and labeling systems for vehicle fuel consumption;

(4) Strengthening conservation management of the transport sector;

(5) Promoting public transit systems; speeding up development of express bus and rail transport, enhancing connection of public transport, intra-region transport and inter-region transport and boosting efficiency of the public transit system. City governments shall increase investment and subsidy for the public transit system, with lower charges so as to encourage the use of the system.

Fuel-efficient measures for boilers (furnaces) have been established.

All thermal power plants (including newly built ones) shall adopt minimum petrol ignition technology and low load stable combustion technology for coal-burning boilers. China will continue to shut down oil-fired units as a major means to close small capacity thermal power plants. In power generation, oil-fired units shall only be used as supporting units. Investment from central budget and central fiscal funds shall be more supportive of oil conservation projects and oil-alternative projects.

Power-efficient measures for electric motor systems are being promoted.

(1) Accelerating the phase-out of low-efficiency motor systems and motor-driven equipments.

(2) Promoting high-efficiency and energy-saving motor systems and related equipment; those in compliance with the provisions of the Catalogue of

Preferential Income Taxes for Enterprises Manufacturing Energy and Water Conservation Equipment shall enjoy the prescribed preferential treatment. Projects involving energy conservation for motor system shall be rewarded.

(3) Strengthening management of power conservation in motor systems; Formulating high-efficiency motor product standards and improving the compulsory energy efficiency standards and operation standards for motors and motor-driven equipment. Establishing motor-testing agencies, and including energy efficiency indicator as a key part of quality control for motor systems and related equipment.

Power-saving measures for air-conditioners have been introduced.

(1) Promoting air-conditioners with high energy-efficiency performance. Strictly enforcing compulsory national energy efficiency standards for air-conditioners as well as energy efficiency labeling rules. Implementing fiscal and taxation policies encouraging purchase of high energy-efficiency products, encouraging development of non-electric air-conditioners.

(2) Strengthening management of air-conditioning use by strictly enforcing temperature control in public buildings.

(3) Improving renovation and maintenance of existing air-conditioning systems.

Power-saving measures for illumination purposes.

(1) Speeding up the phase-out of low-efficiency products.

(2) Cutting urban power use for illumination purposes;

(3) Improving management.

(4) Optimizing lighting systems operation through improving wiring and control modes.

(5) Using natural light whenever and wherever possible, and gradually installing automatic switches in public places.

Power-saving measures for offices. The Notice also requires promoting management of oil and electric power conservation in assessment and review of fixed asset investment projects, strengthening management of major oil and power users, improving power demand prediction management, implementing pricing policies for oil and power conservation promotion; accelerating technological innovation and application; enhancing supervision, strengthening enforcement, conducting information exchange and education campaigns, etc.

In a bid to discourage the production and consumption of high-emission vehicles and eventually to achieve the national emission reduction targets, the Ministry of Finance and the State Taxation Administration decided to readjust the automobile consumption tax rates, The new policy prescribes that the tax rate for vehicles with an emission of above 4 liters will be raised from 20% to 40%; the rate for vehicles with

an emission between 3 liters and 4 liters from 15% to 25%; and vehicles with an emission of no more than 1 liter will be lowered from 3% to 1%.

On Aug 1, 2008, the State Council released the Regulations on Energy Conservation in Public Organizations, prescribing management standards for state agencies, and not-for-profit organizations fully or partly funded by the state budget. The Regulations stipulate that:

(1) Departments in charge of intra-organizational matters within the State Council or governments at and above the county level shall enact energy conservation planning for public institutions at the corresponding level, in accordance with the longer-term conservation plan by the government.

(2) Public organizations shall adopt an energy consumption measurement mechanism, distinguishing energy use types and systems; energy use shall be measured by accounts, by types and by items, with monitoring to identify and halt energy wasting; public organizations shall designate a specific person to take charge of energy use calculation, keep original energy consumption records and maintain statistical ledgers.

(3) The organization shall adopt a quota system for energy use. Energy quotas shall be put in place for overall consumption levels of different sectors and public organizations, and for the Ministry of Finance to formulate energy use expenditure standards.

(4) Priority shall be given to energy-saving products in government purchase. Public organizations shall purchase products and equipment listed in the government procurement catalogues for energy conservation and environmental labelling according to regulations.

(5) Conservation management for development projects shall be strengthened. Renovation of newly built and existing structures of public organizations shall follow relevant requirements and standards for energy-conserving buildings. Departments within the State Council or governments at or above the county-level in charge of approving fixed asset investment projects shall control the scale and level of development projects by public organizations, with full consideration of energy conservation investment and returns, and conduct project energy conservation review and assessment.

(6) Public organizations shall undergo energy audit, conduct technical and economic assessment of their energy-using systems, operation of equipment and energy use. Measures shall be taken to boost energy efficiency in accordance with the audit results. The Regulations also provide accountability measures for non-compliance.

The State Council also released the Regulation on Energy Conservation for non-government buildings.

3. Attention of Top Officials to Climate Change, with Interests in Low Carbon Economy

On Nov 9, 2007, the China Clean Development Mechanism Fund and its management centre were put into operation. Approved by the State Council, the Fund is a not-for-profit state equity fund that is policy-development-based, public welfare-oriented, long-term and open-ended, with the Ministry of Finance as its supervisory authority. The development strategy and major operations are decided by a Fund Review Council composed of the National Development and Reform Commission, Ministries of Finance, Foreign Affairs, Science and Technology, Agriculture, Environmental Protection, and the China Bureau of Meteorology. The source of funding is the state gains the Fund derives from the international cooperation in clean development projects under the Kyoto Protocol. Meanwhile, the Fund is proactive in seeking cooperation with other sources of funding, and based on this, it promotes the participation and coordination of government input, international assistance and cooperation funding as well as private funding in response to climate change.

The Fund uses donations, preferential loans and other instruments to support the state in capacity building, public awareness campaigns, mitigation of and adaptation to climate change, as well as the implementation of China's National Plan for Coping with Climate Change. The Fund bases its operations on extensive domestic and international cooperation and plays the role of a cooperation platform for resources, funding, programs, actions and information exchange.

On June 27, 2008, the CPC Central Politburo held its sixth workshop presided by CPC General Secretary Hu Jintao, focusing on global climate change and capacity building for responding to climate change. Hu stressed the necessity and importance of full recognition of the need to respond to climate change, commitment to sustainable development, more effective policy measures and capacity building. Party branches and governments at all levels shall integrate climate change into development plans, take appropriate measures to boost organization and implementation capacity in response to climate change.

China, upholding the common but differentiated responsibilities identified in UNFCCC and the Kyoto Protocol, maintains that developed countries should take the lead in committing to emission reductions and providing funding assistance and technology transfer to developing countries. China also believes that developing nations should contribute to reversing climate change by pursuing sustainable development.

It was also stated that, in its response to climate change, China should focus on economic development, with priorities in energy conservation, ecological protection and development, and technological advances as supporting tools. China needs to control and mitigate greenhouse gas emission, boost its response capacity, enhance sustainability, and achieve economic growth and environmental protection.

It was decided that the following measures should be taken to address climate change:

(1) Implement measures to cut greenhouse gas emissions, commit to the basic national policy of energy conservation and environmental protection, adopt industrialization patterns with Chinese characteristics, shift growth models, conserve energy and boost energy efficiency, develop Circular Economy and Low Carbon economy, and increase forestry coverage.

(2) Improve climate change response capacity, strengthen basic development of farm land, rationally develop and optimize water resources, continue major ecological projects, and improve overall climate change impact assessment.

(3) Apply technological innovations, invest in R&D and application of major technologies, strengthen basic research, and promote international exchange and cooperation.

(4) Improve systems, mechanisms, laws and regulations regarding climate change, promote reform in energy management system and pricing, improve monitoring, early warning and response systems for various disasters, enhance multi-department decision-making coordination mechanisms, public participation mechanisms, and in particular, the capacity in comprehensive monitoring and early warning, in responding to extreme meteorological disasters.

(5) Encourage public participation in dealing with climate change by raising awareness and capabilities.

Low Carbon Economy is receiving increasing attention in policy discussions. Wan Gang, Minister of Science and Technology, pointed out at the 11th CPPCC (Chinese People's Political Consultative Conference) session that to fight global climate change, new technologies must be adopted to cut emissions and conserve energy, and to build a low-carbon and carbon sequestration economy. During the annual CPPCC and NPC sessions, Wu Xiaoqing, vice Minister of MEP, noted that with the new international developments, China must act promptly to meet the challenges raised by the low-carbon economy, based on low energy consumption and low pollution. Wu also said that how to reduce the reliance on resources and energy consumption has now become a major challenge for China. Low carbon undoubtedly provides a new approach to sustainable development for China. It may well be the future for social and economic development, thus becoming a strategic choice in achieving energy conservation and emissions reduction, as well as fighting climate change.

4. Increased Investment in Environment, with Fiscal and Taxation Policies as Leverage

The Ministry of Finance (MOF) is adopting a series of policies to conserve energy and cut emissions:

(1) Setting up special funds and increasing funding in conservation and allocating more money for research and development through various programs. According to the Temporary Rules on the Management of Incentive Funding for Energy Conservation Technologies, companies will receive state financial grants if they initiate programs that help to reduce energy use by 10,000 tons of standard coal.

(2) Adjusting tax systems to encourage conservation, proper exploration and use of energy. The government will expand the consumption tax coverage, and will collect tax on products causing serious pollution or using large quantities of resources, in an effort to let taxation play a larger part in conservation and emissions reduction.

(3) Improving government procurement policies by encouraging government agencies to take the lead in conservation.

(4) Strengthening the user fee system for resources, environmental deposit system, urban sewage treatment system, and the discharge fee system; promoting full cost accounting in energy to reflect the full cost; tapping into market mechanisms for conservation and reduction, such as pay-for-discharge-right and discharge right trading system; setting up trans-river ecological compensation mechanism; fully promoting the “pay for mining rights” system, and environmental and ecological accountability system for mining companies; and establishing carbon trading systems.

(5) Improving fuel tax reform schemes and imposing fuel tax at an appropriate time; subsidizing special industries and grain-growing farmers to create a stable environment for rationalizing prices of refined oil and to create conditions for a pricing mechanism conducive to efficient and economic use of fuel.

(6) Establishing special funds for renewable energy to support the development of renewable energy and new energy sources and to reduce reliance on traditional fuel. Developing supporting financial and taxation policies for restricted biofuel sources, thus avoiding impact on food security and grain price; speeding up the development of financial policies to encourage the use of crop residues (stalks and straw) as energy sources.

In 2008, the MOF set aside RMB 27 billion as special fund for conservation and emission reduction, including 7.5 billion for 10 major projects, 7 billion for sewage pipe network development in cities in the central and western part of China, 4 billion for phasing out outdated infrastucture, 5 billion for cleanup of the three rivers and three lakes as well as the Songhuajiang River, 3.5 billion for environmental monitoring capacity building and basic conservation work. In addition to the 14.8 billion from the Central Development Investment, a total of 41.8 billion is allocated from the central budget for energy conservation and emission reduction.

5. Implementation of Economic Measures for Environmental Protection, with Extensive Application of Market Mechanisms

China had never before so extensively and systematically proposed and applied market mechanisms to address environmental problems as it did in the past year. The newly released Law on Energy Conservation and Law on Promoting Circular Economy both explicitly recommend the use of market mechanisms and economic measures to promote relevant programs. In particular, the new conservation law includes a chapter on incentive policies, stating that the state should adopt fiscal, taxation, pricing, credit policies and government procurement to promote energy conservation and industrial upgrading in enterprises, and prescribing a series of compulsory measures to restrict the development of industries featuring high energy consumption and high pollution, including compulsory energy efficiency labelling.

Green Credit Policy

In July 2007, SEPA, the Bank of China, and the China Banking Regulatory Commission (CBRC) jointly released the Proposal on Implementation of Environmental Requirements to Ward off Credit Risks. Following this, CBRC released the Notice on Warding off and Controlling Risks of Loans to Corporations with High Energy Consumption and Pollution in July, and the Guide on Credit Granting for Energy Conservation and Emission Reduction in November 2007, requiring that financial institutions cooperate with environmental authorities, implement national industrial policies aimed at restricting development of projects with high energy consumption and high environmental risks. Financial institutions and environmental departments in most regions responded positively to these policies.

Green Insurance Policy

On 18 February 2008, SEPA and the China Insurance Regulatory Commission jointly released the Proposal on Environmental Pollution Liability Insurance, as an experiment on pollution liability insurance practices. According to the road map, the two agencies will conduct pilot programs of liability insurance in businesses involved in production, sales, storage, transportation and use of hazardous chemicals; and in petrochemical corporations and hazardous waste disposal facilities most susceptible to pollution accidents; and in particular, in the corporations and industries that have caused major pollution incidents in recent years. During the 11th Five-Year-Plan period, the aim is to establish a pollution liability insurance system, conduct pilot projects in major industries and regions, and establish a catalogue of environmental risk-based insurable sources and pollution damage compensation standards. The goal for 2015 is to improve the insurance system to make it applicable nationwide, and to strengthen this mechanism for risk evaluation, loss assessment, liability identification, incident response, and damage control.

Green Securities Policy

In February 2008, SEPA released the Proposal on Stepping Up Environmental Regulation on Listed Companies. Green Securities is the third environmental

economic policy following Green Credit and Green Insurance. The Proposal will focus on: developing an environmental verification system and information disclosure of listed companies; containing excessive expansion of industries with high energy consumption and pollution; curbing capital risk; and pressing listed companies to improve their environmental performance. It requires that companies in thermal power generation, iron and steel, cement, electrolyte aluminum, and trans-provincial industries with high energy consumption and pollution (13 categories of heavy polluting industries), when applying for IPO or refinancing in the capital market, shall conduct environmental verification in line with SEPA rules. In accordance with China Security Regulation Commission's Notice on the IPO Application Documents of Companies in Heavy Pollution Industries, such companies, in the application for IPO, must secure MEP's verification approval; otherwise, the application will be rejected.

Green Trade Policy

On Feb 26, 2008, SEPA made public the first Catalogue of 'High Pollution, High Environmental Risk' Products, covering 141 kinds of products in 6 industries. Among them, 39 products including pesticide, paint, battery, and organic arsenic still enjoy export tax rebate. SEPA made recommendations to the MOF and the State Taxation Administration for canceling the tax rebate, and to the MOC and the Customs to ban the trade of such products.

Emission Trading Policy

Emission trading has been in practice in China for some years. The Government conducted a series of pilot programs in this regard. The Decision to Implement the Scientific Development Concept and Strengthen Environmental Protection in 2006 proposed that emission trading such as SO_2 trading could be conducted in appropriate places. Despite the absence of a national normative document governing emission trading, local governments are active in exploring this market mechanism to promote local environmental protection. In 2007 and 2008, many parts of China made substantive progress in emissions trading. Jiaxing of Zhejiang province, Shanghai, Beijing, Tianjin, Lvliang of Shanxi province, and Taihu area in Jiangsu province have established environmental trading exchanges, with substantive trading cases. Other places like Hubei province, Changsha city and Chongqing also issued regulations for emission trading. Within the framework of Sino-US SED, MEP has initiated the Sino-US pilot program in SO_2 emission trading, with Heilongjiang province confirming its participation in this pilot effort.

6. Improving the ronmental Legal System and developing more Laws and Regulations

Currently, China has 28 laws governing the protection of resources and environment, and 66 regulations enacted by the State Council, all of which provide a legal basis for the protection work. However, with economic development and change of time, loopholes in those laws and regulations emerge, resulting in heavy demand for revision. In 2007 and 2008, 3 laws have been revised and more regulations

released.

Environmental Laws

The Energy Conservation Law of China, revised on Oct 28, 2007, has been in force since 1 April 2008. This revision identifies energy conservation as the nation's basic policy at legal level, explicitly prescribing that "the nation shall implement the basic state policy of practicing energy conservation, and the energy strategy of 'conservation and development with priority to conservation'." China now adopts a conservation target responsibility system and conservation assessment system, incorporating conservation targets into the overall assessment of local governments and officials. The revised energy conservation law expands scope and operability, further defines clauses governing energy conservation in the industrial sector, and adds provisions of energy conservation in construction, transportation and public institutions in response to weak areas for energy conservation.

The revised Law on Prevention and Control of Water Pollution, adopted on Feb 28, 2008, came into force on June 1, 2008. The revised law says that "governments at and above the county level shall integrate water protection into economic and social development plans", forming a legal basis for environmental protection in economic and social development, with a more detailed and improved management system for prevention and control of water pollution. The new version establishes the legal status for building accountable management systems and mechanisms for water protection, assessment, ecological compensation, discharge permit, restricted regions, legal assistance for water pollution damage proceedings, thus making the water pollution management system more effective.

It defines the responsibilities of local governments in water protection, establishes the accountability system for governments at and above the county level with regard to the water quality within their jurisdiction, integrates water protection targets into assessment of local governments and the officials in charge, and institutes more stringent legal liabilities for violators. It also increases financial penalties for violations substantially, removing fine ceilings for some violations; it covers more punishable actions by establishing sanctions for failure to perform duties in a responsible and effective fashion. It expands the enforcement authorities of environmental agencies, and grants agencies the authority to impose administrative sanctions in cases of excessive discharge or failure to meet discharge requirements within the designated deadline.

The Law on Urban Planning, revised and adopted on Oct 28, 2007, has been in force since 1 January 2008. The old version stresses guiding development, while the new edition emphasizes resource protection, covering arable land, natural resources, cultural heritage, scenery spots and places of historical interests, and includes an implementation plan.

The National People's Congress (NPC) adopted the Law on Promotion of Circular Economy on August 29, 2008, which will come into effect on 1 January 2009.

Circular Economy refers to all the activities of reduction, reuse and recycling in production, circulation and consumption. The Law has established 6 primary systems: planning system for Circular Economy; aggregate control system for containing resource waste and emission of pollutants; circular economy assessment system; producer-centered accountability system; system for regulating enterprises of high energy and water use; and an economic statistical system.

To meet reduction requirements, the Law covers areas including information disclosure, reducing resource consumption and waste generation in the designing, adopting advanced or appropriate water saving technology, formulating and adopting water saving plans, strengthening water saving management, adoption of overall planning in development of mineral resources, using processes that are efficient in energy, water, space and materials, as well as small-sized, light and renewable products in the design, construction and building of architectural structures; promoting intensive land use, encouraging and supporting the use of advanced farming, animal husbandry and irrigation techniques that save water, fertilizer and pesticide, giving priority to eco-agriculture and promoting energy saving agricultural machinery. State agencies and state funded organizations shall take the lead in using environmentally friendly products, equipment and facilities that save energy, water, space and materials; service-oriented businesses such as catering, entertainment, and hotels shall use environmentally friendly products that save energy, water and materials, reduce or stop the use of waste-generating products; the state encourages and supports the use of recycled water and restrict the production and distribution of disposable products.

To meet reuse and recycling requirements, the Law states that the industrial sector will promote cooperation among enterprises in comprehensive use of resources in an efficient and circular fashion. Industrial solid wastes, waste water, excessive heat, building materials waste, byproducts in agriculture, used agricultural plastic films, and forestry wastes shall be recycled and reused, and an information system for waste exchange shall be set up. The state encourages and promotes the establishment of waste recovery systems; strengthening management of electronic products recovery; recovery and remaking of motor vehicle parts, engineering machinery, machine tools and tires. Governments at and above the county level shall put in place an overall planning of facilities for sorted collection and recycling of urban and rural domestic wastes to boost recycling.

Normative Documents: Other Environmental Laws, Regulations, Standards

To ensure full and timely collection of discharge fees and correct noncompliance in the collection process, SEPA released the Rules on Discharge Fee Collection Inspection which took effect on December 1, 2007. In 2008, MEP issued a notice concerning discharge fees on waste water and gas.

On 10 December 2007, SEPA, MOC and MOST jointly released the Interim Regulations on National Ecological Industrial Parks which sets rules for the application, construction, management, naming, and acceptance check. The parks are

designed based on the theory of Circular Economy, industrial ecology and clean production. The development of such parks helps to improve ecological environment in industrial parks, and promote the shift of growth model and development of new and high technologies.

On 31 December 2007, the State Council Office released the Notice on the Restriction of Production, Sale and Use of Ultra-thin Plastic Bags (SCO DOC 72, 2007), requiring that, as of June 1, 2008, the production, sale and use of ultra-thin plastic shopping bags shall be restricted; the approach of pay-for-use shall be adopted; supervision and inspection shall be stepped up; used plastics shall be recycled to the greatest extent possible. With the implementation of the restriction, plastic shopping bag use in department stores and supermarkets has dropped by more than 80%.

In November 2007, SEPA released The Rules on Monitoring Reduction of Major Pollutants. On Apr. 9, 2008, MEP released The Measures for Administration of Automatic Monitoring Equipment at Sources, which has become effective since May 1, 2008. The Measure requires the installation of automatic monitoring equipment at sources, which feeds information to the network of environmental agencies.

With respect to electronic waste, hazardous waste, nuclear management, prevention and control of marine pollution, protection of bio-diversity, normative documents were also released. The State Council started the revision of The Regulation on Prevention and Control of Marine Pollution Caused by Marine Construction Projects on January 1, 2008. To prevent and control pollution caused by electronic waste and improve environmental management, The Measures on Prevention and Control of Electronic Waste Pollution came into force on February 1, 2008. The MEP and NDRC jointly released the revised National Catalogue of Hazardous Waste, based on the Law on Prevention and Control of Solid Waste Pollution. It became effective on 1 August 2008. The Catalogue covers solid and liquid wastes that are corrosive, toxic, combustible , radioactive, infectious, or potentially hazardous; and that need to be handled as hazardous waste. Medical waste is identified as hazardous waste. To regulate the export of hazardous waste and prevent environmental pollution pursuant to the Basel Convention, SEPA released the Measures on the Regulation of Hazardous Waste Export on March 1, 2008.

With respect to nuclear safety management, a series of documents have been released, including the Rules on the Regulation of Imported Civil Nuclear Safety Equipment (HAF604), the Rules on the Regulation of Welder Qualification for Civil Nuclear Safety Equipment (HAF603), the Rules on the Regulation of Design, Manufacturing, Installation and Non-Destructive Testing of Civil Nuclear Safety Equipment (HAF601), and the Rules on the Regulation of Qualifications of Non-Destructive Testers for Civil Nuclear Safety Equipment (HAF602).

In 2008, the National Standard Committee will focus on the 82 national standards pursuant to the Law on Resource Conservation and the Law on Circular Economy, and the revision and implementation of the General Rules on the Building Standard System of Corporate Energy Conservation. There is also the need to intensify research

on market entry standards such as energy efficiency standards for energy-consuming products and equipment, and energy consumption ceilings for high energy-consuming products, in order to achieve targets for energy conservation and emissions reduction. The National Standards Committee and the NDRC prepared the Plan for the Development of Resource Conservation and Comprehensive Utilization Standards 2008-2010. The plan proposes 1121 standards to be developed or revised for 2008-2010, including 676 national standards and 445 industry standards. The year 2008 has also seen the implementation of standards concerning motor vehicle emission, pesticide use, pollution control in landfills, and technical requirements for environmental products.

7. Environmental Information Disclosure and Public Participation

SEPA released the Rules on the Disclosure of Environmental Information on Feb 8, 2007 in order to ensure disclosure of information and encourage public participation. This has been in effect from May 1, 2008. It requires that environmental authorities make public 17 categories of governmental environmental information including laws and regulations, policies, standards, administrative permissions and administrative approvals. It also demands that sources with excessive discharges of pollutants shall disclose four categories of environmental information which shall not be withheld on the ground of business confidentiality. In addition, it encourages voluntary information disclosure. The Rules represents the first normative document on information disclosure as well as the first comprehensive departmental rules on environmental information disclosure released by the government following the State Council's Rules on Disclosure of Government Information.

On Jan 30, 2008, SEPA issued a notice on the applicability of the Rules to EIA reports (EC No. 50 2008).

On May 6, 2008, MEP released on its official website the first MEP Categories for Information Disclosure and MEP Guide on Information Disclosure. MEP will make public 17 categories of information, and will respond to any public application for disclosure of environmental information within 15 working days from the day of application.

8. Emerging Environmental Concerns and Problems

Some unprecedented environmental challenges are emerging in the wake of urbanization and industrialization in China. This trend forces China to deal with more new environmental problems, such as ecological degradation and rural pollution, while dealing with industrial pollution. In the past year, some efforts have been dedicated to the new challenges by promulgating new regulations, launching new initiatives on research and surveys, and investing more money and human resources for handling new problems.

Ecological Preservation

On Dec 7, 2007, SEPA released the General Plan for the Protection of Major National Ecological Protection Zones, and the General Plan for the Preservation and Exploration of Animal Species. The Plan identified major objectives for the coming 15 years, with three stages for implementation. It also identified 12 key areas, including animals, plants, microbes, traditional knowledge, import and export management, together with some others. The Plan listed 10 priority actions and 55 priority projects for the 11th Five-Year-Plan period, which provides the direction for financial support.

The General Plan for the Protection of Major National Ecological Protection Zones sets forth the guidelines, principles and tasks for the development of ecological function zones. The Plan points out that development activities are restricted within the protection zones. Building of the zones shall follow the principles of overall planning; phased development; commitment and sound organization; protection over development; avoidance of duplication; and a search for complementarity. The Plan is the first of its kind explicitly designed for capacity building, and represents the efforts of the NDRC and MOF in implementing the scientific development concept. With its implementation, the environmental regulatory capacity across the country has been greatly improved, making a stride towards a modernized, standardized and informed regulatory system with Chinese features.

Environment and Public Health

On November 6, 2007, the Ministry of Health and SEPA, together with 16 other ministries and commissions jointly released the National Action Plan for Environment and Public Health 2007-2015 (the Action Plan for short), an indication of China's commitment to protection of public health and implementation of environmental protection as a basic state policy. The 17th CPC provided historical opportunities to environmental protection, creating favorable conditions for work in environment and health. The Action Plan, as the country's first guideline on environment and health, points out development directions and major tasks for environment and health, identifies roles and responsibilities for different departments, creating cooperation and coordination opportunities in promoting environment and health work. On January 20, 2008, the Action Plan was formally initiated.

Environment in Rural Areas

On Nov 13, 2007, the NDRC, the Ministry of Agriculture, the Ministry of Construction, the Ministry of Water Conservation, the Ministry of Land and Resources, SEPA, and the Bureau of Forestry jointly released the Proposal on Strengthening Rural Environmental Protection (No.63, State Council Office, 2007). It is a directive document following the 17th CPC, for implementing the scientific development concept, building a harmonious society, and achieving economic, social, and environmental benefits at the same time.

The Proposal identifies 7 major rural environmental problems in need of solutions:

(1) Protection of sources of drinking water and improvement of water quality.

(2) Treatment of pollution caused by daily life.

(3) Industrial pollution in rural areas.

(4) Prevention and control of pollution caused by animal husbandry and aquatic farming.

(5) Control of non-point source pollution.

(6) Soil pollution control.

(7) Ecological preservation.

The Proposal lists the following as main objectives for 2010:

Containing the worsening pollution trend; improving environmental quality in drinking water sources; obtaining knowledge about the nation's soil pollution and agricultural pollution sources and making progress in controlling non-point source (NPS) pollution; raising application rate of the soil-test-based fertilizer technology and the use of pesticides featuring high effectiveness, low toxicity and low residue by over 10%; improving water supply; ensuring more than 65% of rural toilets meet set hygiene standards; controlling serious health hazards; achieving preliminary results in controlling industrial pollution and household waste pollution; improving environmental regulation in rural areas; raising environmental awareness; better production and stewardship of the living environment.

The objectives for 2015 are:

Considerable improvement in living and ecological environment; containing the worsening trend in NPS pollution; enhanced regulatory capacity and environmental awareness; coordinated economic, social and environmental development. For those objectives, the Proposal suggests the following 6 measures: (1) improving policies, regulations and standard system; (2) establishing and improving rural environmental management institutions; (3) increasing investment; (4) wide application of technologies; (5) enhancing environmental monitoring and regulation; and (6) promoting information, education and training.

Soil Pollution

On January 8, 2008, SEPA convened in Beijing the first meeting on prevention and control of soil pollution. The year 2008 will see the preliminary completion of the setup of a database concerning soil pollution in China, an information system of rules and regulations as well as standards on prevention and control of soil pollution as preparation for the drafting of the Law on Prevention and Control of Soil Pollution and including it into the NPC's legislative agenda as soon as possible. On June 6, 2008, MEP released the Directive of Strengthening Prevention and Control of Soil Pollution which identifies the following major objectives:

(1) By 2010, complete a survey of soil pollution across the nation, with a

comprehensive understanding of soil quality situation in China; establish an environmental monitoring network for soil; draft national and local plans for controlling soil pollution, formulate administrative framework for policies, rules and regulations; complete an action plan for conducting soil safety campaigns, resulting in enhanced public awareness concerning soil pollution prevention and control.

(2) By 2015, establish an administrative and supervisory system for soil pollution control, with the release of a series of laws and regulations and improvement in the standard system for prevention and control of soil pollution with contingency plans for soil pollution emergencies, improve soil monitoring network; enhance regulatory capacity, with considerable improvement in public awareness; implement prevention and control plans, and conduct research.

9. International Cooperation in Environment, and Consensus Building in Key Areas

In 2007, Climate change was an important issue in China and received extensive international cooperation. China was increasingly active in international efforts to cope with climate change. In December 2007, China took a proactive stance at the UN Convention on Climate Change held in Bali, and contributed to the formation of the Bali roadmap.

On July 9, 2008, Chinese president Hu Jintao was invited to the G8 summit, at which he made a speech on energy security for economic powers and climate change. Hu presented the guidelines, principles and measures in China's response to climate change, noting that climate change problems, fundamentally development problems, shall be addressed within the framework of sustainable development; international cooperation in climate change shall proceed in the context of economic growth, social development and environmental protection, with economic development as the focus; sustainability as the goal; energy conservation and ecological preservation as priorities; and technological advances as back-up support. Such a framework should improve the capability of the international community in mitigating and adapting to climate change. Countries, differing from one another in terms of economic development, technological achievements and national realities, shall make their own efforts to achieve positive results in coping with climate change on the principle of common but differentiated responsibilities.

President Hu Jintao noted that three factors should be taken into account when looking at China's emission problems:

(1) China, as a developing country in the process of industrialization and modernization, with imbalances in urban and rural development, regional disparity in social development and economic development, still faces the major task of improving people's livelihood and developing economy. (2) Per capita emission level in China is low, and cumulative emissions even lower. (3) Changes in international

division of labor and shifting of manufacturing activities to China have posed greater pressure for China.

Hu also elaborated on the measures China adopted for emission cuts. The Chinese government, responsible for its own people and people of the world, has been attaching great importance to climate change:

(1) It has identified ecological development as a strategic mission, emphasized the basic state policy for resource conservation and environmental protection, and tried to build an industrial structure, growth model and consumption pattern that preserves energy and resources and protects the environment. (2) It has taken energy conservation and emission reduction as the entry point in responding to climate change, and achieved positive results by taking a series of measure such as conserving energy, improving energy mix, enhancing energy efficiency and forestation. (3) China has been improving its capacity in adapting to climate change in areas such as agriculture, natural ecological systems, and water resources, giving priority to disaster prevention and relief and reducing loss resulting from disastrous and extreme weather conditions.

China has sent delegations to a number of international climate change meetings, for instance, China attended UNEP's 10th Special Council and Global Ministerial Environment Forum on Feb 20-22, 2008 in Monaco; it also participated in the legislators' forum on climate sponsored by GLOBE International in Tokyo on June 28, 2008.

China's breakthrough progress in many environmental protection areas often starts in bilateral and multilateral cooperation. In the past year, China worked closely with the US and Japan in addressing some international environmental problems of common concern and pressing environmental problems in China.

On Dec 12 and 13, 2007, China and the US held their 3rd Strategic Economic Dialogue (SED) in Beijing, signed an MOU on Strengthening Cooperation in the Area of Converting Biomass into Fuel, and discussed the possibility of signing an MOU in fighting illegal logging and related trade problems to promote sustainable exploration of forests. China will initiate SO_2 emission trading in the power generation sector nationwide. The US will provide technical support for water pollution management projects and adoption of clean energy and its use in motor vehicles. The two sides reiterated their commitment within the WTO framework on "the reduction or, as appropriate, elimination of tariff and non-tariff barriers to environmental goods and services".

On June 17 and 18, 2008, the two countries met at the 4th SED in the United States Naval Academy in Annapolis, Maryland, USA, with the release of a joint statement covering the following: signing of a framework for cooperation in energy and environment in the coming decade; discussing ways of fully exploring energy security principles through dialogue; agreeing to cooperate with international energy institutions and agencies in areas of common concern to address energy security

problems facing both sides, including global energy market, strategic oil reserve, energy diversification, energy efficiency and clean energy technology; agreeing to share information and experience in the reuse, disposal and regulation of wastes; consenting to conduct bilateral exchange with regard to product range and modes of the reduction and, as appropriate, exemption of tariffs, so as to achieve a comprehensive WTO agreement on environmental products and services; agreeing to explore the establishment of a mechanism by which information concerning trade in timber and forest products as well as legality of timber can be exchanged on a regular basis, in an effort to promote trade of legal timber and forest products, as well as global forest enforcement and governance.

On Dec 27-30, 2007, Japanese Prime Minister Yasuo Fukuda paid an official visit to China. The two countries signed the Joint Communiqué of the two governments on the Promotion of Cooperation in Environment and Energy, a document reflecting many consensus, covering strengthening response to climate change, protection of forestry and wildlife, technology transfer in energy conservation and emission reduction, intellectual property right protection, funding and capacity building, personnel exchange and training programs. The two sides will support joint research and pilot programs in pollutant reduction and its synergy effects on the reduction of greenhouse gas emissions, and strengthen concrete collaboration in water, waste and 3R (reduce, reuse and recycle) areas. China and Japan will continue cooperation in water pollution prevention and control in major river basins such as the Yangtze River, in development of recycling-based cities, and conduct dialogue and technical cooperation for waste management and 3R topics as well as cooperation in the area of environment and health.

On May 7, 2008, Chinese President Hu Jintao signed the Joint Statement by the Government of China and the Government of Japan on Climate Change during his visit to Japan. The two sides will work together to respond to climate change and forge a partnership in doing so. In addition to reiterating their common commitment to international conventions on climate change and principles for addressing climate change, the two sides also expressed willingness to actively participate in negotiations aimed to strengthen the effective progress and framework, before 2012 and beyond, established in the Bali Roadmap, in order that positive results can be accomplished on the Meeting of Signatories to the Convention and Protocol to be held in Copenhagen in late 2009. The Joint Statement also points out that the two countries will strengthen cooperation in technology transfer and capacity building in coping with climate change, and conduct joint research in key areas, particularly research on the impact of measuring industry-specific emission reduction, enhancing technology and capacity for coping with climate change, research in financial input in climate change response, among others.

Conclusions on China’s Policies and Progress

Clearly this past year has been perhaps the most active ever for China in terms of

the number of initiatives taken for improving the relationship of environment and development. It lends credence to the observations of CCICED in 2006 that China has entered a transformative era, or, as it is sometimes started, "a historic transition." However, this listing of policy changes should not be taken as an assessment of implementation success. That is a more complex task.[4]

The long lists of policy innovations and the specific tasks to be accomplished in a very short time frame are daunting, and elicit a number of concerns that have been examined in the past by CCICED. These include:

(1) Coordination of actions horizontally and vertically within government. The level of inter-agency coordination, potential for duplication of effort, unclear lines of responsibility, and the need for accountability between levels of government remain as serious concerns.

(2) Unclear level of commitment to the "Three Transforms" intended to put environmental matters on an equal footing with economic decision-making. On-going subsidies in use of energy, for example, work against the level of conservation that is required.

(3) Strength of the new MEP, which is still under-staffed to deal with the coordination needs and responsibilities of its broad mandate.

(4) Funding levels for environment and development. The 1.35% of GDP may seem like a substantial investment—and it is—but this level is still below levels considered optimal in some other countries. There is also the major concern about how well this money will be used, especially with the limitations on capacity that need to be addressed.

(5) Need for a clear and coordinated approach to such key issues as environmental technology innovation, and a sufficiently strong approach to environment and health—both topics that will be dealt with at the CCICED 2008 AGM.

(6) An approach to capacity building for environment and development that is commensurate with the implementation needs, and that fully takes into account the limitations on small and medium-sized enterprises within China, and the need to ensure that poorer parts of China participate fully in environmental protection actions.

(7) Improving the quality of environmental justice in China, whether for ensuring sanctions against those damaging the environment are sufficient, for ensuring those who help to improve the environment are appropriately rewarded or compensated, and for removing the problems of corruption that can be as damaging to environmental protection as they are to social and economic development.

[4] See, for example, OECD. 2007. *Environmental Performance Review CHINA*. OECD, Paris. 336 pp.

(8) China's ability to influence international directions on environment and development policies is likely to increase substantially in coming years, and certainly the effort now being undertaken on energy and environment highlights China's concern to be a responsible global citizen. But there is little doubt that on issues such as climate change, action by the international community is too slow. This will be damaging to China in the long run, and new ways of meeting such challenges need to be identified.

It will be important to continue strengthening monitoring and analysis of progress. This point certainly seems to be well recognized by China's decision makers, who have taken a number of steps in this direction. But the perils of gathering good quality information are still considerable, and there is a need for better compatibility of data, and for independent analysis that provides the most accurate picture.

There have been many important milestones on environment and development in this past year which reflect the deepening and broadening of this subject matter in China. Three that stand out for their innovative quality are:

(1) The administrative measures taken towards greater openness with the public on environmental information. This is a most important step towards improved public participation in environment and development decision making.

(2) The comprehensive involvement of the financial sector in various ways related to credit, availability of insurance, sources of investment, etc.

(3) The growing interest in Low Carbon Economy as an organizing focus for planning on energy and environment, and, indeed, for action towards a Circular Economy.

These components of policy and strategy should be of growing significance to China in coming years.

There are certain topics that have not received full coverage in this report. Two that stand out are the policies and action on environment that China undertook during the Beijing Olympics. An example is the policy approach of odd and even numbered license plates for vehicle use. This is a policy that could be put in place elsewhere in the country. And the policies that have guided China successfully through the Wenchuan Earthquake and other disasters have been of considerable significance for setting new directions on natural disasters. This topic has been examined in the CCICED 2008 Issues Paper.

Finally, while it is somewhat early to determine what new policy directions are likely to emerge within China and in China's international relations as a consequence of the global financial and credit crisis, there likely will be consequences for environment and development in the months and year ahead.

China deserves considerable credit for its significant efforts in 2007-2008 to position environment and development as a prominent and transformative component

of national policy.

(This report is provided by Chief Advisors & Support Team)

Meeting Record

Shangri-La Hotel, Beijing

November 12 – 14, 2008

I. INTRODUCTION

1. The China Council for International Cooperation on Environment and Development ("the Council" or CCICED) was established by the State Council of the Government of China (GOC) in 1992 to support cooperation in the areas of environment and development between China and the international community.

2. The Council is a high-level advisory body that puts forth recommendations on environment and sustainable development for the Chinese Government's consideration. It has so far held five annual meetings in each of the First, Second and Third Phases, and convened two meetings in the Fourth Phase.

3. The Council supports the development of an integrated and coherent approach to sustainable development and environment, while promoting closer cooperation between China and other countries. While being non-governmental, the Council has strong government involvement. At present the Council is composed of 24 Chinese Members and 22 International Members, all chosen for their experience and their expertise.

4. The Council is chaired by Mr. Li Keqiang, Vice Premier of China's State Council and a member of the Political Bureau's Standing Committee. It was at his invitation that the Members of the Council attended the Second Meeting of the Fourth Phase.

5. The host institution is the Ministry of Environmental Protection (MEP). Previously known as the State Environmental Protection Agency (SEPA), MEP has been made responsible for the Council and for ensuring inter-ministerial coordination. It has established a Secretariat (SERI) to maintain and develop international and domestic contacts. The Secretariat ensures follow-up in China to CCICED recommendations, and deals with routine matters when the Council is not in session. The Secretariat is assisted by the Secretariat International Support Office (SISO), directed by Mr. Christopher Dagg. The CCICED Secretariat International Support Office is located at Simon Fraser University in Burnaby, Canada, and is funded by the Canadian International Development Agency (CIDA).

6. This Summary Record of the CCICED 2008 Annual General Meeting was prepared by Ms Lucie McNeill for SISO. It was compiled on the basis of more detailed notes recorded during the Annual General Meeting (AGM). The Summary Record represents SISO's interpretation of the discussions and not necessarily the views of all participants. To encourage frank and direct exchanges it has been agreed that the Summary Record of the Meeting should present an overview of the discussions without attribution to individual speakers.

II. AGENDA ITEMS

ITEM 1. ADOPTION OF THE AGENDA

7. The 2008 Annual General Meeting was called to order by Executive Vice-Chair Zhou Shengxian who presided over this first session of the AGM. He remarked on the presence of Council Chair, Vice Premier Li Keqiang. He introduced the International Executive Vice-Chair and CIDA President Margaret Biggs; Vice-Chairs Børge Brende, Klaus Töpfer, and Xie Zhenhua; and the CCICED Secretary General Zhu Guangyao. He welcomed guests, Council members, and observers to the 2008 AGM.

The 2008 AGM's theme is Institutional Innovation and Harmonious Development. The agenda was presented and adopted as circulated to the Council.

ITEM 2. OPENING CEREMONY

8. Vice-Chair Zhou Shengxian invited CIDA President and Council Executive Vice-Chair Margaret Biggs to address the assembly. During the course of her remarks, Ms Biggs made the following points.

1) The Council, founded in 1992, has a successful history of bringing the best Chinese and international expertise to bear on China's pressing problems. It is a unique forum for collaboration between policy makers, scientists, academics, practitioners and experts, demonstrating not only international commitment to cooperation, but also China's determination to meet these challenges. The work of the Council is as relevant as it has ever been. The Council will endeavour to produce sound recommendations to the Government of China.
2) The current global recession will require renewed strategies for economic growth. The world's economy and its ecology are interlinked but the present crisis threatens to derail current efforts on the environmental front. Council recommendations will need careful crafting to avoid this pitfall and embrace environmental investment as a key component of the new economic growth paradigm.
3) The Task Force report on Innovation for an Environmentally Friendly Society calls for an Environmental Innovation Action Plan and Program that can quickly move innovative technologies from the laboratory to the market, thereby curtailing pollution and environmental degradation, and boosting competitiveness. The development of markets is key to innovation, and recommendations will deal with market development and the role of international cooperation in this area.
4) The Task Force on Environment and Health indicates there is more research needed in China on the full extent of the damage to human health from environmental sources. The announcement by China's MEP and the Ministry of Health on an Action Plan to address these issues is noted. The AGM will discuss recommendations to provide a much stronger and publicly available information base on toxic

substances, as well as mechanisms required to make the Action Plan effective. The experience of other countries in the area of compensation for environmental damage to health will be presented.

5) Early consideration will be given to progress made by Task Forces addressing environment and energy – a vitally important issue for China and the world. The Council has been exploring the Low Carbon Economy for the past two years and preliminary Task Force recommendations will be presented, with suggestions that these be taken into account as China prepares its 12th Five Year Plan (FYP).
6) The Council, by helping China safeguard its own sustainability achievements including reaching many of the Millennium Development Goals (MDG), restoring forests and grasslands, and improving environmental sanitation, is also helping the rest of the world move closer to the concept expressed by China as *Ecological Civilization.* China's continued seriousness and determination in facing its environment and development challenges are impressive. One of the measures taken was the creation in 2007 of the Ministry of Environmental Protection (MEP) and the Council offers its continued cooperation and support to Minister Zhou Shengxian and his colleagues.

9. Vice-Chair Zhou Shengxian invited China's Vice Premier and CCICED Chair Li Keqiang to address the Council. On behalf of the GOC, Vice Premier Li thanked those who contribute to the work of the Council and welcomed CCICED members to China. He highlighted these issues during the course of his remarks.

1) The world economy is going through dramatic changes, with the current global financial crisis starting to affect physical markets, almost certainly bringing about a slowdown of development. Countries around the world must work in concert to maintain stable growth. China is also affected by the global downturn, and has had to deal with disasters last year, such as the Sichuan earthquake.
2) While China's economy is expected to continue to grow, it is taking proactive measures to maintain stability such as its flexible monetary policy and the recently announced rescue package which will provide significant funds for infrastructure and ecological construction. Although it is increasing investment in order to spur consumption, the GOC is taking into account the protection of the environment. The economic crisis presents an opportunity to transform China's development model and adjust its industrial structure while improving livelihoods. It is also an opportunity to strengthen weak links between the economy and the environment, nurturing promising new ventures such as green technologies, products and processes. China is hoping to enter a new development paradigm.
3) As China celebrates the 30th anniversary of the Reform and Opening Policy, the GOC is emphasizing sustainable development and ecological protection, while not neglecting economic growth. Its efforts are paying off in the form of reduced Chemical Oxygen Demand (COD) and sulphur dioxide (SO_2) in 2007. The Sichuan earthquake triggered additional environmental problems such as unsafe drinking water. The Beijing Olympics galvanized government action at all levels, with resulting improvements in air quality during the Games.
4) China is still a less developed country (LDC), going through rapid processes of industrialization, urbanization and growth, and experiencing regional gaps in terms of economic and social development.

The GOC realizes how central environmental protection is to its own people's and the world's wellbeing. China is committed to a scientific approach to development, and to putting people first; it will intensify the coordination between the environment, economic development and social considerations, promoting ecological civilization, realizing energy conservation and supporting an environmentally-friendly industrial structure. This will require institutional innovation and mobilizing the population.

5) The GOC believes market mechanisms can be powerful levers. It has decided to adopt energy pricing that reflects supply and demand, as well as the scarcity of the resource and environmental costs. Enterprises and households will thus be encouraged to reduce consumption and emissions. Gradually, ecological compensation mechanisms will be strengthened in order to improve our capacity to protect the environment. This will require the development of emerging energy efficient industries. Expect the government to support innovation, to develop environmental technologies, to disseminate them and to speed up the development of energy conservation facilities and services. We hope these measures will also grow the economy.
6) The GOC intends to conduct more campaigns focusing on energy conservation and environmental protection in order to inform people and enterprises; it is felt environmental awareness will help China become an energy conserving and environmentally friendly society. The government believes the Reform and Opening Policy has proven effective in promoting environmental protection through international cooperation and the introduction of advanced technologies.
7) Climate change is an issue facing the whole globe. Even with a slowing economy, no country can relent in the struggle. China will continue to shoulder its common but differentiated responsibility in this matter.
8) The CCICED started in 1992 and has been an important window to showcase China's achievement in the area of environmental protection. It has been a vital platform for cooperation and exchange. It is hoped the Council will continue to provide the GOC with targeted recommendations that can be implemented and benefit the whole planet, humanity's common home.

ITEM 3. SPECIAL SPEECHES AND GENERAL DEBATE

a) CCICED Vice-Chairs' Opening Statements

10. With CCICED Executive Vice-Chair Margaret Biggs presiding, Council Vice-Chairs Xie Zhenhua, Klaus Töpfer and Børge Brende addressed the AGM.

11. In his remarks Mr Xie Zhenhua, National Development and Reform Commission (NDRC) Vice-Chair, underlined the following points:

1) The GOC has continued its efforts to reduce emissions and increase energy efficiency since the last AGM and in preparation for the Copenhagen conference. China had to overcome serious challenges

and hardships over the past year due to natural disasters. The Beijing Olympics saw improved performance on emissions and energy conservation. Many laws and regulations related to the environment were improved; work is now starting on major revisions of the country's main Environmental Law.

2) Resource conservation must be a basic principle of China's development; a responsibility system will be set up to deal with emissions reduction and energy conservation. Next January, a new law will be enacted to implement the circular economy; it includes rules on energy consumption in public buildings. These and other measures, such as incentives to adopt more energy efficient technologies and hard targets for emissions, present a systematic approach to reducing energy consumption and encouraging conservation. Twelve major emissions reduction, conservation and energy efficiency projects have been initiated. By the end of 2008, 80% of China's new buildings must comply with energy efficiency criteria; similarly, 113 priority cities have been mandated to reach set standards for surface water collection, as well as improve their performance in waste reduction and energy efficiency.
3) In 2006 and 2007 despite a rapidly growing economy, cumulative energy savings reached the equivalent of 147 million tonnes of coal. By the end of last year, China had desulphurization equipment installed on some 120 million kilowatt of thermal power generation across the country; new urban waste water treatment capacity had reached 13 million tonnes per day; COD emissions were down 3.2% from 2006, to 13.82 million tonnes; total SO_2 emissions were 4.7% less than last year, falling to 24.68 million tonnes. In the first half of 2008, COD and SO_2 have both decreased by 3.96% and 2.48% respectively, compared with the same period in 2007.
4) There has been tighter management of energy-intensive enterprises. China has decommissioned a significant capacity of its highly polluting and energy consuming enterprises, promoting instead more benign investments such as the service sector. The GOC is also implementing significant reforms in resource pricing, as well as its tariff and subsidy structure. Generally, it is adopting incentives for energy efficient and environmentally friendly products and industries, while providing disincentives targeting heavy polluters, energy users and producers of resource-inefficient products. For example, tariffs have been cut on highly efficient vehicles. Financial measures have also been taken, ensuring credit markets favour energy-efficient and environmentally friendly enterprises; China now approves of bond issues to finance environmental infrastructure such as water treatment plants.
5) Despite progress made, China's current development model has yet to be transformed. Energy and resource consumption are high and will continue to grow due to the rising population, continuing urbanization and industrialization. Efforts will have to intensify if China is to achieve the mandatory intensity-based emissions and energy targets set out in the 11^{th} FYP. In order to deal with the current global economic crisis, the GOC has put forth a 4 trillion RMB stimulus package, comprising 10 major measures to boost domestic demand and improve quality of life; some of the measures deal with post-earthquake reconstruction, and some target environmental infrastructure projects. The GOC sees this stimulus package as an opportunity to tackle climate change and other environmental challenges.

6) Currently, 8.3% of China's total energy is supplied by renewable sources; the target for 2010 is 10% and for 2020, 15%. In order to achieve the targets, China is investing in wind farms, hydropower generating stations and nuclear stations. China has become more efficient in its use of coal, reducing CO_2 emissions by 835 million tons. And it is playing an active role in rallying international consensus and momentum around the Paris Roadmap and the Copenhagen Conference. The GOC has released a working paper on climate change, detailing China's relevant policies and measures. The CCICED is well positioned to contribute to the GOC's thinking in this area at this critical time.

12. Council Vice-Chair and the former Executive Director of the United Nations Environment Programme (UNEP) Mr Klaus Töpfer made the following points as he addressed the Council:

1) The past year has been fruitful on the environmental world stage for China. President Hu Jintao articulated clearly at the Communist Party of China (CPC) Congress the paradigm shift that is sought as China moves to implement its goals of a harmonious society and ecological civilization. Legislation is now in place to support the circular economy, renewable energy and urban planning. International members of Council should contribute to the greater dissemination of information about China's commitments.
2) The current global economic recession will cause job losses, stagnation and social dislocation. This will be felt especially deeply in developing countries and among the poorest of the poor. With its recent stimulus package, China is demonstrating it is a responsible global citizen. This crisis must spur us to realize a green economic structure; otherwise this cycle is doomed to repeat itself. China could be one of the countries taking the lead in developing this new structure and integrating the principle of fairness. The implementation of China's US $500 million stimulus package is a good opportunity to implement Premier Wen's *Three Transformations*.
3) China's White Paper on Climate Change shows China will not be a victim, rather it intends to use the crisis as an opportunity to improve energy efficiency, build new infrastructure and conserve resources. China's actions are bound to make a significant contribution to the Copenhagen Conference.
4) China is to be commended for hosting the Green Olympics in Beijing. The next major event with be the 2010 "*Better Cities, Better Life"* World Exhibition in Shanghai. Sustainable development as a concept can only succeed if it is applied in cities. It is expected that 30% of China's population will live in cities by 2030. China is exploring actively many sustainable processes and solutions. Thanks to a Clean Development Mechanism (CDM) project, methane collected in a Shanghai landfill is burned, contributing to the regional power grid. China is also researching using the sludge that is a bi-product of sewage treatment plants.
5) The most visible sign of China's commitment to the environment is the creation of the Ministry of Environmental Protection. It is hoped MEP will be granted the necessary staff and budget.

13. Vice-Chair Børge Brende, who is also Deputy Chair of the Standing Committee on Energy and Environment of the Parliament of Norway, addressed the AGM and stressed these ideas:

1) Premier Wen Jiabao has announced a brave and timely stimulus package that also includes important environmental measures. Past downturns saw a corresponding destruction of the environment but the world can no longer afford to rescue the economy at the expense of forests, land and other resources.
2) China has shown it is an economic innovator; it will prove to be so as well in environment and development. The path taken by 1.3 billion people cannot but have an impact on the rest of the world. The global financial crisis is the right time for China to move to a low carbon growth path, with investment in renewable and low carbon technologies. Two lessons were learned during the recent World Economic Forum in Dubai: first, the longer the delay in mitigating risk, the greater the crisis. Secondly, the growth engine the world needs now could be investment in low carbon infrastructure and energy efficiency.
3) Enormous markets will develop for environmentally friendly technologies and products. China, with its large domestic market, its manufacturing strength and in some cases with international cooperation in the area of research and development, could support the development, testing and large-scale production of climate friendly products. This collaboration between LDCs and developed countries (DCs) could complement the negotiations that will take place in the context of the Copenhagen Conference, allowing for greater trust between LDCs and DCs.
4) A low carbon economy will put greater emphasis on efficiency, conservation and recycling of materials – reducing resource shortages. A growing number of countries are taking action to reduce greenhouse gas (GHG) emissions. Consumers in many countries have a rising awareness of the carbon footprint of their consumption. The new US administration is already signalling it will support the transformation of blue collar work into green collar opportunities. UNEP is to be commended for having launched the concept of a New Green Deal to get the markets back to work – a very timely initiative.

b) Special Remarks by the Minister of Environmental Protection

14. On behalf of the CCICED, Vice-Chair Margaret Biggs congratulated Council Executive Vice-Chair Zhou Shengxian on the promotion of SEPA to a full ministry. She invited him to address Council and during his special remarks, Minister Zhou made the following points.

15. During the first three quarters of 2008, COD and SO_2 emissions decreased by 2.7% and 4.2% respectively as a result of concerted efforts and despite the ice storm, the earthquake that hit Sichuan province and the current economic crisis. Coordinated development is at the core of China's promotion of a scientific approach to development; this concept encompasses the economy, the environment and population. Pollution is essentially the result of an imbalance between the environment and a human activity; the history of environmental protection is the history of seeking to balance these forces. Humans cannot live without air and their health depends on clean air

16. When Premier Wen Jiabao met Council members last year, he mentioned aspiring to be a Green Premier, a guarantor of China's clear skies and white clouds. The GOC had promised that the air would be clean for the 2008 Olympics. Beijing is surrounded by mountains, making it difficult to flush out air pollution and there were concerns that the GOC would not deliver on that promise. Success was achieved however, thanks to the efforts of the central and local governments, to the stringent measures adopted and the 1 trillion RMB that was spent. Major polluters, such as Capital Steel, were forced to move away or shut down. The rivers within the city's sixth ring road were cleaned up. Citizens were highly aware of these efforts and have become better defenders of the environment as a result of the Green Olympics. In 2006, the 6 provinces surrounding Beijing Municipality established the Air Quality Control Leading Group to support the effort. Research was conducted involving China's foremost experts; measures taken included the installation of desulphurization facilities in power plants, to clean up air pollution. The results have been remarkable, with decreased emissions of NO_x and SO_2, and with an increasing number of days with high air quality standards.

17. The achievement of the Green Olympics is a case study in sustainable development. In recent years, quality of life for urban and rural residents has improved continuously thanks to rapid economic and environmental improvements. The Green Olympics demonstrates how people and nature can coexist in harmony. Coordinated development is the way to generate a benign cycle where an energy efficient and environmentally friendly society is established.

18. However, efforts must be strengthened and accelerated on environmental protection at all levels of China's society. Clean production, improved incentives and better results are sought. Enterprises must be encouraged to conserve energy, cut emissions and grow in sustainability and competitiveness. China must adopt advanced technologies, improve efficiency and productivity, ensure laws and regulations are obeyed, retire redundant technologies and transform the industrial structure. This will facilitate accelerated adoption of technologies that are resource efficient and clean.

19. As the world faces a global financial tsunami, China has launched a 1 trillion RMB, three-year stimulus package which will also benefit the environment. China will not allow low efficiency, high emissions enterprises to start production; rather, it will use the crisis as an opportunity to increase domestic consumption and promote structural change. It will focus on environmental products, new technologies, renewable energy, and generating greener engines of economic growth. China also plans to develop the service sector and create a level playing field for burgeoning small and medium enterprises (SME). The Green Olympics will be used as a springboard, increasing consumer awareness of, and demand for green products. Regional efforts for environmental protection will be encouraged; for instance, a new management system for areas like the Pearl River Delta will be proposed, supporting regional planning and supervision, and encouraging more benign industries and sectors.

20. China also needs to pay as much attention to the rural environment as it does the urban environment since both are interdependent. Safe drinking water, pollution control and environmental protection are critical in the countryside. China plans to mobilize its entire population to build an ecological civilization. People can make wise choices as consumers and protect the environment; limiting certain behaviours and ensuring greater awareness will also bring about ecological civilization.

21. The environment must come first if China is to achieve its goals of resource conservation, efficiency and sustainable development; sustainable consumption at the household level is essential to reaching this goal. Compensation measures, new regulations and setting up a responsibility system will contribute to the restoration of China's rivers and lakes. President Hu Jintao emphasized, in the case of the Huai River, the need to let nature rest so regeneration can occur.

22. Humanity has focused on development, but now we face severe environmental challenges. All countries need to take a long-term perspective, and realize that cooperation amongst nations is essential. Greater common efforts are needed to ensure a better future, especially as the issues to manage are complex and the global economy is slowing down. Barriers preventing technology transfer must be abolished in order to ensure efficient flows of knowledge and funding. This CCICED AGM is occurring at a critical time and its input is needed as never before.

c) Presentation of the CCICED Issues Paper

23. Vice-Chair Margaret Biggs presided over the presentation of the Issues Paper by CCICED Chief Advisors Shen Guofang and Arthur Hanson. During their remarks, they highlighted the following:

24. The theme of the 2008 Issues Paper is *Environment and Development for a Harmonious Society*. China is experiencing rapid urbanization, industrialization and strong economic growth. Environmental degradation is severe in some areas, exposing glaring imbalances between environment and development. In October 2007, the CPC Congress was held; a theory of openness and scientific development was put forth, within the context of building socialism with Chinese characteristics, and with added emphasis on ecological civilization. Transformation and innovation will allow China to resolve the long-standing conflict between environment and development.

25. Many in the international community hope that China can be a "*leader*", while some Chinese specialists prefer the less emphatic "*take the lead*". Leadership needs to be understood in the context of Premier Wen's statement, that China's development will continue to be prosperous, harmonious and democratic, and that China will continue to champion world peace and progress.

26. 2008 has been an unusual year for China. It marks the 30th anniversary of the Reform and Opening Policy, the 30th year since the promulgation of China's Environmental Law and the creation of the Ministry of Environmental Protection. This year numerous natural disasters occurred, the successful Beijing Olympics were held, and more recently we were hit by a global financial crisis. The Council must bear these in mind in its work.

27. Shortly after the finalization of the Issues Paper, the State Council announced its 1 trillion RMB stimulus package to encourage domestic consumption, putting the accent on environmental protection. China is trying to learn from past mistakes, using the concept of ecological civilization in resolving the conflict between development and environment. The Issues Paper considered the notion of justice in tackling rural issues and recommending compensation schemes. Similarly, the policy of *Putting People First* is relevant to public health and environmental challenges.

28. The term *Harmonious Society* is not used in the international community and Chinese understanding of these words is difficult to explain and operationalize. China is both rich and poor; it is in need of ecological restoration, but also in need of an educated and healthy population. The past 30 years have heralded amazing changes for China since Deng Xiaoping's *Reform and Opening*. The past year's earthquake demonstrated China's new capacity for emergency response.

29. This year also marks the 20th anniversary of the Brundtland Report, which coined the phrase *sustainable development*. This concept is not yet a reality globally, and a new paradigm is needed. Harmonious development could prove to be this paradigm. Harmony is an ancient concept in China; China's decision-makers are integrating in it the notion of democracy, which in China embodies both public participation and stability. Harmonious development includes the notion of a steady course, of an ecology in balance, but also of dynamism and ecological innovation. The concept also integrates the notion of putting people first, which includes the rule of law, environmental statutes and regulations, fairness and justice through schemes such as ecological compensation.

30. Harmonious society takes into account five major elements: harmony between urban and rural development, generating more equality for rural people in terms of wealth, health and opportunity; harmonious regional development with emphasis on assistance to less developed regions; harmony between economic and social development; harmony between economic development and the environment; and a harmonious interaction between the domestic economy and international trade. There are interactions among all of these elements.

31. It remains a challenge to determine whether the harmonious society concept is simply aspirational, or whether it can be operational and its progress can be measured. Possible indicators are the MDGs, which China already reports to the UN; the mandatory environmental targets included in the 11th FYP; and Green GDP. Monitoring remains a serious challenge.

32. Ecological civilization is a grand vision signifying in China the harmony between people and nature. But China has credibility challenges in advancing this notion internationally because of recent scandals such as melamine in milk products and lead found in paint and toys. There is a global perception that China is not making progress on environment and development. This could be reflected in consumer resistance to "Made in China" products.

33. The international challenge posed by the financial crisis can be related to harmonious society in that the global recession could lead to a rethinking about the need for further regulations correcting the imbalances of globalization. This could bring effective action on international trade agreements, including the World Trade Organization (WTO). This could pose challenges for China.

34. China's future economic growth model will include difficult adjustments such as new approaches for sustainable domestic consumption, rural reforms and correction of income inequalities. The baseline created by the Beijing Olympics in August has generated expectations in China and the world; supervision and enforcement of environmental measures require a given level of deterrence which in turn produces compliance. Adequate

information and monitoring, with coordination and cooperation from relevant authorities and levels of government, are key to enforcement.

35. The GOC announced important rural environmental reforms in October. By 2020, rural incomes are to be raised, with food security a central preoccupation and planned investments in public utilities. Rural reform is key to the achievement of a harmonious society in China.

36. The ongoing environmental challenges including climate change can create opportunities. Stability will depend on ensuring the public is kept well informed and participates, and on sustained efforts to reduce environmental degradation suffered by the poor, providing mechanisms such as ecological compensation.

37. What if world trade rules were based on ecological civilization principles? China is a world leader in achieving the MDGs, but it still has trouble meeting environmental goals. Examples such as Hebei Province's city of Baoding that has become a centre of innovation for alternative energy could be useful.

38. The Issues Paper lays out eight essential breakthroughs: the radical adjustment of the relationship between the environment and the economy; making trade, investment and financial sector reform consistent with sustainable development; long-term transition to a Low Carbon Economy (LCE); environment and health actions that reflect the alarming range and level of toxic impacts, potential for pandemic diseases and other environmental risks; new ecosystem protection approaches yielding substantial and lasting economic, environmental and social benefits for rural people; accelerating the pace of development and commercialization of technological innovation for environment and sustainable development; re-orienting and strengthening the existing environmental management system to integrate public participation and respect for public environmental rights; shifting international environmental cooperation towards integrated sustainable development solutions.

39. China's frequent use of words such as friendship, peace, cooperation and development can be dismissed as rhetoric, but the international community stands to gain by trying to understand what these mean in China and how they could be useful to all countries. The Council is in a position to understand how environment and development contribute to these broad concepts guiding the future of China.

d) Special Remarks by the Director General of IUCN

40. Vice-Chair Margaret Biggs invited Council Member and Director General of the International Union for the Conservation of Nature (IUCN), Ms Julia Marton-Lefèvre, to address the AGM. The following issues were presented to members by the speaker.

41. IUCN's World Conservation Congress, held every four years, concluded last month in Barcelona. Despite the current financial crisis, the Congress attracted 8,000 participants representing a wide range of stakeholders. It was the largest ever, which demonstrates there is now a mass movement eager to build what China calls a harmonious society. The vision of the Congress is to support a diverse and sustainable world; biodiversity is essential to the health of human beings and their societies. IUCN put its principles in action by staging a green meeting in a sustainable convention centre, pushing hotels to provide environmentally-friendly services, going paperless, and offsetting the carbon footprint of delegates.

42. The Congress encompassed a Forum and an Assembly. The Forum included events such as workshops, knowledge cafés, exhibition pavilions showcasing IUCN and its partners' work, a women entrepreneurs' fair and firm commitments by donors. Discussions focused on the challenges to establish a sustainable economy; how to address climate change; how to stage local actions for biodiversity; philanthropy for sustainable development; green buildings; and sustainable living. A global Platform of Action was agreed upon.

43. The Assembly was held for the members of IUCN; the organization's high level decision-making body approved the 2009 – 2012 Programme, financial plans and resolutions. In its new Programme, IUCN remains committed to the conservation of biodiversity and is focusing on promoting the greening of the world economy. Attention was paid to the economics of ecosystems and biodiversity because humans depend on nature to provide resources but pricing remains problematic.

44. IUCN's Assembly agreed to pay attention to the ethics of conservation, calling on governments to take into consideration the rights of vulnerable and indigenous communities, poverty reduction, land tenure rights, and the "*Do No Harm*" principle. The link between conservation and climate was underlined, since healthy ecosystems are powerful agents to combat climate change. IUCN is demanding more specific goals from the next UN Climate Change Summit to take place in December. It endorsed the need to proceed with climate change mitigation actions such as reducing emissions from deforestation and degradation. The Assembly recognized the private sector is interested in reducing impacts on biodiversity.

45. The most publicized result of the Congress was the publication of the Red List of Threatened Species. The news is not good, with almost one in four of the world's mammals on the brink of extinction. However, some species that were on the threatened list in years past are now showing signs of recovery. IUCN also considered energy options and concluded that not all bio-fuels are alike. It called on governments to regulate them in order to limit their impacts on people and nature.

46. A study on the transition to sustainability was launched in Barcelona. The premise is that ecosystems are life support systems. We are in what some writers have called the *Anthropocene,* the Age of Man. Humanity's use of resources since 1750 shows dramatic trends, with available data revealing that humanity's ecological footprint is huge. We are called upon to "*decarbonize*" the world economy, de-linking economic growth from carbon, while at the same time addressing poverty and protecting our biosphere. The crucible of evolution is biodiversity, and this needs to be better communicated. IUCN's knowledge and influence will be brought to bear on decision-makers in order to ensure biodiversity considerations are integrated in the measures taken to fight climate change, increase security, stabilize markets and promote trade.

e) General Debate and Comments

47. With Vice-Chair Margaret Biggs presiding, Council members took part in a brief general debate on the AGM's theme, the Issues Paper and other points raised by the speakers. Members had this to say:

48. In the context of the current global financial crisis and the rescue packages that have been announced by various countries, what China decides to do will have an impact. There is a debate in Europe with sceptics questioning the push for a green economy, despite the consensus among leading specialists that this crisis is a golden opportunity. China's actions could help tip the debate currently raging in Europe.

49. China's policy articulates not only the need to clean up the environment but also to drive future economic growth towards a sustainable paradigm – the *green economy*. China is not hampered as western democracies are; other countries will try to stabilize their steel and car industries. These measures will not help the poor. We should consider how the trillions of dollars mobilized can serve us better than merely stabilizing the economy. China is leading the thinking in this area, more than any of the Organization for Economic Cooperation and Development (OECD) countries, yet the world knows little about this.

50. Substantial research funds are going to carbon sequestration technologies, while little money is spent on the planet's natural potential as a carbon sink in forests, peat lands, grasslands and marine areas. Roughly 15% of the carbon is already sequestered in some 100,000 protected areas around the world covering 11% of the earth's surface. The present crisis shows us that economic resources can be marshalled; these resources could be re-directed towards conservation, or to technology transfer to LDCs in order to support GHG emissions reductions and adaptation to climate change. The current debate around climate change needs to shift from the lose-lose perspective to offering the kind of win-win view that China is now taking. The rise in carbon emissions, faster than was predicted, lends urgency to this.

51. The term *resilience* should be added to those already mentioned in the Issues Paper. It embodies elements of stability; but it also describes how systems withstand and recover from stress and shock. It is also crucial to understand there are non-linear causes to catastrophes; there are tipping points beyond which the rate of change accelerates. A lot of these have been identified in climate change research. This is something that the Council could study under the heading of ecological civilization.

52. The need to move towards a LCE has been discussed. But the price of crude oil is an important aspect that should not be overlooked. A few months ago when the price of a barrel of crude oil stood at US$ $150, there was a significant change in consumption patterns and some owners were selling their more inefficient vehicles. The price of crude oil is now at $ 60 per barrel and consumption is again on the rise. The price of crude oil is one of the key elements determining how fast and how far we can go in shifting to a LCE.

ITEM 4. TASK FORCE REPORTS – FIRST SESSION

a. Task Force on Innovation and Environmentally-Friendly Society

53. Vice-Chair Xie Zhenhua presided over the presentation of the Task Force on Innovation and Environmentally-Friendly Society. Co-chairs David Strangway and Professor Feng Zhijun provided Council members with a summary of their work.

54. Three main themes were explored in the Task Force (TF) report: technology innovation for environment and sustainable development; regulations, standards and enforcement; and public participation.

55. A key finding is that China has the capacity and the need to become a global leader in innovation technology. China has mandatory intensity targets for emissions reduction, based on per unit of Gross Domestic Product (GDP); while this is good, it is time to look at absolute pollutant reduction, not just intensity reductions since the rate of growth of China's economy ensures that total emissions continue to rise.

56. The TF visited three cities: Baoding, Ningbo and Wuhai. It noted that the intensity of pollution is inversely correlated with public participation and sustainability in these cities. For instance, Baoding where pollution is the lowest is also where public participation and sustainability are greatest.

57. The central conclusion of the report is that regulations are key to innovation; clear, stable and uniformly enforced regulations are necessary to the creation of markets. Without regulations, there is no market – hence no incentive for innovation in the first place. The elements creating innovation are not in a linear progression – rather they are interrelated in a network and encompass institutions such as government research institutions, universities, private research facilities and firms. The process follows a series of steps: basic research, applied research, pre-commercial research and in some cases creation of a new company, demonstration with niche deployment, and widespread deployment and diffusion.

58. The environmental innovation system in China is comprised of: government and public involvement; universities and research institutes; and regulations and standards. In the universities, a gap has been identified between basic research and the delivery of marketable research products. The TF recommends MEP create industry sector R&D institutes focusing on problem solving; they have existed in the past but now are inadequate to handle the sector related to environmental technologies. There are also problems associated with SMEs and the TF proposes the creation of innovation support networks.

59. There has been substantial growth in the provision of capital to SMEs through venture capital markets and private equity. Many of China's new regulations and standards are moving towards international levels. There is inadequate enforcement which has hindered the development of markets. Full, open reporting to independent third parties is essential in order to foster environmental innovation. The TF recommends that MEP be authorized to create a National Environmental Information System which would allow for free access to information on pertinent regulations. An open and transparent process would help drive innovation.

60. The TF emphasizes in several passages the importance of effective enforcement, and calls on China to give further thought to the enforcement of Intellectual Property Rights (IPR) protection measures. Green procurement policies can also stimulate innovation.

61. These various elements are proposed by the TF as forming a National Innovation Action Plan. Public involvement is necessary as China continues to develop. Civic groups and Non-Governmental Organizations (NGOs) are not yet fully empowered in China; the TF believes that wider access to information would empower local groups.

62. China is playing an important role in the bio-science and technology area; it is playing a lead role in the information and communications technologies, as well as in nanoscience and materials' technologies.

Revolutions have taken place in these fields, driven by scientific research. China is also well positioned to play a lead role in the new clean technologies sector. The fields that will be essential to establish this include: clean transport technologies such as electrical vehicles; enhanced geothermal systems; photovoltaic cells; wind energy; new nuclear power systems; carbon capture and sequestration; clean coal; desalination of sea water; biofuels and bio-products. If China were to leapfrog in any of these areas, it stands to gain from significant export potential. Other interesting areas are the circular economy, clean building technology and recycling.

63. One area of opportunity is the research to improve cellulosic biofuel production. This is driven by innovations in genomics, with knowledge now passing from basic science to commercial applications. The time cycle for the development of biofuels has been very short. The Inter-Academy Council has demonstrated that there is a close relationship between basic research and commercialization.

64. The TF recommends there be strengthening of the basic research platform; China has a Science and Technology (S&T) Medium to Long Term Plan, and rapid improvements are taking place in this context. Incentives to meet standards can be powerful levers for innovation, as is international cooperation. China is now in a position to lead this cooperation process, bringing other parties to the table. The Academy-Industry linkage needs to be strengthened, but this is not unique to China. The creation of internationally-recognized prizes could stimulate breakthroughs. The TF is uncertain whether or not the CDM per se has led to innovation; another platform may be needed in order to produce this result.

65. An Enterprise Forum sponsored by the CCICED was held this past year. The TF believes it may be time to convene another session in 2009, bringing together enterprises and investors to discuss the barriers to innovation and commercialization. China must create the environment for an innovation culture; unless people are allowed to fail, they will not truly innovate. China's education system needs to focus more on creativity than on rote learning.

66. Looking at innovation as being created by the public, government and industry, the TF finds that the public involvement side of the equation needs to be strengthened considerably. With proper information and channels of participation, the public can help protect the environment. This transition time presents China with a good opportunity to push for innovation in environmental technologies.

67. China is already starting to work on reducing total pollutant loads. It is formulating an evaluation and performance system that would provide incentives for this; public participation should be a key part of this mechanism. Innovation must also be people-centred, not simply focus on the economy or high technologies. The goal of a harmonious society also guides this development. Before China can take the lead internationally, it will have to ensure improved management of innovation domestically.

b) Task Force on Environment and Health

68. Vice-Chair Xie Zhenhua called upon the Co-Chairs of the Environment and Health Task Force, Professor Seiji Ikatai and Guo Xinbiao, to present their report to Council. In the course of their comments, the TF Co-Chairs underlined the following issues.

69. The TF held a number of meetings where significant understanding gaps among all participants, international and Chinese, were bridged. The TF determined to limit the scope of its work to health damage caused by human-induced pollution.

70. International experience and lessons from the US, the EU and Japan were reviewed. The TF concludes that cost-effectiveness dictates that prevention be the first priority in environment and health management. Secondly, proper intervention is necessary to deal with inevitable pollution threats. There should be government intervention in the case of priority pollutants to which serious health effects are linked; health impact assessments should be conducted as a matter of course. Thirdly, government coordination mechanisms are important, given the number of stakeholders involved. Fourth, adequate legislation is necessary to support health and environment management. Fifth, financial and human resources need to be adequate to the task. In addition, information disclosure and public access are essential. Regarding compensation and relief mechanisms, all three countries studied have different schemes. A compensation mechanism, as well as a dispute resolution mechanism, is needed. Good research and data gathering systems are the foundations of this management system. A performance measurement system to monitor the behaviour of main actors is found in all studied countries and is valuable.

71. TF members conclude that in order to avoid tragedies such as Japan's Minamata disease, concrete action must be taken to prevent health effects; if there are such effects, pollution victims must be quickly treated and compensated; and the establishment of an effective health management system is recommended.

72. Health effects from pollution are serious in China, with numerous areas where air, water and soil pollution is serious. Some research has been conducted, but the surface has barely been scratched. Preliminary findings suggest the situation may differ between rural and urban areas.

73. China faces a challenge in tackling these issues because there is no clear division of responsibility among relevant government departments, not enough staff have been tasked to deal with these issues, nor is there a solid environmental health management system. Moreover, there is a severe lack of reliable data on environment and health. Various authorities are jealous of the data they possess and do not share information. There is no tradition of public disclosure of sensitive information on environment and health in China.

74. The recommendations to the GOC comprise six main areas: strengthen the responsibility of the government and set up an environment and health management system, in which the government plays the lead role and the public participates extensively; improve environment and health legislation, policies and regulations, and form an effective management system; focus on prevention and take effective measures to avert environment and health risks; increase relevant budgets and build the capacity of staff to manage the environment and health system; ensure information disclosure and support public participation; finally, focus on environment and health work and take targeted intervention measures.

75. China is still an LDC and measures imposed must be gradual. Work could start in cities by focusing on air pollution, and in rural areas with drinking water as well as indoor air quality. In addition, immediate action should be taken to halt the spread of known pollutants with known serious health effects. Research must be

conducted on emerging pollution problems that have potential health effects. Prevention must be the GOC's prime directive.

c) General Debate and Comments

76. With Vice-Chair Xie Zhenhua presiding, members of Council engaged in the following discussion.

77. The recommendations from the Innovations TF relevant to regulations, standards and enforcement are most welcome from the perspective of the business community. Business is often thought antagonistic to regulation, but in fact this is essential to the creation of markets. This point could be further emphasized in the recommendations. Good regulations specify the performance that is required; they encourage innovation and stimulate markets to deliver results in the most efficient way. Poor regulations are overly prescriptive and destroy innovation. It would also be good to pay attention to the steps needed to improve compliance; energy efficient building regulations have been said to receive only 25% compliance; China would like this to increase to 80% in a few years.

78. Regulations, standards and enforcement must be performance-based, providing the incentives and generating the demand for pushing industry beyond present standards. Within enterprises, a culture of continuous environmental innovation must be created; they must be allowed to reap from the marketplace the rewards of reduced costs and the gains from the deployment of new technologies. A good example is the US government's SO_2 control measures; the regulations stipulated certain flue gas desulphurization technologies and as a result, there were no innovations generated. In 1995 when the Acid Rain Program was implemented, along with an emissions trading system, there were substantial improvements in the removal of SO_2 from flue gas emissions because companies were rewarded for innovation.

79. It is also true for Europe that sound standards and regulations generated innovation. This is linked with the report on economic instruments that will be submitted to Council during this AGM. The proper economic instruments are also key to creating the enabling environment for innovation. International cooperation has an important role to play in supporting pilot and demonstration projects. Task Forces need to coordinate their recommendations where they overlap.

80. It is right to design environmental policies that focus on human health considerations; greater knowledge on environment and health interactions is necessary to ensure such policies get widespread support. However, a step by step approach is recommended; the first steps should focus on policy and enforcement, because building extensive administrative systems in the environment and health field is much more demanding and complex.

81. The Innovations TF identifies three types of innovations. The first is incremental, the second is transformational, and the third is radical innovations that are spurred by the climate change threat. The TF should consider whether or not there is a need for specific instruments, institutions and strategies to generate radical innovations.

82. In the case of biofuels innovation, the lag time between the basic scientific idea and commercialization is getting increasingly shorter. But all three categories of innovation are happening at the same time – it would be difficult to isolate the conditions that favour one over the others. All options should be kept open.

83. The Innovations TF report questions whether the CDM has led to significant innovations; this is a correct assessment. China uses 60% of the CDM credit to implement projects. The CDM should continue as a project-based mechanism, but other complementary, and easier to implement mechanisms could be put in place. Such mechanisms could be based on energy intensity in given sectors or on specific technology. China could play a role in championing this view as we move towards a new global climate agreement.

84. The Enterprise Forum is an excellent innovation of the CCICED. The first Forum was held this spring, with strong participation from business, government, industry and experts. The Council should consider holding another one in 2009.

85. One of the central recommendations of the Innovations TF is the launch of a National Environment Innovation Action Plan. Environmental technologies have the potential to reduce the pressure on natural resources and stimulate competition. However, barriers are hindering their development and uptake. In 2004, the EU adopted its own Environmental Technologies Action Plan to overcome such challenges. It includes measures to get innovations to market more rapidly, and to improve the chances of successful commercialization. In this regard, China should not neglect the role that green public procurement can play in creating attractive markets for innovators. In 2006, the EU decided to achieve a 50% quota of green public procurement by 2010.

86. Two EU initiatives that could be of interest to China deal with SMEs and should perhaps be integrated in the report. In both China and the EU, over 90% of enterprises are SMEs. Creative financial instruments are essential to increase the chances that SMEs will get a foothold in the market for their environmental innovations. The EU has a 400 million Euro fund earmarked to support eco-innovative SMEs. The monies flow through two channels: the Growth Initiative Facility, which allows for participation in venture capital funds during start-up or expansion phases; and the Pilot and Market Replication Instrument which provides grants to SMEs ready to commercialize eco-innovations. For 2008 and 2009, the funds target SMEs involved in materials recycling, sustainable building, and food and beverage; other sectors will be added in future.

87. The environment and health nexus is of paramount importance. China asked the government of Japan to support this TF because of the worrisome rise in pollution-related health problems. The thorough work of the TF yielded agreement on key principles and measures, such as the precautionary principle, preventive measures, “polluter pay”, government coordination, information disclosure, public participation, environment and health monitoring, compensation mechanisms, financing and accountability. In order to realize the recommendations put forth by the TF, Japan is considering a bilateral project that would support the adoption of these measures.

88. Regulations are certainly necessary to enhance the market for innovations, but an education system that encourages creativity is also essential. Hong Kong’s Innovation Committee set up a centre where individual innovators can process IPR registrations – a one-stop-shop. The process can be daunting for SMEs, tempting them to forego IPR protection and jeopardizing the full rewards of innovation.

89. The report on Environmental Health was comprehensive. Although this issue is sensitive in China, an epidemiological baseline for rural and for urban environmental health indicators needs to be established in order to assess the challenges that are faced and the targets that could be set. Catastrophic, one-time events need to be distinguished from endemic issues. Academia would gladly take up such data gathering and research challenges.

90. China's new energy standards for buildings represent a 50% improvement in efficiency over previous years; but while building design has improved, construction does not yield energy-efficient buildings. There is much potential to be realized from the ongoing research into improved materials.

91. Regarding innovation and the CDM in the context of the Kyoto Protocol, there are currently over 1,600 CDM projects in China; only one-fourth are internationally registered. These projects have reduced GHG emissions, but certainly China would benefit from increased emphasis on innovation. Were the transfers of technologies be made easier, emissions could be further reduced.

92. The Innovations TF proposes an Action Plan and market-based instruments to stimulate innovation. China has long been conscious of the need to install desulphurization equipment, but until new technologies were introduced, costs were prohibitive. The introduction of new technologies led to broader adoption of desulphurization by thermal power plants; government incentives also played a role. Similar incentives can be used to improve sewage treatment and other pollution issues.

93. China has been attempting to coordinate its investment and its development strategies; good results have been achieved for sewage treatment plants. Similar instruments have been developed to encourage the decommission of highly polluting enterprises, antiquated machinery and equipment.

94. At present, the GOC provides a 50% subsidy on compact fluorescent light bulbs, making them more affordable and increasing their market penetration. The GOC has found that market instruments and incentives are more powerful than propaganda and slogans. China has adopted a green procurement policy. China's policy is to ensure that the land used for biofuels should not encroach on the land needed to produce food; rather, China is encouraging the conversion of waste straw and rotted grain into biofuels.

ITEM 5. TASK FORCE REPORTS – SECOND SESSION

a) Task Force on Economic Instruments for Energy Efficiency and Environment

95. Vice-Chair Klaus Töpfer presided over the presentation of the TF report, inviting Co-Chairs Ernst Ulrich von Weizsacker and Ye Ruqiu to address the Council. During their remarks, the Co-Chairs emphasized the following issues.

96. This is an interim report resulting from the initial work of the international and Chinese TF members on issues that are related to climate change. The CCICED is already familiar with the challenges this will pose: the rise of sea levels leading to dramatic changes in coastlines; ice melting faster than predicted in Greenland; increased fresh water coverage. In a matter of a few decades, it is now predicted that the sea level will rise by seven meters.

97. In order to stabilize GHG concentrations, emissions need to be cut by 50% - but even if this was achieved, GHG concentrations would continue to grow in absolute numbers for 150 years. The world stands a better chance if we learn how to extract more energy and wealth from the fossil fuels, the water and other resources. Bold thinking is urgently needed. A four-fold increase in energy productivity is possible if we are more efficient. We are already seeing this progress in vehicles, passively heated houses and LED lights. China is now the leader in the adoption of compact fluorescent light bulbs, which improve energy efficiency by a factor of four. Business travel can also be replaced with video-conferencing.

98. The TF is suggesting a change in the technological paradigm, from seeking labour productivity gains only to adding the dimension of resource productivity. Labour productivity has increased 20-fold in DCs and China is rapidly catching up; labour productivity has increased in tandem with labour costs because there is a mutual causality between the two.

99. Resource productivity could increase 10-fold in 100 years; rising resource prices can be expected to be a key factor in this. But resource prices have actually been dropping, and falling prices cannot generate efficiency gains. In order to increase energy productivity, governments will have to increase energy prices. If prices and productivity rise together, there would be no economic hardship. Wildly fluctuating energy prices over the past months have had much more severe impacts. Predictability and smoothness are valuable to business and individuals, allowing for planning and adjustments. High energy prices should not be feared. Studies show countries with the highest prices performed best, while those with the lowest prices had poor economic performance.

100. The TF's preliminary recommendations are that China should adopt as a national goal the strategic increase of energy productivity. China made a start in its 11th FYP, but this is only a short term commitment. Energy prices should rise gradually, in concert with productivity gains; the TF refers to this as the *long-term price escalator*. This measure should be initiated in the 12th FYP. The predictability would attract investors interested in energy innovations.

101. Free energy markets are not harmonious. The short-term elasticity of energy prices is virtually zero, while long-term elasticity is much greater. The proposed *escalator* makes use of this difference and is based on the positive experience OECD countries have had with energy taxation. Perverse energy subsidies should be eliminated first; channelling energy tax revenues into reducing the Value Added Tax (VAT) could avoid inflationary effects, a concern in China. Were China to become a pioneer in energy efficiency, it would become a technology pioneer. Similar price escalators are conceivable for water extraction, raw minerals and other resources, and their adoption could bring about the circular economy.

102. The TF is still making progress on its remaining study program and a full report will be submitted to Council in 2009.

b) Task Force on Energy Efficiency and Urban Development

103. With Vice-Chair Klaus Töpfer presiding, the Energy Efficiency and Urban Development TF Co-Chair Ms Laurence Tubiana and TF member Professor Mao Qizhi briefed Council on their preliminary findings.

104. The Factor Four concept discussed in the previous presentation is an inspiring one; optimizing systems is the thought that guides much of this TF's work; there are also parallels with the work of the TF on the Low Carbon Economy. Collaboration among the three groups will be useful.

105. Cities are at the core of the transformation of the economy. Cities are where lifestyles take shape, changes occur and new ideas for the future are defined. Choices made in cities today will influence tomorrow's production and consumption levels. The TF is focusing mostly on the building and transport sectors; in DCs over the past 40 years, cities' share of energy has been growing steadily, in tandem with per capita GDP. In OECD and EU countries, the energy used in buildings and transport represents two thirds of total energy consumption and of GHG emissions. This is largely due to consumption patterns and urban sprawl.

106. Today's pattern of urban development and infrastructure choices will determine energy demand trends in the future. China has the opportunity to make wise choices based on high energy prices and thus avoid being locked into inefficient urbanization and transport patterns; DCs have less flexibility. In France, urban planning is no longer a policy tool, whereas China can still innovate in urban design.

107. The TF will endeavour to incorporate urbanization, climate change and energy considerations in its work. It will conduct surveys and case studies in several cities, comparing different urban models. Strategies, frameworks, policies and urban design that decrease the energy demand of the building and transport sectors will be proposed.

108. Total floor space in China has doubled in five years. As China's per capita floor space approaches that of OECD countries, energy used in this sector is rapidly rising and taking a greater proportion of total energy consumption.

109. Cities that have greater density of population support different lifestyles and energy consumption patterns. The link between urban density, transportation and energy consumption is well established. Studies conducted in Paris show that in the inner city where most residents do not use private vehicles, energy used for transport is 80% less than in the surrounding zone between the first and the second ring roads. The TF identified three different pathways of energy use in terms of buildings and transportation, exhibited by typical North American, European and Asian cities; Tokyo, Amsterdam and Hong Kong have been built along the most sustainable pathway and can be models. Urban design and policy decisions rather than income are the main determinants. These high-density urban design choices are open to China.

110. The TF will examine three main dimensions of urban design, planning and energy efficiency: economic, that is optimizing the energy bill of China; environmental, that is improving conditions in cities by minimizing energy demand; and social, that is optimal lifestyles to minimize energy consumption and reduce inequalities in such a way as to foster inclusion and optimize social harmony. The TF will look at two levels that governments should address: the micro level of the urban citizen; and the macro level of the city as a whole. The TF will consider transport and building issues from the perspective of service provision.

111. When considering examples from DCs, technology is not the only response to energy challenges. While technology has brought significant energy efficiencies, these have been negated by the overall growth in energy consumption per capita. Rather, responsible lifestyles are key to energy efficient cities, as well as systemic approach to key elements of urban design and transport options. Responsible lifestyles have to encompass issues such as floor space per inhabitant, desired indoor temperatures, indoor management of energy requirements in various parts of a dwelling, the wise use of cars and indeed the development of alternatives to private car ownership. European cities are experimenting with fleets of vehicles that can be accessed as a service.

112. Chinese surveys have shown that there are significant differences in energy consumption depending on housing types. The TF also notes vastly different energy consumption patterns depending on citizen's choices in terms of living, working or leisure.

113. This coming year, the TF will focus on an analysis of policies at various levels, and in a set of major Chinese cities, in order to determine the main drivers of energy efficiency in building and transport. It will pay particular attention to urban design and management. It will analyze the effectiveness of existing policies, assess the financial stimuli of energy efficiency, examine institutional and organizational frameworks, and will develop a set of policy recommendations.

c) Task Force on Pathways Towards a Low Carbon Economy

114. Co-Chair Klaus Töpfer presided over the presentation of a progress report from TF Co-Chairs Liu Shijin, Gordon Conway and Björn Stigson. During their remarks, they highlighted the following.

115. The TF initiated its work in June, held several meetings and developed preliminary findings; however, more debate is needed to further elucidate key questions.

116. Initial work focused on defining terms; the word "low" is relative and implies the need to agree on a certain baseline, for example a set amount per unit of GDP that could be equated with reaching the LCE standard. It was argued that the TF focus on a more qualitative definition, with due consideration to the stage of China's overall development that is characterized by high levels of industrialization and urbanization. It might be difficult for China to adhere to the LCE goal while its economy is still in full expansion. It has been suggested that a more general concept integrating high energy efficiency and low GHG emissions could be more workable. There is as yet no consensus on these issues among TF members.

117. The TF will take into account three core elements that need to be balanced if LCE is to be a workable concept in China: the country's development targets, the reduction of CO_2 emissions and cost considerations. Having agreed on a balanced view of the three core elements, the TF could consider the optimal mix of technologies, production modes, incentives and policies to support a gradual lowering of emissions. Therefore, an acceptable definition of LCE from the Chinese perspective would be that LCE promotes sustainable development, reduces emissions and lowers costs.

118. Other scenarios have to be considered: what if there is a decrease in GHG emissions and the economy is "low carbon", but development targets are not reached? Or if emissions are indeed reduced but at too great a

cost, this pathway would be hard to sustain. If China is to achieve LCE, it will need to gain access to specific technologies, techniques, incentives, government policies – ensuring costs remain reasonable. And this transition needs to be gradual – with progress measured in relative rather than absolute terms. It could perhaps best be understood as a paradigm that leads to systemic, transformative choices.

119. Areas that will need to be addressed by the TF in the specific Chinese context are industrial production, energy efficiency, power from renewable sources, energy conservation measures throughout the economy, low energy transport options and others. The TF will also need to consider that China is at present at the lower end of the industrial chain; this explains to a great extent why energy efficiency remains low. China has taken on the burden of high GHG emissions because of its current comparative advantage; insufficient levels of technical innovation and existing barriers to technological transfer are hampering the progress China could make in energy efficiency. China's choice of administrative rather than market mechanisms to cut emissions has limited the scope of the reductions; State-set oil prices have discouraged energy efficiency.

120. China's GHG emissions are therefore very high and the country faces heavy pressure to take action. The international community will, next year, work on a new emissions reduction agreement. According to international figures, China and the US were close in terms of total GHG emissions in 2007; however, if cumulative energy consumption is considered, China has only emitted 8.5% while the US is responsible for 27.2% of total global emissions; when considered on a per capita basis, China's historic emission rate still ranks very low. China believes it must share part of the burden of global emissions reduction, but the GOC also believes that history, per capital emissions, and the fact that it has a very large export sector must all be taken into account.

121. It is inevitable that China embarks upon a LCE pathway. The TF has some preliminary recommendations for the GOC. The country should develop technologies, policies and mechanisms to support the LCE. China should consider exploring the concept of a Developing Country LCE; specific sectors or industries could be selected to pilot new approaches, testing them for sustainability, economic and operational factors. Special features of the LCE model need to be better understood, including the needs for technological and institutional innovation and policies; this is where international cooperation and communication have important roles to play.

122. Three initial chapters have been completed; three more will be written in the coming year. Various scenarios and pathways will be explored and policy recommendations will be finalized. The LCE is an evolutionary process, a continuation and expansion of approaches and policies already in place. Components of the LCE, such as low carbon intensity per unit of energy or GDP, make for a challenging list because of cost constraints and because of considerations for human well-being and welfare.

123. The TF hopes the report will be of use in the preparation of the 12th FYP, and that some of the stimulus package just announced could be spent on the infrastructure needed to realize a LCE. The TF is thinking of the LCE as an end and as a means; China has the capacity to be a world leader in clean technologies, and is indeed at the forefront of some technologies – as the TF on Innovations emphasized. This and other TFs provide opportunities for good cooperation.

124. No one knows what a LCE should look like; it is not only about technology or design, but also about social change involving lifestyles and behaviours, of individuals and organizations. The LCE could be seen as the cornerstone of a new harmonious society for China.

125. The move towards the LCE will be important to the global business community; it sees the LCE as a new driver for economic growth, for innovation and for investment. The timeline for action is critical; how quickly the existing asset base – energy generation, transport, production, buildings – can be turned around and at what cost are key questions. At present, China is rapidly building an asset base which does not conform to any definition of LCE. It will become increasingly urgent to harmonize present investments with LCE requirements in order to limit costs.

126. Lifestyle and consumption patterns will be critical to realizing LCE objectives. Low carbon countries occupy one tenth the footprint of big consumers; comparing the footprint of a rural Chinese family with that of a suburban American family reveals dramatic differences. The ability of China and other countries to achieve LCE will depend on their ability to influence consumption patterns and lifestyles. Human habits and behaviours have proven very hard to change.

ITEM 6. DRAFT AGM RECOMMENDATIONS AND DISCUSSION

127. With Vice-Chair Klaus Töpfer presiding, the Chief Advisors Shen Guofang and Arthur Hanson highlighted key points of the draft Recommendations circulated to Council members. During their comments, they made the following points.

128. The Recommendations follow the thinking outlined in the Issues Paper. They meet the principles of the *scientific approach to development* and adopt as main theme that of the *Harmonious Society*. China is at a critical point, on the cusp of key transformations. In this context, four main groups of recommendations are put forward: one deals with the challenges brought forth by this unusual year of 2008; one addresses technological innovation; the third comprises environment and health issues; and the fourth focuses on energy efficiency and the LCE.

129. Regarding new challenges in environment and development in the specific context of 2008 – its successes and problems – recommendations emphasize the need to adhere to the scientific approach to development and to take a long-term strategic perspective. Seven specific recommendations are made under this heading: economic growth should not be achieved at the expense of the environment; efforts to restructure the economy should be accelerated; there should be greater investments in environmental infrastructure; key investments in rural and urban areas should focus on new environmental industries. A balance between regulation, enforcement and market mechanisms should be sought. Greater efforts need to be made to protect the rural environment. The Green Olympics' example of strong environmental management and systems should be emulated, with greater public information, disclosure and participation. The newly established MEP and other ministries need to better coordinate and distinguish their responsibilities, capacities and efficiencies.

130. The second set of recommendations deals with innovation. It includes sub-recommendations for a National Action Plan for Environmental Innovations 2010 - 2020 covering 9 aspects: strengthening indigenous innovation capacity, setting up a program for clean technology innovation, a national centre for innovation management, sectoral innovation research institutes, inter-disciplinary innovation institutions and laboratories, and systematic approaches to management, institutions and capacity building. Stronger incentives, standards and regulations are needed to create more ideal market conditions for innovation. Financial support needs to be strengthened. Stronger international linkages are also recommended.

131. The third set of recommendations deals with environment and health. International experience illustrates that mishandling this area could lead to serious political and social consequences for China. Protecting citizens' health from environmental threats is critical to realizing a harmonious society. The CCICED proposes a National Action Plan on Environment and Health 2007 – 2015; a national management system for environment and health should be adopted; prevention needs to be the guiding principle, and priority must be given to reducing existing serious environmental health risks; government must take the lead in this work; public information and participation needs to be encouraged; legislation, increased budgets and capacity building are required; compensation should be investigated and established; government needs to take targeted action against the most grievous environmental threats to human health.

132. Recommendations on energy efficiency encompass the preliminary work of five TFs. More comprehensive recommendations will be issued in 2009, and it is hoped this work can be integrated into the 12th FYP which is currently being drafted. Two main sub-recommendations are proposed in order to enable China to embark on the LCE path: strategies, approaches and policies need to be further studied; LCE targets need to be developed for inclusion in the 12th FYP. Three issues need to be considered in putting forth energy efficiency suggestions: a long term strategy on energy efficiency is essential; both theory and experience have proven that price is the most powerful lever for reducing energy demand, driving technological innovation and raising productivity. Caution must be exercised in energy price increases however; the steady, predictable *escalator* approach is recommended.

Discussion

133. A holistic approach to environment management is called for, especially when it comes to legislation and regulations – including the selection of economic instruments. Legislation needs to be powerful enough to generate results; it should be backed with supervision, monitoring and reporting. Government has to increase its capacity for inspection and control.

134. In reporting to the GOC, there are overarching themes emerging from the work of the TFs that should be underlined. One is the need for China to take the lead in environmentally-friendly technologies; it has demonstrated its capacity this year by dealing with emergency situations at home and by hosting the Olympics. The second is the importance of an informed public that participates actively and that has access to the

information it needs. The third is the critical nature of our chosen lifestyles where responsible, sustainable choices and shifts in our perceptions of comfort and necessities are urgently needed.

135. In considering the LCE in the context of China, with its current stage of development and the needs of its people, it might perhaps be more useful to talk about *Low Carbon Prosperity*, a concept that captures the human element. There is a tension in the recommendations between the gradualist approach and the need for transformative change. The world is now changing at a dramatic pace and we are called upon to push ourselves towards the transformative end of the scale. There is also a tension between policy and performance – a complex issue in the context of a country as large as China. Building the capacity for delivery will be key to policy effectiveness at the local levels.

136. A number of reports emphasize the difficulty with monitoring, enforcement and compliance. In countries around the world, compliance is directly correlated with the degree of public awareness and interest in environmental protection. In China, the right level of public education and awareness could contribute a great deal to enforcing the rules. This needs to be more clearly emphasized in the final recommendations, although it is highlighted in TF reports. The CCICED should consider proposing a massive public education campaign to protect the environment; in countries such as South Africa where efforts were made in this regard, pressure is brought to bear on decision makers from their own family members.

137. The section of the recommendations dealing with China's contribution to global sustainable development needs strengthening. The paradigm for environmental protection and sustainable development has been developed in DCs; LDCs are reacting to something they have not contributed to creating. China now has the ability and the responsibility to set the global agenda. Just as in the recent global financial crisis, the world has turned to China. This changed context should be more strongly reflected in the Council's suggestions. Further, greater dialogue needs to be encouraged between China and LDCs in these areas.

138. In considering the LCE, it is key to ensure integration and coordination among TFs and their recommendations. High level planning would allow China to leapfrog into the LCE. For example, the Council recommends the integration of urban and transport planning; a dimension that is not mentioned is the energy infrastructure planning – which allows for zone heating or cooling in cities. If global energy prices were directly reflected in China, better signals would be sent; while China's coal prices have gone up significantly, market signals cannot be effective if thermal power plants get access to coal at subsidized prices.

139. Regarding the recommendations dealing with regulations, the plans proposed are ambitious and costly. Money has become more expensive and scarce over the past few months; we should ensure that what we propose is pragmatic and operational. It is therefore important to consider what attracts private equity. No markets were created 30 years ago when the US brought in measures to protect wetlands and clean air; now, there is a booming market for wetland mitigation and wildlife protection in a country that has not endorsed the Kyoto Protocol. Private equity players should be included in TF discussions in order to provide greater insights into what makes regulations effective. It is important to talk about policies to the people who will end up financing them.

140. The Draft Recommendations would benefit from the integration of key lessons found in the TF reports, such as the importance of solid, accurate, reliable data on key environmental indicators. China is one of the

world's great savers and has exported its savings; now is perhaps the time to fund some of its own investment. Leapfrogging is in China's strategic long term interest.

141. Regarding the recommendation on environmental management in the context of the creation of the MEP, it would be useful to be clear about the need for the MEP to be adequately funded, staffed and trained in order to fulfill its new responsibilities.

142. The GOC's 1 trillion RMB stimulus package should be guided by an enhanced green procurement policy. The overall environmental footprint of the stimulus package should be minimized in terms of the investments made and the inputs used. Regarding the eco-compensation process the Council recommends that there is a need to go beyond water-borne pollution to air pollution, addressing climate change, the impact of pollution on agriculture production and rural livelihoods. The key lesson from the Beijing Olympics is regional environment cooperation; the five provinces surrounding Beijing contributed to the quality of the air. Regional mechanisms are a priority for the management of China's environmental challenges and should be emphasized through items such as regional carbon trading and other instruments.

143. The LCE is both evolutionary and transformative. While no country is clear on the shape it might take in the future, a common vision should be developed. Recommendations should stress that this common vision could be accomplished by taking different pathways.

144. Consistency among TF reports is important. The challenge this represents is illustrated when we talk about LCE – or low carbon prosperity as has been suggested. The costs of reducing CO_2 have been studied; options that represent win-win situations at the macro level need to be favoured even if they are not yet cost effective. This can be accomplished by adopting fiscal measures that reduce costs and allow for their widespread adoption by enterprises or households. Emphasis must be put on transformational change that is pursued through incremental yet predictable measures.

ITEM 7. PARALLEL GROUP DISCUSSION

a) Chinese Language Group

145. MEP Vice-Minister Li Ganjie chaired the session and called on CCICED Secretary General Zhu Guangyao to address participants. A report on Premier Wen's remarks during his meeting with the Council's foreign members was outlined.

146. Lead Speaker Ms Wang Jirong, National People's Congress (NPC) Environment Protection and Resources Conservation Committee Vice-Chair briefed participants on the NPC's recent efforts to remedy the lack of enforcement of laws and regulations. This enforcement gap has three basic reasons:

147. Twenty-nine environment-related laws have already been enacted. Drafted by line ministries in accordance with their respective mandate and without coordination with other concerned agencies, these laws lack specific enforcement regulations and have proven hard to implement. Legislation has not been amended to

take into account the sweeping changes of the last thirty years. And enforcement agencies lack institutional capacity.

148. Participants of the Chinese Language Parallel Group made the following comments on the TF reports, as well as on the draft Recommendations.

149. There was consensus on the relevance and appropriateness of the research topics with regard to the pressing needs and challenges facing China's environment and development. The treatment of the topics was concrete, factual and more focused than last year. The reports were deemed to be of high quality.

150. In order to make the maximum impact on China's busy decision-makers, participants suggested policy recommendations be further condensed. The introduction and background information should be minimized, while the focus of specific recommendations should be sharpened. The content of some sub-sections could also be minimized.

151. More research is needed on agricultural issues. There are good data on agricultural pollution, but impacts have yet to be fully understood. Standards for agricultural technologies and inputs are still inexistent. In the countryside, there is little environmental awareness. Rural infrastructure is still insufficient. There are no regulations covering rural waste, which is largely organic and could be reused if transportation problems were solved.

152. In dealing with emergencies and natural disasters such as this year's major snowstorm and earthquake, the GOC should focus on resource use as well as on risk mitigation and management. There is a need for environmental assessments of possible disasters on drinking water, sewage treatment, nuclear plants and other possibly toxic industries. Further research and policy work are needed in this respect.

153. More research is needed on environment and health, a major concern of the general population. There is a serious gap between legislation and enforcement in this area. The GOC should establish effective platforms for public participation in environment and public health management.

154. People are not aware of the dangers of indoor air pollution in rural households. Numerous surveys indicate that, despite wide-scale government intervention, traditional open-hearth fires are still used widely in Southern China and they cause serious health problems.

155. Birth defects are on the rise, accounting for 4 - 6% of live births; annually, roughly 100,000 infants are born with defects; China now has 80 million disabled persons – due to both genetic and environmental factors. This needs to be underlined in the Council report.

156. The milk contamination incident should be characterized as an enterprise social responsibility issue, not as an environment and human health issue. Convincing examples are needed to better document and illustrate environment and health issues. But it illustrates the fact that, in the absence of high moral standards, even the best legislative framework will prove to be ineffective.

157. In China, environmental problems are also triggered by poverty. Resource conservation and improving citizens' livelihoods need to be addressed in order to solve environmental problems. The first priority of the UN MDGs is poverty eradication. In a country such as China, it is necessary to focus on environmental and social livelihood issues in tandem.

158. The main difference between China's and DCs' environmental problems is that China has to satisfy the basic needs of a rising population, increase living standards, and at the same time protect the environment. This enormous challenge has not been sufficiently explored by TFs. This should be one of the Council's main tasks in the coming years.

159. While energy issues need to be studied in the larger international context of climate change, there is a need to focus more closely on environment protection in China. The Council could help resolve differences over key indicators. For instance, CO_2 is used internationally, while China's 11th five-year plan focused on $S0_2$. China also has other major pollutants related to energy use, such as NO_X. But China does not want to select indicators that make its performance look worse.

160. In order to engage China's leadership on the LCE, the TF report should describe the various pathways towards this goal, and outline the concrete strategies and measures to realize this goal. Research on the development and deployment of new and clean energy technologies should also, at an early stage, take into account the environmental efficiency and impact of hydro-power, solar, wind and other types of clean and new energies. For example, during the planning stage of the Three-Gorges dam project, environmental impacts should have been researched and identified.

161. There is a need for research and recommendations on green design for both public and residential buildings, the present regulatory environment impeding the full deployment of green design building technology. Wealthy people are investing massively in real estate; no limits have been imposed as yet. The TF should research the management and control of commercial housing, including the taxation of secondary domiciles and possible limits on housing purchases; recommendations should take into account the need to provide housing solutions for all urban residents.

162. Further research and policy recommendations are needed on public transportation using clean energy technologies. Rail transportation, including light rail, is only possible in larger cities; other solutions need to be put forward. Further policy support is needed for the use of clean energy in public and private transportation. At present, there are no limits imposed on the number of vehicles an individual may own. The TF should consider researching vehicle ownership management, as is practiced in some Chinese cities, while taking into account employment and growth repercussions.

163. Beijing's Green Olympics have left a positive environmental legacy, albeit at heavy cost. This legacy should be promoted in other cities and Shanghai's 2010 World Expo provides an excellent opportunity to do so. Still, more research is required on the economic costs of environmental protection.

164. While some TFs have completed their study program, the Council needs to ensure there is proper follow-up, including linkages to new research areas. There is a need for better coordination and collaboration among TFs. A mechanism should be established to allow for more engagement of Council members in the TFs. The Secretariat could provide members with information and financial support.

165. MEP will face the challenge of promoting interdepartmental, inter-provincial and trans-boundary collaboration. For instance, cleaning up the Huaihe River was on the agenda in the 1950's; this cannot happen

without a concerted effort of the provinces in that watershed. Internationally, the success of the Columbia River management is due to the establishment of a supra-national treaty body between Canada and the US.

166. MEP's website should be updated to facilitate better communication with the international community and create a better enabling environment for China's environmental work. Perhaps changing the MEP's name to Ministry of the Environment would reflect the broader, more pro-active approach that is needed.

167. Before borrowing models from the West, China first needs to look at its present economic, social and environmental situation, matching this to the corresponding phase Western countries experienced. Today's China resembles the North America and Europe of the 1960s and 1970s. This comparison is necessary in order not to underestimate the difficulties facing environmental work in China.

168. The international community has high expectations regarding environmental protection in China because of its present economic performance. Some members argue that China is in no position to take the lead, be it in terms of economic, social or environmental development.

b) English Language Group

169. With Vice-Chair Børge Brende presiding, English-speaking members convened to hear Leading Speaker Mr Hans van der Vlist, the Netherlands' Vice Minister of Housing, Spatial Planning and Environment. These initial comments were then followed by a general debate on the CCICED recommendations and comments on the Task Force reports. During the Parallel English Language Group Discussion, the following points were made.

170. We are not only facing a financial crisis but also a food crisis, a climate crisis, an environmental crisis. They have a common cause: economic activities that are not sufficiently regulated and failure of the markets to solve the emergent problems. The climate and the financial crises are daunting because of their global nature; only global governance and institutions have the necessary means to address the challenges. Unfortunately, these institutions have yet to be created and countries have to turn to existing international agreements.

171. Premier Wen Jiabao, in meeting with Council members, stated that the GOC's stimulus package would target consumer demand – yet with long term consumer confidence low in all countries, this lever may not be effective.

172. The necessary reform of the international financial system offers opportunities to finally promote sustainable development. Four changes need to be supported: the global governance of the financial systems is likely to become more transparent; secondly, governments, by acting together, can demonstrate their capacity to cooperate, thereby injecting much needed confidence; thirdly, long term thinking in the decision-making process will take precedence over the current short-term focus on profits, leading to the adoption of sustainable solutions and corporate social responsibility; fourthly, governments will start to look more critically at market operations and intervene earlier to prevent the occurrence of perverse incentives and ecological damage. Better regulated and more stable markets are likely to result from these changes.

173. Governments and the private sector should start putting together these new governance structures, invest in the LCE and in stable markets. The GOC's own stimulus package is an opportunity to take steps in this direction, investing for instance in low emissions technology. China's experience with state involvement in the financial sector could become valuable to other countries, unaccustomed to such interventions.

174. Four of the TF reports submitted to Council deal with one of the essential elements of transformation, energy efficiency. It will be useful for this discussion to ensure a consistent and coherent message is offered to the GOC on this issue. For instance, is the long-term, stable escalator principle for energy prices that have been put forward by one TF consistent with the need to spur innovation? Are price mechanisms sufficient, or are emissions caps and standards also necessary? Recommendations from the four TFs dealing with energy issues should be grouped together. Environment and Health is the other great theme of this AGM. The proposed recommendations were clear and can be presented separately from the LCE issues.

175. The current contraction of the global economy, not seen since the 1970s, should be taken into account in our recommendations. The GOC's stimulus package is to ensure continued growth in China, but the Council needs to stress the kind of opportunity this could be for the realization of sustainable development. The projects that are most likely to be launched immediately have no doubt been planned for some time and therefore are not necessarily ecologically sound. The Council can provide sound advice beyond suggesting Environmental Impact Assessments (EIA) be conducted. This is tricky, because EIAs will delay the necessary public works.

176. These projects, as described by China's Premier to Council members, include environmental infrastructure. However if a large impact is desired, this kind of investment is not always helpful because there can be long lags for employment and consumption effects. The GOC has no doubt already considered what will give a rapid boost to consumer demand and job creation. The Council could provide advice on two areas of public spending that would also build natural capital: environmental infrastructure works, such as watershed management or sewage treatment plants; and the investment in or expansion of ecological restoration work, such as aforestation, rehabilitation of wetlands and grasslands. Much of China's focus has been on cleaning up after the damage is done; the need is now to see the environment as a driver for economic growth, jobs and shoring up natural capital.

177. The current financial crisis presents risks and opportunities that have not been seen in over 60 years; this is not business as usual and it must be reflected in our recommendations. There seems to be a paradigm shift regarding the LCE and climate-oriented business models around the world. We are confronted with a huge power shift in terms of economics and innovation – China is leading the way in translating the new thinking modes into practice. Yet climate change indicators are more worrisome than ever, most specifically GHG emissions which continue to accelerate, a rising GHG intensity per unit of GDP globally, and a decreasing absorptive capacity of ecosystems. The Council's most important advice to the GOC should be on the actions to be prioritized, and the time frame required. This kind of consideration is lacking from the current TF reports and recommendations.

178. Previous economic downturns in various countries have corresponded with environmental degradation. It is critical to propose options that would allow China to avoid this during the current crisis.

179. It is expected that China's stimulus package will mostly be spent on cement and steel – this is the easiest option to stimulate domestic demand and job creation. But focusing instead on a green recovery and on an investment in human capital, namely health and education, could be very productive. There are also opportunities for infrastructure investment in climate-friendly transport such as public transit and rail. China's banking system does not have sound mechanisms to finance such long-term projects; international cooperation could prove valuable in this area.

180. The present crisis will require long-term public intervention in order to be effective; this is also the case for the LCE – a sensitive topic in China. Perhaps the Council could be the platform to convene a roundtable on "green recovery" and the need for a coordinated global LCE response. This would support future discussions on climate change in Copenhagen and elsewhere. Further, China needs help in developing the vision of what the LCE could look like in 2050 – beyond the short-term perspective of the FYPs; the CCICED could assist China in this regard.

181. The CCICED has to focus on assisting China integrate its recommendations into the next FYP. The previous FYP was also focused on the domestic market, seeking a transformation from manufacturer of cheap export goods, to domestic higher quality goods. The key will be to transform China's manufacturing forces into sustainable ones. China's investment into its transport network is to connect poor areas to markets; this will continue, but integration with rail infrastructure could be optimized. Investments will also continue into power generation and urbanization. Council recommendations need to target areas that are the focus of China's FYPs. The Premier is keen on market incentives and AGM recommendations can provide counsel in this area.

182. How Council amends recommendations remains a hazy process; open debate in Council tends to be monopolized by international members and the present discussions are being held in parallel sessions. It is felt that a joint discussion among international and Chinese members on TF reports and policy recommendations would have been more valuable.

183. This year's experiment with parallel discussions was instituted precisely to encourage a greater number of Chinese interveners to express their views while allowing for greater discussion time among international members. The experiment may need to be revisited next year.

184. The present stimulus package may be a transition between the 11^{th} and the 12^{th} FYPs; its objectives are to restore confidence despite a slowdown in growth, to increase domestic demand, and to reduce unemployment which is bound to rise. Much of this package will no doubt be composed in part of old commitments or ongoing projects. The key will be to push for energy efficient, low carbon infrastructure projects which at the same time can generate employment; environment projects such as sewage plants and river clean-ups can be both labour intensive and yield environmental benefits. The Council's advice could be useful to the GOC in optimizing the use of the stimulus funds.

185. Any talk of LCE must be anchored in solid knowledge of the energy system; recommendations must take into account the blockages to energy efficiency and low emissions. The energy system comprises six elements: power generation, from renewable and non-renewable sources; industry and manufacturing; transport, where energy efficiencies will only be achieved through regulations and standards; buildings; land use; and

finally consumption. Energy policies must focus specifically on each area in order to have impact. Discussions so far seem to imply one set of LCE policies will be sufficient.

186. Some 26% of China's carbon emissions are embedded in its export products; much of these exports are produced in plants which are partly or wholly owned by foreign investors; some reports indicate 70% of inputs used in Germany are produced in German factories in China. We need to consider whose carbon we are talking about, understand China's position and share the responsibility accordingly.

187. China is undergoing massive urbanization. Moving rural families to cities implies a 12-fold increase in carbon footprint due simply to a change in lifestyle. Hundreds of millions of rural people are relocating to cities with serious consequences for GHG emissions. This effect will be difficult to offset. Some studies indicate that carbon emissions by 2030 will be greater than had been projected a year ago in spite of slower economic growth and higher energy prices. Council recommendations do not take these forces into account and need to be more sophisticated.

188. Perhaps starting with a simple idea could be productive. Premier Wen Jiabao mentioned the mandatory target he must meet – a 4% reduction each year in energy intensity during this FYP. This is in itself a LCE concept and the Council should follow this lead. This would indicate China is already focusing on the demand side of the energy equation. Sustainable coal use will be one of the main topics of the LCE TF over the coming year.

189. It is unclear whether or not the stimulus package includes mostly "old" projects. Infrastructure investment implies greater use of power, steel and cement. Stimulating domestic demand means industries and manufacturing will proceed apace. The energy intensity targets during this FYP are to total 20% - but China is also committed to a minimum 8% GDP growth, which implies GHG emissions, will peak sometime between 2020 and 2030. Council recommendations should be more explicit on emphasizing the need for an efficient environmental management system; legislation, regulations, standards, monitoring, inspection and control are all still lacking, and increased resources and capacity building are urgently needed. These are concrete suggestions for making the use of funds in the stimulus package more environmentally-friendly.

190. Sustainable development does not happen quickly and requires careful consideration; it is not easily handled in crisis-driven spending plans. Spending on watershed management, reforestation and ecological construction can be both labour intensive and be rapidly planned. Such interventions would have desired impacts on environment and biodiversity conservation, if not on the achievement of a LCE. China, which has been visionary in so many areas throughout its history, needs to accept the mantle of leadership and innovate boldly in the area of sustainable development.

191. A key sector targeted in the stimulus package is agriculture and the rural economy; Premier Wen mentioned immediate spending on methane digesters for rural energy generation; it can represent significant spending in poor areas, reduce GHG emissions and create employment. While not as glamorous as large power plants, such small projects can have a significant cumulative impact. Members should also remember that China's Environmental Law is to be revised this year, with a focus on the penalty structure. At present, penalties

are too low to be an effective deterrent. Environment officials need to be given powerful tools to enforce the laws.

192. Most of this parallel session has focused on energy issues; vast areas of the recommendations have yet to be discussed. Moreover, energy-related recommendations need to be better coordinated. Perhaps the 11th FYP mandatory energy efficiency targets could be the unifying principle for Council's suggestions in this area. China should stop investing in energy intensive industries and plants – today's dinosaurs – during the 12th FYP. Further, recommendations need to be consistent about the short term stimulus package versus the long-term vision that is the LCE; financing projects to stimulate domestic demand should not harm longer term environmental considerations.

193. The Council recommendations should aim to influence China beyond the immediate financial crisis. The stimulus package announced is to rebuild consumer confidence, stimulate demand and create jobs; it would be extremely fortunate if these funds were to serve environmental goals as well. In any event, none of the funds will be targeted at such a strategic goal as the LCE. Were Council recommendations to be too closely tied to the current crisis, they risk contamination. China has indicated a willingness to explore greater public information and participation – an important, systemic improvement; the Council needs to emphasize this as a pre-requisite for any success in environmental protection.

194. The Council needs to be realistic about its expectations of the stimulus package – the GOC is actually ahead of the curve, indicating the environment will be integrated in the public projects funded. Premier Wen was silent on the Council's health recommendations – in this area, Council is ahead of China and its contribution could be significant. Another area where Council can impact decision-making is the LCE which offers China the opportunity to leapfrog, and where international cooperation could be fruitful. The window of opportunity is the 12th FYP; the Council's next AGM could focus on this since the current FYP ends in 2010.

195. The areas where the Council provides value-added to China are immediate technical assistance for emergent issues, and collaborative thinking about longer term problems. During the parallel Chinese discussion, mention was made that international members focus too much on longer-term considerations, forgetting about China's immediate, practical needs. The Council's report on Environment and Health addresses short term priorities; while the LCE report deals with the future and could be the focus of more collaborative thinking between international and Chinese participants. China is starting to shift its thinking into a new paradigm, but programs and implementation remain stuck in the past – this has been referred to as "green thinking but brown reality." The Council is well placed to help China draft the roadmap from the brown present to the green future.

196. Members expressed some concern over the insufficient distribution of Recommendations drafts, and the lack of explicit connection between the Issues Paper and the Recommendations.

197. Council needs to take care not to focus uniquely on climate issues; livelihoods and quality of life, including health, are highly relevant to China. Focusing solely on climate change could lead to accusations that international members only care about issues that affect their countries directly.

198. China uses language for its broad concepts that is visionary: *Harmonious Society* and *Ecological Civilization* – expressions that are inconceivable in western societies. However, China needs to move from broad

vision to operational issues and actions. The temptation of segmenting the response according to traditional sectors of the economy should be resisted. A systems approach is needed. It should also be remembered that the LCE is not only about emissions reduction, but also about carbon sequestration, something that natural ecosystems do very well.

199. Language is key and members need to be aware that much is often lost in translation.

200. An umbrella statement is needed at the beginning of the Recommendations, linking clearly the Issues Paper with the theme of the AGM and the recommendations that emerged from TF reports.

201. Council should be explicit in stating that the global leadership in sustainable development (SD) and real solutions will be coming from emerging economies such as China's.

202. Much has to happen domestically in order for the GOC and the people to address the country's own problems. This, rather than currying favour with the international community, is China's motivation. In recommending public participation, China's specific context, its need to maintain social stability, have to be respected and a gradual approach needs to be stressed. However, Council must be clear that although public participation may create ripples which on the surface appear negative, in the long run the genuine involvement of the public is the only hope for effective implementation of environmental laws and regulations.

203. The structure of the Recommendations paper and some of its language need to be tweaked. Members are reminded that the drafting group avoids repeating points that have been made to the GOC in previous Recommendations.

204. Members would profit from a report on the successful implementation of the 11th FYP, since much of this will provide subtext for the preparation of the 12th.

205. It is suggested the AGM be structured differently, providing thematic discussion groups where relevant officials and ministers of the GOC could dialogue freely with members.

206. It should be stressed that the AGM is an opportunity for international members to learn more about China and report back to their organizations, providing much needed context. Discussions should not be held separately for international and for Chinese members. Perhaps smaller discussion groups could be staged; assigned seating dinners would also facilitate greater exchange among Chinese and international participants.

ITEM 8. DISCUSSION AND ADOPTION OF AGM POLICY RECOMMENDATIONS

a) Briefing on the Parallel Group Discussions

207. Co-Chair Børge Brende presided over the presentation of discussion summaries from the Parallel Groups. The Rapporteur from the Chinese Language Parallel Group summarized the main points made during the discussion.

208. China is inseparable from the rest of the world – it shares both opportunities and challenges when it comes to protecting the earth. China's determination and capacity to solve problems of environmental protection and economic development were reaffirmed. It is recognized that much of the legislative framework related to

the environment is normative rather than actionable, hence is not effectively implemented; clear improvements are needed in this area and public participation should be integrated in new statutes.

209. The Chinese Language Parallel Group found that TF reports were detailed and contained specific recommendations; they are pertinent to China's current stage of development and in line with its goals of fostering a harmonious society. Specific suggestions for improvement were made.

210. A greater number of recommendations should focus on resource use, as well as on disaster mitigation, prevention and relief. In recommendations related to clean energy, the environmental effects of large-scale hydro dams and wind farms should be examined. The LCE sections need to be more specific and operational. One of China's main goals remains poverty reduction; it seems most recommendations do not take this factor into account. The recommendations do not reflect China's focus on environmental challenges in rural areas; any discussion of energy for instance should also address rural energy issues.

211. While it is important to address climate change in a global context, Chinese members would like to see the issues of atmospheric pollution control addressed more directly, especially at the regional and local levels. Urban planning is a powerful tool; it would be best to integrate in relevant recommendations issues such as energy efficiency in buildings and vehicles. Law enforcement will require more coordinated action on the part of governments at all levels, as well as the cooperation of enterprises. TF reports should be more explicit in linking with previous and future TFs that deal with similar issues; there should also be improved coordination among all TFs. The Secretariat could play a role in involving members in TF activities.

212. While the Olympics were successful from an environmental perspective, the costs were quite high; cost effectiveness must also be taken into account when recommending models of environmental protection. The MEP website needs to be improved, with greater data availability and transparency. Finally, participants proposed text changes to the draft recommendations.

213. The Rapporteur of the English Language Parallel Group listed the following points made during the discussions.

214. International members reiterated the importance they attach to the meeting held with Premier Wen Jiabao. Members also acknowledge that the AGM is taking place in challenging times for the global community; recommendations need to reflect on the financial crisis and address the opportunities it presents in two ways. First, the crisis will impact on international and national governance; secondly, there are risks and opportunities associated with the stimulus packages being announced. Regarding governance, the participants believe the G20 and other meetings to be held on the crisis could generate greater confidence and spur concerted action; China's own stimulus package is contributing to this. It is hoped this good will can spill over into upcoming climate change negotiations.

215. Regarding stimulus packages, participants recognize many of the plans funded are pre-existent; but it is of utmost importance to ensure these short term interventions be guided by medium and long-term considerations of the environment and climate change. The principles to follow in selecting projects for funding should be: "*Do no Harm"* as efforts are made to stimulate consumer demand and jump-start economic growth; where possible, a systems approach should be taken to determining the contents of a stimulus package; consideration

should be given to labour intensive projects that also support investments in natural capital, projects such as reforestation, or projects that support sustainable rural economies such as small scale public works to supply safe drinking water, produce methane from organic waste, or provide solar-heated hot water.

216. Implementation of environmental protection statutes remains a problem in China. A stimulus package can provide short term training and employment opportunities for people – recruiting them and building their capacity to do monitoring and surveillance. International members also see the stimulus package as a bridge between the 11th and the 12th FYPs. The next FYP could see China using its considerable savings and building on its comparative advantage to develop, test, scale up and market new environmental technologies.

217. Sustainable development is a long-term effort and a vision for 2050 is needed; leadership in this area is shifting from Europe to emerging economies such as China. They will be called upon to find the right balance between economic, environmental and social development considerations. Leadership is not to be confused with the power to dictate, but rather should be understood as the capacity to develop a model for others to emulate.

218. Participants commended the TFs for their reports, but noted that greater linkages need to be drawn among their findings and recommendations. They are cognizant of the challenges posed by natural disasters, but believe that a focus on long-term issues will provide China with solid prevention strategies, and better serve the goals of the Council. They also noted the common theme in TF reports of the importance of reliable data, public information, strong regulations, effective enforcement and penalties, citizens' participation, and coordination – both horizontal and vertical – among government agencies.

b) Presentation of the Revised CCICED Recommendations

219. Vice-Chair Børge Brende asked the Chief Advisors Shen Guofang and Arthur Hanson to brief Council on the final draft document. During their remarks, they emphasized the following:

220. The drafting group incorporated several crucial elements, such as Vice Premier Li's speech and statements by Premier Wen Jiabao, in addition to the existing recommendations, summaries of the parallel group discussions, TF reports and members' suggested amendments. Members need to keep in mind that the AGM is an annual event focusing on a specific theme; AGM recommendations must avoid repetition of items covered in previous years.

221. Sections on energy and the LCE have been integrated in the first portion of the document for coherence's sake. Since next year's AGM recommendations will focus on energy issues, the more detailed recommendations is this area have not been included. The recommendations are more specific on environmental considerations that should prevail in projects funded through the newly announced stimulus package, including a recommendation on green procurement. Other changes in the text include an emphasis on the 12th FYP, energy pricing reform, LCE and climate change.

222. Members left detailed changes to the draft of the Recommendations tabled on 14 November to the drafting group.

ITEM 9. CLOSING SESSION

a) Secretary General's Report

223. Vice-Chair Margaret Biggs chaired the Closing Session of the CCICED 2008 AGM. Secretary General Zhu Guangyao was asked to brief Council on the accomplishments of 2008 and the workplan for 2009. During the course of his remarks, the Secretary General made the following key points.

224. The CCICED got solid support from the GOC in 2008; policy recommendations submitted were well received by relevant ministries and agencies. CCICED partnerships are expanding, with a greater number of domestic and international donors, laying a good foundation for future work. The organization of the CCICED is proving quite flexible; members and TF partners are able to maintain good communication. The first roundtable was organized during the past year and helped to disseminate the Council's work and recommendations.

225. In order for members to assess the impact of the Council's work, the Secretariat tasked the Chief Advisors to compile a report on the results of past recommendations; this report will soon be published and distributed.

226. 2009 will be a busy year for the CCICED. The Bureau has authorized a number of TFs that will focus on energy issues, including the TFs on LCE, on economic instruments, on rural development, on sustainable use of coal and on urban development. A number of these have already submitted interim reports; all of these TFs will be reporting to Council at the 2009 AGM.

227. The Bureau has also approved two new TFs which are starting work in 2009 and are to submit their report in 2010: the TF on Ecosystem Service and Management Strategy, and the TF on Sustainable Development Strategy for Oceans. In addition, research cooperation will commence with India and a China Environment and Development Outlook project will be launched. The Secretariat this coming year will also prepare another Roundtable and the AGM; members will be kept informed on these events. In addition, the Secretariat will continue to strengthen relationships with other ministries of the GOC, as well as the private sector, universities and research institutes.

228. The Secretariat is working on a long term development plan for the Council. Members and partners are invited to put forward suggestions and recommendations.

b) General Discussion

229. At the invitation of Vice-Chair Margaret Biggs, members commented on the AGM and on the Secretary General's report. They made the following points.

230. IUCN would be interested in helping develop the work of the two new TFs on ecosystem services and on the oceans.

231. Working with the Council is a learning experience for members. It will be key to outline what the vision for the LCE is and future work will help better define this. Premier Wen mentioned that China could be the ideal place where new technologies can be tested and marketed; perhaps a roundtable on this issue could be organized.

232. It is most productive for all Chinese and international TF Co-Chairs to meet in a timely fashion in order to better coordinate their work. This meeting should be held early enough in the year to influence the course of each TF's work.

233. The launch of roundtables as a Council event should be lauded. This year's roundtable also included an Enterprise Forum where it was possible to engage the Chinese business community. It would be good to have Chinese business representation on Council as well.

234. The concept of Low Carbon Prosperity provides Council with the means as well as the ends – the end being prosperity, and the means being the successful implementation of the LCE. The two ideas could be explored over the coming year.

c) Closing Remarks by Council Executive Vice-Chair Zhou Shengxian

235. With Vice-Chair Margaret Biggs presiding, Executive Vice-Chair and MEP Minister Zhou Shengxian addressed Council. During his closing remarks, Minister Zhou emphasized these points.

236. The 2008 AGM was fruitful thanks to the contribution of members, experts and staff. When meeting with the Council, Premier Wen raised a central issue: in this time of crisis, it is more pressing than ever to protect the environment and ensure sustainable development. The current slowdown presents China with the opportunity to transform production and restructure industries in order to protect the environment.

237. The presence of Vice-Premier Li Keqiang and the meeting with Premier Wen demonstrate the importance given to the Council by the GOC. The agenda of the 2008 AGM was completed successfully and the Secretariat will work to ensure its recommendations get broad distribution. A report on the implementation of the 2008 recommendations will be presented to Council in 2009; equally important will be an analysis of the reasons why some recommendations are not adopted by the GOC.

238. China has not, nor will it ever stop protecting the environment and supporting sustainable development through progress on production and energy efficiency and resource conservation.

239. China's successful handling of the current financial crisis can turn these difficulties into opportunities. The MEP will shoulder its responsibilities. It is believed that environmental protection can stimulate further economic growth; there is significant potential demand for environmental technologies and products. China will support the development of a Green Economy, a LCE. Innovation, including in our institutional frameworks, is key to this process. International cooperation can be key to face the current global crisis. The CCICED is an ideal platform for China to learn from international experience, both its successes and failures.

240. The 2008 AGM of the CCICED was adjourned by Vice-Chair Margaret Biggs.

III RECOMMENDATIONS OF THE COUNCIL TO THE CHINESE GOVERNMENT (Final Version, 4 December 2008)

241. The 2008 Annual General Meeting of the China Council for International Cooperation on Environment and Development was held in Beijing from 12-14 November 2008 with the theme of "Harmonious Development through Innovation". This meeting occurred at a time of great turmoil in the world's financial markets, with the threat of severe global recession, but also a call for "re-regulation." This year is also a time of celebration of tremendous achievement in China—30 years after the *Reform and Opening Up*, and after the very successful Beijing Olympics.

These events, and also China's remarkable efforts during the snowstorm and earthquake disasters, and in response to the melamine contamination and other public health incidents have focused our discussions on how environment and development can play a stronger role in China's future harmonious relationships.

The 17th Party Congress of the CPC specified that scientific development, Harmonious Society, and promoting an *Ecological Civilization* should guide China's social values and progress. Now, a year after this historic meeting, there is growing evidence that transformative action is taking place towards building a resource conserving and environment friendly society in China.

It is particularly significant that progress is being made on the 11th Five Year Plan program for energy conservation and pollution reduction, that China leads the world on achieving many of the Millennium Development Goals, and that many of China's science and technology innovation goals are for sustainable development. Also, that necessary institutional strengthening including the formation of the Ministry of Environmental Protection (MEP) is taking place. CCICED applauds this evidence of domestic progress and also China's expanding role on international environment and development.

Despite these praiseworthy efforts and achievements, China's domestic program for environment and development still faces many challenges, and much corrective action before its full contribution to a Harmonious Society can be realized. The action taken at the 3rd Plenary Session (October 2008) of the 17th CPC Party Congress to reduce the imbalances between urban and rural development is an important opportunity where increased environmental efforts will lead a more harmonious society. The CCICED members are aware that public health problems induced directly or indirectly by pollution remain a serious factor for social advancement in China. This has been a priority area for CCICED research on harmonious development.

CCICED believes that an appropriate mix of incremental and transformative changes is needed to build a new relationship of environment and development in China and globally. It is fortunate that China is well positioned for carrying out these changes. Environmental progress should intensify over time, first through incremental improvements, and later by leaps and bounds, as the investments now being made in sustainable development innovation produce better technical solutions. CCICED has examined how environment and sustainable development innovations could be fast tracked, since it is unlikely that incremental change alone will satisfy China's ambitious environmental targets and longer term needs.

Nowhere is this need for innovation greater than in addressing environment and energy relationships and the global need to address reductions in greenhouse gases. CCICED has started several task forces and other activities on these topics. While the main results will not be reported until the 2009 AGM, a few preliminary recommendations are provided in this document.

The global environmental situation continues to decline, with direct effects on China through trade, climate change and in other ways. The Beijing Olympics has created a level of awareness around the world of China's environmental problems and its capacity to address them. How China chooses to go about its efforts to promote an *Ecological Civilization* at a global level is therefore a significant matter, with implications for trade, market supply chains, and action on pressing concerns such as climate change. But China's domestic and international environment and development efforts could be threatened if the credit and financial crisis turns into a worse situation of recession.

The worsening global economic situation threatens social, economic and environmental progress of all nations, including China. This topic received special attention from both Chinese and international members. The CCICED AGM occurred just as China announced its substantial economic recovery package. Therefore there was a substantive basis for considering how China can turn the economic crisis into an opportunity for strengthening economic growth.

In the period of global crisis ahead there will be many opportunities where China and a few other major developing countries have advantages not found in more established industrial economies. This is particularly the case for sunrise industries and for green products, which will become of increasing significance in the second decade of this new century. In fact there may be a historic shift in leadership on environment and sustainable development from Europe and North America towards Asia. Trade and investment will be drivers for this to happen. Real solutions for global sustainable development are now as likely to arise from action in China as they are from other parts of the world.

Council members appreciated the Chinese position that the global economic slowdown therefore must not be allowed to stand in the way of environmental progress. And that the economic

stimulus package developed by China has incorporated environmental aspects. During this time of rebuilding the world's financial system and new economic growth paths, China could benefit by positioning its investments towards activities that will allow it to shape the nature of future world growth, for example as a supplier of renewable energy products and services. These are examples of what CCICED's Chairman, Vice Premier Li Keqiang, noted are actions that "promote development of the economy while taking good care of the earth that we share."

At the 2008 AGM CCICED reviewed final recommendations from Task Forces on *Innovation and an Environmentally Friendly Society*, and on *Environment and Health.* In addition, the Council received interim reports with some recommendations from three energy and environment Task Forces that will submit final recommendations in 2009 (*Pathway toward Low Carbon Economy, Economic Instruments for Energy Efficiency and Environment, Energy Efficiency and Urban Development).* In addition, the CCICED Issues Paper prepared

for the 2008 AGM identified a number of urgent challenges facing China, in part the result of the international economic and environmental situation. Our three key recommendation topics draw upon these reports as well as on the views of Council members.

The Council's reports and discussions again underscore the need for effective implementation and enforcement of strong environmental legislation, greater use of credible economic instruments, and a more scientific approach to the development and dissemination of reliable environment and development information as means to build confidence and public trust in China's environmental decision making. Of these points, the first and last deserve particular attention. Enforcement of regulations at a level that will change behaviour is absolutely essential in order to foster innovative technologies and to improve environmental health conditions. But it is also vital to stress the need for public data that can be trusted by citizens and can become benchmarks for positive change via good standards.

RECOMMENDATION TOPICS

1. Transform Challenges into Opportunities for Further Implementation of a Scientific Development Approach.

2008 will surely be viewed as an exceptional year for China because of the devastating natural disasters, international financial turbulence, food safety incidents, successful Olympic and Paralympics Games as well as the 30th anniversary of the introduction of *Reform and Opening Up*. The year on the one hand gave rise to a number of new problems and challenges for China in the field of

the environment and development, on the other hand, the great success and joy of the year left a precious legacy for China as well. As the year of 2008 draws to its end, it is now important for the Chinese government to face up to the problems and challenges, identify opportunities and potentials, review experiences and lessons, take positive actions and look into the future.

Therefore we recommend that China:

(1) Seek Opportunities in the Wake of the Financial Crisis, and Advance "Sound and Rapid" Environment and Development Initiatives.

To find a remedy for the financial market and achieve stable economic growth are undoubtedly the top priorities for the world right now. However, we must remain alert to prevent the environment from becoming the next victim of the financial crisis, as may occur in some parts of the world. Once it becomes a trend to neglect environmental factors, the world's sustainable development will take a significant step backward. Thus, China must work with unwavering determination to reduce emissions, improve energy efficiency and fight climate change. The Chinese government has recognized the risk from the current crisis and has integrated environmental

protection in the domestic stimulus package. It must now transform the challenges to opportunities for sound and rapid sustainable development.

The stimulus package should follow four principles with respect to environment and development. First, do no harm to the environment in the implementation of the package. Second, take a systems perspective that will identify positive relationships for environment and economy. Third, highlight labour-intensive activities operating at an appropriate scale to help poor people while protecting local environmental conditions, especially in the countryside. And, fourth, seek co-benefits, especially for improving health and ecological restoration, as a consequence of energy improvements, disaster relief and reconstruction, and pollution reduction. It is recommended that the Chinese government should be fully aware of risks and opportunities, and take the following actions:

1) Strengthen supervision and environmental management in the execution of the domestic stimulus plan, so as to prevent regions from boosting economic growth at the expense of environment in their response to the financial crisis.
2) Consider not only environmental protection as one of the investment priorities of the stimulus package, but also carry out examination of supply chain environmental consequences and strengthen green procurement policies. These steps will boost the development of environmental protection industries and convey the strong determination of the government that environmental protection can be maintained even in the wake of the financial crisis
3) Take advantage of the opportunities arising from the financial crisis in order to advance transformation of the development mode for the domestic economy. This can be done by boosting the development of clean energy and technical innovation, low carbon economy and by strengthening capacities in the area of environmental protection and climate change in the remaining years of the 11th Five Year Plan, and particularly during the 12th Five Year development period.
4) Advance energy price reform and further internalize environmental externalities with the plunge of oil and commodities prices. It is advisable for China to adopt a long term “escalator” approach to gradually raise energy prices. It means small, but periodic and predictable rises of prices or introduction of additional environment or energy taxes, with information transparency to fully prepare the general public and reduce possible resistance.
5) And for the longer-term, develop Low Carbon Economy. The Chinese government should attach great importance to the development of Low Carbon Economy (LCE) and get prepared for action, particularly in terms of technology options and feasibility analysis. The development of a low carbon economy will benefit China both internally, in terms of addressing resources and environmental problems, and externally by contributing to the fight against climate change and raising international competitiveness. China should consider specifying low carbon economy related targets in the 12th Five Year Plan for economic and social development, and incorporate low carbon economy in current strategies and actions.

(2) Create a Better Mix of Government Regulation and Market-Based Mechanisms, and between Factors Favouring Innovation and Those Favouring Stability.

The world financial crisis and the infant formula incident have shown that excessive reliance on market forces without effective regulation will create huge risks. In fact, market failures such as environmental externalities are often hard to control. The government thus should strengthen its supervision while adopting market-based instruments. China is at the initial stage of a socialist market economy where both market function and government regulation await improvement. Therefore the government should step up its supervision while giving full play to market-based instruments suitable for environmental protection.

Some of the most important market based approaches will require significant levels of capacity building for adequate management and supervision, including improved emissions

monitoring, consolidation and standardizing of emissions data, designating a legal registry for emissions reductions, and enforcing non-compliance with much stiffer penalties.

It is important for the Chinese government to maintain the balance between innovation and stability. Stability is a prerequisite for a harmonious society while innovation often entails reform to avoid unreasonable benefit distribution. Imbalance between the two will give rise to conflicts. But if innovation helps encourage public engagement, promotes fairer benefit distribution and betterment of social welfare, it will help promote the development of a harmonious society. For instance, environmental innovation could help to optimize the relations between the environment and economy, resolve problems in the field of the environment and health, encourage wider public involvement, and give full play to the role of women in building a harmonious society.

(3) Step up Infrastructure Construction and Quality for Optimized Development and Harmonious Society.

In the face of such natural disasters as the snow storm and earthquake in 2008, the foundation for optimized development and harmonious society has proved fairly weak. Such weakness can be found in the relevant mechanisms, urban development patterns, the layout and quality of infrastructure, social security and emergency response. The weaknesses demonstrate that it is urgent for China to shift its growth pattern from quantitative expansion to quality development, and to achieve harmony between people and nature. The infant formula incident served notice that corporate social responsibility should be further stressed. A massive and systematic program is needed to achieve a more balanced development among various social and economic aspects. The foundations for harmonious society should be strengthened, including the moral and cultural basis for scientific development. If environmental factors are built into this more advanced approach to development, the chances for sustainability will be enhanced.

(4) Strengthen Rural Environmental Management and Help Improves Overall Environmental Protection of China.

The rural areas of China not only lag behind the cities in terms of economic and social development but also bear the brunt of environmental pollution and ecological damage. The countryside is thus a weak point in environmental protection and the building of a harmonious society. The central government of China is committed to the integrated development of urban and rural areas. In addition to the strategic goal of building a new socialist countryside, a comprehensive

rural reform scheme was passed during the 3rd Plenary Session of the 17th Party Congress. Against this backdrop, China should create a bigger role for environmental protection as part of the overall strategic goal of building a new socialist countryside. The environmental priorities of rural areas should include greater attention to rural environmental management system and capacity building, environmental infrastructure, drinking water safety, soil contamination, indoor air quality management, and exploration of an integrated urban-rural environmental management mechanism and eco-compensation. The eco-compensation policies should be expanded to include climate change mitigation and adaptation needs, and damages cost by air pollution. Efforts on these priorities will improve overall environmental protection throughout China.

(5) Develop Innovative Environmental Management Systems and Mechanisms Based on the Successful Experiences of Green Olympic Games.

The successful Green Olympic Games has left China with valuable environmental legacies, including hardware such as demonstration projects, and infrastructure that help to improve the environment and serve the public, as well as software such as the concept of ecological civilization, improved environmental management, environmental information disclosure and wider public participation. All these may help to bring about deep changes in economic and social development patterns.

In its effort to host a Green Olympic Games, the Chinese government adopted successful measures to promote pollution prevention and control planning, environment friendly buildings and infrastructure, environmental information disclosure, public participation, commercialization of the innovation technologies employed in the Green Olympics, control of trans-boundary emissions through the establishment of a regional environmental management system, tail gas pollution control, the phase out of heavily polluting enterprises, etc. China should review these successful experiences and develop standardized and long-term mechanisms of environmental management to improve the environmental quality of Beijing and other parts of the country on a continuing basis.

The 2010 Shanghai Expo offers a new opportunity for the implementation of the “Green Olympics” experience, The Government of China should integrate more green measures in the planning and implementation of a “Better city; Better Life” Expo.

Also, China urgently needs to control trans-boundary emissions via regional environmental management systems operating on total emissions control, emissions trading and with appropriate institutions, such as coordinating groups comprised of the relevant provincial governors. The experience of the Olympics in reducing

inflow of pollutants from provinces surrounding Beijing sets a remarkable precedent of cooperation that deserves to be emulated.

(6) Review the Experiences of the Past Three Decades and Continuously Improve the Environmental Management System.

Over the past 30 years, China has tried to keep pace with the international community when dealing with the field of environment and development. In light of its realities, and drawing upon international experiences and expertise, China has developed its own approach with Chinese characteristics to address environmental problems and has made significant progress in creating its environmental management system and, in some locations, for improving environmental quality.

Three decades on, China is now in an important period for strategic transformation of its environment and development relationship. It is now necessary to systematically review the strategic ideas, theories, policies and managerial practices in the field of environmental protection over the past 30 years. Such a review will not only help to consolidate successes achieved so far and further improve the environmental management system of China, but also contribute to the international community by sharing the Chinese experience.

The establishment of the Ministry of Environmental Protection in 2008 was a major step forward for the Chinese environmental management system, and reflects the commitment of the Chinese government to historical transformation in the environmental field. However, we note that environmental management system reform, perhaps leading to a super environment ministry, likely will be a gradualist process. The next step should be further integration of environmental responsibilities of different ministries, which optimizes the central government organization and helps raise capacity and efficiency. For the new environmental ministry, current attention should be focused on capacity building and financial resources. Responsibility, power, capacity and efficiency should be integrated in this super ministry, which can put people first and better serve the general public.

(7) Make New Contributions to Global Sustainable Development and the Building of a Harmonious World.

China and the world are mutually dependent. Given the large population and economic output as well as the important role of China in the global environment, the international community
has higher expectations for China on issues like climate change and the financial crisis. China has made tremendous progress in development and now proposes concepts such as ecological civilization and harmonious society. These efforts should make the world more interested in China’s ideas and experiences.

Therefore, it is the right time for China to make a more substantive contribution towards global sustainable development and a harmonious world. Stabilizing the financial system, sustaining rapid economic growth and resolving environmental problems in China are in themselves great contributions to the world. Meanwhile, based upon the principle of common but differentiated responsibility, China should make new

contributions to the global fight against climate change and sustainable development; and expand its existing environmental international cooperation into

cooperation for sustainable development, with strengthened cooperation between China and other developing countries.

2. Introduce a National Action Plan or Program for Environmental Innovation, 2010-2020.

China's complicated and unprecedented challenges as it works towards becoming an environmentally friendly society open the door to unprecedented innovation opportunities. Yet environmental innovation in China remains at a low level and lags behind innovations in other fields, and falls well short of the needs. There are several reasons for this situation:

Pollution clean-up rather than pollution prevention still dominates, and the institutions and mechanisms under which environmental protection and economic growth reinforce each other are yet to be established.

Incentives and enforcement action are still too weak and the command and control approaches still predominate. There is not a mechanism or policy system in place that encourages enterprises to invest spontaneously in environmental innovation.

A disconnect exists between research on environmental science and technology and the commercialization of research achievements due to the absence of technological application research institutes and supporting coordinating mechanisms.

Poorly developed technology and a limited system for collecting and publicizing environmental information accounts for low participation by the general public in environmental innovation and decision making.

China identified innovation as a core national strategy and mapped out the National Innovation Strategy and the Mid-to-long-term Plan for Development of Science and Technology in China 2006-2020. While this strategy and plan can produce some of the necessary indigenous research and technological applications for key environmental problems, there is a need for a specific environmental innovation approach that can ensure the sustained and integrative effort necessary to fully capture benefits and opportunities.

Therefore we recommend that China:

Introduce a *National Action Plan/Program for Environmental Innovation 2010-2020 for China.* The action plan should define the strategic goals, targets, and measures of environmental innovation of China, and address technological, institutional, social and organizational aspects of innovation. The Action Plan/Program should be supported by key projects and increased investment, and consideration should be given to the following two points.

(1) Strengthen Indigenous Innovation Capacity by Setting Up a Special Program for Clean Technology Innovation, National Research Centres for Environmental Innovation, Sectoral Industrial Environment Research Institutes, and a System of Cross-disciplinary Sustainability Innovation Laboratories.

A *Special Program for Clean Technology Innovation* needs to be introduced, and this Program could cover technologies relating to vehicle pollution treatment, clean coal, solar power, wind power, nuclear power, carbon sequestration, energy efficient building, ecological restoration, and clean production. This Special Program would introduce Clean Technology as a major research platform in the same way as other fields such as nanotechnology have been fostered. It should be developed at a level equivalent to China's space program, with expectations that it will become an important part of China's future economic growth and exports as well as a key component of better environmental protection.

The Government of China should collaborate with relevant parties and jointly establish a number of high-level *National Research Centres for Environmental Innovation* in universities and research institutes. These Centres will bridge the gap between basic research institutes and market needs, and help introduce, absorb and utilize foreign technology. They should link research-intensive industries and China's most renowned research bodies to establish China as a major player for environmental innovation.

Common environmental problems within specific industrial sectors necessitate the establishment of research institutes for specific energy intensive and heavily polluting industries on a cooperative basis among the government, the industries and the industry associations.

Considering the ecological and environmental features of different regions in China, the State should collaborate with local governments, business and civil society to establish cross-disciplinary *Sustainability Innovation Laboratories* designed to demonstrate how to live at a high standard with

minimum waste in rural and in urban settings. Their focus should be on practical demonstration of what can be done within the context of local social and economic circumstances and environmental conditions.

(2) Adopt an Integrated Approach to Address Mechanisms, Institutions and Capacity Development Required for Full Application of Environmental Innovation.

The following needs must be met. First, in the field of environmental innovation, the environmental protection authorities should lead the coordination among relevant parties and give full play to the bridging role of industry associations connecting government and the industry. Stronger regulatory rules and standards, incentives and supportive policies should be introduced to help build up innovation capacities of the enterprises, especially small and medium sized enterprises.

Second, to foster a market for environmental products, several measures could be taken: tighten environmental enforcement in order to create a potential demand market; and, where appropriate and for a limited time, subsidize environmental products used by enterprises and consumers so as to foster dissemination

and application of environmental technology. Also needed are more effective *Green Public Procurement Regulations* which require government agencies to procure a certain percentage of environment friendly products will be particularly helpful in creating a sizable market for environmental products; also, action should be taken to raise resource and energy prices to expand the demand for environmental products that increase use efficiency.

Third, to considerably increase financial support for environmental innovation activities, *Environmental Innovation Funds* should be established with a focus on a Special Program for Clean Technology, and other components important for enhancing indigenous environmental and sustainable development technology innovation. The State should devise a financial supporting plan for environmental innovation and adopt financial measures including venture capital investment, preferential listing policies, green credit, and preferential loans etc., to support environmental innovation activities.

Fourth, China needs to strengthen IPR protection and international environmental cooperation and establish an *International Study Network on Environmental Technology* to facilitate learning from abroad and through joint efforts.

Fifth, drawing upon the experiences of OECD countries, China should establish an evaluation system for environmental innovation, covering the whole process from R&D to commercialization as well as such aspects as environmental, safety, health and life cycle impacts.

(3) Set Up an Improved National Information System for Environmental Quality, Environmental Pollution and Environmental Science and Technology Knowledge, with an Expanded Scope for Information Disclosure in order to Encourage Wider Public Involvement in Environmental Innovation Activities.

While China has made progress in environmental monitoring and public information disclosure, much work remains to be done before a full national environmental information system is in place and functioning well. This is a vital component for decision making of government, business,
communities and the general public. The system must operate in a very transparent fashion, with regular reporting on key environmental problems and environmental performance. Knowledge access should be as direct as possible and at low cost so that people and institutions throughout China can access the information. Information needs to be packaged in ways that permit comparisons and easy understanding.

Improved information access will promote innovation in several ways: knowledge about environmental options will improve sustainable consumption, better public acceptance of new environmental technologies and environmental measures, place pressure on firms and local governments to improve environmental performance, and provide information helpful to environmental innovators, including SMEs.

3. Expedite the Establishment of a National Management System for Environment and Health.

China is faced with enormous challenges in the field of the environment and human health. First, a large number of its people are exposed to seriously polluted air, water and soil environment, which poses huge health risks. Second, because of the absence of systematic research, monitoring and statistics, there is not yet a clear picture of the full magnitude and range of public health risks posed by pollution. Hence it is extremely difficult to identify targeted measures to address the problem. Third, whether or not the economic growth pattern of China changes fundamentally within the near future, environmental pollution will remain a serious problem for a relatively long period of time, and this may give rise to more substantial health risks. Fourth, as the living standard increases, the general public will have higher expectations for a good and safe environment. Fifth, China has recently issued the National Action Plan for the Environment and Health 2007-2015, but concrete work under the action plan is yet to be carried out.

International experience illustrates that mishandling of environmental and health issues could generate complicated social and political problems that result in harm to public health, impaired government credibility, and heavy social and economic costs. China is currently in a critical period of building a harmonious society and consequently the issue of the environment and health should be given highest attention.

Therefore, we suggest:

On the basis of the National Action Plan for the Environment and Health 2007-2015, that the Government of China should accelerate the development of a national management system for the environment and health as well as an environmental management system based on “putting people first”. In order to achieve this goal, efforts should be made in the following six areas:

(1) Stick to Prevention as the Main Approach and Take Effective Measures to Reduce Environmental and Health Risks.

A risk prevention system can be established by improving the environmental standards system, introducing a list of priority pollutants and enforcing stricter control of environmental access by harmful substances. The monitoring network for the environment and health should be strengthened, especially in the field of health impact monitoring relevant to human exposure. The government also should gradually set up an early warning system for environment and health, which will help to predict potential environmental and health risks, and will eradicate or reduce health damage by pollution.

(2) The Government Must Bear the Main Responsibility of Environmental and Health Issues. The Government Therefore Should Strengthen its Leadership in the Management System while Encouraging Extensive Public Participation.

Coordination mechanism between the relevant ministries should be strengthened. This could be realized through establishment of a national environment and health administrative coordination mechanism that is under the leadership of the State Council with participation by different ministries. It is also necessary to assess government performance to ensure laws and regulations are properly implemented. Based on their respective responsibilities, the environmental and health authorities

should allocate sufficient staff and resources to establish specialized administrative system for managing environmental and health issues.

(3) Establish and Strengthen Legislation for Environment and Health based on the Polluter Pays Principle.

Legislation should address prevention, enforcement, and environmental rights of the Chinese public. A dispute settlement mechanism should be set up to help concerned parties to reach reconciliation over environmental and health disputes through mediation, administrative settlement, arbitration and litigation. The government also should gradually introduce a compensation system for human health damage by pollution so as to protect the environmental rights of the general public.

Improved coordination is needed between central and local authorities so that environmental health issues can be reported and assessed in a timely manner, with more effective action taken.

(4) Increase Financial Investment in Capacity Building for Environmental and Health Management, Research, and Compensation.

The central and local governments should increase their financial support for capacity building and basic research in the field of the environment and health. An *Environment and Health Fund* could be established to help compensate victims of historical environmental problems, or when the responsible party has no civil compensation capability and when it is hard to identify who should be responsible. The Fund could help victims during their recovery and support education and communications activities. Multi-sourced funding should be sought.

(5) Improve Disclosure and Access to Environmental and Health Information and Encourage Public Participation.

The government should make public environmental and health information available through accessible and comprehensible tools, such as government websites and the mass media. Prevention requires information on risks to be effective. The Government of China should launch a public access data base on pollutants and health risks. The government also should improve the public complaint mechanism and public announcement system,

and create smooth channels for the public to participate in environmental and health management. Supervision by the general public, social organizations and

the mass media should be strengthened and the reporting of environmental and health violations should be encouraged. Various kinds of hearings and consultation meetings should be held to hear the voices of the public and relevant stakeholders on environmental and health issues.

(6) Undertake Targeted Intervention Measures to Address Prominent Problems in the Field of the Environment and Health

Where pollution has already caused harm to human health or induced diseases, action to reduce harm and risk needs to occur quickly, and health intervention or medical care should routinely be provided to the victims. For the pollutants proved potentially dangerous to human health, the government should issue a catalogue of such pollutants as well as relevant risk evaluation system, environmental access standards and identification criteria. Such pre-intervention measures and health impact monitoring will help eradicate or reduce health risks caused by pollution. For other environmental factors with unclear health impact, China should step up research and adopt preventative measures.

IV. MEETING WITH PREMIER WEN JIABAO

242. ***Premier Wen Jiabao****:* The CCICED is 17 years old and I have taken part in 12 of your meetings. But this year's AGM is different because it is taking place in an unusual year, with as a backdrop the international financial crisis. All economies of the world are affected – yet we must not flag in our efforts to protect the environment. What is the relationship between this financial crisis, our rescue package and China's long term development? We have different questions facing us than in previous years. The fact that you have come from many countries around the world to Beijing this year shows your commitment to China's environmental protection and sustainable development. I'm confident that because we take care of environmental protection, including technical development and extension, energy conservation and emissions reduction, we will maintain our steady economic growth. I am interested now in hearing your views.

CCICED Vice-Chair – Margaret Biggs*:* On behalf of the Council Members we congratulate you on your return to a second term as Premier. And we want to take the opportunity to recall your personal commitment in our meeting last year to be a Green Premier, with a Green Cabinet. And the hope you expressed for CCICED to continue for a long time.

WJB: Yes I said this. I hope that when I step down, the China Council will be able to positively assess my tenure as Premier.

MB: It is a privilege for me to join CCICED, and to meet with you at this very significant point in China's development—30 years after the start of *Reform and Opening Up.* By any measure it has been a remarkable year for China. And now, as you said, we all face this threat of worldwide recession. This is not only a threat to economic progress, but it could seriously impact progress on climate change action, add to the world's growing ecological deficit, and make the poor more vulnerable. How can China seize this moment to build a new and productive relationship between the environment and economy? We see three key opportunities. First, CCICED members congratulate you for highlighting that within China economic slowdown will not be at the expense of environmental progress.

WJB: In fact, I reiterated those two firm commitments at a recent meeting we hosted jointly with the UN in Beijing on Climate Change. I said China would take action on climate change and that the

Government of China would still meet the targets it had set regarding energy conservation and emissions reduction.

MB: In the economic stimulus package, the emphasis on green infrastructure such as sewage treatment and watershed conservation is a good start.

WJB: Yes, in this 4 trillion RMB package just announced to protect the continued growth of our economy, a good proportion of this will go to environmental projects – and not just to sewage treatment infrastructure. It will also include construction projects related to pipelines and networks, as well as our commitment to accelerate construction on ten major environment projects related to energy conservation. We will also take active measures to manage and treat our three major rivers and three major lakes.

MB: To extract maximum environment and development value from the entire package it will be helpful to specify green procurement procedures and identify potential environmental risks. This action will stimulate further growth of China's environmental industries. It will signal to many sectors that China values environmental protection even during difficult economic times.

WJB: You're right. Even during this economic slowdown and while we are experiencing a slowdown in the external demand for Chinese goods, we find opportunities in high technologies and new technologies in the environment-related industries that are emerging. Our wind and solar industries continue to develop – this is a sector with great growth potential in China.

MB: The second key opportunity is structural changes through pricing. Some of the high commodity prices, including oil have dropped. It is a good opportunity for China to undertake price reform that takes into account environmental damage. This can be done in an escalating fashion, providing greater predictability for business, and reducing consumer resistance.

WJB: This is correct and we are already preparing relevant plans and policies to this effect. In 20 days, you will be able to see this when China announces plans to reform our pricing of oil.

MB: Mr. Premier, the third opportunity is fundamental to China's future economy, and for the emergence of sustainable economic growth in the world. It is the right time for China to accelerate Clean Technology innovation.

WJB: Yes. This time as part of our economic stimulus package, and in the context of our program to improve rural people's lives, we will encourage farmers to produce and use biogas for rural energy – the government will be subsidizing this.

MB: CCICED is recommending that a major Program for Environmental Innovation be created. The outcome would be to elevate Clean Technology action to become a key engine of growth within China and in restructured world economic markets. This initiative could function in the same way as your Space Program, built around achieving specific objectives, and with firm timetables.

China's great advantage of huge domestic market potential, international competitiveness, and scientific development, and this can open the opportunity for China to set the direction, domestically and internationally for economic growth driven by Clean Technology. It will support new trends for sustainable rural and urban development, climate change mitigation, and industry based on green design and pollution prevention.

For the Program to be a success, markets for new technologies must be created. This will require: Strong, clear, uniformly enforced regulation and standards. Better and faster public access to credible information. And more public-private sector investment and incentives.

Mr. Premier, we know and admire your front-line approach taken in the recent crises. Environmental health threatens to become one of these issues requiring front-line attention. China has a serious, perhaps grim set of problems related to environment and health. We have studied the current situation carefully in close cooperation with your officials in the Ministry of Environment and the Ministry of Health. The full extent of problems in rural and urban communities does not appear to be known, so more monitoring is urgently required.

We are recommending that a National Management System for Environment and Health be established as soon as possible. This is needed if China is to benefit fully and quickly from its recently announced Environment and Health Action Plan. It is a way for central government to signal that it bears the main responsibility for reducing environment and health risks. Legislation needs to address prevention, enforcement and environmental rights of the Chinese public. Better alignment is needed between levels of government since it is apparent that local governments do not always see environment and health in the same way as the central government. And a well-funded, more focused

research effort is required to find good solutions for a greater number of environment and health problems.

The primary focus should be prevention, but a strong case also can be made for setting in place a fair and just compensation scheme for victims of severe environmental damage. One way of doing this would be to set up an Environment and Health Foundation designed to assist victims in their recovery and to support education that would reduce risk. Action on environment and health within China also will demonstrate to consumers abroad that China is building the standards, monitoring and other regulatory measures that can give assurance of safety in the products from this country. A significant conclusion from our work on environment and health is that China's goals in these areas will be difficult to meet without the full participation of the Chinese people. The public needs to be more fully informed and become participants in environment and health solutions.

Finally, Premier Wen, we were delighted to see the establishment of the Ministry of Environmental Protection. To ensure its success in fulfilling its broad mandate, this Ministry will have to build its capacity and

influence. We look forward to seeing further progress next year on environment and development. We are certain that such progress will benefit China's effort to build a *Harmonious Society*, and will highlight to the world concrete ways and means towards an *Ecological Civilization.* We are eager to hear your views and response to our suggestions. And I hope there may be an opportunity for our other two international vice-chairs to provide a few additional observations on Council work currently underway—on Low Carbon Economy, and on sustainable urban development.

WJB: I'll respond briefly to some of the recommendations you have been putting forward. Your three major recommendations impressed me with their depth and usefulness. We are actually studying or implementing actions in these areas. First, the GOC is clear that China's economic growth cannot come at the expense of the environment, and China's development has to be sustainable development. China will continue to pursue a people-centred development, not only meeting people's material or cultural needs but also their health and the environment. There is no change in the basic views of the Chinese government here.

Now that we are in the midst of this international financial crisis, we are taking measures to expand domestic demand and invest in our economy. We see this as a golden opportunity to transform our economic growth pattern and to restructure our industries. We have announced 10 specific measures to promote economic development and they fall in 4 broad categories. Many of them are related to the environment. The first is a group of projects that will contribute to the wellbeing of our people – housing, health and education.

Secondly, we are funding infrastructure projects covering the management and control of our major rivers and lakes as well as other main environmental projects. Thirdly, we are spending on projects dealing with post-earthquake reconstruction following the disaster earlier this year. A major part of this will focus on ecological rehabilitation and on forests. The fourth category deals with the environment directly, in terms of ecological and technological improvements, energy conservation and emissions reduction.

We will never allow the launch of new projects that pollute heavily or use energy intensively. On the contrary, we will phase out outdated capacity in our industries. Perhaps during your meeting, my officials have already told you that last year we have closed down small coal fired power plants totalling a capacity of 14 million kilowatt, and we have closed down well over 1,000 small coal mines, and we phased out some 46 million tons of capacity of iron smelters, and 37 million tons of capacity in our steel smelters.

At the same time, we are also developing heavily our clean energy sources – hydro, wind, solar and nuclear. So in this time of economic crisis, we consider this our opportunity for economic development and for cleaning up our environment. I appreciate the views you have put forward. In times of crisis, we need innovation and China has a huge potential in terms of its domestic market and that for the environment.

We have this large domestic market potential because of the two basic imbalances we have in China, that between our regions, and that between our rural and urban areas. Because of these lags, and by seizing these two opportunities, China's economic performance will not be affected and in fact will contribute to greater growth. We must adopt strategies and plans based on your good ideas. When I met with you last year, I told you that we would change the administration of environmental matters and create a ministry. I have kept my

word. But the key is not the title, the important point is the capacity built and the authority this confers them. We now need to improve our legislation in the environmental field.

CCICED Vice-Chair Mr Klaus Töpfer : We discussed the huge success of the Green Olympics and the expectation this has raised in and out of China for environmental progress as a result. We are impressed today that there are blue skies over us. China will soon have another great opportunity, the 2010 World Expo in Shanghai, with the theme *Better Cities, Better Life.* This will allow for strong signals to be sent for environmental protection, waste management and water conservation in our big cities. This is a big challenge for China. We would like to ask for your support, putting as much effort with this as you have with the Olympics.

WJB: In fact, since the Olympics, Beijing's air has improved a lot. We took out about 40% of the cars off the road during the Olympics and to build on this success, we are now keeping every day some 800,000 cars off the road. To achieve this, we need the understanding and support of our citizens. We need to develop our buses, subways and inter-city rail systems in major ways. You have a good
suggestion, that we use the 2010 Expo in Shanghai as an opportunity to clean the air there – but we should go beyond those two cities and expand this to cities all around China.

CCICED Vice-Chair Mr Børge Brende: Next year we will be examining energy, environment and climate change. We will be making a full report on how China could benefit from a long term commitment to a low carbon economy and to low carbon prosperity. China's enormous manufacturing power represents the only way to drive down the price of renewable and new technologies. For now, the CCICED suggests that you look at the possibility of making the low carbon economy a part of the 12th Five Year Plan you are now preparing.

WJB: China is part of the UN Framework Convention on Climate Change and we are part of the Kyoto Protocol. Next year, we will also show a constructive attitude at the Copenhagen Conference. We believe that all countries in the world share a responsibility to achieve the low carbon economy and to fight climate change. But because of historical factors and because of our different levels of development, we believe that we have common but differentiated responsibilities.

Still, China as a major nation will never shy away from its responsibilities. This is why we have put in place our own climate change program. We have also set objectives to reduce the energy intensity per unit of GDP by 4% each year. These targets are mandatory and each year I must report on them to the National People's Congress. I agree that China's manufacturing prowess can play a role in the drive for the low carbon technologies. We are now world leaders in the production of photovoltaic cells – although we export most of them to Europe.

***CCICED Member Mr Achim Steiner**:* I add my voice to the chorus of admiration and the prospect of further emulation of the green Olympics. At UNEP, we are working with the Ministry of Environment Protection and the Beijing Environment Protection Bureau, on a study of the impacts and lessons of these Olympics so this can be replicated elsewhere. This touches upon what we have talked about at the Council regarding the green economy. The stimulus package includes investment in the economy. The meeting in Washington over the coming days will be key in determining how the trillions of dollars will be spent on, and whether it can be used on the environment and building a green

economy. China's example is useful here. China can play a role in promoting a Green New Deal. This would provide a building block to the agreement in Copenhagen, from which we are at present very far away.

WJB: Thank you for coming to Beijing and taking part in the CCICED while the attention of the world is focused on Wall Street and the next big meeting (G20) in Washington DC. You show your commitment to the future of humanity, to the environment and to sustainable development. As the world grapples with the international financial crisis, we cannot lose sight of two objectives: environmental protection and climate change on the one hand, and the achievement of the Millennium Development Goals on the other. Yet both of these objectives will affect heavily the majority of people and will affect the future of humanity.

I hope the Council will continue to operate in the future and that China's efforts to protect the environment will go on and expand. So that when you come back next year, you can see fresh progress on the environmental front. I hope you will not only witness progress in China's development but also witness China's efforts on the environmental front. Thank you.

CCICED Issues Paper 2008

ENVIRONMENT AND DEVELOPMENT FOR A HARMONIOUS SOCIETY

I. INTRODUCTION

China seeks a transformative approach to environment and development that will provide lasting social, economic and environmental benefits for its own society and, ultimately, for the world. It seeks an *Ecological Civilization* where conservation, in the broadest sense of the word, is a strong driving force influencing all elements of society. China wishes to accomplish these goals through fundamental shifts in the complex relationships between environment and economy, including the use of an expanded range of market and regulatory instruments, specific implementation targets and timetables, and action consistent with scientific development and innovation. A successful transformative approach to environment and development will depend upon broad-based public support and participation, and on international cooperation. The need is great for international leadership and action from a number of large countries, including China.

Harmonious Society

At the October 2007 17th CPC Congress[1], people-centred scientific development was adopted as a constitutional amendment of the Communist Party, along with an amendment to pursue a "socialist harmonious society." These amendments focus attention on the role of values and reason in addressing developmental issues, including the protection of the environment. China's new approach has global relevance, with the potential for contributing to a "harmonious world" based on a path of "peaceful development." Premier Wen Jiabao has stated that:

> "As China's development has shown and will continue to show, a prosperous, democratic, harmonious, civilized and modernized China will make even greater contribution to maintaining world peace and promoting human progress." [2]

These lofty ideals and welcome directions raise the issue of how Environment and Development action by China, other nations and the international community can contribute to a Harmonious Society within China and globally. This is the subject of the 2008 CCICED Issues Paper.[3]

Global Threats

The 2008 AGM comes at a time of unprecedented global financial market turmoil and the threat of severe global recession. Yet a large and growing ecological debt also threatens humanity. This coming year will test the commitment and capacity of all governments towards effective environmental action. It is vital that promising pathways towards sustainable development in China and globally not fall victim to tough economic times. It is via these pathways that future prosperity and stability will be secured. The paper examines key challenges and options.

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[1] 17th National Congress of the Communist Party of China.
[2] Speech at the 2007 Summer World Economic Forum meeting in Dalian.
[3] This paper has been prepared by the Chief Advisors to the CCICED, Professor Shen Guofang and Dr. Arthur Hanson, with inputs from the Chief Advisors Group.

Innovation

This year's AGM theme builds on discussions and recommendations concerning innovation from last year's AGM and also a CCICED Round Table Meeting held in April 2008[4], as well as task forces providing interim or final reports at the 2008 AGM[5]. CCICED believes that major commitments to innovation via science and technology and through institutional and behavioral change are essential to meet China's commitment to create an environmentally-friendly society. Therefore we will continue to focus on innovation as an organizing approach in our Issues Papers.

The link between a harmonious society and innovation is an interesting and potentially quite difficult one. On the one hand, both concepts share characteristics such as promoting creativity, public information access and participation in decisions. On the other hand, a fundamental issue is how to reconcile the inherent interest in creating stability within a society while still providing great room for the inherent instabilities associated with new ways of doing things—innovation. This may require a sophisticated recognition that "a society in real harmony does not appear to be stable or calm or harmonious at all. It is a real society in which all voices can be heard and discussed. It is in an equal society that all groups have the same access to the government and the media. It is a strong society in which that no dissenting ideas or different political orientation can harm or destroy."[6] We might add that rapid economic development and innovation will create this same appearance of turbulence, but ultimately can lead to stability—if conditions such as reasonably equal access to benefits and awareness raising accompanies change.

2008

2008 has been a very eventful year for China: holding the very successful Beijing Olympics; coping with major disasters including unprecedented snowstorms and the Sichuan earthquake; staying the course of economic development despite high oil prices, rapid increases in food and other commodity prices, seeking stabilization and reform to the global financial sector; and addressing several crises of product contamination, including melamine in milk.

And it is an important anniversary—30 years after the *Reform and Opening Up of China* to modernization and globalization as a consequence of Deng Xiaoping's transformative policy shift This Opening Up has led to profound social change and poverty reduction, massive economic growth, initial action to correct severe pollution and other environmental problems, and international relations based around goals of trade, peace and regional stability.

It is also almost 20 years since China formulated its National Environmental Protection Law.[7] In March 2008 China formed the new *Ministry of Environmental Protection (MEP)*, with Mr. Zhou Shengxian serving as the first minister having full cabinet status. China is now completing the third year of the 11th Five Year Plan. There has been better progress this year towards achieving

[4] CCICED Annual Policy Report 2007 *Innovation for an Environmentally-Friendly Society*; and Report of CCICED Round Table Meeting 23-24 April 2008.
[5] Task Forces on Innovation for Sustainable Development, Environment & Health presenting Final Reports; plus three Energy and Environment Interim Task Force Reports.
[6] Hayan Wang, 2007. *China: Building or Painting a Harmonious Society?* China This Week 9/29-10/5, 07.
[7] This law came into effect on 26 December 1989, see MEP http://english.mep.gov.cn/ ; http://www.chinaenvironmentallaw.com/ ; http://www.greenlaw.org.cn/enblog/

the Plan's environment and development objectives,[8] but not enough. Without further transformative changes in approach, it is likely that environmental improvements in China will continue along a linear pathway while factors creating environmental degradation occur in an exponential fashion. That is also the worry about climate change.

Internationally, there has been considerable introspection about the limited progress of sustainable development implementation during this year marking 20 years since the world began to respond to recommendations in the Brundtland Commission's report, *Our Common Future.*[9]

II. HARMONIOUS SOCIETY EXPLAINED

Harmonious Society is not a phrase widely used in western industrial countries, even though all the OECD countries, among others, strive to build a functional level of social cohesion and agreement on pathways that will lead to good quality of life and to happiness. There is some concern abroad that the term could be used simply as a slogan, or that its meaning could be a warning towards those with views that do not fit well with those of the government, or of the majority of people.[10] Therefore part of China's challenge in communicating with the rest of the world is to provide a persuasive view that its vision of Harmonious Society is one that is truly beneficial and in line with democratization and efforts for improving social equity.

Definition

Harmonious Society, as described in Chinese society from ancient times to today's approach, is holistic and balanced in approach. President Hu Jintao provides the following description[11]:

> "The harmonious socialist society that we are trying to build features democracy, rule of law, fairness, justice, honesty, fraternity, dynamism, stability, orderliness and harmony between man and nature. Democracy and rule of law means that socialist democracy is brought into full play, the basic policy of rule of law is implemented, and the positive elements of various sides are fully mobilized. Fairness and justice means that the interests of various social sectors are appropriately coordinated, civil conflicts and other social conflicts are correctly handled, and social fairness and justice is defended and realized. Honesty and fraternity means that everyone helps one another, honesty prevails in the society, and the people live next to each other in harmony with equality and fraternity.

[8] MEP The National Eleventh Five-year Plan for Environmental Protection (2005-2010) http://english.mep.gov.cn/Plans_Reports/11th_five_year_plan

[9] These reviews and scenarios generally suggest future disharmony globally and the need for early action to avoid systematic environmental and societal breakdown. All call for transformative action at a societal level. These perspectives include the following reports and books: UNEP. November 2007. *GEO 4 Global Environment Outlook. Environment for Development*. UNEP, Nairobi. 539 pp.; OECD. March 2008. *OECD Environmental Outlook to 2030*. Summary and full report OECD, Paris.; Shell International. April 2008. *Shell Energy Scenarios to 2050.* 48 pp.; Gus Speth. 2008. *The Bridge at the Edge of the World. Capitalism, the Environment and Crossing from Crisis to Sustainability*. Yale University Press, New Haven. 295 pp.; Lord Nicholas Stern. April 2008. *Key Elements of a Global Climate Change Deal.* London School of Economics and Political Science. 56 pp.; Fred Krupp and Miriam Horn. March, 2008. *Earth: The Sequel: The Race to Reinvent Energy and Stop Global Warming.* W.W. Norton and Company. 279 pp.

[10] An example of a skeptical view is the following quote from The Economist (9 October 2008): "A harmonious society—a peaceful Olympics" says a slogan painted on a wall in Baoding. This is party-speak for "do not make trouble"."

[11] Bo Guili. 2005. The Role of Chinese Government in Building a Harmonious Society. China National School of Administration. 7 pp. Quote by President Hu on p 2.

> Dynamism means that every creative wish that is conducive to social development will be respected, creative activities will be supported, creative talents will be given free rein, and creative accomplishments will be acknowledged. Stability and orderliness means sound social organization mechanism, social management, and social order; people live and work in peace and contentment; social stability and unity are maintained. Harmony between man and nature means that economic development, wealthy life and balanced ecology."

A researcher for the China Foundation for International and Strategic Studies[12] provided the following description: "A harmonious society, in essence, is one that respects the rights of people, sticks to the principles of human civilization, and abides by the laws of nature."

Five Harmonization Elements

The following harmonization elements are emphasized in current government policy: (1) in the development of urban and rural areas (greater priority for rural development); (2) in regional development (assistance to poorer areas); (3) between economic and social development (health, education, employment opportunities); (4) between economic development and environment (resource use and environmental protection); (5) between domestic development and opening-up policy (domestic market growth and international trade). Since these elements are linked, it is necessary to address environment and development with respect to all five.

Measuring Progress

Measurement of progress on achieving a harmonious society will be difficult. In China as elsewhere, there is recognition that various standard measures of progress such as GDP increase are inadequate.[13] Indeed, China's efforts to construct a Green GDP index reveal that a substantial portion of China's phenomenal economic growth is offset by environmental damage. China's policies are intended to take "People as a First Priority". The emphasis on people's well-being can be translated into a substantial number of concerns related to environment, including: poverty reduction, pollution reduction, ecosystem stability and services, health and environment, disaster management and improved welfare and quality of life. The UN Human Development Index is a helpful measure for some of these. Progress on achieving the Millennium Development Goals within China is a remarkable achievement.[14] Yet all of the measures cited are still insufficient to cover the range of aspirations set out by China. The implications for monitoring environment and development in the context of a harmonious society need further research.

Ecological Civilization

The broadest Harmonious Society thinking has been statements concerning transformations within China and globally towards an Ecological Civilization.[15] An article in the China Daily[16] just after the 17th CPC reflected on the need for changed perspectives:

> "This concept reflects an important change in the Party's understanding of development. Rather than emphasizing economic construction as the core of development as it did in

[12] China Daily 13 October 2005. *Harmonious Society to be a Model for the World.*
[13] OECD's project on *Global Progress on Measuring the Progress of Societies* provides many examples of research on alternative measures.
[14] *MDGs: China's Progress towards the Millennium Development Goals 2008.* China and UNDP.
[15] Pan Yue. 2005. Ecological Civilization; and 17th Party Congress statements.
[16] China Daily 24 October 2007. *Ecological Civilization.*

> the past, the Party authorities have come to realize that development, if sustainable, must entail a list of elements including the right relationship between man and nature.
>
> This concept is proposed at a time when 62 percent of the country's major rivers have been seriously polluted, 90 percent of waterways flowing through urban areas are contaminated, more than 300 million residents are yet to have clean water to drink, and quite a number of localities fail to fulfill the required quotas for pollutant emission reduction and energy saving.
>
> Facing such a reality, the construction of ecological civilization was absolutely not rhetoric for chest thumping by officials in their speeches. It needs to be transformed into tangible measures that will change the way our economy develops.
>
> But it is never enough for the concept to be understood as environmental protection only and neither is it adequate for it to be comprehended as a supporting tool only for balanced economic development. With its definition containing a much broader meaning, the concept emphasizes the cultural dimension of development.
>
> In this dimension, we need to put our relationship with nature in a new perspective: consider nature as part of our life rather than something we can exploit without restraint.
>
> Also in this dimension, social justice and fairness must be of great concern in development. We cannot expect to maintain ecological balance in a political sense unless we can make sure that disadvantaged social groups can fairly enjoy the benefits of development.
>
> From the Outlook on Scientific Development to harmonious development and ecological civilization, we can see where the Party is trying to orientate the country's economic development and social progress."

This notion of an Ecological Civilization is in line with China's domestic efforts to build a resource-efficient, environmentally-friendly society, a Circular Economy[17], a Low Carbon Economy, and to become a *Xiaokang* Society. These approaches reflect the reality of China's situation and needs. It is impossible for China to achieve its development along the wasteful lines followed over the last few hundred years by western societies. The planet will not bear the environmental burden, and it is a pattern of development inconsistent with Chinese cultural ways.[18] The USA and China are believed to be the two nations with the largest ecological footprints, although the USA population is less than a quarter the size of China's.[19]

Leading by Doing

The path taken by 1.3 billion people cannot fail to have an impact on the world. This is a key point of China's potential importance in persuading other countries to follow a path towards an Ecological Civilization. Perhaps this concept proposed by China—and the actions that follow from it—could become the embodiment of *Our Common Future* for today's and tomorrow's generations worldwide.

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[17] The *Law on Promotion of a Circular Economy* was passed on 29 August 2008 by the NPC Standing Committee and will take effect at the beginning of 2009.

[18] The CCICED-WWF report on China's Ecological Footprint shows the low per capita ecological footprint of China, but also the implications of a rise in consumption levels in a world already stressed beyond its long-term capacity to meet human and ecological resource and environmental needs.

[19] "The USA and China have the largest national footprints, each in total about 21 per cent of global biocapacity, but US citizens each require an average of 9.4 global ha (or nearly 4.5 Planet Earths if the global population had US consumption patterns) while Chinese citizens use on average 2.1 global ha per person" Source: WWF. October, 2008.*Living Planet Report.* http://www.panda.org/index.cfm?uNewsID=148922

Internationally, China has taken a relatively low profile over these past decades as it began its ascent towards its full position of influence in global society. It has participated in many multilateral arrangements for environment and development, and has engaged in scientific, business and developmental relations with countries and people throughout the world. Now perhaps, it is impossible for China not to be in a leadership role. The country's actions are simply too important for it to be seen as a secondary participant or as an observer. China has demonstrated that it is an innovator on economic development, and it will be an innovator on environment and development.

III. INTERNATIONAL EXPERIENCE

Some scientists argue that we have entered the *Anthropocene*, a period where human intervention has become a dominant factor affecting the Earth's ecology and natural cycles. This underscores China's concern for widespread action to create an Ecological Civilization. At the October 2008 IUCN World Congress, members of this global voice for environment and development debated their vision for a new global transition for sustainability.[20] In the words of IUCN's Director General, Julia Marton-Lefevre "We need a new era of conservation that creates a social movement for change and relates to the nature of everyday living – one that embraces sustainable lifestyles and livelihoods as well as endangered species and spaces." The IUCN document provides at least a partial roadmap towards the vision of an Ecological Civilization. China's efforts could help realize of this vision for 1/5 of the world's population, and influence others.

The desire for a conservation philosophy has been with humanity for many thousands of years. Yet it has been exceptionally difficult to implement in modern affluent societies, and in situations of significant poverty. It is apparent that the impacts of high consumption affect ecological conditions globally and that gross over-consumption can set off unintended financial consequences such as the current credit and economic crisis now affecting the entire world. Furthermore, although the global environmental agreements contribute to harmony among nations and across boundaries of culture, religion, etc., they are progressing far too slowly in their implementation at national levels. Despite this gloomy picture there are lessons to be learned from various positive experiences in both rich nations and poor. Here we have space to cover only a very limited number of examples.

Positive National Experiences

Nations that lead in the UNDP Human Development Index, the Yale-Davos Environmental Sustainability Index, and other indices of well being, are of special interest also from the perspective of how they seek harmony in their development.[21] All those listed among the top 10 to 20 nations emphasize environmental quality within a broader quest for high quality of life.

In Europe, the efforts to create harmonious societies appear to be particularly successful in some smaller countries, such as the Scandinavian countries and Switzerland. Given its position at a cultural and linguistic crossroads, Switzerland is particularly interesting. It has developed a

[20] IUCN. September 2008. *Transition to Sustainability: Towards a Humane and Diverse World*. Gland, Switzerland. 107 pp.

[21] Other indices and research efforts include the Global Peace Index http://www.visionof humanity.org ; GNH Gross National Happiness; Well-being of Nations Index; Happy Planet Index of the New Economics Foundation.

democratic governance system that operates at the local level (canton) upwards. There is genuine "Unity in Diversity", including urban and rural views, at least four major cultural groups, and a strong, diversified economic base. A good environment, especially rural landscapes, is considered a key national and local asset, which needs to be well protected for millennia.

Norway is a nation that appears to have developed a harmonious society through a combination of factors that includes: (1) respect for stable land ownership, including systems that discourage consolidation or excessive subdivision of family farms; (2) co-management and planning locally for sustainable natural resource use; (3) maintaining equity between rural and urban lifestyles and among different occupations; (4) proactive environmental planning and incentive-setting to address environmental concerns before they get out of hand; (5) concern for future generations through creation of sovereign wealth funds; and (6) investment in technology innovation for sustainable development. Norway (and other Nordic nations) have played important roles in seeking global harmonious development as well, through their high profile on international environment and development matters, and through the attention and funding they bring to international development cooperation.

Canada is quite a relevant example, given its geographic size and range of ecosystems, administrative complexity, and emphasis on multicultural harmony. Box 1 identifies several examples of institutions, management approaches and mechanisms intended to build cooperation around environment and development. A substantial amount of Canada's efforts are directed towards federal-provincial harmonization and also to addressing Canada-US issues in a cooperative fashion. Canada has tried comprehensive approaches such as the *Projet de Société,* initiated in 1992 to develop a broad societal consensus around environment and development, but these have not thrived.

Japan, especially in its post-war efforts to build a resource-efficient society, protection of its forests, and construction of environmentally-friendly cities and towns, has created models for a harmonious society. These strengths include unique government-industrial relationships that sometimes foster remarkable progress on environmental innovation, for example, Toyota's leadership in automobile innovation, and Keidanren corporate social responsibility[22]. Yet in past decades Japan's progress was sometimes at the expense of a complex ecological footprint such as the damage created through tropical forest supply chains. And despite the perception of being a relatively homogenous and harmonious society, the people of Japan hold strong and differentiated views. An example is the prolonged land use and environmental disputes that surrounded the construction of Narita Airport. Japan's harmonious relationship with nature stems, in part from religious belief, especially Shintō where "nature was whole; it was clean, and inherently good."

Several developing countries have developed relevant experience. One of the most dramatic examples in recent decades has been the efforts of Costa Rica to build an economy focused on ecological restoration of its forest lands and on the value of its biological diversity for ecotourism and other direct benefits.[23] The effort has been successful because of the country's social investments, especially for health and education. Also, Costa Rica has developed a participatory governance system, and invested in science and technology for sustainable use of its ecosystems.

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[22] http://www.keidanren.or.jp/english/policy/csr.html

[23] http://web.worldbank.org/WBSITE/EXTERNAL/COUNTRIES/LACEXT/COSTARICAEXTN/0,,contentMDK:20232979~pagePK:141137~piPK:141127~theSitePK:295413,00.html ; Honey, M. 1999. *Ecotourism and Sustainable Development. Who owns Paradise?* Island Press, Washington D.C.

Box 1. Canadian Environment and Development Approaches for Harmonization

Canada faces some of the same types of challenges as China in terms of the range of development concerns in its various regions, income disparities and rural-urban divides, need for ecological stewardship, an export-driven economy, concern for harmonious relations with neighboring countries, and various security issues, especially in marine and coastal areas, and those related to climate change. Canada is a federation of provinces and territories that hold significant natural resource management and other responsibilities. There is a high level of public participation in governmental decision-making, and a variety of channels exists to ensure this happens. While often there appears to be disagreement, impasses, etc., there are many examples of how the mechanism in place for environment and development do help to improve social harmony, justice and quality of life—all factors in why Canada has ranked among the top countries on indices such as the UNDP Development Index and the Yale-Davos ESI.

Example Institutions

CCME – The Canadian Council of Ministers of the Environment has been in existence for more than 40 years. It is "the principal forum for members to develop national strategies, norms, and guidelines that each environment ministry across the country can use," operating by consensus. It has produced harmonized guidelines that enhance efficiency and certainty across the country, especially for business endeavours.

NRTEE – The National Round Table on the Environment and Economy was established 20 years ago to seek common ground among industry, governmental and civil society on specific environment and development concerns and transmits this advice to members of the federal cabinet. It builds its views with considerable input from the public.

IJC – The International Joint Commission is comprised of an equal number of US and Canadian Commissioners who address environmental concerns in border regions. The IJC has been particularly effective on complex concerns related to the Great Lakes. It operates via government references, and provides for stakeholder and government inputs.

CEC – The Commission on Environmental Cooperation operates within the framework of the NAFTA Free Trade Agreement between Canada, Mexico and the USA. It develops common strategies for the continent on management of biodiversity, produces a State of the Environment report for North America, and other reports such as release or toxic substances by various states and provinces. CEC has a formal citizen complaint process to investigate situations where a country may not be enforcing its environmental laws adequately for a specific issue.

Example Management Approaches

Co-management Agreements – A growing number of formal agreements between the federal government and resource users to share responsibility on specific natural resource management situations. Most of these have been worked out with First Nations and Inuit. The creation of Nunavut, a new territorial government in the eastern Arctic is an example where co-management is enshrined, and covers fish and wildlife among other topics. Another prominent agreement is for the management of the Gwaii Haanas National Park Reserve on the BC coast, with responsibility shared between the Haida First Nation and Canada.

LRMP – British Columbia Province faced acrimony bordering on violence, and loss of some export markets over its forest management practices during the 1980s and early 1990s. An integrated Land and Resource Management Plan for each forest region was developed by the Provincial Government in a highly structured, participatory fashion to achieve agreement among stakeholders. This approach has been coupled with the development of a major system of protected areas in BC. Versions of LRMP now exist elsewhere.

FCM-Green Municipal Fund – The Federation of Canadian Municipalities is an independent body representing all Canadian cities and towns—large and small. Through the Green Municipal Fund the Federal government entrusts FCM with substantial funding for environment and sustainable development projects, including water treatment, air pollution control, brownfield restoration, and other initiatives of interest to the municipalities. This approach ensures that interests and priorities of the municipalities can be addressed, while ensuring a transparent and competitive process.

Environmental Justice

NWMO – Long-term management of Canada's nuclear wastes has been a contentious concern subject to several major studies. These have led to the arms-length Nuclear Waste Management Organization. The nuclear power plants put substantial funding into a trust fund until there is agreement on location for a permanent waste storage site. This site will be selected only from one or more communities that express interest in having such a site, and with inputs from many stakeholders. This is intended to avoid NIMBY ("Not In My Back Yard") debates.

Intervenor Funding for Environmental Assessment and Monitoring – A persistent concern has been to provide sufficient funding that key stakeholders can participate in environmental hearings on an equal footing with business and government. These funds are generally built into major environmental assessments, for example in the Mackenzie Valley pipeline project, one of Canada's biggest projects proposed at present.

An example of regional effort is in the Amazon Basin of South America. There is a need to protect the rights and economic needs of indigenous tribes, provide some opportunities for poor farmers and others, and to adequately protect the biodiversity and ecological integrity of this vast region. The Republics of Bolivia, Brazil, Colombia, Ecuador, Guyana, Peru, Suriname and Venezuela must cooperate on the Amazon. They signed a 1978 Treaty for "harmonious development" of the Amazon. And in 1995 ACTO, the Amazon Cooperation Treaty Organization, was established to conduct work in support of biodiversity conservation and other needs. This body is an adjunct to the national efforts of countries such as Brazil.

Community-based Initiatives

Harmony within societies at local levels depends upon relationships involving environmental impacts, social justice issues such as exposure to pollution or lack of basic needs such as clean drinking water, and economic factors such as employment opportunities associated with local resource development. Problems often are traced to situations of gender inequality, discrimination against minorities or poorer people who live and/or work in more dangerous and unhealthy situations. Both the World Conservation Organization (IUCN) through its *Conservation for Poverty Reduction Initiative*[24] and the UNDP though its *Equator Initiative Prize*[25], have documented hundreds of situations where environmental objectives are being met by communities fostering harmonious relations locally and with national governments.

Throughout the world there has been a move towards decentralization of environmental and natural resource management. Sometimes, such as the case of Indonesia, this has been to move stewardship responsibilities directly from national to local (*kabupaten*/county) level. In some countries, negotiated arrangements have been made with specific groups for co-management or community-based management of environmental resources, including habitat, fisheries, and forests, for example. In some cases land and resource ownership is ceded to local interests. Such mechanisms have the potential for improving stewardship of the environment, but also lead to greater harmony and innovative institutions for managing biodiversity, water resources, etc.

Corporate Policies

Some of the most interesting and significant environmental efforts for societal harmony happen through the interplay of government, industry and civil society, either at the level of individual enterprises, but also at a sectoral level through industry associations, or sometimes via cooperative efforts involving government, non-governmental or community organizations. Government's role is to set standards and to create an enabling situation where industry can meet challenges in an efficient fashion. Industry efforts are driven by various motives, including the desire to avoid excessive regulation, the right to operate in communities, corporate social responsibility (CSR)[26], access to financing and insurance, risk reduction, etc. The Responsible Care Program of the chemical industry (and now many other sectors); many gas and oil initiatives and mining, and the move towards socially and environmentally responsible forestry throughout the world. There are many local, national and international organizations that help to make these cooperative sectoral efforts credible and effective. They include CSR advocates and monitoring

[24] http://www.iucn.org/about/work/initiatives/sp_cprihome/index.cfm
[25] http://www.equatorinitiative.org/
[26] For overview on China, see Geoffrey See. 2008. *Mapping the Harmonious Society and CSR Link1.* Wharton Research Scholars Journal. U of Pennsylvania. http://repository.upenn.edu/cgi/viewcontent.cgi?article=1047&context=wharton_research_scholars

bodies[27], standard-setting and certification organizations such as the Forest Stewardship Council (FSC), ethical banking for project financing.[28] Major environmental organizations such as the WWF, the World Resources Institute, and international bodies such as UNEP play important roles through their convening power, research and ability to provide credible, independent views.

Gender and Environment

In recent times greater attention is being given to gender and environment relationships, especially in rural areas, where women (and children) may be severely affected by poor indoor air quality, or by issues such as pesticide use that may affect reproductive health, or from natural resource and other development projects that fail to provide sufficient benefits oriented towards women. The UN Millennium Development Goals highlight the need for gender sensitivity; and this theme is important for all international development agencies. Access to social benefits, including good health care and equality in education opportunities, are essential if all citizens are to be informed and capable of contributing to environmental improvement. *Gender mainstreaming* is becoming an essential part of environmental management and sustainable development. This is a means of improving power sharing and therefore increasing the potential for greater harmony in social relationships.

The UN Fourth World Conference on Women was held in Beijing in 1995 and set the basis for many of today's considerations on the role of women in sustainable development. China's equality provisions in its constitution and laws, and its adhesion to the International Convention for the Elimination of Discrimination Against Women (CEDAW) provide a good basis for further action on gender and environment. China is well-positioned to promote this element in seeking a harmonious society.[29]

Three Key Issues Facing the Global Community

Addressing Imbalances in Globalization Benefits and Costs

At the March 2008 China Development Forum, Angel Gurria, OECD Secretary-General[30] noted that while globalization has reduced poverty, especially within China, some 40% of global assets are now in the hands of only 1% of the world's adults. Even within many of the world's richest nations, child poverty has increased during the past decade (17 of 24 OECD nations). His conclusion is that "Globalization is inevitable, but it is intrinsically neither good nor bad. It is our policy responses that make the difference."

Mr. Gurria focused on several important matters where the response of both developed and developing countries needs to be well-coordinated if we are to have a more harmonious form of globalization: stabilizing and improving the factors of economic growth worldwide; tackling climate change with a viable cost-sharing formula between the richer and poorer nations; restoring the ethical dimension of economics so that poverty can be firmly addressed in the

[27] WBCSD, Global Reporting Initiative, UN Global Compact, CSRChina.net, etc.
[28] Equator Principles http://www.equator-principles.com/index.shtml
[29] CCICED has prepared a *Gender Equality Strategy* to guide its own work. CCICED Secretariat and Secretariat Int'l Support Office. July 2008. 15 pp.; The Tenth National Women's Congress was held in October 2008, pledging measures to narrow female-male income gaps and to improve women's ability to participate in science and technology innovation, and to enhance participation in decision-making bodies.
[30] *Working in Partnership for a Harmonious Globalisation. Speech by* Angel Gurria. March 2008. Beijing. http://www.oecd.org/document/38/0,3343,en_2649_201185_40333606_1_1_1_1,00.html

context of producing more harmonious societies; breaking the deadlock of the Doha Development Agenda (DDA) of trade reform[31]; and addressing internal migration in the context of aging populations and other factors.

The imbalances of globalization created within a country such as China are seen as interlocked challenges that now urgently need to be addressed [32] including: income inequality and regional disparities, the right balance between rural and urban development, high consumption of natural resources and great need for cleaner energy, and improved environmental quality. Certainly other developing countries face similar challenges. Gurria notes that the list is in fact similar to the challenges faced by OECD nations. Therefore it is desirable to find solutions that reinforce the overall strength of global society. He indicates that the concept of "harmonious development" of China is very close to the "core mandate" of OECD itself.

Renewed Attention to Regulation

Over the past 25 years the power of markets has been celebrated—not only for unleashing creativity leading to high economic growth, but also as an opportunity for improving competitiveness and for decreasing the need for command and control regulation. In particular, if macroeconomic conditions can be properly set, and if macropolicies are in place to meet some of the concerns related to social and environmental externalities, then market-based instruments should be successful supplements to slimmed-down regulatory frameworks. Over time market-based approaches have produced dazzling results in the rapid growth of economies. They have led to concepts such as "smart regulation" that rely upon self-regulation and limited governmental checks and balances; and on the opening of markets to new influences and purposes beyond their originally intended purpose, for example, commodity markets as a place for speculative trading beyond the purpose of spreading risk for producers.

The powerful message arising from the financial meltdown that has occurred this fall is that self-interest of even the richest and most powerful financial institutions can be misdirected. Recent years have demonstrated other important flaws in some fundamental decisions related to market-based approaches. Specifically, on environmental externalities, market failure is common and not easy to overcome. Second, as the recent turmoil in world markets has demonstrated, when fundamental safeguards on the financial sector are ignored or removed, the systemic effects will be widespread to the point where these effects are a threat to both development and environment worldwide. The havoc wreaked by high oil prices compromised the ability of governments to move towards a systemic approach towards pricing carbon, for example. And, third, when regulatory breakdown occurs either at the producing or distribution end, consumers pay a price in terms of environmental health, with backlash felt on trade. This has been demonstrated repeatedly over this past year as China faced problems with heavy metal contaminants in toys, and melamine, first in pet foods, and then in the milk scandal. These contamination problems are viewed as not only inadequacies within the Chinese regulatory systems[33], but also those of the countries and companies that are inadequately regulating and monitoring quality of products before they reach consumers.

We can expect a renewed focus on regulation of all types. This focus will not reject market-based regulation, hopefully, but it will emphasize the need for much stronger and more effective

[31] http://www.wto.org/english/tratop_e/dda_e/dda_e.htm
[32] Angel Gurria. 2008.
[33] Willy Lam. October 2008. *Milk Powder Scandal Exposes China's Worsening Administrative Malaise.* China Brief. Jamestown Foundation. Vol. 8, Issue 19.

regulatory frameworks in which markets should function better. The implication is that monitoring needs to be a more prominent component so that improper behaviour can be caught and dealt with at an earlier stage. Ultimately there must be sanctions that operate at a level sufficient to deter such behavior.

An important question is whether environment and sustainable development considerations can lead the way in developing a new balance for regulatory systems. It is attractive to consider this possibility for several reasons. First, a great deal of theoretical effort, and some good practical experience exists on how a balance can be found between market-based and other regulatory approaches. Much of the work relates to pricing and incentives, where necessary standards and understanding of potential environmental benefits are already available.

The second reason is the urgency of addressing environmental matters in the context of the new economic realities facing the world. Past economic downturns have led to increased environmental disruptions (e.g., effects on forest land-use and small-scale mining impacts in the aftermath of the Asian Meltdown of 1997). Climate change mitigation and adaptation should be incorporated into the priorities associated with national and international financial restructuring. These will be among the world's largest financing needs over the coming decades. Climate change will require continued building of new markets such as the sale of carbon credits.

A third reason is the comprehensive nature of sustainable development. From its start, sustainable development has focused on the interlocked nature of economy and environment concerns, and on how treating the environment responsibly will provide substantial social benefits, including greater equity. As regulatory regimes get reviewed, it is important that they be based on sustainable development principles and support integrative objectives, for example, those supporting environment and public health, and that they promote preventive action on pollution and excessive resource consumption.

China is in a relatively strong position for this renewed attention to regulation. It has made a point of developing a "socialist market economy" with opportunities to adjust raw market forces. China also is still in the design of its approach to "rule of law" and to the opening up of its financial sector. China has the buffer of substantial financial reserves, and a population oriented towards savings rather than excessive consumption. Hopefully these attributes can be used not only to minimize some of the damage being created elsewhere by the current turmoil, but also to ensure that China's own financial commitment both to environment and to the innovation required for implementation of scientific development can be sustained. China likely will be of great help to other nations and the world community in the critical months and year ahead.

Effective Action on Global Agreements for Environment, Economy and Development

Achieving agreement on steps to be taken and actual progress under several global accords—particularly those on climate change and on biodiversity, on the Millennium Development Goals, and on full acceptance of the Doha Development Agenda—has been on the most important "to do" list for environment and development of the world community for several years. The limited success has been disappointing, especially since many countries have passed through a period of great prosperity when action was quite possible. Now, during this period of economic recovery and greater hardship for many, there is a serious need to increase momentum, and use these goals as building blocks for more sustainable approaches to development.

The key selling point certainly can start with the contribution each accord could make towards improved investment results. Should rich countries reduce high level of agricultural subsidies,

including those new, and generally ill-conceived subsidies for biofuels from corn and grain?[34] How can reducing trade barriers and international development assistance be targeted even more directly towards meeting the MDG goals, including transfer of experience from the most successful country of all, China? And how can innovative financing for climate change action be increased in a way that contributes to renewed economic growth? Such questions are not really new to any of us, but they take on new meaning in a time of severe global downturn.

If we need to be reminded about how serious the overall environment and development situation is, or could become, it is only necessary to see how quickly the gathering storm of climate change effects has become apparent, and how missing the 2015 targets of the MDGs will expose the world to further disharmony and human misery arising from poverty.

Addressing Convergent Crises

A significant international debate has emerged concerning the potential for the collapse of societies and even civilizations from environmental crises.[35] This debate covers the far end of the spectrum of disharmony associated with environmental change and impacts. There are other possibilities seriously discussed, for example, concern expressed by senior EU officials about climate change refugees flooding Europe[36], or Japan's plan to repatriate all its citizens living abroad in the event of a global pandemic[37]. And, of a more immediate nature are the major short-term dislocations of millions of people that now routinely happen in the USA, China and elsewhere as a consequence of severe weather events such as hurricanes, typhoons and cyclones. Such efforts to protect populations at risk promote social harmony. China should be applauded for its efforts to improve weather monitoring, early warning systems and planning that can achieve rapid evacuation when weather or other natural threats occur. The two environmental monitoring satellites launched in September 2008 will help.[38]

Societies no longer can deal with individual crises in isolation. There is a tendency for convergent crises to develop. Effects of an international financial crisis may affect food supply, at a time of serious drought within a country or region, which may lead to social unrest. Environmental degradation is sometimes the serious consequence of prolonged crisis cycles, for example those associated with civil strife and war in many developing nations, or of gradual loss in ecosystem productivity and services arising from repeated droughts, or systemic pollution such as acid rain.

Over the past decade China appears to have developed a considerable level of resilience in addressing convergent crises. It was able to avoid the worst consequences of the "Asian Financial Meltdown" in the late 1990s and at the same time turned the major crisis of severe flooding arising from El Niño into an opportunity for ecological restoration of damaged uplands. In 2008 China has once again been put to the severe test of several major natural disasters while at the

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[34] This topic is explored in specific countries, including the USA and China in a series of reports produced by the Global Subsidies Initiative. The report on China, *Biofuels - At What Cost? Government Support for Ethanol and Biodiesel in China.* Is available at http://www.iisd.org

[35] Jared M. Diamond. 2005. *Collapse: How Societies Choose to Fail or Succeed*; T. Homer-Dixon. 2006. *The Upside of Down. Catastrophe, Creativity and the Renewal of Civilization.* Random House of Canada; James Lovelock. 2006. *The Revenge of Gaia: Why the Earth Is Fighting Back - and How We Can Still Save Humanity.* Allen Lane.

[36] Ian Traynor. 10 March 2008. *EU Told to Prepare for Flood of Climate Change Migrants.* The Guardian.

[37] Asahi Shimbun. 11 April 2008. *SDF to Retrieve Japanese if New Flu Hits Abroad*.

[38] 8 Sept 2008. *Chinese Vice Premier Hails Launching of Disaster-monitoring Satellites.* *http://news.xinhuanet.com/english/2008-09/06/content_9810515.htm*

same time having to deal with serious inflation and international energy, food and financial market crises. It is clear that China has strengthened its capacity to respond quickly and definitively, although problems remain (see Box 2).

Box 2. Some Lessons from the 2008 Wenchuan Earthquake

The economic growth and development mode need to be improved. During the development process, science and objective rules should be respected, and the development direction, sectoral and industrial distribution, urban construction and development layout, etc., need to be scientifically proved and planned. It is necessary to set up an effective social supervision system and mechanisms to guide the whole society and ensure that the economy develops along a good, sequential and sustainable track.

Regulate and improve the social mechanism to respond to natural disasters. This includes the establishment of warning the emergency response system against natural disasters, improvement of information transparency to promote wider public participation, establishment of effective disaster insurance systems and formal control and supervision mechanism on modern social charity, etc.

Improve awareness and strengthen capacity building. It is especially necessary to popularize the education and knowledge on natural disasters to improve awareness and safety knowledge, thus to enable people to protect themselves and rescue others when disasters take place. At the same time, the technology and capacity to tackle natural disasters need to be strengthened, including research and development of rescue technology and equipments, training of rescue professionals, etc.

Guide the disaster-hit region reconstruction with the concept of scientific development. Post-disaster reconstruction is not simply to restore the original status. It shall not lead to scientific, rational and harmonized new cities and villages built under the principles of sustainable development from the planning stage through to management and administration of the completed infrastructure.

(extracted from a longer report prepared for this Issues paper by Yu Hai of the PRCEE in MEP)

The way forward should include a clearer approach for turning crisis situations towards sustainable development. This will become more urgent as climate change effects become more prevalent throughout China. Climate change adaptation needs to be directed not only towards crisis avoidance, but also to creating sustainable development strategies in key sectors based on the presumption of serious "surprises" that are characteristic of complex interactions among crises. Many of the effects of severe natural disasters are really the effects of poor planning, corruption, management, and supervision decisions—together making populations vulnerable.

IV. CHINA'S CHALLENGES

Economic Growth Model, Volatile Markets and Recession

Others have pointed out China's difficulties associated with the current economic growth model. There is growing inequality as measured by the internationally-recognized Gini Coefficient, which has grown from 0.29 to 0.41.[39] Joseph Stiglitz calls for distributive impacts being a part of every policy decision, and focusing on a good balance between the market and government regulatory system, an improved property rights legal framework, and a broader tax system that places less emphasis on value-added tax. He points out that based on the experience of the US and elsewhere, weakening social protections goes counter to a Harmonious Society, and may interfere with future productivity. Specifically, Prof. Stiglitz cites the low investment in education

[39] Joseph Stiglitz. 2008. *Towards a More Sustainable Growth Strategy for China.* Presentation at CCER, Peking University.

and schooling (e.g., in the period 2002-2005, China spent about 1.9% of GDP on education and about 5% on health; Brazil, by comparison spent 4.4% and 8.8%); and the lack of access to health insurance for many families. He calls for a new economic model where innovation can help to provide a focus on saving resources, not saving labour. Such a model, in the opinion of Stiglitz will lead to a more harmonious society, while providing for long-term, robust growth that will give China a competitive edge internationally.

China's Vice Minister of Finance believes financing sustainable economic development will provide the "material foundation for a harmonious society." The Government in its budgets will give top priority to key factors contributing to this objective including: "sufficient supplies of qualified workers and capital, technological innovation, and the capability of resources and environment to sustain rapid economic development."[40]

China appears to be uniquely positioned among all nations during the current world financial crisis and recession. While not immune to negative impacts, it also has buffers including its large and growing domestic market, budget surplus and huge financial reserves. Premier Wen has suggested recently that "If a large country of 1.3 billion people can keep up stable and relatively fast economic growth, that's a big contribution to the world." (Xinhua)

The environment and development challenge is to avoid responding to economic downturn by sacrificing existing environmental gains, or by cutting back on future sustainable development. There are three specific matters for consideration: (1) how to accelerate employment and revenue opportunities associated with environmental protection initiatives and innovation, especially in water and air pollution, solid waste, and on energy and climate change problems; (2) how to flow increased funding to China's rural countryside through environmental protection initiatives of direct benefit to local people, and/or to protect ecological services for the nation; and (3) how to increase the contribution and efficiency of private sector efforts and therefore relieve some of the burden on government?

At this time of very tight credit abroad, which will affect start-up environmental technology companies around the world, and therefore the rate at which environmental innovations will become commercially viable, Chinese financing and access to Chinese markets might prove valuable. Joint ventures could be encouraged, perhaps under highly favourable conditions for China. It may also be a good time for China to invest in well-established environmental companies abroad, in anticipation of future opportunities in fields such as water sanitation, renewable energy, etc.

This is also a time when China might work with other nations to ensure that banks and other elements of the financial sector further develop environmental safeguards in their lending practices, insurance policies, and in "green investing." This is a new topic for China, but an exceedingly important one. It also relates to Corporate Social Responsibility implementation for companies operating within China and Chinese firms operating abroad.

Olympic Games "Green Experience"

The 2008 Beijing Olympics and Paralympics have left a lasting impression domestically and internationally of China's efforts to come to grips with its environmental protection needs.

[40] Xinhua News Agency. 29 June, 2008. *Govt's Budget Targets Education, Innovation, Environment.* CHINA.ORG.CN

Beijing's air quality rose to the highest levels seen in a decade, among other environmental achievements?[41] In the aftermath of the Games, Mr. Ban Ki Moon, the UN Secretary General said that "The Beijing Games is a…success of the practice of "a green Olympics, a High-tech Olympics and the People's Olympics…The Games was also an important chance for the international community to promote world peace and harmony through enhancing dialogue and mutual trust."[42]

The challenge is to maximize the lasting benefits to come from these Games, including the experience gained in the advanced measures for environmental protection, including vehicle controls, advanced building design, and Circular Economy applications. People throughout China and throughout the world now have a better appreciation of the magnitude of China's environment and development situation and the efforts and the large expenditures involved in environmental cleanup. The challenge remains about how Beijing can continue to experience the cleaner air exhibited in August 2008—and better, and how the environmental benefits seen in Beijing can spread to other locations throughout China, given the great financial effort required for one major city? How can other nations learn from these undertakings?

The Olympics were really a celebration of the 30 years of Opening Up and Reform that made China a candidate to host the Olympic Games and other forthcoming events such as the 2010 Shanghai Expo, which has a theme of "Better City, Better Life" and a focus on how to create an eco-friendly society and maintain sustainable development.[43] Through these events China has created a tremendous "green marketing effort" that may have more influence with citizens than other more technical approaches towards sustainable development.

Environmental Supervision and Enforcement

This past year has seen an unprecedented effort to strengthen environmental supervision and enforcement, especially via the new MEP.[44] Even so, the efforts are still not enough to turn the tide of environmental degradation and illegal activities. Some existing laws and regulations provide for stiffer penalties than in the past. But this does not necessarily deter polluters and others who damage the environment. Local governments often do not strictly enforce environmental protection measures. This problem continues to be a key challenge for the central government. There also is a major problem of the quality and continuity of environmental monitoring. These and other issues have been addressed in detail by past CCICED task forces[45] and in OECD's China Environmental Performance Review.[46]

Rural Environment and Development Reform

Rural people still comprise 56% of China's 1.3 billion population, with income levels of only about 30% of city-dwellers. In 2007 the income gap was the largest ever. This inequality, and other disparities, especially in access to education and health are matters of great concern. At the

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[41] Greenpeace China has provided a thoughtful and detailed analysis of China's Olympic environmental effort: *After the Olympics: Lessons from Beijing.* 45 pp.
[42] www.chinaview.org 17 September 2008.
[43] http://en.expo2010china.com/expo/expoenglish
[44] See the *2008 Policy Report* by the CCICED Chief Advisors Group, which documents China's efforts to strengthen environmental policies over the past 12 months.
[45] CCICED. 2006. Environmental Governance Task Force Report; CCICED. 2007. Task Force Report on Achieving 11th Five Year Plan Environmental Objectives.
[46] http://www.oecd.org/document/47/0,3343,en_2649_34307_37809647_1_1_1_1,00.html

October 2008 meeting of the CPC Central Committee major decisions were taken to address this persistent and deeply troubling disparity.[47] These decisions included: a commitment to double disposable income of rural residents by 2020 (based on 2008 levels); to eliminate absolute poverty (now at 15 million according to official estimates); "establish a mechanism to integrate rural and urban areas in terms of economic growth and social development"; protect farmers rights; positioning agriculture as the foundation of the national economy and putting food security as the top priority, with agricultural modernization, supervision of product quality; and developing public utilities in rural regions.

This approach is meant to promote greater equity and social harmony. The list does not explicitly address environment and development matters, but there are several. Already China is the world's largest consumer of fertilizers, which often are over-applied. With a renewed focus on food security, there is a need to work out improved means to address severe agricultural pollution of China's waterways and groundwater. Treatment of manure and utilization of agricultural residues for biofuels, biogas and chemicals are important topics where many more environmental advances can be expected through eco-innovation efforts. The call for increased public utilities in rural areas should open new employment and wealth creation in the countryside through investment in water supply and sewage, and through more efforts on rural sustainable energy such as wind farms and solar electrical generation sites. Product quality concerns will demand much more attention to pollutants entering into food chains, and issues such as organic certification.

Stability

China values stability in its political system, in its economic growth pattern, and as an important prerequisite for its development. China has been able to absorb the impacts of many internal and external perturbations over this past decade, and undoubtedly will have to deal with more in the future. The challenge is how to keep a steady course in a world with many destabilizing influences. Environmental degradation is one of the major such influences, locally, and now with climate change, also regionally and globally. Another part of the stability challenge is the country's ability to turn serious crisis situations into opportunities to foster sustainable development, This already appears to be a significant element of China's efforts to build a harmonious society.

Environment and security provides a framework for examining relationships between environmental degradation and societal stability. [48] Another approach is to examine how environmental justice concepts are applied to reduce social friction and to redress harm done to particular groups or members of society.

In particular, achieving the necessary level of ecological services will require substantially more investment in eco-compensation programs and effective ecological construction efforts, with a better guarantee of long-term results. This is especially important for insidious environmental change with the potential to affect large areas and major populations. The prime example in the past has been desertification, especially in the Loess Plateau. In the future water supply and quality problems are likely to become major environmental justice issues.

[47] 3rd Plenary Session of the 17th CPC Central Committee 9-12 October 2008.
[48] See the Woodrow Wilson Center Environmental Change and Security Program publications on China. http://www.wilsoncenter.org/index.cfm?topic_id=1413&fuseaction=topics.publications

The poor suffer the most serious consequences of natural disasters and the effects of long-term environmental degradation. In China this raises important questions about environmental justice and equity issues related to pollution, health and environment. A prime example is indoor air pollution, associated with substandard housing in rural households. Badly ventilated stoves, often burning coal, contribute to respiratory diseases and death among the poorest people and particularly affect women, who must spend long periods of time cooking and other indoor tasks.

The substantial number of protests each year concerning pollution incidents provides evidence of discontent and crisis on the part of some people directly affected by these problems. But many others suffer silently because they have little choice, for example those living and working in many of China's coal mining communities. In some other parts of the world, their situation of pervasive, health-threatening air, water and soil pollution would be unacceptable from a social or environmental justice perspective. As part of China's drive towards a harmonious society, that will also become the case within China, likely in the coming decade. Environmental justice has major reform implications for the justice system and rule of law.

International Cooperation

China has made it quite clear over the past several years that it wishes to contribute substantively to global environment and development but not through overt leadership. On the other hand, there is a growing international view that China is a vital player on almost all environmental matters. China can demonstrate by its domestic actions how to achieve a more harmonious society globally, including environmental aspects. China also can directly assist other countries by sharing its environment experience And China can be an important contributor by its enhanced participation through international cooperation and agreements. A major challenge for China is to seek what it considers "fair and just" international rules, whether for environment, climate change, trade, transfer of technology, or other objectives.

World Trade and a Harmonious Society

China owes much of its rise in economic prominence to its careful entry into the World Trade Organization, and its skillful use of comparative advantages to build markets abroad. It also has benefited other countries through its demand for raw materials, which come from a growing number of sources, including developing nations in Latin America, Africa and Asia. Yet there are voices abroad that worry about China's growing impact on resource and environmental sustainability in other countries, and on job losses through outsourcing of employment to China and other Asian countries. These are matters related to globalization trends more generally, but China is seen as the key country.

Market supply chains for food, energy, and other commodities and goods imported into or exported from China are central to the debate. The environmental costs and benefits are just beginning to be understood through careful research. There are two key aspects: how to maintain access to resources while contributing to international good relations and prosperity elsewhere; and how to avoid being caught in international squeezes such as food availability and price rises that will reduce domestic Chinese security and harmony.

The volatility of pricing in commodities such as metals, oil and gas, etc., has meant windfall profits for some companies and countries, and great hardship for others. There are strong suspicions of market manipulation that exacerbate the situation. It is certainly not the path towards a globally harmonious society. It is also foreclosing governmental capacity to make shifts

such as the introduction of carbon taxes and alterations in resource pricing that would promote proper cost internalization of environmental externalities.

China is in a difficult position, since it depends so much on imported raw materials, and also is deeply concerned with higher rates of inflation that can influence not only social stability but also its economic growth rate. The substantial government support provided to maintain gasoline and diesel fuel prices below world levels is an example of the serious situation.

The World Trade Organization has argued from the start of its existence that trade agreements are a route for enhancing global harmony and sustainable development. There is a danger, however, that the current impasse/breakdown of World Trade negotiations, especially on the issue of agricultural market access, will lead to further bilateral and regional trading arrangements, and to a movement away from globalized trade. There could be serious implications for China, and indeed for many of its key trading partners.

Furthermore, there is still much to be done before the world's trading system, environment and sustainable development are made compatible. Whether by the widespread adoption of international standards for the environmentally sound production of goods, and further development and acceptance of meaningful environmental certification, or through binding rules negotiated as part of trade agreements, the existing situation needs to change dramatically if it is to be compatible with the concept of an "Ecological Civilization." What should China's position be on the strengthening of environment in trade agreements? So far, China has been engaged but not really in a leadership role.

Fair and Just International Environmental Rules

The international community should set up fair and just international environmental rules, abide by the principle of "common but differentiated responsibility", shoulder global environmental obligations together, step up international environmental treatment, establish smooth and efficient implementation mechanisms for international environmental conventions and treaties, and eventually leading to a more harmonious world.

These ideals tend to become stumbling blocks once they are translated into specific agreements and implementation strategies. They may lead to disappointment and frustration on the part of China and others in the quest for real progress on matters such as climate change[49], movement of hazardous wastes, and agreement on the inclusion of environmental matters in trade agreements.

How can this situation be improved for the mutual benefit not only of large developing countries such as China, Brazil and India, but also smaller and poorer nations, and the OECD nations? Certainly one part of the solution is related to the role of the USA under a new President. The announced positions on climate change of both parties is stronger than those of the current administration, and with a greater chance for multilateral solutions.

But the USA is not the only player with a major role in proposing and agreeing to environmental rules. If China is to satisfy its own needs for improved international environmental frameworks, it will have to build coalitions that cut across many interests. And it will need to build its image of both responsible international cooperation, and of a nation genuinely committed to environmental improvement domestically and globally.

[49] On 29 October 2008 China issued a White Paper on *China's Policies and Actions for Addressing Climate Change* http://www.china.org.cn/government/news/2008-10/29/content_16681689.htm

Millennium Development Goals (MDGs)

The MDGs are an essential part of the global move towards sustainable development, but in many countries progress on meeting 2015 targets has been limited.[50] China has been an important exception. In the words of UNDP's China representative, Mr. Khalid Malik, " China is leading the way." It will achieve its MDGs by 2015. Yet key challenges remain. In his view they are environment, equity and gender equality.[51]

At his speech at the UN session on MDGs held in New York in September 2008, Premier Wen focused attention on the need for greater cooperation with other nations in order to meet the global MDG objectives.[52] He also noted China's direct efforts with poorer developing nations, including debt forgiveness, direct financial assistance, capacity building and technology sharing. Included is a new five-year commitment to 100 small-scale clean energy projects for developing countries, including small hydropower, solar power and bio-gas initiatives.

China should be able to deploy more of its domestic environmental protection experience in support of developing countries in the years ahead. The commitment it has made for innovative technology development in water use, renewable energy, and for pollution treatment will produce an array of new tools. Very likely the Chinese technologies will be cheaper and perhaps more effective for the needs of poor populations. Also, China is building a substantial body of experience on how to protect environmental services, including ecological reconstruction, and on financial systems for eco-compensation. This experience will be of value for many other countries that face similar problems concerning water basin, forest, agricultural and coastal sustainability. China's disease control experience and growing efforts to address environment and health issues link well to MDG needs abroad as well as in China.

V. ENVIRONMENTAL PROTECTION AND HARMONIOUS SOCIETY

The fundamental premise of this Issues Paper is that environmental protection is an intrinsic part of, and contributor to a Harmonious Society in China. In this section we will examine several breakthroughs needed for this premise to be fully realized over time.[53]

Roles and Principles

The role of environmental protection in building a harmonious society/world is illustrated below, focusing on five elements (Figure 1).

[50] Jeffrey D. Sachs. 2008. *Common Wealth. Economics for a Crowded Planet*. Penguin Press. New York. 386 pp.
[51] Khalid Malik. 2007. *A Contribution to the Achievement of a Harmonious Society.* Statement at International Conference on CSR in China, 29 June 2007, Kunlun Hotel; and *MDGs: China's Progress towards the Millennium Development Goals 2008.* China and UNDP.
[52] Wen Jiabao. 26 September 2008. Speech at High Level Meeting on MDGs. United Nations, New York http://news.xinhuanet.com/english/2008-09/26/content_10116246.htm
[53] The first part of this section is based on a longer report prepared for this Issues Paper by Zhou Guomei, from the Policy Research Center of MEP.

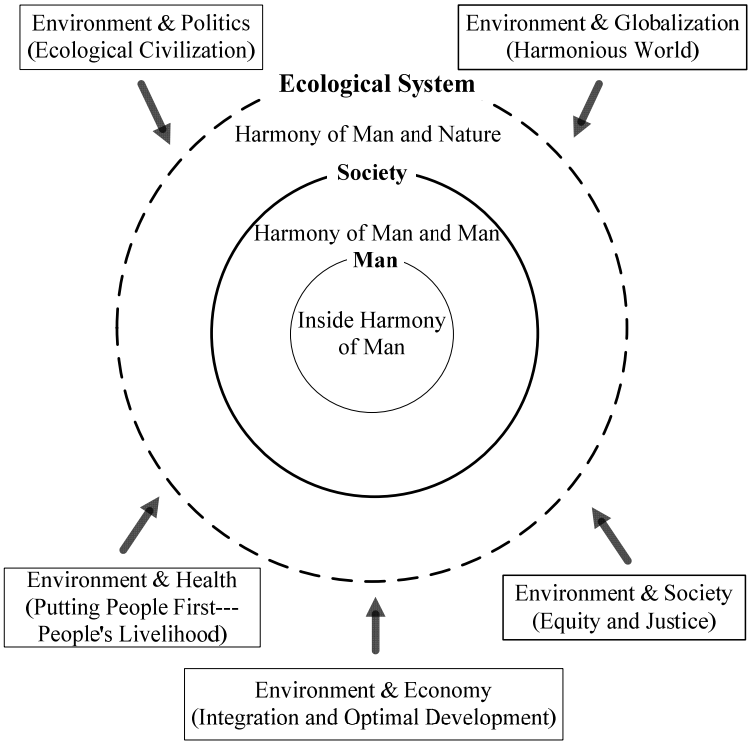

Figure 1. Roles of Environmental Protection in Building a Harmonious Society

Several principles, consistent with statements of current Chinese leaders, are noted below:

- Concept of Ecological Civilization is a basic tenet for a harmonious society.
- Putting People First is key to a sound environment and harmonious society relationship.
- Harmony of humans and nature requires integration of environment and economy for optimizing development.
- Seek social equity and justice through environmental protection.
- Promote international environmental equity and contribute to building a Harmonious World.

Approaches to Sound Environment and a Harmonious Society

In order to materialize a "socialist harmonious society", the scientific outlook of development should be adopted, where the harmonious development between people and nature is an important idea. The immediate priorities should be to (1) solve environmental problems that threaten people's health and sustainable development, (2) safeguard ecosystems, and (3) reform environmental management systems. Much attention already has been given to these priorities, including within the 11th Five Year Plan, and in various Chinese and international reviews, including CCICED reports and past recommendations. Therefore detailed accounts are not given here. Instead, we focus on the breakthroughs needed during the coming five years if China is to achieve its long-term vision of an environmentally friendly society domestically, and contribute to an *Ecological Civilization* globally.

We believe eight breakthroughs are essential.

(1) Radical adjustment of the relationship between the environment and economy.

This fundamental shift has been called for in Premier Wen's Three Transformations, and in the efforts of the 11th FYP to meet pollution reduction and energy efficient targets. But the adjustments will have to be much more radical in the years ahead. These adjustments should include reaching efficiency levels in resource utilization that the world has not yet achieved; and campaigns with Chinese consumers, municipalities, businesses and government bodies to ensure that "awareness of conservation will be firmly established in the whole of society".

The necessary adjustments will require relentless attention to achieving more stringent environmental protection targets, greater investment in the means to do so, and monitoring of the benefits. It will require more attention to environmental protection and standards over the full life cycle of goods produced distributed and consumed in China. The result for China should be a high level of competitiveness in the sunrise economy of sustainable development globally and nationally. It will mean a very discerning type of consumerism, especially in demand for high quality products and services. And it will be fostered by Circular Economy development.

(2) Make trade, investment and financial sector reform consistent with sustainable development.

While China has benefited tremendously from its membership in the World Trade Organization (WTO) and from the immense inward flow of foreign capital, by no means has this been without major problems. These problems include environmental degradation associated with manufacturing for export, impacts associated with market supply chains (domestically and internationally), and difficulty in accessing the best technology for environmental protection. By supplying cheap goods to world markets and buying raw materials, China has provided benefits to some developing countries, but most of the produced goods have gone to richer countries, exacerbating overconsumption in these markets.

China has only limited capability to address trade and investment issues on its own. But it is very clear that bodies such as the WTO, national regulatory bodies and central banks, and the financial markets that operate internationally, have failed to create a system that respects the dictates of either environmental protection or sustainable development. The realization of failure is quite apparent, and in particular the political talk and action accompanying current bailouts of the financial sector suggests a re-making of the system. It would be a shame if this did not include greater attention to sustainable development. This is also true with respect to the current efforts to breath life into WTO negotiations.

China will have considerable credibility in global negotiations over the coming years and could help to move the international agenda of trade and investment, and financial sector reform towards consideration of environment and sustainable development. This would also require additional attention to these aspects domestically, within Chinese banks, insurance companies, stock markets, trade and investment regulatory bodies.

(3) Long-term transition for China to become a Low Carbon Economy.

China's energy and environment relationship is currently heading into difficult territory, with significant increases in imported oil and gas and high projections for the use of coal. Conventional energy efficiency solutions are needed in many sectors, including major industries, transportation, agriculture, municipal infrastructure, etc., but will not be enough. Energy conservation in daily living of people is also essential. But a Low Carbon Economy solution will go much further. It will be comprehensive in the sense that it will account for capture and reduction of greenhouse gases; and it will provide for economic valuation of carbon, including

carbon storage in nature. A Low Carbon Economy will be opportunity-driven, making it attractive to innovators and entrepreneurs in Chinese society. It will be based in part on the substantial financial opportunities associated with international and domestic carbon trading, and special funds such as the Clean Development Mechanism (CDM).While the transition may be long-term, the directions need to be set soon, ideally during the planning for the 12th FYP.

(4) Environment and health action consistent with the alarming range and level of toxic impacts, potential for pandemic disease, and other environmental risks.

It is laudable that China now has an Action Plan on Environment and Health.[54] However, as will be reported by the CCICED Task Force on Environment and Health, this is only the start of what will need to be a very significant effort to reduce the mortality and ill health associated with chronic pollution, workplace and home health hazards, casualties related to disasters, and the threat of pandemics. Environmental health in China also includes the substantial number of deaths and injuries associated with transportation now that private autos are so prevalent, and lifestyle matters such as the rise in the number of smokers, and factors that will lead to increased cancer, heart disease, diabetes and other health problems associated with affluence. Many of these problems are interactive so that solutions are not straight-forward.

(5) New ecosystem protection approaches that provide substantial and lasting economic, environmental and social benefits to rural people.

The investment by China in forest and grassland restoration, protection of water supply, and ecological services associated with wetlands, nature reserves, degraded agricultural areas, watersheds and coastal deltas is already substantial. But it is not optimal, since national systems for eco-compensation are not fully worked out, nor is the effectiveness of existing approaches very great. There is a need to act on the reality that most of these efforts should become permanent, and provide a greater level of benefits to rural residents. Also, to recognize that pollution remediation is now an important part of ecological restoration, including industrial, agricultural, mining and energy, municipal clean-ups and preventative action. Integrative solutions must combine economic, fiscal, ecological, technological and institutional innovation.

(6) Greatly accelerate the pace of development and commercialization of technological innovation for environment and sustainable development.

China should become the leading nation in the world in applying innovative environmental technologies. This may not happen until the next decade, but the groundwork is being laid through the tremendous S&T research investment, and through the emerging demand that will guarantee large domestic markets. China also offers huge advantages for low cost production, and to bring production on line quickly. Wind energy is an excellent example.

The range of environment and sustainability products and their associated services will define the 21st Century economy to a considerable extent, including advanced transportation modes, smart power grids, lighting, renewable energy sources, advanced water use including capture of value of waste products such as heat from urban sewage, biorefineries and other advanced approaches associated with biotechnology and information technology.

[54] Ministry of Health. 12 November 2007. *Action Plan on Environment and Health (2007-2015).* Available on http://english.mep.gov.cn

At present there is no well defined national innovation system for environmental protection, even though there are many initiatives and some important platforms.

(7) Re-orient and strengthen the existing environmental management system to take full advantage of public participation and to respect public environmental rights.

The increased information transparency[55] and steps taken to provide for public inputs to environmental decision-making, and the handling of environmental complaints from the public have been successful. In the years ahead the public needs to have a more substantive role in decision-making and also to have the awareness and capacity to do so effectively. In some settings it should be possible for people and community-based organizations to become co-managers with government in addressing resource and environmental concerns. This should be the case in areas surrounding major nature reserves, for example.

Public environmental rights can be expanded to include the right of environmental supervision, the right of being informed, the right of environmental compensation, and right to participate in development of environmental policies and decisions affecting projects. All citizens, rich and poor, rural and urban, male and female, should enjoy equal access to these environmental rights.

Clearly the existing environmental management system still suffers from the limited quality of information available to detect problems in a timely and definitive way, and also to verify progress. There is a need for a much stronger monitoring system—a system that should operate with due consideration of public input and information sharing.

(8) Shift international environmental cooperation towards integrated sustainable development solutions.

International environmental cooperation should expand from pure environmental considerations to sustainable development. We should combine environmental cooperation with development cooperation, and resolve many, if not most environmental problems through development. While we have witnessed progress for some global environment and development problems, the majority of problems continued to worsen. We have noted the growing prominence of regional environmental problems and trans-boundary environmental conflicts, and these problems have had more impact on political, economic and social development. In addition, there are always new environmental problems emerging and becoming international in scope. These challenges make strengthened international cooperation a must. Sustainable development is a consensus of the international community. We should overcome cultural and ideological differences by taking coordinated action to establish smooth and efficient implementation mechanisms for international environmental conventions and treaties.

The benefits from successfully addressing these breakthroughs will directly contribute to a more harmonious society within China:

- New economic opportunities and livelihoods with less negative impacts.
- Better access by businesses and communities to cost-effective environmental solutions.
- Improved corporate social responsibility on the part of Chinese companies.
- Opportunities for people to be heard and to contribute to decisions affecting local development and national development.

[55] For example, the MEP Guidelines for Release of Information, National Catalogue of Hazardous Wastes, Blacklist of Polluted Cities, State of the Environment Report, and Semi-Annual Report on Indicators of Major Pollutant Discharges of All Provinces, Autonomous Regions and Municipalities.

- Safer environmental conditions, including reduced risk of injury or losses arising from natural disasters and also from pollutants.
- Improved quality of life and health, with other benefits such as improved transportation.
- Improved trust on the part of people towards decision-makers.

VI. CONCLUSION

Environment and development is a key component in China's efforts to build a harmonious society. The existing efforts at improving environmental management within China should pay good future dividends in terms of social and economic well-being for the people of China through improvement in the quality of life and satisfaction. But much more progress is needed. In fact, the entire foundation for building a harmonious society in China requires considerable strengthening.

Experience elsewhere in the world has shown that environmental improvement is a shared concern within societies, around which conciliation and consensus for action can occur. Environmental matters also can lead to measurable progress that can be communicated and provide a good entry point for public awareness-raising and responsible civic action.

China is taking a robust overall approach to environmental problem solving through scientific development, transformative rather than simply incremental change on environment and development, and attention to application of a broader range of instruments to bring about desirable environmental improvements. However, the challenges are still massive, as noted in the eight breakthroughs described in the previous section. Implementation challenges continue to hinder progress on building a new relationship between environment and development, and therefore, the progress on creating a harmonious society.

China faces the prospect of additional crises, given the presence of natural hazards such as earthquakes, floods and droughts; the effects of existing environmental degradation and unsustainable patterns of development; and global factors such as climate change. The tendency in the world today is for crises to converge into "Perfect Storms" involving environmental, food, energy, financial or other crises. Globally, we are likely in such a situation at present. Fortunately, China in recent times has demonstrated both resilience and responsiveness to such circumstances. And, importantly, it has recognized that with crises, no matter how complex, comes opportunity to innovate and seek new sustainable development pathways. As the severe tests of Wenchuan and other disasters this year have shown, there is still considerable room for improvement.

Environment and health is a pressing issue that is likely to become a source of greater social disharmony within China unless it is addressed more vigorously and quickly. It is an issue for citizen in all parts of the country, and in both cities and the countryside. Transparency of information remains a concern, along with full definition of the extent of specific problems and equitable solutions. Increasingly, failure to deal effectively with environment and health makes China vulnerable in its external relationships—trade, environment and public health.

China's commitment to becoming an innovation society is, of course, tied to its efforts to build a harmonious society. It will be helpful to consider environment and development as an important bridge in this process. China's efforts to build a new economy around a better balance of domestic and international consumer demand, based on products and services requiring less energy and material, will open many new opportunities for the country to increase its competitiveness. We believe this shift should be taken even further in certain sectors, such as

renewable energy, where China can demonstrate world leadership and make full use of its comparative advantages. A shift towards being a country known for its commitment to a Low Carbon Economy and also firmly embracing advanced approaches to becoming a Circular Economy are practical ways this can be done.

China's great goal of promoting an *Ecological Civilization* needs to be introduced to the world in a highly skillful way, backed by significant action both domestically and internationally. The former is well underway with the 11th Five Year Plan environmental goals. But China's reputation as a nation committed to building international cooperation on the basis of peaceful development and improving the global environment still needs to be strengthened. China's commitment to achieving the Millennium Development Goals domestically and to use this experience with others internationally is a good example where progress is clear.

The global community is seeking clear signals of leadership from China on a number of matters including environmental concerns. The present global financial crisis has highlighted how China has positioned itself to reduce the impacts faced by others. Yet it should also be apparent that no country is immune from the longer-term impacts. Thus an important element of seek a harmonious society will be innovative polices to keep the global and national goals for environment and development alive, with demonstrated progress, no matter how difficult the economic environment becomes during the coming year. It is a crucial time for climate change matters in particular, and on this topic, China can demonstrate considerable resolve, hopefully in concert with the new political regime in the USA and others in Europe, and elsewhere.

The worst situation would be to revert to the old economic model of "pollute first, clean up later."

Innovation and Environmentally-friendly Society

2008 CCICED Policy Study Report

The 2008 Annual General Meeting
China Council for International Cooperation on Environment and Development

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A National Environmental Innovation Action Plan

Executive Summary

China has both the capacity and the need to become a global leader in sustainable development and innovation in environmental technology.

China has had dramatic and sustained industrial, economic and social development over the past 30 years. Prompt and forceful response to the devastating Sichuan earthquake and the spectacular staging of the 2008 Summer Olympics are clear illustrations of the remarkable transformation that is taking place.

However, economic development has come at a cost. Pollution to air, water and land is having a very serious impact on the health and well-being of the people of China and on the ecosystems of China. The need for China to reduce its emissions is abundantly clear. Many steps are being taken and the problem is fully recognized by China's leadership. Targets on reducing intensity of emissions on a per GDP basis have been set. However, what ultimately matters is not per GDP (or per capita) emission, but the levels of pollution to which people and ecosystems are exposed. **Reduction targets of pollutants on an absolute basis must be established.** If these are to be reduced from today's levels to a healthy level, a new transformation will be needed in which the creative and innovative potential of the people and institutions is further developed!

In this report we review the science and technology system of China and we examine the many steps under way to improve its ability to support innovative and cost effective environmental clean up. We review what drives innovation and the conditions necessary to develop an innovative society. The continuum from basic research in science and engineering to applied research to precompetitive research and new company creation to demonstration to deployment and the interaction between these elements is moving at a dramatic pace. This can be described as an Innovation Ecosystem since all elements interact. The opportunity for technology innovation has never been greater as we discuss in this report.

Science and technology are moving ahead globally at a dramatic pace, creating unique opportunities for solving environmental problems.

We recommend the establishment of a National Environmental Innovation Action Plan. The elements of this plan are discussed in this report and cover the elements of the innovation process from research and development (R&D) to deployment. MEP needs to be strengthened to support this plan.

We know that innovation requires a firm market demand. In the environmental area, such demand will not develop or persist without strong regulatory frameworks. Clear

standards and enforced regulations created equitably by government are what create the market for environmental innovation.

Without strong, clear, stable, and uniformly-enforced regulations and standards, there is no market and hence no incentive for investment in development and wide deployment of innovative environmental technologies.

To achieve a more effective nationwide regulatory environment and to bolster public participation, we urge the creation of a National Environment Information System (NEIS). NEIS would be managed by the new Ministry of Environmental Protection (MEP), who would be responsible for collecting, processing, and reporting pollution in an open format accessible to all.

It will of course be necessary for government to fund the appropriate elements of the National Environmental Innovation Action Plan.

In addition to creating and supporting the NEIS, there are a number of steps that can be taken to strengthen China's environmental capacity. China is in a position to develop a globally competitive capacity in the rapidly developing area of clean technology (CT). There are many dimensions identified in this report under the three themes:

1. **Technology Innovation** for environmental protection and sustainable development
2. **Regulations, Standards, and Enforcement**, and
3. **Public Participation**.

Technology Innovation proposes a number of approaches. There is a need to strengthen the various elements of the innovation process as it relates to environment; continue to strengthen basic research; create competence centres; develop industry sector research institutes; create Environmental Innovation Support Networks to assist SMEs; develop incentives to meet energy efficiency standards; funds for international cooperation; support academic-industry linkages; institute internationally recognized prizes; and develop the circular economy.

Regulations, Standards, and Enforcement are central to innovation. Within the context of the NEIS, the cost of compliance must become less than the cost of non-compliance. National and international standards need to be set and enforced.

Public Participation of citizens and local NGOs is vital in addressing the immediate impacts of pollution which are widely understood as occurring most critically at the local and regional levels . While steps are being taken to strengthen such local involvement, much more needs to be done. China needs to stimulate, empower and mobilize citizens at the local and regional levels to act in the interest of resolving the environmental problems of their communities. This can be reinforced in many ways including education and public awareness campaigns. The power of the citizens to act will be greatly strengthened by access to the independent National Environment Information System.

Much has been done. Much remains to be done to release the innovation capacity of

China to provide an example of sustainable development which can be a model to the world. Continuing to grow the GDP, while decreasing pollution through innovations in technology, in institutions, and in society must be the objective.

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Chapter1

Introduction

1.1 Innovation, Environment and Development: Challenge and Opportunities

Today, it seems that there is still no globally recognized strategy for economic growth leading to sustainable development. The global resource and environmental situation is already beyond the earth's long term carrying capacity. Industrial nations struggle to reduce effects of high per capita consumption levels. Many developing countries face the challenge of conquering poverty, while addressing declining environmental conditions. Others, including China face the dual challenge of rapid growth, export-led, while modernizing and eliminating poverty. Environment suffers, and with declining conditions, so also does people's health and the health of ecosystems.

Though many governments, international organizations and non-government organizations have expended major effort to reverse the decline, incremental environmental improvements are no longer good enough to deal with the ecological, health and development challenges of rapidly rising consumption and population growth.

Technological, institutional and social innovation is the only way to reconcile continued rapid economic development with environmental sustainability. This means innovation will require much faster, and more widespread, adoption of currently available cleaner and more efficient technologies. As well it means development and deployment of sustainable technologies globally on a scale and over a time frame never before experienced in the world.

China, as a fast catching up country, has experienced a period of rapid economic growth from 1978 onwards. China has created many outstanding economic and social advances over this 30 year period. However, these achievements have come at a high price to resources and the environment. The conflict between economic growth on the one hand and resources and environment on the other is becoming increasingly acute. It is very unlikely that problems can be solved without transformative change in regulation and enforcement, supportive institutions and stronger management within both government and enterprises. And, there is a pressing need to apply environmental science and technology at an unprecedented level—perhaps at a scale and time frame never before experienced by any other nation. **China could lead the world in environmentally-friendly technologies, provided it seizes the opportunity.**

The unique Chinese growth pattern, its crises and new opportunities have their roots. First, China is a world manufacturing base and produces a lot of goods for the world, while much of the pollution remains within the country. Secondly, China is entering its heavy-chemical stage of industrialization—a stage often associated with heavy pollution elsewhere. Thirdly, for a long time, there has been mismatched strategy: government emphasized economic growth while neglecting the magnitude of the challenge associated with the equally important subject of sustainable development. The opportunity for change comes from the growing wealth of the nation, the desire of government and the people for action on environment, and certain advantages of China.

These advantages include the existing low per capita level of consumption, adaptive people and communities, low manufacturing costs which allow China to produce and distribute sustainability products (e.g. solar panels) worldwide, and a commitment to scientific development (including the 15 year science and technology strategy) intended to make China a science-oriented and innovative society. Additionally, China's access to knowledge, capital and technologies via foreign direct investment exceeds almost all other nations.

The Chinese government has decided to build an environmentally-friendly society by 2020. Introduced into China in 2005 as a development concept, an environment-friendly society is one where harmony between man and nature, and among people is promoted on the basis of the carrying capacity of the environment and resources, under the guidance of natural law and by means of sustainable economic, technological and cultural policies. The aim of such a society is to create an efficient productive system, a moderate consumption and living system, sustainable and recycling resource environmental systems, a stable and efficient economic system, an innovative technological system, open and orderly trade and financial systems, a fair distribution system and an enlightened and progressive socialist democratic system.

Furthermore, Premier Wen Jiabao has pointed out the need to give equal weight to environment and to economy, to treat environmental concerns at the same time and not to wait until after economic development proceeds, and to employ a variety of environmental measures including economic and voluntary approaches, not just command and control regulations. These imperatives should help to move environmental action beyond the costly, but necessary, compliance-driven approach in China today.

Action will need to move towards a situation of innovation where policies and incentives exist to explore re-design within industries and communities. Also, where innovative technologies are available, either externally or through indigenous development, a concerted effort will be needed to broaden deployment. New approaches can then emerge, leading to new levels of prosperity while improving resource efficiency and creating better environmental conditions.

Often during this journey towards sustainable development there is a stage where risk management becomes important. An example is the chemical industry which depends on the right to operate in particular settings and to get continuous access to insurance and financing. In the USA, Canada and the EU countries during the 1980s and 1990s the chemical industry realized that it would be necessary to undertake innovative approaches, not only to clean up the environment, but also to substantially reduce or eliminate harmful substances in manufacturing processes. Individual companies faced drastic action on the part of communities, banks and insurers as well as heavy pressures from regulators. The Responsible Care Program was introduced through industry associations and quickly led to reductions in harmful emissions. It was driven by risk management but led to substantial environmental improvement. Responsible Care Programs are voluntary and have been introduced into other sectors and countries, including China.

Now, however, there has to be to be a level of action that moves into creation of new technology platforms and more effective deployment of existing ones intended to address such issues as tapping energy from renewable resources, and replacing fossil fuel use for chemicals with biological sources such as agriculture and wood fibre.

These are demanding tasks that can be considered as sustainable development technologies with the potential for profitable returns as well as contributing to environmental problem-solving.

Environmental protection innovation needs will increase and grow more complex with the transition from compliance-driven action to risk management action and to proactive sustainable development. At present China is at a stage where most attention is focused on compliance and enforcement concerns. But for a significant number of sectors and especially for large-scale heavy industry there will be a rapid transition beyond this stage, as has happened already in the modern steel mills, for example. Many SMEs, are not at a point where environmental compliance occurs. Conversely, there are substantial numbers of both large enterprises and SMEs engaged in the environmental protection sector and fields such as recycling and renewable energy that depend on innovation for their future. Thus China's environmental innovation situation is complex, with a need to focus on compliance, risk management and sustainable development solutions simultaneously—for the foreseeable future.

Currently, a conspicuous problem that China faces is that it has accessed or developed some advanced environmental protection and energy-saving technologies, but without strict technical controls that would guide their application and performance. Nor are they sufficiently deployed. Some highly relevant technologies from the developed world have yet to be introduced to businesses and households. And while China's stated goals regarding development of indigenous technology include a strong focus on environment and sustainable development, how this is to be done is unclear since there is no overall strategy for environmental and sustainable development innovation.

It is imperative for the nation's environmental sector to accelerate the entry of environmental and sustainable development technologies into economic activities and to put them to the best possible use. In response, this study aims to find a workable solution from the perspective of the national innovation system (NIS) and from the perspective of environmental and sustainable development management, to help China transform into an environment-friendly society by 2020, with ramifications for patterns of innovation well into the period to 2030 and beyond.

1.2 China at a Transformative Point on Environment and Development

The rapid economic growth of the nation has brought unprecedented pressure on its resources and its environment, thereby giving rise to a host of social problems. Relative to the 1980s, profound changes have taken place in the nation's ecology and environment in terms of type, scale, composition, technique and influence.

This growth of problems has included a number of very disturbing characteristics:

1) The discharge of major pollutants has exceeded the carrying capacity of the environment. Worse still, pollution and damage caused by pollution has spread from land to offshore, from surface to underground, and from single environmental sources to complex multiple sources. Industrial pollution is rapidly increasing and spreading widely. In many key economic regions and river basins, there is major pollution. Industrial production and domestic pollution combined stack up; new and old pollutants are mixed; pollution of water, air, and soil mutually interact.

2) Harm caused by new pollutants and persistent organic pollutants (POPs) is increasing dramatically. Some new pollutants, such as antibiotics, endocrine disrupting chemicals, algae, toxins, pesticides, oxidation byproducts, pose larger and longer-lasting threats to the ecosystem, to food safety, and to human health.

3) Ecological and environmental problems have become more complex with more risks. Social stability and the environment are severely imperiled by such problems as eutrophication of lakes and inshore waters, regional acid deposition, combined air pollution, soil pollution, and distributed-source pollution, toxic and hazardous pollutants, regional (river basin) ecosystem degradation, biodiversity reduction, alien species invasion, genetic resource loss, and environmental emergencies. Ecological restoration and ecological construction have become expensive additions to national and local budgets.

4) Rapid increases in energy consumption and heavy reliance on coal and rapid increase in the use of other fossil fuels are creating new concerns related to localized smog, regional air pollution and climate change.

5) Environment has become a hot topic in China's foreign policy. As globalization and market integration advance, international trade disputes, and friction regarding resources and the environment have become more serious. Delivery of national environmental obligations, improvement of global environmental quality, guarantee of natural resource supply, and breakthroughs in green trade barriers have emerged as new topics and as a basic part of China's foreign policy.

While China is faced with an extremely grave situation in pursuing its sustainable development agenda, it has been taking many actions in terms of its legal frameworks and in reducing emissions on a per unit of GDP basis. These steps represent a genuine commitment. For the 11th Five Year Plan period, China has set the goals of reducing energy consumption per unit of GDP by 20% and cutting down the total discharge of major pollutants by about 10%. We know that while these are laudable targets, the proposed intensity reductions are inadequate. As GDP grows, pollution must decrease even faster on a total emission basis. To achieve these goals, it is necessary to uphold the scientific development outlook, develop a Circular (recycling) Economy by using advanced technologies, and accelerate the building of a resource-efficient and environment-friendly society through innovation. These efforts are also fundamental to realizing better and faster socioeconomic development.

The results so far have been mixed. For example, the total discharge of wastewater in 2006 was only up 2.3% from the previous year. The volume of soot emission fell by 7.9% from the previous year. However, the quality of 26% of the nation's major rivers was still below acceptable standards. Seventy-five percent of the lakes have become eutrophic to varying degrees. Among the rural population, 360 million people had no access to up-to-standard drinking water. It is estimated that China's current emission of major pollutants, like sulfur dioxide, carbon dioxide, and chemical oxygen demand (COD) far exceeds the environmental capacity for absorption. In light of the current environmental situation and development trends, the former Chinese Vice-Premier Zeng Peiyan recently pointed out that "China faces an extremely grim situation in its sustainable economic and social development."

China Environmental Statistical Bulletin 2002-2007, Ministry of Environmental

Protection, http://www.sepa.gov.cn

CCICED in 2007 declared that China is at a transformative point where action on environment will accelerate. The evidence for this includes significant increases in total investment for pollution control. In 2007, government spent about 338.76 billion RMB(1.36 per GDP) for pollution control, about 2.5 times of the level of 2002..

The Chinese leadership has identified several key considerations. First, in terms of the economic growth pattern, there should be increased emphasis on consumption and domestic demand while continuing investment and exports. Secondly, from the perspective of its industrial structure, China should give increasing weight to the knowledge intensive sector and cleaner manufacturing. Thirdly, the basis for development should be shifted from natural resource intensive endeavors to human resources and technical progress. Fourthly, with respect to resource utilization, the uni-directional linear process of resources—products—waste should be replaced with the Circular Economy process of resources—products—waste—resources. The purposes are to enable China to base its economic growth on better economic structure, higher technical content, improved quality of life for its population and enhanced quality and efficiency of its economy, and to develop a growth pattern characterized by low inputs and consumption, high yields, little discharge, recycling, and sustainability.

China plans that its GDP should grow by a factor of four by 2020 in order to provide an improved quality of life for its people. In the process:

1) emissions must be dramatically reduced in absolute terms from their present levels for the benefit of the people of China, and potentially for the wider world, and
2) the present industrial strategy as manufacturer to the world must evolve to being more knowledge-intensive and lead to cleaner businesses.
3) The Chinese people have to be resource conserving and environmentally-friendly.

It has been noted that technology innovation has been incremental to date and largely imported. But increasingly it needs to become more indigenous, more demand driven, and the time to deployment needs to be reduced.

It is difficult to know whether China or any other nation will be able to fully make such major transformations within such a short period of time (between now and 2020), and in the process to fully reconcile the relationship between environment and economy. From environmental, inflationary and perhaps other perspectives, there may be a serious conflict of goals and strategies by being in the middle of heavy chemical industry and infrastructure build-up that is still highly dependent on obsolete coal technologies for massive build-up of electrical supply. Environmental degradation may still continue to rise, and not be contained even through the promise of massive investment in science and technology. It is a great challenge, but one that must be undertaken.

1.3 How an Environmental Innovation Strategy Can Help

During the transformations over the coming 10 to 15 years to build a society that is well-off, environmentally-friendly and harmonious, and to realize sustainable economic development, it is essential to:

1) enforce the evolving legal framework for environmental protection;
2) establish a better incentive framework for companies, individuals and others to innovate;
3) create a strategy to give full play to business as major players in innovation;
4) create markets for environment and sustainable development innovation;
5) develop an environmental innovation system that enables effective interaction and participation of governments, businesses, research bodies, colleges and universities, and citizens;
6) put in place an open innovation system whereby both China and developed nations can work together on innovation efforts;
7) stimulate, support and be responsive to public participation on environmental issues and technology innovation; and
8) strengthen the Ecological Civilization mindset.

In the process of transformation, technological innovation is the source, institutional innovation provides the guarantee, social innovation serves as the basis, and promotion of development and application of energy-saving and environment-friendly technologies represents the core.

1.4 Innovation Challenges

Innovation comes from the bottom up, not from the top down. China needs to develop incentives to stimulate innovative ideas. In the longer run, it is clear that many ideas need to be supported, as only very few innovations will become commercially relevant in the short term. Basic and applied research in platform fields such as (1) Information and Communication Technology, (2) Nano-Material technologies, (3) Bioscience and Biotechnologies, as well as the rapidly developing field of (4) Clean Technology, need to be fostered within China at globally competitive levels. Some of these will lead to short term implementation while others will provide the basis for ensuring the longer range flow of innovations. Innovation is a continuous process.

Notwithstanding the significant commitment and progress made by China in dealing with its environmental pollution, much needs to be done to ensure that total emission is reduced from its present level. This is a dramatic challenge given the commitment to grow the GDP significantly in the coming decades.

We have identified a number of key gaps which should be addressed if innovation adoption is to be a major part of the solutions for a better environment and development relationship in China.

1) **Lack of effective incentives to create the necessary markets.** Innovation is driven to a large extent by the opportunity created by market potential. In the case of environmental technology innovation, government must create the conditions that will allow the innovator to realize the market potential. Smart government procurement is a key element of market creation.
2) **Effective institutions.** To be effective, institutions must be given the tools to create and enforce incentives. Enforcement of regulations and standards are key to creating demand for environmental technology innovation. This means the creation of a monitoring and reporting system on environmental conditions relative to standards and regulations that is firm and fair and available on a completely open basis. Reporting must be directly to a central body and dependable information must be readily available on a nationwide basis.

3) **Public Empowerment.** The public must have full and open access to credible information on the pollution situation at a local and regional basis. Individuals or groups or local or national NGOs need to have access to information and need to be encouraged to present their views and to be listened to without fear or favour.

4) **Technology Innovation.** If the above processes are firmly in place and with an independent data acquisition centre in place, many technological innovations whether domestic or international will be adopted. The innovation process includes a number of interacting elements: basic research, applied research, new company creation and precompetitive research, demonstration and niche deployment, widespread deployment and diffusion. Sponsoring innovative SME companies can lead to new technologies that may be adopted. China must be strong in all parts of this interactive process with all of the various feedback mechanisms from one part to the other. Some innovations may be ready for adoption now. Strong basic research must be at the highest international standards to ensure that China will play a key role in creating the next generation of technologies.

5) **Financing.** Funding of the various crucial steps must be in place through funding basic and applied research, funding precompetitive research and new company creation, funding demonstration projects, and funding a comprehensive centre for collection and dissemination of credible and open pollution information. Smart procurement of new technologies and creation of markets by regulation and standards and by proper pricing, will allow China to meet its own urgent needs. This will also lead to potential export markets as China takes the initiative and the global lead.

One of the key elements of a successful innovation system is a cultural setting that allows entrepreneurs to try a new idea, fail without being disgraced and be given the resources and opportunity to try again.

Creativity and innovation while having somewhat different meanings, to a very large degree are one and the same. China (along with many other countries) has focused much of its education system on developing highly specialized skills. These are important in today's global world. But it is important also in today's world to release the creative potential of individuals and groups. The culture of breaking down discipline boundaries is essential for innovation in science and technology, in institutions and in societies.

1.5 Conclusion

China has both the capacity and the need to become a global leader in sustainable development and environmental technology innovation. In the process it can successfully address its own pressing environmental problems while continuing to meet its domestic goals for economic growth and social development.

Chapter 2

Current State of China's Environmental Innovation

2.1 Brief History of Accomplishments and Failures Related to Innovation

It was not until the 1970s that China initiated environmental protection. In the 1980s, China carried out assessment and studies on environmental background values, environmental capacity, and environmental impact, laying a foundation for environment management. In the 1990s, there were studies on acid rain control, on control of eutrophic lakes, on cleaner production and new pollution control technologies-based environmental management in key basins, areas, cities, and waters, and on industrial pollution control. In the new century, basic studies on persistent organic pollutants (POPs) and on pollutants movement and transformation, demonstrated the environmental behavior of some pollutants. With the development of a number of key technologies such as desulfurization, dust removal, removal of organic pollutants, and ecological restoration of water, China made progress. Studies on key supporting technologies for national environmental management made positive contributions to the improvement of China's laws and standards, strengthening of macro environmental management and enhancement of international environmental cooperation.

Overall, the introduction of new technology and innovation was mainly based on technology imports and to a lesser extent on local R&D efforts. The general picture is this: China has reduced its technological gap in many fields; some have already reached the stage of being at the technological frontier. University research programs at institutions such as Tsinghua University are competitive with international universities. However, the strength of the existing Chinese environmental technology approach is in cleaning up pollutant emissions. The weakness is in the development and deployment of clean technology (clean tech) to reduce the emissions of pollutants in the first place and the use of various approaches to make recycling more effective.

2.2 Achievements of Governmental Programs and Projects

Technological innovation serves as a basis for environmental protection and progress towards an environmental-friendly society. The emergence of a series of key technological breakthroughs as the result of government programs has solved numerous environmental problems.

During the 10th five-year plan, as part of its efforts to control pollution of lakes and rivers, China launched key basic research (973) programs, such as *Research on Eutrophic Process of Lakes and on Mechanism of Blue Algae Bloom*, as well as special research into the hi-tech field (863), such as *Water Pollution Control Technology and Treatment Project*. These programs led to better pollution control and environmental quality in some areas (river basins) and made significant contributions to boost the ability of China to control pollution in key areas and basins.

In the 11th breakthrough program, R&D for applied environmental technologies was selected for some industries. The most important one is the new generation of recycled steel processing technology. This project will cost about one billion yuan. It

is hoped that this technology can be diffused in China in the future. One important R&D project is "monitoring and recovering of ecology of rural areas." It will establish a system of wireless communications for monitoring the water, earth, and air in rural areas.

A host of new municipal wastewater treatment processes and technologies that are suitable to China's conditions have been developed in the field of water pollution control, particularly in the fields of intensified biological treatment, catalytic oxidation and membrane bioreactor treatment of refractory wastewater, and high-efficiency inorganic polymer flocculants. Application of these technologies has helped to effectively control water pollution in the key river basins nationwide. In the basins of the three rivers (Huaihe, Liaohe, and Haihe) and three lakes (Taihu, Dianchi, and Chaohu), 416 wastewater treatment plants have been completed or are under construction, with a combined daily treatment capacity of 21 million tons. More than 80% of the over 5,000 heavy polluters in these basins have met the standard discharge level. As a result, water pollutants there have been substantially reduced. Water quality deterioration has been contained, and the quality of water in some parts of the rivers and lakes has notably improved.

Statistics show that adoption of new environmental technologies and strengthening of pollution control from 2002-2006 led to reductions in the intensity of China's COD emissions in the period . The absolute level of total COD increased slightly from a level of 13.7 million tons to 14.3 million tons in 2006. So, the intensity level of the emission of COD per unit of GDP has decreased from 11.36 (1000 tons/billion Yuan) in 2002 to 6.8 in 2006.

Following the 1992 UN Conference on Environment and Development, China drafted *China's Agenda 21* and made positive headway in environmental protection by way of legal and economic means. The country's energy policies began to feature reduction and some level of control of environmental damage and pollution caused in the course of energy development and utilization.

The 10th Five Year Plan period witnessed breakthroughs in technologies and facilities for desulfurization of flue gas from coal-fired power plants and from large and medium industrial boilers, in technologies and in facilities for the effective control of the particulates of gas discharged by coal-fired power plants and boilers, and in the key technologies for purifying nitrogen oxide from diesel engines and for diesel trapping particulates. These breakthroughs provided a basis for the application of advanced technologies in air pollution control and helped control pollution in sulfur dioxide and acid rain pollution in control areas. Two control zones have been established. In these zones, acid rain and SO_2 have already exceeded acceptable limits. These two zones cover about 10% of China's landmass. In these areas, the state controls the energy structure by promoting clean fuels and low-sulfur coal, and by prohibiting the household use of coal and adopting technologies for controlling coal-fired boilers in large and medium sized cities.

There was development of environmental protection technology, including research on processing technology of municipal sewage, on polluted sources of drinking water, on organic industrial effluents, on clean coal technology, and on localization of waste incineration facilities. This provided a number of key technologies and equipment for the control of air pollution, municipal sewage, and solid waste. Flue gas desulfurization saw great progress in technology but a slow rate of deployment.

Adjustment of industrial pollution control strategy, combined with progress in environmental technology has resulted in substantial achievement in pollution control in China's key industries. Take the case of wastewater discharge as an example. The level of waste water discharge in 2002 is about 43.9 billion tons, in 2006, it was about 53.7 billion tons. But as GDP has doubled in that period, the intensity per GDP has decreased.

China's total energy consumption in 2006 was about 1.62 times as much (in tons of standardized coal energy (SCE)) as it was in 2002. As GDP almost doubled, the energy consumption per GDP has decreased gradually.

2.3 Diffusion of Innovative Technology has Boosted the Level of Environmental Protection

In a bid to facilitate technological innovation and apply more technological results in production, the State Environmental Protection Administration (now the Ministry of Environmental Protection) created the Best Practical Technology Evaluation Committee and the Best Practical Environmental Technology Extension Office in 1991, and carried out selection, appraisal, and extension of best practical environmental technologies throughout China. The extension work was originally the responsibility of the Department of Science, Technology, and Standards and began to be overseen by the China Association of Environmental Protection Industry after 2000.

In 1999, SEPA launched a program called "National Key Environmental Protection Practical Technology Program (NKEPPTP)". It aims to diffuse information about the best practical technology. Chinese companies can apply to have their technologies listed in the National Key Environmental Practical Technology file. After evaluation, they will be included. MEP then has the responsibility to diffuse the technology list throughout China. Different regional governments must adopt the technology as their first priority. They can give the deploying company or government subsidies. In 2008, about 49 technologies were selected by MEP. The number one technology is the denitrification technology for 600 MW power plants. The owner of the technology is China Da Tang Group.

Based on incomplete statistics, by the year 2000, about 320,000 companies adapted practical technology in China with a total investment of RMB 18.1 billion Yuan and generated RMB 14.5 billion Yuan in economic returns (resource recovery, water and energy saving)[1].

The 11th Five Year Plan is a golden period of development for the environmental protection industry of China. The implementation and popularization of National Key Environmental Protection Practical Technology plays an important role in fulfilling national pollution reduction by way of environmental industry development of China.

2.4 Case Histories

Environmental improvements and sustainable development are all at different stages of development in different parts of China. Case histories for Baoding, Ningbo and Wuhai are presented in appendixes 2, 3 and 4. These examples are based on very different stages. Baoding is a city that has undergone dramatic transformation and is

[1] Source: http://www.caepi.org.cn/query-answer/2739.shtml

developing as a high technology city based on materials sciences affecting products such as photovoltaics. It is at a relatively advanced stage of environmental awareness. Ningbo is a manufacturing city but one in which environmental action and public involvement is high. Wuhai, in Inner Mongolia is a heavy industrial city based on coal and in which pollution emissions are very high. There is little public participation.

2.5 Conclusion

China has been active in environmental protection and has had made many steps forward since the 1970s. It has developed a strong science and technology strategy (NIS) that incorporates environmental technology innovation. Much remains to be done. Desulfurization technologies for example, although mature, are only now being deployed. As illustrated by the case histories (Baoding, Ningbo and Wuhai), developments in environmental innovations are at very different stages in different parts of China.

Chapter 3

Technology Innovation for Environment and Sustainable Development

"Innovation is interactive, one thing built on the back of another"

Mike Lazaridis, founder of Research in Motion, inventor of the Blackberry

"Innovation is a bottom-up process, not a top-down process."

Daniel Dudek, Environmental Defense Fund

3.1 Environment and Competitiveness

Today the need for technology innovation is dramatic and increasing. At the same time the opportunities for transformative changes have never been higher. The opportunities shown in Appendix 1, *Grand Challenges of Engineering*, for example, document a view presented by the National Academy of Engineering of the U.S. Many of the grand challenges and opportunities are well known. Many of them relate directly to environment and sustainable development. There is much to be done, but there is much that can and must be done. New research is constantly opening new doors and opportunities.

In 1995, Michael Porter and Claas van der Linde presented a compelling view of the direct relationship between environment protection and competitiveness. As they point out succinctly, the view that there is a struggle between ecology and economy is based on a static view of environmental regulation. But we live in a dynamic and changing world.

In the case of environmental innovation, the capacity for innovation is then to a large degree driven by the establishment of properly designed regulations and standards. China has established regulations and standards, but these have not been effectively applied in order to meet Porter's paradigm of the relationship between competitiveness and environment. Currently in China, it is frequently possible to ignore or bypass the standards. Penalties for violating the standards are minimal, so it is commonly cheaper to violate and pay, than it is to meet the standard. This means that China is not able to capitalize on the challenge "that properly designed environmental standards can trigger innovation that may partially or more than fully offset the costs of complying with them." (Porter and van der Linde)

3.2 Environment and Economic Growth

Grossman and Krueger (1991) some years ago wrote on the reduction of trade barriers and the effect this would have on environment. They create a framework to categorize the potential environmental impact of the resulting economic growth. Their framework is relevant for China as its economy is growing rapidly.

1. Scale – in this category they talk about increasing the volume of what is presently being done. In the case of China, where much of the present economic activity is massively polluting, more of the same would simply mean massive further increases in pollution.

2. Composition – in this category they talk about changing the mix of the existing industries. For China this would mean more growth of less polluting industries and less growth or even shrinkage of the more polluting industries.
3. Technique – in this category one can place innovations that will lead to improved environmental performance in the processes of the current heavily polluting activities and the evolution of newer cleaner businesses. As China must reduce its total emissions from present levels, the focus for China must be on innovations that reduce total emissions dramatically. By requiring that standards be met, much innovation will follow.

Contradiction between its ever more severe environmental problems and the slow transition of its growth pattern makes it difficult for China to harmonize the relations between its economy and its environment. Contradiction between the pressing demands of its people to improve the environment and the long time needed for environmental controls to take effect is a "focus" problem, triggering social conflicts. Contradiction exists between the increasingly grim pollution in the nation and the ever higher demands of domestic environmental standards and international environmental standards.

The contradiction among these imperatives is not whether they can be resolved, but how fast the necessary changes can be made.

3.3 The Innovation Process

In a treatise on industrial innovation and environmental regulation Kemp states the following.

"In most countries, environmental and innovation policies are not fully or adequately integrated. Yet; it is widely accepted that there is constant interplay between innovation, environmental protection and further innovation. Given that numerous countries, particularly in the north, have at least a formal environmental policy and an innovation policy, it is only the next logical step to attempt to integrate the objectives of the two policies. Innovation policy can be more explicitly directed toward environmental protection by providing support for R&D in the development of environmental technologies." Parto and Herbert-Copley (2007)

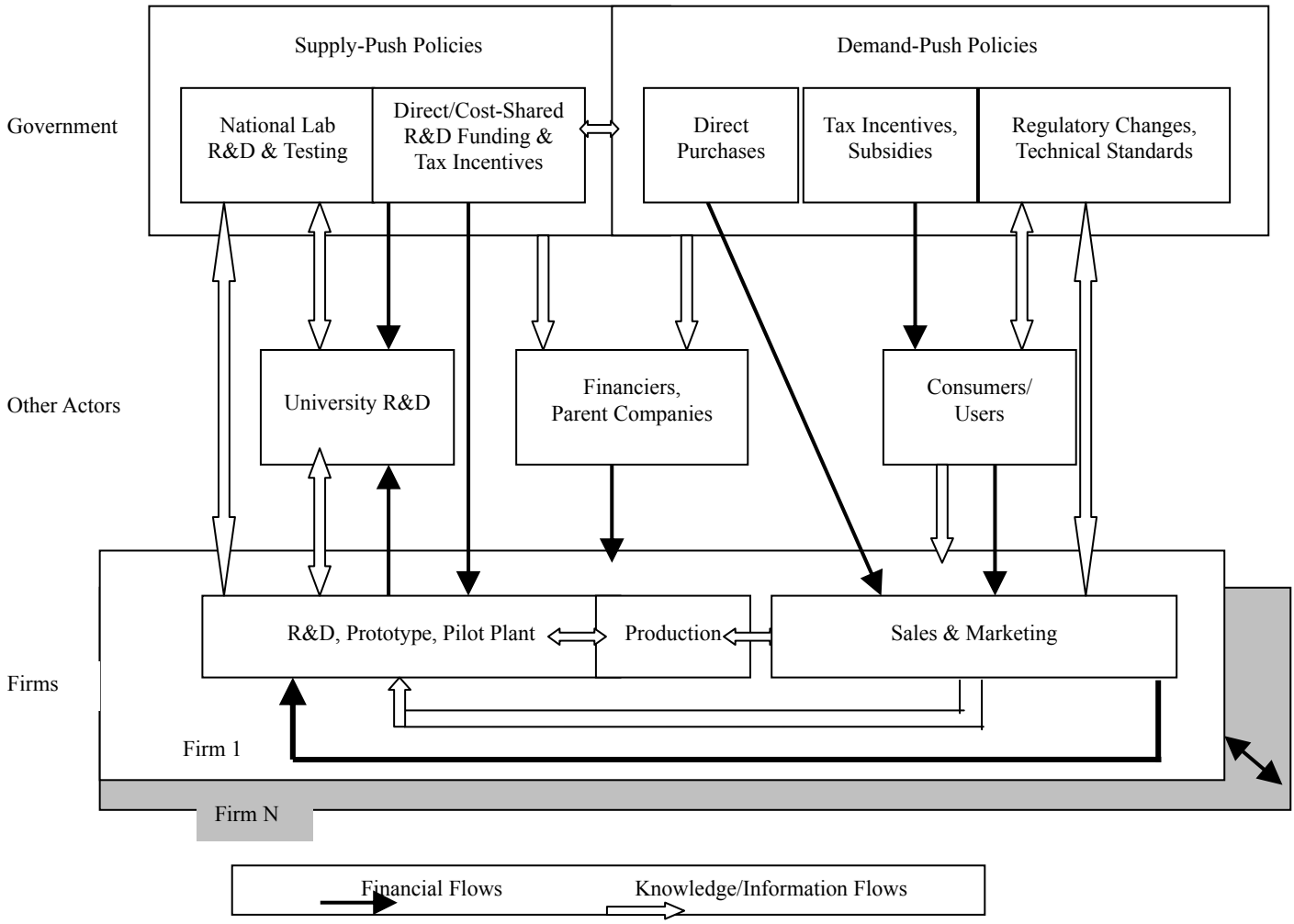
Gallagher et al (2006) have written comprehensively in a literature review on Energy – Technology Innovation (ETI). Although the article focuses on energy, their description of the innovation process is useful for all aspects of innovation.

"ETI is the set of processes by which improvements in energy technology, which may take the form of refinements of previously existing technologies or their replacement by substantially different ones, are conceived, studied, built, demonstrated and refined in environments from the laboratory to the commercial marketplace; and propagated into widespread use. Innovation, then, does not consist of research and development (R&D) alone; it is not complete unless it includes the further steps through which the new technologies or improvements attain widespread application."

They describe the elements of innovation, but are careful to point out that these are not in a linear sequence as often portrayed. Each stage of innovation interacts with each of the other stages. New technologies can lead to new basic research. Implementation of new technologies can open the mind to new and better approaches in ways that may be unpredictable. Gallagher et al (2006) document the work by

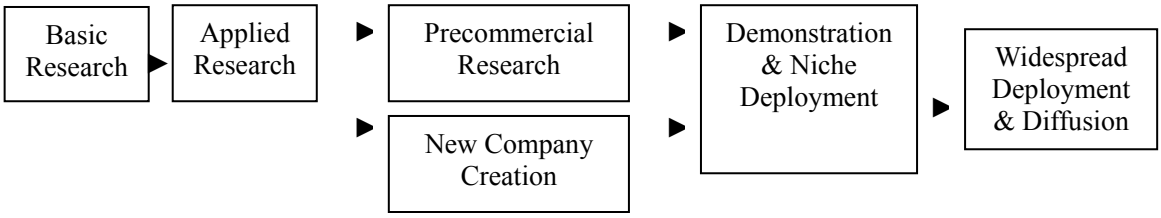
Margolis and show a chart that shows a typical set of stages and the dynamic feedback between them.

Box 3.1 The Innovation Process



The chart in Box 3.1 divides the innovation process into supply side and demand side on the one hand , and into various performers – government, others (universities and academies), and firms. This is a useful description of the various actors involved. New research ideas and new technologies may come from the research or supply side. But frequently it is these new ideas and techniques that then create the demand.

The elements of the innovation process can also be shown in the following way, while recognizing that each element is fully interactive. New research can lead to new technology and new technology can lead to new research breakthroughs.



3.4 Basic Research

Basic research is typically pursued in universities and research institutes. It is

typically publicly funded and most commonly on a peer reviewed competitive basis. There are many dimensions to basic research and a wide range of activities need to be supported. Today it is common to emphasize the platform sciences and technologies. Traditionally these are:

- Information and communication technology (ICT)
- Nanoscience and Technology (NT)
- Bioscience and Technology (BT)

Today, given the focus on meeting environmental necessity, we can add:

- Green Science and Clean Technology (CT)

It is common to use the Gross Expenditures on Research and Development (GERD) as a percentage of GDP as an indicator of innovation potential in a country.

The highest GERD/GDP ratios are in the Scandinavian countries (e.g., Finland, Sweden) that are as high as 4%. It is common to think of 3% as the aim for most developed countries (U.S. 2.7%; Germany 2.5%; Japan 3%). In China's "Medium to Long-Term Plan for the Development of Science and Technology" (MLP) published in 2006 a target of moving from 1.34% in 2005 to 2.5% by 2020 will ensure that China is fully competitive with the EU/US/Japan (Cao et al, 2006)

It is useful to point to a few examples in which basic science is a known key driver of the innovation process. Many others will develop as science continues to evolve presenting new opportunities.

Biofuels

There is a great deal of emphasis on biofuels and in particular cellulosic biofuels. The opportunities are remarkable and are directly connected to the revolution taking place today in the life sciences from functional genomics, to enzyme creation, to mutagenesis and to synthetic biology. This has been well documented in a report of the Interacademy Council. The venture capital going into these new companies is dramatic, as documented by Krupp and Horn (2008).

Photovoltaics

Appendix 5 describes the status of the photovoltaic industry in China. Fast developing strategies to improve the functioning of photovoltaic solar cells depends on breakthroughs in nanotechnology. These techniques have evolved from the concepts of solid state physics. Today nanotechnology promises to dramatically improve the conversion rate of solar energy by creating energy trapping surface films. Suntech power based in Wuxi, China, was created by Shi Zhenrong and is now one of the largest producers of solar-cell modules in the world. He was a student in the 80s in Australia. He moved to a university spin-off company and was one of the first to grow crystalline silicon on glass at low temperatures. In 2001 he returned to China with his patents and the result has been dramatic (*New Scientist*, 2007, Nov.10)

3.5 Applied Research

The boundary between basic and applied research is not sharp, but rather is a continuum. For example, medical research on a particular disease is applied research, but today draws heavily on basic genomic and proteomic research. Funding for applied research in engineering and agriculture is oriented to practical problem solving.

It is in this element that the focus on industry partnerships develops most effectively. Industry-university partnerships should flourish. Patents are likely to be developed in this element. These may lead to the creation of new spin-off companies or to processes that may be adopted or adapted by larger organizations.

Research parks typically associated with universities become a hotbed for entrepreneurial innovative activity. China has been actively creating such research parks associated with its major universities across the country.

3.6 Pre-commercial Research and New Company Creation

China is lacking pre-commercial research centres to support industry sector needs. These would support research on industry wide problems that are common to particular industries such as pulp and paper or forestry and to many others. The existing institutions in China have moved to form profit centres and typically address a company specific problem rather than an industry-wide need. This element of the innovation process is not well met in China. A series of such centres should be created within MEP to address the environmental issues faced, sector by sector. These could be established on a non-profit basis, funded jointly by government, groups and companies. The governance should be dominated by CEO level industry leaders to define the problems that most need to be tackled.

These could be located in association with universities and research parks and be a key element in reinforcing clusters.

There are examples in other places that address this need such as:

Australia – Australia has created a series of Collaborative Research Centres (CRC) that are funded by industry and by government. They are created as consortia of universities and industries to carry out research that is directly relevant to that industry's needs.

Germany – Germany has created two sets of research institutions. The first are the better known Max Planck Institutes that focus on basic research. Less well known but equally important are the set of applied research institutions known as the Fraunhofer Institutes. These are institutions that work collaboratively with consortia of industries to develop training and research that is sector specific.

Canada – Some examples in Canada are funded jointly by the federal government, the provincial governments, and the industry sector. Their applied research is directly on problems of the industry sector and corporate presidents are on the board. Pulp and Paper Research Institute of Canada and the Forest Industry Technology Institute are examples.

In Canada there is an organization called Sustainable Development Technology Canada (SDTC). This organization was established by the Government of Canada in order to assist in filling the need that this element frequently requires. It is an arms length body from government and receives proposals from groups that cover pre-commercial needs, assistance with start-up needs, and demonstration projects. To be eligible to compete for funding for sustainable development and for biofuels, projects must have a strong private sector focus and they typically partner with a research institution. This shared funding mechanism provides significant incentive to private companies, both small and large, in taking projects through to the commercialization stage.

Selection of projects is based on expert advice. The governance structure has a predominance of private sector members. This model has been examined by many jurisdictions as serving a critical need.

A comparable body in Canada – The Canada Foundation for Innovation (CFI), was established by the federal government with $3.5 billion to be sure that equipment and facilities were accessible to researchers in Canada. Again this is a shared funding model supporting universities and hospitals along with their partners from other levels of government and the private sector. Proposals must be submitted by institutions and they must find 60% of the funds from other sources. Institutions must show the benefit to Canada including potential linkages to industry or the potential for creating spin-offs. This model has been widely examined by other countries.

3.7 Demonstration and Niche Deployment

This is a very important part of the innovation chain that starts to move projects through to the actual deployment level. China has many such projects at this stage. We see for example in sulphur dioxide flue gas reduction (Appendix 6) that there are many demonstrations in place or under way. Many of these should be and are being funded by the relevant industry as they determine how best to meet the regulations and standards most cost effectively. Hundreds of excellent examples were demonstrated during the Beijing Olympics. Many lessons can be learned from these demonstration projects.

3.8 Widespread Deployment/Diffusion

There are a number of widespread deployments of environmental technologies in place: the regulation and response of the automobile industry (Appendix 7), the wide range of activities documented at Ningbo (Appendix 4) and others. Many such as photovoltaics or wind power systems are in widespread use. Sulphur dioxide flue gas desulfurization had been installed in 12% of power plants by 2007 (Appendix 6). China has committed to the Green Gen Project which by 2015 will be the world's first full scale coal-fired thermal power plant with zero emissions.

3.9 Innovation Ecosystem: Another look at the Innovation Process

Judy Estrin (2009) has published an interesting treatise on her view of innovation in a new book called "Closing the Innovation Gap". She has been the CTO at Cisco and has created several successful startup companies in Silicon Valley.

She has interviewed hundreds of successful entrepreneurs as well as building on her own experience. She describes the innovation process as an Innovation Ecosystem. This is a useful description, as it emphasizes that all of the elements must be present and they must interact with each other. The core values that underlie innovation must all be met and they must be in the right balance with each other. These core values are: 1. Questioning；2. Risk Taking；3. Openness；4. Patience；5. Trust.

3.10 Global Learning Networks

Globalization is having a dramatic impact on innovation. Innovation can take place anywhere. It can happen in developed or in developing countries. India and China are

remarkable examples that are moving fast to developed states.

China has rapidly become a centre to which research and innovation is outsourced as it has developed its pool of highly skilled and educated people and created globally competitive research focuses.

But what is now starting to happen and needs to be encouraged is that China's industries are moving to be partners in global learning networks. China is now creating research facilities in developed countries such as the EU or the US, where particular expertise is concentrated. This is documented in a recent OECD (2008) report. In a sense China is joining "clusters of innovation" in other parts of the world and other parts of the world are joining "clusters of innovation" in China. A recent report in China Daily (Sept 25, 2008) states that in 2007, China invested $18.6 billion overseas. Given China's dramatic need in environment and sustainable development, this is a process that will serve China well as people move around the world. Just as today's problems must move beyond discipline boundaries, so today's ideas know no geographic boundaries.

3.11 Venture Capital in the Field of Clean Technology

Venture capital (also known as VC or Venture) is a type of private equity capital typically provided to immature, high-potential, growth companies in the interest of generating a return through an eventual realization event such as an IPO or sale of the company. Venture capital investments are generally made as cash in exchange for shares in the invested company. Venture capital typically comes from institutional investors and high net worth individuals and is pooled together by dedicated investment firms. Venture capital is very important in promoting the industrialization of various high-techs and economic development, including the field of clean technology.

Recently, China's venture capital market has been developing rapidly. In the year 2001, the overall amount of venture capital in China was only 518 million dollars; however, by the end of the second season of 2008, this figure has risen to 3845 million dollars, nearly 8 times that in the year 2001. Especially in the last two years, the number and amount of venture capital both maintained high growth rate, reaching an average rate of more than 50 percent per year. See table 3.1.

Table 3.1 Annual amount of venture capital in China, 2001 to 2008 August

Year	Number of Cases	Growth rate	VC amount（US$M）	Growth rate
2001	216	—	518.00	—
2002	226	4.6%	418.00	-19.3%
2003	177	-21.7%	992.00	137.3%
2004	253	42.9%	1,269.00	27.9%
2005	228	-9.9%	1,173.00	-7.6%
2006	324	42.1%	1,777.42	51.5%
2007	440	35.8%	3247.05	82.7%
2008（up to August）	198	—	3845.04	—

Data source: zero2ipo research center, www.zero2ipo.com

What's worth mentioning is the rapid increase in the demand of clean technology and

new renewable energy. Recently, with the continuous rise of traditional resource's price, the business value of clean energy resources, such as solar energy and wind energy, has constantly grown. Additionally, the policy direction has also promoted the market demand of clean technology. Along with many long term capitalists, venture capitalists are making this investment in the fields of solar energy, wind energy and other sustainable energies.

In the year 2007, the clean technology market in China has undergone drastic development According to Zero2IPO's (A Chinese leading VC management and consulting company in the field of clean technologies) statistical data, in 2007 alone, venture capital related to clean technology and new renewable resources has amounted to 100 million dollars. And what's more is that in a single month, August of 2008, Venture capital in the field of clean technology has reached 700 million dollars, accounting for 19.2% of the total in the month. Despite few investments in this field, the clean technology industry in China is witnessing stable progress and the field is rapidly emerging.

In China, there are more and more demands and investments in the fields of clean technology and new energy resources. 9% of the world's energy resource investments are in China (Zero2IPO, 2008). According to the report of Zero2IPO, in 2007, the capital funds put into solar energy industry, from silicon chips, silicon cells to the whole solar energy system and relevant products, achieved more than 10billion RMB. The passion for new energy resources could certainly be seen by the senior managers of international investment banks. For example, in the year 2007, investment in the field of clean energy resources worldwide by Goldman Sachs, from wind power to ethanol manufacturers, reached 1billion US dollars. And JP Morgan Chase& Co has invested in 17 wind power generating stations and is on its way to solar and geothermal generating. Operated by "Stock god" Warrent Buffet, Berkshire Hathaway has invested 385 million dollars on the construction of wind power generating stations worldwide.

Venture capital and regional government support have given great support for those clean-tech companies in China. For example, the development of Wuxi Suntech, set up in 2001, has came at a very high speed. In 2004 alone, the achievements were 20 times that of the previous year. In 2006, Suntech got access into NYSE and became the company in solar photovoltaic industry that had the highest market value. The president and CEO of Suntech, Dr Shi Zhengrong thus became the richest man in China. Both government support in form of government venture capital and commercial venture capital helped Suntech in its startup stages. After Suntech, China witnessed a hot investment in solar photovoltaic industry. Some companies in the industry, such as LDKsolar in Jiangxi province, YingLi solar in Hebei province, and China Sunergy in Nanjing, are involved in IPO Financing.

3.12 China's Environmental and Sustainable Development Paradigm – The "China Advantage Model"

China, in addition to its profound need for emission reduction, has a number of advantages. It has a global manufacturing advantage recognized universally. It has a large domestic market that is growing fast. It has an export advantage in terms of price, skilled workers, flexibility, and speed. It has made significant investments in the research at its universities and academies and is building international competitiveness and recognition and attracting many of the best minds. The skilled

labor force is developing very fast through education and training and through sending large numbers of people for educational opportunities abroad. It is committed to the concept of the circular economy. It has and is establishing a number of well focused clusters or learning networks where universities, academies, businesses and supply chains can learn from each other. China is committed to the idea of the Innovation Society including basic science, technology, national institutions and to building the public capacity for understanding science.

In transportation and in the home electronic appliance industry, companies, such as Haier, Huawei, Lenovo, take advantage of the big domestic market and become a global leader in those industries. We believe that in the environmental sector, China's comparative advantage can also give Chinese companies the power to become highly innovative global companies.

3.13 Creative Mindset

"China has yet to establish a research tradition that is both conducive to creative achievements and tolerant of creative failures."

"Research is too often derivative in nature, which wastes resources and discourages creativity and independent thinking."

These are quotes from Cao et al (2006). They reflect on the need to engender a creative mindset in China's S&T community if the objectives of the MLP are to be realized.

The idea of creative mindset at the individual level, at the corporate level, and at the government level is increasingly seen as a necessary condition for innovation. As Daniel Dudek said at the Enterprise Forum "there is a need to create broader-based incentive programs here. The challenge for innovation is empowering and harnessing China's vast entrepreneurial talent. Innovators are highly creative people and are not and should not be constrained in their thinking by traditional approaches to problem solving" or even by the prospect of failure.

Innovations in today's increasingly specialized world require that individuals and organizations must be able to get beyond this specialization and not be constrained by various boundaries – these include boundaries between disciplines, boundaries between government ministries and boundaries between different jurisdictions, both within and between countries. This may mean a need to rethink the objectives of the education system at all levels. Can creativity, imagination, and entrepreneurship become a significant part of educational curricula? Can individuals be empowered and given incentives? Can they be encouraged to be risk takers? Judy Estrin (2009) describes the need for T shaped people. Broadly educated across discipline boundaries on the one hand with depth on the other.

3.14 Selected Needs and Technology for the Future

In January 2006, China initiated a 15 year Medium to Long-term Plan for the development of science and technology. China aims to become an "Innovative Country" by 2020. It commits China to developing capabilities of "indigenous innovation". China will invest 2.5% of GDP by 2020 to R&D. As the GDP is growing rapidly, the absolute size of R&D will be much larger than it is now.

Environmental innovation is also within the scope of the 15 years S&T plan. It covers

ecology, energy and environmental S&T and innovation. To reach this ambitious goal, China will spend more money on environmental technology and innovation. China must find solutions for new energy and for other kinds of needs. At the same time China has to find a way of clean manufacturing to reach the goal of fast and sustainable economic growth. All of this leads to China fast becoming a global leader in the clean tech revolution now under way.

At present one of the most important science and technology projects for environmental protection is water pollution control. This is the first key science and technology project administered and managed by the Ministry of Environmental Protection. The estimated budget for water projects is RMB 14.168 billion Yuan from the central government and RMB 21.483 billion Yuan from local financing and enterprises. With a total budget of RMB 35.651 billion Yuan, the plan will be implemented in the 13 years from 2007 to 2020.

Automobile Pollution

Starting in the 1990s, China improved its level of vehicle exhaust treatment by improving its own technological capabilities, and most importantly by implementing vehicle emission standards in stages. By imposing a requirement for tailpipe emissions control through policy, foreign and Chinese automakers alike had the incentive to transfer and/or develop vehicle emissions control technologies, and install them in every new vehicle (see Gallagher 2006). (Appendix 7)

Clean Coal Technology

Zhou and Gallagher (2008) document the move to cleaner coal using coal gasification and polygeneration technology in China. China has committed to a zero-emission coal-fired demonstration power plant by 2015. This is now under development as GreenGen, which is led by Huaneng, one of China's leading power companies. This integrated gasification combined cycle (IGCC) coal plant will capture and store carbon dioxide underground and the hydrogen will be used to power fuel cells, resulting in a highly-efficient co-generation plant.

Krupp and Horn document exciting developments in progress in a number of areas. They give examples of science and technology which is one of the necessary conditions for innovation. They show many examples of the elements of the innovation process including basic research to demonstration and the investment of major amounts of venture capital in promising technologies. Based on a consideration of supply and needs, we list a number of areas important to the future of China.

1. **Solar Cells, Photovoltaics (PVs), Solar Thermal Technology (STT) and Enhanced Geothermal Systems (EGS)**

While China enjoys a large and growing export market for solar PV, this technology remains very expensive for bulk power applications. Ongoing global research will, however, probably deliver cost competitive solutions throughout the value chain in the near future (see Appendix 5). Solar thermal technology, which heats a working fluid (with high heat capacity) which is then used to make steam to generate electricity, is potentially more cost effective than PV to generate bulk power in desert regions. Further, heat can be stored in insulated vessels, and then used to carry over to generation, when there are clouds, or during peak demand in the early evening when the sun has set. While there are a number of solar thermal plants now operating, development challenges include reducing the cost of collectors (e.g. with flat plate

Fresnel zone lenses) and developing thermal storage systems. In addition to meeting domestic energy needs, China might also develop a substantial export market for such technology. China is addressing many of these topics. See photovoltaics Appendix 5.

Enhanced Geothermal Systems do not need the naturally occurring pockets of steam to turn a conventional turbine. The advantage of EGS is essentially targeting heat rather than other specific geological conditions. Priority targets are the most geothermally rich resources with the highest temperatures closest to the surface. With further technological improvements, the reach will become vast, even with relatively low temperatures.

2. Wind Power and New Nuclear Power Systems Now in Advanced Stages of Development

For renewable energy use, China lags behind advanced countries. In total, energy, hydro, wind, and nuclear only had a 7% share. As China has a vast land and many parts have good resources, so wind power has a good potential for a future in China. China has become a leader in manufacturing and installing wind power. Now, the installed capacity of wind power in China is number 3 in the world in 2007, about 6.05 million KW.

New generation of nuclear power is also one of the important potential sources of energy. China will establish about 30 new nuclear plants to have a better energy system (amounting to 6% of the total electricity supply by 2020). China lags far behind other countries in nuclear and radiation safety. This is reflected in the following aspects: (i) nuclear power plants are short of risk control technology as well as measures and means to prevent and mitigate serious accidents; (ii) since most of the nuclear safety software is from overseas, much research work is still needed to assimilate and apply such software; (iii) efforts are lacking on nuclear safety risk assessment, radioactive waste pollution control, optimal management of nuclear radiation, and electromagnetic radiation and environmental safety; (iv) study of nuclear facility decommissioning technology is still at a low level; (v) study on the disposal of high-level radioactive waste (including spent fuel) is at an early stage and there will be a long way to go before realizing final disposal; (vi) security study (especially fast discrimination and probing technologies) of nuclear materials trails far behind that in other countries; and (vii) study on the technologies and measures to counter nuclear and radioactive terrorist attacks is still in its infancy.

3. Carbon Capture and Sequestration and Integrated Gasification Combined Cycle (IGCC)

Coal fired utilities in China provide more than 70% of the electricity demand. Over the coming decades it will simply not be possible to reduce dramatically the use of coal, while meeting energy needs. While there has been a great deal of discussion of advanced coal technology and deep geological sequestration in the industrialized world, actual progress has been slow. Indeed, today it appears that China may be as far or further along in actual development and demonstration of these technologies as any other country. With some serious push, China could become a world leader in this area, not only contributing to reducing its own contributions to local and global environmental loads, but also to become a major international supplier of advanced clean technology. Gallagher documents the move to using cleaner coal using Integrated Gasification Combined Cycle (IGCC) in China. China has committed to a zero emission coal fired demonstration power plant by 2015. This is now under

development as Green Gen operated by a consortium of the leading power companies. This will use IGCC super critical technology, CO_2 will be captured and stored underground, the hydrogen will be used to operate fuel cells and the output will be combined heat and power (cph) as a highly efficient cogeneration plant.

4. Desalination of Saline Water

China faces serious and growing problems with fresh water supply. The same is true in many other parts of the world and as climate change becomes more serious, the number of regions around the world that are running short of fresh water will grow. Today, reverse osmosis is the leading technology for desalination of sea water and other saline waters. This technology is expensive, but costs have fallen sufficiently such that the technology is seeing growing application, especially in wealthier parts of the world. There are a variety of other technologies that hold potential for supporting desalination at lower cost. If China is able to develop such technologies, they could both meet a growing domestic need and also provide an important and growing export market.

5. High Efficiency Buildings and Infrastructure

Buildings consume about 1/3 of the total energy. Efficiency in buildings and infrastructure can save a lot of energy for a big country like China. In this area, new technologies will find many applications. Appendix 7 gives a review of what is and can be done in regard to reducing pollution with well designed and regulated transportation systems.

6. Ecological Conservation, Reforestation, and Grassland Development

Eco-environmental damage in China is showing some new features: First, the damage has expanded from small local areas to large regions; and second, the damage caused by a single factor has become functional damage in regions or areas, resulting in badly degraded or even loss of ecological functions in many important ecological zones. It is necessary to attach strategic importance to the study of the carrying capacity of the eco-environment, strengthen development of ecosystem health management technology systems, and carry out monitoring, assessment, and study of typical regional eco-environments. The attached Box 3.12 documents a remarkably successful rehabilitation project in Sudbury, Canada, driven to a large extent by local citizens.

7. Key Technological Aspects in the Development of the Recycling Economy

As one of the important strategic objectives of China's sustainable development, the recycling economy has an enormous bearing on the improvement of resource productivity and building of a resource-efficient and environment-friendly society. This represents the long-term and future-oriented direction for technological development. To achieve such development, it is necessary for China to develop platform technologies for the recycling economy at the earliest possible date. In terms of pollution control and environmental management, the first step is to develop environmental pollution assessment, control technologies for waste reclamation, and create well-functioning national policies and systems regarding reclamation. The second step is to develop technology for effective and clean utilization of resources, namely, cleaner production technology, and to enhance the capability for independent innovation. Furthermore, it is imperative to select typical cities and key industries for

demonstration activities, and to develop technologies that will propel development of other technologies, ultimately serving as alternatives to the traditional technologies in the heavy polluting industries. The third, is to develop a business coexistence network, ecological industrial integration systems, ecological industry, eco-agricultural technology, and to explore the mode for the construction of ecologically friendly cities and countries.

3.15 Conclusions

Technology Innovation for Environment and Sustainable Development is a process that involves many dimensions and many elements. These range from basic research to deployment. We live in times sometimes referred to as the New Industrial Revolution, where new ideas and new deployments are urgently needed to ensure that China and indeed the broader world must be committed to the care of our environment. Innovation has a major role. Emissions, not just on a per GDP basis but in total, must be reduced on an absolute basis.

Perhaps the framework for innovation can best be described as an Innovation Ecosystem in which the various elements must work together to ensure that new ideas are quickly adapted to restore polluted sites and to reduce pollutant emissions. There are many actors involved in the process ranging from government to universities to enterprises. These must work together to meet both supply and demand. But in the world of innovation, the development of new research or supply may also be the source of demand. We describe various approaches that can be used to bridge the gap linking research to defined needs, for example in an industry sector.

China is a large country with various parts at very different stages of development. In some cases incremental improvements are needed, in others there are leapfrogging opportunities and in yet others there are major opportunities for China to lead with radically disruptive technologies.

Chapter 4

Environmental Innovation System of China

Describing the innovation system is a good approach to see the interaction of different actors in terms of knowledge creation, refinement and diffusion.

4.1 University and Government Research Institutes

In China, there are numerous research institutions related to environmental protection. At present, an environmental science and technology system has been created in China. It is composed of four parts including the Chinese Academy of Sciences system, the higher education system, the industrial department system, and the Ministry of Environmental Protection. The most important knowledge creators are university and government research institutes.

There are more than 230 scientific institutions at the country, province and district level and nearly 10,000 scientific researchers and administrative personnel in the environmental protection system. Research directions of the scientific institutions under the Ministry of Environmental Protection are greatly different from those of the Chinese Academy of Sciences, the higher educational institutions, and the industrial departments. They primarily aim at national and global environmental problems and address the needs of national environmental management. They provide technology support for the strategic policy of national environmental protection.

Their role in environmental innovation system can be seen from Table 4.1. As most of their budget comes from the government, we can see their performance in a national project called the 863 program. The areas of biology, new materials and advanced manufacturing are the top three in paper publication. Information, new materials and advanced manufacturing are the top three for patenting. The poor attention given to environment is relatively small compared to other innovation areas.

Table 4.1: Programs funded by the 863 project in 2004

Field	Number of trained graduate students	Number of published articles	Number of applied patents	Number of invention patents
Information	3777	2818	1022	590
Biology and modern agriculture	2787	6871	2115	1479
New materials	2852	5244	1557	1102
Advanced manufacturing	4452	7833	718	190
Energy	561	1169	380	270
Resources and environment	1117	1951	632	476
Total	15546	25885	6424	4107

Source of data: Database Online, The Ministry of Science and Technology of China

A major gap in the R&D system here is that research done by many government research institutes as well as in universities, funded by the Ministry of Science and Technology, does not fit the needs of industry well. Lots of research results remain locked in at the laboratory stage and are not being applied to industry.

At the same time, many applied research institutes have been transformed into private companies, leaving a gap between basic research done by the Chinese Academy of

Science and universities and the consulting services done by the applied research institutes. Little real research is done in areas of general technological problems for industry sectors, such as standard setting, and demonstration research. A system based on public and private partnership, targeting industrial and regional level problem, is badly needed.

4.2 Domestic Enterprises

Overall, companies are important actors in the innovation system of China. But this is less true for the environmental innovation system. With the lack of strongly enforced environmental regulations for a long period, companies have not had a strong incentive to innovate.

Now, government has introduced tougher measures of environmental protection. Large scale, state-owned enterprises have higher pressure and have taken more responsibility for environmental innovation problems as part of their business practice. They are taking appropriate actions to solve the environmental problems they are facing.

Multinationals from developed countries often have a greater commitment to environmental protection because the regulations and business practices in their home jurisdictions require this. They pay attention to energy saving, as well as environmental conservation, so they actively participate in clean production and technology research and development of pollution controls as an element of good business practice.

There are two groups of small and medium enterprises (SMEs). Some are the leaders in introducing innovation in their industry. Some SMEs lag behind. They do some investment in environmental protection, but only under the pressure of local government officials.

Another set of important actors are the new environmental protection enterprises. Through years of practice, the environmental protection industry of different types and sizes has been formed in China. By the end of 2004, there were 11,623 units with income of more than 2,000,000 Yuan annual sales and 1,595,000 employees. Annual revenue of this industry has reached RMB 457.21 billion Yuan with profit of RMB 39.39 billion Yuan. (National 96-05 white book on environmental protection by MEP).

In China, large private companies are becoming dominant players in environmental innovation. Of China's top 500 companies, 98 are private companies. Some of them are leaders in environmental innovation. For example, Wuxi Suntech Power Co., Ltd. reached an output of 364 megawatts of installed capacity with sales revenue of over 10 billion yuan. It came third among photovoltaic cell manufacturers in the world. Following is Baoding Tianwei Yingli New Energy Sources Company Ltd. The ENN group is a major power company located in Hebei Province of China. This company is one of the largest providers of clean energy. In 2007, it had revenues of 12 billion RMB with 20,000 people. The company invented a clean coal process to turn coal into dimethyl ether for power plants, household and vehicle use. One of its advantages is that it generates no sulfur dioxide or soot when burned. In the wind power sector, Goldwind has captured 33% of sales in China. In 2006, Goldwind installed 442 MW of wind capacity.

Although the domestic environment-engineering corporations have had a period of

fast growth, their core technical skills and key equipment still have to be imported from abroad. In addition, a majority of consumers are reluctant to buy domestic made equipment and instead purchase overseas equipment. This results in low adoption of domestic technology and equipment.

At present, investment for environmental protection is hindered by the high cost of obeying the law and the low cost of breaking the law. Enterprises have little incentive for environmental innovation. Major steps must be taken to raise the cost of breaking the law and to continuously reduce the cost of adopting new innovative technologies.

4.3 Industry-Academic Linkage

Industry-academic linkage is one of the bridges for knowledge transfer from academy to industry. Though government has pushed hard to encourage this linkage, more effort is needed in China. In Chinese Academy of Science system, there were about 1265 patent applications before 2007, but only 20 of them are joint patent applications with industry. This is also true for Tsinghua University. In the department of environmental science and engineering, there are about 155 invention patent applications, but only 15 of these are joint applications with industry.

One of big challenge is that the former applied research institutes have been transformed into profit-seeking companies. Their technology capabilities gradually degenerated. They cannot respond to the needs of the market. For example, from our visit in Wuhai, we know that some large energy related companies cannot get the needed technology from those companies. They have to rely on imported technology and to improve by themselves.

Global industrial-academic linkage can play a role here. In the photovoltaic industry, for example, the leading scientists in China have learned the latest knowledge in a university in Australia. Those companies still have good connections with them.

China needs to increase incentives through R&D funds to encourage increased industry-academic linkages.

4.4 Role of Government

Government plays a very important role in developing the environmental innovation system.

Led by the Ministry of Environmental Protection, there are many governmental bodies responsible for the environmental innovation system in China. These include the National Development and Reform Committee (NDRC), Ministry of Science and Technology (MOST) and others. MEP and NDRC are responsible for the regulation of environmental issues. China has made great progress in terms of law making and standard setting and implementation. Institutional change in China is in transition. The environmental protection law and policy of China in this period basically follows a ‘command and control’ philosophy. End treatment of pollution is still the focus for pollution control. Implementation is the big challenge as regional governments cannot independently operate in some regions.

Funds for environmental science are allocated through a variety of national S&T programs controlled by the Ministry of Science and Technology of China. First, funds for operating grants of research institutions, refers to an allowance for experimental manufacturing of new products, expenses for pilot-plant test and subvention for major

scientific research projects, which are established by the state. Second, funds come from national S&T program controlled by MOST. They are the principal funding source for research in China. The largest and most recent one is water treatment. It has about 30 billion Yuan for the project. Third, part of the pollution charge can also be used for research purposes. Part of this is used for pollution abatement and capacity building of environmental protection organizations; part is used for technological activities of enterprises and scientific establishments, especially local scientific institutions.

The big challenge here is lack of coordination in the environmental innovation system of China. China has a good tradition of coordination as it has five year plans and different forms of specialized committees. But the environmental problem is a horizontal issue. The specialized function of each ministry means cross boundary problems remain an issue. The National Environment Information System proposed later in this report would cut across all aspects of government as well as businesses and public institutions.

Water pollution presents a very important example. The distribution, dispatch, protection, supervision, and administration of fresh water resources (the seawater resource is under the administration of the State Oceanic Administration) are within the purview of the Ministry of Water Resources. The utilization quota of water resources and the use of water by industry, construction, and production are determined and supervised by other departments including the National Development Reform Commission, the Ministry of Construction, the Ministry of Communications and so on. Sewage disposal facilities are administrated by the Construction Administrative Department, but not by the Ministry of Environmental Protection. However, sewage drained to the surface water (lakes and rivers) is administered by the Ministry of Environmental Protection. The water drained to the sea is under the administration of the State Oceanic Administration. The drainage process of motor vessels is out of the administration of the Ministry of Environmental Protection but within the administration of the Department of Transportation.

Money for R&D and for diffusion of technology is an interesting example. The distribution, dispatch, protection, supervision, and administration of environment are in the purview of the Ministry of Environmental Protection. They know what kinds of innovations are required for the problems. But they do not have the fund to do that. The Ministry of Science and Technology controls most of fund for environmental R&D, but they do not have the ability to allocate the funds to the right agencies. At the same time, government procurement of clean tech products is still inadequate. Nobody is responsible for the pilot stage of innovation.

4.5 Global Linkages

Since opening to the world, the World Bank and many developed countries have helped China very much in terms of regulation, standard setting and transfer of best practices.

The Clean Development Mechanisms (CDM) for example, is one of the mechanisms established according to the *Kyoto Protocol* (1997). CDM is deemed to be a double-win mechanism, for it provides more flexibility for developed countries to reduce performance cost and it provides the CDM project countries with new capital and advanced technology.

The World Bank has supported China with nine carbon-purchasing agreements since the beginning of the first three proposals in September 2003. The agreements relate to energy sources (coal mine methane, hydropower stations in river channels and wind farms), energy efficiency (exhaust gas reclamation during steel production), carbon sequestration (forestry), and industrial gas destruction (HFC-23). China is the largest HFC-23 emission source in the world. In December 2005, the World Bank and two project units supported by the Chinese government signed a CDM trade purchasing agreement with the largest registered amount thus far, including two HFC-23 reduction and emission projects with reduction or emission amounts exceeding 129 million tons. Due to the support of the World Bank, China increased its share in the global CDM credit market, acquiring 60% of the global amount. Up to now, the World Bank has signed nine purchasing agreements in China, with a total value of 1.1 billion U.S. dollars, reducing 170 million tons of exhaust gas emissions. This kind of global tool not only brings benefits to China, but also strengthens the local capability of China's energy industry (China and World Bank: the fellowship of promoting innovation, 2007). But whether CDM is leading to innovation and diffusion of technology is an important question. The effectiveness of CDM as a driver of innovation must be examined carefully as there are conflicting views. This proposed study should be completed in time for the Copenhagen 2009 meeting.

FDI is another important factor for knowledge transfer. Many multinational companies from developed countries have good environmental consciousness and a sense of social responsibility, because they are driven by home-based, tough standards, that must be met. However, with its lower pollution standards and lack of enforcement, China has selectively attracted more heavily polluting industries. Research done by Jing Zhang and Xiao Lan Fu[1] found that FDI prefer to locate in regions with relatively weak environmental regulations. They suggest some evidence of a pollution haven within China. They also found that in terms of environmental protection, multinationals from developed countries do better than those from Hong Kong, Macao and Taiwan. Enterprises with polluting industries can use low technology in China with huge pollution as a result. But many multinationals stand out as models of environmental protection in a lot of regions. We expect that by green purchasing of local suppliers, they can help local companies to acquire related knowledge. *China Daily* reports that in 2007 China received 82.6 billion in FDI and this is rising further in 2008 (*China Daily* Sept 25, 2008). Government has started to curb investment in energy-consuming and environment-polluting industries, instead encouraging investors to go into hi-tech, modern agriculture, and service industries.

4.6 Conclusion

The system of environmental innovation is inadequately developed in China. Domestic companies do not have enough incentive to do R&D as there is a lack of necessary regulations and their implementation to make innovation a competitive enhancing force. Most university and government research institutes are inclined to do basic research and it is far away for transfer. The key between R&D and commercialization of technology is missing, as there are not enough capable applied research institutes. The coordination and funding system needs to be improved to strengthen the pilot and test elements of innovation. FDI and other kinds of global linkages help China to access the latest technology. Multinationals can play an important role by green purchasing from local suppliers. They can help local companies to acquire related knowledge.

Chapter 5

Regulation, Standards, and Enforcement

Regulations and standards are the rules of the game for environmental innovation.

5.1 Need for Enforcement of Regulations and Standards to Drive Innovation

Environmental technologies are managed centrally. Government implements related regulations and standards approved by the National People's Congress and requires businesses and other entities to follow. Under the socialist market economy, the involvement of the market diversifies interests. The interests of local and central governments often do not agree. Local governments base their decisions on their understanding of their maximum interests. The current environmental legal system and the status of law enforcement do not motivate businesses to meet environmental regulations.

In the ideal situation, environmental regulations and standards would be stringent and they would be strictly enforced. Businesses would pay far more for causing pollution in violation of the law, than they would for acting within the regulations and standards. They would get far more benefit from operating within the regulations than they would in avoiding the controls. In this event, businesses would be motivated to seek every technology possible to lower their pollution control costs. The strong market demand would then push forward needed innovation. This in turn, would generate returns from the market. The problem is how to ensure that regulations and standards are enforced to achieve these results. It is impossible now, since decisions must be supported by information on pollution levels established relative to standards. Obtaining such information entails huge costs and difficulties. Governments have adopted a series of regulations, policies and incentives and carried out promotion and education activities with the aim of encouraging technology flow and application to improve the situation.

Only by providing corresponding organizational guarantees and pushing forward system reform, can the obstacles to building the environmental portion of the National Innovation System (NIS) be addressed. The existing organizational systems must be reformed and a system must be created which allows environmental technologies to flow among the developers, the disseminators and the users. Governments, businesses, universities and colleges, research institutes, intermediaries and individuals, need to be involved in the process. Businesses are the main force in the operation of NIS, while governments are responsible for implementing and enforcing the regulatory environment and for creating markets and for correcting system failures.

There are a large number of regulations and standards. These are regularly reviewed and updated. Over time they are increasingly meeting international standards. It is clear that China has an effective set of regulations and policies, but these are not uniformly, rigorously and fairly applied from jurisdiction to jurisdiction. One only has to read the three case histories – Baoding, Ningbo and Wuhai, (Appendices 3, 4, 5) to understand the dramatic differences in different jurisdictions in China. It is also clear that many SMEs have been able to escape these regulations – sometimes by

simply shutting down and reopening elsewhere.

The task force is explicit in making the following statement:

"Without strong and uniformly enforced regulations and standards, there is no market and hence no incentive for investment in or deployment of innovation environmental technologies."

A big incentive to create a market for clean technology is good regulation, standards, and tough enforcement at all levels.

5.2 Creating a Market for Clean Technology

China has seen enormous economic growth in areas in which there is a clear domestic or international market that demands products and services. However, until there is a clear market demand for clean technology (including both pollution control for existing processes and newer clean and efficient technologies) growth of markets in this area will be slow. When we look internationally at how industrialized countries have made the transition to cleaner and somewhat more sustainable economies, several factors have been essential. These include:

- Strong public demand for clean and efficient products and processes based on good access to information and effective organizations to support regulation and continued adoption of best practices;
- Good environmental standards, actively and uniformly enforced, which start with levels that are technically and economically achievable, and continue to get more restrictive over time as progress is made.
- Incorporation of environmental externalities into the pricing of resources like coal and water, usually done with some form of taxation.

We have found from the Baoding visit that the Spring Wind program from National Development and Reform Commission has helped the wind power industry in China. The high price for wind power electricity and the allowance of wind power electricity to integrate with the national grid system stimulated this new industry in China. Many local regions and local power companies have taken active steps to implement wind power stations in their regions following government financial program.

There are cases where voluntary standards have led to improvement, but for the most part, voluntary standards have not been effective in driving innovation in the developed world. On the other hand, once strict standards have been put in place, markets, and associated innovation to reduce costs have grown rapidly in developed countries. For example in the United States, innovation in sulfur dioxide pollution-control technologies largely occurred after strict well enforced emission control regulations were put in place. Also, innovation to reduce emissions from motor vehicles largely occurred after strict well enforced emission control regulations were implemented. We can also see evidence of this phenomenon in China where once pollution-control standards were established for motor vehicles, emission-control technologies were transferred, developed, and deployed in China (Gallagher 2006, Appendix 7).

Increasing costs associated with bad practices can also be powerful signals to the market. Sometimes this happens naturally through normal market process, but sometimes the government must intervene and impose externality taxes. For

example, China is beginning to use coal more efficiently than it once did, in part because prices have risen. Similarly, US consumers are demanding smaller more fuel efficient (and thus cleaner) cars because gasoline prices have recently doubled.

Public support, strong, well-enforced regulations, and correct pricing are essential to creating a market for clean and efficient technology. Two other factors can also play an important role in making progress in improving environmental quality and promoting clean and sustainable processes and technology:

- The growth of a culture within corporations, especially among industry leaders, that takes pride in being a "best actor" and thus applies pressure on poorer actors in the same sector;
- Direct (e.g. subsidy) and indirect (e.g. tax breaks) support from government to cover the incremental costs of demonstrating advanced technologies that have not yet become cost effective but hold great potential.

5.3 Leapfrogging and Standards

Leapfrogging to current and modern technologies is a very strong option for developing countries. Leapfrogging to modern approaches has been practiced in China and is included in China's medium to long term science and technology plan. But the process is highly dependent on having in place a supportive and functioning regulatory system. Each leapfrogging activity needs to be considered on its own merits.

There are many opportunities for leapfrogging in China. We give below a few representative examples that have both domestic and export potential.

(1) Energy Storage Technology: As greater use is made of intermittent renewable energy sources, such as wind, and as more effort is placed on reducing emissions from vehicles fueled by petroleum products, the need will grow rapidly for efficient, cost effective energy storage technologies that can be cycled (filled and depleted) many times. Today the leading candidate is advanced battery technology. Other technologies include ultra capacitors, kinetic energy storage (flywheels), and electrochemical systems such as bidirectional fuel cells. If China can develop effective new products in this area, it should enjoy both a large domestic and international market while also making a large contribution to improving environmental quality.

(2) Advanced Materials Separation: China produces large amounts of solid waste and also imports large volumes of waste material and products (such as used electronics) from elsewhere around the world. At the moment, technology for separating valuable materials for recycling, and making use of the embedded energy in these wastes is still at a fairly primitive stage, both in China and in much of the rest of the world. Research and innovation that develops and commercializes advanced methods of separation could both help dramatically to improve China's environmental quality and might also become a very lucrative export market since most developed and developing countries face very similar problems and needs.

(3) Low Cost Solid State Power Electronics: In addition to intermittency (capacity factors typically <= 20%), one of the things that makes photovoltaic electric power very expensive is the "balance of system" costs (the power electronics needed to convert DC into AC). Power electronics also play's a key role in many other

advanced applications such as wind, motor control, power system control, etc. Both the domestic and international markets would be very large if China could develop low cost "package units" that can perform simple tasks such as DC to AC conversion, synthesis of varying frequency three phase AC power for motor control, and similar products that would enable greater energy efficiency at low cost.

(4) Carbon Capture and Deep Geological Sequestration: Coal is central to the energy economy of China and of many other nations including the United States and much of Europe. Over the coming decades it will simply not be possible to reduce dramatically global CO_2 emissions while meeting energy needs without continuing to make use of coal. While there has been a great deal of discussion of advanced coal technology and deep geological sequestration in the industrialized world, actual progress has been slow. Indeed, today it appears that China may be as far or further along in actual development and demonstration of these technologies as any other country. With some serious push, China could become a world leader in this area, not only contributing to reducing its own contributions to local and global environmental loadings, but also become a major international supplier of advanced clean technology.

(5) Solar Thermal Technology: While China enjoys a large and growing export market for solar PV, this technology remains very expensive for bulk power applications. Solar thermal technology, which heats a working fluid (with high heat capacity) which is then used to make steam to generate electricity, is potentially more cost effective than PV to generate bulk power in desert regions. Further, heat can be stored in insulated vessels, and then used to carry over to generation when there are clouds or during peak demand in early evening when the sun has set. While there are a number of solar thermal plants now operating, development challenges include reducing the cost of collectors (e.g. with flat plate Fresnel zone lenses) and developing thermal storage systems. In addition to meeting domestic energy needs, China might also develop a substantial export market for such technology.

(6) Desalination of saline water: China faces serious and growing problems with fresh water supply. The same is true in many other parts of the world and as climate change becomes more serious the number of regions around the world that are running short of fresh water will grow. Today reverse osmosis is the leading technology for desalination of sea water and other saline waters. This technology is expensive, but costs have fallen sufficiently that the technology is seeing growing application, especially in wealthier parts of the world. There are a variety of other technologies that hold potential for supporting desalination at lower cost. If China is able to develop such technologies they could both meet a growing domestic need and also provide an important and growing export market.

These are a few examples in which China can leapfrog and bypass various stages of technological development as it reaches to meet present standards or to establish new standards and the needed technologies to meet environmental and sustainable development needs. There are many others. Higher standards and strongly enforced standards will create the markets that will lead innovators to pursue such avenues. At the same time government policies and funding can accelerate leapfrogging development. As we see from the case histories of Baoding, Ningbo and Wuhai (Appendices 3, 4, 5) there are very interesting opportunities for the less developed parts of China to leapfrog based on the experience of the more developed parts of China. MEP should consider running an intensive workshop on this topic as it

develops opportunities for joint funding of projects with private sector partners.

5.4 Enforcement

The fact is that lack of strong, uniform enforcement of standards and regulations is a phenomenon well known and frequently commented on previously by CCICED and by various task forces. Enforcement remains a serious challenge for China. As we have seen a strong system is necessary to trigger innovation. The supply side based on new technologies alone is not enough. The demand side must also be stimulated. This is where enforcement of regulations and standards are necessary at all levels of government. If a company knows it must meet standards, it will seek the most innovative and cost effective way to do so. As Stigson (2008) pointed out at the April 2008, CCICED Enterprise Forum, this means among other things, ensuring the security of the IP used in meeting these standards.

It is worth noting that the World Business Council on Sustainable Development (WBCSD), is creating a system in which member companies make IP openly available where this relates to environmental protection technologies. This IP commons is designed to increase diffusion around the world.

We see from the experience on SO_2 pollution control in thermal power plants (Appendix 6) that enforcing standards is beginning to pay dividends, as the technology of flue gas reduction is increasingly being deployed.

But at this stage we find that China does not have an effective monitoring system. We have learned that environmental protection bureaus (EPB) typically report to local governments. This means that such data as are available may or may not be reliable. There is no independent monitoring available. What is available is often so aggregated that it is bears little or no relation to whether the standards are being met or not.

In the US, one of the early policies that was established was the Toxic Release Inventory (TRI). Over time this inventory has developed effectively as a tool for monitoring and it is managed independently. The results are company by company and are publicly available. As a result, the culture has changed and organizations seek to be good performers.

The US Toxic Release Inventory (TRI): A strategy to promote citizen involvement

In 1986 the US Congress passed the Emergency Planning and Community Right-to-Know Act (EPCRA), as explained on the EPA website (www.epa.gov/tri/):

> Sections 311 and 312 of EPCRA require businesses to report the locations and quantities of chemicals stored on-site to state and local governments in order to help communities prepare to respond to chemical spills and similar emergencies. EPCRA Section 313 requires EPA and the States to annually collect data on releases and transfers of certain toxic chemicals from industrial facilities, and make the data available to the public in the Toxic Release Inventory (TRI). In 1990 Congress passed the Pollution Prevention Act which required that additional data on waste management and source reduction activities be reported under TRI. The goal of TRI is to empower citizens, through information, to hold companies and local governments accountable in terms of how toxic chemicals are managed.

When this requirement was first proposed, arguments were advanced by some in industry and academic circles that the data would not be accurate and that simply reporting total mass of emissions, without some estimate of actual exposure and toxicity would not be useful. Nevertheless the program went forward, and the data have been important in inducing reductions in emissions. This has happened in two ways. Some firms have been embarrassed to have to publish data that make them look bad, and so have taken steps to reduce their emissions and improve their public profile. Perhaps more importantly, these data have been widely used by environmental and community groups to bring pressure to improve local environmental quality.

Anyone can log onto the scorecard website and summary maps of emission data, including toxicity-weighted data, nationwide. Users can also input their local postal zip code and get data on emissions sources in their local region.

5.5 International Standards

There are thousands of standards in place around the world in different jurisdictions. In some cases these are in a form that could be adopted by any given jurisdiction. Examples include forest practice codes, biocontainment codes, biodiversity codes, and many others. Adoption of these can be a major stimulus to innovation in developing new approaches to meet these standards. Perhaps best known is the Montreal Protocol on HFCs.

The first standard was introduced in 1973 in China for three wastes: waste water, air and solids. Now, in China, there are about 1000 standards in environmental protection. Standards can be a driver for environmental innovation. It sets a goal for companies to realize. Therefore, it pushes companies to find new solutions to match the standard. Innovation can then follow from that action. For example, the standard of ISO14000 is a big impetus for movement of clean production in China. Many large companies are leaders in introducing the standards. This standard is the driver of managerial innovations in the case of environmental protection. For example, Bao Steel took a timely action to diffuse the ISO14001 standard in the whole company system, from design, to production, to the supply chain. This produced positive effects in energy saving and in pollution control. At the same time, the Ministry of Environmental Protection diffused the idea to regional levels, especially to many high-tech zones and economic development zones.

Standard setting is very important in some industries. For example, in vehicle and power plant industries standard setting is key to environmental innovation. Since the 1980s, China has been introducing vehicle emission standards. Modification of the old standard began in 1993, when the limit of emission was still very low. Several phases were developed following the EU standards over time. Now, the emission limit of HC, CO and NOx for gas vehicles at China Phase IV is less than 10% of that before China Phase I. As for heavy duty vehicles, the emission limit of NOx and particulates is about 10% of that before China Phase I (see Appendix 7) and meets current EU standards.

5.6 National Environment Information System

We urge that the Ministry of Environmental Protection (MEP) be empowered to establish a National Environmental Information System. For this to be successful the environmental protection bureaus (EPB) of the various jurisdictions need to be

separated from the local governments and need to report their information directly to the central system of MEP. This system would build on and substantially extend the functionality of the 3000 stations under the China National Monitoring Station system that produces annual reports. Individual governments will not necessarily welcome this separation, but it would put MEP in the position of being a third party monitoring and auditing agency. Results put together in their Control and Information Centre (CIC), would then be openly published and available widely. This availability would ensure that all information of the nationwide system could be reviewed in real time by any organization or any local, national, or international NGO or the public at large at any time.

This will take time, money, and people to implement, but would go a long way to ensuring standards were being met as standards would be published along with the information. Violations could then be identified and enforced, and suitable penalties established and implemented. This independent "auditing" would have a big impact on driving innovation, whether imported or indigenous. This innovation would in turn provide credibility for China as it seeks to export environmental technology. MEP would establish advisory committees to assist in implementation and ensuring that the best technologies were in place for the monitoring and open reporting.

By making this commitment, China would have a strong key not only to drive technological innovation, but also institutional innovation, as agencies and businesses determined how best to deal with this open and independent reporting of pollution information. It would also provide an evaluation system that could monitor the results of deployment and adoption of new technologies. This evaluation could, for example, be used to document the actual effectiveness of the various CDM projects that have been and are being implemented. In turn new regulations and new standards could be developed from this information base.

The development and operation of a major environmental information data base is truly a massive undertaking that involves uniform gathering of information of much critical data. This needs to be routinely updated and of course new techniques in both hardware and software need to be developed and implemented. Production of information nationwide on a real time basis uniformly and without opportunity for intervention at any level will require many innovations. A new cluster of innovative activity could be developed in support of and in relation to this new centre. Activities in relation to this centre could be thought of as creating a central core for the new clean tech research platform. Today information gathering can be done by wireless techniques and satellite collection to a central location. This type of centre would in itself provide a steady flow of further innovation in support of the clean tech platform. One might even think of this centre as being something like a typical space agency control centre.

5.7 Conclusion

Good regulations, high standards, and tough but fair enforcement of them are absolutely necessary if markets for environmental technology innovation are to be developed. China's enforcement is known to be inadequate. It is proposed that a National Environment Information System be developed and implemented. This system must be open and accessible and provide accurate and dependable information for all interested parties to use. Such an open system could provide confidence in knowing what is happening in a form of third party audit by MEP.

This is a massive undertaking and could anchor a cluster of innovation in its own right.

Given such a system, there are also many opportunities to set the global standard and to aggressively develop leapfrogging opportunities.

Chapter 6

Public Participation and Environmental Innovation

In recent years public participation has been developing in China in respect of environmental issues and the related environmental innovation needed to deal with these pressing issues. In this chapter we consider the role of the public and community organization in achieving sustained environmentally-friendly economic and social development. For the public to be able play their role in the government – business – civil society triangle there is need for maximum transparency in information about existing pollution, about pollution associated with new developments, about mitigation possibilities in this pollution, and the potential health and quality of life impacts. Much has been done, but a great deal remains to be done to fully empower the public.

6.1 Why Public Participation is Needed

Public participation is a necessary condition for understanding the impact of environmental pollution on communities and the environmental innovation needed to deal with the pollution. First, the public is the end user of industrial products. The complexity of environmental problems and the universality of their impact create problems that cannot be addressed by government or the market alone. It is necessary to ensure that the public is empowered to play its key role by recognizing the impact of today's pollution, as well as the potential impact of future projects. Secondly, the essence of a harmonious society is in how people can share in the benefits of regional economic development. There can be conflict between companies and local people or between governments and local companies. The company can take the profits of the project, and leave the environmental degradation to the public. The involvement of the public can bring stakeholders into the development process and thus reduce the conflict between the company and the local communities. Thirdly, economic development can only be done with public input in an environmentally sensitive way. Is it possible for regional levels of government to take the lead in competing with each other to be the best environmental jurisdiction? And in this way they can also be economically successful and help to create a harmonious society. An informed public that is listened to is a key to the harmonious society. What this means is that in the context of "It's glorious to be rich", it is necessary to be environmentally-friendly, if the objective of being rich is to be sustained. The devastation of pollution continues to rise in China and to cause dramatic health impacts on its people; the economy will in turn suffer.

6.2 Public can Play a Role

The development of environmental protection activities in western countries is inseparable from the active participation of the public. Many environmental issues have been resolved by the public, especially those who are the victims of environmental hazards. Groups who suffer from environmental hazards often launch environmental protection campaigns. These activities frequently lead government to create environmental legislation, to take management measures, and to create environmental assessment processes. But these results must be available to the public.

China's environmental protection has been dominated by government. It is worth

examining how to include people's views in the process of environmental protection and slated technological innovation. The most typical and effective approach can be seen from an example. In April 2005, the State Environmental Protection Administration (SEPA) held the first public hearing on Yuanmingyuan's anti-seepage project. In February 2006, the *Provisional Measures for Public Participation in Environmental Assessment (EIA)* were issued. Meanwhile, the higher specification and broader coverage of *Measures for Public Participation in Environmental Protection* have also been legislated. Public participation in environmental protection is important in creating the environmental policies that affect people's daily lives. The rapid development of environmental NGOs has also been important in this regard. NGOS may help to focus public opinion and thus to form policies and to hold decision makers accountable.

The public through individual action, through community organizations and through NGO's has a big impact on dealing with local environmental issues, impacting both governments and businesses. The resolution of many of these issues is through environmental innovation and again the public can both press for these innovation and assess their effectiveness. Today through the incredible power of various communication media including the internet, much can be done to keep the public engaged.

Attention should be paid for example to the Blue Planet Prize (established in 1992 by the Asahi Glass Foundation) awarded to support action for the protection of the global environment and its beauty. The list of winners is a remarkable list of distinguished citizens. It would be interesting for China to create national environmental prizes to be recognized internationally administered by the MEP on best environmental citizen or citizen's group, and on best technological innovation. These prizes would complement the ones presently awarded and give global recognition. As for public participation in the system of technological innovation, the public should have the right to be informed and even to supervise projects that damage the environment. They should have the right and the channels to obtain information about ecological technology. Public supervisory systems include public announcements, hearing systems, mass reporting systems, police and people joint supervision systems under *Environmental Impact Assessment (EIA)* as well as public opinion systems for civil society green organizations and public media.

A good example of public impact is the Sudbury area in Canada. This is a case where mining, forestry and smelting over nearly a century had devastated thousands of square kilometers around the city. Active citizens and many local groups started to force change. Eventually the companies, the local government, the provincial government and the federal government joined the effort to rehabilitate this devastated site. Today, this is considered one of the world's most successful restoration projects and demonstrates that even the most polluted sites can be regreened driven by public participation.

There are increasing examples in China of active public participation. Consider the recent public pressure in Xiamen that caused the relocation of a seriously polluting chemical factory. According to existing laws, the government's decision to build up the large chemical project in the region cannot be rejected. But public pressure changed the government's decision. (Xing Jing Bao (Daily), December 8, 2007)

The Ningbo case gives an example of public participation that is particularly effective. The case of Wuhai on the other hand documents the severe pollution from dirty

industries in an area where there are few active community organizations, few active NGOs, and little public participation.

6.3 How can the Public Participate?

6.3.1 Public Accessing Information

Before public involvement, the key thing is how the public community can get access to information. The proposed National Environmental Information System can provide a solution to this. The government and companies would have the responsibility to disclose the relevant information.

In the previous section on standards, regulations and enforcement, we made a recommendation that the MEP be empowered to institute a full Centre for Information and Control that could not be manipulated by any local or regional or national interests. Technical independent advisory committees would advise on this system. Such a system would be an essential element in empowering the public to hold governments and enterprises accountable for their actions in the release of pollutants.

In view of the dramatic health impacts on the population, it would be useful to start compiling and making public impacts on health available in the data centre (this could include WHO monitored data). There is concern that by focusing on emission intensity targets rather than total emission; that the government may be creating a false sense of security as total emissions continue to rise rapidly. By presenting authenticated results openly and publicly, and by presenting these together with the relevant standards, the public, community organizations, local NGOs, and international NGOs, can determine if standards both local and international are being met.

6.3.2 Public Hearing and Supervision

At present, the hearing system as defined in environmental legislation, environmental project assessment, environmental science and technology policy exists only to a limited extent. On environmental legislation, the State Environmental Protection Administration held a hearing on "*Regulations of Pollutant Discharge License*" for the first time on Aug. 6, 2004. This marked the establishment of an environmental legislative hearing system. Since then, consultative activities on environmental legislation have been held.

Public supervision of the environmental technology innovation process is reflected in two types of activities: one is individual reports on enterprises violating the law or regulations. The other is various measures adopted by the relevant environmental protection organizations or non-governmental organizations. As far as individual reports and supervision activity is concerned, the approaches mainly include the constant "complaint mailbox", "12369" the environmental report hotline of the environmental protection institution or its website. Personal representation to the relevant institution is also available. The modes of environmental technology innovation supervision of relevant environmental protection organizations and non-government organizations include approaches such as public meetings, public protests, establishment of green citizen organizations, citizens voting in political elections, and boycott action2. The supervision of these activities on environmental

[2] Zhuang Xiaochun, Li Changyi: *On Public Participation in Environmental Problem*, published on *Journal of the Party School of Province-Level Organs of Sichuan Province Committee of CCP* February 2003.

technology innovation not only ensures the actual application of environmental technology, but also makes important contributions to creating a system favorable for public policy input on environment and can assess the effectiveness of these measures including the risks. Public supervision directly highlights the social benefit of environmental protection. Public benefit is managed and assessed by the public, which can then effectively solve the problem as "market failure", or "government failure" at several levels or both.

The public are also consumers of many products. Where they have a choice, they will choose environmentally-friendly products. Developing green products such as solar water heaters is a strength in China. The city of Rizhao in Shandong province is a city known as sunshine city and is a model for use of solar hot water healing (*New Scientist*, Nov 10th, 2007). Appliances can be more or less friendly to the environment. There is considerable innovation needed to drive up the environmental standard, while maintaining the price.

6.3.3 Give Full Play to Social Communities, NGOs and Volunteers

As environmental problems are usually very complex, relying on government and business alone cannot resolve the whole issue. Community organizations and non-government organizations need to fill the gap that the government and business leave.

The community organization is a basic unit of society. To construct a resource-efficient and environment-friendly society, it is required to build the community into an environmentally-friendly community. Traditionally, China has laid less emphasis on the concept of the community organization, and on the social supervision function of grassroots communities. Now, the community has become a network for social management, for public service and for social support. In implementation of social welfare, social relief, social charity, occupational support, public security, family planning, health services, judicial correction, environmental protection, grassroots mediation of social disputes, and life services, the community organizations must play an active role.

Throughout the world, non-government organizations (NGOs) play an important role in environmental protection and innovation. Up to 2005, China has only 2,768 non-governmental environmental protection organizations, including 1,382 non-governmental environmental protection organizations initiated by the government. Non-governmental environmental protection organizations have 224 000 members, including 69 000 full-time staff, and 155 000 part-time staff. The average full-time staff of each organization is about 25 people; about 30% of spontaneous non-governmental environmental organizations have only part-time staff, but no full-time staff. Though China's non-governmental environmental organizations have developed quickly, the number is still limited and the scale is not large. Their role in environmental protection activities is obviously smaller than that of government environmental protection organizations. Environmental Protection NGOs should be given a greater role in the innovation system. They can effectively assess the local needs and the pollution impact already happening, as well as the potential impact of future developments. The need of innovation then is driven by addressing these local needs. NGOs can evaluate the effectiveness if given open and transparent access to all information and can press for the needed improvements.

Volunteers prove to be another important force in driving environmental innovation.

They can fill the gap left by governments and NGOs. Many volunteers can pick the best practice and diffuse them into their community. For example, in Beijing, one volunteer proposed to control room temperature using air conditions at 26º as a low cap in order to save energy. This kind of effort later on became the practice of the government.

6.4 Education, Training and Publicity of the Public

China should, through public education, training and publicity, mobilize and empower the public to carry out direct and grassroots-orientated supervision, so as to promote the development of innovation for ecology. It is important for the public to understand and be prepared to accept innovation in science and technology for sustainable development and environmental protection. This means strong outreach to the citizens of China and increased awareness and education.

6.5 Conclusion

The public, through individuals, through community organizations and through more formal NGOs has a major role to play in environmental issues. It is through this channel that the need for innovation can be manifested. In order to play the key role of civil society in the triangle between government, business and civil society there must be full transparency of information. The public needs to be empowered through access to information through the National Environment Information System proposed. The public should be in a position to hold governments and businesses accountable. The creation of community organizations needs to be stimulated. There needs to be widespread education available to ensure there is an informed public.

Chapter 7

Conclusions and Recommendations

This report has reviewed a number of aspects of innovation and the environment friendly society. China has made many major steps towards dealing with emissions of pollutants. Targets have been set to reduce emissions on a per GDP basis and steps have been taken. Significant projects (e.g., Green Gen) are under way, to develop power plants that will have zero emission, including carbon capture and storage (CCS). At the same time, the plan is to continue to increase the GDP at a rate very much faster than the planned emission "reduction". Given that the pollution levels are already well beyond the ability to support the environmentally-friendly society envisioned, much remains to be done. **Reduction targets of pollutants on an absolute level must be established.** Given the enormous level of pollution and damage to the ecology of land, rivers, lakes, air, and ocean, there is a massive job of remediation to be done as well.

In this report we have examined the need for innovation in support of environmental protection and sustainable development and what needs to be done to stimulate that innovation.

China has not escaped the pattern of many developed countries: pollution first, and control of pollution later. Environmental protection is sometimes not a precondition for economic development. China favors more direct control by command, than by regulation based on law. There are no effective market signals to stimulate environmental innovation. There is a gap between the work of university and research institutes and companies needs. Applied research institutes that function to test and diffuse new technology are lacking in China. China lacks a national environmental information system providing accurate and reliable information needed to create markets and incentives. Opening this system to the public will send this signal by creating confidence.

Facing the big challenge of heavy pollution and shortage of resources, China is in a position to lead a clean technology revolution. Without a clean technology revolution, the environmentally-friendly society in China will not be possible. In addition to dependable market signals, this will require careful investments.

The development efforts of environmental protection lie in the improvement of existing technologies (things we know), in the development of new technologies (new breakthrough technologies), and in institutional innovation. New materials (NT), biotechnologies (BT), and information and communication technology (ICT) are all seen as basic research platforms. To this must now be added clean technology (CT). It builds on new energy, new materials, BT and IT, focusing on saving energy, clean energy, and clean manufacturing.

China is confronted with a complicated situation in which it is simultaneously suffering from the double pollution of production and of daily life, co-existing pollution from point, line, and area sources; the interaction among old and new pollutants, and the international pollution of water, air, and earth. China must support science and technology for environmental protection. It must move to strengthen its indigenous innovation capacity and to realize that integrated innovation is needed for problem solving. While continuing to import advanced technology is necessary, this

will be substantially reduced over time as China moves to become a leader in innovation for an environmentally-friendly society. **China must launch a National Environmental Innovation Program.** The program will include the following key elements:

7.1 Technology Innovation for Environmental Protection and Sustainable Development

We have described the nature of the innovation process. This can be thought of as a constant flow process in which each element influences every other element, in other words, an innovation ecosystem. Some innovations are ready for adoption and deployment. Others depend on having an innovation culture and mindset that ensures that it is ready to lead and to adopt new innovations as the research and development elements evolve along many fronts. **China must be strong in all elements of the innovation process that focus on sustainable development.**

Innovation is already an important part of the national science and technology strategy (see China's scientific and technological actions on climate changes, 2007), the National Innovation Strategy (see OECD Reviews of Innovation Policy China, 2007) and the Medium to Long Term Science and Technology Plan (2006-2020). All elements of the innovation process need to function well to deal with short term needs, as well as being ready to develop and exploit future challenges and opportunities.

7.1.1 Strengthen China's Basic Research Capacity

The existing foreign technology and integrated incremental innovation are not sufficient for the goal of environmentally-friendly society building. **China needs radical and original innovation to deal with the environmental challenge.**

China needs to invest more in basic research. China is doing much in this area but must continue this development to be sure it is globally competitive in attracting and retaining the best researchers. There is a need to further strengthen China's basic research capacity, as it is the base for the next generation of innovation and for China's move to a more knowledge intensive economy. By funding competitive research, introducing prizes and scholarships, as well as broadening the base support to universities beyond the key universities, China will increase its role in global learning networks.

Another incentive that will increase China's international R&D capacity is the establishment of a number of *competence* centers for research focused on innovation with a high international scientific quality. China has already done much through research parks affiliated with universities to build university business partnerships. However, the emphasis here should be to focus more on cooperation between *research-intensive companies* and *renowned research institutions to foster technology transfer*. This will increase the effectiveness of technology introduction. Major investment to establish China as a major player in ICT, BT, and NT must continue. **China has the opportunity to establish clean tech (CT) as a major research platform and this should be done.**

7.1.2 Create Industry Sector Research Institutes

A number of academies have been moved to become for-profit institutions. This means that they are less likely to take on industry sector wide problem solving, as

these are less likely to be profitable. Specialized research institutes are needed in specific industry sectors, such as chemical, steel-making, and many others.

Industry sector research institutes serving the needs of industry sectors need to be created and funded. These would serve the need of precommercial research within the innovation process and be the locus for demonstration projects. These would be funded and managed jointly by government (MEP) and industry consortia. These new industry sector research institutes also serve the needs of regional SMEs, and help SMEs to adopt new technologies.

7.1.3 Public Procurement

In China, the public procurement system is expanding to include special support for indigenous innovation. In 2006, the government gave green products some priority in procurement. There has been no special approach to promoting environmental innovation. In European countries, public procurement is about 14% of GDP, of which 19% is for green procurement. In Sweden, it is as high as 50%.

By requiring that a minimum percentage of government funds be invested in clean technology through budget transfers, central governments can create incentives for regional and local governments to invest in green public procurement. **Public procurement can help companies to get more market share for their innovative technology and help build competitive capacity within enterprises.**

7.1.4 Greatly Upgrading SME's Innovation Capability

One gap in China's environmental innovation system is SMEs. The current ways of regulating and supporting the system leave the SMEs untouched. In future, tough measures are needed to help SMEs to get information on clean technology, to implement new technology and acquire knowledge. Secure financial support to introduce the latest technology is required. Where these smaller companies are part of the supply chain to larger corporations, high standards should be required by the large corporations. Regulations and standards should be enforced throughout the supply chain. At the same time, the proposed industrial sector research institutes should help local SMEs to upgrade their innovation capacity.

7.1.5 Innovation Financing must be Available

China needs to improve its venture capital mechanism. Venture capital is increasingly available and must continue to substantially increase if China is to develop and fully exploit "the new industrial revolution". Good examples exist, in particular where investors see the opportunity for export markets. The long term potential of environmentally-friendly companies and the likelihood of their business success given the right market mechanisms need to be recognized.

7.1.6 International Cooperation/Global Learning Networks

China has a lot to learn from the international society, but there is also a lot that China can teach the world. There are a number of opportunities for international partnerships such as CCS; biorefineries, and clean coal. China is beginning to position itself to be a leader of such consortia, as China seeks to meet its own needs. A number of Chinese institutions and companies have been developing global learning networks. This means sending students and employees abroad to study or work in teams, or inviting

international experts to participate in China based centres or clusters. This is already common practice among universities. China is the largest developing country recipient of FDI. Increasingly the focus of FDI is towards investment focusing on less polluting industries and in industries that draw on China's rapidly increasing pool of skilled talent. A study should be made of the effectiveness of the CDM process in driving innovation. Chinese enterprises are starting to invest in international businesses or in setting up research facilities in selected jurisdictions in order to be part of the global network. Additionally, China cooperates with several international partners in the creation of various eco-cities in China, aiming at creating ecologically healthy cities that balance social, economic and environmental factors to achieve sustainable development. Some portion of the funds in the environmental innovation program needs to be earmarked to support international cooperation. China should continue to actively participate in international environmental cooperation, both through public and private initiatives, as this will strengthen the country as it becomes an environmentally-friendly society.

7.1.7 Intellectual Property Rights and Leapfrogging

China needs to change its viewpoint towards intellectual property rights (IPR). Even though IPR are standardized and regulated by law in China, they are inadequately monitored and enforced, making MNEs reluctant to invest and transfer advanced and green technology to China. In spite of China's various measures to deal with these challenges, the changes needed in order to attract foreign technology will not happen fast enough to meet China's goal of becoming an environmentally-friendly society. With a complementary, rapid deployment approach, China can turn these challenges into advantages.

It is quite likely that the cost of restoring the environment by using outdated technology will far exceed the cost of acquiring and *investing* in new clean technology. We therefore urge China to acquire some of the appropriate technologies owned by foreign companies.

Investments in advanced and clean technology owned by foreign firms are comparable to investments in raw materials in foreign countries. Both are one time investments, both aim at meeting China's priority demands, and both contribute to future returns.

In addition, this will open China to significant export markets to both developed and developing countries.

Investments in advanced and clean technology will enable China to leapfrog to a more advanced technological base, which in turn will create competitive incentives for further R&D in the invested technologies.

Leapfrogging can and has played a significant role in China. **MEP should organize an intensive workshop of national and international active participants in the environmental innovation process to identify leapfrogging opportunities that will directly impact environmental technology and thus be the object of investment. This would be an in depth sequel to the Enterprise Forum of 2008.**

7.1.8 Create Experimental Innovation Laboratories

One approach to creating an environmentally-friendly society in China can be done through establishing cross-disciplinary and cross-cultural collaborative projects.

These projects would play the role of indigenous think tanks and should encourage and attract Chinese and international scientists, researchers, designers, architects, artists, philosophers, politicians, and business people, to meet, work, and study how to approach sustainable development. The aim of these projects involving government, business, and civil society should be to show how to reduce the use of non-renewable resources, as well as to show the world that it is possible to live with a high standard of living and yet have no waste since everything is utilized. China provides ecological conditions with enormous diversity; hence it would be beneficial to create such projects in different parts of China as global pilot demonstrations.

7.2 Regulations, Standards and Enforcement

In addition to the investments described in the previous section, it is only through firm and fairly enforced standards that China can both bring international innovation to China and further develop China's own capacity to meet domestic need and to further develop export potential. China has developed a set of standards and laws. Nevertheless, these standards and laws are not adequately enforced. China needs to develop a strong focus on enforcement, and to create a better monitoring system to detect environmental violations. **The cost of non-compliance must become greater than the cost of compliance.**

7.2.1 Create the Market

Enterprises are the main source of environmental technology. They are thus one of the most important actors in the creation of an environmentally-friendly society. **For China to develop and deploy cleaner and more efficient technologies, the market for environmental technologies must be created by a comprehensive system of incentives. These include enforced regulations, real pricing of natural resources (water, energy), tax incentives, subsidies, and procurement.** The government gives some subsidies to environmentally-friendly products, but the reward is far below the cost.

7.2.2 Create a National Environment Information System (NEIS)

The MEP should be funded and authorized to develop a nationwide environment information system that has independence from all levels of government and that is demonstrably a source of credible information. This information would be collected nationally and reported directly to MEP. MEP would then have the role of independent third party auditor of data at all levels of government. The information should be openly available and show the information by company and by local region. This data base, openly accessible and with data assurance in place, will then become the basis for widespread and uniform enforcement. NEIS should also have basic analytical resources, e.g., enabling benchmarking of information with emission regulations, suggesting corrective actions, etc. With this in place, innovation can be expected to flourish as it has elsewhere. Enterprises will have the needed incentive and they will have the incentive to force the same standards on their supply chains. This would involve significant funding and a change in institutions. This could be operated by an MEP Control and Information Centre (CIC). The public and local NGOs would have access to the National Environmental Information System so they can assess for themselves, with the help of experts, the impact on health and on

quality of life. **This centre would be the core of a cluster of innovation, building on the technologies required for implementation and continuing improvements.** It might even be analogous to a space centre. Manpower to develop and operate this system needs to be developed through skill training programs.

7.2.3 Improve Policy Coordination between Various Departments and Institutions

In the process of technological innovation and practice, policy makers often focus only on their own departments and units, rather than on the overall needs of nation. We therefore urge that MEP be recognized as a crosscutting agency for environmental innovation holding other agencies to account for their environmental practices. More effective coordination of policies and actions on environmental innovation cutting across all agencies would result.

7.2.4 Give Local Governments Incentives to become Best Performers

We recommend that local governments are given incentives to become best performers in environmental management and leadership. The MEP should evaluate and rate each local government based on data from the proposed National Environment Monitoring System (NEMS),and disclose the results to the public through media channels. Rating can be done, similarly to the GreenWatch program, by giving the local governments colors based on their ranked performance, with two (black, red) denoting inferior performance; one (yellow) denoting compliance with minimum emission regulations, but failure to comply with stricter requirements; and two ratings (blue, green) denoting superior performance. This would give the local governments incentives to compete with each other to improve their environmental management and in addition it gives them a chance to evaluate their own practices. This should also give the public means to demand more from their local authorities and become more involved in environmental conservation and innovation. The ranking of the local governments can be constructed as a system which is based on internal reporting from the local government, benchmarked towards NEMS, and with external evaluations from the MEP, as well as surveys of how the public perceive the performance of their local government.

7.3 Public Participation

We know that involvement of the public has been key to innovation in environmental issues. In the end, it is the citizens that will benefit from a successful model of sustainable development leading to both jobs and prosperity through economic growth, and doing this in a way that increases the quality of life.

A start has been made on empowering citizens and NGOs to be highly active in ensuring that they can increase their quality of life without fear of punishment or environmental disaster. This must be developed much further. These organizations must be kept independent and at arm’s length from government if they are to hold officials accountable in the three-way relationship between government, business, and civil society.

7.3.1 Increase Public Awareness

The public needs to be educated, gain awareness, and receive credible information so

that they can develop their own actions. By making full use of local and civil society organizations to actively launch green civilization activities, such as green districts, green communities, green schools, green parks, green cities, and green units, China can gradually encourage all people to participate in green action. To trigger these actions, China could establish local and regional competitions for citizens and citizen groups for best environmental practice, to be covered, for example, by regular television programs. This could also be extended to include businesses on best technological innovation and environmental practices, including international cooperation. We also recommend that the Chinese Government plays a redistributive role of directing funds towards less developed areas of the country in order to empower and create higher public awareness among the citizens in these areas as well. This might be done by creating separate programs in these areas, grass root campaigns, and more funding and human resources to enhance relevant education. Green public actions and awareness will enable Chinese citizens to take pride in helping China to become an environmentally-friendly society.

7.3.2 Public Involvement in Local Environmental Protection

With increased public education and awareness towards building an environmentally-friendly society, the public should be able to inquire and supervise projects that could potentially damage the local environment. **By creating public reporting and opinion channels, the public will have the opportunity to actively and directly participate in the protection of their local environment.** Additionally, it will increase the effectiveness of the National Environmental Information System.

7.3.3Make Civil Society a Key Actor in the Environmental Innovation System

The public as consumers and users of environmental products can be potential innovation drivers. If the public is involved in the innovation ecosystem, they will help to build the environmentally-friendly society. It is best to have some competition for environmental ideas in the media, such as in CCTV. The ability for informed criticism is one element of the harmonious society.

7.3.4 More Emphasis on Innovation in the Education System

China has been a remarkably creative society in the past. This is rapidly developing again in these transformative times. **The Chinese education system needs to focus more on creativity and less on textbook learning.** Today's problems in topics such as sustainable development do not relate well to the traditional single discipline focus that dominates the education system of so many countries. Creativity demands tolerance for failure and repeated effort. In China mistakes can often lead to punishment. The opportunities and challenges that face China know no boundaries. Boundaries between disciplines, between government ministries, and between different levels of government need to be reduced and made more transparent.

China has both the capacity and the need to become a global leader in sustainable development and innovation in environmental technology.

——This report was provided by the Task Force.

Environment and Health Management System and Policy Framework

2008 CCICED Policy Study Report

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Executive Summary

Since the adoption of the reform and opening up policy in China, China's social economy has witnessed tremendous changes. The economy develops rapidly, the living standard of the ordinary people is raised drastically, and the social security such as education and medical care is improved considerably. However, under the combined action of the economic structure, the economic growth mode, the population pressure and the accelerated development of urbanization, the environmental problems in China are getting increasingly severe, and disputes and group events triggered by the environmental problems are also on the rise. With the improvement of the environmental awareness of the public and the appearance of the accumulative effect of environmental pollution, the adverse impact of the environmental pollution on human health is drawing much more attention.

It is true that the Chinese government has done much work in coping with the environment and health issues, which makes positive achievements: under the huge pressure of environmental resources, the rapid economic growth doesn't bring about the sharp deterioration of the environment, the tendency of environment deterioration is basically controlled, and the environmental quality in some areas is even improved to some degree. Meanwhile, the medical and health service level in urban and rural areas upgraded significantly, allowing the effective control over the infectious disease, increase in the life expectancy of the population, and the decline in infant mortality rate and the maternal mortality rate. Nevertheless, a great deal of problems and challenges still lie ahead of the Chinese government in respect of the prevention and treatment of the adverse impact on human health incurred by the environmental pollution, and a set of effective environment and health management system and mechanism is in urgent need.

With the successful holding of the Beijing 2008 Olympic Games, China draws wide attention throughout the world. In particular, the social, political and environmental issues of China have become the focus of the people worldwide, with no exception of the environment and health issues. Many international organizations and countries show much concerns on China's environment and health issues, hoping to learn more about the basic situation of China's environment and health issues, and the World Bank even conducts research and evaluation on the damage to human health caused by the environmental pollution in China.

Therefore, the environment and health issues in China have become the hot issues concerned commonly at home and broad. In line with the principle of satisfying the domestic demands, embodying the common concerns and active participation, China Council for International Cooperation on Environment and Development (the CCICED) established the research subject of "China's environment and health management system and policy framework" in 2006, with the aim of analyzing the problems and challenges confronted by the environment and health management of China, learning the experience and lessons from the international environment and health management, constructing China's environment and health management system and policy framework, and offering policy suggestions for the government to further strengthen the environment and health management.

The State Environmental Protection Administration (existing Ministry of Environmental Protection) and the Ministry of Health vigorously supported the

establishment of the subject team, and helped the CCICED to found the Chinese and foreign expert group for the subject team, and the secretariat for the organization and implementation of the projects. The Ministry of Environment of Japan and Rockefeller Brothers Fund provided financial support for the implementation of the subject, and the Japan OECC undertook the task of coordinating the work of the foreign experts. The Policy Research Center for Environment and Economy of the Ministry of Environmental Protection, as the secretariat of the subject team, undertook the task of the organization and implementation of various works of the subject team, the communication and coordination of the experts, the routine management and etc.

To promote the smooth development of various work of the subject team and to ensure the quality of the research results, the subject team successively organized two subject team leader conferences, respectively discussing the subject research framework, the work plan and the policy suggestion report. The Chinese and foreign expert group leaders and core members, and officials from the Ministry of Environmental Protection, the Ministry of Health and the Ministry of Environment of Japan all attended the subject team leader conferences. On top of that, the subject team also successively held three subject team conferences, respectively discussing the work plan, the mid-term and final research results and the policy suggestions. The Chinese and foreign expert group leaders and all experts, the officials from the Ministry of Environmental Protection, the Ministry of Health and the Ministry of Environment of Japan as well as the representatives of relevant organizations all attended the subject team conferences. Through the subject team conferences and the subject team leader conferences, the Chinese and foreign exports came to an agreement on the research tasks, the work plan, the interim report and final reports, the summary reports and the policy suggestion reports and other items, and brought forwards suggestions on the further revision and perfection of the items discussed.

In line with the actual demands of the environment and health management of China, the research content of the subject is mainly divided into four parts: the analysis on status quo of the Chinese environment and health problems and the Chinese environment and health management, the international experience and lessons on environment and health management, the construction of the Chinese environment and health management system as well as the policy and legal framework of the Chinese environment and health management.

The research shows that the Chinese government still faces formidable conditions and challenges in the course of development of environment and health cause. First of all, the environmental pollution situation remains severe, a number of people are still exposed to the environment that is seriously polluted (air, water, soil and noise), and huge environment and health risk is latent. Secondly, China's environment and health problems are not clear presently, and there are much hidden danger in environment and health. Besides, the environment and health management work is still weak, and the prevention, early warning, treatment and other jobs concerning environment and health issues have not been developed effectively, unable to meet the needs of the public for the environment quality and health and safety; in some areas, the social stability and harmony are even affected.

International experience and lessons indicate environment and health problems which are handled improperly may develop into complex social and political ones, which not only gravely jeopardize the public health, affect the credibility of the government, but compel the government to pay a heavy economic cost. Their main

experience and practices are: The first is to intensify prevention and make active intervention so as to avoid environmental pollution from threatening the human health; the second is to improve legislation, intensify the administration of justice, and establish an environment and health-related dispute settlement mechanism and a health compensation mechanism.

Considering the increasingly grievous environment and health situation at present and possibly more environment and health risks in the future in China, the subject team recommended that the Chinese government should raise much concern on environment and health issues, further enhance the environment and health management, and improve the management system and mechanism, lay emphasis on intensification of preventive works, develop the environment and health management work with the risk prevention as the core. It also suggested that priority should be given to solving hot issues in environment and health which cause much attention from the people so as to maintain their environment and health rights and interests.

The concrete policy suggestions are as follows:

The government is the main responsibility body for environment and health management, and should strengthen their leadership, make clear their responsibility and establish an environment and health management system featured by the domination of the government and the wide participation by the general public. The environment and health departments and other major governmental departments should set up special agencies based on their respective functions and equip themselves with sufficient human and financial resources to ensure the implementation of government functions.

The government should reinforce the legislation construction on the environment and health management, with the focus on the legislation and enforcement construction of the environment and health prevention, and establish the settlement mechanism for the environment and health disputes to protect the environment and health rights of the public. It should also gradually establish and perfect the environment and health-related dispute settlement mechanism, provide the dispute parties with various methods to settle the disputes, including regulation, administrative settlement, arbitration and litigation, and gradually establish and implement the compensation system for the damage to human health induced by the environmental pollution, so as to safeguard the public environmental rights and interests.

In conducting the environment and health management, the government should adhere to the principle of focusing on prevention and take effective measures to avert environment and health risks; establish the prevention system by perfecting the environmental standard system, setting down the directory of priority-controlled pollutants, framing and implementing strict environment access system and other policy means and measures; further strengthen and improve the building of the environment and health monitoring network, especially increase environment monitoring and health impact monitoring related to the crowd exposure level; and gradually develop the early warning mechanism related to environment and health, conduct the environment and health risk prediction, and take prompt measures to avoid or reduce the significant damage to human health imposed by the environmental pollution.

The government should increase financial input and reinforce the environment and health management capacity building. The national and local financial departments should increase investment to support the capacity building of and basic research on the environment and health management. The state may consider the establishment of an environment and health fund mechanism, where public interest compensation can be made for health damage from historical environmental problems, for having no civil compensation capacity on the responsible part, and to victims for whom a principal responsible part is hard to be defined; the state may also support development of environment-caused health education and health damage rehabilitation and other activities. At the same time, the government should establish various social financing channels to raise environment and health funds; and stick to disclosure of environment and health information and encourage public participation in environment and health management. It should opportunely release environment and health information to which the masses pay attention on the government's websites and various news media and the like in a way of easy access and understanding by the public; set up channels for the public to participate in environment and health management, further improve complaint handling via letters and visits, public notification and other systems; strengthen supervision by the public, social groups and media over the environment and health work, encourage the public to inform against and report violations of environment and health regulations, and fully listen to comments from the public on the environment and health work by holding meetings of experts, demonstration meeting, hearings and other ways.

With regard to features and prominent problems of environment and health in China, the government should conduct the environment and health work with focus and take targeted intervention measures. As for the environmental pollution that has caused damage to and disease of the human health, the government should immediately eliminate and harness the pollution and give positive health intervention or medical treatment to the victims; as for the pollutants that may cause serious health hazard, the government should make the priority control directory, the health hazard assessment and the environment access standard and diagnostic standard, strengthen beforehand intervention, and monitor the level of environmental pollution and its impact on human health, so as to avoid and reduce the health impairment incurred by the environment pollution. Meanwhile, to those environmental factors with clear effect on health not identified, it should enhance researches and take positive preventive measures.

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Preface

The environmental and health problems are of complexity and related to the two factors of environment and health. The environmental and health problem includes two sides in the broad and narrow. The latter is a major proportion in this study on the environmental and health problems. It is mainly studying and probing the interrelationship between the impact of the new environmental factors produced by human activities such as human production and living as well as changes of such factors on health. And it is studying the rules and problems existing between the two and is probing ways and measures to reduce or eliminate the adverse impact of changes of environmental factors on human health.

The main aim of this subject is to build up China's environment and health management system and policy framework, probe a policy system for China to establish an environment pollution compensation system according to China's actual needs in implementing effective environment and health management and by reference to international experience. Finally, the subject team will put forward a proposal for establishing an effective environment and health management system and a policy framework to the Chinese government in light of domestic and foreign experience and the study results achieved by the subject team.

The main contents of this study contain five parts, i.e. analysis of the status quo, international experience, policy framework and legal system, management system and policy proposal.

1 Status quo of Chinese environment and health problems:

Since 1980s when China implemented the reform and opening-up policy, China's social economy has developed with high momentum. Nevertheless China's environment and resource issue is increasingly prominent. The environment pollution issue in China is widely concerned, the pollution situation is serious, and the environmental pollution is worse than ever. But with the joint effort of the governments at various levels and the relevant departments, the growth rate of the pollution is sluggish and lower than that of the economy. In some areas, the pollution level even keeps stable.

1.1 The basic situation of the environmental pollution in China

1.1.1 The air pollution remains serious, threatening human health

According to 2006 Report on the State of Environment in China, only 24 cities reached Grade I Air Quality Standard (accounting for 4.3%); 159 cities met Grade III Air Quality Standard (accounting for 28.5%) and 51 cities remained lower than Grade III Air Quality Standard (accounting for 9.1%). It deserves considerable attention that as much as 37.6% of the cities under air quality monitoring failed to meet the national Grade II air quality standard, and some cities are still obsessed by the serious air pollution.

At this moment, the air pollution in China has the following characteristics: a. Coal-burning air pollution is prevailing in provinces abundant in coal and northern areas, oil-burning air pollution is commonly seen in developed areas and southern cities, and the compound air pollution with both the coal-burning and oil-burning pollution has emerged in many large and middle sized cities. In different seasons of different areas, the pollution sources are various. b. Air pollution in mega-cities and super large scale cities is significantly serious than that in the middle and small cities, especially in mega-cities with population being more than 1 million. c. Particulate in the atmosphere is the main pollutant, followed by sulfur dioxide. NOX pollution level is on the rise in some big cities.

At present, indoor air pollution caused by decoration and fitment has become common in cities or relatively developed towns. Additionally, much attention has been drawn to the sanitation and safety of central air-conditioning system in the cities.

In the rural area of China, 80% of the rural households use the solid fuels as the major supply of life energy. It may bring about the serious indoor air pollution. Coal burning contributes a lot to the SO2 pollution, and the incomplete combustion of biomass fuels gives out particulate matters, carbon monoxide, polycyclic aromatic hydrocarbons, sulfur dioxide, nitrogen oxides, aldehydes and ketones compound and other hazardous substances.

1.1.2 The drinking water situation is serious and the pollution accidents frequently occur, both of which jeopardize human health.

It is shown in the 2006 Report of State of Environment in China that, among 408 monitoring sections of 197 rivers in seven systems, the monitoring sections which are up to the Grade I～III Water Quality Standard, Grade IV Water Quality Standard, and

Grade V Water Quality Standard and the even worse accounted for 46%, 28% and 26% respectively. Among 27 lakes or reservoirs under the key national monitoring, the lakes or reservoirs which met the Grade I～III Water Quality Standard, Grade IV Water Quality Standard, and Grade V Water Quality Standard and the even worse constituted 29%, 23% and 48% respectively.

In rural areas of China, people there takes ground water as the main water supply. A nationwide survey on rural drinking water and environmental sanitation was conducted during August 2006 to November 2007, and the result showed that: the over standard rate of drinking water that fails to meet the basic hygienic safety standard is 44.36%. the surface water claimed the over standard rate of 40.44%; the underground water claimed the over standard rate of 45.94%; the centralized water supply claimed the over standard rate of 40.83%. For the past three years, the water plants financed by the Central Government have claimed the over standard rate of 38.99%, and the decentralized water supply has claimed the over standard rate of 47.73%. The main factor for the over standard rate of rural drinking water is the over standard of the microorganism index. And the low disinfection rate of the rural drinking water is the main reason for the over standard of the microorganism index.1

1.1.3 The soil environmental pollution can not be neglected, and the potential harm is huge.

According to the incomplete statistics at the end of 2006, the cultivated land nationwide polluted is about 150 million mus, the cultivated land polluted by waste water irrigation is about 32.5 million mus, and the cultivated land that is occupied or damaged by solid waste is 2 million mus, totaling up to more than one tenth of the total area of the cultivated land. Majority of these cultivated land polluted are centralized in the economically developed areas. It is estimated that grain polluted by heavy metals in China reaches as much as 12 million tons each year, with the direct economic loss triggered surpassing 20 billion yuan.2

Wastewater irrigation is one of the key factors for the soil pollution. This largely accounts for the adverse effect of soil pollution on health. The irrigation with urban domestic wastewater may cause the pollution of pathogenic microorganism in the soil, while the organic wastewater from industries such as metallic ore mining and dressing industry, metal smelting and processing, petrochemical processing, printing and dyeing, pharmacy and chemical are most dangerous to the soil polluted by the industrial wastewater irrigation. The pollution is mainly centralized in the farmland irrigation areas, and the cadmium and lead contained in the irrigation water injure the health of dwellers around the irrigation areas. Irrigation with petroleum water results in the accumulation of the polycyclic aromatic hydrocarbons (PAH) carcinogen such as BaP, which also pollutes the ground water. At the same time, the improper treatment of the industrial solid wastes and the abuse of pesticide and chemical

[1] Data source: Website of the Ministry of Health of PRC http://www.moh.gov.cn/sofpro/cms/previewjspfile/mohbgt/cms_0000000000000000144_tpl.jsp?requestCode=27879&CategoryID=4811

[2] Data source: Website of the Ministry of Environmental Protection of PRC http://www.zhb.gov.cn/natu/yjsp/qgtrxzdc/200612/t20061231_99195.htm

fertilizer are also two main factors for the heavy pollution of the soil, leading to the pollution of heavy metals such as cadmium, hydrargyrum, lead, chromium and thallium, which deserves much attention.

1.2 Health damage induced by the present Chinese environmental pollution:

1.2.1 Health damage induced by air pollution

Among many air pollutants, the biggest threat to health damage comes from the particulate matter, SO2 and NOx. A survey on urban air pollution and resident mortality in 26 cities was once conducted3, and the result shows that: a. Coal-smoke pollution caused by coal burning is the leading factor of urban air pollution in China; b. Malignant tumor especially the lung cancer is the main cause of death of urban residents; c. The distribution of lung cancer mortality is in conformity with the air pollution degree in 26 cities; d. The severity of air pollution resulted by the industrialization and urbanization is in conformity with the distribution of lung cancer mortality.

The Meta analysis of the relation between the airborne fine particulate pollution and the daily mortality in recently years shows that every increase of 100ìg/m3 of the air PM2.5 concentration is coupled with an increase of 12.07% 4of the mortality. The research work in Beijing, Taiyuan and Shanghai also indicates that the air pollution, in particular the suspended particulate pollution, is linked with the incidence and mortality of cardiovascular diseases. Moreover, it shall deserve much concern that the low concentration of air pollutions can have a chronic influence on human bodies and this should not be neglected.

The health damage created by the air pollution of formaldehyde and benzene series (including benzene, toluene and xylene), which is related to the indoor decoration, has drawn more concern from people. According to a survey on the indoor air pollution in offices induced by decoration and its health effects, office decoration with bad materials may produce some adverse effect on the health of the working staffs, and the degree of the adverse effect is positively correlated with the concentration of formaldehyde, ammonia and benzene5 in the office.

The indoor air pollution created by the combustion of fuels in rural areas has some major effects on human health and especially the respiratory system. The air pollution is closely related to the symptom of respiratory systems and the lowering pulmonary functions of dwellers.

1.2.2 Health damage induced by the polluted drinking water:

At present, there still remain the waterborne diseases caused by biotic pollution. However, the water biological pollution remains one of the main factors that affect human health at present and quite a long time in the future, especially in the extensive

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[3] Review and Prospect of Environment and Health, edited by Geng Jingzhong

[4] Journal of Environment and Health, Issue No 4 of 2005

[5] Journal of Environment and Health, Issue No 5 of 2006

central and western rural areas, where infectious diseases remain one of the main factors leading to the death of children under the age of 5.

Due to the discharge of the industrious, agricultural and domestic wastewater, the total nitrogen and total phosphorus have exceeded the water environmental capacity, leading to the lake eutrophication in China, especially in Lake Tai, Lake Cao and Lake Dian. Besides of affecting the urban water supply, water eutrophication also results in the mass multiplication of the algae, forming the algae toxins. When water in such lakes is taken out as drinking water, after chlorination, the algae organic matters may react with the chlorine elements to produce potential carcinogenic and mutagenic disinfection by-products, posing potential danger for people drinking the water.

In recent years, people have paid more and more attention to the chronic influences of water pollutants on physical health. Taking persistent organic pollutants (POPs) as example, because it is difficult to be degraded, its effect on human health has become a major study subject in the global environmental sanitation safety and food sanitation safety system. Dioxin and furan discharged from the production process and domestic burning widely exist. Researches show that many POPs can disrupt the structure and functions of the body endocrine system and produce various toxic effects, and are called the environmental endocrine disruptors. The types of chemicals that have been proved or suspected as the environmental endocrine disruptors surpass 150 varieties. China started relatively late in the research of this respect, still lacking big samples and thorough epidemiology research data. Health damage related to POPs represents one of the pending environment and health issues for China.

1.2.3 Health damage induced by the polluted soil:

The soil pollution caused by urban wastewater irrigation may produce various pathogens, which will cause various digestive symptoms that affect human health. The salmonella and ascarid infection rate, the infant acute diarrhea incidence and its mortality of the residents in wastewater irrigation areas are far higher than that in the control area.

The health damage posed by the heavy metal pollution in the soil is also formidable. According to the survey[6] on the growth and development of children that are exposed to the cadmium pollution in respects of height, weight, chest circumference, vital capacity and other indexes, the growth and development of children in the polluted areas lags behind that of the control area, indicating the adverse effect of the environmental cadmium pollution on the growth and development of the children under exposure. According to the survey[7] on the reproductive health of the reproductive women that are exposed to the cadmium pollution, among the reproductive women in the polluted areas, the rate of sterility in married women is significantly higher than those in the non-polluted area, and the rate of early birth and stillbirth in married women is also significantly higher than those in the non-polluted area. The standardized mortality of the group that suffered from malignant tumors, respiratory

[6] Journal of Environment and Health, Issue No 1 of 1995

[7] Chinese Journal of Epidemiology, Issue No. 10 of 2004

disease, digestive disease and the neonatal diseases in the polluted areas is higher than that in the non-polluted areas.

1.3 Characteristics of environmental pollution and health damage in China:

The unbalance of regional economy development and geographic diversity results in the current condition that traditional and modern environment and health problems coexist. The unfavorable impact of environmental pollution on residents' health is in sight gradually. The environmental pollution in some regions has led to severe health damage.

As the government departments at all levels attach more importance to the environmental pollution problems, an increasing investment is made in the control of environmental pollution. In terms of the local environment, some polluted regions have witnessed an improved environment and controlled the undesirable impacts of environmental pollution on physical health. Since the environmental pollution have various ways of access to human bodies and a long-term influence, together with the serious combined pollution of various pollutants, the human bodies will face the complicated health effects related to environmental pollution, resulting in much difficulty for research and management work.

Generally speaking, the environment and health issues in China have the following characteristics:

(a). High pollution degree. The air and water environment in some areas of China are in serious pollution. And at this moment, the quality of air and water has not reached the national Grade II standard. While the national environmental standards of China are far lower.

(b). Large population exposed and broad exposure approaches. It is preliminarily estimated that more than 150 million people in cities at prefecture level and over in China are living in seriously polluted air environment[8]. The environment pollution has formed a situation where the point source pollution and the area source pollution coexist, domestic pollution and industrious discharge overlap and traditional and newly emerged pollution intertwine. The environmental pollution is complex than ever before, and various environmental media are all polluted. All that makes people easily access the pollutants via various environmental media, leading to the diversification of the damage to human health

(c). Notable urban-rural difference. As for the urban areas, air pollution brings great damage to human health. As far as the rural areas are concerned, due to the insufficient guarantee of the drinking water safety, the drinking water pollution causes

[8] In 2006, the total population of the cities at prefecture level nationwide was 368 million with the mobile population exclusive. And if the population at county level cities and the mobile population are counted in, it is estimated that nearly a population of 200 million are exposed to the heavily polluted air environment.

damages to human health; as the water pollution triggers the soil pollution. Intestinal infectious diseases and tumors are two health impairments induced by water pollution, with the incidence being on the increase. In recent years, the high incidence of the digestive system tumor in some areas is correlated with the drinking water pollution to some extent.

(d). Both the traditional pollution and the newly emerged pollution are severe. Since the 1990s, China has not only failed to bring the problems of environmental pollution under effective control, but also reported a deteriorating trend. The status of environmental pollution are quite serious. The emergency of new products and new industries also leads to the appearance of new compounds, and the newly emerged pollution produced by the production and use of new chemicals intertwine with the traditional pollution to form the compound pollution, which perplexes the environment and health issues. Now we are confronted with more complicated health issues.

2 Analysis of problems and requirements of the Chinese environment and health management

2.1 Status quo of the Chinese environment and health management

At present, the environment and health issue in China is quite outstanding. In recent years, the health damage caused by environmental pollution has experienced an annual increase and adversely affected the social stability and development as well as the construction of harmonious society. Currently, the environmental problem is highly valued by the Chinese government departments. The Chinese environment and health management is being reinforced gradually based on the previous work. Yet, its foundation is still rather weak, and the related scientific research and technical support systems are less than well-established so that the environment and health management as a whole remains at a low level.

2.1.1 System and mechanism of the Chinese environment and health management work

The Health Supervision Bureau and the Disease Control and Prevention Bureau are in charge of the environment and health management of the Ministry of Health, with the focus on the drinking water sanitation in urban and rural areas, the administration of products related to water and the public place sanitation. At this moment, the Ministry of Health, the disease prevention and control centers at different levels as well as the hospitals have developed a set of public health and disease prevention and control systems so as to monitor and deal with the health problems concerning the environmental pollution.

The environment and health work of the Ministry of Environmental Protection also develops rapidly. In January 2005, the former State Environmental Protection Administration established the special Environment and Health Monitoring Office in the Department of Science and Technology and Standards to take charge of the administration and guidance of the environment and health work in China. Currently, it emphatically carries out the basic survey of environment and health, the construction of basic legal system, the management and assessment of technical specification, the study and establishment of standards and etc. Yet, the environmental protection departments at the provincial level or below haven't had the corresponding agencies in charge of environment and health management.

Presently, China's environment monitoring ground network system centering on the state control network monitoring station is preliminarily formed. In addition, thanks to the continuous development for over three decades, China has created the well-established urban air quality automatic monitoring system and the surface water automatic monitoring system so that the automatic monitoring capacity of pollution sources has experienced a rapid growth.

The environment and health management involves many departments. To solve this complicated issue and complete the arduous tasks, we must strengthen the communication and cooperation of various departments.

To this end, the State Environmental Protection Administration (SEPA) and the Ministry of Health jointly established the Cooperation Mechanism of the State Environmental Protection Administration and the Ministry of Health on Environment and Health Work in 2006, to study the micro administrative policies on environment and health to be formulated or required to be adjusted significantly, and direct the environment and health work.

2.1.2 Scientific & Technical support conditions of the Chinese environment and health management work

Since 1980s, based on the scientific research institutions such as the Chinese Research Academy of Environmental Sciences(CRAES) and State Key Laboratory of Environmental Protection and Environment and Health, China has organized and developed a series of field investigations and fundamental researches, preliminarily grasped the state the health damage resulted from some regional environmental pollutions and about the emission conditions and pollution routes of the pollutants capable of health damage, organized the tracing monitoring over the key areas with possible public nuisance diseases, conducted the follow-up investigations of health conditions of those permanent residents living in pollution areas, and strengthened the supervision and management of environment and health, laying a sound foundation for the environment and health management work.

As regards to the scientific research achievements, the health and epidemic prevention stations, scientific research institutes and colleges and universities in various regions have conducted a lot of investigation on the relation of the environment and health. For example, since 2000, the quantitative study of the effect of coal-smoke pollution on human health, urban air pollution and residents' health, the living environment monitoring and its effect on human health, research on the technology of controlling the damage of indoor air pollutant to human health and other studies have been conducted, attaining substantial achievements.

In China's environment and health management, it also can not be neglected the function of colleges or universities. They are a senior professional structure carrying out environmental science and health research. They have a high standard of environmental science experts and a wealth of young talent resources, and they are one of the important power in the Chinese team of environment and health.

2.1.3 Policies and regulations related to China's environmental and health management work

Environment and health work involves many disciplines and departments, and yet the existing environmental management standards, policies, laws and regulations are a lack of convergence with most health problems. In addition, comparing with environmental pollution work of prevention and treatment, it late starts that environment and health work in China. And the existing environment system has not

yet defined the requirements in the work of environment and health. At the same time, it is a lack of the standards, laws and regulations, related to environment and health.

In order to effectively promote the environment and health work in China, and use the experience of other countries for reference, aiming at those outstanding problems in the field of environment and health in China, on November 6, 2007, 18 ministries and commissions including the Ministry of Health and the State Environmental Protection Administration jointly promulgated the National Environment and Health Action Plan (from 2007 to 2015). As the first programmatic document in China's environmental and health field, the Action Plan fully demonstrates the Chinese government's attitude and determination to carry out the basic national policy of environmental protection for people, indicates the development direction and main tasks of China's environmental and health undertakings in the future, defines the jobs and responsibilities of relevant departments and creates a new situation where concerted efforts are made to promote development of the environment and health cause. It is of practical guiding significance for advancing development of China's environmental and health cause in a scientific manner.

2.1.4 Funding mechanism related to China's environmental and health management work

The environment and health work has long been presided by different sectors, so the associated links of the environment and health become the weak point of the management. The study on risks of environmental health damage requires a great many samples, a long cycle and a huge amount of money. But over a long period of time, development study has been stressed in China's scientific researches. The money allocated for investments in scientific researches is not enough in such public fields as environment and health which are related to public interests and the system for investments in scientific researches has not been rational.

Before 1980s, relying on the disease prevention and control system of the health system and the management monitoring system of the environmental protection sectors, China basically established teams and networks at four levels of city, county or district, town and village, and effectively launched various environment and health work.

2.2 Problems existing in current environment and health management work

2.2.1 The environment and health work management is loose, lacking a long-term mechanism.

Nowadays, the environment and health work in China has two centralized units-the Ministry of Health and the State Environmental Protection Administration. China established the "Mechanism between Ministry of Health and State Environmental Protection Administration for Cooperation in Environment and Health Work" in 2006, released the "National Environment and Health Action Plan (2007-2015)" in 2007, defined the responsibilities of 18 relevant departments for supervision and management of environment and health according to their administrative authority, proposed to establish a work mechanism for cooperation between the state, localities and departments In 2008, the national environment and

health work leading team was established in line with the requirements of the Action Plan, however, owing to the fact that these mechanisms and leading teams are at their primary stage, and their effect still needs further observation. After all, the problems existing in the environment and health work of China can not be solved merely through coordination, and a definite centralized management department is necessary.

2.2.2 The environment and health management professional team construction and the technical force are insufficient.

The environment and health problems belong to the new sphere under environment management and the construction of local environment and health management team has to be strengthened. The environmental protection sectors at all levels should actively cooperate with the State Environmental Protection Administration on the environment and health investigation to find out the environment and health damages within their respective jurisdictions. Special monitoring personnel should be designated and corresponding law enforcement teams should be established in key areas. In addition to that, the environment and health issue which is featured by cross-discipline and cross-sector requires strong specialization and policy nature, but the professional technical reserve, the scientific research ability and the existing facilities of the environment and health work are all limited, leading to gaps with the practical working need.The requirements for the professional team reconstruction and staff ability cultivation of the environment and health work is imperative, so we must conduct relevant work as soon as possible, and cultivate professionals in practice, enabling them to accumulate work experience and raise their technical level.

2.2.3 The basic study on the environment and health is weak, and the investigation, study and monitoring of human health is imperative.

Currently, in China the base number of health damage cases caused by environmental pollution is obscure and the basic data is deficient, therefore it is difficult to tackle the health damage problem.

For this reason, the investigation into human health damage caused by environmental pollution should be carried out. We need conduct environment and health investigation in key areas to find the pollution source that affects human health and conduct environment and health investigation in typical areas to gradually grasp the basic data so as to understand the health status of the group related to environmental pollution; we still need to launch cutting-edge scientific researches in the environment and health work field, such as conducting research on the damage of the main environmental pollutants to human health at the present stage of China and conducting the health-based risk assessment on the main pollutants; study the effect of environmental pollutants on damage to health, and establish health-monitoring networks, etc.

2.2.4 Early warning against environment and health risks and the ability to deal with emergencies need to be strengthened

It’s necessary to warn against serious environmental pollution and damage to health that may happen in environmental and health management, and analyze, forecast and take countermeasures early so as to prevent the occurrence of serious

environmental pollution and the damage to health. Considering that damage is often caused by emergent environmental pollution to human health in China, measures for rapid response to emergencies should also be taken immediately against emergent impairment caused by environmental pollution to health.

The work of environment and health is an important content of environmental protection work in China. At this moment, the environment monitoring information data and the human health monitoring data are in separated systems and cannot be shared. Besides that, the environmental monitoring data can not meet the demand of human health monitoring. Viewed from the long-term development, to establish the information database and work network on environment and health and as well as realize information sharing is one of the basic conditions for conducting environment and health work.

2.2.5 The environment and health management work lacks funds guarantee, and more investment is needed.

Although China pays more attention to the environment and health works, and the Chinese government obviously invests more than ever before, in environment and health management work, it is still far from meeting the requirements of the work. As compared with the developed countries, there is still large gap in terms of the investment in the environment and health research.

2.3 Requirements for policy in strengthening China's environment and health management

Since the foundation of the Chinese environment and health management work is weak, currently the Chinese environment and health management remains at a low level. As far as the policy is concerned, at least the following several aspects should be enhanced:

2.3.1 The administrative system for the environment and health administration needs to be established and perfected.

In a word, the Chinese government has not yet established a set of administrative systems that can effectively and completely solve the issues on environment and health. The State Environmental Protection Administration and the Ministry of Health are two major sectors that are related to the environment and health management, but they don not have the functions relevant to the environment and health affairs in their governmental management functions as endued by the State Council. At the same time, the National Environment and Health Action Plan should be implemented with the close cross-sector cooperation. Though it divides the functions for relevant governmental departments, its own authority and public trust are questioned. The unclear of governmental functions on the environment and health management has not been solved fundamentally. Meanwhile the effect of the existing coordination mechanism for environment and health work remains to be observed. Therefore, the first task for the Chinese government to form the environment and health management system is to clearly divide the functions of relevant government departments based on the principle of "prevention first and combination of prevention and treatment" according to needs from the environment and health management work, and to set up

special agencies in important departments to fulfill the environment and health management functions.

2.3.2 A set of complete laws and regulations system and policy needs to be formulated

The existing laws and regulations system is yet to be perfected and couldn't well meet the demands of the present environment and health management work. For example, the existing process of environmental impact assessment tends to lay more emphasis on the effects on air, water and soil, etc, overlooking the impacts of environment on health, etc. Therefore, in view of the problems existing in practical work, the existing environment and health laws and regulations need to be improved on the whole to form a complete system. As the management works of environment and health are charged by different departments for a long time, the existing standard system and technical norms, etc couldn't satisfy the demands of environment and health management work. It is required that the managing organs, after taking the Chinese specific national conditions into account, plan and coordinate the revision of standards as a whole, perfect standard system and press forward to formulate the basic standards urgently needed in important areas of environment and health, so as to guarantee smooth progress of environment and health work.

2.3.3 The prevention, early warning and emergency mechanism of environment and health risk management needs to be established.

Currently, the environment and health risk management system is not perfect. In order to enhance the capabilities of prediction and management and decision-making on controllable environment harmful factors and their health damage, it is required to carry out the assessment on environment and health risks in accordance with the conditions of environmental pollution and environment impacts on health and the existing management policies, etc. The relevant organs should, on the basis of scientific assessment, give early warning on the possible severe environmental pollution and health damage, realize the targets of early analysis, early forecast and early intervention to prevent the occurrence of significant environmental pollution and health damage. Moreover, the department concerned should strengthen the building up of the handling capability of rapid response to emergency cases involving environmental pollution and health damage, establish and improve the emergency mechanism. When the emergencies happen, the departments of health and environmental protection departments should act as the main entities to carry out the emergency treatment work, guarantee the smooth progress of emergency handling work, and give effective treatment to the health damage cases caused by environmental pollution on time, prevent the damage from developing, alleviate the burden of damage, earnestly safeguard the rights and interest of the victims' life and health.

2.3.4 The compensation mechanism and legal system for handling compensation of environment and health damage needs to be established.

Nowadays, people's consciousness of safeguarding legitimate right has been strengthened much more than before. However, what embarrasses them is that, after the events of health damage resulted from environmental pollution happen, the masses lack the evidences and means in safeguarding the rights, therefore, it is difficult to restrict

and supervise the polluters substantially. Moreover, the identification technology and methodology system of health damage caused by environmental pollution are yet to be established, therefore, it is difficult to define the cause-effect relations between environmental pollution and health damage. Even though there are clear evidences which can prove that the health damage is resulted from environmental pollution, there are no unified regulations on the compensation standards and procedures. Therefore, it is urgent to carry out the research of laws and regulations on compensation for health damage induced by environmental pollution, further intensify the legal responsibilities of environmental pollution, perfect the legal evidence of compensation for health damage induced by environmental pollution, as well as research and formulate the detailed compensation methods such as the identification of health damage degree, compensation standards and procedure.

3. International experiences and lessons in establishing environment and health management system

3.0 Preface

This chapter provides recommendations for improving China's environment and health management system[9] based on the review of international experiences and lessons from the United State, the European Union, Japan and other countries.

3.1 Environment and Health Management System in the United States

3.1.1 Experiences and lessons in response to health damage caused by pollution in the US

Although environmental health regulations ultimately are all aimed at improving environmental quality, and thereby reducing environmentally-linked diseases, the terms of each specific regulation are founded on methodologies that have different starting points, depending on the law that serves as a basis for the rule. Some statutes ("risk based statutes") provide protection with health standards, directing that controls be established taking into account only what is required to protect health and not by examining other issues that might be germane to setting a standard, such as cost to achieve that level of control or whether technology exists to do so. Other statutes ("technology based statutes") tie the ultimate regulatory standard to the capability of technology. These might be viewed as the opposite of health-based standards because instead of asking what is needed to protect health, they ask what is possible to do from an engineering perspective. Resulting standards are based on the best available pollution control technology. Some statutes require EPA to protect against "*unreasonable risks*" by balancing the environmental and health effects of chemicals against the economic consequences of regulation. Finally, some statutes rely upon *economic incentive* approaches to control, with the most notable example as "cap and trade" approaches under the Clean Air Act that create a system of tradable allowances to emit certain pollutants and by imposing a tax on each ton of emissions.

Of these approaches, history has shown that technology-based standards are by far the easiest to undertake and lead to the most expeditious results in reducing environmental pollutants. This is because determining the best technology available to control pollution is a far easier task than reviewing the toxicology literature to establish a safe standard of exposure.

3.1.2 Information Disclosure and Public Involvement

A critical component of the USA system is the Right-To-Know requirements found in the major U.S. environmental laws and in the broadly applicable Freedom of Information Act. These laws require EPA and other federal agencies to make environmental hazard information available to the public. Environmental NGOs and

[9] Environment and health management system is defined as a socio-economic system fundamentally concerned with the prevention of health damage caused by environmental pollution induced by human activities.

community groups in the United States have a long history of using this information to pressure government to then take action to improve environmental quality.

Environmental monitoring data collected by the government is available to the public in the United States, for example, much of it over the internet. Similarly, permit conditions and violations are public information. Most comprehensively, the Emergency Planning and Community Right-to-Know Act, which was enacted in 1986 with CERCLA, required businesses to report all their emissions of hazardous substances to EPA, which the Agency then discloses to the public. The resulting Toxic Release Inventory is published each year and widely accessible over the internet. Citizens can review pollution problems in their locale, check on the environmental performance of certain companies across the country, investigate the nature and extent of emissions of certain chemicals to air versus water, etc.

With a similar motivation, the Safe Drinking Water Act as amended in 1996 required public water suppliers to state the nature and levels of contaminants in drinking water; they send this information to customers along with their water bill.

The government is also required to involve the public when developing its policies for environmental health protection by the Administrative Procedures Act. The little-known but important Act establishes specific citizen rights to access government information of relevance and to participate in government decisions affecting them. Rulemakings not compliant with the Administrative Procedures Act can and have been litigated in federal courts.

3.1.3 Citizen Suit Enforcement in Courts of Law

Access to the courts has been an important method to prevent environmental harm in the United States. Congress included an unusual enforcement mechanism in almost all federal pollution control statutes: the environmental citizen suit. In general, citizen suit provisions allow individual litigants to bring two kinds of lawsuits to ensure implementation of pollution statutes: 1) suits against the relevant federal agency for failure to perform duties, and 2) suits against individual polluting factories and facilities, to force compliance and assess civil penalties. These provisions do not require proof of damages to health or property in the case; instead citizens are allowed to sue over regulatory violations that put the public health at risk even if no specific individual has yet to experience signs or symptoms of disease.

Citizen suit authorities, combined with government enforcement decisions, extend the reach of environmental laws enacted by Congress in a very productive way, creating a channel for social judgments about the harms that matter and helping to formulate the balance between costs and benefits of environmental regulation by articulating the public values at stake in environmental law. The combination of EPA oversight of state agencies, easy access to information, media and public attention, and the availability of citizen suits creates considerable transparency and motivation for state officials to enforce environmental requirements.

3.2 Environment and Health Management System in the European Union

The EU is a co-operation between its Member States and thus European policy is a mix of country specific and EU-wide measures. The EU is acting to reduce exposure to pollution through EC legislation, through work at international level to reduce

cross-border pollution, through co-operation with sectors responsible for pollution, through national and regional authorities and NGOs, and through research.

An important tool for priority setting in EU environmental policy is the Thematic Strategies, among which is the *EU Strategy on Environment and Health* (adopted in 2003). This Strategy takes a medium-term perspective to around 2020 and is founded on thorough research and science, and follows an in-depth review of existing policy and wide-ranging stakeholder consultation. The Strategy on Environment and Health was followed up by the European Environment and Health Action Plan 2004-2010 which proposes an Integrated Information System on Environment and Health as well as a coordinated approach to Human Biomonitoring. Some useful tools for identifying the relative burden or severity of a given environmental health problem and in prioritizing EH issues based on the degree of health impact and related costs and/or burden in the EU are “Burden of Disease Analysis and Environmental Burden of Disease (EBoD)”, Cost of environmental degradation analysis , Health Impact Assessment, etc.

3.2.1 Experiences and lessons in response to health damage caused by pollution in EU

Urban ambient air pollution is the main environmental contributor to ill health in Europe at present (WHO, 2005[10]). However, the levels of air pollutants have been substantially reduced since around 1985 – 1990. The reductions are a result of the combined merits of international treaties on air pollution (e.g. the multi-component Gothenburg Protocol under the ECE Convention on Long-range Transboundary Air Pollution, LRTAP), EU legislation, national implementation schemes for complying with EU and international treaties, and a range of local measure. The main policies are formulated in *EU Directives* which are turned into national law in the member states. Most directives targeting environmental pollution with potential health consequences prescribe command-and-control policies such as BAT, emission limit values and standards. The exception is the NEC (National Emissions Ceiling) directive, which gives member states a freedom of choice in how to meet the national emission ceilings. The role of economic instruments in EHM is discussed in Appendix 3 in the Technical Report. A lesson from an assessment of European air quality policies and measures is that a mix of instruments (command-and-control approaches and economic instruments) should be applied. Whatever policy instruments are used, a large apparatus of monitoring and surveillance has been instrumental to ensuring that emissions are reported correctly[11].

In all EU member states, there are national civil liability regimes that cover damages to persons and property. The EU Environmental Liability Directive became effective in April 2007 and is the first EU law specifically based on the "polluter pays principle". It only deals with damage to the wider environment. Personal injury and damage to goods and property will still be dealt with under national civil liability legislation. Its aim is to hold operators whose activities have caused environmental damage financially liable for remedying this and for taking preventive actions. ‘Diffuse pollution’, as general air pollution and nitrate pollution in water bodies, are

[11] http://www2.dmu.dk/atmosphericEnvironment/expost/

not covered by the Directive i.e. because there are large obstacles to damage attribution on an individual level (easier on a population basis). Maritime oil disasters and nuclear accidents are also exempted from the Directive, because they are covered by other international environmental liability arrangements.

3.2.2 Laws, regulations, standards, and other mechanisms related to environmental health management

A main instrument for safeguarding the environment in the EU is the *EU Directives on environment* that require EU states to implement measures to achieve environmental standards. Framework Directives on air quality, water quality, drinking water, waste, landfills, soil (suggested) etc. define and establish objectives for environmental quality, and are supplemented by Daughter Directives. The EU also has legislation to control emissions from different industrial sources, such as the *Large Combustion Plant Directive* and the *Integrated Pollution Prevention and Control Directive*. Industrial accidents and emergency response are addressed in the 'Seveso Directives', the C*ouncil Directive on the major-accident hazards of certain industrial activities* and the *Directive on the control of major-accident hazards involving dangerous substances*. The directives lay out procedures for assessing the environmental quality on the basis of common methods and criteria (e.g. *guideline values*, typically based on WHO Guidelines) and prescribe how information on environmental quality is obtained and made available to the public. Health surveillance is part of a national health system. Coordination is ensured via the *European Environment and Health Action Plan 2004-2010*. The Environmental Health Committee in EU oversees coordination and follow-up and involves a range of governmental and non-governmental stakeholders.

The member countries' governments are responsible for implementing the EU Directives, monitoring of environmental quality and health surveillance. The European Environment Agency (EEA) of the EU works closely with WHO and is a major information source for those involved in developing, implementing and evaluating environmental policy, and also for the general public. EEA coordinates the European Environment Information and Observation Network (Eionet), which is co-funded by its member and cooperating countries. The close coordination between national and EU bodies when it comes to monitoring and reporting environmental quality statistics and the supranational level of the EEA have secured that robust and independent information on the environment is made available.

Research funds for EH research and monitoring are provided, inter alia, by EU Framework Programme for Research and Technological Development and national research councils. The European Commission's Directorate General of Health and Consumer Protection also directly support a range of research activities, e.g., the Apheis (Air Pollution and Health: A European Information System) which among other things carry out HIAs. The European Commission co-funds the European Environment and Health Information System project (ENHIS) with WHO/Europe. Extensive funding from national and EU sources have been instrumental to establishing the current knowledge base related to EH issues in Europe.

The environmental Directives set monitoring provisions and requires the Commission to conduct *mandatory reviews of the directives*. The Commission involves stake holders, including expert from Member States, Acceding Countries, Industry, NGOs, the Commission and research bodies, in reviewing directives and

giving recommendations on possible amendments. These initiatives related to monitoring and reviewing are core elements in ensuring and improving the quality of EH management in EU.

Legislation requiring health impact assessment and/or environmental impact assessment and litigation are examples of specific legal instruments used to control pollution in relation to specific media and/or specific settings and sectors. Not all forms of environment and health damage can be remedied through liability.

The UN ECE Convention on Access to Information, Public Participation in Decision-making and Access to Justice in Environmental Matters adopted in Aarhus in June 25, 1998 (the Aarhus Convention) is the first international legal instrument which bases the access to information, public participation and access to justice rights provided by the convention on "the right of every person of present and future generations to live in an environment adequate to his or her health and well-being." It also includes a general obligation for the parties "to guarantee access to information, public participation in decision-making and access to justice in environmental matters". In EU, the European Commission sets rules which ensure freedom of access to, and dissemination of, information on the environment held by public authorities and to set out the basic terms and conditions under which such information should be made available (Directive 2003/4/EC on public access to environmental information). All results from monitoring of environmental quality carried out by Member countries are in principal disclosed to the public, inter alia via national web sites and EEAs web pages. Concerning private data disclose, as emission data from industries, the European Union decided, in July 2000, to establish a mandatory European Pollutant Emission Register (EPER 2000), to be operated by the European Environment Agency (EEA). These data are accessible through the web.

3.3 Environment and Health Management System in Japan

3.3.1 Background analysis

Japan’s serious environmental pollution during the rapid economic growth after World War II led to the outbreak of a large number of victims whose health had been severely damaged. Many lives were lost and an enormous amount of money was needed to compensate the surviving victims and to retrieve the environment from its serious state of pollution. The vast amount that Japan invested to overcome environmental pollution, however, is known to have had no significant negative impact on the subsequent state of the economy. Moreover, the strict environmental regulations against vehicle emission that was introduced in the 1970s motivated the automobile manufacturers to develop innovative technology, which stimulated the succeeding economic growth in Japan.

The lessons derived from Japanese experience demonstrate that while environmental health damage led to huge cost, early environmental investments and preventive measures were rational also in economic terms. Through such experience, environment and health management system in Japan has been established on the basis of prompt and fair compensation and relief, as well as preventive measures against environmental pollution and health damages.

3.3.2 Legal systems and standards related to environment and health management system in Japan

Having experienced the tragic pollution-related health damage incidents, a nation-wide consensus has been built on prevention as the utmost important measure to be taken for environmental protection.

Currently, the Basic Environmental Law is the underlying law in environmental policy and prevention is one of its most important objectives. Article 16 clearly states the environmental standards-setting as the objective of environmental policy: “With regard to the environmental conditions related to air pollution, water pollution, soil contamination and noise, the Government shall respectively establish environmental quality standards, the maintenance of which is desirable for the protection of human health and the conservation of the living environment.”

Emission and effluent standards for pollutants released from factories and other facilities are stipulated in Air Pollution Control Law and Water Pollution Control Law as specific measures for achieving the environmental quality standards. Nation-wide uniform emission and effluent standards are set by the central government in which local governments can impose more stringent standards (supplementary standards) if necessary. Penalties are imposed for non-compliance.

A nation-wide environmental monitoring is indispensable for maintaining the environmental quality standards. In principle, local governments are in charge of carrying out monitoring and disclosing the results to the public in real-time or on a regular basis every year. Moreover, companies are also responsible to monitor pollutants emitted from their facilities. In health monitoring system, various surveys are carried out regularly and when needed, both at national and local levels, to check any occurrence of significant or abnormal health issues.

In addition, legal systems for chemicals and pesticide management as well as Environmental Impact Assessment Law to check the impacts on the environment have been established.

The Ministry of the Environment plays the central role for conducting such preventive measures against environmental pollution. At the same time, cooperation among the relevant institutions and overall environmental administration capacity are strengthened through provisions such as personnel exchanges with the Ministry of Health, Labour and Welfare, and other ministries as well as with local governments. Also, training for environmental monitoring and other measures for capacity building are provided by the national government. Information on environment are widely disclosed to the public and Public Comment System is in place to invite opinions of the public.

3.3.3 Other mechanisms for environmental health management in Japan

In Japan, public health centers under the Ministry of Health, Labor and Welfare have been playing an important role in the prevention of environmental health damage and issues related to sudden occurrence of regional health problems. In addition, aside from the provision of laws and regulations related to pollution and judicial settlement, environmental disputes settlement system for prompt and adequate settlement with less rigid procedures, has been developed. Citizens can consult with environmental sections in municipality and public health centers at the local level, and if the problem

cannot be solved, the case is handled by the Prefectural Pollution Examination Commission at the prefectural level. For those cases which involve serious environmental pollution, wide-area-concerned case, compensation for damage, and fact-finding of cause-and-effect, the cases are then handled by the Environmental Dispute Coordination Commission at the national level.

Moreover, government and companies as well as the media and environmental organizations have also contributed significantly in the prevention of environmental health hazards through information disclosure.

3.3.4 Experiences and lessons of legal compensation procedures of health damage caused by pollution in Japan

In addition to judicial and administrative resolution stipulated by the civil law, a set of legal systems specifically focused on environmental pollution control have been established. Due to the substantial number of pollution-related health damaged cases that occurred in Japan, many victims were unable to receive compensation and relief through individual civil lawsuits, which required each victim with the time and efforts for the settlement. This drew a serious social attention and led to the establishment of related Laws. Hence, the Law Concerning the Settlement of Environmental Pollution Disputes was established in 1970 and the Compensation Law was established in 1973 as a compensation and relief mechanism based on civil liability. Through such establishment of legal systems, prompt and fair compensation and relief measures for the victims were provided, and a certain degree of resolution was realized. As improvements were observed in air quality, in 1987, this law was amended with the cancellation of designated regions and it was also decided that no further pollution patients would be certified.

3.3.5 Judgment methods and standards in providing relief for pollution-related health damage in Japan

The judgment methods and standards for relief for pollution-related health damage are stipulated in the Compensation Law. Based on the medical certificates, Prefectural Pollution Examination Commissions, established in designated areas, examine whether the applicants are subject to certification. The governor or the mayor of the designated area, then issues the certification at the final stage.

When an individual is dissatisfied with the certification assessment, the first option is to bring a formal challenge against the prefectural governor or designated city mayor who made the assessment. When there is an objection to the governor or mayor’s decision regarding the challenge, or when two months have passed since the challenge was brought and no decision had been made, an application for review can be requested to the Pollution-related Health Damage Compensation Grievance Board which is under the jurisdiction of the Minister of the Environment. If there is a further objection to the ruling of the Board, the courts can be asked to void the board’s decision.

3.4 Comparison on environment and health management system and implementation mechanism –a comparison between China and other countries

3.4.1 Government's role and coordination mechanism

The US, EU countries and Japan all have government departments specializing in matters related to environmental pollution and its effect on people's health. For years, departments responsible for national medical care, health and public hygiene, safety of drinking water, control of hazardous chemical substances have been established, and in some countries, these departments handle environment and health problems as well. There is also a department that deals exclusively with occupational health. The interrelation among these departments are quite complex and various systems have been formed in order to improve mutual cooperation and coordination.

The situation is similar in China. The Ministry of Health is responsible for providing medical service, managing public hygiene and related matters. The Ministry of Environmental Protection is responsible for the control of environmental pollution likely to have an adverse effect on human health, but does not have the function to carry out a national health survey in relation to environmental pollution. Cooperation and concerted efforts, particularly between the Ministry of Health and the Ministry of Environmental Protection, are indispensable among the relevant departments.

Better integration of environmental policies with other policies is a common issue among the international community.

3.4.2 Financial and human resources

In China, the Ministry of Environmental Protection is established as a part of the central government, whose service primarily covers the establishment of standards for environmental pollutants, collection and analysis of data from monitoring and investigations. A system to carrying out nationwide health survey with respect to environmental pollution and examining the health status of residents in contaminated areas is yet developed. Budget allocated for environmental and health management and officers specialized in this field are very limited. In local governments, each province and city has its Environment Protection Bureau, with assigned personnel, but a system to carry out sophisticated environmental monitoring and health surveys for local residents is yet to be established.

In the US, environmental protection agency or departments are established at the federal and state levels which are financed through tax revenues. Budget is provided from the federal government to the states to cover the cost for enforcing federal laws. The US does not have special financial resource for the compensation of health damage. Polluters are fined for violations, but the collected fines do not always reach to the environmental agencies and in some cases funneled into the general revenue source.

In the EU, national agencies and research institutions are mainly responsible for the execution of EU laws, environmental monitoring and health surveillance. The EU has its own European Environment Agency (EEA), which is closely collaborated with the World Health Organization (WHO). The EEA coordinates the European Environment Information and Observation Network (Eionet) co-funded by the EU

countries and cooperating countries. Expenses for research and monitoring investigations on environmental health are financed by the "EU Framework Program for Research and Technological Development" and research councils of the respective central governments. The European Commission's Directorate General of Health and Consumer Protection provides financial support for a number of environment-related activities.

In Japan, the Ministry of the Environment conducts environmental monitoring and investigations on chemical substances and other various studies and research. Each prefecture and city is responsible for local environmental monitoring. Public health centers are established in each prefecture and government designated city and whenever health defect of local residents arises, it will be immediately reported to the center. The victims of pollution-related diseases are certified by the examining commissions established in each prefecture and government designated city. Collection of levies from polluters, payment of compensation to victims, and others are administered by the Environment Restoration and Conservation Agency of Japan (ERCA).

3.4.3 Priority areas

Even though China has already enacted such control laws as the Water Pollution Prevention Law and the Air Pollution Prevention Law, pollution-related health damage is aggravating. Particularly, the state of health damage attributable to air pollution in urban areas and water pollution in rural districts are serious and yet no sufficient investigation has been conducted to examine the actual situation.

In the U.S., the Environmental Protection Agency prepares lists of priority industries, contaminants and health effects to be dealt with. Priority items are also determined based on the review by the EPA on pollutant emissions and discharges, results of environmental monitoring and other data.

In EU, the "EU Strategy on Environment and Health" is an important tool for deciding on priority problems in the area of environmental health. This Strategy covers political outlooks over the years up to about 2020 compiled based on consultations with interested parties, and sets out important areas of environmental health and the course of countermeasures to be taken.

In Japan, the prevention of health damage is placed much importance in environmental policy, since environmental administration has been developed in response to the emergence of pollution-related health problems. Therefore, environmental monitoring is emphasized and if pollution level that could seriously threaten the health of the local residents is detected, health survey is carried out immediately.

WHO has developed a program called "Burden of Disease" and the World Bank has developed an analysis methodology on "Cost of Degradation" both which have helped to define priority areas on environmental health issues.

3.4.4 Compensation (and relief) mechanism

China is experiencing an increasing number of court cases involving health damage caused by environmental pollution. Since laws and regulations to deal with these issues are inadequate and there are no established criteria for the court's

decisions, the plaintiffs rarely win their case. In addition to the difficulty in proving health damage, there is also no compensation mechanism.

In Japan, the Law Concerning Compensation and Prevention of Pollution-related Health Damage was established in 1973. The law incorporates the concept of liability without fault (or strict liability) for compensation. Diseases subject to the law are "*specific diseases*" having a definite causal relationship between polluters and victims (such as Minamata disease) and "*nonspecific diseases*" having no clear causal relationship (such as bronchial asthma attributable to air pollution). For *specific diseases*, polluting companies are required to pay compensation fees. For *nonspecific diseases*, polluters throughout the country bear the cost at certain rates (pollution levy collected from factories and the like 80%, automobile weight tax 20%). The Environmental Dispute Coordination Commission has been established as an institution for environmental dispute settlement based on the Pollution Dispute Settlement Law (the Prefectural Pollution Examination Commission has been established at prefectural level). Environmental disputes can be settled without court proceedings through the Commission by approving requests to submit documents and on-the-spot inspection.

The U.S. does not have special laws regarding compensation for pollution-related health damage. When a problem arises, individual or groups of individuals need to bring the causal company to court.

Member states of EU have their own national civil liability regimes that cover damages to persons or property. The EU Environmental Liability Directive (enforced in 2007) is based on the PPP (polluter pays principal), but it concerns compensation for collective damage; individual damage is dealt with under the national civil law.

As for developing countries, compensation system for pollution-related health damage per se has not been identified, but there are some examples on apportionment of liability and consequent reparation measures for environmental damages in countries.

3.4.5 Information disclosure and public access to information

In China, the Ministry of Environmental Protection collects data from nationwide monitoring data of environmental quality and pollution sources and the Ministry of Health collects statistic data on disease, but there are no systems to link the two. Moreover, attempt to study the relationship between pollution levels and the health condition of the people living in the regions, education and public awareness on the environment and health are limited.

In the US as well as in the EU, all information acquired by the respective governments on environmental pollution and violating enterprises is disclosed under the laws concerning information disclosure and such information is easily accessible through websites.

The Japanese government prepares a yearly White Paper on the Environment and local governments also publish annual reports on the results of environmental monitoring and degree of achievements to comply with the environmental standards, etc. The release amount of hazardous chemical substances are reported and disclosed through the Pollutant Release and Transfer Register (PRTR) system based on the Law Concerning Reporting, etc. of Release to the Environment of Specific

Chemical Substances and Promoting Improvements in Their Management. Moreover, enterprises are active in publishing environmental reports which include the situation of pollutant emissions and reduction measures.

In India, the government established the Environmental Information System (ENVIS) in 1982 providing information to decision maker, policy planners, scientists, and engineers, research workers. ENVIS network consists of 81 partner nodes including government organizations, research institutes, NGOs, etc. and provides online information dissemination.

Common to many countries, the voice of the citizens and support from the public play a vital role in effectively monitoring pollution and promoting enterprises to take necessary measures. This also requires the provision of valid information via various media, e.g. television and newspapers, and also, the role of environmental educational activities by NGOs is very important.

3.4.6 Performance evaluation

China has established the National Environment and Health Work Leading Team composed of members from 18 ministries. The leading team is responsible for formulating environment and health management policies, and reviewing the development of scientific study and research on environment and health issues. However, practical issues such as ways to implement policies, to assess and evaluate the roles of local governments and relevant authorities still remain.

The U.S. and the EU have mechanisms for investigating and reviewing how the measures and laws concerned are being enforced.

In Japan, based on the Government Policy Evaluation Act, the ministries and agencies prepare policy evaluation reports each year, which are open to the public for comments. Local governments are directly responsible for environment and health administration at the site and if any health disorder is found, it is reported to the local public health center and an investigation is conducted immediately. In addition, mass media and NGOs observe and monitor performances of government and enterprises.

In Brazil, there is a unique system for prosecution to protect the rights of the people and to question government institutions in charge about non-enforcement problems. The Ministério Público is a body of autonomous magistrates formed of public prosecutors working both at federal and state level protecting the rights of the people including those affected by environmental health damage.

3.4.7 Measures which worked

In China, the National Environment and Health Action Plan (2007–2015) was announced. In the U.S. technology based standards for all major categories of pollution sources proved to be effective in reducing pollutant discharges. The EU took various measures to reduce emission and achieved remarkable results through a command-and-control approach.

In Japan, the Compensation Law was enacted as a remedial response to the outbreak of pollution-induced health damages caused by inadequate legislation and administrative systems. Currently, the priority of Japanese environmental policy has shifted to prevention.

The above-mentioned countries all started with systematic environmental monitoring and steadily lowered the concentration of pollutants in the environment, resulting in successful prevention of health damage.

Also in some developing countries, environmental health information systems have been developed. For example, Brazil has developed an effective environmental health information system, building on the experience from other countries such as the US. A number of topic specific hubs collect information on water, public health, chemicals, etc. which are utilized for policy and decision-making. In India, progress has been made in accessing the judiciary to address environmental pollution issues. An Indian NGO worked through campaigns using quantitative information on health damage effects and estimated mortality rates, raising public awareness which had resulted in the Supreme Court to issue the first comprehensive mandate for tackling air pollution.

3.4.8 Measures which did not work

China needs to improve the administrative level of government agencies related to environment and health management. Capacity development of expert officials, establishment of prevention system for health damage, and formulation of related laws and regulations are necessary.

In every country, whether developed or developing, disclosure of information on environmental health risk is very important. Numerous experiences in countries around the world have demonstrated that lack of scientific information can unnecessarily spread damage on health. There are many incidents where people who are uninformed have been placed at higher risks. For example, the tragic accident in Bhopal India in 1984 took many lives of the people who were exposed to toxins from a nocturnal gas leak in a pesticide plant. This case showed how lack of information disclosure could exacerbate the scale of damage in such incident. It took twenty years to enact the basic Right to Information law in India.

3.5 Recommendations to improving environmental health management system in China

Based on the environmental health problems faced in China and international experiences on environment and health issues, the following statements provide recommendations to improving environmental health management system in China.

Recommendation 1: Government functions and coordination mechanism

To strengthen government functions and put in place a management and coordination mechanism with clearly defined responsibilities at the central, provincial and local levels. In particular, the functions of environment and health departments should be enhanced. An effective coordination mechanism should be in place, data should be shared and a prevention, early warning and relief mechanism for environmental health should be built eventually.

Recommendation 2: Financial and human resources

To increase financial and human resources for environmental health, priority areas include survey of environmental health problems, R&D of comprehensive and basic technologies, capacity building for monitoring and capacity building for legal enforcement. Increased financial resources can be provided, at least in part, from

pollution fees collected from regulated sources (polluters), and other multiple funding channels such as funds and donations, etc.

Recommendation 3: Identification of priorities

To identify key problems and gaps in environmental health management including gaps in laws, information and implementation in the first place, and then set priorities for effective environmental health management such as pollution control and establishment of monitoring and evaluation system, For example, integrated environment and health information system and Health Impact Assessment included into the current Environmental Impact Assessment (EIA) and Strategic Environmental Assessment (SEA) systems.

Recommendation 4: Compensation (and relief) mechanism

To build a compensation mechanism for environmental health in accordance with the polluter pays principle. The financing mechanism for compensation should be addressed including health damage which its polluters are difficult to identify. At the same time, a dispute settlement mechanism before one resorts to court should be put in place to protect people's interest.

Recommendation 5: Information disclosure & public access to information

To enhance information disclosure for environmental health and facility environmental performance through various channels such as the media, NGOs, research institutions and other stakeholders, etc. Government should play a proactive role in providing information on environment and health risks to the public. The public, media, and NGOs should also play as "watchdogs" to monitor and report the environmental pollution and health incidents.

Recommendation 6: Performance assessment

To build a performance assessment mechanism for environmental health management of the government, especially for local government, it provides the necessary incentives to encourage enforcement of environmental laws along with other matters. It is also important to strengthen justice system and the ability to deal with environment and health issues. For example, by strengthening liability for environmental pollution to ensure that the polluter pays and to ensure the truthfulness of the data submitted. Also, it is recommended to establish an accountability office for assessing the performance and industries (enterprises) from the perspective of the environment and health management.

4 Construction of China's environmental and health management system

4.1 Main bodies, objects and goals of China's environment and health management

To conduct effective environmental and health management, government departments' responsibilities should be made clear firstly, an effective communication and coordination mechanism should be set up between departments secondly, there should be a clear management system and measures thirdly, the state should have a specific strategy and objective fourthly and there should be a work plan and work highlights for implementation step by step fifthly. The five aspects are also the issues we give priority to in studying China's environmental and health management system.

4.1.1 Main bodies for governmental management

The environmental and health issue involves various aspects of the society, economy and environment and there are many departments which are connected with environmental and health management. Therefore it is highly possible to incur the overlapping in functions and management conflicts among different departments and the weakening in environment and health management efficiency without the sound inter-department coordination mechanism and the clear division of government duties. Considering the basic characteristics and management basis of the Chinese environment and health issues, the government agencies serve as the core departments closely related to management include the Ministry of Environmental Protection, the Ministry of Health, the National Development and Reform Commission, the Ministry of Finance and the Ministry of Science and Technology.

4.1.2 Stakeholders of the environment and health management

Major stakeholders of the Chinese environment and health management and the functions they exert are described in the following four aspects. There are the pollution producers, the pollution preventers, the stakeholders of pollution-induced health damage, the parties responsible for health prevention and medical treatment by sequence. Four stakeholders involved in many aspects .For example all levels of government, enterprises and institutions, ordinary people, scientific research institutions, social groups and organizations and so on.

4.1.3 Working thoughts and basic principles of environment and health management:

According to the international experience, the early prevention is the fundamental working thoughts and starting point for environment and health management work, and the active follow-up relief is the basic demand for protecting the rights and benefits of victims. The status quo and future trend of the Chinese environment and health problems have shown that the basic starting point and work

focus for environment and health work are to prevent the environment and health problems from worsening, and guard against more serious health damage from environmental pollution. Meanwhile, some comprehensive treatment and relief measures shall be taken to resolve the health damage incurred by environmental pollution.

Thus, the environment and health management work of China shall adopt the working thoughts of "focusing on prevention and combining prevention with control". The construction of environment and health management system shall not merely aim to resolve the current environment and health problems, but prevent any possible environment and health risks in the future by improving the policies, systems, technologies and methods, and enhancing the management capacities. Meanwhile, the Chinese environment and health management work shall also comply with the principles as dominant status of government and social participation, making overall plans and conducting the inter-department coordination, prevention, early warning and active treatment.

4.1.4 Management goals

The final goal of establishing the environmental and health management system is to strengthen the government's public service, safeguard the public's environmental and health rights and prevent, control and salvage health damage done by environmental pollution. The establishment of the environment and health system is main involved with the following seven parts such as establishment a management system and coordination mechanism in which work is clearly divided, establishment a monitoring and information exchange system and mechanism for environment and health, establishment a prevention, early warning and salvage mechanism for environment and health, establishment a scientific and technical R&D mechanism for environment and health, establishment a financial and fund guarantee mechanism for environment and health, establishment a legal, regulation and policy system for environment and health and establishment a compensation mechanism for environment and health.

4.2 Arrangement of China's environment and health management system

As far as the environment and health management work is concerned, the government shall play a predominant role. The well defined management responsibilities are the basis and precondition for the governments to conduct the effective environment and health management work. Besides, the broad social participation also serves as a significant guarantee for supervising and encouraging the environment and health management work of government departments.

4.2.1 Responsibility and division of work for environmental and health management

Environmental protection departments should set up the work philosophy of protect human health as its goal and gradual establish the management style whose core is health risk control to change passive manage for active prevention and control. At the same time, it is necessary to strengthen the law studies of environmental

management, environmental quality and human health and comprehensive prevent and monitor to the environment risk for these departments. It is also important for them to lay stress on the prevention of the damage to human health done by environment pollution and control links and particularly in pollution prevention and control areas to fulfill commitment more government functions. They should develop the prevention, early warning and intervention systems to environment and health and make the task on environment and health into the mainstream of the environmental protection. At the same time, the environmental protection departments should conduct a comprehensive study and found those different pollutants on human health. Furthermore, the environmental protection departments should strengthen the research of baseline and implement the environment and health management based on the "risk prevention".

The Ministry of Health shall focus on assuming and performing government functions in discovery, response, and treatment of damage from environmental pollution, and other links, bring the prevention and control task on disease caused by environmental pollution into the mainstream in the national disease control and health work, and provide support for development of the environment and health prevention and pre-warning work through the research on and oversight over the serious health damage possibly induced by environmental pollution.

Besides, National Development and Reform Commission (NDRC) shall play an important role in coordinating environmental protection, public health, economic development and other aspects. Its main responsibilities are to bring the environment and health work plans and mid and long-term programs of the Ministry of Environmental Protection and the Ministry of Health into the program and plan for national economy and support them with policies, projects and funds, etc; incorporate environmental protection and prevention from health damage into the formulation and implementation of local development planning so as to guard against the occurrence of environment and health problems.

The Ministry of Finance shall ensure the government finance’s role in intensifying the support in environment and health management and intervention. It shall enumerate the fund for environment and health management on the routine budget list, give necessary fund support for all work concerned, set up financial support mechanism for the work of environment and health.

The Ministry of Science and Technology shall play an important role in organizing and strengthening environment- and health-related basic research and development. Its main governmental functions are to organize significant scientific and technical researches in the environmental and health field, enumerate researches on the benefit relationship between environment and health (dosage-reaction) and the lists of pollutants to be controlled under priority control as important national projects for scientific and technical researches and give them support in technology, finance and human resources.

4.2.2 Coordination mechanism for environmental and health management

To better coordinate related departments in promoting environmental and health works, a national environmental and health administrative coordination mechanism

which is widely participated by all departments is proposed to be established on the basis of the current coordination mechanism for environment and health work between the Ministry of Environmental Protection and the Ministry of Health. It is suggested that a leading group responsible for promoting the environmental protection and health work shall be established under the State Council. This group is mainly tasked to discuss and handle significant topics related to environment and health management such as strategies and planning; to coordinate work between different departments and establish a platform for exchange of views and communication; to coordinate and settle departmental disputes and conflicts; to tackle difficulties and problems in their work; to press forward with the implementation of various tasks, so that the national strategy, tasks and administrative duties with regard to environment and health can be put into place.

This leading group shall be headed by a related leader of the State Council with the minister of environmental protection and the minister of health as its vice heads, and other major leaders of departments concerned as its members.

Meanwhile, the leading group has to have its own office in which routine organization and coordination are handled.

4.2.3 Mechanism of Public Participation in environmental and health management

The establishment of a public participation mechanism mainly contains the following two aspects. One is to establish an information-communicating mechanism. The government shall release timely information about environment and health of public concern on the governmental website and through other news media in ways that are mostly available to the public, so that the public are able to grasp the timely, accurate information on environment and health. The government shall also open a special channel to listen to the information of environment and health reflected by the general public, especially establish the procedure and approach for the public to appeal to the government for the solution of environment- and health-related problems. The other is to study and discuss establishment of public interest litigation, legal assistance and hearing systems in the environment and health field. The state and other groups may lodge a lawsuit with regard to some major pollution-caused health harms on behalf of the public to safeguard their interest. As for the difficulties for the social vulnerable group in defending their rights to environment and health, the state shall offer legal assistance and help them defend their rights. At the same time, the hearing on environment and health shall be added to the examination and approval of major development plans and projects and other administrative examination, so that the public opinion can be heard. In addition, it shall be prudent to approve the plans and projects that are universally objected by the public.

4.3 Establish a prevention system for environment and health management

Establishment of a prevention system for environmental and health management is the core of the establishment of the environmental and health management system. Effective environmental and health management is not only to solve the environmental and health problem which has already arisen formerly, but, more

importantly, is to prevent the problem from arising and avoid or alleviate health damage that may be caused by environmental pollution through establishing a prevention system for environmental and health.

4.3.1 Establish a standard system guarding against the environment and health risks

The environmental and health standards constitute an important basis for identifying the environmental health risks and conducting the environmental intervention.

We shall, in accordance with the requirements of environment and health work and in consideration of the actual national conditions of China, plan, coordinate and intensify the formulation and revision of standards, improve the standard systems, work hard to design the fundamental standards in urgent need of key environment and health fields, solve the continuity of current standards in the shortest possible time and support the smooth progress of environment and health work. At present, we shall make more efforts to strengthen the construction of following standard systems. The first is to revise pollutant emission control standard based on impact on health. Secondly, it is to revise evaluation standard for environmental quality based on impact on health. The third is to revise environment monitoring standard based on impact on health. The fourth is to revise evaluation standard for environmental impact based on impact on health. The fifth is health impact monitoring and risk assessment of environmental pollution. The sixth is control standards, and other standards for soil pollution, electromagnetic radiation pollution. The last is assessment and identification standards of the damages caused by environmental pollution.

4.3.2 Establish a directory of priority-controlled pollutants

In order to prevent the damage to health by environmental pollution, the priority shall be given to the study and establishment of national and local directories of priority-controlled pollutants so as to carry out the prevention from damage to environment and public health with clear aims and emphases. The environmental protection and public health authorities shall strengthen their cooperation for its early appearance. Meanwhile, local governments at all levels shall study and establish their own directories of priority-controlled pollutants and take effective measures to prevent severe health risks in light of the actual conditions of their local environmental protection and health work.

4.3.3 Establish a stringent environmental access system

It is an important part of effectively preventing pollution-caused damages to public health to establish a stringent environmental access system. Those pollutants that may severely endanger human health shall be banned or restricted in their production, use and discharge. The directory of chemicals that are banned in production, use and discharge shall be established with a view to safeguarding human health. For those chemicals that are restricted in their production, use and discharge, we shall establish a stringent access standard in order to extinguish the possibility of environmental pollution and health damages in the wake.

As a result, it is required that, while formulating its industrial development policy, the state shall prohibit the domestic production of those chemicals of which production and sales are banned, and apply active measures such as evaluation of environmental impact, real-time monitoring and tracking survey of health effect to those chemicals that are restrictedly used, in order to prevent serious harm to public health.

4.4 Establish an environmental and health monitoring system

The top priority of establishing the environment and health monitoring system is to transform these existing monitoring networks and forces of the Ministry of Environmental Protection and the Ministry of Health, to build an environment-monitoring and disease-monitoring system and an information platform that support the environment and health prevention, to monitor for long run those key pollution sources and pollutants and grasp the dynamic changes of the Chinese major pollutants and human health to provide important data for the state's preventions and interventions by establishing the environment and health monitoring database.

4.4.1 Establish a water environmental and health monitoring network

On the basis of existing monitoring facilities such as the water environment monitoring system and the drinking water monitoring system, we shall intensify the monitoring of water pollution and health damage, especially the monitoring of water quality of drinking water source and rural water environment and health, with the overall requirements of national water pollution prevention work and related requirements of urban and rural drinking water safety taken into consideration.

4.4.2 Establish a monitoring network for air pollution and health

Monitoring air pollution means monitoring and tracking the major pollutants in the air to be controlled that will directly affect or indirectly affect through other channels the health of the residents. It means in particular the effective monitor and control of the pollutants to be controlled in priority. At the same time, it means the monitor of the health conditions of different groups of people and the establishment of a health monitoring station in each social community and formulation of the relevant indexes for monitoring and collecting the health information of the residents.

4.4.3 Establish a monitoring network for soil environment and people's health

On the base of the investigation on the current state of the soil environment and the assessment of the soil environment health risks, we should integrate and strengthen the existing monitoring resources and capability to form a national soil environment and health monitoring network according to the needs of the monitoring work.

4.4.4 Establish a monitoring network to monitor extreme weather events and people's health

Provinces (autonomous regions and municipalities directly under the Central Government) shall be regarded as a monitoring unit with monitoring stations and

posts established at the municipal and county levels to monitor, analyze and assess the extreme climate harm to the people's health. The existing weather and health monitoring resources and capability in the national meteorological departments and health departments shall be consolidated and reinforced to set up a national extreme climate event and health monitoring network.

4.4.5 Establish a monitoring network for the public place health and biological safety in given places：

Based on Hygienic Management in Public Places, it is necessary to set up monitoring areas in important places, monitor the hygiene biological safety and form a national monitoring network of hygiene in public places and biological safety in specially designated places.

4.5 Early warning mechanisms for environment and health management

Where the prevention system has not been improved or has not even been established yet and the pollutants producing grave consequences to people's health cannot be effectively controlled, it is necessary to establish a pre-warning system for people to evade and avoid the hazards to people's health. Others unexpected events, extreme weather and accumulated effects may still bring about great pollutant threat to people's health. Therefore, it is still necessary to establish a pre-warning system for people to evade and avoid health risks.

4.5.1 Establish the assessment mechanism for environment and health risks

China shall establish the assessment mechanism for environment and health risks. Environmental protection and health departments and other relevant departments shall have a close cooperation to set up and improve environmental and health risk assessment system, research and perfect risk assessment procedures, and constitute related guidance, techniques and methods, and determine the acceptable level of danger, scientifically work out grade divisions of national environment and health risks, and gradually keep the costs of environmental and health risks under control.

4.5.2 Strengthen early warning ability for environmental and health risks

Departments of environmental protection and health at all regions shall jointly conduct the early warning work on environmental and health risks, warn the possible serious environmental pollution and damages to health in advance, put forward management and technical responsive measures to realize scientific decision-making and prevention on the basis of environment and health monitoring and risk assessment; set up early warning mechanisms for environment and health risks, reporting systems for environmental pollution and health damages and early warning release systems, improve early warning and prevention policies, measures and means and strive to prevent serious environmental pollution and health damaging events from happening by early analysis, early prediction and early intervention; study the relationship between environmental pollution and health damages with a purpose of stressing and decreasing environmental pollution and health damages, make reasonable

early-warning, prevention and treatment plans for different risk grades and constantly increase the level of guarding against grave environment and health risks.

4.6 Improve the emergency handling mechanisms for environment and health management

It is necessary to further improve the environment and health mechanism against emergencies and formulate the work rules to deal with the outbreak of unexpected events, the report system of emergent and major events and the regulations to handle the unanticipated environment and health events. The environmental protection and health departments shall cooperate with each other closely to deal with emergent events in connection with the environment and health and improve their capacity to deal with such events. It is necessary to realize unified decision making, command, allocation of resources and dealing with the emergent cases, striving to swiftly and effectively control the pollution, mitigate the health harm and provide prompt medical treatment to the victims.

4.7 Reinforce the construction of technical support systems for environment and health management

4.7.1 Strengthen the construction of technical capabilities and professional teams

Strengthening the technical supporting capacity for the environment and health is crucial to enhancing the supporting level with science and technology. What needs strengthening urgently is the basic research capability of environment and health, the monitoring capability, the laboratory facilities and equipment, the standard system development capability and the capacity building for the human resources training.

4.7.2 Strengthen investigations on the current condition of the environment and health impact

The inadequate investigation of the environment and health problems has not only directly affected the objective and accurate judgment of the environment and health problems in China but also the effective development of the environment and health management. Hence, it is necessary to timely carry out investigations on the major environmental factors and damages to health caused by the polluted environment nationwide, find out the kinds, degrees, nature and distribution of the health damages caused by the environmental pollution in China and keep abreast of the spectrum of diseases caused by environmental pollution to provide scientific basis for the implementation of the environment and health actions.

The investigation of environment and health problems mainly covers the following two areas. One is Investigations on the status quo of the major environmental pollutants. The other is Investigations on health impact caused by environmental pollution.

4.7.3 Launch the environment and health research projects in urgent need

According to the development situations and actual requirements of international and domestic environment and health work, some basic application researches shall

be started in the shortest possible time. For instance, study on assessment technology of health damages caused by environmental pollution and study on the load assessment system of the diseases caused by environmental pollution.

4.8 Complementary mechanism of environment and health management in China:

4.8.1 Financial assurance mechanism

It aims to meet the requirements of the government departments such as environmental protection and health to conduct the environment and health surveys, monitoring and system maintenance, and complete the environment and health prevention, warning and emergency work. The environment protection department and the health department at all levels shall formulate medium- and long-term plans and annual plans on the environment and health management, specify work content, apply for reasonable financial budget and submit it to the financial department for approval. Meanwhile, the financial allocation of central government and local governments at different levels shall arrange the funds in their annual budgets to ensure the administrative fees and major project costs.

The State is advised to develop the environmental pollution responsibility insurance system and create the compensation fund for environmental health damages (hereinafter referred to as the compensation fund). The State shall implement the environmental pollution responsibility insurance system and intend part of premium as the compensation fund. The financial departments shall make some financial contributions to the compensation fund on an annual basis. In the meantime, a certain amount of pollution discharge fees collected on an annual basis shall be contributed to this fund. The social donations can also constitute a source of compensation funds. The compensation fund shall be paid in the following situations. Firstly, compensation for the victims of health damages caused by historical environmental problems; Secondly, compensation for the victims if the responsible parties lack the civil compensation capacities; Third, compensation for the victims if the responsibility subjects can’t be identified.

4.8.2 Information supporting system:

The establishment of environment and health information management and publication mechanism will contribute to the creation of national environment and health information platform and the environment and health information service mechanism. We shall periodically release environment and health news and publish environment pollution data and health damage to the public so as to accept the public supervision and help the public to evade and avoid the health risks. We also shall establish the national and local dynamic monitoring databases of environmental pollution and health effects and create the effective information sources of monitoring data to provide the scientific basis for the national and local environment and health decision-making work, and offer the basic data for the environment and health research.

4.8.3 Supporting policies and regulations

It's necessary to assess the implementation outcome of current laws and regulations in a comprehensive manner and suggest the general plan for improving the related environment and health laws and regulations in order to dissolve the outstanding contradictions in the present work. We shall gradually set up a complete set of legal systems including the laws and regulations on environmental health risk and impact assessment, prevention of environmental health problems, compensation of environmental health damages, emergency treatment of environmental health events, relief of environmental health damages so that the each link of environmental health work can act upon the laws and regulations accordingly. We shall study the legal systems on compensation for damages caused by environmental pollution, further consolidate the legal responsibilities for environmental pollution, improve the legal basis of compensation for damages caused by environmental pollution, and study and design the specific compensation measures including the identification of damages caused by environmental pollution, and the compensation procedure and scope, as well as the legal aid methods for those suffering from pollution. We shall better the construction of laws and regulations on environmental impact assessment, treat the environmental health impacts as an integral component of environmental impact assessment and strengthen the prevention and control of environmental health damages.

4.8.4 Other supporting policies and measures:

The related departments shall intensify the organization of environment and health work, earnestly carry out the tasks, goals and requirements, guarantee the transparency of government affairs, tighten the responsibility checkup, receive the social supervision, and ensure the successful and effective development of environment and health work. Meanwhile, we shall spare no efforts to launch the publicity of environment and health knowledge and the public education, enhance the people's consciousness of environmental protection and health protection, boost the development of sound individual and social conducts, and create a positive atmosphere in which the whole society protects environment and maintains health. In addition, we shall actively conduct the domestic and international exchange activities absorb the advanced experience in environment and health work, learn the new technologies and methods, and continuously increase the capacity and level of environment and health work in China.

4.9 Key fields of China's environment and health management:

China's environment and health intervention work shall focus on the prevention and treatment of the health damages and risks induced by air pollution in urban area (including highly urbanized rural areas) and in big cities in particular. Since there is lack of drinking water and increasing pollution of water bodies in the vast rural areas of our country, priority of intervention shall be given to the prevention and treatment of health damages and risks caused by water pollution or biological pollution of the water environment there. Great attention shall be paid not only to modern environment and health problem but also to the traditional environment and health problems there. Strategically, we shall intervene without delay the environmental risks which have led to diseases or definite damages, and create the remedy ad

compensation mechanism for environmental health damages. Though we have definite knowledge of environmental health damages and influence approaches, the serious damages are still yet to come, such being the case, we shall focus our efforts on monitoring and prevention, strengthen the early intervention, and avoid and decrease the health damages caused by environmental pollution. We shall intensify monitoring and impose a rigorous access requirement on those environmental factors with indefinite health influences.

5. Policy and legislation framework of Evironment and Health

5.1 Basic framework of China's environment and health management policies and legislation

5.1.1 Basic framework of China's environment and health management policies

China's environment and health policies consist of health policies in connection with environmental protection and environmental policies in connection with health protection involving environmental factors. Specifically they include:

(1) Policies for preventing environment health-related damage. The prevention policy remains one of the basic policies for the environment and health protection. Policies for preventing environment health-related damage are mainly realized by rational planning, assessment of health impact and development of clean production and recycling economy. First, China tries to protect the environment, prevent and control the pollution, avoid the adverse impact to the utmost of the production and construction on the living environment and health of people through rational development plan. Documents such as the Outlines of National Economy and Social Development every five years and the Program of Action for Sustainable Development in China in the Early 21st Century all embody the policy of protecting the environment and human health via planning. Next, China lays emphasis on the assessment of impact of environment on health, and prevents the adverse impact of production and construction on human health through environmental assessment of planning and construction projects. The Assessment of the Impact of Environmental Pollution on Health (for trail) released by the Ministry of Health in 2001 and the National Environment and Health Action Plan (2007 to 2015) jointly issued by many ministries and commissions have concentrated reflection. And the Action Plan puts forwards the requirements of reasonably determining the acceptable risk level, mapping out the national environment and health risk grade division, improving the prediction and management decision-making on the controllable environmental harmful factors and health hazard, gradually realizing the environment and health risk cost control and etc. Second, China formulates a series of policies of eliminating backward productivity and developing clean production and recycling economy. These policies are partially reflected in the Decision of the State Council on Several Issues Concerning Environmental Protection released in 1996, Several Opinions of the State Council on Speeding up the Development of Recycling Economy and the Decision of the State Council on Implementing Scientific Concept of Development and Strengthening Environmental Protection issued in 2005. These policies also are best reflected in the documents of various competent administrative departments, such as the Catalogue of Backward Productivity, Process and Products to Be Eliminated, the Technical Guiding Catalog of Clean Production of National Key Industries and etc.

(2) Policies for restoring and relieving environment and health-related damage. Restoring and relieving environment health-related damage includes contents in three aspects: first, restoring environment that does harm to human health; second, restoring human health; and third, relieving and remedying damage done by environment to

health. First of all, regarding the restoration of the environment that causes damages to human health, the policies and stipulations in China are mainly reflected in the policy of "whoever pollutes shall control", the substitutive execution system and etc. Second, in terms of restoration of human health, special and definite policies are yet to be established. As to the damage to human body caused by the environment and health-related damage accidents, temporary measures are normally taken after the accidents, and the pollution enterprises and the government together provide funds for the treatment. At last, in respect of relieving the environment and health-related damage, China currently has no special policy and the relief is generally administered through the administrative or judicial channel.

(3) Emergency policies for environment and health-related accidents. Since 2003, the Chinese Government has gradually constructed and perfected the preparation system for rapid response to environmental pollution emergencies, and established the "National Inter-Ministry Joint Conference System for Environment Protection" as the top integrated coordination institution for the outbreaks of environmental pollution emergencies. The above-said emergency system certainly covers the rapid response to the environment and health-related accidents.. The National Environmental and Health Action Plan is a policy document which stipulates early warning against environment and health risks and rapid response to emergencies for the first time. It requires to establish the disposal system for rapid response to emergencies and the reporting mechanism for emergencies and major events; makes it clear that environmental protection departments and health departments should take the main responsibility for dealing with emergent public accidents caused by environmental pollution and other relevant departments should participate according to needs; integrates relevant institutions and posts of the environmental protection sectors and the health sectors.…gives full play to the environment and health monitoring network and the risk assessment measures. …carries out afterward on-the-spot environmental investigation, health impact tracing and monitoring and emergency disposal effect assessment, to direct the on-the-spot environmental remediation and health damage treatment after the outbreak of an emergency.…timely and effectively treats the damage to health caused by the environmental pollution in line with the existing medical security system and the medical assistance system in urban and rural areas, prevents the aggravation of the damage, reduces the damage burden and feasibly safeguards the life and health of the victims."

5.1.2 Basic framework of China's environment and health management legislation

China has preliminarily set up the environment and health law guarantee system including the constitution, civil laws, criminal laws, administrative laws, environmental laws and etc., which are described as follows:

(1) Constitution. The state has the responsibility for protecting citizens' health and the Chinese Constitution contains many such provisions. Article 21 of the Constitution (1982) stipulates the state should develop the medical and health cause, develop public health activities and protect people's health. And Section 2, Article 36, Article 42 and Article 45 of the Constitution stipulate the state has the responsibility for protecting citizens' health in different aspects.

(2) Civil law. The General Principles of Civil Law gives detailed stipulation of the health right which is one of the important personal rights of citizen. Article 98 of the law stipulates citizens have life and health rights. Article 106 prescribes the civil liability for infringing others' life and health rights and the liability principle.

(3) Criminal law. The criminal liability and criminal punishment induced by infringement upon citizens' life and health rights which has constituted crimes is an important component of the Criminal Law, which effectively guarantee citizens' rights to health.

(4) Health law. The administrative laws that protect citizens' health right are mainly health laws. At present, China has already published 9 health laws and over 20 heath regulations. But the health administration regulations relating to the environment and health management are only prescribed in the public health legal norms, such as the Law of the PRC on the Prevention and Treatment of Infectious Diseases, the Food Hygiene Law, the Law of the PRC on the Prevention and Treatment of Occupational Diseases, Regulations on Preparedness for and Response to Public Health Emergencies and etc.

(5) Environmental law. One of the objectives of the environment legislation in China is to safeguard human health. It prescribes the relief for the damages to human health caused by the environment problems. First, on the basis of establishing "safeguarding human health" as one of the objectives of the environmental legislation, the existing Environmental Protection Law prescribes, in the first article, that the law is formulated for the purpose of protecting and improving people's living environment and the ecological environment, preventing and controlling pollution and other public nuisance, safeguarding human health and facilitating the development of socialist modernization The subsequently promulgated laws and regulations such as the Law of the PRC on the Prevention and Control of Atmospheric Pollution, the Law of the PRC on the Prevention and Control of Environmental Noise Pollution, the Law of the PRC on the Prevention and Control of Environmental Pollution Caused by Solid Waste, the Law of the PRC on the Prevention and Control of Radioactive Pollution, the Regulations on the Administration of Agriculture Genetically Modified Organism Safety and the Regulations of the Safety and Protection of Radioisotopes and Radiation Apparatus all list "safeguarding (protecting) human health" as one of their legislation objectives without exception. Second, with regards to the relief for damages to human health caused by environment problems, Article 41 of the Environmental Protection Law stipulates that any unit that has caused an environmental pollution hazard shall have the obligation to eliminate it and make compensation to the unit or individual that suffered direct losses. A dispute over the liability to make compensation or the amount of compensation may, upon the request of the parties concerned, be settled by the competent administrative department of environmental protection or another department vested by law with power to conduct environmental supervision and management. If a party refuses to accept the decision on the settlement, it may bring a suit before a people's court. The party may also directly bring a suit before the people's court." Article 42 stipulates that the limitation period for prosecution with respect to compensation for environmental pollution losses shall be three years, counted from the time when the party becomes aware of or should become aware of the pollution losses. Other environmental protection laws all have the similar stipulations.

(6) Labor law. So far, China has successfully set down a series of laws, regulations and rules relating to the environment and health and safety protection of labors, such as Mine Safety Laws, Labor Law, Law of the PRC on the Prevention and Control of Occupational Diseases, Law of the PRC on Safe Production, Decision of the State Council on Strengthening Control on Dust-proof and Toxicant Prevention, Regulations for the Implementation of Law of the PRC on Safety in Mines, Regulations on Labor Protection in Workplaces Where Toxic Substances Are Used and Measures for Administration of the Occupational Health Monitoring and Protection. These normative documents have played a very important role in protecting the safety and health of labors in China.

(7) Judicial interpretation. The Supreme People's Court makes several judicial interpretations that favor the environment and health protection. For example, Article 4 of the Several Provisions of the Supreme People's Court on Evidence in Civil Proceedings clearly stipulated that adopting the inversion in burden of proof for environmental tort litigation cases, which vails the victims for safeguarding their rights and interests. While the Interpretation of the Supreme People's Court on Several Issues Regarding the Ascertainment of Compensation Liability for Mental Damages in Civil Torts feasibly solves the operability of the life and health right protection in the judicatories, so as to allow the victims of the pollution to obtain the compensation for mental damages.

(8) Environmental standards. China has established many environment standards that closely relate to the environment and health. First is to make out environmental quality standards to protect the environment and safeguard human health. Second is to establish standards for pollutant discharge to prevent and restrain the environmental pollution from damaging human health, such as the Integrated Emission Standard of Air Pollutants, the Standard for Pollution Control on the Landfill Site of Municipal Solid Waste and etc. Third is to establish the health protection zone standards to prevent the toxic and harmful substances of the factories and mines corporations from affecting the normal living environment and health of the residents, such as the Health Protection Zone Standard for Oil Refinery and the Health Protection Zone Standard for Cement Plant, so as to prevent, control and reduce the adverse effect of pollution on human health. Forth is to establish the using standards for the toxic and harmful substances to prevent the environment and health-related damage caused by using such substances, such as the Hazardous Materials Control Standard for Motor Vehicle Gasoline and the Guidelines for the Hazard Evaluation of New Chemical Substances. Fifth is to establish the discriminant and identification standards of the environment and health-related damage to solve the environment and health disputes, such as the Discrimination Standard for Health Hazard Area Caused by Environmental Cadmium Pollution and the Standard for Identification of Area of Chronic Arsenic Poisoning Caused by Environmental Arsenic Pollution.

5.2 Analysis of the problems of the Chinese environment and health management policies and legislation

Despite the fact that China has made remarkable progress in the construction of laws and policies on environment and health, we have to say the policies and legislation on the environment and health management in China remains confronted

with severe challenges. And these to be solved are caused by many factors such as economy, history, science and technology.

5.2.1 Challenge confronted by the Chinese environment and health management policies and legislation

The environment and health management policy and legislation system in China has defects with respects to the environment and health management policy, the laws, regulations and normative documents on the environment and health management, and the environment and health management system. And it has many shortcomings in respect of the execution of the policy and legislation, which is mainly reflected as follows:

First is shortage of the comprehensive and systematic environment and health management policies. Currently, the environment and health policies are not comprehensive enough, and there're not the comprehensive and systematic relief policies for the environment and health-related damage like the environmental health recovery and the insurance of environment and health-related damage, nor are there the environment and health supervision policies mainly supported by facilitating the disclosure of environment and health information and promoting public participation.

Second is shortage of the sound legal systems on environment and health management. China lacks the special legislation on environment and health problems, and the related laws and regulations can be found in quite a few legal departments so that the judicial practice is impossible without the coordination of several related laws and regulations. At present, the legal guarantee system on environment and health consists of the related entities like the civil law, administrative law, criminal law, environment law, civil procedure law, administrative procedure law and criminal procedure law, and the specific provisions of procedural laws, which appears to be rather disorderly and can hardly form a complete and systematic legal system. These disorderly environment and health laws and norms can hardly effectively protect the human health and prevent the frequent occurrence of the environment and health accidents.

Third is shortage of the necessary legal system on environment and health management. A multitude of environment and health legislation cases are just limited to the abstract prescription in the objectives of the legislation. There aren't any detailed provisions concerning the measures for safeguarding the human health, the criterion for assessing the health damage, and the relief approaches and methods for health damage, resulting in failure to satisfy the needs for environment and health protection. Meanwhile, some specific environment and health management systems are imperative to be established, such as environment and health risk assessment system, reporting system for environment and health-related damage, monitoring system for environment and health-related damage, early warning system for environment and health-related damage, authentication and evaluation system for environment and health-related damage, compensation system for environment and health-related damage, insurance system for environment and health-related damage, disclosure system for environment and health-related damage information, emergency system for environment and health-related accidents.

The last one is ineffective implementation of the present environmental management systems and measures. It is the truth that we lack special environment and health management system. But if some of the existing environment management systems can really be implemented, we can still solve the environment and health issues to some degree. As a matter of fact, these systems are not implemented effectively. Especially the criteria on human health protection have not been given proper attention. For example, the environment impact assessment system inherently contains the assessment on human health impact. However, in the concrete operation, the relevant assessment standards are absent. What's more, the personnel for approving environment assessment documents seldom considers the influence of the projects on human health, some environment assessment units even practice fraud intentionally just to pass the environment assessment report smoothly. Taking another example, the environmental damage compensation system surly includes the compensation on human health damage, however, the institutions, procedures and standards on the identification of damage to human health caused by pollution are absent. As a result, many victims of the environmental pollution can not be identified and compensated.

5.2.2 Analysis of the reasons of the Chinese environment and health management policies and legislation absence

The various problems in environment and health policies and legislation as stated above not only originate from some historical origins, but from certain economic and technical causes; they can be attributed to the restricted awareness of government leaders and the insufficient public consciousness of environment and health, and are related to the management mechanisms and judicial practices. Concretely speaking:

(1) The environment and health management starts late in China. The history of environmental protection is just 30 years in modern China, and less than 30 years in terms of the environmental protection legislation. And at this stage, it is difficult for the state to pay proper attention to the health damages that are not visible or are featured by posteriority and potentiality. Therefore, the legislation work may state the general provisions on "protecting the human health", but the specific management and protection measures are rarely available. Besides, due to the lacking of environment and health cases and the environment and health management experience, the draft and establishment of the environment and health policy and legislation surly can not be emphasized and conducted.

(2) The environment and health management is restricted to the economic development. In the past 30 years, China has always taken the development as the overriding principle, while some local leaders even unilaterally interprets the "development is the most important principle" as "economic development is the most important principle", which results in an average annual growth rate of 10% or over for the GDP but much less investment on environmental protection. During the 8^{th} Five-year Plan, the ratio of the environmental protection investment to the GDP was only 0.69%, nearly 1% during the 9^{th} Five-year Plan, and 1.32% during the 10^{th} Five-year Plan, which is registered as dramatic increase. While the investment in environmental protection in developed nations generally accounts for 1.5% of the

GDP. [12] With such low proportion of environmental protection investment, China's environmental situation will surly deteriorate, and then affects human health. While the general public, especially the leaders at various levels are absorbed in the economic development, having little time or not willing to pay attention to the environment and health, the special and concrete legislation on the environment and health management certainly can hardly be put on the agenda.

(3) The technological capacity of environment and health management is weak. In respect of the technical factors, it still remains uncertain to identify the cause-effect relations for environment and health-related damage. The diseases related to environment and health can't be identified often because of the absence of technical authentication. As a result, some facts on environmental health hazard are concealed. Furthermore, the environmental medical researches of China not merely have a late start, but are confronted with the technical weakness. The research expenditures in short supply and the restricted site investigations render it hard to master the comprehensive data of environment and health. Because the environment and health problems are not based on the scientific researches and the comprehensive survey data, they can't draw enough attention from the government and administrative departments, or be put on agenda of national legislation work.

(4) The environment and health management is not emphasized by the leaders. Some local government leaders don't recognize the significant impact of the environment health hazard on the state, and they blindly think that the environmental pollution hazards including the environment and health hazard are inevitable in the course of economic development, even view that certain environment and health hazard is the cost China has to pay for its economic soar. Under such mentality, it is impossible for them to highly value the environment and health issues. In addition to that, due to the mentality of "holding back the unpleasant information" that prevails through the whole country, the environment and health damage which will affect the political achievement and image can not be reported actively. In addition to that, due to the mentality of "holding back the unpleasant information" that prevails through the whole country, the environment and health hazard which will affect the political achievement and image can not be reported actively.

(5) The environment and health management is deficient in public basis. For a long time, China has lacked propaganda and education in environment and health, leading to the low environment and health consciousness of the Chinese citizens. They are accustomed to and can not recognize the environment and health damage they suffered, even when they are seriously jeopardized, they do not actively complain and press for solving the problems. Some residents that suffered damage from the environmental pollution even give up their complaints if obtaining some economic compensation from the polluter, which also affects the cognition of the decision making departments on the seriousness of the environment and health problems and the urgency for solving these problems, and further influences the legislation of the environment and health.

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[12] Analysis on the Chinese Environmental Protection Investment at http://www.paper800.com/paper8/39151403/, Time of Latest Browse: 18：00. .August 20, 2007.

(6) The environment and health management lacks the judiciary support. Various courts are normally reluctant to accept the environment and health hazard cases. So, few environment and health damage cases can be successfully prosecuted, let along cases that win the lawsuit. Since the courts have witnessed few lawsuits concerning environment and health problems, it'll be hard to reflect the judicial demands for legislation of environment and health and accumulate various environment and health cases necessary for legislation work. Hence, people have a false impression that the legislation is unnecessary and ungrounded.

5.3 Perfection and improvement of the Chinese environment and health management policies and legislation

As we said above, the environment and health management policy and legislation system is perplexed by many problems with manifold causes. With the establishment of the scientific concept of development, the Chinese government pays more attention to people's livelihood, pursues the social harmony, and increasingly concerns the environment and health issues that relate to the fundamental interests of the majority of the people in China. Meanwhile, with the economic development and the scientific and technological progress, China has possessed the ability to solve environment and health issues, and the People's governments at all levels and the general public are all gradually realized the importance of environment and health management. On top of that, along with the perfection of the environmental law system of China, People begin to notice the defects of the environment and health policy and legislation, and are willing to improve and perfect it with effective measures.

The environment and health policy and legislation should be improved and perfected mainly in the following aspects:

5.3.1 Formulation of the comprehensive and systematic environment and health management policies

The comprehensive and systematic environment and health management policies shall include the preventive policies for environment and health-related damage, which focus on the rational planning and the environment and health risk assessment; the industrial policies favorable for environment and health, dominated by the clean production and environmental friendliness; the policies on treatment of environmental pollution sources, which focus on the elimination of backward production process and equipment; the relief policies for environment and health-related damage, mainly including the development of insurance for environment and health-related damage, the administrative relief and the judicial relief; the environment and health supervision policies mainly supported by facilitating the disclosure of the environment and health information and promoting public participation.

5.3.2 Gradual improvement of the legal systems on environment and health

Since China's environment and health work was just initiated, it's still premature to develop the comprehensive environment and health legislation immediately. During the "10^{th} Five-Year Plan", the former State Environmental Protection Administration organized the national science and technology development topic

entitled the Research into the Human Health Damage Caused by Environmental Pollutions and the Compensation Mechanisms, worked out the legal framework for the health damage rating and compensation mechanism, providing a technical platform for conducting the environment and health management and identifying and compensating for the environment and health-related damage. On the basis of that, through the cooperation of various departments, clauses that relate to the environment and health can be properly added in the process of drafting and establishing relevant environmental protection laws and regulations. For example, content of human health impact assessment can be added in the Technical Guideline of Environment Impact Assessment. We can revise the related clauses of Civil Procedure Law, Administrative Procedure Law and Criminal Procedure Law, and specify the procedures concerning the lawsuits against environment and health-related damage including the plaintiff's procedural competence, collection of evidence, burden of proof, the determination of cause-effect relation, and time limit for litigation. On the basis of the supplement and perfection of relevant laws and regulations, we can also draft and establish special laws and regulations on environment and health, such as the Law of Compensation for Environment and health-related Damage and the Regulations for the Management of Environment and Health, and work out a series of standards and technical specifications to support the implementation of the laws and regulations. And finally, we will form a harmonious and unified environment and health law system constituted by a series of laws, regulations, rules and standards. See Table 4.1

5.3.3 Establishment of a whole set of inter-linked and coordinated environment and health management systems

The sound environment and health systems shall include the environment and health planning system, the assessment system for impact of planning and construction projects on health, the monitoring system for environment and health-related damage, the disclosure system for environment and health-related damage information, the public participation system for environment and health management, the early warning system for environment and health-related damage, the reporting system for environment and health-related damage, the treatment system for environment and health-related damage, the identification and assessment system for environment and health-related damage, the compensation system for environment and health-related damage, the fund system for environment and health-related damage, the insurance system for environment and health-related damage and the emergency system for environmental health accidents. These systems should be inter-linked and coordinated to create a whole set of well-established systems. At present, the several systems that urgently need to be established are listed as follows:

(1) The environment and health-related damage monitoring system. At this moment, the biggest challenges we face in our environment and health management are that the quantity and degree of the environment and health-related damage are not clear and the relevant data is deficient, so it is necessary to establish the environment and health-related damage monitoring system as soon as possible. The environment and health-related damage monitoring system should comprehensively and dynamically investigate the environment and health-related damage situation over all the country, especially in areas that have long been afflicted by pollution, opportunely integrate the environmental pollutant monitoring and the epidemic monitoring, and realize the connection with the environment and health planning system, the early

warning system for environment and health-related damage and etc. At this moment, we can conduct the monitoring work relying on the environment monitoring network which is relatively sound. As for the monitoring on the status quo of the human health, the Ministry of Health can organize the disease control center and the relevant medical institutions to conduct the monitoring. The monitoring data of various departments and units should be disclosed and shared, and consultation should be conducted for major problems found in the monitoring.

(2) Identification and assessment system for environment and health-related damage. The compound character of the environmental problems in China brings about the complexity and diversity of the environment and health issues. Since the identification of cause, nature, size, degree and impact scope of environment and health-related damage requires the considerable professional and technical capacities, it's necessary to establish the special identification and assessment institutions for environment and health-related damage so as to provide the parties concerned with the damage identification and assessment services. The environmental protection administrative department of the State Council should establish the environment and health-related damage assessment system to identify the assessment qualification of the environment and health-related damage evaluation institutions, and frame and release relevant identification standards and technical specifications for environment and health-related damage. The conclusive assessments, which are made by the statutory assessment institutions according to the relevant assessment norms, should have the legal effect, and constitute a major basis for determining the damages related to environment and health.

(3) The environmental liability insurance system. The environment and health hazard events always involve a large number of people and huge compensation amount, and generally the pollutant discharging enterprises can not bear the charges independently. So, we must set up the environment liability insurance system to disperse the risk in a socialized way

(4) The emergency system for environment and health accidents. At present, the environment and health accidents in China are mainly managed in line with the policy documents such as the National Environmental and Health Action Plan, lacking effective laws and regulations basis. The feasible emergency system for environment and health accidents is yet to be established. Based on the own characteristics of the environment and health accidents, it is required that the environment and health accident emergency system should pay more attention to the beforehand prevention and early warning and the afterwards long-term relief, etc. The environment and health accident emergency system should contain the following content: establishing special environment and health accident emergency management legislation on the administrative regulations level, as well as relevant matching department rules; nailing down the leading bodies and the participating departments for the environment and health accident emergency treatment; establishing the emergency management pre-plan system for environment and health accidents; setting up the reporting system for environment and health accidents; making clear the source of emergency funds for the environment and health accident and establishing corresponding accidents restoration funds; creating stringent emergency responsibility investigation system for environment and health accidents.

5.3.4 Creating the robust law enforcement mechanism of environment and health management

The environment and health management work in China starts late, and is featured by insufficient investment, low level and weak public participation base, so the administrative law enforcement remains the main mean and inevitable path for implementing the environment and health policies, laws and regulations. First, we should strengthen the construction of environment and health institutions, and nail down their corresponding responsibilities. Currently, we should specially make clear the status and responsibilities of the administrative departments such as the environmental protection departments and the health departments in enforcement of the environment and health management, furnish necessary professionals and funds for them, and improve their ability and level in conducting the administrative enforcement on environment and health management. Second, we should enhance the communication and coordination of various departments on the government level, establish and perfect the enforcement cooperation mechanism of the environment and health management among various departments. Finally, we should provide ways for the public to participate in and supervise the enforcement of the environment and health management through the disclosure system for environment and health-related damage information and the public participation system for environment and health management, strengthen the acceptance and trial of the judicatory system on the civil cases, administrative cases and criminal cases concerning the environment and health, and enhance the administrative enforcement of the environment and health management by social supervision and judicial supervision and etc.

5.3.5 Implementation of various applicable systems and measures on environment and health management

Promotion of the implementation of various systems and measures on environment and health management is the realistic choice to solve the issues concerning the environment and health management policy and legislation, also is the implication for perfecting the environment and health management policy and legislation. The environment planning system, the environment impact assessment system, the environment damage compensation system and other systems are all proven environment management systems supported by relevant sound policies, legislation and concrete measures. Because we have not yet comprehensively and clearly recognize the relation between the environment and health management and these systems, these systems and measures fail to meet the practical need of the environment and health management in the implementation process. The implementation of various systems and measures of the environment and health management should be initiated with two aspects. On one hand, we need to firmly carry out various systems and measures to facilitate the rapid development of the environment and health management. On the other hand, we need to make overall arrangement, using the existing systems and measures to promptly and properly regulate in advance the issues that are scheduled to be governed by policies, systems and measures that have not been mapped out and also can be regulated by the existing systems and measures, so as to make up the system construction lagging. For example, before the promulgation of the special Law of Compensation for Environmental Damage, we can flexibly use the existing environmental damage compensation

system to solve the issues on compensation from environment and health-related damage.

6 Report on Recommendations for Policies on Strengthening the Environment and Health Management

According to international experience, environment and health problems which are handled improperly may develop into complex social and political ones, which gravely jeopardize the public health, affect the credibility of the government, and cause the government to pay a heavy economic cost. Therefore, different countries all over the world currently pay much attention to the environment and health management, strengthening management and intervention, and have made good results. Their main experience and practices are: The first is to intensify prevention and make active intervention so as to avoid harm from environmental pollution to human health; the second is to improve legislation, strengthen the administration of justice, and establish an environment and health-related dispute settlement mechanism and a health compensation mechanism.

Considering the increasingly grievous environment and health situation at present and possibly more environment and health risks in the future in China, the subject team recommend that the Chinese government should raise much concern for environment and health problems, further enhance the environment and health management, and set up an environment and health management system, in which the government plays a dominant role and the public participate extensively. The focus should be on reinforcing the environment and health prevention work, eliminating or reducing harm from environmental pollution to human health, and averting environment and health risks. Priority should be given to solving hot issues in environment and health which cause much attention from the people, in order to maintain their environment and health rights and interests.

6.1 To strengthen the responsibility of the government and build an environment and health management system, in which the government play a dominant role and the public participate extensively

Firstly, the main body responsible for the environment and health management is the government, which should further enhance the environment and health management by making clear responsibility and intensifying leadership, supervision and other measures, for the purpose of establishing an environment and health management system, in which the government plays a dominant role and the public participate extensively.

Secondly, the government should first set up an administrative system with clear division of work. The major governmental departments for environment and health management such as environment and health departments should set up special agencies based on their respective functions and equip themselves with sufficient human and financial resources to ensure the implementation of government functions.

The environmental protection departments should bear and fulfill more governmental functions in the prevention and control links of guarding against the damage from environmental pollution to the human health and should further make

clear the guiding ideology that safeguarding human health is the basic starting point and the fundamental purpose for pollution prevention and control, mainstreaming the environment and health work to the environmental protection work.

The health departments should focus on assuming and performing governmental functions in prevention, monitoring, and treatment of disease from environmental pollution, and other links, should bring the prevention and control task on disease owing to environmental pollution into the mainstream in the national disease control and health work, providing technical support for development of the environment and health prevention and pre-warning work. At the same time, it should specify governmental duties of the development and reform, finance, science and technology, social security and other related departments to support the environment and health work.

Thirdly, a national environmental and health administrative coordination mechanism which is actively coordinated by departments such as environmental protection and health departments, and widely participated by all departments under the leadership of the State Council is proposed to be established on the basis of the current coordination mechanism for environment and health work between the Ministry of Environmental Protection and the Ministry of Health for the purpose of discussing and dealing with the difficulties and problems arising in environment and health management, coordinating the workflow among different departments and urging the implementation of various tasks to ensure China's environmental and health strategies, tasks and government duties are implemented. To this end, the State Council Working Group for Environment and Health Work may be established which is headed by a leader in charge of the State Council and deputy heads should be leaders in charge of the General Office of the State Council, the Ministry of Environmental Protection, and the Ministry of Health, with members from other 16 departments concerned13.

It is suggested to employ the civil servant exchanges and shift-rotating system between different governmental departments and between the central and local departments to step up staff exchange, communication and understanding among people engaged in environment and health management and boost the coordination and mutual support among departments as well as between central and local governments.

Fourthly, it should emphasize the building of local environment and health management systems. Local governments at all levels should set up their respective environment and health management systems, clarify the duties of relevant departments, form agencies and furnish personnel by referring to the one established by the Central Government, so as to identify and solve local environment and health problems and report major environment and health problems in time.

Fifthly, it is necessary to establish a government performance assessment and accountability mechanism of the environment and health work, in order to supervise and urge governments and departments at all levels to fulfill their environment and health management duties. Responsibility of governments and leaders at all levels

[13] Sixteen departments including the finance, development and reform, water conservancy, construction, agriculture, and meteorology which participated in signing and formulating the National Environment and Health Action Plan.

should be clarified in respect of environmental protection and public health safeguarding, and supervision and restriction should be strengthened over the government's fulfillment of its environment and health management function by improving the government and cadre performance assessment and accountability mechanism, in order to increase the effectiveness of environment and health law enforcement. At the same time, criminal and civil penalties should be given to the government officials, enterprise legal persons and individuals and others who cause major environment and health hazards by perfecting relevant laws and regulations.

6.2 To improve environment and health laws and regulations and policy systems and form an effective environment and health management system

Firstly, it is imperative to strengthen the construction of legislation in environment and health management. It is a must to start from paying attention to the public health rights and interests, amend, supplement and perfect the existing laws and regulations and policy systems related to environment and health. Such systems should be established through improvement in legislation as an environment and health planning system, an environment and health impact assessment system, an environment and health monitoring system, an environment and health prevention, early warning and emergency system, an environment and health information disclosure system, a public participation system of environment and health management, an environment and health damage dispute handling system, an environment and health damage compensation system, and so on.

Secondly, the focus should be on intensifying the legislation and law enforcement building of environment and health prevention. It is necessary to proceed from maintaining human health and avoiding health risks, further revise and improve the current environment and health standards, access standards and emission standards, and set up a strict legal system of environment access management.

Thirdly, suggestions are to strengthen requirements for health impact assessment in the existing environmental impact assessment system, amend the Environmental Impact Assessment Law, establish and implement the environment and health impact assessment system, carry out environment and health impact assessment of construction projects, plans and strategies gradually, and fulfill environment and health management access system.

Fourthly, an environment and health dispute settlement mechanism should be set up to protect the rights and interests of the public environment and health. The government can gradually form and improve an environment and health dispute settlement mechanism through environmental dispute handling legislation, providing parties to environment and health disputes with mediation, administrative treatment, arbitration, litigation and many other means for dispute settlement. Besides, it is necessary to establish public interest litigation, legal aid and hearing systems. Against the problem in difficulties for vulnerable groups to safeguard their environment and health rights, the state should consider provision of legal aid and establishment of a public interest litigation system to help the public safeguard their rights.

Fifthly, a compensation system of human health damage from environmental pollution should gradually be set up and implemented in China to maintain the rights and interests of the public environment by further improving relevant laws and

regulations, enhancing related judicial capacity construction, furnishing legal aid, launch public interest litigation, forming a compensation fund, and other means and measures according to China's national condition and the characteristics of health damage compensation issues from pollution. The foregoing compensation system should be established in line with the principle of "polluters pay expenses", and compensation responsibility of the main body in charge should be specified through the legal system building. At the same time, public interest compensation should be given to victims of health damage from pollution through establishment of an environment and health fund and other means.

6.3 To adhere to the principle of focusing on prevention and take effective measures to avert environment and health risks

Firstly, a prevention system of environment and health management should be set up by bettering the environment standard system, preparing a directory of preferentially controlled pollutants, forming and implementing a strict environment access system, and other policy means and measures, in order to carry out source control, especially rigorous control over pollutants which do great harm to human health and enter into the environment via production, flow and consumption and other links, and to guard against environment and health risks.

Secondly, it is a must to further strengthen and improve the building of the environment and health monitoring network, especially to increase environment monitoring (including pollution source monitoring) related to the crowd exposure level and the relevant disease monitoring. On the basis of intensification of risk evaluation and analysis on monitoring data in relation to environment and health, it is required to carry out the pre-warning mechanism of the environment and health step by step, conduct the forecast and the pre-warning of the environment and health risks and take the prompt measures to avoid or reduce the environmental pollution from jeopardizing people’s health.

Thirdly, according to the current problem of frequent environmental pollution emergencies in China, it is necessary to further enhance and perfect environment and health emergency handling and the handling mechanism, and develop an emergency disposal work system, an emergency and major incident notification mechanism, and environment and health emergency disposal norms, for the purpose of upgrading the emergency disposal ability. The environmental protection and health departments shall cooperate with each other closely to realize unified decision making, command, allocation of resources and dealing with the emergent cases, striving to swiftly and effectively control the pollution, mitigate the health harm and provide prompt medical treatment to the victims.

6.4 To increase financial input and reinforce the environment and health management capacity building

Firstly, it is necessary to strengthen the governmental responsibilities and increase the financial input. Meanwhile, the financial allocation of central government and local governments at different levels shall arrange the funds in their annual budgets to ensure the administrative fees and major project costs. According to the actual demand of China’s environment and health management, the main focus of the government investment comprises the following three aspects: the first is to strengthen the environment and health monitoring capacity building and gradually

improve the processing capability of relevant environment and health monitoring information, providing services for development of environment and health risk prevention and early warnings; the second is to increase investment in scientific research into environment and health, organize and launch large-scale surveys of environment and health problems and study of the environment and health base and application, and conduct in-depth study of relations between environmental pollution and health damage, so as to find out the basic condition of China's environment and health problems and provide scientific and technical support for the government's scientific decision-making and development of effective environment and health management. The third is to enhance the government's capacity building of environment and health management, especially the capacity building of local governments, the public and judicial system and incorporate relevant expenditures into the financial budget of the local government at the same level.

Secondly, the state may consider the establishment of an environment and health fund mechanism, where public interest compensation can be made for health damage from historical environmental problems, for having no civil compensation capacity on the responsible part, and to victims for whom a principal responsible part is hard to be defined; the state may also support development of environment-caused health damage education and health damage rehabilitation and other activities.

The state formulates relevant provisions of the environment and health fund raising, operation and use. Local governments at the provincial and municipal levels should establish local environment and health funds in accordance with the relevant provisions of the state, specifically forming and operating the funds, implementing relevant compensation, and organizing development of related activities. The state can support local governments by furnishing special capital from national finance.

Thirdly, efforts should be made to establish social multi-channel financing channels, raise environment and health funds, and support development of public interest compensation for human health damage for reasons of the environment. The raising channels of environment and health funds include: the first is that the state raises capital by forming an environmental responsibility insurance system, where the specific method is to take a certain proportion of the capital from premiums for addition to a compensation fund; the second is that a certain amount of pollution discharge fees collected on an annual basis shall be contributed to this fund. the third is to accept donations from all sectors of society; the fourth is that a certain proportion of capital should also be injected from the government revenue into the fund to ensure capital needs of the fund for developing relevant compensation and activities; the fifth is that the compensation fund can be managed under the oversight of the Chinese government according to the limited market operation model so as to maintain the fund safety and promote its value increase through investment or operation in the capital market.

6.5 To stick to environment and health information disclosure and encourage public participation

Firstly, the government should intensify environment and health education through regular and irregular education channels and various media and networks and the like, in order to deepen the public understanding of environment and health issues and upgrade their capacity of participating in environment and health management.

Secondly, the government should opportunely release environment and health information to which the masses pay attention on the government's websites and various news media and the like in a way of easy access and understanding by the public. Environment and health information which should be released to the public in time includes: environmental air and environmental quality, water environment quality and other important environmental quality information; possible environment and health risk pre-warning information; health risk pre-warning information on major environmental pollution incidents; important monitoring information on health disease due to environmental pollution; major incidents of health damage owing to environmental pollution; the procedures and means through which the public request the government to address environment and health problems, and so on.

Thirdly, the government should set up channels for the public to participate in environment and health management, further improving complaint handling via letters and visits, public notification and other systems. The environmental protection and health departments should establish specialized agencies or provide special personnel to listen to views of the public, opportunely feed back and deal with environment and health problems reported by the public, supplying them with approaches to participation in politics, discussion on government affairs, and reporting issues.

Fourthly, it is necessary to strengthen supervision by the public, social groups and media over the environment and health work, encourage the public to inform against and report violations of environment and health regulations, and fully listen to comments from the public on the environment and health work by holding meetings of experts, demonstration meeting, hearings and other ways.

6.6 With regard to features and prominent problems of environment and health in China, it is recommended to conduct the environment and health work with focus and take targeted intervention measures.

First, the government should apply different countermeasures for different environment and health problems, and focus on problems of health damage incurred by environmental pollution, and prevent environmental pollution with high risk on human health. To be specific, we should intervene without delay the environmental pollutions which have led to diseases or definite damages, and provide the victims with the treatment and compensation. For the pollutants which have been proven to possibly cause serious health damage, the state must identify a directory of preferentially controlled pollutants, rigidly enforce access, and intensify early intervention, so as to prevent and reduce harm of environmental pollution to health. Meanwhile, to those environmental factors with clear effect on health not identified, we should enhance researches and take positive prevention measures. The emphasis of work on environmental pollution prevention and control should gradually expand from control of traditional pollutants to that of contaminants such as organics, PM2.5 and so on, which are more harmful to human health.

Second, in China, as air pollution in urban areas and water pollution in rural areas are two severe threats to human health, it is imperative to strengthen the management and intervention of environment and health. In urban areas, more importance should be attached to the prevention, precaution, emergency management and medical treatment for environment and health events closely related to air pollution, establishing and perfecting relevant monitoring, information sharing, intervention, and treatment systems. In rural areas, the focus should be on prevention

and medical treatment of environment and health problems because of water pollution, and on establishment of an environment and health monitoring, prevention and intervention system.

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Long-term Incentive Strategies for Energy Efficiency

Background Report on Economic Instruments for Energy Efficiency and the Environment

The 2008 Annual General Meeting
China Council for International Cooperation on Environment and Development
（2008.11.12-14）

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Executive Summary

The China Council for International Cooperation on Environment and Development Task Force on Economic Instruments for Energy Efficiency and the Environment in China assembled a group of environmental policy experts and academics from China, Denmark, France, Germany, Singapore, South Korea and the United States. They are to analyse existing economic instruments in China, especially in regard to effectiveness, efficiency as well as constraints and barriers hampering the effectiveness of economic instruments in China. They shall suggest changes and propose new economic instruments, based on a survey of the experiences of Western countries with economic instruments. In addition, the potential of economic instruments to support the achievement of efficiency targets set in the 11th Five Year Plan should be analysed.

There is now a window of opportunity for China to develop an innovative interaction between its overall social planning system and the use of government-controlled market-based instruments in the energy and environment sectors. In the first instance, it is imperative to improve energy efficiency in view of the energy requirements for continued economic development and China's position as a net importer of energy. In addition, the desire to reduce overall environmental burdens for the economy, as reflected in the 11th 5-year plan, combined with the wide array of pre-existing energy taxes and environmental levies, presents a policy platform that can be extended into a coherent and effective architecture of economic incentives that allow for improvements in overall economic and social welfare. Given that the drafting phase for the 12th 5-year plan has begun, making considerations on long-term energy efficiency strategies is very timely.

The CCICED recognized this opportunity for China and its active initiatives in development of economic instruments for raising energy efficiency and reducing pollutant emission (refer to Appendix I and II). Consequently, it established a two-year-term "Task Force on Economic Instruments for Energy Efficiency and the Environment". The purpose of the Task Force is to make strategic and concrete policy recommendations to the State Council of China and its relevant ministries on environmentally-related taxation, green credit and pollution liability insurance, whilst making reference to related experiences and lessons of the international community.

Empirical data and economic studies show that economic instruments have considerable positive impacts on the environment, employment, innovation and the economy as a whole. Billions of Euros have been and can be saved, which so far are used for importing energy and resources as well as for combating pollution. Several policy processes in the European Union (EU) show that increasing energy and resource efficiency are and will remain high on the political agenda. At the EU Summit in March 2007 the European Council (heads of state) decided that energy efficiency should be improved by 20% by 2020. The European Commission in turn has launched a 'Green Paper on market-based instruments for environment and related policy purposes[1] in March 2007, which takes stock of the implemented economic instruments and sketches out possible potential for broader application.

[1] Resource: http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0140:FIN:EN:HTML .

The Task Force held its inception meeting in April of 2008. In the succeeding months, the Task Force has prepared this interim report for the 2008 AGM of the CCICED, with focus on long-term incentive strategies for energy efficiency. In addition, the Task Force intends to conduct a study tour to Europe to get hands-on experience in discussions with top-level professionals from academia, science, politics, non-governmental organisations and associations and to enrich the Task Force Members' practical impressions on how to deal with economic instruments in developed countries. A roadmap towards the more effective application of existing and the introduction of new economic instruments shall be proposed. This shall include an incentive strategy for energy productivity as well as detailed implementation steps for economic instruments by the groups: environmental taxation and greening credits and insurance. The overall research results and the recommendations elabourated by the Task Force shall be presented at an international conference. The general working progress of the Task Force is presented separately in the appendixes and the overall outputs of the Task Force will be finally reported to the 2009 AGM.

The Task Force acknowledges both the contribution by a previous CCICED Task Force on environmental taxation, and also the parallel existence of the Task Force on a low carbon economy. However, it identifies its separate strategic role as bringing together environmental and energy efficiency concerns under a coherent perspective. The CCICED addresses market-based policy instruments as a vehicle for reforms that are both economically efficient and environmentally consistent.

The Task Force proposes a fiscal reform that progressively and predictably moves fuel and energy prices upwards. It also proposes long term infrastructure planning, based upon the assumption of these rising prices. This double strategy can be designed to be socially benign, thus avoiding any additional inflation and stimulating long term technological progress.

Significant technical opportunities for dramatic increases of energy productivity do exist, but are so far dormant, waiting to be developed and applied. The foreseen long term rising energy prices and taxes, can spur technological innovation in the direction of high energy productivity, promising prosperity and environmentally sustainability at the same time.

The Task Force takes note of the implications of China's aim to maintain a harmonious society with continued economic development and recognizes the sensitivity of inflation in the current situation of increasing energy prices and thus comes up with proposals contributing to this aim.

The rising of energy prices can be attributed to two subtly different rationales. In one case, the revenues flow directly to oil and coal producing countries. In the other situation, the energy taxes are domestically imposed, so the revenues from increasing the energy prices are captured and recycled back to lower other taxes, in order not to increase the tax burden. In addition, a portion of the revenue is spent to stimulate innovation and diffusion of energy-efficient technologies. The Task Force has reviewed international experiences with market-based instruments and provides below a preliminary account of its findings and observations on energy taxes. The concrete recommendations on the implementation of environmental taxes will be reported to the AGM 2009.

The following preliminary recommendations are made:

1) The concept of energy productivity suggests that energy policies should target not only the energy supply side but also the energy demand side as well. Thus, it is vital to optimize the whole system of socio-economic activities. China should take a systematic and long-term strategy of increasing energy productivity as a national goal.

2) Raising energy price is a fundamental driving force to raise energy productivity through curbing energy demands and stimulating technology innovation. In the past 200 years before 2000, the real prices of raw industrial resources including energy had been falling in general trend, and the prospecting, mining and transport technologies were the main drivers of reducing prices. Consequently, the incentives have weakened for all investors to put their money into high technology efficiency innovation.

3) Considering the complexity of raising energy prices, China can adopt a long-term strategy - the 'escalator' idea of adding small, announced, periodical price signals. The escalator strategies should be kept stable for many decades and the slope of the upward escalator could be determined annually or every five years by the cycle of the five-year plans in line with measured average productivity gains over the previous years. Raising prices at the same rate as raising productivity concurs to the concept of a Harmonious Society.

4) Regarding impacts of energy-related taxes, the link of the tax increases to the productivity gains will ensure to have no negative effects on welfare and thus would be no average suffering. If the fiscal revenue from energy taxes is re-channelled into the economy by reducing the fiscal or parafiscal load on human labour, it would give an additional push to overcome unemployment. To this end a tax shift could be made from value added taxes (VAT) to energy taxes with a net neutral effect on inflation. If the increase of energy prices is linked to energy productivity gains, pioneering countries are likely to be at the forefront of a trend that will come worldwide anyway. Aiming at the largest potentials for energy efficiency first (Chinese industry), this will limit impacts on the consumer prices, too.

5) It is conceivable that similar long-term escalator strategies are applicable to other natural resources such as industrial materials and water.

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1. Energy productivity as a national goal

1.1. Understanding the importance of energy productivity

In economics, productivity is the amount of output created (in terms of goods produced or services rendered) per unit input used. For instance, labour productivity is typically measured as output per worker or output per labour-hour. Resource productivity refers to the economic output per resource input. The Chinese GDP of 2007 divided by the amount of resources consumed in that year is the Chinese resource productivity of 2007. This can, of course, be subdivided and differentiated for different resources such as energy, water, minerals etc.

Like labour or capital productivity, energy productivity measures the output and quality of goods and services (or welfare) generated with a given set of inputs, taking into account of the entire energy chain as illustrated in Figure 1.

End-use energy consumption includes several resources that fall into two categories, i.e. primary energy such as coal, oil, nuclear, natural gas, hydropower, biomass and so on, and secondary energy such as electricity, thermal power, gasoline and so on that are converted from primary energy. The needs like a “light, warm room” or a “cool drink” have to be considered too, since there are different ways of providing these services. It thus goes one important step further; from primary energy via end energy to services. This allows for a much larger potential of energy productivity to be exploited.

Factors which influence China's energy productivity include: technology innovation; development and deployment; resource allocation structure; industrial structure and institutional arrangement; management and mechanisms; subsidy; price and tax structures; demand preferences which are dependent on prices; infrastructures; institutional presetting; cultural habits; etc.

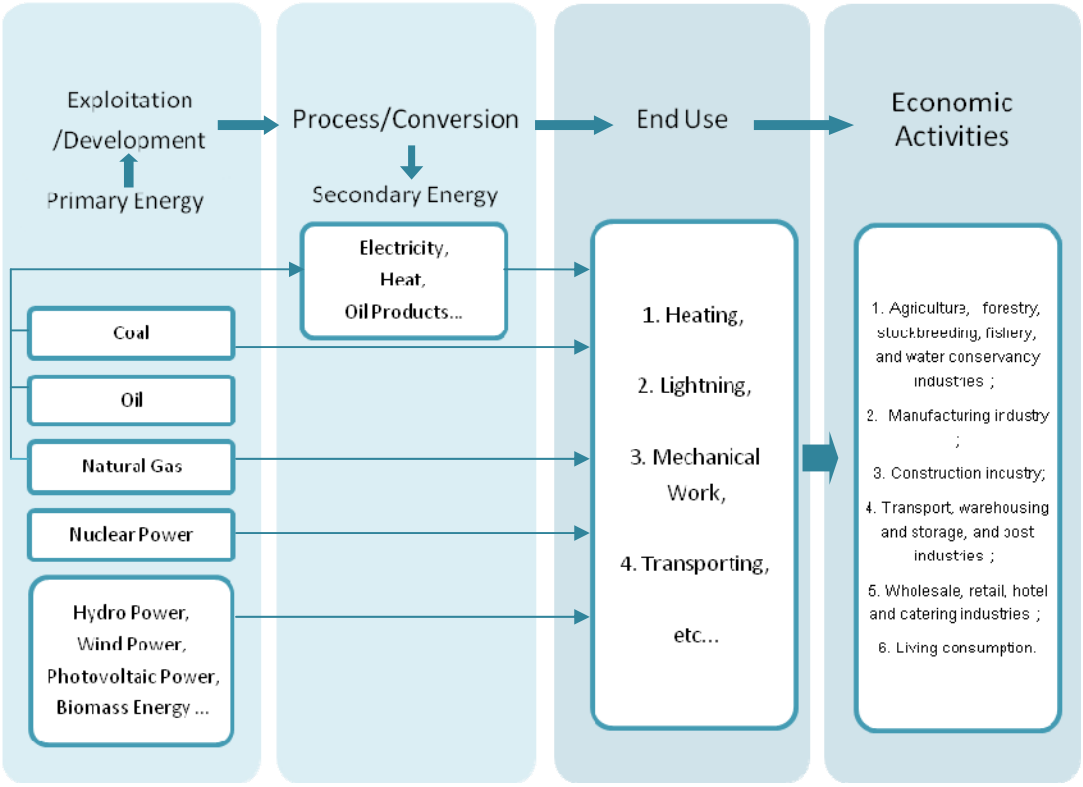

Figure 1: Comprehensive Energy System

The concept of energy productivity provides an overarching framework for understanding the evolving relationship between energy consumption and economic growth. Energy-productivity improvements can come either from reducing the energy inputs required to produce the same level of energy-related services or from increasing the quantity or quality of economic output without increasing energy inputs. Within each of these, there are multiple components that can change over time. Thus, emphasis of energy productivity should focus on energy efficiency improvement as well as substantial system changes.

1.2. Taking increase of energy productivity as a Chinese national goal

Energy demand is rising in China and world-wide at high speed. Oil and gas are becoming increasingly scarce and expensive. Coal is available, but causes big environmental problems locally (in particular health damages) and globally (global warming). Renewable sources of energy enjoy strong growth rates. However, for the considerable future, they will remain a limited option - chiefly for reasons of space and cost. Nuclear energy in relevant amounts will be facing serious problems of uranium scarcity (uranium prices rose much faster than oil prices in recent years). There are also other problems to consider, such as radioactive wastes and the nuclear cycle's vulnerability to terrorism and wars.

The core of the answer to the energy challenges may not come from modified energy supplies but from a systematic, long term strategy of increasing energy

productivity, which essentially means curbing energy demands' whilst further increasing prosperity.

It is actually a fact that huge efficiency increases are theoretically available. In a book, Factor Four, also available in Chinese[2], fifty examples are presented of a quadrupling of energy and material productivity. A more ambitious sequel, called Factor Five[3] is under preparation and will focus more on systemic productivity increases beyond isolated efficiency technologies. Eventually, even a factor of twenty should be feasible. This could solve most energy-related problems of climate, the local environment and social equity, both in China and world-wide.

A strategic increase of energy productivity looks like a highly attractive national goal for China. According to the 11th Five-Year-Plan, the Chinese government has established detailed plans specifically in energy conservation, such as the Comprehensive Working Scheme on Energy Conservation and Reduction of Pollutant Emissions, in which it set out the targets for the year 2010:

- energy consumption per 10,000 Yuan GDP reduced from 1.22 tons of standard coal in 2005 to below 1 ton, down by about 20%;
- water consumption per unit of industrial value added reduced by 30%; and
- discharge of major pollutants reduced by 10%".

2. Surprise lesson from history: resource prices have been falling

Despite basically well-known potentials, there are few signs in any country of aggressively pursuing the energy productivity agenda. Australia's and other countries' decisions of phasing out incandescent light bulbs; Japan's top runner program; the EU's emissions trading system ETS; and China's commitment in the 11th Five Year Plan to increase energy productivity; compare favourably with the inertia in other parts of the world. But even these laudable measures fall very short of meeting the challenges.

The basic reason for inertia on this front, so it seems, is a world-wide policy of keeping energy prices as low as possible. This has understandable social reasons but it also sends a signal to consumers, manufacturers, and investors that energy efficiency and productivity will be mostly left to idealism or some mild state intervention. The trillions of yuans, dollars, and euros invested annually in new businesses and infrastructures have almost no commercial motive of addressing energy productivity. This is the reason why many of the Factor Four examples, such as Amory Lovins' high tech 'Hypercar' needing less than 2 litres per 100 kilometres, have not made it to the market. To successfully reach the market in significant numbers, they require huge investments, which will not pay off under present conditions.

To make such strategic investments in resource productivity profitable, resource prices should go up. However, so far, the opposite has occurred. Combined efforts by

[2] Von Weizsäcker, Ernst Ulrich, Amory Lovins, Hunter Lovins. Factor Four. Doubling Wealth, Halving Resource Use. London. Earthscan, 1997; also available in 12 other languages including Chinese.
[3] Von Weizsäcker, Ernst Ulrich, Charlie Hargroves, Michael Smith. Factor Five. London Earthscan, 2009.

politicians, entrepreneurs and mining engineers have established a long term trend of continuous decreases of resource prices, as shown in Fig. 2 for “raw industrials”, meaning natural resources of industrial importance, including energy. This comes as a big surprise to many who are accustomed to complaining about high resource prices. The price hikes of the past couple of years have just brought us back into the *lower* confidence interval of the long-term downward trend. (The picture does not reflect the development after 2004!)

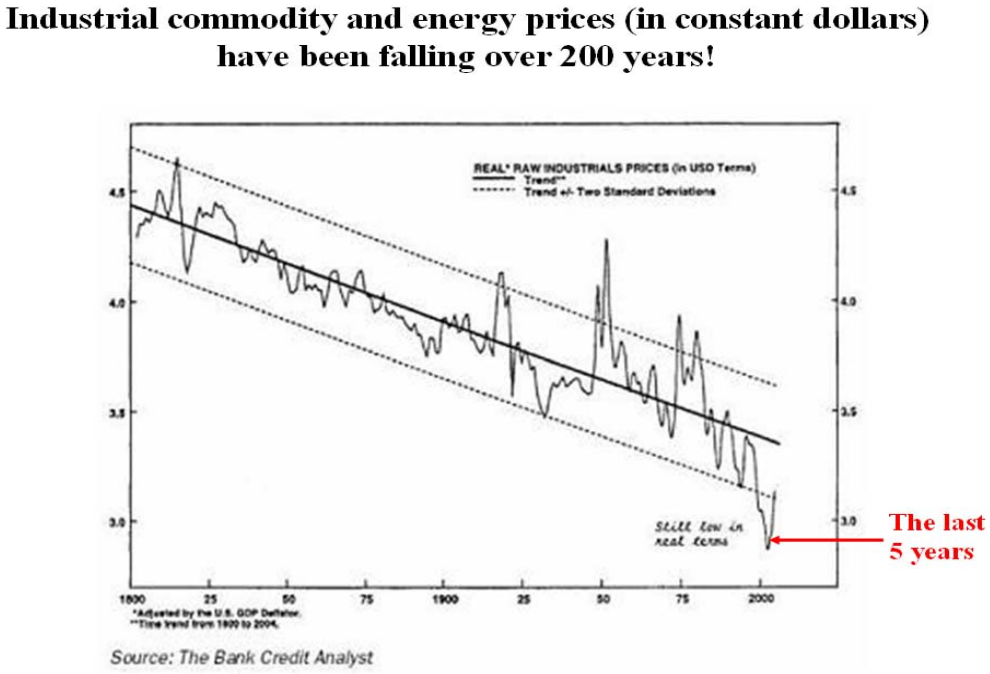

Fig. 2. Industrial raw resource prices, inflation adjusted over 200 years. Prospecting, mining and transport technologies were the main drivers. The price hikes since 2000 have just brought us back into the lower confidence interval of the downward trend! Source: The Bank Credit Analyst, 2005

There have been a few periods during which resource prices increased, notably the two World Wars. More memorable in our times have been the oil price shocks of the 1970s, which can also be seen in Fig. 2. In 1973, the oil exporting countries managed to quadruple oil prices overnight and push it further up in 1978. However, the rest of the world reacted by significantly increasing prospecting and mining until, by 1982, oil prices had come down to pre-1973 levels.

During the early years of the 21st century, many people felt that finally, resource prices were now going up irrevocably. The new surge of oil, gas and other mineral resource prices was triggered by steeply rising demand from the rapidly developing Asian economies - led by China. However, China and the world wide mining companies have immediately injected a lot of money into new prospecting and mining, which brought the

surge to a halt and there are indications that commodity prices may come down again, at least in constant dollars.

Typically, it is the geological limits and extraction and refinery cost that ultimately determine prices. In earlier decades, also access and transport limitations played a major role, but the share of transport cost has been falling systematically over time. If the geological limits remain the main determinant factor for resource prices, it could be assumed that oil prices will come down to something like $80 per barrel, reflecting the price of coal (at a high estimate of $100 per short ton of coal) plus the liquefaction cost at industrial scale plus company profits. Clearly, this price would be a blow to all investors putting their money into high tech vehicles like the Hypercar.

3. International experiences in raising energy prices: introduction of environmentally-related taxes

If markets (plus socially motivated price subsidies) lead mostly to low prices and if low prices are seen as the main obstacle to the efficiency revolution, then it would seem evident that China and the world should go for a policy shift from keeping prices low to actively increasing them.

Different instruments are available to put price tags on energy, or, more specifically, on carbon dioxide. In fact, energy can be seen as a good proxy considering all greenhouse gas emissions, so that addressing greenhouse gas emissions (not just CO_2-emissions) via a general energy taxation, is the best choice. The overall objective is to increase energy productivity and to achieve a major shift of the economic structures. To this end, it would by far not be sufficient to concentrate on CO_2 and end up with basically spending many financial resources on an end-of-the-pipe-technology like carbon capture and storage (CCS) with a high uncertainty of permanent success. Furthermore, such a limited strategy would lead to substituting coal with very inefficient nuclear power, leading to other serious problems and thus preventing a substantial increase of energy productivity. Considering this, many OECD countries focus on energy, only sometimes supplemented by CO_2.

Theoretically, prices can be fixed by the state, although in the past this was mostly done to keep prices low. Fees and charges can be levied. The EU's emissions trading scheme (ETS), a cap and trade regime, serves to put a price tag on fossil fuels. Some states, notably in Europe and beginning in Scandinavia, have introduced CO_2-/energy taxes.

In several EU-member states carbon-/energy taxes have been introduced as part of more comprehensive Environmental Tax Reforms (ETR) (referring to Appendix III), that have shifted the tax burden away from taxes on labour in return for innovative taxes on energy products and CO_2. As a result of these reforms, annual tax payments of more than 25 billion Euros have been shifted. The member states in question and the year for the first shifts were Finland (1990), Sweden (1990), Norway (1991), Denmark (1992), Netherlands (1996), Slovenia (1997), Germany (1999), UK (2000); Estonia (2006) and the Czech Republic (2007).

The European countries show a reduction in fuel demand that results from the ETR. The size of this reduction is dependent upon two factors. One relies upon the tax rates imposed i.e. how they are applied to the various fuels and fuel user groups and how easy it is for fuel users to substitute between the various fuel types and non-fuel inputs. The other relies upon the scale of the secondary effects from resulting changes in economic activity. The reductions in fuel demand attained in 2004 were in the range from 1.5% to 5%, when the ETR-effects have been carefully separated out from underlying trends.

In Finland, it is estimated that, in the absence of energy-/CO_2 taxation, carbon emissions would have been 7% higher in 1998, if taxes had remained at the 1990 level. In Norway, carbon dioxide taxes lowered CO_2-emissions of some stationary combustion plants by some 21%.

The reductions in GHGs closely follow the results for total fuel consumption, with the largest reductions (up to 5.9% in 2004) occurring in regions with the highest tax rates, e.g. Finland. In contrast, the German ETR was not particularly efficient in reducing emissions because it did not initially include coal. However, overall the ETR alone resulted in a reduction of 2-3% of CO_2-emissions; and in the transport sector clearly larger effects were noted. In reaction to the world oil price increase, transport fuel sales in Germany dropped by 17% between 1999 and 2007 – after steady increases over several decades.

European countries that implemented ETR did not experience a negative impact on economic growth (GDP) from ETR. In some cases it was even slightly positive. In addition, the number of jobs created increased substantially, e.g. by up to 0.5% or up to 250,000 between 1999 and 2003. To ensure optimal effects and smooth implementation, it is necessary to follow some guidelines for implementation (refer to Appendix III).

As ETR results in higher fuel prices it is considered likely that there will be an increase in the overall price level. The degree of this is likely to be dependent on the scale of the increase in fuel costs; how easy it is for industry and consumers to switch between fuels to cheaper alternatives (and non-energy inputs); and how much of the cost is passed by industry on to consumers (dependent on the level of competition in the industry). It should also be noted that price effects should be reduced through a tax shift (e.g. reductions in employers' social security contributions i.e. labour costs or corporate taxes), or recycling back the revenue to industry, while keeping the incentive effect at the margin.

The measure of inflation, the consumer price index (CPI), will record a larger increase in cases where the taxes are levied on households rather than industry. The reason for this is that the consumer price index is a weighted average of the price of consumer products, including energy. In the cases where the tax is levied on households the whole tax is reflected in the consumer price index rather than just the share that is passed on by industry. Therefore, it is not unexpected that an increase in the consumer price index was seen in Sweden whereas the five other European countries showed no or negligible increases in CPI.

A complication can arise with energy-intensive companies, because the compensation they receive via the reduction in social security contributions does not fully match the additional energy costs. They may have a small labour stock, while they consume large amounts of energy. However, due to significant energy-savings as well as

certain special arrangements (such as tax exemptions) the effective tax burden for energy-intensive industries has in Europe been kept at less than 2 per cent of gross operating surplus.

In Denmark, industry improved energy intensity by close to 30% in the decade from 1990-2000, whereas Netherlands obtained improvements in the range of 10-15%. A particular aspect of Denmark's program of carbon-/energy taxation, believed to have been significant for the marked impacts on energy productivity, was the earmarking of 20% of the revenues to co-finance energy efficiency measures and upgrade production technology.

An interesting variant of energy taxation has been the "escalator" idea of adding small annual price signals that were agreed for many years in advance. This has been first introduced in Great Britain and copied in Germany with some modifications. In retrospect, it can be said that the escalator proved very effective in reducing demand (see Fig. 3, comparing Great Britain, Germany, Canada and the USA with regard to fuel consumption/ CO_2 emissions per capita per year.

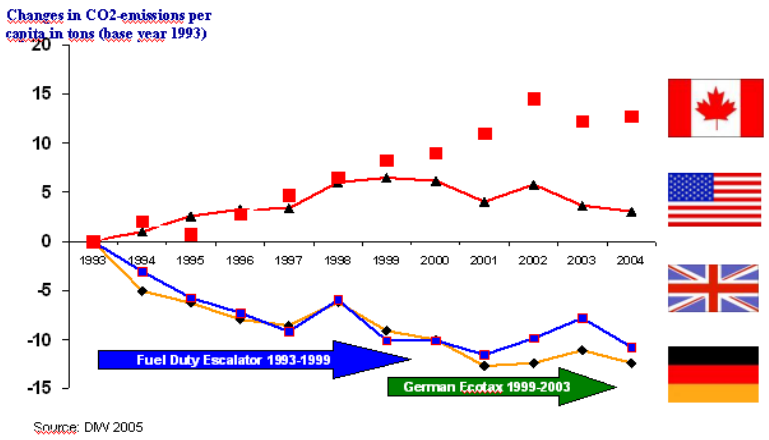

Fig. 3: Steering effect of fuel tax escalators (Picture: FÖS, 2006, Database: DIW, 2005)

4. Increasing energy prices in parallel with energy productivity gains

Combining the escalator idea with the long term goal of increasing energy productivity, leads to a novel policy proposal. The policy suggests, to politically establish a trajectory of steadily progressing energy and commodity prices, with the slope of the trajectory being determined by the statistically established increases of energy and resource productivity.

If energy prices increase only in line with average energy productivity gains, then, by definition, there would be no detrimental social consequences. This is of highest political significance and contrasts favourably with experiences from the past of rising energy prices causing major hardship for families, small enterprises, and whole branches

of industry. The negative effect, however, has always been associated with the size of the price increase and with its unpredictability, allowing no advance adaptation.

Despite this welcome feature of low social impact, the long term escalator sends a strong signal to investors, manufacturers, consumers, and infrastructure planners to be prepared and to adapt. In all likelihood, the signal will actually accelerate investments into energy efficiency technologies and energy productivity creating systems.

The trajectory would have to be kept stable for many decades. Investors will be all the more confident the longer they can rest assured of the trend. The time horizon of the measure should be at least as long as the payback time of the most important investments, meaning long lasting infrastructures. A glance back in history shows that under the conditions of the low gasoline prices in the USA, an investment like the Japanese bullet train (Shinkansen) would never have been possible.

Besides, the OECD country Switzerland has successfully made experiences with a somewhat related approach. For public investments it was tested to calculate the external costs, in addition to the ordinary investment and operational costs, into large investment projects such as infrastructure and buildings. This led to a much improved profitability of energy efficient and renewable technologies.

Are there alternatives to a tax system for establishing the price corridor? In theoretical terms, increasing resource prices could also be induced by an ambitious cap and trade regime with gradually tightened cap levels. However, past experiences with cap and trade regimes show very unpredictable fluctuations of the price, resulting in part from speculation. There is no way of linking resulting prices to previous efficiency gains.

5. Is there a problem for the poor or industry or inflation?

Objections against an ecological tax escalator can come from advocates of the poor, industry and from inflation fears.

Advocates of the poor will hint at the relative importance for the poor of the energy costs in the consumer basket. Energy and water taxes tend to be “regressive”, i.e. negatively impacting the poor more than the rich. To answer this problem, it is possible to grant a tax free or tax reduced minimum tableau of approximately one gigajoule of energy per person and week. Then the really poor would actually benefit, while the burden would shift towards the middle income and rich strata of the society.

Blue collar workers, too, have a tendency of opposing energy taxes. They typically adopt the arguments of the poor and have the concern that energy taxes might destroy industrial jobs. However, as demand for industrial output is rising, a country like China needs not fear net job losses if the price increase goes slowly and predictably.

Industry and investors are actually likely to benefit from the predictability of the transition. They can move into ambitious technological and infrastructural projects with very limited risks. This would hopefully then lead to major advantages over competitors working under conditions of fluctuating (if somewhat lower resource prices) who invariably give too little attention to the long term scarcity of resources.

Another concern, very relevant in China today, is inflation. However, a tax shift could be made from value added taxes to energy with a net neutral effect on the price level.

Evidently, it would be desirable for both ecological and economic reasons to find an international agreement on price trajectories. However, if the increase is linked to productivity gains then pioneering countries are likely to benefit and not loose because they will be at the forefront of a trend that will come world wide anyway.

6. The paradigm of a twenty-fold increase of labour productivity

The history of technological progress so far is the history of the increase of labour productivity. It has been a revolution indeed, the Industrial Revolution. Labour productivity grew at least twenty-fold over time. During the 19th century, the increase in what became to be the industrialised countries was approximately one percent per year, which is not particularly impressive. The rate increased to one and a half percent during the first half of the 20th century and to two percent thereafter. In contrast, there have been phases like Germany during the late 1950s, Japan during the 1960s and China after 2000, where labour productivity increased more than seven percent per year. Though, to a large extent, this can be attributed to copying technologies that had been developed elsewhere.

One fact, well-known by organised labour and by employers, is that wage negotiations have always taken labour productivity gains as their yardstick. It was only during the recent neo-liberal and neo-conservative phase since the early 1980s, that wages began to lag behind productivity gains. From the employers' perspective, this was chiefly due to competition from low wage countries. What is not so well known is that productivity gains also went up in parallel with gross labour cost. What was the hen and what was the egg? Empirically, we observe wages and productivity going up in parallel (Fig. 4).

This trend of labour costs spurring labour productivity is an exciting indication for the potential of using energy price signals for spurring energy productivity gains. As a matter of fact, the "oil crisis" of the 1970s served as an (unplanned) experiment for this hypothesis. As energy prices went up across the board, a new mentality set in that focused on energy efficiency. Fig. 5 shows the effect.

Fig. 4: Rise of wages and of labour productivity mostly in parallel. The picture shows this for a time span of fifty years in the USA, but very similar pictures are available for other countries and other periods of time.

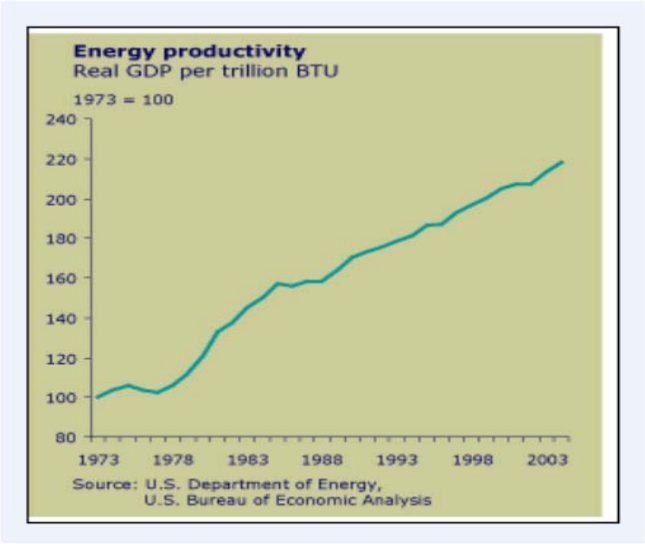

Fig. 5: The oil price shocks of 1973 and 1978 triggered a steady increase of energy productivity in the USA. The new mindset of energy efficiency survived even the period 1981 – 1998 of receding energy prices.

7. A revenue-neutral ecological tax reform

The paradigm of labour productivity seems to support the idea of a steady increase of energy prices. As stated earlier, if energy prices increase in line with average energy productivity gains, there would be no average social suffering. The situation can become even more attractive if the fiscal income from energy taxes is re-channelled into the economy by reducing the fiscal or parafiscal load on human labour thus giving an additional push to overcome unemployment. However, if inflation is the highest concern, the reduction of VAT and/or other taxes could be considered.

The new idea is to make the trajectory of energy prices very predictable by compensating world market fluctuations. Downward fluctuations would be compensated upwards and upward fluctuations, such as the painful price hikes of late 2007, could be compensated downwards, so as to bring prices back to a previously agreed price corridor. The slope of the upward corridor could be determined annually (or every five years by the cycle of Five Year Plans) in line with measured average energy productivity gains over the previous year (or years). Adjustments could be allowed on a quarterly basis so as to make prices even more predictable.

The system could be differentiated for vehicle fuels, electricity, carbon content, and other criteria. It will be a matter of political priority setting weighed against simplicity. This system of increase should be made a law that is valid for the long term, e.g. some twenty years or even fifty or more years, with fairly tough clauses for exemptions or deviations from the rule.

It is conceivable to develop a similar system for materials and for water. If prices for primary raw materials and for water extracted from nature go up steadily, the incentives increase for reuse of materials and for water purification. Simultaneously, the profitability of mining operations go down - which is highly desirable.

8. Long term price elasticity is high

Generally, it can be said that energy and resource consumption have a reasonable low price elasticity in the short term. Otherwise, the upward curve in Fig. 4 would have started in 1973 or 1974, not in 1977! In the long run, however, the price elasticity is astonishingly high, as can be seen from an observation made by Jochen Jesinghaus4.

The picture shows a striking negative correlation between fuel prices and per capita fuel consumption. Ten years after the introduction in the US of the Corporate Average Fuel Economy (CAFE) standards in 1975, this country although admirably catching up on per mile fuel consumption was still the country with by far the highest per capita fuel consumption. In layman terms, under the condition of low fuel prices, what CAFE conveyed to drivers was: "Now you can drive more miles for your bucks". In the absence of any price signal, single efficiency gains did not prevent per capita annual fuel consumption from steeply growing, mostly due to increased mileage and consumers switching to bigger cars.

[4] Ernst von Weizsäcker and Jochen Jesinghaus. 1992. Ecological Tax Reform. London, Zed Books.

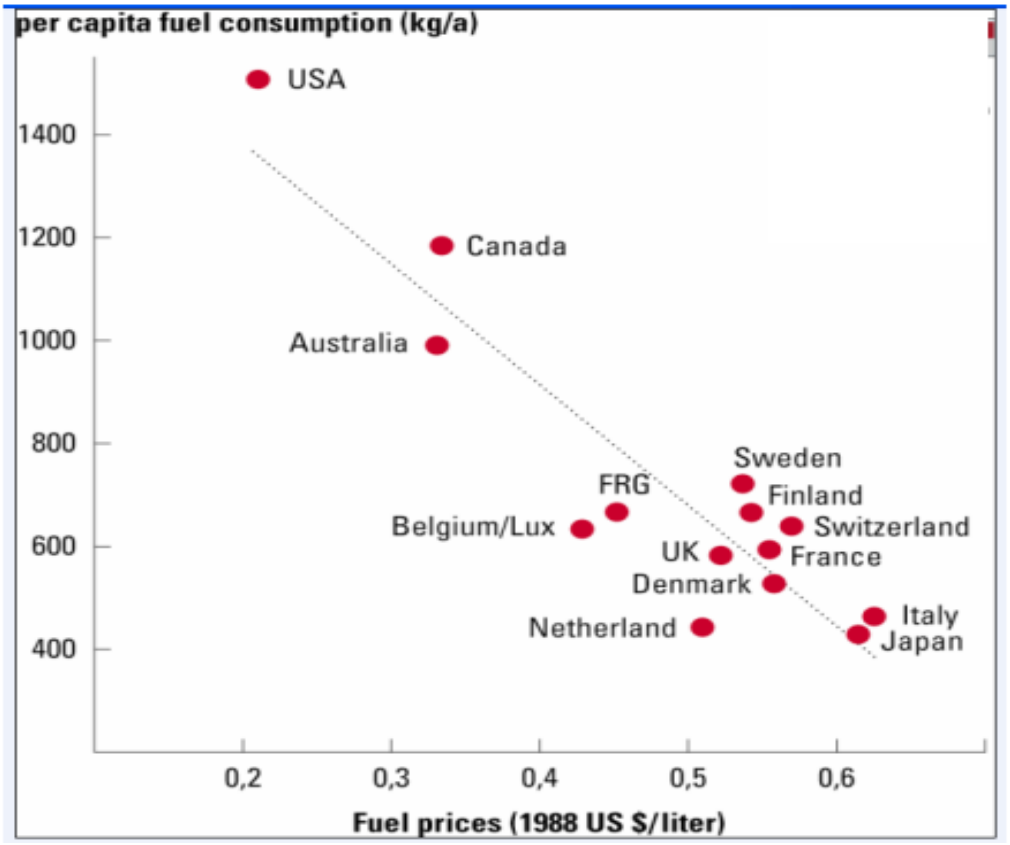

Fig. 6: Even for petrol consumption which is often referred to as nearly inelastic to price changes, we observe a clear correlation between prices and fuel consumption – if we ask the right question. The question asked for this graph was: how much petrol is consumed per capita and year in different OECD countries that have nearly equal levels of wealth and mobility? Countries had more or less stable policies on domestic fuel prices for many years preceding the year (1988) in which the data were collected. The picture reflects long term price elasticity.

This experience is very valuable for determining a price trajectory overcoming the dilemma of short term instruments. We can safely rely on small signals if we give the society assurance of a long term upwards trend for energy and other resource prices.

9. Conclusions and strategic recommendations

1) The concept of energy productivity provides a holistic, strategic, thinking and systematic policy approach to energy challenges. It suggests that energy policies should target not only the energy supply side but also the energy demand side as well. This means considering not only production but also consumption, with a view of curbing energy demand while further increasing prosperity. Thus, it is vital to optimize the whole life cycle of energy resource utilization and the whole system of socio-economic activities. With this understanding, China should take a systematic and long-term strategy

of increasing energy productivity as a national goal, which provides China with a large potential to deal with energy challenges.

2) Both theoretical analysis and practical experience prove that raising energy price is a fundamental driving force to raise energy productivity through curbing energy demands and stimulating technology innovation. In this regard, policymakers may be misled by fluctuation of energy prices in the past. In the past 200 years before 2000, the real prices of raw industrial resources including energy had been falling in general trend, and the prospecting, mining and transport technologies were the main drivers of reducing prices. Consequently, the incentives have weakened for all investors to put their money into high technology efficiency innovation.

3) Considering the complexity of raising energy prices, China can adopt a long-term strategy - the 'escalator' idea of adding small, announced, periodical price signals. The escalator strategies should be kept stable for many decades and the slope of the upward escalator could be determined annually or every five years by the cycle of the five-year plans in line with measured average productivity gains over the previous years. Raising prices at the same rate as raising productivity concurs to the concept of a Harmonious Society. Prices rising only as fast as productivity gains will not, on average, create any social hardship.

There are a number of evidences to support the escalator idea:

(i) The long term escalator sends a strong signal to investors, manufactures, consumers and infrastructure planners to be prepared and to adapt. In all likelihood, the signal will actually accelerate investments into energy efficiency technologies and energy productivity creating systems.

(ii) The history of technological progress so far is the history of the increase of labour productivity. Since the Industrial Revolution, labour productivity in the industrialised countries has grown at least twenty-fold. Concurrently, we observe labour wages and productivity going up in parallel. This trend of labour costs spurring labour productivity is an exciting indication for the potential of using energy price signals for spurring energy productivity gains.

(iii) Generally, energy and resource consumption have a low price elasticity in the short term. Longer term, however, the price elasticity is often surprisingly higher. This experience is very valuable for determining a price trajectory overcoming the dilemma of short term term upwards trend of energy and other resource prices.

(iv) OECD countries' experiences suggest that introduction of comprehensive environmentally/energy-related taxes such as fuel tax, carbon tax, pollutant-related tax, etc. is a good way to establish long term escalator strategies for energy prices. Yet, it should be noted that environmentally harmful subsidies and tax provisions must be removed first.

4) Regarding impacts of energy-related taxes, the following conclusions and observations could help to mitigate the concerns, which are very relevant in China today:

(i) If energy prices increase in line with average energy productivity gains, the introduction of environmentally/energy-related taxes should not have negative effects on welfare and thus would be no average suffering.

(ii) The situation can become ever more attractive if the fiscal revenue from energy taxes is re-channelled into the economy by reducing the fiscal or parafiscal load on human labour thus giving an additional push to overcome unemployment. As demand for industrial output is rising, a country like China need not fear net job losses if the price increase proceeds slowly and predictably.

(iii) A tax shift could be made from value added taxes (VAT) to energy taxes with a net neutral effect on inflation.

(iv) Succinctly, if the increase of energy prices is linked to energy productivity gains, pioneering countries are likely to benefit, not loose because they will be at the forefront of a trend that will come worldwide anyway.

(v) Another means of keeping impacts on price levels low is by aiming at the largest potentials for energy efficiency first, thus starting with Chinese industry, since 70% of energy consumption takes place in that sector. The production costs are so low in China that impacts of potential cost increases due to energy tax increases hardly exist while the above mentioned opportunities are great.

5) It is conceivable that similar long-term escalator strategies are applicable to other natural resources such as industrial materials and water.

Appendix I

Current Situation and Roadmap of Development of Environmental Economic Instruments in China

1. Challenges in command-and-control approach

China now shares a common understanding nationwide that energy and resource shortage and environmental pollution have become a bottleneck hindering its sustainable development after 30 years' rapid growth in economy. The shortage of energy and other natural resources concurs in two dimensions: quite limited capacity of supply on the one hand, and low efficiency in production and consumption on the other hand. As a result, China is suffering from high intensity of pollutant emission caused by low efficiency of energy and natural resource utilization. Generally it is estimated that the average intensity of energy and natural resources per unit products in China is 30 percent higher than that in industrialized countries. This gap would be much bigger if calculating the intensity in per unit of GDP, for example, SO_2 and NOx emission per unit GDP in China would be as high as eight times of averages of OECD countries.

To attack the issue, Chinese Government has taken very extensive and intensive actions since the beginning of the century. Among those actions, of particular significant have been national initiatives in energy-and-resources saving and pollution abatement with legal-bounding targets set in the 11th Five-year Period Plan Outlines for National Economic and Social Development (2005-2010). For instance, As compared with the situations in 2005, China has to reduce its energy intensity of per unit GDP by 20 percent in 2010; the total volume of SO_2 and COD, by 10 percent and water intensity of per unit of industrial value-added, by 30 percent.

For long, command-and-control instruments have dominated China's policy package to address energy and environmental issues, however, no substantial changes in the current national actions to achieve the two legal-bounding targets of energy-saving and pollution abatement have occurred up to now. Consequently, China is facing a number of difficulties and challenges in enforcement of policies and achievement of environmental and resource targets: 1) high costs: a Sino-US Joint Economic Study, for example, shows that 16 percent of costs could be reduced to achieve the 11th Five-year targets of energy-saving and pollution abatement in power sector of China if applying emission trading system, instead of command-and-control instruments; 2) enforcement of some command measures such as shut-down of small enterprises in energy-and-pollution intensive sectors often raise social equity and stability problems and even the legitimacy questions to the enforcement body of government, which contravenes the country's effort in building-up harmonious society; and moreover 3) command-and-control measures can produce immediate effectiveness but such effectiveness can not sustain due to less economic incentives and self-willingness to complying with the command measures.

2. New initiatives and difficulties in development of economic instruments

Fortunately China sees the coming of a strategic transformation period, where Chinese Government has substantially renewed its attitude, strategies, principles and policies to dealing with the relationship of environment and development (Special Study of Strategy Transformation, CCICED, 2007). Regarding the challenges raised by command-and-control measures, Chinese Government has brought forward clear requirements to introduce economic instruments. At the 6th National Conference on Environmental Protection held in 2006, Premier Wen Jiabao pointed out that we shall resolve environmental problems through transformation from mainly relying on administrative means to integrating legal, economic, technological and necessary administrative measures, and follow the economic rule and the natural rule consciously to upgrade environmental protection endeavors. The 17th Congress of CPC, held in 2007, required that reform in fundamental economic systems such as price and taxation shall take environmental protection into consideration and formulate fiscal policies towards sustainable development. More specific requirements for development of market-based policies were set up in the State Council Scheme for Energy-saving and Pollution Abatement issued in 2007.

In responses to the calls of national government, SEPA, NDRC, Ministry of Finance, and other relevant ministries have launched active initiatives. Pan Yue, Vice minister of SEPA, published a SEPA roadmap of development of economic instruments in his article in 2007. The roadmap consists of seven groups of instruments: environmental taxation, pricing and environmental fees, green crediting, environmental insurance, emission trading, eco-compensation mechanism, and green trading policies.

1) Regarding environmental fees related, China has accumulated good experiences. Pollution fees on SO_2, NOx and other main pollutants have been levied for more than twenty years, and sewage fees and waste fees are applied nationwide. The future efforts will be in improving the existing systems, in particular increasing the fee rate with aim at producing sufficient incentives.

2) Emission trading system was introduced several years ago, yet it is still in experimental stage in a number of cities and sectors. With US EPA support, relevant collabourated studies have been done and a few are ongoing.

3) The issue of eco-compensation mechanism (similar to payment for ecosystem services in other countries) has been discussed for a decade and incorporated in a few sectoral policies and experimentally implemented in a number of local communities. Although there is a long road to establish eco-compensation mechanisms nationwide, many studies such as CCICED Task Force on this topic conducted from 2005 to 2006 has provided good grounds to policymaking. SEPA published Guidance of Launching Pilot Projects on Eco-compensation last year.

4) How to mitigate environmental impacts of trade is a pressing concern of green trading policies nowadays in China. In this regard, many studies have touched upon the point, including two task forces of CCICED at its second and third phases. SEPA established a special study team on WTO and environment several years ago, which now is working

intensively on green trading policies. In fact, Chinese Government started strong intervention to reduce exportation of energy-and-pollution based products last year through removing export tax preferential.

Intensive initiatives have taken place since 2007 in environment taxation, green credit, environmental insurance and green stock.

5) SEPA, Ministry of Finance and National Taxation Administration start to discuss the possibilities and approaches of creating new independent environmentally related taxes and incorporating environmental context into the existing tax systems. The discussion is still ongoing. Considerable technical work needs to be done in terms of both general framework of environmental taxation and design of specific tax.

6) In July 2007, SEPA, the People Bank of China and the Supervision Committee for Banks jointly issued the Opinions on Enforcement of Environmental Laws and Prevention of Credit Risks (refer to green credit system hereafter). It requests banks to cancel or postpone lending funds to those enterprises that violate environmental laws/regulations. The issuance of the Opinions has brought about very active responses from local governments, financing institutions and business circles. However, the Opinions is just a starting point of the process, and a number of important technical issues remain there, hindering the process moving forward. For instance: 1) green credit requirement is not workable on many small-and-medium enterprises that raise funds from illegal financing bodies or individuals; 2) there is lack of information-sharing mechanisms and platform between the banks and environmental management bodies; 3) the banks feel hard to make decision on cancellation and limitation of fund lending due to the lack of methodologies and criteria to evaluate enterprises' non-compliance behavior of environmental laws and their environmental risks; And 4) no incentives encourage the banks to implement green credit system.

7) In February 2008, SEPA and the Supervision Committee for Insurances jointly publicized the Guiding Opinions for Liability Insurance of Environmental Pollution. The Guiding Opinions comes out specially referring to the frequent occurrence of pollution accidents in recent years. It is due to the just recent generation and quite general and principle statement in the Guiding Opinions that the actual process of implementation does not start yet and the know-how for implementation is not available now.

8) One week after the publication of environmental insurance, SEPA issued its third new economic instrument alike—Guiding Opinions on Enhancing Environmental Management for Enterprises in Stock Market. The Guiding Opinions is based on two requirements: one is that environmental performance check by environmental management bodies shall be one of qualifications when enterprises apply for entering the stock market; and another is that enterprises in the stock market shall disclose their environmental performance information periodically. SEPA recognizes this system as an economic instrument because it is related to fund-raising of enterprises, a kind of indirect approach against direct borrowing funds from the bank that green credit system is aiming at. As compared with another two new initiatives - green credit and environmental insurance - environmental management for enterprises in stock market has a better technical basis.

3. Concluding remarks

Five observations from all above:

1) Nowadays in China it is a right time to develop economic instruments for resource-saving and environmental protection, characterized by a strong governmental willingness and active initiatives.
2) China has developed the roadmap of environmental economic instruments system, including about 8 instruments and the process to developing specific instruments has been initiated and intensively pushed forward.
3) In terms of technical basis, implementation experiences and existing studies, environmental taxation, green credit and environmental insurance need systematic studies to guide their development.
4) Some other potential instruments beyond the roadmap developed in China, such as environmental bonds, lottery and other market-based financing tool, need to be explored.
5) As compared to the situation of economic instruments for environmental purpose, the development of incentive instruments targeting at energy-and-resource-saving seemingly lags behind.

Appendix II

Assessment of Current Policies for Energy Productivity in China

1. Abstract

Energy productivity refers to the output and quality of goods and services generated with a given set of energy inputs. It is not only about energy efficiency, but also system optimization. Higher labour productivity is caused by the increase of wages, an equal mechanism can be applied with energy productivity. Market based instrument helps the optimization of resource allocation and the efficiency of energy utilization, thus achieves better energy productivity.

The paper reviews of current policies for energy productivity in China, including command and control instruments, market based instruments, information publicity, and persuasion and encouragement, among which command and control and market based instruments are the major two types, with the latter one gradually becoming a major role in policy mix. In order to better achieve policy effectiveness in promoting energy productivity in China, the optimization of policy mix is recommended, enforcing the latter tendency, together with institutional and policy reform.

2. Background

Energy shortage has become a crucial issue in human development. At the present level of energy productivity, the world will only feed and accommodate 1.5 billion people at OECD's average standard of living. Energy efficiency is a popular topic in different events and occasions. It is either emphasized on improving energy supply capacity or reducing end-use consumption. Together with a dramatic increase in the supply of sustainably generated renewable energies these are the two key elements to solve the energy and climate problems. Developing economies are an increasingly dominant force in global energy demand growth while they are marching into their industrialization processes, as industrialized countries did several decades ago. Rather than primarily seeking to reduce end-use energy demand and needs, there should also be a focus on improving energy utilization in a more productive way. Energy productivity is a useful yardstick of progress and a tool to analyze the public policy by substantial system improvements and energy efficiency enhancement.

3. Definition of Energy Productivity

3.1. Energy Consumption System

End-use energy consumption includes several resources that fall into two categories, i.e. primary energy such as coal, oil, nuclear, natural gas, hydropower, biomass and so on, and secondary energy such electricity, thermal power, gasoline and so on that are converted from primary energy. The logistic system is illustrated in Figure 1.

Specifically, energy productivity has to take into account of the entire chain which also includes the needs and services. Hence, the needs like a “light, warm room” or a “cool drink” have to be considered, too, since there are different ways of providing these services. It thus goes one important step further: From primary energy via end energy to services. This allows for a much larger potential of energy productivity to be exploited.

3.2. Definition of Energy Productivity

In economics, productivity is the amount of output created (in terms of goods produced or services rendered) per unit input used. For instance, labour productivity is typically measured as output per worker or output per labour-hour. Resource productivity refers to the economic output per resource input. The Chinese GDP of 2007 divided by the amount of resources consumed in that year is the Chinese resource productivity of 2007. This can, of course, be subdivided and differentiated for different resources such as energy, water, minerals etc.

Like labour or capital productivity, energy productivity measures the output and quality of goods and services (or welfare) generated with a given set of inputs. Factors which influence China's energy productivity include: technology innovation, development and deployment, resource allocation structure, industrial structure and institutional arrangement, management and mechanisms, subsidy, price and tax structures, demand preferences (which are dependent on prices, infrastructures, institutional presetting, cultural habit, etc.

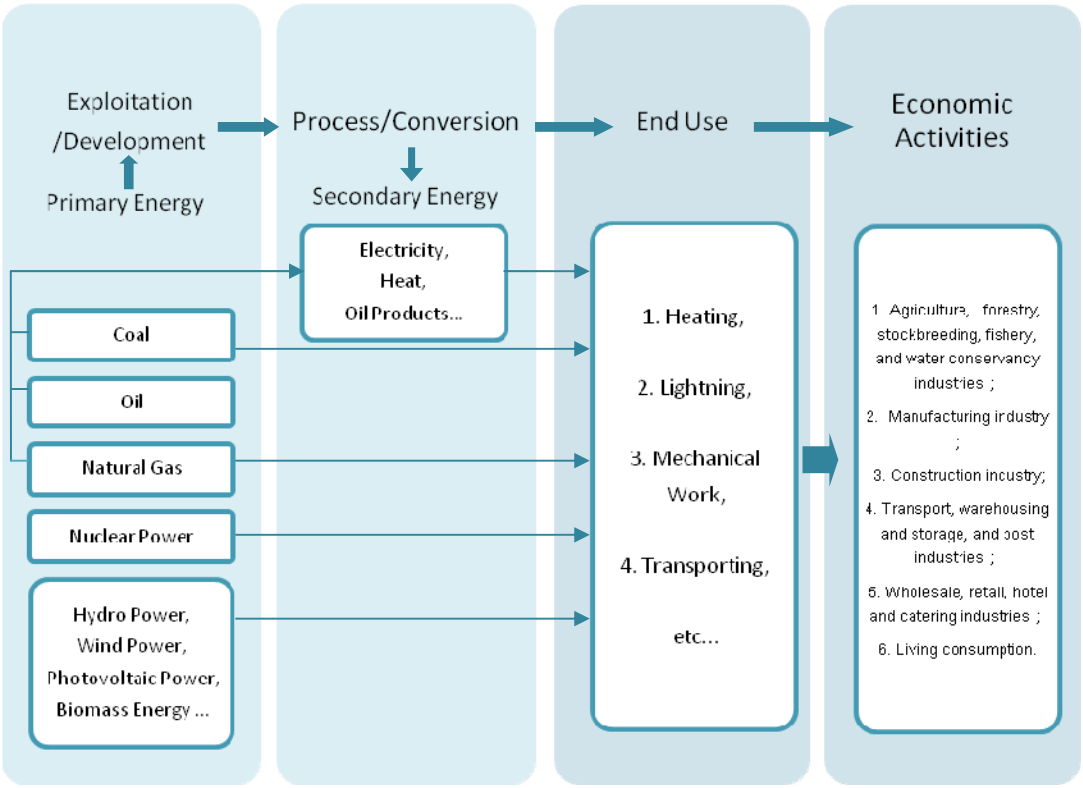

Figure: 7. Comprehensive Energy System

The concept of energy productivity provides an overarching framework for understanding the evolving relationship between energy consumption and economic growth. Energy-productivity improvements can come either from reducing the energy inputs required to produce the same level of energy-related services or from increasing the quantity or quality of economic output without increasing energy inputs. Within each of these, there are multiple components that can change over time. Thus, emphasis of energy productivity should focus on energy efficiency improvement as well as substantial system changes.

4. Current Policy System for Energy Productivity in China

Policy instruments for energy productivity in China include several policy instruments such as command and control instruments, market based instruments, persuasion and encouragement, etc. Policy system in energy productivity is illustrated as bellow.

4.1. Command and Control Instruments

Command and control instruments play a very important role in Chinese policy system, including three categories of strategic planning and sectoral policies, laws and regulations, and administrative commands and guidance. These policies have strong and positive impacts on energy productivity in China.

4.1.1. Strategic Planning and Sectoral Policies

As China's highest level of guiding planning, the 11th Five-Year Plan (11th FYP), has switched its focus from fast economic development to economic development in a sound and fast way. Here "sound" refers to a sustainable and clean way, emphasizing on economic development as well as environmental protection, which can translate into energy conservation and reductions of major pollutants. Following with the 11th FYP, the government has established detailed plans specifically in energy conservation, such as the Comprehensive Working Scheme on Energy Conservation and Reduction of Pollutant Emissions, in which it set out the target of "for the year 2010 included:

- energy consumption per 10,000 Yuan GDP reduced from 1.22 tons of standard coal in 2005 to below 1 ton, down by about 20%;
- water consumption per unit of industrial value added reduced by 30%; and
- discharge of major pollutants reduced by 10%".

In 2007, the State Council released two papers planning the country's energy development, the White Book on China's Energy Conditions and Policies, and The 11th Five Year Plan for Energy Development by NDRC. These two papers portray China's energy conditions and thus summarize the energy policies conducted and to be made in China. The essence of Chinese energy policy is to improve energy production capability to satisfy increasing demands of social production and the elevation of people's living standards, on the base of which emphasizing on energy conservation and environmental protection, and to improve energy efficiency.

In 2004, the Medium and Long Term Energy Conservation Plan was released, one of the major outcomes of which is to implement ten key energy conservation priority programmes:

- Upgrading of Low-efficiency Coal-fired Industrial Boiler (Kiln),
- District Heat and Power Cogeneration,
- Recovery of Residual Heat and Pressure,
- Oil Saving and Substitution,
- Energy Conservation of Motor System,
- Optimization of Energy System,
- Energy Conservation in Buildings,
- Green Lighting, Energy Conservation in Government Agencies,
- Building the Energy Conservation Monitoring and
- Technological Support System.

Trough the implementation of these ten programmes, it is estimated that 240 Mtce can be conserved during the 11th Five-Year Plan period (2006-2010), equivalent to 550 Mt CO_2 emission reductions.

Policy System

(According to importance)

1. General Guiding Planning:
   1) The Eleventh Five-Year Plan for National Social and Economic Development of the People's Republic of China , 2006.3;
   2) Comprehensive Working Scheme on Energy Conservation and Reduction of Pollutant Emissions, the State Council, 2007.6.3;
   3) White Book on China's Energy Conditions and Policies, the State Council, 2007.12;
   4) The 11th Five Year Plan for Energy Development, NDRC, 2007.4;
   5) Medium and Long Term Energy Conservation Plan, NDRC, 2004;
   6) Interim Regulations on Promoting Industry Structure Adjustment, 2005;
   7) Industry Structure Adjustment Guiding Catalog 2005, NDRC;
   8) Industry Structure Adjustment Guiding Catalog 2007, NDRC (Opinion Soliciting Draft);
   9) China's National Climate Change Program, the State Council, 2007.6.4;
   10) China's Specific Scientific and Technical Actions on Climate Change, MOST, NDRC, SEPA, MFA, MOF, etc. 2007.6.13;
2. Sectoral Plan and Policy:
   11) The 11th Five Year Plan for Coal Industry Development, NDRC, 2007.1;
   12) Coal industrial policy, NDRC, 2007.11.23;
   13) Medium and Long Term Development Plan for Nuclear Power (2005-2020), NDRC, 2007.10;
   14) Natural Gas Utilization Policies, NDRC, 2007.8.30;
   15) Medium and Long Term Development Plan of Renewable Energy, NDRC, 2007.9;
   16) The 11th Five-Year Plan on Renewable Energy Development, NDRC, 2008.3;
   17) International Scientific and Technical Cooperation in Renewable and New Energy, MOST, NDRC, 2007.11.12.

These plans are focusing more on energy conservation by improving energy efficiency and by technology improvement. Since late 1980's, Chinese government has emphasized more on the transformation of economic development and the adjustment of economic structures, in order to reduce natural resource and energy consumption, and to improve clean production, as major parts in Chinese industrial policy. There are two Industrial Restructuring Guiding Catalogs in 2005 and 2007 to improve the industrial structures. In the Catalog 2005, over 20 sectors are sorted into three categories of encouragement, restriction, and elimination, within which 47 energy industries are encouraged, 6 are restricted, and 18 are to be eliminated. The number of encouragement, restriction, and elimination catalog of coal sector are 14, 4 and 12 respectively. The numbers in electricity industry are 17, 2, 3. Six items in oil and gas sectors are encouraged, and 3 are to be eliminated. At the moment, Catalog 2007 is still on the state of opinion soliciting

draft, but will generate better and timely energy conservation effect once it is officially released.

Specifically, in facing the challenges of global climate change, China takes a positive and responsive reaction to address the issue, being the first one in developing countries to release China's National Climate Change Program by the State Council, and later China's Specific Scientific and Technical Actions on Climate Change in 2007. As energy conservation, renewable energies and reductions of major pollutants are one of the two actions to fight climate change, namely mitigation and adaptation, by specifically addressing climate change on the national and local level, the country would achieve a great effect in saving energy at the same time.

Besides, China has established sectoral planning and policies regarding to different energy sectors, such as coal industry, nuclear power industry, the utilization of natural gas, and renewable energies. These plans will better facilitate the implementation and application of general energy guiding plans in specific industries with corresponding policies, targets, and instruments.

4.1.2. Basic Energy Laws and Regulations

In 2007, the Energy Conservation Law was revised on the basis of its 1997 version. The revised new law has come into effect on April 1, 2008. This law was revised due to the great progress in social economic development, as well as to better ensure the achievement of the targets set in the 11th FYP of improving energy efficiency by 20%. The revised Energy Conservation Law is greatly supported by a good number of regulations and measures, as well as administrative commands. It is a great progress in various aspects such as:

1) In addition to strengthen relative regulations in industrial energy conservation, by ruling energy conservation policies in different industries and technology upgrade policies, the revised law added energy conservation articles in building, transportation, and public sectors which contribute a great portion to total energy consumption.
2) The revised law perfects energy management and standards system.
    a) Energy saving targets responsibility and energy saving assessment systems. The system is established to set targets for local governments and officers in charge, they will need to report to the central government about implementation effects of energy conservation and will receive negative performance assessment if they fall short of the targets.
    b) Capital assets investment project energy conservation assessment and censor system. With the mandatory energy conservation standards and design norms, the system is to control blind and fast development of high energy consumption industries.

Legal System

(According to importance)

1) Energy Conservation Law, 2008.4.1;
2) Regulation on energy conservation of civil buildings, State Council, 2008.10.1;
3) Measures of Implementation of Energy Conservation Law in Highway and Waterway Transportation, Ministry of Transport, 2008.9.1;
4) Regulations on energy conservation in public institutions, the State Council, 2008.10.1;
5) China's Policy Outline in Energy Conservative Technologies, NDRC, MOST, 2006.12;
6) Renewable Energy Law, 2006.1.1;
7) Law of Energy (opinion soliciting draft), 2007.12.3;
8) Mineral Resources Law of the People's Republic of China, 1996.8.29;
9) Electric Power Law of the People's Republic of China, 2003.09.18
10) Law of the People's Republic of China on Coal Industry, 2003.09.18;
11) Cleaner Production Promotion Law, 2003.02.10;
12) Measures on Energy Saving Management, under revision, 2000.12.29;
13) Implementation of Construction Energy Conservation Monitoring and Management System in Office Building and Large-scale Public Buildings, the Ministry of Housing and Urban-Rural Development, 2007.10;
14) Energy Saving Management Measures in Key Energy Consumption Units (revision);
15) Regulation on Civil Building Energy Conservation Management, the Ministry of Housing and Urban-rural Development, 2006.1.1;
16) Interim Measures on Clean Production Auditing, NDRC, SEPA, 2004.10.1;
17) Measures on Coal Ash Comprehensive Utilization Management, 1994;
18) Measures on Coal Gangue Comprehensive Utilization Management, 1998;
19) Interim Regulations on Lubricant Recycle and Reuse (revision);
20) Regulation in Compilation and Assessment of "Energy Conservation Chapter" in the Feasibility Assessment Report in Fixed Assets Investment Construction Projects;
21) Air Pollution Prevention and Control Law, 2000.4.29.

c) System to eliminate backward high energy consumptive products, facilities and producing processes. On the one hand, the system controls the market entrance of high energy consumptive products, facilities and processes; on the other hand, it enhances shutting down the backward production facilities.

d) Energy management system in key energy consumption units.

e) Energy efficiency label management system. It is established as a law system, declaring implementation targets and punishment measures.

f) Energy conservation honor and awarding system. It is an encouragement

measure by establishing energy conservation models, in order to stimulate working positivism and enthusiasm in the whole society.

3) The revised law defines two systems: energy conservation target duty system, and energy conservation assessment and evaluation system. These two systems include energy conservation targets in the assessment of local governments and officials in charge.

4) The revised law improves economic policies; in regulating that central and provincial government should arrange specific funds to support energy conservation work, to carry out tax preference to listed energy conservative technologies and products, to subsidize the promotion and application of energy conservative products, to induct financial institutes to increase credit support to energy conservation projects, etc.

5) The revised law defines the subjects of energy conservation management and monitoring. The revised law was strengthened with 19 legal responsibilities, defines responsive punishment and increases the scale and degree of punishment.

4.1.3. Administrative Commands and Guidance

1) Decision on Strengthening Energy Conservation by the State Council, 2006.8.6;

2) Guiding Notice of the Ministry of Transport on Port Energy Conservation and Emission Reductions of Pollutants, the Ministry of Transport, 2007.12.20;

3) Several Opinions on Speeding up Shutting Down Small Thermal Power Plants, UNRC, 2007.1.20;

4) List of Backward Cement Production Facilities to be Shut Down in 2007, UNRC, 2007.12.28;

5) Notice of NDRC on Promoting Energy Conservation and Reduction of Pollutants in Small and Medium Companies, 2007.11.27.

4.2. Market-Based Instruments

4.2.1. Energy Pricing Mechanism Reform

1. Electricity Pricing Reform

1) Electricity Pricing Reform Development:

Most relevant to our TF: Since 1985, China has implemented several electricity pricing policies, such as repayment of capital with interest (RCI pricing), fuel and transportation (FT pricing), and operation period (OP pricing). These pricing policies helped turn the long-term power supply shortage situation, thus supported the fast social economic development for a certain period. However, such policies could not accommodate current power demands and market structure change, hindering the healthy development of power industry. In July 2003, Electricity Pricing Reform Scheme was proposed by NDRC, printed and distributed by the General Office of the State Council. This new round of electricity pricing reform started since then.

Policy System

(According to importance)

1) Notice of General Office of the State Council on Printing and Distribution of Electricity Price Reform Scheme, 2003.7.9;
2) Notice of National Development and Reform Commission on Printing and Distribution of Implementation Measures of Electricity Price Reform, 2005.3.28;
3) Interim Measures on On-grid Electricity Price, NDRC, 2005.5.1;
4) Interim Measures on Transmission and Distribution Electricity Price, NDRC, 2005.5.1;
5) Interim Measures on Retail Electricity Price, NDRC, 2005.5.1;
6) Circular on Establishing Coal and Electricity Price Linkage, NDRC, 2004.12.15;
7) Circular on Establishing Coal and Heat Price Linkage, NDRC, Ministry of Housing and Urban-Rural Development, 2005.10.25;
8) Notion on promoting electricity consumption by price leverage, 1999;
9) Interim Management Measures on Burden Sharing of Renewable Energy Power Price and Fees, NDRC, 2006.1;
10) Interim Measures on Renewable Energy Power Additional Price Income Allocation, NDRC, 2007.1.

2) Direction and Goal for Electricity Pricing Reform:

Gradually establish electricity pricing mechanism in market economy system, to optimize resource allocation, to promote healthy development of power industry, and to satisfy increasing power demands; establish a sane electricity purchase mechanism by pricing leverage, to protect the legal rights of electric power companies and consumers; and implement price linkage mechanism of electricity and coal, and that of electricity and heat, to advocate energy conservation and improve energy efficiency.

a) Long-term Goal:

Along with the institutional power reform, power prices will be divided and defined as four parts: onto-grid price, transmission price, distribution price, and sales price. Onto-grid price and sales price are influenced by market competition, while transmission and distribution prices will be fixed by the government. Meanwhile, canonical and transparent price management system should be established.

b) Short-term Goal:

Establish onto-grid price mechanism adapting to moderate competition of

power generation, basing on the separation of power plant and grid company; initially establish transmission and distribution prices mechanism to improve healthy development of power grid; linkage of sales and onto-grid prices; optimization of sales price structures; in conditions permitting areas, relatively high voltage level or electricity consumption users purchase directly from power plants as a trial implementation.

3) Electricity Price Forming Mechanism:

Sales price is under government guidance with unified policies and multi-level management. Sales price is composed by four parts: onto-grid price, transmission and distribution loss, transmission and distribution price, and government fund. An average sales price according to the sum of the four parts, is called benchmark price fixed by the government. There are three different categories of users, resident living electricity utility, agriculture producing utility, and industrial and commercial utility. Electricity prices to different category of users will then be fixed accordingly. The principle in fixing sales prices is equal burden sharing and effective power demand adjustment, as well as paying attention to public policy targets and establishing the linkage with onto-gird price mechanism. Take full advantage of price leverage to better allocate power resources and protect the legal rights of power companies and users.

a) Sales Price = Onto-Gird Price + Transmission and Distribution Loss + Transmission and Distribution Price + Government Fund

i. Onto-Grid Price:

If participating in regional competitive power market: Onto-Grid Price = Capacity Price (fixed by government in charge) +Quantity Price (determined by market competition);

If not participating in regional competitive power market: Onto-Grid Price is fixed by government in charge.

ii. Transmission and Distribution Loss: after grid companies purchase electricity from power plants (including those belonging to grid companies) or other grid companies, the normal loss in transmission and distribution process.

iii. Transmission and Distribution Price = Transmission and Distribution Service Price in Public Network + Special Service Price + Assistant Service Price. (TD price is fixed by the government, with unified policies and multi-level management)

iv. Government Fund: fund and add-ons charged by quantity, according to relative national laws, regulations or those approved by State Council or departments authorized by the State Council.

b) Sales Price Categorizing Reform:

i. Resident living power utility, agriculture producing power utility: unique quantity price;

ii. Industry, commerce and other power utilities: two tariff electricity price= quantity price+ basic price.

c) Sales price adopts peak-valley, rainy-dry-season, and seasonal differentiating prices.

d) Sales prices adjustment: periodic adjustment and linkage adjustment.

i. Periodic adjustment: the government department in charge of prices adjusts sales prices every year. If annual change is small, sales price should try to keep constant.

ii. Linkage adjustment: correlate with onto-grid price, but only applicable to industry, commerce and other users.

4) Coal and Electricity Price Linkage Mechanism

a) Link onto-gird price and coal price, and link sales price and onto-grid price, in order to reduce power plant cost and improve efficiency. But power plant need to assimilate 30% of the price increased.

b) Price linkage period is 6 months in principle. If coal price fluctuation reaches or exceeds 5%, onto-grid electricity price should be adjusted. (and electricity sales price will be adjusted according to the fluctuation of onto-grid price)

c) In order to relieve the coal fire power plants' operation difficulties, China has implemented two coal-electricity price linkages in the past three years. The onto-grid price of power plant raised by 5.01 RMB cents per KWH, which released the operation pressure in power plants to a certain extent.

i. 2005.5.1，initial coal-electricity price linkage, onto-grid price was raised by 2.52 RMB cents;

ii. 2006.6.30, second coal-electricity price linkage, onto-grid price was raised by 2.49 RMB cents.

5) Unique Electricity Price in Urban and Rural Areas

6) Lowering Small Coal Fire Plant Generation price: for those small coal fire plant which have higher sales price than benchmark price, their sales prices will then be lowered to benchmark price.

7) Subsidy for Renewable Energy Additional

By nationwide burden-sharing and proper subsidies, increase onto-grid price properly and gradually fix grid transmission and distribution prices, in order to improve renewable energy power generation, increase sales price and adjust the structure of sales prices. Those projects within subsidy catalog will receive 0.1 Yuan/kwh as subsidy.

8) Summary on Electricity Pricing Reform

Electricity pricing reform has gone through a long history together with institutional reform and market structure adjustment. At present, the coal price is

connected with international market, while the sales price of electricity is under government guidance. The goal of electricity pricing reform is to better establish an electricity system that utilizes the leverage of prices to optimize electricity resource allocation, as well as to establish a normative and transparent price management system.

Coal and electricity prices linkage system has been established to resolve the overturn situation of increasing coal price and frozen electricity price. China has implemented two rounds of coal-electricity price linkage to relieve the market tension, which was a progress on the way to further pricing reform. However, coal price increase weighs over than the increase of electricity price. Coal price almost tripled during the past seven years, while there were only two rounds of coal-electricity price linkage, raising electricity price by 5.01 RMB cents in the past 3 years. Current electricity price hasn't yet completely reflected the market situation of demand and supply, more efforts are expected to be made in pricing reform.

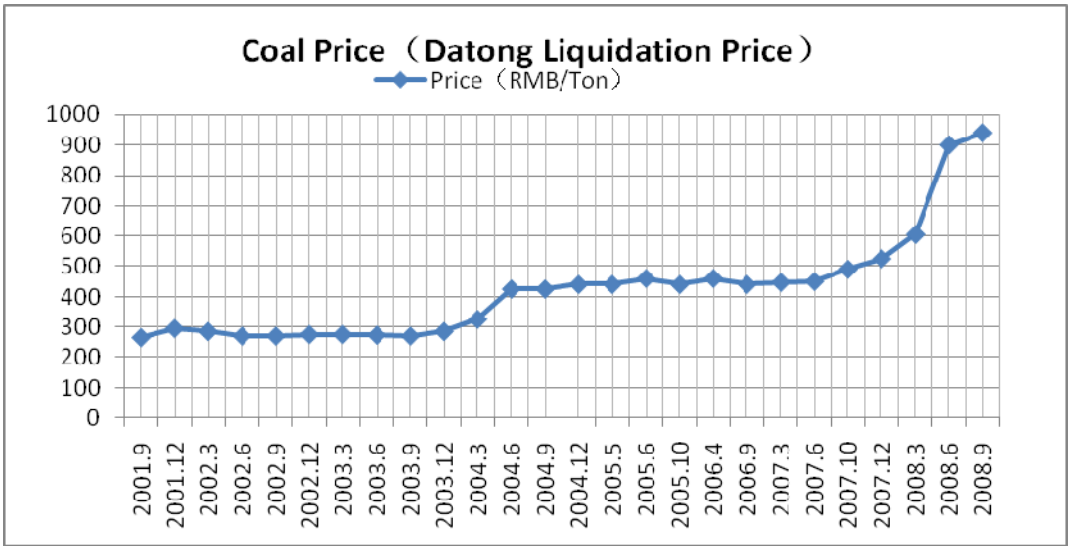

Figure 8: Coal Price Development in China

Due to the long-term low electricity prices, current price reform leads to price increase. On the one hand, it reflects the market condition and better allocates resources by market mechanism with higher efficiency; on the other hand, it also becomes an economic incentive to consumers to save energy.

While increasing the price of electricity generated by conventional coal fire power plants, China is also adopting renewable energies into power generation and certain subsidies are offered to these plants to foster its development. Being cleaner and renewable, these energy forms will achieve the same targets of emission reduction and environmental protection, as well as to substitute to limited fossil fuels and in the mid- and long-term cap the electricity price in case the experience of the German success story of renewables is applied. Here the "merit-order" impact requires that plants are connected to the grid according to their specific costs. Once the electricity price has exceeded the rate of the feed-in-tariff-scheme like often in the case of relatively competitive wind

energy in Germany, the price for electricity will not rise anymore in case of availability of wind energy. In Germany it is estimated around 5 billion Euros p.a. The conclusion to be drawn is that this is an important advantage of such a promotion system by fixed 20-years legally guaranteed, technology-specific support schemes. However, it has one problem which is that it counteracts our general approach of setting the right price signals.

Besides, the system of unique electricity price in urban and rural areas is established to secure social justice and ensure the basic living standards of rural population. While increasing the electricity price, the government also increased the low-income population subsidy. This is very reasonable on one hand. On the other hand we should also consider whether it is – in the mid- and long-term so wise to spend the public money just for compensating the higher energy expenditures. Or if it would not be much more effective if these higher expenditures would be avoided by spending the money in funding efficient/renewable equipment.

2. Oil Pricing Reform

1) Several Stages in Oil Pricing Reform:

   a) On 3 June 1998, the former National Development and Planning Commission issued Crude Oil and Oil Products Prices Reform Scheme, stipulating that the crude oil transaction settlement price is determined by negotiation between the two corporations of China National Petroleum Corporation (CNPC) and China Petrochemical Corporation (Sinopec). The price is composed by crude oil base price and discount (or premium), within which crude oil base price is determined by the former National Development and Planning Commission according to the last month average price of similar quality crude oil international price, and discount is negotiated by supplier and buyer. The prices of gasoline and diesel oil are government referential prices. The former National Development and Planning Commission fixed retail median price by importing tax cost plus domestic proper circulation price. CNPC and Sinopec fix the retail prices with a 5 percent fluctuation range on the basis of retail median price.

   b) Since June 2000, domestic oil products prices started to connect with the international market. Domestic oil products prices adjusted according to the international price changes, but only referred to Singapore price at that time.

   c) In October 2001, according to problems of over direct and transparent connecting method and over price change frequency, oil price connection methods were further adjusted and improved. Since 2006, the prices of oil products are determined on the basis of weighted average prices in Brent, Dubai and Minas, added by refinery cost, proper profits, domestic custom tax, and oil products circulation fees.

2) Current Oil Pricing Mechanism and Policy: in March 2006, General Office of the State Council printed and distributed Oil Price Comprehensive Reform Scheme, in order to further adjust oil price and reform oil pricing mechanism. The current price policy are as follows:

   a) Crude oil price connects with international market, reflecting the international

oil price changes;

b) Considering factors such as domestic market supply, producing cost and various social endurance, government department in charge macro-controls retail prices, while admitting a 8% of fluctuation space for oil product retailers;

c) Allowance mechanism to social vulnerable group and commonweal industries corresponding to oil price increases;

d) Price linkage within relative industries, such as oil price and transport sector price (e.g. taxi price) linkage;

e) Fiscal adjustment mechanism to oil companies price increasing incomes: oil special profit tariff, started to charge on 26 March 2006, with the highest rate of 40%, by Decision of the State Council on imposition of oil special profit tariff;

f) Upstream-downstream profit adjustment mechanism within oil companies, such as crude oil price and oil products prices linkage mechanism.

3) Summary on Oil Pricing Reform

The process of oil pricing reform is companied with the institutional reform of oil industry in China. The oil industry has gone through four major periods since the foundation of the country, from highly concentration and monopoly management, to current market competition system under government macro control. Within the periods, there were two oil circulation system reforms. The first one took place in 1994 that all the crude oil was distributed according to government plans, and the prices of crude oil and oil products were fixed by the former National Planning Commission. Since 1998, a grand pricing reform has been carried out to introduce market mechanism and price leverage, as well as to connect domestic price with international market.

The current pricing system, although needs further and deeper improvement, has achieved good progress in optimizing resource allocation and improving energy utilization efficiency. At present, gasoline price in China is around 1 USD per liter, while the price in EU is around 2 USD per liter and in America 1 USD. The price is lower than that in EU but almost the same with US. If taking income levels into account, the current oil price is higher than that in US and EU. The prices are still under the guidance of the government, which will have a price change lag to the international price fluctuation. Oil and oil products prices are reflecting the international level to a large extent.

Similar to electricity pricing reform, the oil pricing reform leads to larger price increase. It better reflects the market situation of demand and supply as well as international markets conditions, thus optimize energy resource allocation and works as an economic incentive to energy conservation.

Besides, while increasing the oil prices, subsidies to agriculture production industries as well as low-income and rural population increase responsively.

Table 1: Oil Products Prices Adjustment

Date	2008-6-20		2007-10-31		2007-1-14		2006-5-24		2006-3-26	
(RMB/ton)	Price	Markup	Price	Markup	Price	Markup	Price	Markup	Price	Markup
Gasoline	6980	1000	5980	500	6200	-220	5700	500	5400	300
Diesel	6520	1000	5520	500	5520	0	5020	500	4820	200
Jet Fuel	7450	1500	5950	500	6040	-90	5540	500	5240	300
Date	2005-7-23		2005-6-25		2005-5-23		2005-5-10		2005-3-23	
(RMB/Ton)	Price	Markup	Price	Markup	Price	Markup	Price	Markup	Price	Markup
Gasoline	5100	300	4900	200	5050	-150	5050	0	4750	300
Diesel	5470	250	4420	150	4420	0	4270	150	4270	0
Jet Fuel	4940	300	4640	300	4640	0	4640	0	4640	0

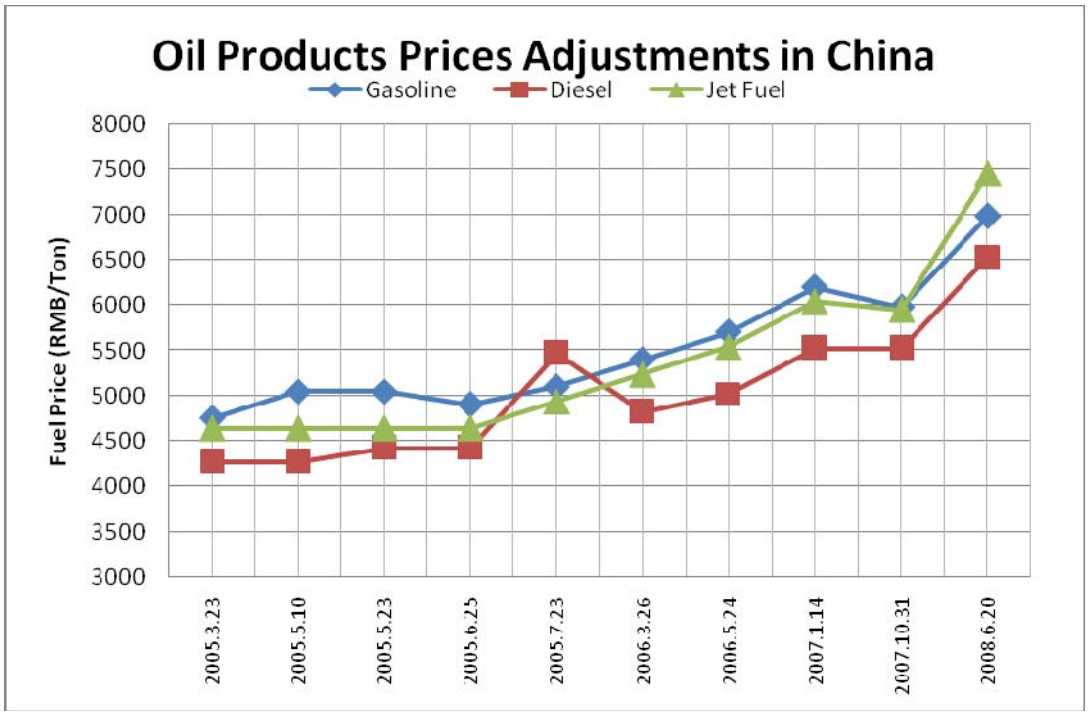

Figure 9: Oil Products Prices Adjustments in China

3. Natural Gas Pricing Reform

On 26 December 2005, National Development and Reform Commission issued a circular on natural gas producing price forming mechanism reform and natural gas producing price rising. The circular declared the pricing reform of natural gas. Major contents in the circular include:

1) Simply price category into fertilizer producing gas, industry gas, and urban gas, and gas from different gas fields are categorized into two grades.

2) The price is government guided. The government provides a factory reference price, with a 10% of fluctuation range determined by market.

3) Price linkage and adjustment system is established. Price linkage is established with substitutional energy prices, and gas prices are adjusted every year.

4) Gas price will be gradually increased. The two grades will achieve a unique price within three to five years.

5) Current gas prices are as follows:

    a) Grade 1 Gas Price:

        1. Fertilizer Gas: 560-710 RMB/1,000m^3
        2. Industry Gas: 585-920 RMB/1,000m^3
        3. Urban Gas: 560-920 RMB/1,000m^3

    b) Grade 2 Gas Price: 980 RMB/1,000m^3

    c) Retail Price (2007.4): 2.05-2.3 RMB/m^3

4. Renewable Energy

Apart from the conventional fossil fuels, renewable energies are positively promoted in China. There are various kinds of renewable energies that are under rapid development, such as solar power, wind power, hydro power, biomass, nuclear power, etc. The prices of renewable energies are relatively high at early stages. The government has supported their development with abundant technological and fiscal policies. Meanwhile, with technology advancement and the increasing prices of fossil fuels, renewable energies will become more attractive and competitive.

Take nuclear electricity price for example. The electricity price of nuclear power varies between different nuclear power plants in China. With the higher domestic production rate of nuclear power plant, the costs of nuclear electricity have been lowered. The electricity price in Qinshan Nuclear Power Plant 2ed Phase is 0.393 Yuan/KWH, which is the national lowest nuclear electricity price. The electricity price of Dayawan nuclear power plant is 0.414 Yuan/KWH, which the average fire electricity price is around 0.387 Yuan/KWH.

4.2.2. Taxation and Fees

1. Definition

Tax is a distribution means of social products, in order to meet social public needs, according to social functions and is prescribed by law, compulsively and voluntarily. Tax is usually collected by taxation agencies, custom and fiscal departments, and is expended by government budget in social public needs.

Fee is a kind of expense that is charged by the government agencies providing certain specific services. It is usually collected by other taxation agencies and institutions. Specific fees are collected for specific expenses.

2. Resource Tax

1) Interim Ordinance on Resource Tax, 1993:

Table 2. Resource Tax Rate in 1993

Tax item	Crude oil	Natural gas	Coal
Tax rate (RMB/Ton)	8-30	2-15	0.3-2.4

2) Resource Tax Adjustment:

   a. 2007.2, coke: 8Yuan/ton;

   b. 2005.5, resource tax of coal: 2.5-4 Yuan/ton;

3) Summary

Levying on natural resources, resource tax was designed to adjust resource rank difference revenue and reflect the compensable use of state-owned resources. Current resource tax is a specific duty, with advantages of low management cost and stable fiscal income. However, comparing with the high energy prices, the low resource tax, even though after adjustments, is weak in functioning of resource rank different revenue adjustment or improving the efficiency in resource utilization.

Further reform is recommended to transfer the specific duty into ad valorem tax, and raise various tax and fee standards related with environmental protection, in order that energy prices will properly reflect resource scarcity and the cost of resource destroy and environment recovery.

3. Eco-compensation Mechanism

1) Regulation on Mine Resource Compensation Fee Levy Collection and Management, the State Council, issued in 1994 and amended in 1997.

2) Eco-compensation demonstration areas

3) Eco-compensation standards system

4) Summary

The mechanism aims at internalization of the external costs of ecological environment, by integrating environment pollution treatment and ecological recovery fees into the production cost of mining companies. The basic principles of the mechanism are: exploiters protection, destroyers' recovery, beneficiaries' compensation, and polluters pay; the beneficiaries of eco-protection have the duty to pay proper compensation fees to eco-protectors. For instance, in the case of a gas transfer project from area A to area B, the gas receivers and consumers in area B have the duty to pay for compensation fees to area A.

A most important system in the eco-compensation mechanism is that of mineral resource exploitation. Eco-compensation Mechanism of mineral resources is designed to guarantee and improve the exploration, protection and proper exploitation of mineral resources, and to protect the state property right and interests of mineral resources.

The fee rates of oil, natural gas, coal, coal mine methane are 1%, apparently low

comparing with international levels between 10% and 16%[5]. The low fee rate underestimates the value of mineral resources, and causes poverty and inequality of the west areas of mineral regions where the compensation fee should have contributed to regional economic and sustainable development.

Thus the rate of mineral resource compensation fee is recommended to increase, transfer from specific duty to valorem duty, and to take into account of the interests of local population.

4. Tax Preference in Favor of Energy Conservation and Pollutants Reductions

Tax preferences are provided for energy and water resource conservation, resource comprehensive utilization and relative tax preference to environment sound products, e.g. in form of an enterprise income tax deduction and exemption to companies implementing energy conservation and environmental protection projects and investing in energy conservation and environmental protection equipments.

1) Enterprise Income Tax Law, 2007.3.19

   a. Article 27: three-year-deduction and three-year-exemption to the enterprise income of environmental protection and energy conservation projects;

   b. Article 33: only 90 percent of the income from enterprises with comprehensive resource utilization to produce products in accordance with national industry policies is calculated in total income for tax;

   c. Article 34: 10 percent of the investment in specific equipments of energy conservation and water saving is deducted from the total enterprise income tax payable; the equipments should be listed in Enterprise Income Tax Preference Catalog of Energy Conservation and Water Saving Specific Equipments.

2) Promotion List of National Key Energy Conservative Technologies, NDRC, 2005;

3) National Guiding List on Clean Production Technologies in Key Industries, NDRC, 2006.

4) Summary

   The tax preference is carried out according to the energy conservation and pollutants emission reductions goal in the 11th FYP, and functions as a supporting measure to energy conservation guiding plans such as Comprehensive Working Scheme on Energy Conservation and Reduction of Pollutant Emissions. The technology lists of energy conservation and clean production are designed as technical guidance to industries for technological upgrades, by applying clean and energy conservative technologies, facilities and processes, thus improve energy efficiency.

[5] Resource: http://www.mlr.gov.cn/zt/hy/gtlh/gtklh/200711/t20071122_93434.htm .

4.2.3. Emissions Trading System and Other Market Based Instruments

1. Emissions Trading System

The emissions trading system of pollutants in China, aiming at environmental protection, has a long history of academic research and experimental implementation in different areas. In order to meet up with the mandatory targets set by the 11th FYP, and better achieve the national energy conservation and pollutants reduction goals, specific SO_2 and COD emissions payable allocation and trading plans have been framed and implemented. Besides, additional electricity price quota trading systems to encourage and support the development of renewable energy have been carried out for the past several years. In recent years, emissions trading system has been introduced to climate protection such as the establishment of international carbon market, and CDM projects responsively to China.

1) Emissions Trading System of Major Pollutants (SO_2 and COD)

   a. Designing aim of emissions trading system: reduce emissions of pollutants by economic incentives, to achieve a win-win situation between environmental protection and economic development

   b. Compulsive energy and environmental protection targets set in the 11th FYP: 10% of major pollutants reduction by 2010 comparing with the base year of 2005. In accordance with and implementation of the 11th FYP, a National Total Amount Controlling Plan of Major Pollutants Discharge During the 11th FYP Period was framed by the Ministry of Environmental Protection and NDRC, and approved by the State Council in 2006. Two Total Amount Controlling Plans were set on COD and SO_2 discharge within different provinces. The 10% of COD discharge reduction is 12.728 million tons, with 12.639 million tons distributed to different provinces and 89,000 tons for payable allocation and emission trading demonstration. The 10% of SO_2 emissions reduction target equals to 22.944 million tons, with 22.467 million tons distributed to provinces and 477,000 tons reserved for payable allocation and emissions trading demonstration.

   c. Development:

      In 1980's, a pollution levy system was established. It was concentration control; since 1990, total amount control of air pollutants, discharge permits system, and emissions trading system was graduated established. In the recent years, emissions trading system have been tested in demonstration areas in seven provinces: Tianjin, Jiangsu, Zhejiang, Shanghai, Shanxi, Henan, and Guangxi. SO_2 emission rights have been traded in such demonstration areas. Emission trading system of COD was also experimented in Jiangsu and Shanghai, with good effects. However, the scale and extent of general emission trading system in China fall behind of the demands of environmental protection.

2) Renewable Energy Power Additional Price Quota Trading System

Renewable energy power additional price quota trading system was established and firstly carried out in 2006 when the initial renewable energy generated electricity price subsidy and quota trading scheme was issued. It was the symbol of the official start of burden sharing system of renewable energy power generation costs. So far, two schemes have been circulated.

a. Circular of 2006 on Renewable Energy Electricity Additional Price Subsidy and Quota Trading Scheme, NDRC and State Electricity Regulatory Commission, 2007.9.

b. Circular of January to September of 2007 on Renewable Energy Electricity Additional Price Subsidy and Quota Trading Scheme, NDRC and State Electricity Regulatory Commission, 2008.3.

3) Clean Development Mechanism

Measures for Operation and Management of Clean Development Mechanism Projects in China, NDRC, Ministry of Science and Technology, Ministry of Foreign Affairs, 2005.11.29.

2. Green Trade Policy

1) Circular on Export Controlling of Certain High Energy Consumption, High Pollution and Resource Intensive Products, NDRC, MOF, MOC, etc, 2005.

2) Cancel the Export Tax Refund of Parts of Resource Intensive Products and Lower Export Tax Refund Rate of Parts of Resource Products, Ministry of Finance, in order to restrict the export of resource- and pollutant-intensive products.

a. 2007.7.1：2831 products were involved, taking up 37% of the total in customs tariff, within which 553 high energy consumption, high polluting and resource products including liquid petroleum gas are canceled, and the drawback rates of 15 types were lowered, including steel products, to the lowest of 5%;

b. 2006.9.14: export drawback of 3 types of products, including coal and natural gas, are canceled, and export drawback rates of 5 types, including steel and cement, were lowered.

3. Green Credit System

Notion on Implementation of Environmental Protection Policies and Regulations to Prevent Credit Risks, SEPA, People's Bank of China, and China Banking Regulatory Commission, 2007.7:

1) To the new construction projects which fail environment assessment approval or the check and accept of environmental equipments, no credit support should be offered in any form by any financial institute.

2) Green credit system emphasizes on both energy conservation and pollution reductions.

4. Government Procurement

Notion of General Office of the State Council on Establishing Mandatory Government Procurement of Energy Conservative Products System, 2007.7.30;

Government Procurement List of Environment Labeled Products;

Government Procurement List of Energy Conservative Products;

5. Information, Persuasion, and Encouragement

1) Energy Efficiency Labeling System: Management Measures on Energy Efficiency Labeling, Products List of Implementing Energy Efficiency Labeling, 2008.6.1;
2) Energy Consumption per GDP Index Bulletin System, NDRC, 2006;
3) Management Measures of Green Building Assessment Labeling (Try out), 2007.8;
4) Energy Conservation Products Authentication Management Regulation, 1999.2.11;
5) Circular on encouraging energy conservative and environmental protective small displacement automobiles, NDRC, etc, 2005.12.15;
6) Bulletin of Energy Utilization Conditions in a Thousand Enterprises, NDRC and National Bureau of Statistics, 2007.9;
7) Nationwide Energy Saving Actions: Notice of the State Council on Deeply Implement Nationwide Energy Saving Actions, 2008.8.1;
8) Public participation: water price adjustment public hearing, etc.

6. Policy Summary and Assessment and Proposal

Firstly, policies and instruments for energy productivity must be designed based on the current situation in Chinese society and policy goals, considering both present and future development needs.

Policies and instruments are designed to achieve certain goals, basing on current situation of the society. When applying Chinese policies of energy productivity, we should take the current Chinese situation into consideration that the major social contradictions lie in the backward capacity of social production and increasing material and cultural demands of the people. Therefore, policy system is designed on the basis of strengthening the country's capability to meet up with the demands of social production and general living standards, while achieving energy conservation and environmental protection, as well as increasing energy efficiency.

Secondly, energy productivity policies at current stage focus more on improving energy efficiency. Further work is needed in researching and introducing policies of

system optimization and promoting renewable energies.

A good number of the policies are to improve the energy efficiency rather than considering the whole network reform or optimization of the energy system. For example, as the highest-level guiding policy of the 11th FYP set the mandatory "energy conservation" target of reducing energy consumption per 10,000 Yuan GDP by 20% by the year of 2010, underneath there are a series of policies designed and carried out to achieve the goal of energy conservation and pollutant reductions, such as the Comprehensive Working Scheme on Energy Conservation and Reductions of Pollutants Emissions, Energy Conservation Law, and so on.

Industrial structure adjustment policy was designed to achieve a better industry structure, via shutting down a number of production processes and equipments in the category of elimination, while others are limited developing or positively encouraged. One of the most important determinants is energy consumption and efficiency improvement. Structure adjustments in seven industries with surplus productivity such as electrolytic aluminum are on the agenda of the government, which is to achieve a better industry structure in the means of system optimization.

Thirdly, command and control instrument is very well applied in China, supported by a set of comprehensive policy system.

However, they are not sufficient to achieve set targets as the ones of environmental protection in the previous 5-year-plans were difficult to achieve. As guided by the highest level of the 11th Five-Year Plan, which set a 20% of mandatory target to cut down energy consumption per 10,000 GDP by 2010 basing on 2005, clear mandatory targets are set in various policies in different aspects have been carried out. We have the White Book on China's Energy Conditions and Policies as a Medium and Long Term Energy Conservation Plan, the 11th Five-Year Plan for Energy Development, and Comprehensive Working Scheme on Energy Conservation and Reduction of Pollutant Emissions, as well as several other specific sectoral plans and polices. These policies form a comprehensive system to emphasize on energy conservation and set detail clear mandatory plans for the targets, covering various aspects in different energy industries. Still, given the difficulties in achieving past targets for SO_2-emissions control in the previous 5-year-plans, additional measures which comprise more economic incentives to strengthen the self-interest of citizens and businesses, are required.

Fourthly, market based instruments are getting more and more important, yet it is expected to play a major role in instrument mix.

A long-term energy price increase in line with the energy productivity increases to accelerate innovations and structural changes is recommended as the major instrument. The rationale is that the market mechanism is considered as the key mechanism to achieve better resource allocation and to improve energy utilization efficiency. Along with institutional and management system reform, pricing reform of major energy resources and taxation reform have taken place for the past decades. At present, coal and crude oil prices are connected with international markets, and determined by market

demand and supply situation. The leverage of price plays its part here. Besides, electricity pricing and oil products pricing mechanisms have transformed from government instruction to government guidance, with price linkage with coal and crude oil. The current electricity price and oil products prices are still lower than the international average. Government sector is expected to further open energy market to transfer to market mechanism determination.

Except for pricing mechanism reform, resource tax, eco-compensation fees are expected to be perfected and the rates to rise to proper standards, better reflecting the scarcity of the energy resource, the cost of resource destroy and environment protection, as well as behaving as an economic incentive to the consumers to achieve industrial and nationwide energy conservation. Besides, new tax such as fuel tax is recommended to be carried out, not only to achieve higher fuel efficiency in single cars, but also a strong economic incentive to steering motorists to reduce their total driving miles, which in turn improve energy productivity by both energy efficiency and system optimization.

However, public sector should also consider social equity and take the society system as a whole. If the energy prices are increased sharply in a short time, or the tax rates will be raised by a large extent, social economic issues such as inflation, as well as agriculture production and the living standards of the low-income population should be fully taken into account. Therefore, steady yet increasing energy prices as well as taxes are recommended to achieve better energy productivity, taking full advantage of the market mechanism and the leverage of prices.

Fifthly, nationwide and continuous energy saving actions are needed.

Nationwide and continuous energy saving actions are greatly encouraged in China. A recent notice on that was issued by the State Council to advocate all the population to take actions to reduce energy consumption. Such measures could be a huge contribution in improving energy productivity. Once the concept of energy productivity is established nationwide, the ideology will have great impact not only in daily life energy saving but also in decision making by the people in charge of various industries.

Besides, the ideology of welfare could be discussed and redefined that when we invest more and more energy to improve our living standards, do we really enjoy the multiplying piling of energy products?

Appendix III

OECD Countries' Experience in Environmentally Related Taxes (ERTs)

1. Brief of ERTs in OECD countries

20 years experience from OECD countries indicates that environmentally related taxes (ERTs)[6] are effective and efficient. In 2006, 375 different ERTs were in use in OECD countries, of which 150 on energy and 125 transport-related. Other ERTs apply to specific air and water emissions and to products such as packaging, batteries pesticides, fertilizers, lubricants, household appliances etc. Most ERTs have proven to be successful, triggering significant emission reductions (see box 1).

Box 1: Examples of ERTs in OECD countries

There is growing evidence on the environmental effectiveness of ERTs. In *Belgium*, the tax differentiation between heavy fuels with a sulphur content below or above 1% induced a decrease in the use of the fuel with the higher sulphur content from 20% of the market in 1994 to less than 1% in 1998 (also due to a switch to natural gas). In *Denmark*, the sulphur tax caused a reduction of emission of 34,000 tons between 1996 and 2000. The tax on non-hazardous waste has reduced the net delivered waste to municipal sites by 26% in the period 1987-1996, and waste to smaller fills and private waste sites by 39% (1990-1996). The *Swedish* sulphur tax (introduced in 1991) led to a fall in the sulphur content of oil-based fuels of more than 50% *beyond the legal standards*. Also in Sweden, a tax differentiation was introduced in 1991 on *diesel fuels* in order to stimulate the use of less polluting fuel oils. From 1992 to 1996, the proportion of "clean" diesel sold in Sweden rose from 1 to 85%, which led to a reduction of more than 75% on average in the sulphur emissions of diesel-driven vehicles. In *Germany*, the sulphur tax differential between transport fuels with a sulphur content of more than 50 parts per million (ppm) and those with practically a hardly measurable content of sulphur (less than 10 ppm) led to a shift of the entire market within a few weeks only at the turn of the year 2003 towards fuels with no sulphur. Many other examples could be quoted.

[6] OECD (and IMF) defines a *tax* as a *compulsory, unrequited payment to general government.* Taxes are unrequited in the sense that benefits provided by government to taxpayers are not normally in proportion to their payments. The term *environmentally related taxes* is used by OECD to describe *any tax levied on tax-bases deemed to be of particular environmental relevance*.

2. Implementing ERTs in OECD countries

Three complementary policy options are open to introduce ERTs.

Firstly, environmentally harmful subsidies and tax provisions must be removed, for instance: certain types of agricultural subsidies leading to overuse of fertilisers and pesticides, intensive farming, soil erosion etc.; energy subsidies cause energy wastage and low energy productivity; under-taxation of polluting fuels such as coal.

Secondly, existing taxes with and environmental relevance can be adapted and restructured. For instance, fuel taxes can include a carbon and sulphur content component.

Thirdly, new ERTs can be introduced on different types of emissions to air and water, domestic and industrial waste, polluting products etc.

Furthermore, as subsidies are just negative taxes, a broader perspective should be chosen, thus ensuring consistency of the policies by choosing the right policy mix. Main steps of such an Environmental Fiscal Reform (EFR), implemented in several OECD countries, comprise reforming environmentally harmful subsidies; restructuring existing taxes; and introducing new environmental taxes.

In implementing ERTs, six main issues must be carefully considered:

1) The use of tax revenue. The revenue of ERTs can be used for different purposes, such as: feeding the general Government budget or dedicated environmental funds; payment of compensation to the most affected segments of population or industry sectors. ERTs can also be implemented in a revenue neutral context, i.e. decreasing other (possibly distortionary) existing taxes such as labour or corporate taxes, thus keeping a constant tax burden on the economy. Compensating new ERTs with a reduction in existing distortionary taxes can provide a “double dividend” in terms of both environmental benefits and economic efficiency gains. Whatever option is chosen, the use of tax revenue should be explicit and transparent. Revenue neutrality greatly contributes to the political acceptability of taxes.

2) International competitiveness. Energy taxes should aim at the largest potentials for energy efficiency first, thus starting with Chinese industry, since 70% of energy consumption takes place in that sector.

As long as domestic energy prices in China remain below the international price level the implication is a subsidy connected to every good produced, not only for the domestic market, but for buyers in the international market as well. A border-tax adjustment for energy embedded in export goods would be a first step towards capturing the uncompensated loss of natural resources implied by the present arrangement, while maintaining a price policy within China in accordance with the harmonious society aim. In the longer run, however, the gap between domestic energy prices and international energy prices will tap on the strength of China’s economy, and approaches need to be identified to reserve the price-support for the most worthy consumers, such as low-income households and certain manufacturers. Taxing export goods in order to capture the rent from energy consumption could at the same time be a viable approach to remedy certain climate policy concerns if the tax to some extent includes the carbon content of fuels in its tax base.

In addition, the Chinese government is looking for potential tools how to reduce problems of the embedded carbon caused by the export-oriented intensive trade by energy-intensive industries in China anyway. Border tax adjustments may be a means to address this problem. Furthermore, the production costs are so low in China that impacts of potential cost increases due to energy tax increases hardly exist while the above mentioned opportunities are great. Still, new ERTs can affect the competitiveness of targeted sectors of the economy (effect on prices and profits).

Furthermore unwanted effects can also be remedied through the conventional measures such as recycling the revenue back to the affected sectors (while maintaining abatement incentives at the margin); reducing other existing taxes such as labour or corporate taxes. In any case, full exemption of the ERT, that would erode the incentive effect of the tax, should be phased out in the medium to longer time perspective.

3) Social implications. ERTs can also affect poorer segments of the population, notably through price increases e.g. on energy, transport and other products. Mitigating such regressive effects by reducing tax rates for the lower income categories would erode the purpose of the tax and should be avoided. Social hardship can be avoided if price increases are politically limited to proven increases of national energy productivity in the previous year (period). Small annual steps allow to combine effectiveness; a strong stimulus for innovation; and social acceptance. Possibly remaining regressive effects should preferably be tackled through either a progressive tax design and/or base or through compensation measures, such as lump sum payment, hence preserving the incentive effect of the tax. In addition, intelligent regulation with market elements such as feed-in-tariffs for renewable energies does also have a positive impact on equalization of differently affected; particularly rural regions.

4) Acceptance building. It is essential to build consensus of stakeholders such as the business and agricultural community, environmental organisations, different government levels and departments (e.g. finance and environmental ministries). Such consensus can be build, in particular, through ex ante consultations with important stakeholders of society (e.g. “environmental tax commissions”), clear objectives, regular consultations, transparency and feedback procedures. To this end, a consistent policy mix is required. Taxes are mostly preferable as they are efficient, raise revenues, trigger and spur innovation and they are predictable in terms of price impacts. However, a sophisticated command-and-control-system should serve as a bottom line.

5) Long-term and progressive implementation. It takes time to the economy to adapt to new price signals provided by new ERTs. For instance, technical innovations, new organisations and structure of the energy sector will take place over time if clear and consistent signals are provided. Concerning energy and transport taxes, OECD data indicate that the price elasticity of demand for petrol or gasoline is relatively low in the short run (-0.15 to -0.28), but significantly higher in the long term (-0.51 to -1.07). This indicates that significant effects could be expected in the longer term – meaning 4-5 years. This also underlines that environmental tax reforms must be seen in a medium / long term context, as it takes time to the economy to adapt to evolving market signals, in particular to enable technical change to take place. Therefore a progressive application of ERTs, according to a predetermined and predictable schedule will enable economic sectors to

adapt and develop new technologies and organisation in a stable and long-term perspective.

6) Inflation. This can be avoided if energy price increases are accompanied by appropriate reductions of other taxes such as employer's social security contributions or as in China taxes on employees liable to the employer or VAT. Other options for revenue recycling, while permanently reducing energy costs, are to co-finance public and private infrastructure and equipment which builds on efficient and renewable technologies.

3. Preliminary conclusions for China

China's current reform process should take benefit of the strategic opportunities stemming from the ongoing reform of tax and fiscal, environmental and energy policies, in particular in the context of the 11th five-year plan and the preparation of the 12th plan. Reforming the tax system offers an opportunity to improve economic, social and environmental welfare in a coherent way. Reforming energy policy should be made consistent with the new tax system, in a long-term perspective. The environmental policy reform should enable to craft an appropriate "policy mix" between social planning with both command and control and economic instruments, in particular taxes. In this respect, it would be desirable to make a comprehensive assessment of existing policy instruments to identify possible duplications, conflicts and inefficiencies and maximise synergies. However, a comprehensive "Assessment of Current Policies for Energy Productivity in China" (annex) has already been carried out, providing very valuable insights in the existing policies and measures to which the proposed measures here can be well linked and integrated into the existing policies.

Many other economic and administrative instruments are available for an effective environmental policy, including environmental bank credits and insurance policies. The Task Force will explore further a range of policy instruments available.

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Background Report on
Energy efficiency and Urban Development

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Excutive Summary

Currently, the proportion of both building and transportation energy consumption in social site energy consumption is as much as about 33%. Following the experiences from developed countries, the proportion would stably increase with the development of economy and the adjustments of industrial structure. For example, the proportions in OECD countries and EU member countries have reached about 2/3, among it the proportion concerning only urban building and transportation is more than 1/2.

Chinese urbanization is currently a great challenge for itself as well as the whole world nowadays. Currently the urban building's scale continuously increases at the speed of 5%-8% in China and more than 1 billion m^2 of new buildings are built every year. This will not only lead to the double floor area of urban buildings and continuous increase of building operating energy consumption in the next 15 years, but also indirectly promote the fast development of energy-intensive building material (cement, steel, glass, etc.) industries. Statistical data shows the energy consumption of the cement, steel, glass, and china used for urban construction account for 20% of the total energy consumption in China in 2005. If the urban construction scale can be decreased half, the total energy consumption can be decreased 10%.

Various types of new buildings are the main part of urbanization. According to the statistical data, the current urban floor area per capita of China is nearly 30 m^2, which exceeds the corresponding index of Hongkong and is close to the average of Japan and Singapore (about 36 m^2), the index of some provinces and cities even exceeds that of Japan and Singapore. But as a whole, the floor area per capita of China is far lower than that of USA and Europe. However, in the recent 15 years, the urban building floor area doubled every 7 years and more than 1 billion m^2 of buildings were constructed every year. If 1 billion m^2 of buildings are built and the urban population increases 15 million every year, the urban floor area per capita of China will reach 42 m^2 and will be close to the European level. The total energy consumption for building operation will certainly increase with the increase of building scale. If the urban building scale increases one time, the building energy consumption will increase one time or even more.

Up to now, the building operating energy consumption per capita in China is 1/12 of that in USA and 1/6 of that in west and north Europe; the building operating energy consumption per capita of cities in China is only 1/7 of that in USA and 1/3.5 of that in west and north Europe; the operating energy consumption per unit floor area for

urban buildings in China is 1/3 of that in USA; the operating energy consumption per unit floor area for residential buildings in China is 1/3 of that in USA and 1/2 of that in Europe. However, recently, with the growth of the economic and the improvement of the life level and also the influence of the ideas of "joint track with international standard" and "30 years of no backwardness", great amount of high standard residential and office buildings that pursue to be different and large have been built. The operating energy consumption for these buildings realizes the conception of "joint track with international standard", the energy consumption per unit floor area has increased greatly. For example, a so called high-grade residential building in a certain place of China, declaims that it has applied the most advanced energy saving technique for air conditioning and heating. Its heating and air conditioning system runs all day long most of the time in a year, and its energy consumption reaches 20kWh/m^2•a, which is 7-10 times that of common residential buildings and is equivalent to that of the high-grade residential buildings in developed countries. Also, the electricity consumption standard per unit floor area of large-scale commercial buildings in most cities of China is 200~300 kWh/m^2•a, which has already reached the level of developed countries such as the USA, Japan and Europe. The commercial buildings in China like those accounts for less than 5% of the total building floor area, while accounts for more than 10% of the total building energy consumption.

If the urbanization idea of "joint track with international standard" spreads widely, building energy consumption in China will reach the high level of the "developed countries". Take the urban building electricity consumption per unit floor area in China for example, if it reaches the current level of that in USA, then the 30 billion urban buildings in China will consume 3 trillion kWh electricity annually in 2020, which is 1.5 times of the current total amount of electricity generation in China; If it reaches the building energy efficiency level in German (60 kWh/m^2•a), then in 2020, the electricity consumption for urban buildings in China will be equivalent to the current total amount of electricity generation for the whole country in a whole year.

In addition, the fast urbanization fuels up the mechanization of China, especially the increment of private cars, which has increase from 5.78 million in 2003 to 13.25 million in 2005 at an annual growth rate of 31.9%. It challenges greatly the urban development. On one hand, there are more and more traffic jams in center area of cities. On the other hand, pollution emission increases with penetrating energy comsumption in transport sector. Actually, transport sector has ranked top in sectoral growth rate of energy consumption, due to its expanding scales. Its growth rate bypasses the social average value.

Researches in both domestic and abroad sufficiently evidents differences between industry sector and consuming sector concerning energy conservation issues. For transport and building sectors obviously featured with consuming charateristics, energy solutions could not entirely rely on technical breakthroughs. Optimized organization and management, hightened energy prices, favored lifestyles of energy conversation and so on, which are defined as non-technic factors, could also be solutions as equally effective. In most times, operation of energy carriers and systems, choice and use of vehicles are more important and decisive. Choosing public traffic instead of private cars for commutting, reducing properly the personal floor area of dwellings and offices, applying locally proper HVAC systems with part-time and part-space operation, lowering indoor set temperature, ventilating rooms in priority of natural ventilation and so on, can reduce energy consumption while maintaining same level of service. And they are the significant reasons why China consumes only 1/3 of USA in residential and 1/2 of USA in commercial.

Moreover, for cities economically dominated by consuming and service sector, urban building and transport energy consumption are closely related to scale of urban area, density of population and building stock, and lifestyles concerning individual living, transportation, work and leisure entertainments.

This task force aims at development of energy and resource conservative society and city, based on comprehensive understand of impacts of above energy solutions on urban energy consumption. Comparative analysis, based on large scale of typical cities of both domestic and abroad, on urban building and transport energy consumption with different scale of urban area, desity of building stock and population, distribution of population with different lifestyles and incomes, would be carry out for 1) modelling macroscopicly the energy consumption through individual living, work, entertainments and transportation aspcts, and 2) impacts of different distribution of different people with different energy consuming modes upon urban building and transport energy consumption.

And further research on inherent social culture and values behind existing social communities with different lifestyles and consuming patterns from sociological aspects would be carried out, too, for indepth analysis on proper solutions for China urbanization in future and relative policies and mechanism. For detail, quantified contribution of supposed microscopic energy solutions to energy saving of different sectors and the whole nation would be analyzed, from aspects of social community and policy, for evidenting concrete policies and mechanism.

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Part I: Energy efficiency and Urbanization: concepts and methodology

1.1 Fundamentals in urban consuming sectors

1.1 Moderating energy consumption is a key issue for sustainability and economic development

The Kyoto Protocol objectives and, more recently, the constraints on energy supply have enhanced the priority given to energy efficiency policies. Almost all OECD countries and an increasing number of non-OECD countries are implementing new or renewed instruments adapted to their national circumstances. Beside a pre-eminent role of market instruments (voluntary agreements, labels, information dissemination), regulatory measures are also widely implemented where the market fails to give the right signals (buildings, appliances).

In less developed countries, moderating/decreasing energy consumption is an important issue but often with different driving forces compared to industrialised countries. In these countries, the need to reduce greenhouse gas emissions and local pollution is probably less of a priority: alleviating the burden of oil imports, reducing energy investments requirement, and making the best use of existing supply capacities to improve the access to energy are more important issues.

With the steep increase in oil price since 2003[1], the cost of oil imports has soared, with severe constraint for the economic growth of the poorest countries. Any efficiency improvement in oil consuming sectors will result in direct benefits in the balance of trade.

Moderating/decreasing energy consumption, for instance in electricity use, will have two benefits:

- Supply more consumers with the same electricity production capacity, which is often the main constraint in many countries of Africa and Asia;
- Reduce the investment needed for the expansion of the electricity sector; this is especially important in countries with high growth of the electricity demand, such as China and many South East Asian countries.

1.2 How moderating/decreasing energy consumption?

Moderation / reduction in the energy consumption can be achieved through technological improvements, but also from moderation in the needs for energy services or from better

[1] Almost a tripling between the beginning of 2003 26 US$/bl for the Brent) and August 2006 (73 US$/bl); since then the price is around 60 US$/bl , which still twice higher than in 2003.

organisation and management along with improved economic conditions in the sector ("non technical factors").

In some cases, because of financial constraints due to high energy prices or low income, consumers may decrease their energy consumption through a reduction of their standard of living (e.g. reduction of comfort temperature; of car mileage). Such reductions, if not supported by changes in people's aspirations, are highly reversible.

Moderating / decreasing energy consumption is first of all a matter of individual behaviour and reflects the rationale of energy consumers. Avoiding unnecessary consumption of energy or choosing the most appropriate equipment to reduce the cost of the energy contributes to decrease individual energy consumption without decreasing individual welfare.

Avoiding unnecessary consumption is certainly a matter of individual behaviour, but it is also, often, a matter of appropriate equipment: thermal regulations of room temperature, or automatic switch off of lights in unoccupied hotel rooms, are good examples of how equipment can reduce the influence of individual behaviour.

But, similarly, the ability of individuals to reduce unnecessary consumption depends on the technical context where they live and move: badly insulated homes heated at 15°C in winter may consume a lot more than a similar home very well insulated and heated at 20°C; people can rely on public transportation rather than on cars for getting to work only if public transportation networks are available close enough to their home.

Moderation / reduction of energy consumption based on technical support proves to be long-lasting: a well insulated building built today will still be there in 50 years from now, and will still generate low energy consumption at that date.

Moderation / reduction of energy consumption based on behavioural support does not provide any guarantee to be still active after some years: increase in incomes or globalisation through internet and all kinds of media, may result in behavioural changes in the wrong direction as regard energy efficiency.

1.3 This is a Policy issue

Any cost related decision concerning energy consumption reduction, at the individual level, is based, more or less, on a trade-off between the immediate cost and the future decrease in energy expenses expected from lower consumption. The higher the energy price, observed or expected, the more attractive are the energy efficient solutions.

Making the "good" investment decision, for domestic appliances or industrial devices, from the energy consumption moderation viewpoint, certainly relies on a sound economic rationale. Good price signals are necessary.

In market economies, where most energy prices to final consumers are deregulated, prices normally reflect fairly accurately the supply costs, and are the main drivers of individual's behaviour as regard energy needs. However, for several reasons, prices often reflect only a part of the overall costs of fuels and electricity. It includes none, or just a few, environmental externalities and long run marginal development costs.

As a result, behaviours as regard the needs for energy services and decisions made by final consumers when purchasing equipment or making an energy efficient investment (e.g. retrofitting of dwelling) are rather far from global economic optimisation, creating a gap between the actual energy consumption and what could be achieved through an accurate price system accounting for all costs involved.

Taxation is the usual means used by governments to reduce or suppress such price distortions at the consumer level. In that sense, taxation is always complementary to energy efficiency policies and measures. It is hardly just a component of these policies and measures because of its much broader socio-economic aspects, but it certainly determines the effectiveness of such policies measures.

1.4 How to measure energy consumption moderation?

China is confronted with two major challenges related to energy:

- A rapid increase of imports of hydrocarbons, likely to raise severe and growing security and socio-economic concerns
- A rapid increase in the emissions of pollutants and GHG related to energy, likely to raise severe and growing internal health diseases and related social unrest, and growing foreign pressures.

Energy consumption moderation / decrease, as appraised by the TF, have to be replaced in this context, and more generally in the context of the sustainable socio-economic growth in China.

This clearly means that improving energy efficiency in cities in China has two main targets:

- « decoupling » the demand for hydrocarbons from the economic development and the welfare improvement ;
- « Decoupling » the emissions of pollutants and GHGs from the economic development and the welfare improvement.

Insulating a house makes it obviously more energy efficient from an engineering point of view: less energy is consumed for the same comfort. But this technical improvement at the micro-level may be not visible at the macro-level - the whole stock of dwellings - if, at the same time, more houses are built, dwellings are larger, more appliances are used and/or if the comfort is improved.

Energy efficiency is not just a technical matter, it is also a matter of efficient services: making a phone call instead of a physical visit, using public transport instead of a car to go to work, recycling bottles, reducing heat at night, using timber instead of concrete for house construction, all result in a decrease in energy consumption for identical or very similar services. Again, such improvements may exist at the micro-level but may not be directly visible at the macro-level. Assessing energy efficiency also means measuring the overall impact of all the improvements at the micro-level on the evolution of the energy consumption

Of course, assessing energy efficiency from a policy view point does not mean reviewing each particular dwelling or factory; but certainly it means estimating, or measuring, how far all these improvements at the micro-level did contribute to the actual evolution of the energy consumption in the various sectors, and for the whole country. This is the role of energy efficiency indicators, as those developed in Europe (ODYSSEE) or by WEC or IEA.

In order to calculate such indicators, the prerequisite is to have detailed data on energy consumption, per sector and per end-use.

1.2 Urban design/planning and energy consumption moderation

1.2.1 General concept

Moderating / decreasing energy consumption of the Chinese cities in relation to sustainability issues has three major meanings, according to the three main dimensions of sustainability:

- From an economic viewpoint, it means: a) minimizing the energy bill of the Chinese urban citizens for a given standard of living; b) minimizing the energy bill of China, in particular as regard energy imports.
- From an environment viewpoint, it means: a) improving the living conditions in cities (air quality, noise, congestion); b) minimizing the GHG emissions for a given standard of living of the Chinese population.
- From a social point of view, it means: a) favoring appropriate conditions for life styles and aspirations (standard of living) which minimize energy needs for a given income : b) reducing inequalities as regard living standards.

There are two main levels where energy consumption moderation / decrease issues in cities should be tackled:

- The first level is that of the urban citizen, both in his current living conditions (the dwelling) and in his urban mobility: minimizing his energy bill and improving his

living conditions while increasing his living standard. It is both a matter of technology and of behavior and life-style.

- The second level is that of the city as a whole: providing a spatial and functional organization of the city likely to minimize the needs for energy services, and providing these energy services minimizing the requirement to imported energy and minimizing the environmental impact, both at local and global levels.

1.2.2 Energy consumption moderation / decrease in buildings and construction

1.2.2.1 A technical perspective

From a technical perspective, energy consumption in buildings and construction can be moderated / decreased by three means:

- The architectural and technical characteristics of the building itself: insulation, passive solar, exposition to the wind, etc…
- The technical performance of the appliances inside the buildings, in particular in relation to heat and cooling demand
- The supply of solar energy through dedicated panels on the building

Existing buildings offer much less possibilities for improving the technical efficiency than new constructions: no possible modification of architectural components, reduced possibilities for insulation and recourse to solar energy, more constraints for changing the in-door heating/cooling system.

Among existing buildings, possibilities for improving energy efficiency also strongly depend on the age of the building, its size, its location, etc…

1.2.2.2 Behaviors and life styles

Behaviors and life-styles are likely to impact strongly the energy consumption of the buildings, as shown in various surveys.

Two aspects are particularly sensitive from this point of view:

- The perception of comfort : for example, what inside temperature is desired in winter, in summer ;
- The in-door management of the energy requirement: for example, differentiation in inside temperature requirement according to the various parts of the dwelling, according to the time of the day, etc…

Moderating / decreasing energy consumption, from this point of view, is not a matter of frustrating people, but to make them more responsible of their in-door management (maybe with the technical assistance of efficient climate management systems), and to convince them that overheating or overcooling may be just the contrary of comfort.

1.2.3 Energy consumption moderation / decrease in urban transport

1.2.3.1 Technical perspectives

From a technical perspective, moderating / decreasing energy consumption in urban transport has two main dimensions:

- The technical performance of the vehicles used for urban transport
- The use of energy with fewer impacts on energy imports and on environment.

The technical performance of the vehicles is both a matter of engine and power-train efficiency, and of vehicle size and power. Very few things can be done to improve the technical efficiency of existing vehicles, but a lot can be done for the new vehicles as compared to the existing ones.

Biofuels and electricity are the most important options for reducing energy imports and local environment problems created by urban vehicles. But, attention should be brought to how biofuels and electricity are produced, and how they affect global environment.

1.2.3.2 Behaviors and lifestyles

There are three major aspects in this regard:

- For those who purchase a car, the characteristics of the car purchased (size, power, energy,)
- For those who own a car, the decision to use it or not according to the travel type and purpose, and how (load factor, driving attitude…)
- For all, the use of soft modes (walking, bicycle) according to travel distance.

Average characteristics of the car purchased are strongly related to the communication of car manufacturers and vendors for selling cars, and to fiscal dispositions regarding cars.

Modal choices are partly constrained by the availability of transport alternatives (public transport, bicycle lanes…), but also depend on social/cultural habits that can be influenced (bicycle may be perceived either as an old-fashioned mean for poor people or by a new-fashioned mean for modern people). For those who own a car, it also depends partly on the conditions of use of cars (tolls, parking availabilities and fees).

1.2.4 Energy efficient urban design

1.2.4.1 Heat density and heat supply

Among the three dimensions to be investigated as regard efficient heat supply, the third one (trade-off) is strongly dependant on the geography of the city, its population and its average

heat density, since these characteristics impact directly the cost-effectiveness of the district heating systems.

From this viewpoint energy efficient urban design is both a matter of existing size and layout of the city and a matter of its future expansion. Since the existing size and layout are « given », there are two main issues as regard energy efficient urban design:

- The efficiency improvement of the heat supply in existing buildings
- The design of the future expansion of the city so as to minimize the cost of efficient heat supply services.

As regard this second aspect, two main concepts worth while being investigated:

- Creating high heat density areas within high population density areas (concentration of high buildings) in order to minimize the cost of district heating systems per dwelling ;
- In sunny regions with a lot of available space, favoring solar passive highly insulated low buildings.

1.2.4.2 Population density, urban functionalities and mobility supply

Providing energy efficient mobility services raises the question of the allocation of the city space for transportation among competing infrastructures (street for cars versus public transportation lanes versus dedicated lanes for « soft » modes). This is a matter of existing size, geography and layout of the city, and a matter of its future expansion. There are therefore two main issues as regard energy efficient mobility supply:

- The possible reallocation of part of the street network in the existing part of the city for bus lanes, tramways and « soft modes » ;
- The energy efficient urban design of the future expansion of the city

An energy efficient urban design, from the mobility viewpoint, tends first at minimizing the transport demand for daily mobility : it is a matter of appropriate zoning, with provisions of goods and services close to the housing areas, minimizing the distances to go to work, to school, to shopping areas, etc….Second it aims at creating appropriate conditions for to make quality public transportation economically viable, in particular locating high transport demand at quality public transportation nodes, easily accessible by walk and bicycle.

For car owners, the attractiveness of public transportation is mostly a matter of availability and time spent in transportation as compared to using car. This is why public transport on separated dedicated routes, like metro, tramway or bus lanes, proves to be much more attractive than normal buses. These require much more expensive infrastructures and equipment that just buses on normal streets, but they prove to be altogether more cost-effective for the city if the passenger traffic is high enough. This is a matter of population of the city and concentration of traffic flows, which in turn is a matter of population density and functional lay-out.

Part II: Review of situations and trends of energy consumption and energy efficiency in urban areas in China and worldwide

2.1 Introduction: Character of China urbanization

30 years have been passed since China's Reform and Opening. During these years, China's urbanizing is keeping a fast increasing pace. The urbanizing level was 17.92% in 1978, but reached 44.94% in 2007, so the annual increment is more than 0.9%.

If the increase rate is stable, the urbanizing level in China will become 48% in 2010, reached the world average level in about 2030, and synchronize with world's increasing pace during year 2030-2050.

During 1990 to 2005, china's urbanizing level increased from 26% to 43%. The urbanizing level is uneven among different places. On the top are Shanghai, Beijing, and Tianjin, which is above 70%. Next are Guangdong, Zhejiang, Jiangsu and the three provinces in northeast, with levels ranging from 50% to 60%. On the bottom are Guizhou, Yunnan and Xizang, with levels lower than 30%. Other places' urbanizing levels range from 30% to 50%.

As can be seen, most places in China are still in the developing stage of urbanizing.

Accompanied with the fast pace of urbanizing, the per capita building area is increasing. According to the statistical data, the current urban floor area per capita of China is nearly 30 m^2, which exceeds the corresponding index of Hongkong and is close to the average of Japan and Singapore (about 36 m^2), the index of some provinces and cities even exceeds that of Japan and Singapore. But as a whole, the floor area per capita of China is far lower than that of USA and Europe. However, in the recent 15 years, the urban building floor area doubled every 7 years and more than 1 billion m^2 of buildings were constructed every year. If 1 billion m^2 of buildings are built and the urban population increases 15 million every year, the urban floor area per capita of China will reach 42 m^2 and will be close to the European level. The total energy consumption for building operation will certainly increase with the increase of building scale. If the urban building scale increases one time, the building energy consumption will increase one time or even more. Therefore it is necessary to scientifically and reasonably control the urban construction scale and urban building scale, and control the urban building floor area per capita to be less than 35 m^2 and the new buildings constructed every year to be less than 0.7 billion m^2.

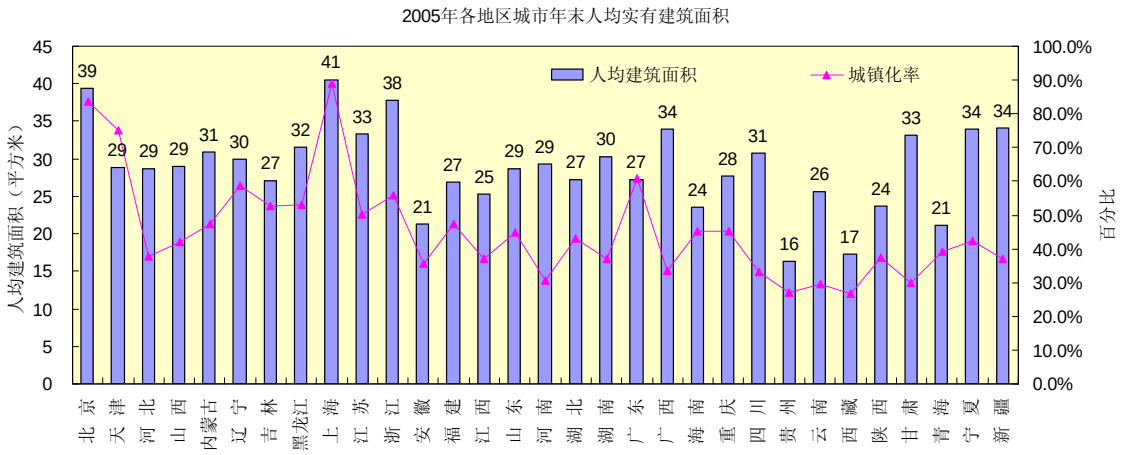

Fig 2-1 Building floor area per capita for each province or typical cities

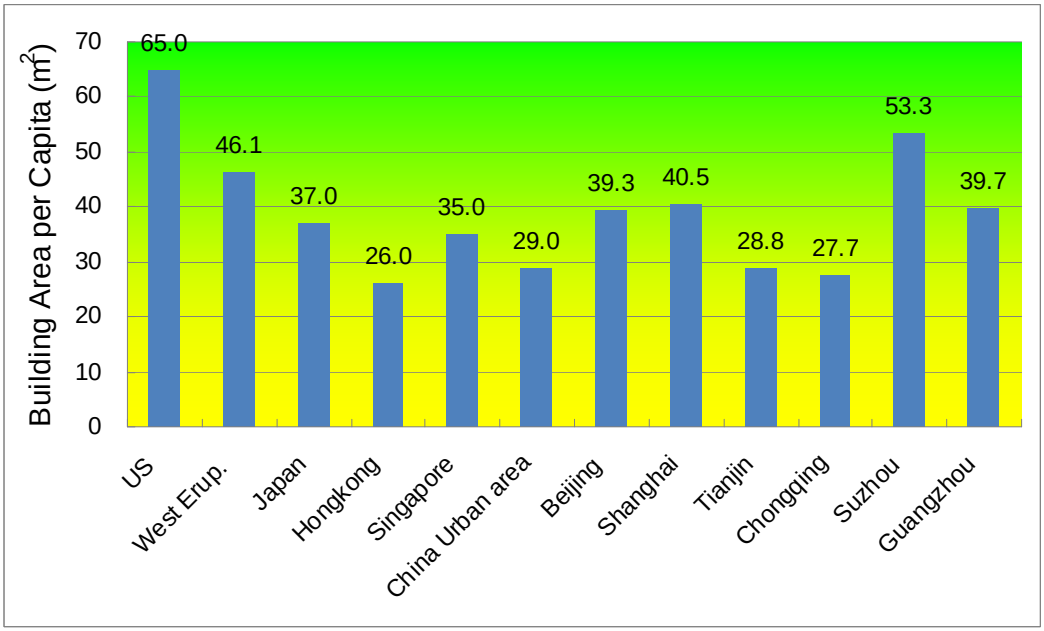

Fig. 2-2 Comparison with developed Countries or areas in the world

The population in cities in China will be increased to 77 million in the next five years, with average growth of more than 15 million. The concentration of large population into the cities will directly increase dramatically the land of residence and various types of public infrastructure. However, the per capita building area we seek will greatly affect the city construction. For example, these are the city construction scope which can be found in three recent versions of “eleventh five-year plan " development program proposal to the year of 2020:

Recently, 2 billion square meter city construction is finished every year. With this speed, 10 billion square meter new construction will be done during the "eleventh five-year plan" program. In 2020, 30 billion square meters building area in cities will be completed and at that time, there will be 45 billion square meter building area, with 54 square meters per capita.

Of the 2 billion square meter's new construction, 1 billion will be in the cities. With this speed, in 2020, 15 billion square meters building area in cities will be completed and at that time, there will be 30 billion square meter building area, with 35 square meters per capita.

New construction area is 0.7-1 billion square meters. With this speed, in 2020, 10 billion square meters building area in cities will be completed and at that time, there will be 25 billion square meter building area, with 30 square meters per capita.

Now the development of city construction is fast gathering momentum, should we indulge and ride with a loose rein, as to reach, even exceed the first prediction above, or bring the development under domination?

As shown from figures 2-2, compared to the data of some advanced countries and districts, building area per capita and domicile area per capita of China's cities are in the forefront. Even if there will be 1.5 million increment of urban people per year resulted from village immigrants, only 500-600 million square meters' new buildings built each year will suffice to keep the building area per capita and domicile area per capita reached the level of advanced countries in Asia; if 1 billion square meters' new building will be built each year, then building area per capita will reached the level of west Europe in 2025. If 2 billion square meters' new building will be built each year, then in 2030, the building area per capita will exceed the level of America. However, we are unable to reach the level of west Europe countries or America because it is beyond the capacity of China's land, resources, energy and environment conditions.

Moreover, not only does the fast urbanizing pace promote the development of building industry, it also boosts the development of building material industry. Many materials used in buildings like steel, cement and glass, are all industrial products that consume large amount of energy. The resources and energy consumed and the pollution emitted during the production process take up a very high proportion in the society.

Take the data of 2005 as an example. The 320 million tones steel production this year consumed 224 million tones standard coal, which took up 11% of the China's merchandise energy consumption. Among the 320 million tones steel, 150 million was used for building, which took up 47% of the production. With the steel used in the railroad, highway, street, bridge and dam added, the steel used for construction took up 70% of the total. In addition to this, the large scale production of plate glass, architectural ceramics, architectural plastics, and architectural non-ferrous metal material, etc., also came with large energy consumption. Tentative estimate shows that these took up 4%-5% of China's merchandise energy consumption. So according to this calculation, the direct or indirect energy consumption in building and transportation construction took up 20% of the China's merchandise energy consumption during year 2005. If the construction scale was decreased to half of that, then the China's merchandise energy consumption can be reduced by 10%.

The overheated city constructions have close relationship with the social consumption idea and culture. In fact, from 2001, China showed the first sign of emphasizing the heavy industry development. Domains like steel, building construction material and real estate showed the high increasing rate which rarely seen during the last 20 years. Gone along with the vigorous market economy are the unremitting improvements of the living standard, and the continuous increment of consumer durable goods like housing, automobile or household appliances. The livelihood consumption pattern in China cities is advancing towards the direction of "high standard", "super lavishing" and so-called “internationalization". As a whole, China's economy is entering the stage of heavy industry development which pulls by the consumption structure upgrading.

It can be found in a study of consumption culture, consumption as an operating symbol of systematization, has became one of the most important factors for self-recognizing. The upper class always shows off their identity and status by lavishing consumption. China’s society is in a special procedure of transition and the social unit (including government officers, entrepreneurs, and ordinary citizens) resulted from the rapid changing of social structure learned from advanced countries without deep understanding. This will lead to dramatically increasing of building energy consumption resulted from the high standard and lavish building and architecture environment (like big glass curtain wall), as well as the American way of building system maintain. In addition, admiring the American car culture even resulted to traffic jams, heavy pollution and fuel bottleneck.

In fact, after experiencing the horrific energy and economic emergency and environment pollution in the last century, the western world deeply meditate the competing and lavishing way of living in the last 50 years, and the brand-new healthy living campaign had launched. Some people in the United States and Europe are voluntary converted to stoic. For example, they prefer clothes drying rope, curtain, and bicycle to cloth drying machine, air-con and car, not only because they are quiet, convenient for operating, fire-free, not noxious to ozone and climate, cheap to buy and easy to repair, but also because they are not that “convenient” to use inasmuch as depending on the prediction of weather, which trains the essential human feeling of space and time.

2.2 Actual Energy consumption of households in urban areas in major countries around the world

2.2.1 Energy consumption status in China and developed countries

Compared to other places in the world, China, as the biggest developing country, is still at a relatively low level of urbanizing, and the energy consumption per capita is not high

However, China is accelerating its urbanizing process, and if no continual measure is taken during the process of high-speed increasing economic growth, it will face rigorous challenge of energy consumption and environmental destruction.

In industrialized countries, the share of building and transport in total energy consumption has been growing steadily with the GDP per capita for the last 4 decades. In OECD as well as in the EU, energy consumption in building and transport is today close to two third of total energy consumption. If we just consider urban areas, the energy consumption in building and transport is almost half of the total consumption of the country. The main drivers of these evolutions have been consumption patterns and urban sprawl, which are closely inter-related. This is clearly a rising challenge for China which must be addressed today.

Tab. 2-1 Energy consumption statuses for Building and Transport Sectors in developed countries (by Enerdata)

	1971	1980	1990	2000	2005
OECD	54%	56%	61%	62%	64%
EU-25	48%	54%	59%	62%	64%

It is worth mentioning that during the 30 years of Reform and Opening, with the development of economy and the improvement of urban function, China's tertiary industry proportion is increasing rapidly, and secondary industry proportion remained almost the same, while primary industry proportion is decreasing. According to the official announcements by the State Statistic Office in April, 2008, the proportion of the primary, secondary, tertiary industry in 2006 is 11.3:48.7:40.0.

In a nutshell, the secondary industry and the tertiary industry in China is the leading industry of cities. What's more, in some parts of the provinces, tertiary industry proportion tends to surpass the secondary industry proportion. For example, tertiary industry in Beijing, Shanghai, Nanjing, and Guangzhou have already become the major part of the industry. According to the international convention, with the economy development and urbanizing, most cities' functions will be changed from manufacture to service, and the tertiary industry will become the most important business activities.

As to the cities with largest tertiary industry, building and transportation will naturally become the most significant composition of the city energy consumption.

The situation in China is quite different, building and transportation industry only takes up 33% of the total, which is as the same level of the EU in 1960s. However, since 1990s, the energy consumption of transportation and service is increasing by 8% per year. At the same time, the total energy consumption only increases 3.4% annually. During 2003 to 2005, the direct livelihood energy consumption increased 13.1%, 7.3%, and 9.9% compared to the last

year. The total direct livelihood energy consumption in China is 530 million standard coals in 2005, which took up 24% of the total, and the number increased by 10% in 2006.

The transportation and building energy consumption took up more than 50% of the total part the advance cities, which is as the same standard of EU in 1980s.

For example, after statistically counting the tertiary industry (building and transportation) energy consumption we can find that, the tertiary industry proportion amounts for 70% in Beijing and the high number come with the highest energy proportion of 50%.

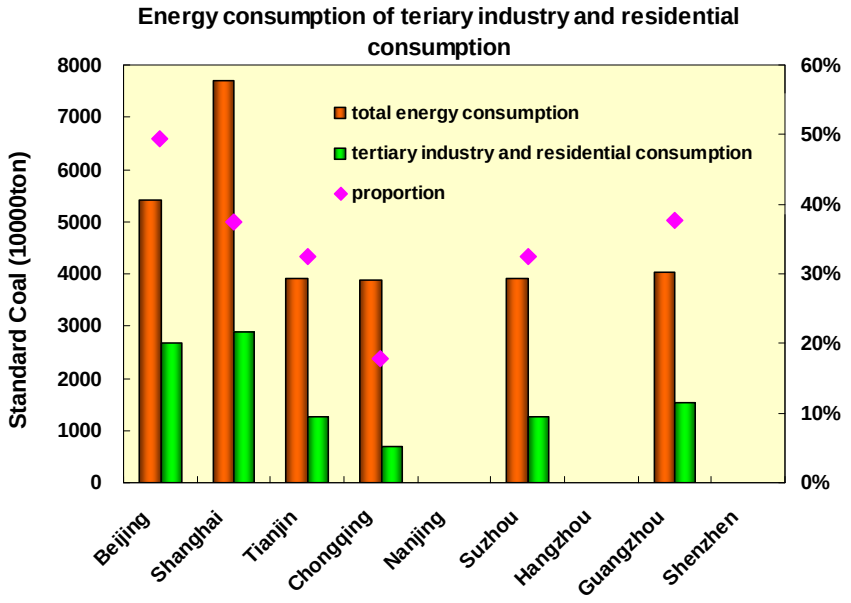

Fig 2-3 Energy Consumption for Building and Transport Sectors in Typical cities of China

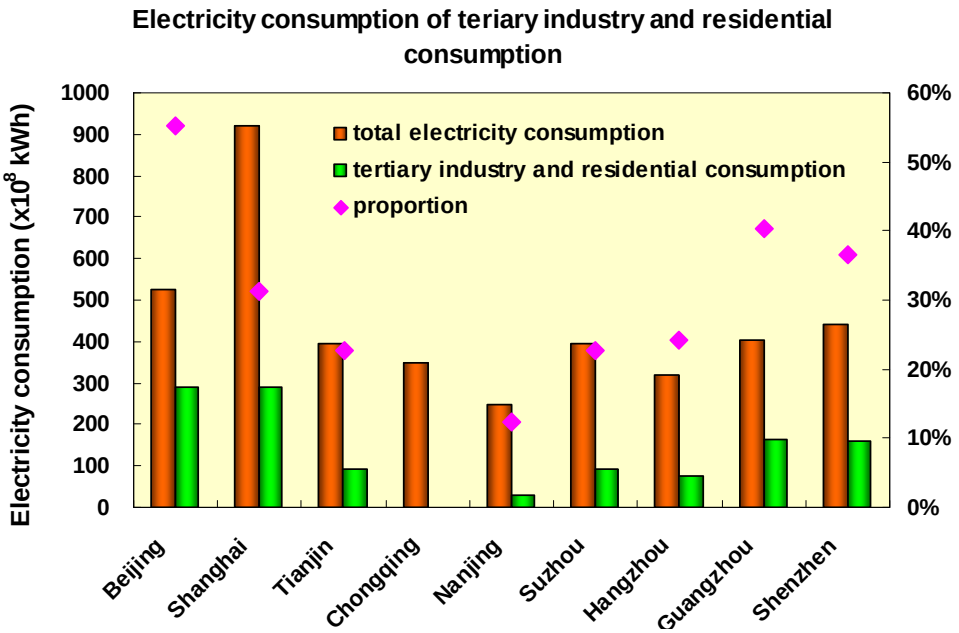

Fig 2-4 Electricity Consumption for Building and Transport Sectors in Typical cities of China

The tertiary occupation energy proportion is less than 20% in Chongqing, which is relatively low. In Shanghai, Tianjin, Suzhou and Guangzhou, the building energy consumption ranges from 30%-40%. As to the building related electrical power consumption, Beijing (55%) also shares the highest. Guangzhou and Shenzhen range from 30%-40%. In Shanghai, Tianjin, Suzhou and Guangzhou, it ranges from 20%-30%. Nanjing's is lower than 20%. See figures 2-3, 2-4.

2.2.2 Urbanization and energy consumption: comparison among countries

Research in urbanism finds that large cities provide very positive side effects on economy. Large cities can produced more specialized goods and services to the local market, can accumulate more financial service provision and an educated labour force, as well as often concentring administrative functions.

More generally, it might be possible that smart urbanism has an impact on the competitiveness of a country. For instance, urbanism can be determinant to have high-quality system of transport, and we know that mobility of goods and people is an important condition to economic development. Moreover, oil procurements are a source of impoverishment for many countries, while oil is mostly imported. Because of its impact on energy demand, urbanism is then, once again, linked to competitiveness.

For similar GDP/capita, size, density and urban pattern seem to be the key determinants of energy consumption.

Density of urban areas across the world

In the world, Asian countries have the more dense cities as it is shown in the graph below. Mumbai and Kolkata in India (not in the graph) appear to the more dense cities in the world: near 30.000 habitants per square kilometres. Karachi in Pakistan, Lagos in Nigeria, Shenzhen in China, and Seoul in South Korea are also very dense cities. On the opposite, American cities are less dense.

This comparison is however difficult because borders of cities may differ. American and European cities are pretty large, while some cities in Asia are more narrowed. For instance, the density of Paris stood at 3500 inhabitants/km^2 in the database, while in the core Paris; it is 20.000 inhabitants/km^2.

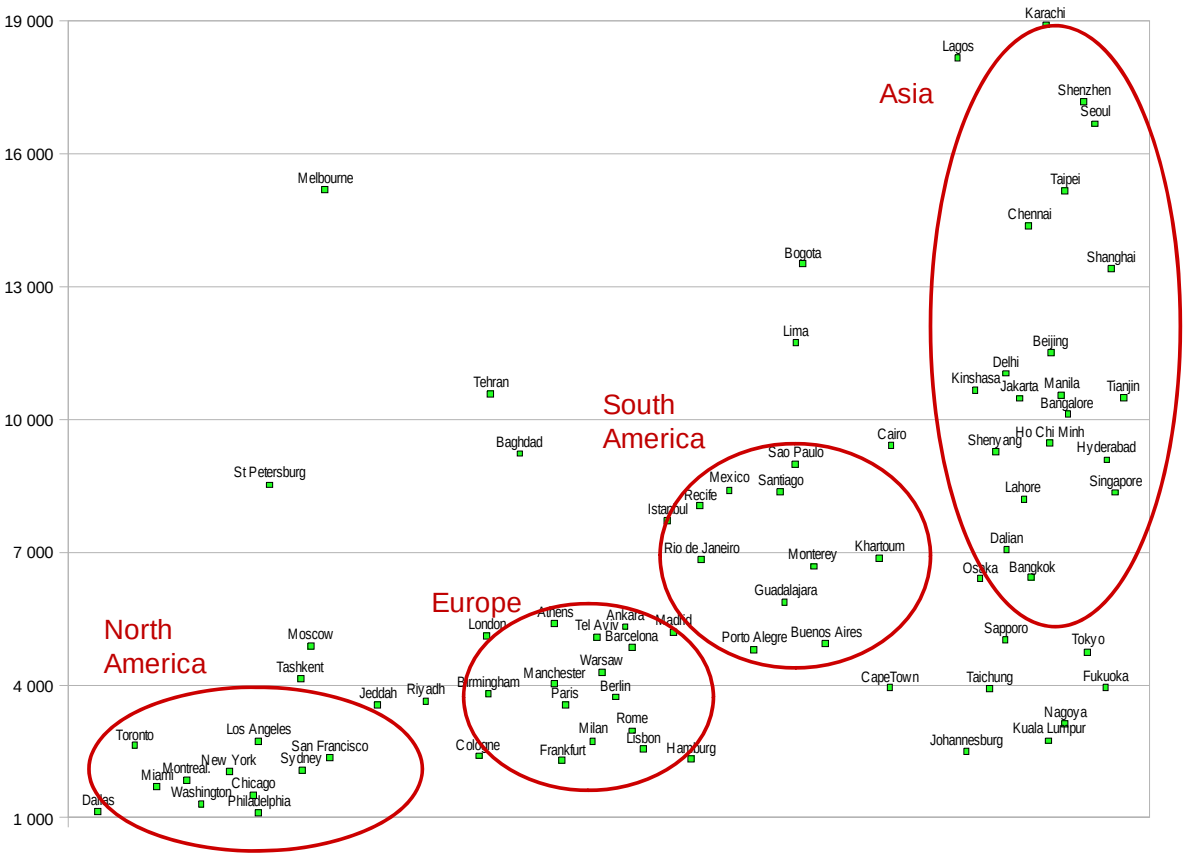

Fig.2-5 Different density for international countries or areas (Source: Enerdata)

The average density per continents has been calculated on the basis of the mains cities in each country. The database compiled more than 250 cities spread all over the world. The results show the following figures:

Tal. 2-2 Average density in main cities

Asia	8200	inhab / km^2
Europe	3200	inhab / km^2
Africa	5300	inhab / km^2
Pacific	2000	inhab / km^2
Middle East	4300	inhab / km^2
Russia and Central Asia	5000	inhab / km^2
North America	1300	inhab / km^2
South and central America	5900	inhab / km^2

Source: Enerdata

European cities were denser in the past than they are now. For the last decades, cities have grown more horizontally than vertically in Europe and US. Thus, core cities have lost population, while suburban areas have grown significantly. Paris illustrate this evolution, the core Paris counted 3 million inhabitants in the beginning of 1900's, without any suburb. Nowadays, the core Paris counts 2 millions inhabitants and the suburb around 8 millions.

The term “urban sprawl” describe this evolution towards very spread out cities. People tend to live outside the city, nearby, they are then becoming commuters. Urban sprawl has few characteristics that are reminded below:

- **It is an often a single-use zoning:** commercial, residential, and industrial areas are separated from one another. As a result, the places where people live, work, shop, and recreate are far from one another, usually to the extent that walking is not practical. Therefore, many of these areas have few or no sidewalks.
- **It is a low-density land use:** sprawl consumes much more land than traditional urban developments because new developments are of low density. The exact definition of "low density" is arguable, but a common example is that of single family homes, as opposed to apartments.
- **It is based on car-dependent communities:** areas of urban sprawl are also characterized as highly dependent on automobiles for transportation, a condition known as automobile dependency. Most activities, such as shopping and commuting to work, require the use of a car as a result of both the area's isolation from the city and the isolation the area's residential zones have from its industrial and commercial zones.

Evidences of the link between density and energy consumption in transport

We have collected figures revealing that public transportation is more developed when cities are dense. The graph below shows the market share of public transport (train, tube, bus...) and density in main cities. In Asia, public transport is relatively high; it is precisely where cities are dense:

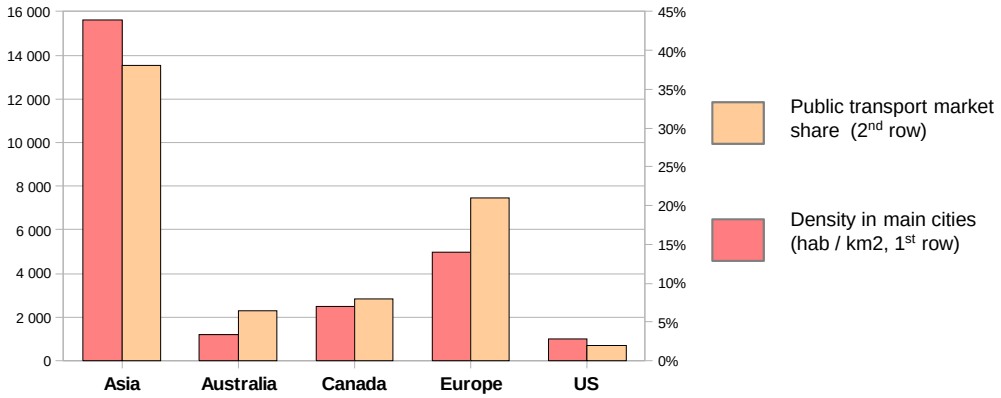

Fig. 2-6 Comparison about the density and public transport

The two maps below deliver the same conclusion. We have collected data of density on one hand, and data of percentage of people using their car to go to work on the other hand. The French national statistical system allows us to gather those figures with high accuracy in terms of geography (Paris and his suburb is divided in more than 400 hundreds sub-element).

We can notice that where density is high, people tend to use other mean of transportation rather than car, and on the contrary, where it is low, the car use become predominant. Thus, in the core Paris and the neighbourhood just aside, density is around 20,000 people per km^2 and

approximately 25% of commuters use their car to go to work. On the contrary, in the distant suburb, density is around 500 people per km^2 and 70% of commuters use their car.

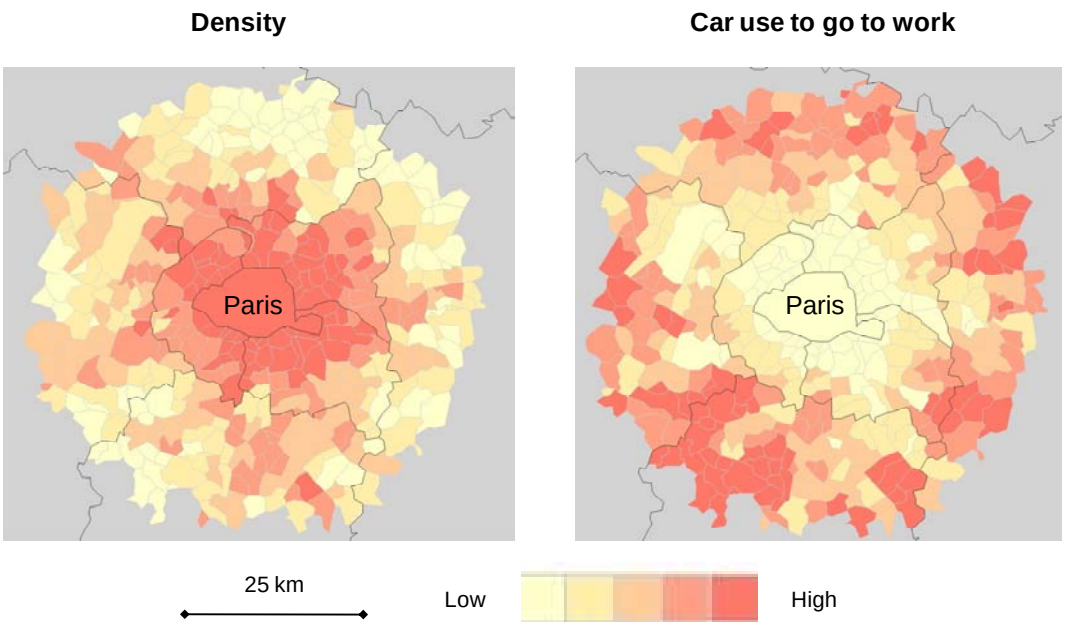

Fig.2-7 Changes of Car use in Paris

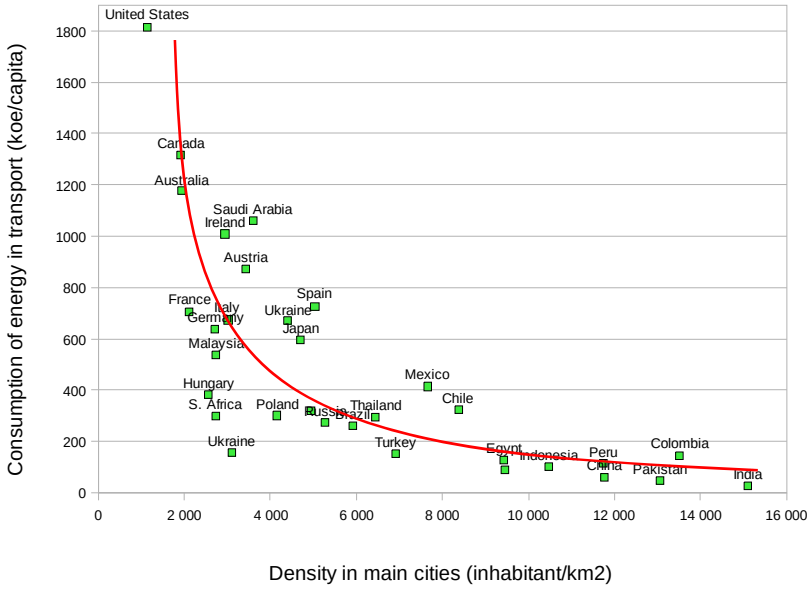

Fig.2-8 Density in main cities

The same idea can be stressed by other indicators. The following graph emphasizes the link between density (axe X) and consumption of energy in transport (axe Y). It appears that, in a country, energy consumption for transport need is high when density is low. For instance, an average American consume 1, 8 toe in transport per year. It is more than twice less in Europe, while the standard of living is quiet similar. This difference is due to urban planning specificity in each continent, European population is more located in cities, and those are denser than in America.

The comparison between USA and Japan is very emblematic of how urbanism can impact energy consumption for transport. In Japan, cities are very dense and the urban sprawl described before has not occurred, or almost not. In USA, the culture is very different. Urban sprawl is part of the national spirit, Los Angeles being often quoted as the paradigm of urban sprawl.

Tab.2-3 Figures at national level for both countries illustrate this difference:

	USA	*Japan*
GDP per capita	43 000 $	37 000 $
Average density	31 inhab. / km^2	350 inhab. / km^2
Number of cars per household	2.4 cars	1.2 car
Consumption of road transport per capita and year	1 820 koe	600 koe

Source: Enerdata

Evidences of the link between density and energy consumption in households

Is density has also an impact for energy consumption in dwellings? While insulation of buildings is better in collective dwellings than in individual dwelling, the answer might be positive as well. A French study has estimated the average consumption of collective dwelling for space heating at 125 KWh/m^2 per year. For individual dwelling, the energy needed has been estimated at 174 KWh/m^2 per year, it is 40% higher.

As a result of that, we can expect that low density zone, which are characterized with much more individual dwellings, might generate more energy consumption.

Energy used for transport and space heating in relation to urbanization: Paris example

Analysis done before outlines the importance of urbanism in energy consumption for space heating and transport. It might be interesting to estimate the energy consumption for those needs, in both cases: a city characterised with low density, and on the contrary a city highly dense.

Paris urban area, our example, is spitted in three parts: the core Paris, the 1^{st} ring suburb and the distant suburb (<=30 km).

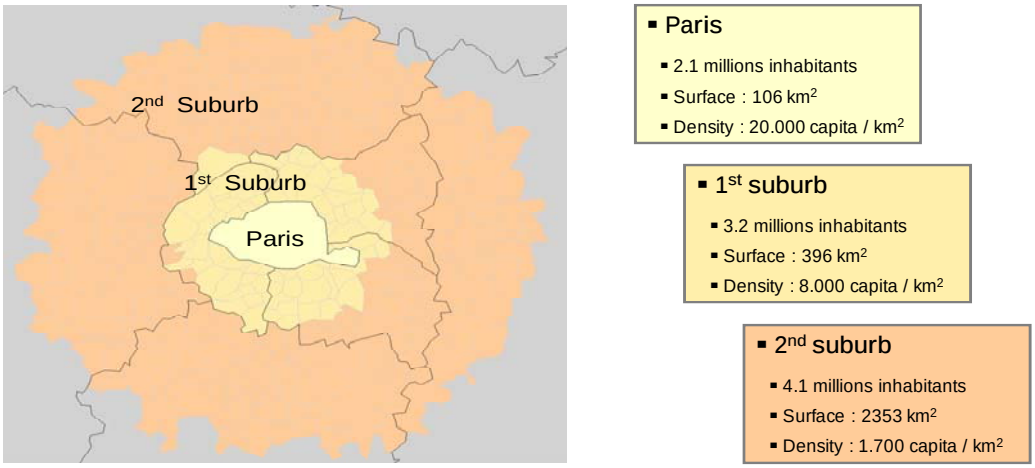

Fig.2-9 Changes in Paris about the suburb area and inner city

We see in the table below that energy consumption per capita for space heating and commuting is 80% higher in the 2nd suburb than in Paris. Indeed, our estimation shows that energy per capita in core Paris is 0.43 tep per year, while it is 0.73 tep per year in the distant suburb.

Tab.2-4 Changes about the city and space heating

Energy used in toe per year	*Paris (2.1 M inhab.)*	*1st suburb (3.2 M inhab.)*	*2nd suburb (4.1 M inhab.)*
Work commuting	120 000	280 000	470 000
Space heating	800 000	1 500 000	2 500 000
Total	**920 000**	**1 780 000**	**2 970 000**
Total per capita	**0,43**	**0,57**	**0,73**

2.3 Energy Consumption in Building Sector in China

Energy consumption in relation to building includes embodied energy (referring to energy used for building material production, building material transportation, housing construction and maintenance) and operating energy (for building operation during its life time). The fast urbanization of China accelerates the rise of building material industry and construction industry, and the subsequent energy consumption has occupied 20% of total commercial energy consumption of China. However, as this part of embodied energy consumption is generally discussed in chapter 1, it will be focusing on the operating energy consumption in this chapter. The rest and most part of operating energy, in detail, include energy consumed for lighting, heating, cooling and electrical appliances and so on during the whole life time of buildings.

2,3.1 Overall building energy consumption

In 2004, the total building area of China is 38.9 billion m^2, and consumed about 0.51 billion tons coal equivalent of commercial energy, which accounts 25.5% of social total energy consumption, as shown in Table 2-5. Energy consumptions in sectoral detail are listed as following:

Table 2-5 China building energy consumption, 2004

	Area	Elec.	Coal	LPG	NG	Coal gas	biomass	Total commodity
	billion m^2	TWh	Mtce	Mtce	Mtce	Mtce	Mtce	Mtce
rural	24	83	153.3	9.6	-	-	266	192
Urban res. (excl. heating)	9.6	150	4.6	12.1	5.5	2.9	-	78.2
residential heating along Yangzi River	4	21	-	-	-	-	-	7.4
North China urban heating	6.4	-	127.4	-	-	-	-	127.4
Ordinary commercial	4.9	202	17.4	-	5.9	-	-	94.7
Large scale commercial	0.4	50		-		-	-	17.6
Total	38.9	506	302.7	21.7	11.4	2.9	266	517.3

***Note**: Fuel and heat consumptions are converted to standard coal equivalent according to their gross calorific values. And when calculating the total energy consumptions, the electric power is converted to standard coal equivalent according to the conversion coefficient subject to the mean plant coal consumption in thermal power plants in China of the year 2004, i.e. 1 kWh electrical power is equivalent to 354 g coal equivalent*
Data source: 1) rural data: sustainable energy source development financial and economic policies research reference documents, data of 2005, Wang Qingyi, Oct. 2005; 2) other data: China Statistic Yearbook 2005.

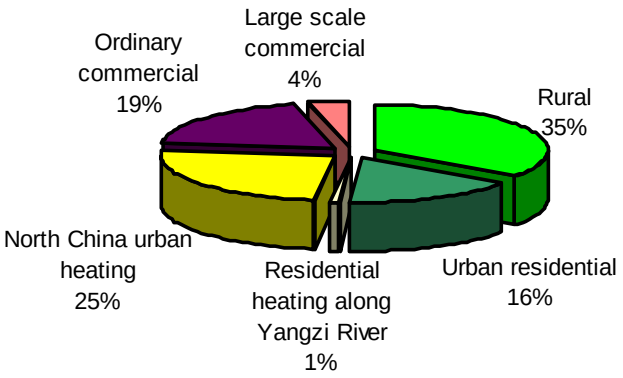

Fig. 2-10: Sectoral energy consumption of China, 2004

2.3.2 Lower energy consumption in China than in developed countries

As shown in Fig. 2-7, although having already reached 510 Mtce, yet China building energy consumptions are far lower than that of developed countries. Even compared with European countries, where there are fairly good policies on building energy efficiency, China's unit area consumptions are only 1/5 of Europe, the per capita value only 1/7 of European level. Even the energy consumption of the less developed rural areas is excluded; there are still folds of gap between China and developed countries. Although the energy statistical methods and

systems of each country are different, yet all the data are match with each other in their quantities and developing trends. Thus, according to the energy consumption data comparison between China and major developed countries, it can be reasonably concluded that unit area building energy consumption of China is currently only 1/2- 1/3 of the developed countries' level.

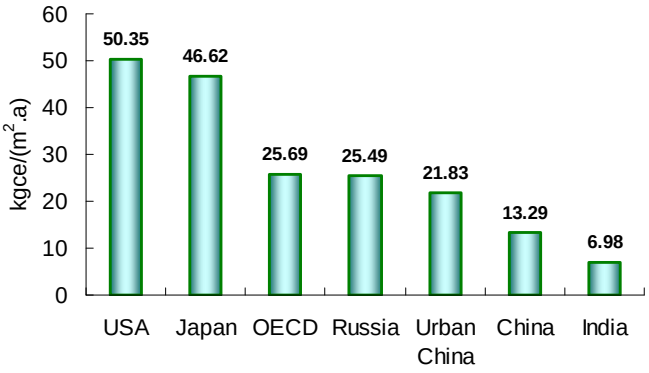

Fig. 2-11: Per unit area building energy consumption, 2004

What is more, in fact, the China heating consumption is not double, as known currently world wide, of developed countries with similar climate. Table 2-2 shows the investigated heat demand of buildings in over 100 residential quarters in Beijing when the room temperature is maintained 18℃. The data is sourced from the real consumption in the year 2006 and amended according to the outer temperature (the correction coefficient is above 1 concerning that the winter of 2006 is fairly warmer than usual, and the outer temperature is higher than design climate parameters of Beijing). And, further, the highest values and the lowest values respectively occupying 10% of the statistical samples are excluded. Table 2-3 shows the heating consumption of some European countries. Concerning the climatic differences, amended consumption data are also provided in the table. According to comparison of Table 2-5 and 2-6, the conclusion that there are no great differences of heat demand between Beijing and European countries could be drawn.

Table 2-5 Heating demand in Beijing buildings (room temperature18℃)

Building category	Heating demand scope kWh/m^2. year
Common residential building	50～100
Common office building	30～90
Hotel	40～90
emporium	10～120
school	30～100

Table 2-6 heating consumption in surveyed some countries

Year	Building type	Country	Heating degree days	Heating consumption (kWh/m^2 year)	Heating consumption after climatic correction (kWh/m^2 year)
2004	Residential	Beijing	2450	83	83
1998	Residential 1	Poland	4043	124	75
2004	Residential	Germany	3126	185	145
1998	Residential 2	Germany	3430	57	41
2004	Residential	France	2747	150	134
1998	Residential 3	Finland	5303	55	25
1998	Residential 11	Sweden	3230	20	15
2004	Residential	Greece	1565	120	188
2004	Office	Germany	3126	120	94
2004	Office	France	2747	166	148
2004	Office	Holland	2784	310	273
2004	Office	Greece	1565	100	157
2004	Hotel	Germany	3126	225	176
2004	Hotel	France	2747	179	160
2004	School	Germany	3126	160	125
2004	School	France	2747	118	105
2004	School	Holland	2784	145	128
2004	School	Greece	1565	55	86

Note:

(1) Energy consumption data source:
(a) 1998 data are from the survey on a batch of energy efficient buildings: INDICATORS OF ENERGY EFFICIENCY IN COLD-CLIMATE BUILDINGS, Results from a BCS Expert Working Group, http://eetd.lbl.gov/EA/Buildings/ALAN/indicators99/index.html.
(b) 2004 data is the statistical data from: Beijing--Report on Beijing residential building heating test in 2005-2006 by Tsinghua University; other countries--Applying the EPBD to improve the Energy Performance Requirements to Existing Buildings- ENPER-EXIST, Intelligent Energy of EPBD, 2007.
(2) Climate data source: Beijing data is sourced from "civil building energy saving design standard JGJ26-95", based on 18 °C; USA data is from "monthly state, regional, and national heating degree days weighed by population, National Climate Data Centre", USA, 2006, based on 65 Fahrenheit; Japan data is sourced from "Handbook of Energy and Economic Statistics of Japan", energy conservation centre, 2006, based on 14 °C; Other European countries are sourced from 2007 Earth Satellite Corporation (www.earthsat.com), based on 18.3 °C.
(3) Correction methodology:
Amended energy consumption of region A=heating consumption of region A /heating degree days of region A × heating degree days of Beijing.

Among the reasons that explain these discrepancies, despite of far better insulations in European buildings: building shape coefficient, ventilation and infiltration, and maintained room temperature. European residential buildings are mostly detached houses, and their shape coefficient is approximately 2 folds of high-rise apartments in China (12 floors), and shape coefficient of most office buildings in Europe is over 1.5 folds of that in China. In addition, in recent years, indoor air quality of European buildings is strictly controlled by common application of mechanical ventilation, and the exhaust volume is mostly over 1 times per hour. Besides, the set temperature in European residences varies from 21 °C to 24°C, which shall consume approximately 15% more energy than that of 18°C.

And another important reason could be the CHP sourced district heating system in North China, which makes full use of exhaust heat of coal-fired CHP to maintain total energy efficiency as high as in developed countries. Primary energy consumption of optimized CHP for heat production is only 70%~85% of water source heat pumps which are regarded as the most energy efficient currently. Consequently, although the envelope in China is worse insulated, yet the overall heating consumption appears lower, compared with developed countries.

2.3.3 Great individual differences in domestic buildings in China

It could be obviously concluded that, China consumes much less energy than developed countries in buildings, compared either in unit area or in per capita building energy consumption. However, great discrepancies of individual building energy consumption occur, even the buildings serve the same function in the same geographical region of China. Fig. 2-12 shows the surveyed annual electricity consumption of some residential buildings in Beijing, Shanghai and Chongqing, including all household electric end-uses such as AC, lighting, and household electric appliances, etc. 3~5 folds of individual differences would be easily found.

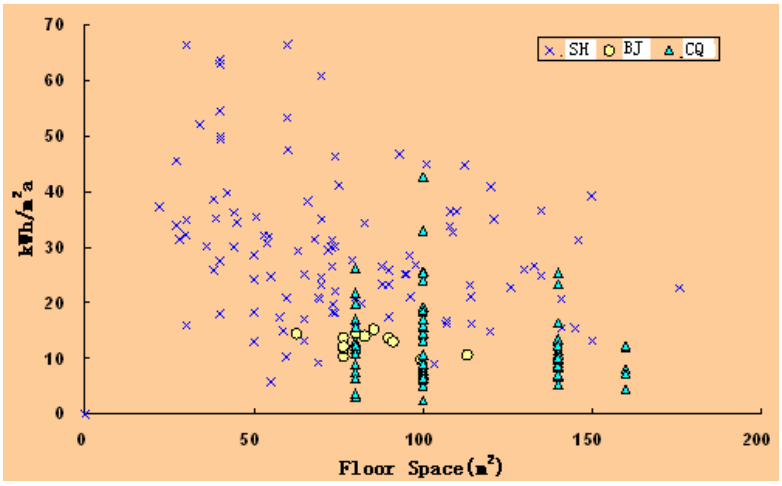

Fig. 2-12: Surveyed residential electricity consumption (Beijing, Shanghai and Chongqing)

Fig.2-13 offers the whole year AC electricity consumption of medium income families in a Beijing residential building, with application of split AC respectively measured in 2007. Household electricity consumptions differ greatly from flat to flat, although all the dwelling families share the same envelope insulations, earn approximately the same lives and use the same cooling device – split air conditioner. Further analysis suggests that the over ten times differences in Fig. 2-13 are not greatly concerned with the incomes of each family but with the ages of householder. The older person will have lower AC energy consumptions.

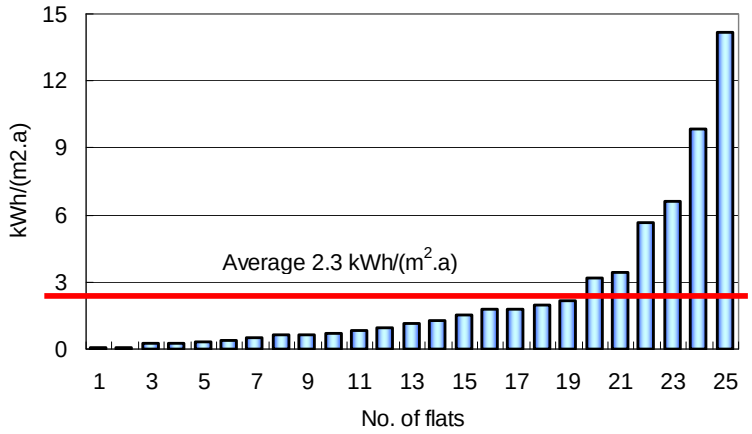

Fig. 2-13: Electricity consumption of split ACs in a Beijing residential building

2.3.4 Differences in commercial sector are also majorly determined by energy consuming modes

Impacts of energy consuming modes on residential energy consumption are as discussed in above paragraphs. And generally, the same conclusion could be well drawn in commercial sector. Folds of differences on energy consumption in commercial buildings can be, in major, attributing to how people use buildings rather than what technical solutions are equipped in buildings.

Fig. 2-14 is the comparison on annual electricity consumption of some office buildings in two famous campuses of Beijing (China) and Philadelphia (US). An office building, with its electricity consumption near to the average level of the whole campus, is selected for in-depth analysis on the energy consumptions of Philadelphia campus building. This building was built in 2002 with very good insulation and Variable Air Volume (VAV) Systems for air conditioning. The main differences are caused by lighting and appliances, cooling, and ventilation fans in a centralized AC system.

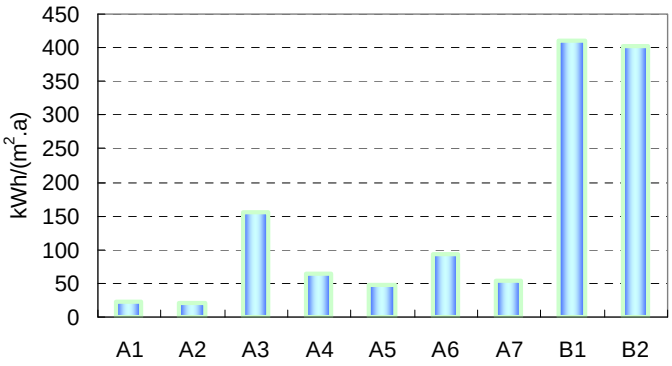

Fig. 2-14: Annual electricity consumption of campus office buildings in Philadelphia (B) and Beijing (A)

Fig. 2-15 illustrates the cooling consumptions of several Beijing government office buildings applying centralized AC systems. Individual floor area of these buildings is similar to this case, but there is an over 1 times gap of cooling consumptions among them. The reasons are ranked in descending order of their influences as: total operation time, fan electricity consumptions, mechanical ventilation volume of outdoor fresh air, and indoor temperature and humidity. Differences of these factors would result in different levels of indoor thermal comfort, such as satisfaction rate of all air conditioned rooms, satisfaction hours in the whole cooling period, and satisfaction rate of all occupants.

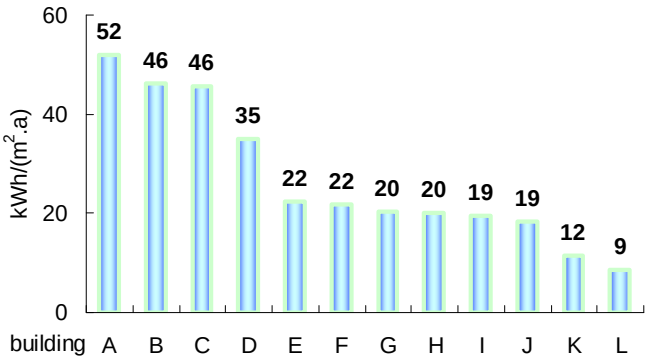

Fig. 2-15: AC electricity consumptions of some government office buildings, Beijing

2.3.5 Impacts of different routines for indoor environment maintenance on building energy consumption

Generalizing above discussions, there are now two different routines for good indoor environment: 1) mechanical one, which consumes great amount of energy, and 2) natural one, which is mainly in virtue of natural means, with complementation of mechanical solutions.

Mechanical routine: The "Most Comfort" indoor environment is maintained by artificial mechanical ventilation, cooling and heating, so that the indoor physical status is rigidly controlled. More, the industrial revolution with developing scientific technologies enables greatly the human being to maintain good indoor environment. The concept of "human will overwhelm natural forces" had gradually prevailed, which is un-appraisable consequence of unreasonable expansion of the energy conception in industrial sector to building sector. Various environmental parameters such as temperature, humidity, air flow and indoor luminance are rigidly implemented and maintained by mechanical AC, ventilation and lighting and so on, so as to provide the optimal services for residents. However, it ignores the adaptability and regulation capacity of the human body, and their positive regulation upon the environment. Then two consequences emerge: 1) enormous amount of energy is consumed; if all people follow this living mode, it shall consume 130% of the produced energy in the present whole world; 2) the residents are not very satisfied for lacking free choices of individual control upon indoor environment, which is actually not coherent with human beings' requirements after millions of years' evolution, especially requirements for physical health. The energy consumptions can be reduced in a certain degree through various technical

breakthroughs, yet it is almost an infeasible dream to lower the proportion to 30%-40% from the 130% at present merely by technical solutions. Indeed, endowing the residents with abilities of regulation upon preferred environment conditions may be more psychologically appropriate, and shall be fulfilled by technical innovations. Yet completely relying on mechanical approach to maintain such environment may further increase the demands of energy resources.

Natural routine: in natural mode, various passive means and self regulations of the residents, such as opening window for ventilation and sunshade and so on, should be used for appropriate indoor environment. Also should it be coordinated with, and adapted to the natural environment through the self regulation and adaptability of the human body. If these means finally cannot meet environment requirements, it shall be complemented by mechanical (or manual) means, such as heating. The mechanical dominating mode usually assures an invariable indoor status with constant environmental parameters, while the nature dominating mode aims at being harmonious with the variable natural environment. In fact, in the days before modern society, this mode was widely used, which has supported the breeding and civilization development of the human being. The residential environment under this mode does not consume too much natural resources, and has no overflow destruction upon the global environment, and would be regarded as sustainable.

To sum up, it is the choice between these two routines that causes, in major, times and even ten times differences of building energy consumption.

2.4 Current Status of China Urban Transport and Energy Consumption

Rapid urbanization and motorization, especially the rapid growth of private cars, has brought great challenge to urban transport system. Figure 2-16 shows the growth of vehicle ownership in recent years. From the early 1990s to today, China has maintained a high annual growth rate of 13% in vehicle ownership. By the end of 2006, the total number of registered vehicles was close to 37 millions; furthermore, of the vehicles registered, ownership of private vehicles experienced an annual growth rate of 23%, far higher than that of total vehicle ownership. In Figure 3-1, the civil vehicle fleet includes the passenger vehicles and truck which provide commercial transport service, vehicles belonging to commercial enterprises and government institutions, and private vehicles. They don’t include the vehicles for special purpose, such as fire trucks, municipal sanitation, and military fleets. Furthermore, the private vehicle fleet includes the vehicles belonging to private individuals.

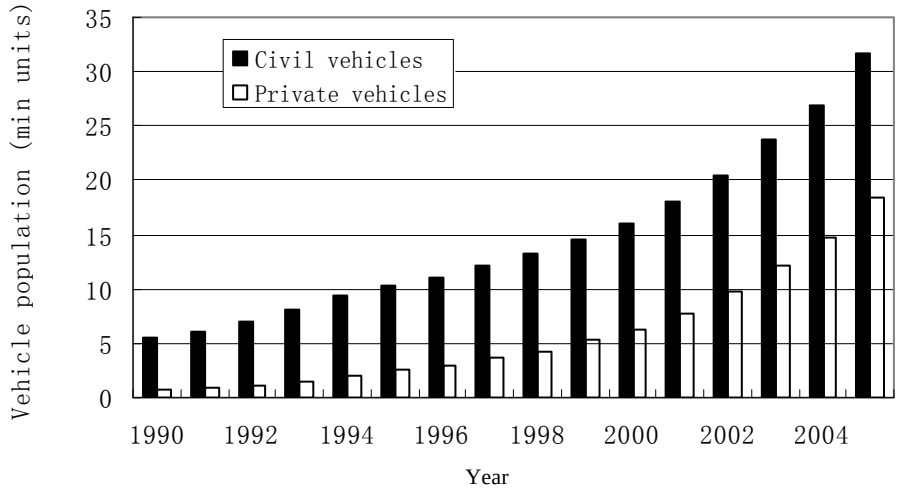

Figure 2-16 Growth of Registered Motor Vehicles in China

Motorization will continue rapidly in the next 10-20 years, yet the vehicle ownership in China is much lower compared with that in other developed countries. International experience shows that there will be a vehicle purchase peak in a country when its per capita GDP reaches 3,000-4,000 USD, which China will attain in 20 years. Thus vehicle ownership, as an important indicator for standard of living, will continue to rise.

2.4.1 Overview of China Transport Development

The urban transport development was catalyzed by its own conflicts along with evolvement. The urban transport development process can be viewed as following four main phases due to different implicating conflicts in the case of China cities.

（1） Initial Phase

Before the industrialization and motorization, urban population increased slowly, and people traveled by foot, animal or bicycle, etc. Most available transport modes were at a low speed, besides the travel distance was generally short. The conflict of transport was no evident in this phase. The travel time and distance are tolerable by most people.

（2） Startup Phase

Along with the development of urban economies, GDP and public living quality, the urbanization and motorization began taking place. In this phase, the major conflict was between the rapid increase of motorized transport’s demand and relatively limited road resources. Therefore, the motor focus transport development plan is in a great need. Many cities started constructions for new broader vehicle lanes, express ways, separation bridges, and so on. The development of those infrastructures further accelerated the motorization process in cities. Congestions became worse. Lessons showed that the free development of small cars was not beneficial.

（3） Rapid Development Phase

In order to accommodate the rapid motorization and the healthy development of urban transport, China cities began to implement series of policies and measures for the Smooth Project, and bring attention to public transport's priority. Ministry and other national government constituted relative regulations, and also raised a goal of establishing a public transport focused system by 2010. During the phase, the conflict between public and private transport became more evident, besides the supply-demand conflict. In that motorization process developed dramatically, and brought significant impact to the urban living condition, many cities added special items in to their urban transport management frame to restrict the over development of small cars, and to promote prior development of public transport. Those measures adopted brought important positive affects to urban transport issues, but faces many challenges by far. More effort should be enhanced to strategic planning and land using to meet development objectives eventually.

（4） Maturation Phase

After the conflict between urban transport demand and supply, between private and public transport is alleviated, some new issues may take places, such as transport systems' service level and the variety of resident travels. Therefore, a fast, safe, various, efficient and highly accessible transport system should be provided. Social and economic resources are in need of optimal utilization to satisfy people's update transport demand, whether motorized or non motorized, and private or public transport is adopted.

2.4.2 Demand of Resident Travel Keeps Increasing

Rapid urbanization and the improvement of citizens' standard of living will lead to increasing travel distances and time. Such situations may stimulate the use of motor vehicles and travels by other motorized modes. The experience of developed countries indicates that there is a growing trend of trips for leisure purposes; with the improvement of standard of living, average daily trips by urban citizens will be gradually rising, therefore travel distance and reliance on vehicles will rise as well. It is estimated that, on the basis of the macro-economic development scenarios, passenger trips in Chinese urban areas will be 951.7 billion person trips by 2020, including 255.7 billion person trips by public transport and automobiles, with an expected annual growth rate of 9% from 1998 to 2020 (Figure 2-17).

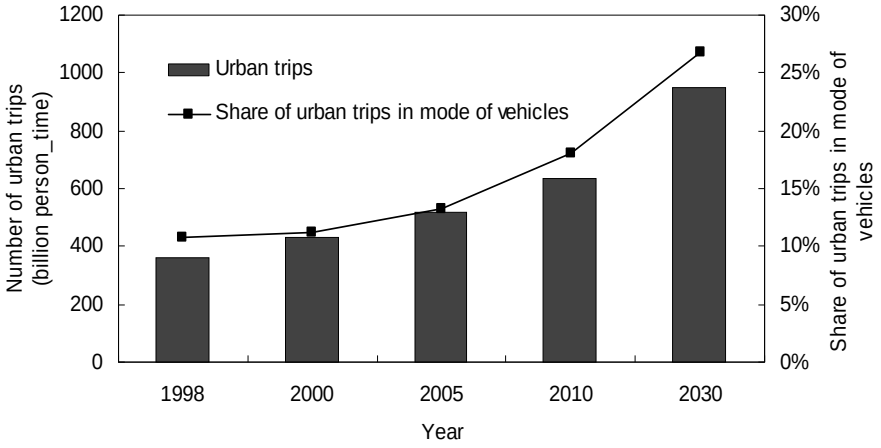

Figure 2-17 Future Personal Trips in China

2.4.3 Urban Passenger Transport Volume Increases Rapidly

The urban public transport volume including bus, metro and rails kept increasing since 1980, because the demand of resident travel rose, with 48,369.30 million people in 2005 increased 1.6 times of 1980. Especially in latest 10 years, it increases 7.4% per year, which is close to the rate of GDP increase (Figure 2-18). The urban passenger transport is a major petroleum consumer in China, while it consumes a relative less ration of diesel. The petroleum consumption of Beijing was 1.06 million tons in 2000, and increased 122% to 2.35 million tons in 2005. Shanghai consumed 1.33 million tons of petroleum in 2000, and 2.42 tons in 2005. Above 90% of petroleum was used for transport. Most of that was used for urban passenger transport, and small portions were taken by inter-city passenger transport and freight transport. As the study of China National Development and Reform Commission, Beijing's petroleum consumption was 0.9 million tons in 2000, and 2.1 million tons in 2005 respectively. Correspondingly, figures of Shanghai are 1.06 and 2 million tons. Small cars took 80% of the total petroleum consumption.

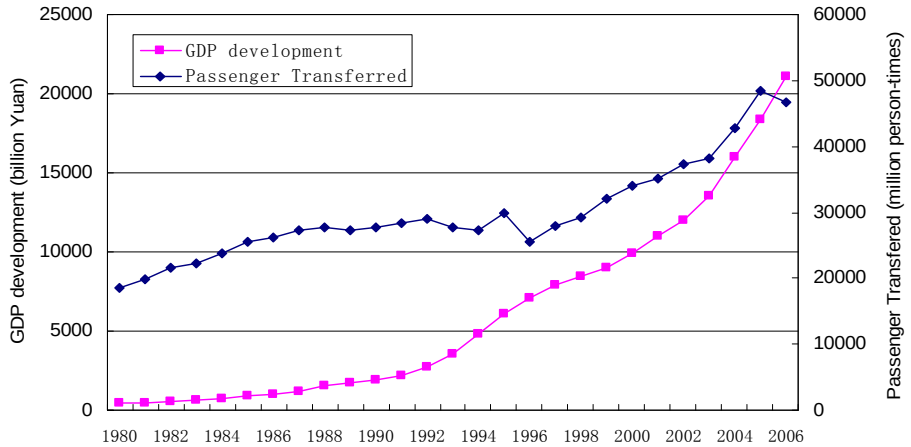

Figure 2-18 Passenger volume of public transport in China

2.4.4 China Transport Energy Consumption Increases Most Comparing with Other Sectors

The transport sector is significantly relied on recourses. The energy consumption for transport increases dramatically along with China's economic development. It becomes one of the most rapidly increasing industries in terms of energy consumption. Data reveals that the transport industry consumed 7.55% of total energy used by the nation. For oil related products, transport takes 31.45%. Two figures increased 10.75% and 12.16% respectively since 2000 (Figure 2-19). There is still evident gap between China and developed countries, regarding to unit energy consumption, utilization rate, equipment efficiency of the transport industry.

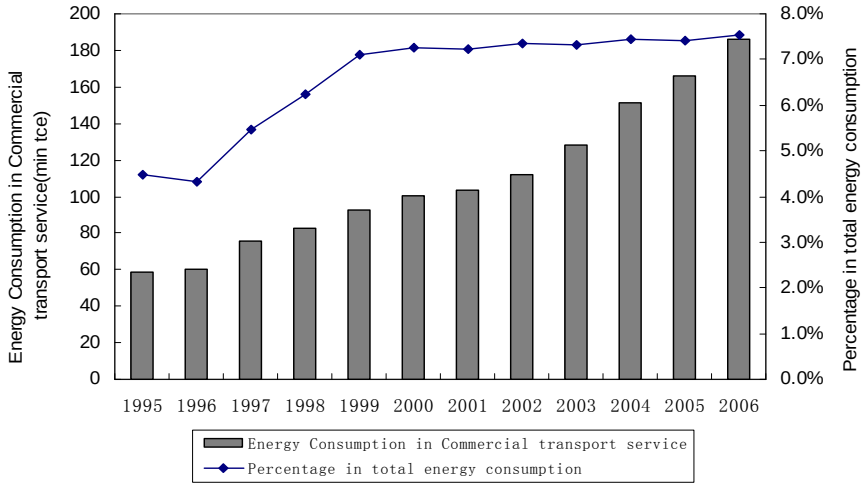

Figure 2-19 Transport energy consumption in 1995-2006

It should be noted that the data in China's statistics system only includes operational transport enterprises whose energy consumption is counted. The current data do not contain those non transport vehicles and their consumptions. As the estimation by international standards, the energy consumption of transport would take 10% of the nation's total. The transport industry consumes almost all gasoline, 60% of diesel, and 80% of coal oil. China's petroleum is dependent on foreign import at a high rate of 40%, where the dependence is keep growing. In order to ensure the nation's energy security and reach the energy conservation goal for the Eleventh Five Plan of reducing 20% energy consumption per unit GDP, the transport industry must bring more effort on energy conservation.

2.4.5 Cars Consume Most Energy in All Transport Modes

Different modes of transport differ drastically in energy consumption in urban transport system. Table 2-7 shows that cars consume most energy per passenger-kilometer. The energy consumption per passenger-kilometer of light rail, subway and tramcar is only 6% that of cars and the buses (single bus) is 10% of the cars. And cars produce the largest CO2 emission per passenger-kilometer among the six modes of transport, and 7 times the buses. Thus, from views of both of environment benefit and transport efficiency, promotion of mass public

transfer tool such as light rail, subway or tramcar is one the measures to established an energy-effective urban transport system in the future.

Table 2-7 Comparison of Energy Consumption among Various Transport Modes (energy intensity per person-km of single bus Set at 1)

Transport means	Energy consumption per Person-kilometer	Transport means	Energy consumption per Person-kilometer
Bike	0	Electric trolley bus (hinge joint)	0.8
Motorcycle	5.6	Electric trolley bus (BRT)	0.7
Car	8.1	Tram	0.4
Bus（single）	1	Light Rail Transit	0.45
Bus（hinge joint）	0.9	Subway	0.5
Bus（BRT）	0.8		

2.4.6 Transport Energy Consumption Per Capita is less than Developed Countries, but increasing rapidly

The fuel consumption per capita in China had been increasing steadily from 1990 to 2005(Figure 2-20), where Beijing consumes most fuel as much as 3 times of the nation's average level which is still less than Japan and Korea. Figure 3-5 shows that Tokyo's fuel consumption per capita was less than the national average until 1999. One of reasons to that is the change of preferences of car buyers in Tokyo. It is common for families in Japan having two vehicles. Most of them would like to buy bigger cars at first, so the fuel consumption kept increasing. When families purchase their second car, they become to prefer small or economy-model ones regarding to tax costs and environmental issues. Hence, Tokyo's car population increased continuously, but its fuel consumption per capita stayed at a relative steady rate.

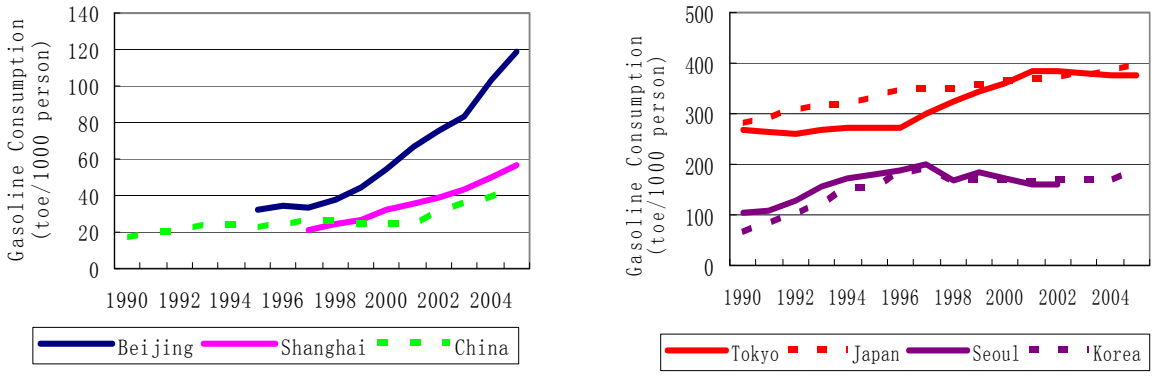

Figure 2-20 Urban passenger transport energy consumption of China, Japan and Korea

2.4.7 Cars Take Largest Portion of Urban Passenger Transport Energy Consumption

It's reported that China urban passenger transport consumed 7.9 million tons of oil in 2000, and the increasing rate from 2000 to 2030 is 5.9%. 45.3 million tons of oil will be consumed in 2030, as 6 times as the amount of 2000, and small cars take 80% of the total urban transport energy consumption, which is undoubted the largest consumer of energy (Fig.2-21).

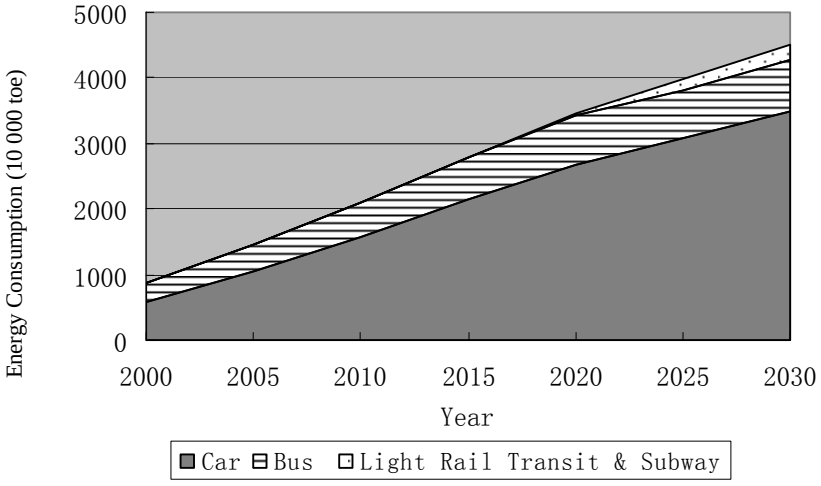

Fig. 2-21 Energy consumption of China urban passenger transport in 2000-2030

Part III: Conclusions

Currently, the proportion of both building and transportation energy consumption in social site energy consumption is as much as about 33%. Following the experiences from developed countries, the proportion would stably increase with the development of economy and the adjustments of industrial structure. For example, the proportions in OECD countries and EU member countries have reached about 2/3, among it the proportion concerning only urban building and transportation is more than 1/2.

Chinese urbanization is currently a great challenge for itself as well as the whole world nowadays. Currently the urban building's scale continuously increases at the speed of 5%-8% in China and more than 1 billion m^2 of new buildings are built every year. This will not only lead to the double floor area of urban buildings and continuous increase of building operating energy consumption in the next 15 years, but also indirectly promote the fast development of energy-intensive building material (cement, steel, glass, etc.) industries. Statistical data shows the energy consumption of the cement, steel, glass, and china used for urban construction account for 20% of the total energy consumption in China in 2005. If the urban construction scale can be decreased half, the total energy consumption can be decreased 10%.

Various types of new buildings are the main part of urbanization. According to the statistical data, the current urban floor area per capita of China is nearly 30 m^2, which exceeds the corresponding index of Hongkong and is close to the average of Japan and Singapore (about 36 m^2), the index of some provinces and cities even exceeds that of Japan and Singapore. But as a whole, the floor area per capita of China is far lower than that of USA and Europe. However, in the recent 15 years, the urban building floor area doubled every 7 years and more than 1 billion m^2 of buildings were constructed every year. If 1 billion m^2 of buildings are built and the urban population increases 15 million every year, the urban floor area per capita of China will reach 42 m^2 and will be close to the European level. The total energy consumption for building operation will certainly increase with the increase of building scale. If the urban building scale increases one time, the building energy consumption will increase one time or even more. Therefore it is necessary to scientifically and reasonably control the urban construction scale and urban building scale, and control the urban building floor area per capita to be less than 35 m^2 and the new buildings constructed every year to be less than 0.7 billion m^2. This should be the important part of the construction of resource-saving society, and is the basic guarantee to realize the sustainable development of urban construction according to the scientific development view.

Up to now, the building operating energy consumption per capita in China is 1/12 of that in USA and 1/6 of that in west and north Europe; the building operating energy consumption per capita of cities in China is only 1/7 of that in USA and 1/3.5 of that in west and north Europe;

the operating energy consumption per unit floor area for urban buildings in China is 1/3 of that in USA; the operating energy consumption per unit floor area for residential buildings in China is 1/3 of that in USA and 1/2 of that in Europe. However, recently, with the growth of the economic and the improvement of the life level and also the influence of the ideas of "joint track with international standard" and "30 years of no backwardness", great amount of high standard residential and office buildings that pursue to be different and large have been built. The operating energy consumption for these buildings realizes the conception of "joint track with international standard", the energy consumption per unit floor area has increased greatly. For example, a so called high-grade residential building in a certain place of China, declaims that it has applied the most advanced energy saving technique for air conditioning and heating. Its heating and air conditioning system runs all day long most of the time in a year, and its energy consumption reaches 20kWh/m^2•a, which is 7-10 times that of common residential buildings and is equivalent to that of the high-grade residential buildings in developed countries. Also, the electricity consumption standard per unit floor area of large-scale commercial buildings in most cities of China is 200~300 kWh/m^2•a, which has already reached the level of developed countries such as the USA, Japan and Europe. The commercial buildings in China like those accounts for less than 5% of the total building floor area, while accounts for more than 10% of the total building energy consumption.

If the urbanization idea of "joint track with international standard" spreads widely, building energy consumption in China will reach the high level of the "developed countries". Take the urban building electricity consumption per unit floor area in China for example, if it reaches the current level of that in USA, then the 30 billion urban buildings in China will consume 3 trillion kWh electricity annually in 2020, which is 1.5 times of the current total amount of electricity generation in China; If it reaches the legal building energy efficiency level in German (60 kWh/m^2•a), then in 2020, the electricity consumption for urban buildings in China will be equivalent to the current total amount of electricity generation for the whole country in a whole year.

Moreover, rapid urbanization and the improvement of citizens' standard of living will lead to increasing travel distances and time. Such situations may stimulate the use of motor vehicles and travels by other motorized modes. The experience of developed countries indicates that there is a growing trend of trips for leisure purposes; with the improvement of standard of living, average daily trips by urban citizens will be gradually rising, therefore travel distance and reliance on vehicles will rise as well.

However, it should be noticed the expanding trend of luxury consumption in China from 2001 on. The improving livings of citizens due to great economic achievements of China inherently increase requirements of daily consumables such as dwellings, cars, domestic appliances and so on. Generally, motivation for industry development is transferring to updating structure of consuming sector of China economy. This necessitates the researches on: 1) impacts of living,

work, leisure entertainment and individual transportation on urban building and transport energy consumption; 2) categorization and distribution of different consuming patterns and their inherent social impacts; 3) objective policies and social guidance for energy conservative society of China; 4) possible consuming pattern in term of energy and resource conservation in future society; 5) proper energy consuming modes in building and transport sectors. These would be essential to achieve social development and better citizen life while consuming less energy compared with developed countries.

Both international and domestic research and experiences show that, energy consumption moderation / decrease can be achieved as well by more efficient technologies to satisfy one's needs, and by more efficient organization, life-styles and consumption pattern. Moderation / reduction in the energy consumption in consumption sector, especially for building sector and transport sector, can be achieved through technological improvements, but also from moderation in the needs for energy services or from better organisation and management along with improved economic conditions in the sector ("non technical factors"). Moderating / decreasing energy consumption is first of all a matter of individual behaviour and reflects the rationale of energy consumers. Avoiding unnecessary consumption of energy or choosing the most appropriate equipment to reduce the cost of the energy contributes to decrease individual energy consumption without decreasing individual welfare. At the other hand, it seems that the urban design has influnces on the energy consumption in transportation sector and household space heating.

This task force will come out with a common and clear understanding of the role of energy efficiency in relation to sustainability, especially the relation of between urban design/planning, life styles and energy efficiency, and the relation between transport/energy networks and urban design/planning by reviewing the relationships from the history and the experiences from international and domectic cities in China.

A general mathematical model for China's urban buildings and transportation energy consumption would be founded after city-level energy survey and individual survey for household and the behaviour distribution. By analytical comparison on typical urban policy backgrounds and implementation results of both domestic and abroad cities, that is the implemented strategies, mechanisms and inspiriting measurements for urban development and structural adjustments aiming at reducing energy consumption, possible policies would be advised as controlling urban developing speed, encorouging suitable lifestyle and developing corresponding technoligies.

This report was provided by Task Force.

Background Report on the Pathway towards a Low Carbon Economy in China

2008 CCICED Policy Study Report

The 2008 Annual General Meeting
China Council for International Cooperation on Environment and Development
（2008.11.12-14）

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Abstract

Since the publication of IPCC Fourth Assessment Report entitled *Climate Change 2007* and *The Stern Review on the Economics of Climate Change*, Low Carbon Economy (LCE) is receiving wide attention from China and the international community at large. However, there is yet to be systematic research on the following topics: what is LCE; does China need to develop LCE; if there is the need, then when and how to develop LCE and what policy measures are necessary for that purpose. To answer these questions, China Council for International Cooperation on Environment and Development worked with several Chinese and foreign institutions, including the Industrial Economics Research Department of Development Research Center of the State Council, Energy Research Institute of National Development & Reform Commission, Research Centre for Sustainable Development under Chinese Academy of Social Sciences, Center for China Study of Tsinghua University, UK Department for International Development, World Business Council for Sustainable Development and Swedish Energy Agency, forming a cross-sectoral task force covering management, industrial, academic and research communities to conduct research on the approaches to LCE for China. The Industrial Economics Research Department under Development Research Center of the State Council, acting as the executive institution, is responsible for convening and coordination.

Since the initiation of the project in March, 2008, two general meetings including all the members of the Chinese and International task forces and several small meetings were called to discuss the outline of the task, the division of labor and key research conclusions. Three sub reports were completed: The International Trend and Direction of LCE Development; Necessity and Urgency to Develop Low Carbon Economy in China and Difficulties and Obstacles in the Development of Low-Carbon Economy in China. Consolidated from the three sub reports above, this is the background research report for the Study on the Approaches to LCE for China. The highlights identified are as follows:

I. "A LCE is an economic model on the rise, its core is built on the basis of market mechanism, it is formulated and innovated through the system framework and policy measurements, it motivates and enhances high efficiency technology, energy saving technology, as well as the development and application of the technology in re-cycled energy and reduction of GHG emission, it transforms the society into a model in which economy is being shaped by high energy efficiency, low energy consumption and low carbon emission". Although it is a method to reduce the emission of greenhouse gases by the developed countries, it is not based upon the precondition of commitment to reducing the total emission. For China, development of LCE is consistent with the existing efforts being put into energy saving and environmental protection. It is a continuation and expansion of the country's key strategies and policies such as scientific outlook of development, the construction of resource-saving, environmentally-friendly society and

transformation of the mode of economic growth.

II. From the perspective of international development trend, reduction of GHGs emission is growing from a scientific consensus into a global act. A considerable number of developed countries have set the reduction targets and substantially adjusted their socio-economic policies, meanwhile some developing countries are also taking actions to respond to climate change. The general trend of global economy transforming into LCE is becoming more pronounced and its impact upon the international economic pattern and trade rules is becoming clearer.

III. For China, development of LCE is both an inherent needs to address its energy, resource and environment issues and an important measure to respond to international climate change that is conducive to foster the growth of related industries and new competitive advantages for the nation. China should make arrangements and preparations to advance the development of LCE as soon as possible.

IV. China, however, faces certain challenges in the development of LCE: in the rapid process of industrialization of urbanization, China has a huge appetite for energy and resource consumption; in terms of division of labor, as China is located at the lower end of the industrial chain in international trade, large amounts of energy and GHGs emissions are exported embedded in export products; the resource endowment of China dictates that the energy structure underpinned by coal consumption can hardly be changed in the short to medium term; and there are also such factors as insufficient capacity for technological innovation and barriers to the transfer of low carbon technologies, etc. In addition, there are systemic obstacles: energy prices regulated by the government require substantial subsidies; there is lack of incentives in the form of policy obstacles for energy saving and emission reduction programs at the corporate level; over-reliance upon administrative measures for advancement of energy saving and emission reduction indicates lack of market-based solutions.

Initial suggestions: firstly, systematic researches on the strategy, methods and related policies should be conducted to approach the development of LCE from the knowledge dimension; secondly, considerations shall be made to include the development of LCE in the targets for socio-economic development in the Twelfth-Five-Year Plan; thirdly, the impact of climate change upon the international economic growth and trade rules should be closely watched and followed. The research and communications upon the calculation of C loads should be stepped up; and the progress and negotiation of border tax adjustment in international trade should be closely followed to create favorable trade environment and reduce the impact of changes in international policies upon Chinese export sectors; and the development of international low carbon technologies and industries should be studied to advance the growth of related domestic industries.

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Research on the Pathway to Low Carbon Economy for China

I. The Concept and Connotation of LCE and its Relations with Some Key Concepts

Since the publication of IPCC Fourth Assessment Report entitled *Climate Change 2007* and *The Stern Review on the Economics of Climate Change*, Low Carbon Economy (LCE) is receiving more and more international attention. Some countries have published initiatives and action plans on the development of LCE. However, there is yet to be a universally accepted definition for LCE. At present the most widely cited definition is the description by the British environmental expert Paul Robbins: "A LCE is an economic model on the rise, its core is built on the basis of market mechanism, it is formulated and innovated through the system framework and policy measurements, it motivates and enhances high efficiency technology, energy saving technology, as well as the development and application of the technology in re-cycled energy and reduction of GHG emission, it transforms the society into a model in which economy is being shaped by high energy efficiency, low energy consumption and low carbon emission"

Then what does LCE mean and what is its connotation? The Chinese and foreign experts of the task force agree that the following elements have substantial meaning:

- High levels of industrial production efficiency – low C emissions per unit of output
- High levels of energy efficiency from fossil fuels – low C per unit of electricity or transport mileage
- Very high proportion of energy from renewable and nuclear sources
- Predominance of fuel efficient, low C emitting forms of transport
- High levels of energy conservation in offices, other workplaces and in the home
- Reduction in exports of products with high energy consumption and high emission in their manufacture
- Substitution of public for private transport, greater use of bicycles and walking
- The core element is to stimulate the innovation and application of high energy efficiency and low emission technologies by means of systemic and institutional adjustment for the purpose of raising the level of global energy efficiency and reducing GHGs emissions.

For China, development of LCE is consistent with the existing efforts being put into

energy saving and environmental protection. It is a continuation and expansion of the country's key strategies and policies such as scientific outlook of development, the construction of resource-saving, environmentally-friendly society and transformation of the mode of economic growth. In practice, the development of LCE has the following meaning for the country:

- controlling the development of those industries with high energy consumption and the export of high energy consumption products
- raising the physical energy efficiency to an advanced international level by 2025
- rapid development of renewable energy - wind power generation, hydro power generation, large scale, photo-thermal generation, and commercial use of photovoltaic power generation
- rapid development of nuclear power with emphasis on the 3rd generation and the 4th generation;
- the promotion of public awareness by extensive coverage, and eventually turning the low carbon way of life into ordinary, everyday behavior.

It needs to be emphasized that the concept of LCE was first proposed by developed countries as an important way to reduce emission in a bid to honor the preset targets. However, reduction of total emission is not a precondition for the development of LCE. LCE is a new concept of development proposed by the human society in the face of increasing pressure of global warming. It is a mode of economic growth which attempts to replace the consumption of fossil fuel by technological innovations and applications. Because their historic and per capita emissions are lower and they have strong demand for economic growth, developing countries could not and should not share the same reduction obligations with those of the developed countries. However, by developing LCE, applying high efficiency and low emission technologies in the process of development and adopting conserving consumption patterns and behavior, developing countries could find a development philosophy and mode distinguished from the traditional concept of paying a higher price for higher energy consumption and higher pollution. Developing a LCE has to give equal attention to two considerations: "low carbon" and "economy".

II. The International Development and Trend of LCE

(I). Reducing GHGs emissions is growing from a scientific consensus into a global act, forming a powerful force driving the development of LCE

Scientific evidence indicates that our planet is warming at a rate that is unprecedented. It has risen at about 0.15o C per decade since the 1970s – the 17 warmest years have all occurred in the last 20 years. [1] The global temperature has risen by about 0.7o C since 1900 (Refer to Chart 1). Most scientists now agree that the warming is anthropogenic – the result of rapidly increasing greenhouse gas emissions (GHGs) since the industrial revolution. Since pre-industrial times (around 1750), carbon dioxide concentrations have increased from 280 parts per million (ppm) to 380 ppm today. Taking all the greenhouse gases into account, the current level is around 430 ppm of CO2 equivalent or CO2eq and it is rising at around 2.3 ppm per year. [2]

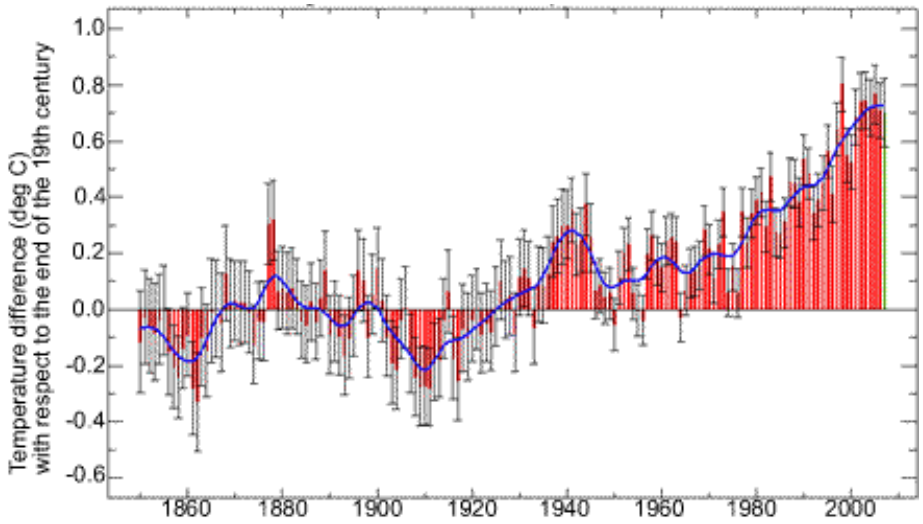

Chart 1 Global Temperature Change since Industrial Revolution

There is now a fairly widespread consensus that we should keep the temperature increase to just 2-3°C above pre-industrial. This is partly because it is believed that deleterious effects increase rapidly in frequency and scale above that level and particularly because there exists a number of potential 'tipping points' which if exceeded will result in run-away, if not irreversible, change. [3] To achieve the above targets, the concentration of GHGs in the atmosphere shall be limited to about 450 ppm – 550 ppm CO2-eq. Correspondingly, the global CO2 emissions will need to peak by 2020 and fall by somewhere between 30%-85% by 2050 relative to the level in 2000. CO2 emissions will need to and fall by over 50% by 2050 (refer to Table 1).

Table 1 IPCC Analysis of CO2 Concentration, Temperature and Emission Reduction in Different Scenarios

[1] 2007 and 2008 are relatively cool years (below the trend) because of the influence of the La Niña phenomenon in the Pacific Ocean.

[2] The total CO2 eq is responsible for the greenhouse effect and hence for the global warming.

[3] DEFRA 2006 *Avoiding Dangerous Climate Change*. Met Office, Exeter, UK; Lenton, T.M. et al 2008 Tipping elements in the Earth's climate system. *PNAS*, 105, 1786-1793 (http://www.pnas.org/content/105/6/1786.full.pdf)

类别	辐射强迫 (W/m2)	CO_2浓度c) (ppm)	CO_2当量浓度c) (ppm)	通过"最佳估值"气候敏感度在工业化前基础上的达到平衡状态全球平均温度b), c) (°C)	CO_2排放最高峰值年份d) (年份)	2050年全球CO_2排放的变化(2000年排放的%) d)
I	2.5-3.0	350-400	445-490	2.0-2.4	2000-2015	-85 to -50
II	3.0-3.5	400-440	490-535	2.4-2.8	2000-2020	-60 to -30
III	3.5-4.0	440-485	535-590	2.8-3.2	2010-2030	-30 to +5
IV	4.0-5.0	485-570	590-710	3.2-4.0	2020-2060	+10 to +60
V	5.0-6.0	570-660	710-855	4.0-4.9	2050-2080	+25 to +85
VI	6.0-7.5	660-790	855-1130	4.9-6.1	2060-2090	+90 to +140

The scientific consensus on climate change is transforming into global action. At the 2008 summit, G8 leaders have agreed to cut the GHGs emissions by 50% by 2050, representing emission reduction of 75% to 95% by developed countries, which is approaching "zero emission" society. Germany proposes an ambitious target which is twice the current EU target, to cut the emissions by 40% by 2020 from 1990 level. Despite the reduction target of 60% publicized in 2006, UK has committed itself to cut its overall GHGs emissions by 80% by the mid of this century in the new publication in October 2008. France promises to cut its emissions by 75% to 80% by 2050 if other countries take concerted actions. Japan plans to deliver a low carbon society and sets the target to reduce the energy consumption per unit GDP by 30% by 2030. Norway further sets the target to realize carbon neutrality by 2030, aiming to achieve net zero carbon emissions by balancing a measured amount of carbon released with an equivalent amount sequestered or offset.

During the Bush administration, the US Federal Government has not set any target for emission reduction. But on the level of state governments, the Governor of California declared in 2005 that California should stabilize greenhouse gas emissions at the 2000 level before 2010, reduce the emissions to 1990 level within 2020 and reduce the emissions by 80 per cent below 1990 level before 2050. An action plan to that purpose was published in March 2006. Some other state governments including Texas and New England have made similar proposals.

As for developing countries, South Africa plans to halt its growth of greenhouse gas emissions at the latest by 2020-2025 and to adopt various economic and policy measures so that emissions will eventually stabilize and decline. In India, the country's first National Action Plan on Climate Change released in June 2008 describes the vision in which its economic activities shift from high consumption of fossil fuels to non-fossil fuels and proposes measures on eight aspects such as developing solar energy, increasing energy efficiency, forestation, environmental

protection.

The global action on GHGs emission reduction has accelerated the pace worldwide to improve energy efficiency, develop renewable energies and subscribe to LCE. In addition, the need for energy security, protection of national and local environment and sustainable development highlighted by the upsurge of international oil price and volatility of the oil market is also fuelling the development of LCE.

(II) Some developed countries have made substantial socio-economic policy adjustment to subscribe to the development of LCE

First, implement emissions trading to discover the price for carbon. By way of the cap and trade systems, emission trading could reduce the emission costs, discover the price for carbon emission and create incentives to improve energy efficiency and develop renewable energies. At present the first phase of EU Emissions Trading Scheme has ended. The second phase will exercise a tighter cap on emissions (2008-2012). In 2007, the European market was worth about $50 billion, trading around 2 Mt CO2e. EU ETS continues to grow in scale and ambition. From 2013 the emission trading will be expanded EU-wide to all the members.

In the United States, voluntary trade in emission is practiced while the mandatory trade is also being campaigned for. Barack Obama proposed a scheme that would auction up to 100% of emissions permits and direct $15bn per year into renewable energy, energy efficiency and clean vehicles. New Carbon Finance suggested that the value of the US carbon market could be in the order of $1 trillion per year by 2020, which could be around double that of the EU ETS.

New Zealand's emissions trading scheme will be introduced for 2008-2013, bringing in sectors in phases. The transport sector will join the scheme from the 2009. This is linked to New Zealand's goal of reducing per capita emissions from the transport sector by half by 2040.

South Korea issued framework legislation in 2008 that will establish a mandatory domestic emissions trading scheme. Other countries considering similar schemes include Australia, Japan and South Africa.

Second, apply carbon tax to establish green tax revenue system. At present, EU members such as Norway, Sweden, Netherlands, Denmark, Germany and UK have introduced carbon taxes. Norway has had a carbon tax of approximately US$50 per tones of CO2 covering about 60% of national emissions since 1991. Some EU countries, particularly the Nordic countries have introduced environmental tax, taxing all the links related to environment from resource exploration, transportation,

transformation, utilization to emission (carbon tax is only part of environmental tax). At the same time, they have adjusted the entire taxation system to cut income-related taxes. The adjustment of taxation policies in the above countries not only facilitates the improvement of energy efficiency, the development of renewable energies and the reduction of emissions but also drives economic growth. A recent study concluded that the introduction of energy or environmental taxes and adjustment of taxation system had a positive effect on GDP compared with the counterfactual reference case of no environmental tax reform, with a neutral effect in the United Kingdom. [4] The EU, the United States, Canada, New Zealand and South Africa are also discussing and studying the related taxes.

Third, raise the standards of energy efficiency and environmental regulation.

A 2007 US law requires the average fuel economy of the combined fleet of all passenger cars and light trucks sold by 2020 to be at least 31% above the 2007 new fleet average. Latest EU plans would reduce the average CO2 emissions of new passenger cars to 120 grams per kilometer by 2012. In terms of energy efficiency regulation, Japan adopts 'Top Runner' program for many products to set the highest energy efficiency currently on the market as the reference level for the next period, e.g. the minimum regulation standard, to encourage improvement of energy efficiency.

Fourth, encourage improvement of energy efficiency and development of renewable energies.

The EU proposes to improve the energy efficiency by a further 20% before 2020 and introduces a target calling for a more than 3 fold increase from current levels so that 20% of the EU's energy comes from renewable energy sources by 2020. In 2007, new investment by the EU in renewable energies reached $55 billion. In the United States, 37 states have taken actions to create specific targets for the use of renewable energy, for example in Florida the state utility is required to produce 7.5% of its electricity from renewable energy sources by 2015, or in Massachusetts all electricity retailers must produce 4% of their electricity from renewable sources by 2010. At a federal level, the US provides fiscal subsidies and tax credits for improvement of energy efficiency and development of renewable energies, such as tax breaks for the hybrid vehicles.

Fifth, increase investment in R&D. Government research and development from the G7 countries decreased by around 30% in real terms over the last two decades, but public investments in clean energy are now on the rise. Japan's Ministry of Economy, Trade and Industry will request ¥717.3 billion (nearly $6.6 billion) in its budget for

[4] Barker, T., S. Junankar, H. Pollitt and P. Summerton (forthcoming) "The macroeconomic effects of unilateral environmental tax reforms in Europe, 1995-2012" in Innovation, Technology and Employment: Impacts of Environmental Fiscal Reforms and Other Market-Based Instruments, edited volume of "Critical Issues in Environmental Taxation VOL VI", Oxford University Press.

fiscal 2009 to finance low-carbon investments. Australia Prime Minister Kevin Rudd announced his government will set up a A$100-million (US$81 million) global institute to promote technology that captures and stores carbon emissions. Australia's Green Car Innovation Fund should be doubled to A$1 billion ($864 million) during its planned five years.

Through substantial policy adjustment described above, some developed countries have embarked on the LCE pathway. The old trend of economic growth accompanied by increase of energy consumption and GHGs emission has started to change, decoupling the economic growth from the GHGs emission. Take Sweden as an example, from 1990 to 2006, its economy grew by 44% while its CO2 emission fell by 9%.

(III) Reducing GHGs emissions is producing profound impact on the international economic pattern and trade rules

First, encourage the growth of low-carbon-related new industries. According to IEA analysis, if the GHGs emissions of 2050 are to be controlled at the level of 2005, additional investment needs (the extra investments needed for emission reduction, for example, the price gap between the electric-powered vehicles and traditional vehicles) in the energy sector are estimated at $17 trillion, between now and 2050. This is on average around $400 billion per year, roughly equivalent to the gross domestic product (GDP) of the Netherlands, or 0.4% of global GDP each year. If the carbon emissions are to be reduced to the level of half of that of 2005, additional investment needs are $45 trillion. The total is about $1.1 trillion per year, roughly equivalent to the current GDP of Italy. It represents an average of some 1.1% of global GDP each year. [5] The Stern Review also points out that if the CO2 concentrations in the atmosphere are to be limited to about 500 ppm – 550 ppm, the upper limit of the investment will be nearly equivalent to 1% of the global investment. Heavy investments will necessarily stimulate the development of low carbon technologies and products.

Second, take into consideration the impact on international trade rules. Many developed countries have initiated emission trading and some countries have applied carbon tax. Concerns about a loss of competitiveness of internationally traded carbon-intensive industries (e.g. steel, aluminum and basic chemicals) have prompted policy makers to consider the use of "border tax adjustment". When carbon intensive products are introduced to countries conducting emission trading, a certain amount of emission quota is required to be purchased; when such products are introduced to

[5] IEA: *Energy Technology Perspectives 2008*

countries applying carbon tax, a border tax is applied.

Third, take into consideration the impact on consumption behavior. Following the widespread attention to climate issues, the consumers start to be concerned over the GHGs emissions caused by products. The UK government and the Carbon Trust are developing a methodology for evaluating the carbon impact of products, working towards common standards and the development of carbon reduction labels. These labels will display the grams of carbon per kg produced during the entire lifecycle of the product, taking into account: product shelf life, country of origin, infrastructure in the country of origin, and how far the food product must travel. The food retailer Tesco has been working with Carbon Trust to pioneer the scheme. Some form of carbon accounting has been increasingly experimented in supply chain management, not just for European companies but also those from the US, including Wal-Mart.

III. Necessity and Urgency to Develop Low Carbon Economy in China

(I) Developing low carbon economy is an inherent requirement for China to address energy, resources, and environment problems

China has made great achievements in economic growth since its reform and opening-up 30 years ago. The Chinese GDP has been growing at an average rate of 9.8% from 1978 to 2007, and reached $ 2,460 per capita in 2007, making it the fourth largest economy in the world. However, China is taking a path of compressed industrialization, and is meeting various energy and environment problems that have occurred to developed countries in different stages of industrialization in a century. In the new century China has shown a trend of accelerated growth of heavy industries and chemical industries. The extensive growth mode, which causes resources dissipation and environment damage, has made resources and environment problems the constraints of China's economic and social development.

The first is to ensure energy security. Energy is the engine of economic growth, and the rapid growth of Chinese economy has caused a rapidly increasing energy demand, which translated into total energy consumption of 990 million tons of standard coal in 1990, and 2.65 billion in 2007. China's energy consumption has exceeded energy production since 1992, and consequently, energy security (steady supply), particularly petroleum availability, is becoming increasingly a bottleneck of China's economic development in the backdrop of rapid growth of its economy. China has been an importer of petroleum since 1993, and an importer of crude petroleum since 1996. China is now the second largest petroleum consumer, only behind the US, and one of the largest petroleum importers in the world, with its import dependence at 46.6% in 2007. However, the price of crude petroleum has been rising in the international market since 2003 and once reached $ 147 per barrel in June 2008. Despite its

emphasis on a clean energy structure, China will not be able to change its coal-dominated energy structure in a long time because of the limited alternatives. Considering the overdue sensitivity of the international community to China's petroleum import and the lessons learned from western countries in the first and second oil crises, China must place emphasis on energy supply and security, while energy conservation, emission reduction, and a low carbon economy will help China achieve its energy security.

The second is to overcome resources shortage. At a stage of accelerated growth of heavy and chemical industries, China has a higher demand of energy and raw materials and the extensive growth mode has made even shorter those important fundamental and strategic resources, such as petroleum, water, and power. Statistics show that China contributed 5.5% to the global GDP, but consumed 15%, 30%, and 54% of the global energy, steel, and cement in 2006[6]. It is predicted that among the 45 mineral resources needed for China's economic development, China can ensure full supply of 24, ensure nearly full supply of 2, fall short of 10, and fall seriously short of 9 in 2020[7]. China will have an import dependence of 58%, 52%, 38%, 82%, 52% and 69% respectively on petroleum, iron, manganese, copper, lead, and zinc in 2020[8]. With China's economic growth and production scale, it is unrealistic to support extensive growth with enormous import of resources, because China cannot make limitless use of international market. Therefore, China should, in addition to enhancing domestic resources exploitation and international resources utilization, more focus on changing economic growth mode and reducing resources consumption.

The third is to protect environment. Together with the apparent bottleneck of resources, there is high pressure on environment with the discharge of waste water and solid waste and emission of waste gas growing at a rapid rate and causing an increased social cost. Research shows that China environmental cost takes 2.68%-5.78% of GDP in 2003[9]. According to the data issued by State Environmental Protection Administration and National Bureau of Statistics in 2006, the cost caused by pollution in 2004 equaled to 3.05% of the GDP of the same year[10]. China has 13% of the global coal reserve but only 1% of the global petroleum and natural gas reserve.

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[6] Jie, Han & Yu, Wang, Full participation in energy conservation & emission reductions with binding targets as support, *www.gov.cn*, 27th November 2007.

[7] Yong, Ren, China steps into a turning period of environment and development strategy, *Proceedings of the fourth China Economic Forum by Chinese Academy of Social Sciences*, May 2008.

[8] Zhongyuan, Lu, The prominent problems, basic tasks, outlook, and policy orientations of China's economic and social development in the 11th five-year period to 2020, internal report of State Council Development Research Center, 2005.

[9] State Environmental Protection Administration & World Bank, *Cost of pollution in China*, international workshop on cost of pollution in China, 2007.

[10] State Environmental Protection Administration & National Bureau of Statistics, Study Report 2004 for Green National Economic Accounting, *http://www.zhb.gov.cn/xcjy/zwhb/200609/t20060907_92529.htm.2008-05-30*.

Therefore, 70% of energy demand is satisfied by coal in China, and consequently a high proportion of air pollutants, such as CO2、SO2、NOx, is caused by burning coal in China, among which SO2 is of highest pollution and caused a direct cost of $ 60 billion in 2005[11]. World Bank data in 2001 showed that 16 of the 20 cities with highest air pollution were in China. According to World Health Organization (WHO), 30% of the area in China suffers from serious acid rain, and there were only 31% of Chinese cities meeting the WHO air quality standard in 2004.

The fourth is to reduce natural disasters caused by climate change. Poor climate, heavy natural disasters, and fragile ecology are basic circumstances of China. As a big country with complicated ecology and the largest population in the world, China is one of the biggest victims of climate change in the world. China's National Climate Change Programme points out that China's annual average temperature increased by 0.5-0.8 ℃ in the recent 100 years, slightly higher than the global average, and warming is particularly apparent in the recent 50 years. Secondly, there is no apparent trend of change in annual average precipitation in the recent 100 years, but there is high regional variation and more uneven temporal and spatial distribution. The precipitation in the most areas of North China, eastern part of Northwest China, and Northeast China, which are usually dry, has decreased apparently by 20-40 mm every 10 years, particularly apparent in North China. In contrast, the precipitation in South China and Southwest China has increased apparently by 20-60 mm every 10 years. Thirdly, there are also apparent changes in the frequency and intensity of extreme weather events in China in the recently 50 years. There is heavier drought in North China and Northeast China and heavier blood in Southeast China and the Middle and Lower Reaches of Yantze River. Since 1990 the average precipitation in China has been higher than usual in most years, characterized by blood in the south and drought in the north, with drought and blood occurring frequently. Fourthly, China experiences an annual average rise of sea level of 2.5 mm, slightly higher than the global average, in the recent 50 years. Fifthly, there is rapid shrinking of mountain ice caps, which has a trend of acceleration, in China. Climate change has impacted China in agriculture, husbandry, forest, water resource, sea coast, and other ecological systems. Despite the positive effects of climate change on agricultural in some areas, such as longer growth period for some plants and shorter frost period, climate change has more negative impacts than positive ones on agriculture and obvious impacts on other fields in China.

(II) Developing low carbon economy is an important measure for China to address climate change

As mentioned above, to reduce greenhouse gas emissions and control temperate at a

[11] Daniel H. Rosen, Trevor Houser. "China Energy: A Guide for the Perplexed", A Joint Project by the Center for Strategic and International Studies and the Peterson Institute for International Economics, May 2007.

reasonable level has become a scientific consensus. At the political level, major developed countries have committed to reducing CO2 emissions by 50% by 2050. China will play a key role to realize the goal. In the 13 years from 1990 t0 2003, China accounts for 25% of global energy consumption increase and 34% of greenhouse gas emission increase12 (See Table 2). According to IEA, the global CO2 emissions will keep increasing without new policies and measures taken. Under this scenario, the global CO2 emissions will increase to 69% above 2000 level by 2030. Non-OECD countries will account for the rapidest growth by doubling their 2000 level. The share of OECD countries in global CO2 emissions will decrease from 54% in 2000 to 42% in 2030, while that of non-OECD countries will increase from 46% to 58%, among which the share of China will increase from 13% to 17%13. As a responsible country, China must improve energy efficiency, create a clean energy structure, and shift its lifestyle and consumption patterns through technological innovation, institutional innovation and changes in the view of development, so as to abandon its traditional way of high dissipation and move to a new path of low carbon development, slow down the rapid increase of greenhouse gas emissions, and play an active role in the global efforts in emission reductions. In this way China could signal its attitude and resolution to address climate change and help improve its international image and status.

Table 2 CO2 Emissions in Some Countries and Regions from 1990-2030

(Unit: million CO2)

Countries/Regions	History		Predication	
	1990	2003	2015	2030
US	4978	5796	6718	8115
EU 15	4089	4264	4623	5123
Japan	1011	1206	1228	1219
China	2241	3541	7000	10716
India	578	1023	1592	2205
World	21223	25028	33663	43676

Data source: IEA (2006)

Furthermore, in addition to developed countries which are setting national targets for mandatory emission reductions, there is increasingly more voices calling for a global carbon price. Developed countries, in addition to implementing carbon tax internally, are also trying to relate carbon pricing to international trade through a border adjust tax imposed on imports and exports with emissions. Therefore, carbon pricing could be spread into developing countries through international trade and the border adjust tax, and thus helps forming a global carbon price and contributing to global emission reductions. The Chinese economy has been integrated into the global economy with a

[12] EIA (Energy Information Administration). 2006. *International Energy Outlook 2006*, Official Energy Statistics from the U.S. Government.

[13] International Energy Agency (IEA), *30 Key Energy Trends in the IEA & Worldwide*, 30th Anniversary of the International Energy Agency, IEA, 2005.

foreign trade dependence of 70% in 2006. If the above call turns into action, it will hugely impact China's foreign trade and economic growth, while developing low carbon economy will help mitigate and adapt to the impacts.

(III) Developing low carbon economy will help promote the development of relevant industries and form new competitive advantages

As mentioned above, reducing greenhouse gas emissions causes cost on the one hand, and brings new business opportunities on the other hand, in particular stimulating the development of relevant industries in energy conservation and emission reduction. Although China has not mastered some key technologies in energy conservation, new energies, and emission reduction, such as advanced nuclear technologies and carbon capture and storage technologies, the new change will possibly bring new opportunities to the Chinese economy. The reasons are as follows:

Firstly, it helps make technological breakthroughs and form technological advantages. Compared with developed countries, China lags behind less in new energy technologies than in traditional energy technologies and other traditional technologies. Particularly, China leads the world in the commercialization of some important new energies, such as solar energy and wind energy. China is also doing well in the research of electric motors in a global pattern of tri-party competition between EU, US, and Japan. Therefore, China is likely to achieve breakthroughs in the above areas and form its own technological advantages.

Secondly, it helps form a country's competitive advantage. Compared with developed countries, China has a large and rapidly growing market and enjoys huge cost advantage with cheap labor, especially in the fields of processing, manufacturing, and installing. For example, in the unit investment of IGCC, China has a much lower cost than the international level (See Chart 2). Currently China begins large-scale export to the EU and US in solar photovoltaic power and wind power. Compared with other developing countries, China has good industrial foundation and high quality labor force that are absent in other developing countries, most of which cannot make efficient energy equipment. With the development in the above fields, China is very likely to form cost advantages against developed countries, and technological advantages against developing countries, and thus enjoy unique competitive force. Furthermore, the global efforts in emission reductions create a huge market space for this unique competitive force. It will help change the pattern that China competes intensively with developing countries in lower end manufacturing but have no access to high value-added industries, and thus improve the overall competitive force of China.

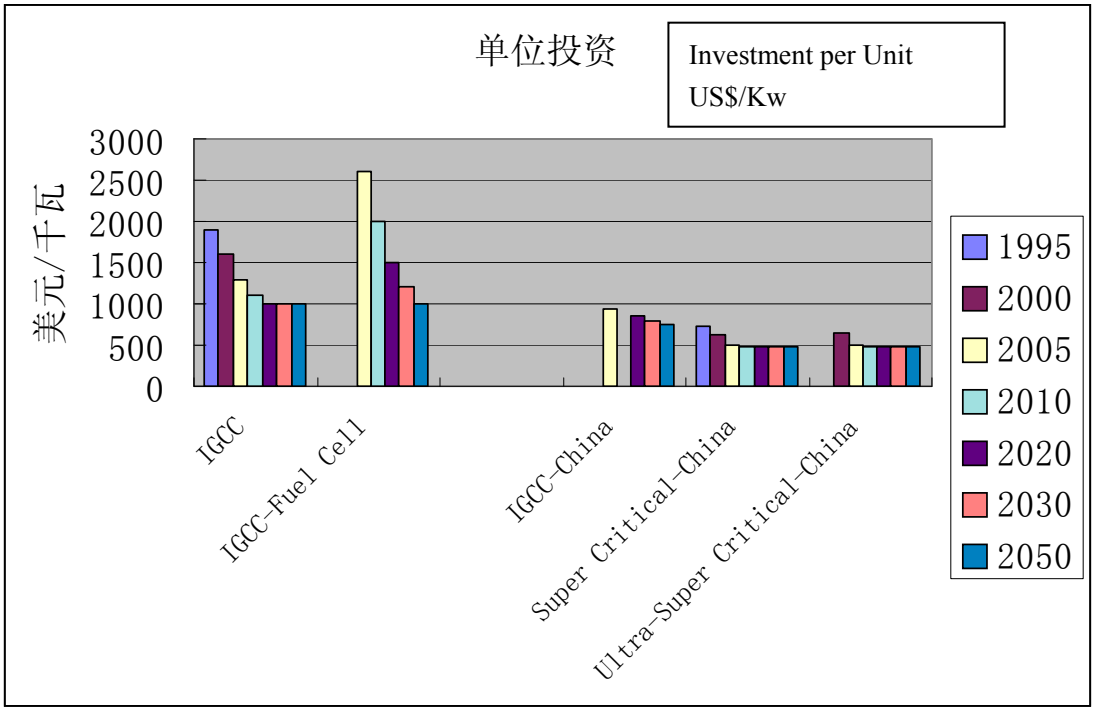

Chart 2 Unit Investment of Power Generation in China

Thirdly, it enables China to acquire fund and technology through global climate change cooperation mechanism. As a developing country, China could acquire international fund and technology through the CDM mechanism under the UNFCCC to develop low carbon industries, but lacks similar external environment to develop other industries. The international cooperation helps improve China's competitive advantages. China approved 4 CDM projects for the first time in 2006, and has approved 1444 CDM projects by 13rd August 2008. According to statistics on the CDM EB website, by 2nd September 2008 China has 263 registered projects, accounting for 22.75% of the total number (Chart 3). It is expected that China will have annually 113,470,635 carbon credits issued, accounting for 51.90% of the total number (221,996,290) (Chart 4).

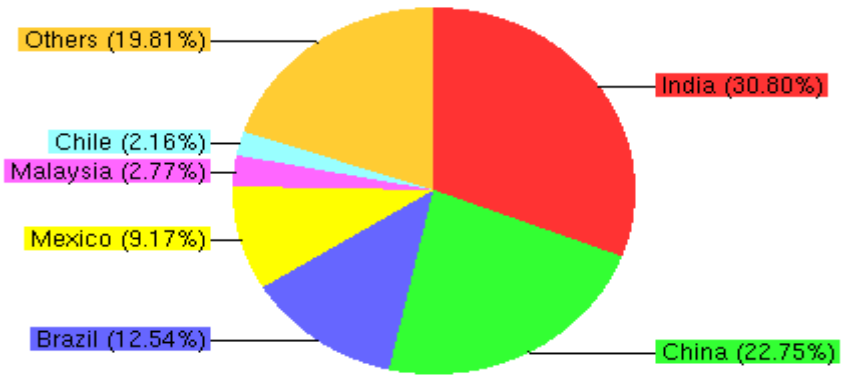

Chart 3 Share of China's Registered CDM Projects

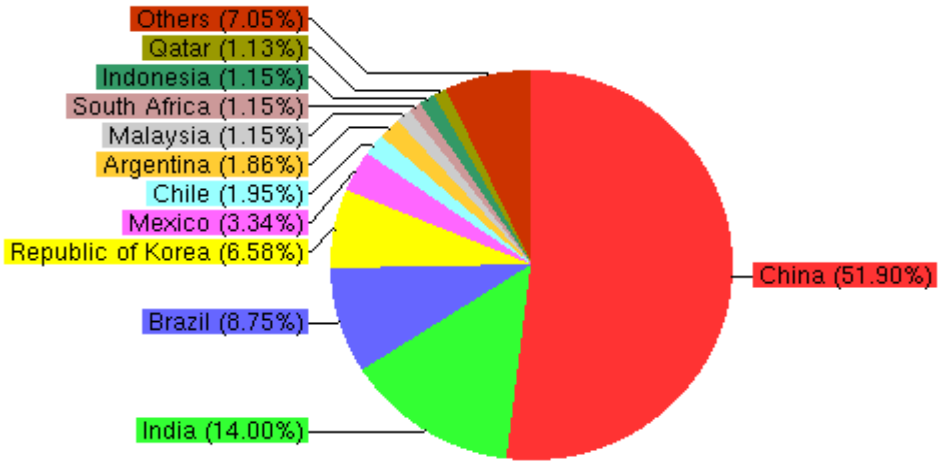

Chart 4 Expected Annual CERs from registered projects by country14

To turn the above opportunities into real competitive force must rely on developing low carbon economy as its basis. Seen from the development of domestic industries, it will be difficult to industrialize the new sciences and technologies and form international competitive force if there is no strong domestic demand, no matter how independent innovation is stressed. With China's huge market, these industries are rapidly developed into economy of scale and enjoy the advantage of scale. After the technologies are mastered, they start large scale of exports and accordingly form international competitive force. The super-critical power unit from its introduction to export is a good example. China introduced 600 MW super-critical boiler for the first time in 2000. Due to the rapid rise of coal price in China and the intensive competition between power companies, there was a high demand on efficient power generation technologies. Combined with a newly installed capacity of 100 million kW each year, China's domestic manufacturing ability grew quickly and in 2007 China's Dongfang Boiler Works began to export super-critical boilers to Turkey. The same story also occurred in Japan in the 1970s, when Japan began to make great efforts in improving energy efficiency and fighting pollution as a response to oil crisis and domestic pollution. With huge investment, for example investment in desulfuration alone accounted for 1.4% of the GDP in its peak period, the energy conservation and environmental protection industries grew and developed in Japan. Now the energy efficiency and environment-friendliness is still an important aspect of the competitive force of Japan's manufacturing industry. The examples, both domestically and internationally, show that developing low carbon economy could stimulate the development of relevant industries and form new competitive advantage.

[14] CERs, Certified Emission Reductions

(IV) Early planning and deployment is needed to promote the development of low carbon economy

Developing low carbon economy is now a global trend and gradually becomes the consensus of policy makers at various levels in various countries. China should also make early move to develop a low carbon economy. The reasons are as follows:

The first is to avoid the locking effect of energy consumption and greenhouse gas emission. China is in the process of rapid industrialization and urbanization, with much infrastructure and equipment put into operation each year. Since the lifetime of infrastructure and equipment ranges from a dozen years to decades, they will be locked to high energy consumption, high pollution and high emission once built without advanced technologies, equipment and view of development. Therefore, low carbon economy should be developed by adopting advanced technologies and equipment, reasonable mode of urbanization and consumption to take a path of low energy consumption, low pollution and low emission. The Stern Review also points out that to control the global temperature at 2-3^{o} C above pre-industrial level, actions must be taken early to reduce the cost and risks of climate change, although the greenhouse gas emission is still allowed to increase before 2020.

The second is to adapt to the changes in the international economic patterns and trade rules caused by greenhouse gas emission reduction. As mentioned above many developed countries have made essential adjustments in their economic and social policies to shift to a low carbon economy, and some developing countries are also beginning to move. The impacts of climate change on industrial development, international trade rules and consumption behavior has begun to emerge. As a country with high foreign trade dependence, China should take early actions to adapt to the changes in the international economy.

The third is to lead the world in technological development and industrialization by early planning and deployment during this period of low carbon technological development. Many low carbon technologies are now at the stage of research and development, with intensive competition between different technological paths and with rapid changes. For example, there is intensive competition between different technological paths for energy efficient and environment-friendly cars. Developed countries are investing fund and showing leadership in research and development of low carbon technologies. China is leading the world in the research of some low carbon technologies. If China cannot keep up with the pace of low carbon technological innovation, it will be very difficult to catch up once the low carbon technologies step into large-scale commercialization. China would repeat the traditional mode of technological import and low cost competition and could not realize its idea of building new international competitive advantage.

IV. Difficulties & Obstacles in the Development of Low-Carbon Economy in China

(I). Difficulties in the development of LCE in China

1.Huge Energy Consumption due to the Accelerated Industrialization and Urbanization of China

From the history of global economic development, a country requires a huge amount of material and energy in the process of industrialization and urbanization to meet the growing demands of steel, auto, ship-building, machinery industries as well as the large-scale urban expansion, such as the US between 1870 to 1973, and Japan between 1950 to 1973. Only after the completion of industrialization and urbanization can the energy consumption per capita stabilize (see Table 3). So is the same with the Carbon Emission per capita, before the income per capita reaches USD10k (according to related study, the USD10k income per capita is a major criteria for a generally completed industrialization and urbanization), the Carbon Emission per capita increases following the rise of income, and after the industrialization and urbanization, the Carbon Emission per capita begins to slow down and eventually stays stable or even drops (see Chart 5).

Table 3 Primary Energy Consumption Per Capita (Oil eq: ton)

Year	Global	the UK	the US	Japan	China
1820	0.21	0.61	2.45	0.20	
1870	0.31	2.21	2.45	0.20	
1913	0.61	3.24	4.47	0.42	
1950	0.84	3.14	5.68	0.54	
1973	1.54	3.93	8.19	2.98	0.48
1998	1.65	3.89	8.15	4.04	0.88
2005	1.78	3.88	7.89	4.5	1.32

Madison, 2005, Table 4 and Table 5；
Data of 2005 quoted from International Energy Agency, Key World Energy Statistics 2007.

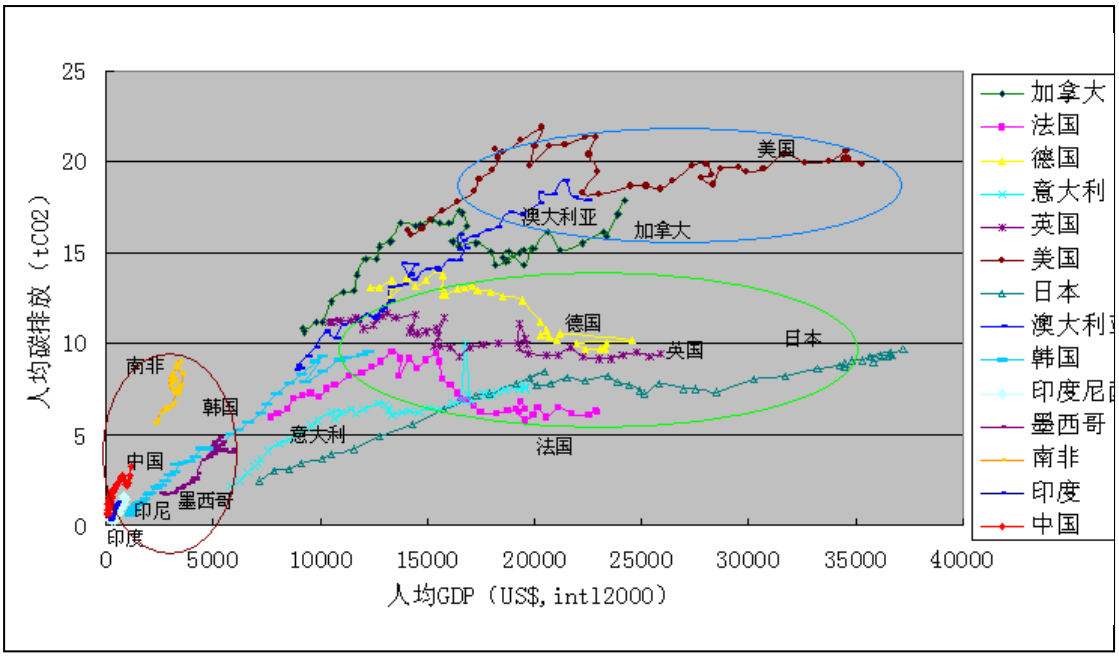

Chart 5: Relationship between Carbon Emission per capita and Phases of Development

Left: carbon emission per capita

The right column countries by order: Canada, France, Germany, Italy, UK, USA, Japan, Australia, S. Korea, Indonesia, Mexico, South Africa, India, China

Bottom: Per Capita GDP

China is currently undergoing rapid industrialization and urbanization, with relatively low economic development level and big regional gaps. In 2007, China's income per capita was only USD 2,460, belonging to mid-low level income countries. In light of urbanization process, in 2006, China's urbanization rate only stood at 43.9%, among which that of eastern, central and western regions was 54.6%, 40.4% and 35.7% respectively: Shanghai enjoyed the highest 88.7%, followed by Beijing with 84.3% and Tianjin 75.7%, while that of Guizhou and Tibet was the lowest with 27.5% and 28.2% respectively. The urbanization rate of China is not only lower than that of developed countries, but also lower than the countries at the same income level. It's estimated that China's rapid urbanization will last till 2030, with an annual 1% of the total population, around 14 million, transferring from countryside to urban areas which will stimulate huge demand for urban housing and infrastructure construction.

China is generally in the mid-phase of the industrialization. In the four economic sections, the eastern region has entered the post- industrialization phase, the northeastern is in the mid-industrialization phase, while the central and western regions are in the latter half of the pro-industrialization phase. Vast gaps can be seen in the industrialization levels of the four regions, making the task of invigorating the central and developing the west tougher (see Table 4). [15] It is estimated that the industrialization of China will last till 2020 or even after, and the accelerated

[15] Chen Jiagui, Huang Qunhui, Zhong Hongwu: The Synthetic Evaluation and Comprehensive Analysis of the Industrialization Process in China, from 2006's 6th issue of Economic Research.

development of industrialization, especially the heavy and chemical industries, will foster huge material and energy consumption.

Table 4 Comparisons of Varied Industrialization Phases of Different Regions in China (2004)

Year & Phase		Four Economic Sections	31 Provinces, Municipalities and Regions
Post- industrialization (5th)			Shanghai, Beijing
Later period of industrialization (4th)	Latter Half		Tianjin
	First-half	East	Guangdong, Zhejiang, Jiangsu
Mid-industrialization(3rd)	Latter Half		Shandong
	First-half	Nationwide, Northeast	Liaoning, Fujian, Shanxi, Jilin, Heilongjiang, Hebei
Early-industrialization(2nd)	Latter Half	Central region, West	Inner Mongolia, Ningxia, Hubei, Chongqing, Shaanxi, Qinghai, Xinjiang, Yunnan, Hunan, Henan, Gansu, Jiangxi, Anhui, Sichuan, Hainan
	First-half		Guangxi, Guizhou
Pre- industrialization(1st)			Tibet

Source: Chen Jiagui and associates (2006)

China's high energy consumption may continue to climb for quite a long time in future given its low level of economic development at present, and the at least 20 years' industrialization and urbanization endeavor. Also, the IEA has forecasted in the World Energy Outlook 2007 two scenarios for China's energy consumption growth (Table 5), the first is to adopt certain measures and regulations to control energy consumption under selective policy circumstance (scenario a), the second is about energy consumption amid the fast economic growth (a 7.5% annual average economic growth rate from 2005 to 2030) circumstance (scenario b) [16]. Over these 25 years, China's energy consumption will climb between 2.6 - 4.1% without sharp declines.

Table 5 Forecast on the energy consumption of China (Oil eq: million tons)

	2005	2015a	2015b	2030a	2030b	2005 - 2030 Average growth rate a	2005 - 2030 Average growth rate b

[16] Forecast data on China's future economic and energy consumption growth rates can refer to: U.S. Department of Energy, *International Energy Outlook 1999, 2005*; International Energy Agency, *World Energy Outlook 2000, 2004*; APEC Asian Pacific Energy Research Centre, *Energy Demand and Supply Outlook in APEC Northeast Asia Case, 2005*; APEC Asian Pacific Energy Research Centre, *Energy Demand and Supply Outlook 2002*.

Coal	1 094	1 766	2 075	1 861	3 003	2.1%	4.1%
Oil	327	517	625	652	1 048	2.8%	4.8%
Natural Gas	42	126	125	225	284	6.9%	7.9%
Nuclear	14	44	34	120	82	9.0%	7.4%
Water power	34	70	63	99	91	4.4%	4.0%
Biomass and waste	224	218	229	251	219	0.5%	-0.1%
other renewable energy		13	11	50	38	0.0%	-
Total	1 735	2 754	3 163	3 257	4 765	2.6%	4.1%

Source: IEA，World Energy Outlook 2007.

2. As China is at the Lower Stream of the Industrial Chain in the International Trade Division, Huge Amounts of Energy and GHG Emission are Exported Indirectly thru Its Exported Products

China is increasingly involved in the world economic integration and has been highly dependent on the international trade in the context of globalization. In 2005, the foreign trade of China totaled 14 trillion (accounting for 77% of the country's GDP), and it is emerging as the major manufacturing base of the world. However, as it is at a relatively down stream of the international labor division, most of its imports are high value-added products and services, while its exports are mainly focused on energy-intensive manufactured goods. Correspondingly, Imported goods are of lower energy intensity than exported goods, resulting in international energy trade unbalance. Under such foreign trade structure, China indirectly exported huge amounts of energy when selling its products to other countries and meeting demands of consumers worldwide. Take the heavily exported electrolytic aluminum for instance, its export volume in 2003, 2004 and 2005 was 1.04, 1.41 and 1.14 million tons respectively, and despite a slight decrease in 2005, these figures were the equivalent of 15.5, 21.2, and 17.1 billion kw/h of electricity.

According to the statistics from 2007 World Energy Outlook: Insights into the Energy Futures of China and India, the energy re-export volume of China was 400Mtoe in 2004, approximately 25% of China's total energy consumption; while the imports only contained 171Mtoe of energy, about 10% of the country's total. The amount of energy contained in China's exports is far larger than that of any other countries (the energy re-export ratio of the US, the EU and Japan in 2001 was 6%, 7% and 10% respectively), and this high proportion has also resulted in high CO2 emission. In 2004, the CO2 emission caused by China's energy re-export was 430Mt, accounting for 26% of the total carbon intensity from all departments in 2001.

The research (Wang and Watson，2007) from Tyndall Centre for Climate Change Research also demonstrated that in 2004, about 1.11Gt of CO2 emission came from China's gross export, accounting for 23%, or nearly 1/4 of that year's total (4.73Gt),

which was the equivalent of the entire CO2 emission of Japan, the sum of Germany and Australia, and more than twice as much as that of the UK. [17]

3. Coal-dominated Energy Structure Is not Easy to Change in the Mid-long Term, Determined by China's Resource Peculiarity

Coal, oil and natural gas account for 94%, 5.4% and 0.6% respectively in the proved energy reserves of China. Such energy proportion has determined that the coal-dominated energy production and consumption pattern of China will not change easily in the long term. Although in the past two decades, Chinese authorities have made the utmost to diversify energy sources, reduce dependence on fossil fuels, and develop renewable energy, the coal-dominated energy structure didn't have any obvious shift. As of 2006, the proportion of coal in the primary energy consumption reached more than 69.4%, much higher than the EU and the world average level (see Chart 6). In early 2005, the Renewable Energy Law was launched and has taken effect since January 1, 2006. As a supplement of this law, The Middle And Long Term Program of Renewable Energy Development has been approved and issued by the State Council. According to this new program, by the year 2020, the installed power generation capacity of renewable energy will account for 30% of the total, among which that of water, wind, solar and biomass power will reach 300GW, 30GW, 1.8GW and 30GW respectively. The supply of renewable energy will become the equivalent of 400-500Mt standard coal. By that time, the total of the primary energy consumption will reach around 3.5Bt, among which renewable energy will account for about 1/7. [18]Although the use of renewable energy is expanding in China, it only plays a minor role in mitigating the proportion of coal in the energy structure. In the near future, fossil fuels, especially coal, will still stay as the major energy supply.

[17] Tao Wang and Jim Watson, "Who Owns China's Carbon Emissions?" , Tyndall Briefing Note No. 23, October 2007, http://tyndall.webapp1.uea.ac.uk/publications/briefing_notes/bn23.pdf

[18] Research results on the projected energy demand may vary a lot. Here presents relatively conservative data.

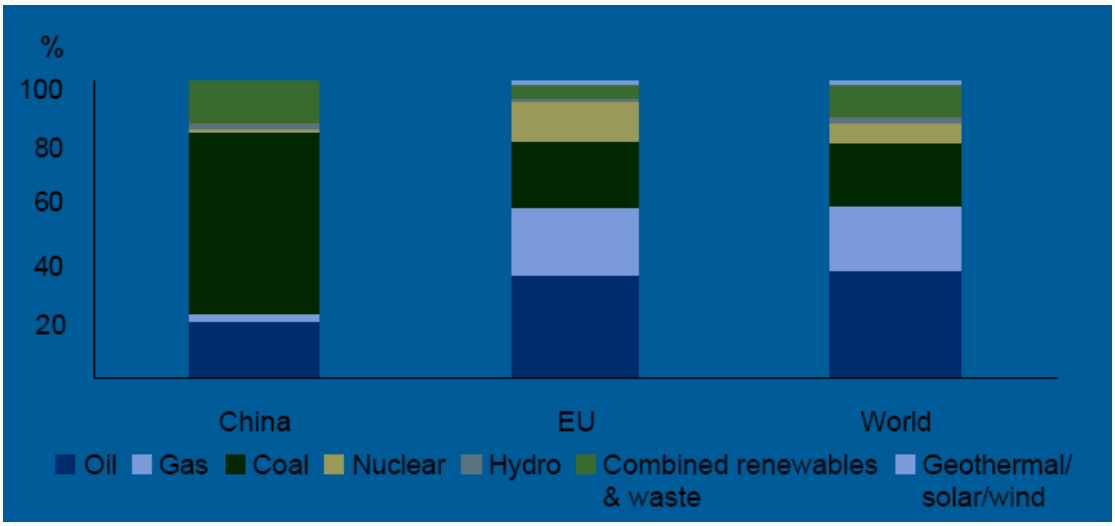

Chart 6 Comparison of the Energy Structures of China, the EU and the world average

4. Insufficient Technology Innovation Capacity, Obstacles Exists in the Technology Transfer

First, insufficient self-innovation capacity. From the capital injection perspective, the current R&D spending in China accounts for less than 1.5% of GDP, still far behind the 2% goal set in the 11th five year plan, and this is further lagged behind by 2% of developed countries and 5% to 10% of the world top 500 companies. Great efforts are needed in order to overtake the 3% level of the world leading economies. Calculated by R&D funding per capita, that of China was only USD140, accounting for 14% of that of Japan (USD1k). From the perspective of investment composition, foreign enterprises have enhanced their investment in China: approximately 800 multi-national enterprises have set up R&D centers in China, and Japanese leading enterprises, like Sony and Toshiba, have established their R&D base here. As to the patent applications to be submitted to the State Patent Bureau, 1/2 of the high-tech inventions and patents (core technologies included) belong to MNCs. When it comes to company investment, enterprises have accounted for over 70% of the total R&D investment, approaching the level of developed countries, but the gap of total R&D expenditure and intensity from developed countries is still big. At present, only 25% of the over 28,000 large-and-medium sized enterprises have their own R&D institutes, and 75% have no R&D professionals at all. Among the 1,000 enterprises listed on The 2005 R&D Scoreboard unveiled by the Department of Trade and Industry (DTI) of the UK, the R&D investment of enterprises from the US, Japan and Germany account for 71.9% of the total. Only four mainland Chinese enterprises entered the scoreboard, with R&D funding no more than 22million pounds each, while that of the three top 15 Japanese enterprises was over 2.5billion pounds each. With regard to the innovative capacity of the company, at present, for most Chinese enterprises, only 24% of the R&D funding is allocated to new product development, with major focus on short-term projects rather than long-term and forward-looking fundamental research

(less than 10%). The over-emphasis on short-term economic benefits, utility-type and exterior-design patents and low "circulation rate" of the R&D of the military and civilian technologies have hindered the scientific and technological advancement of China. In addition, a great number of Chinese enterprises spend more money on technology import and less on technology absorption and digestion with the average ratio of 6.5 : 1. By contrast, that of Japan after the WWII was 1 : 7.

Second, obstacles in technology transfer. The international community has reached a common consensus on the crucial role of the technology innovation and transfer in addressing global climate change. Study shows that in order to stabilize the GHG intensity to the level of 550ppm, about 70% of the emission cut will be realized in the coming 20 years with the aid of current and near commercialized technologies. At present, developing countries still lack advanced technologies conducive to GHG reduction, and their economic development features high carbon emission. Whether developing countries are able to utilize their advantages as latter comers so as to achieve the goal of LCE during industrialization depends on their funding and technology capacity. Although the UN Framework Convention on Climate Change has stipulated the obligation of developed countries to transfer advanced technology to their developing counterparts, the actual progress is still far away from the expectations. In terms of technology providers, the fear for monopoly has hobbled the quick spread and transfer of low carbon technology, especially with regard to trans-national obstacles with issues such as IPR and market shares. As to technology recipients, talents shortage, high technology transfer fees, scattered industrial structure and incomplete policies and laws have become major international obstacles, which if conquered or mitigated by international climate system, will benefit us from lower GHG emission. Additionally, although one essential objective of CDM was to urge developed countries to transfer low carbon technology to developing country, in practice, transfer still mainly centers around capital, or the pure trade of carbon emission rights, instead of technology transfer. Given the technology gap from developed countries, their slow action to transfer advanced technology, and the country's limited R&D capacity, China has to rely on commercial channel to import technology. Therefore despite China's continuous efforts in importing advanced energy technologies such as wind, solar power and nuclear, these are basically commercial transfer, while the terms on IPR transfer are very strict. In short, China still has a long way to go before realizing comprehensive industrialization and extensive development of its energy industry by relying on its own R&D capacity.

Thirdly, inadequate attention to technology absorption and digestion. These two factors are of equal importance to technology import, yet have long been ignored by Chinese enterprises, who repeatedly bring in technologies and end up with over-dependence on them. [19]There are two models of technology import: one is for the mere use of technology, while the other is for improving the self innovation capacity. Under the on-going industrial reform, a great many enterprises are still

[19] Chen Qingtai: Inadequate Innovation Capacity has become Achilles'heel for China's Economy, quoted from www.ce.cn, Feb 20, 2006

influenced by the backward mechanism and are willing to spend money on technology import as it promises immediate benefits, but are stingy on technology absorption and digestion, perhaps they think the distant water can not quench present thirst. Horizontally, several enterprises repeatedly purchase one technology; vertically, the first-round introduction is followed by the second-round, which ends in huge spending, incomplete technological study with no mature self-innovation capacity. Since the present technology innovation has many uncertainties, and is subject to piracy and fruits loss, it requires tougher environment and conditions than other investments. Thus the foremost for a technology innovation-friendly environment is to enhance the motivation mechanism within the enterprises through the implementation of a series of effective measures, typified by government incentives such as environmental conservation laws, technical standards, safety and sanitation regulations and market access requirements. Only when the due high-yield policy environment is secured for the successful technology innovations can enterprises give priority to and get permanent driving force for technology innovation for improving market competitive edges. In the meantime, it's of great significance to support small-and-medium sized enterprises (SMEs) who are good at technological and scientific innovation. Survey shows even in the large company-dominated US, 83% of technology innovation comes from innovative SMEs, whose clear property rights from private sectors, flexible mechanism, astute sense of market exploration, and thirst for adventure which helps to diversify risks have made them a task force of technology innovation. In China, however, SMEs are still in a fledging phase and many innovative and informed entrepreneurs lack capital and business operating experiences.

(II) The Institutional and Mechanism Obstacles for China to Develop Low-carbon Economy

1. Government control over energy price and large subsidy

China is a developing country in economic transition where a transitive subsidy for energy consumption is justifiable and even necessary sometimes. Government should provide each citizen with affordable and accessible energy service in an acceptable price. The practical buying power should be factored in calculating the proportion of against disposable income for the sake of social justice and harmony. For the significance of energy in economy and its own distinction, the energy industry is more often intervened by government. According to IEA estimate, China's energy subsidy reached $25 billion in 2005, only after two energy giants, Russia and Iran, see chart 7:

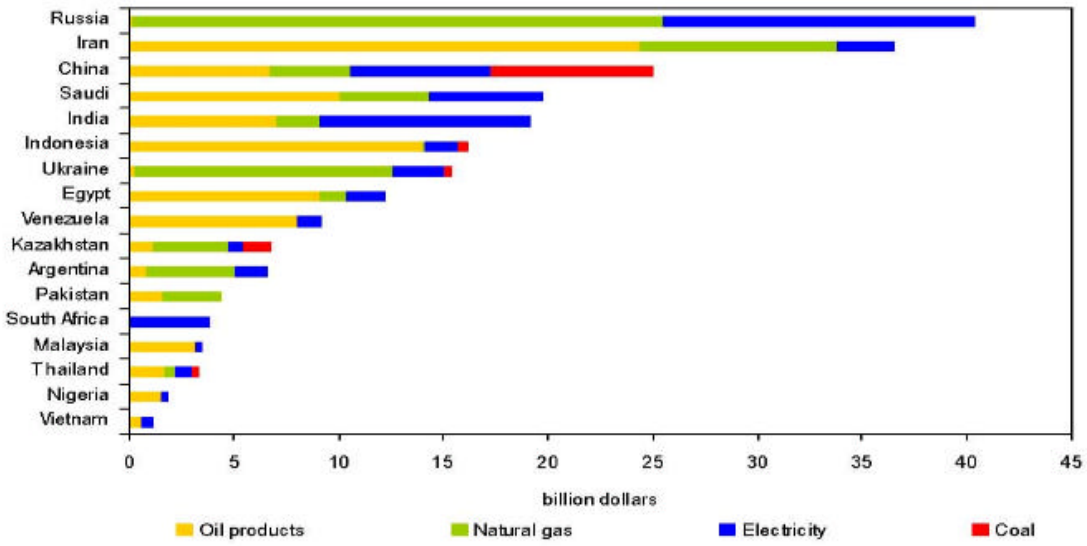

Chart 7 the energy subsidy of Non-OECD countries 2005

In recent years, since the coal and oil price has been increasing, government consequently kept control of the price of oil and electricity which has been high for a period of time. But under-pricing of energy must be compensated by subsidy.

There are problems for the controlling and subsidizing of price of oil and power. First, price control means subsidy for production which in fact exerts no influence on final consumption. Domestic consumption of oil and power will not be influenced by the rising international oil price but encouraged and enhanced by production subsidy and finally lead to ineffective consumption, higher pressure for price and supply of energy and deteriorating environmental pollution. Furthermore, current subsidy for energy production which encourages consumption means that most of the subsidy will flow into the pockets of the rich in the way that low energy price will lead to indirect energy subsidy for foreign consumers through international division of labor and international trade.

Under current circumstances, subsidizing energy price in large scale is fundamentally against economic reality of China. It will impede industrial restructuring and investment in energy conservation and energy efficiency. China, a developing country experiencing fast industrialization, must refrain from repeating the model of developed countries whose industrialization exhausted energy and raw materials. As for power consumption, industrial use contributes 76%, over 40% of which is for energy-intensive industries while residential consumption only accounts for 11% of the total, agricultural use no more than 3%. In this case, the largest share of subsidy will go to manufacturing industry. To certain extent, price signal is able to stimulate energy-intensive industries. In this sense, reforming energy price mechanism should start with price of oil and power. Price subsidy should be eliminated as soon as possible for current and long-term interest.[22]

[22] Zhou Dadi, *Who is subsidized by the low electricity price* (《压低电价补贴了谁》), Xinhua

The fast growth of heavy industry has made people realize that low energy price should be blamed for over consumption of energy and low energy efficiency. Low price stimulates enterprises to invest on energy-intensive or inefficient technologies and equipments, doing harm to industrial restructuring. Related research proves that the short-term price elasticity in terms of demand for energy is –0.015 while long-term is -0.122. This means price mechanism does influence on demand, but this influence is still minor due to the low elasticity of energy price (absolute value) and whole economy. Because the energy price mechanism only has minor influence on demand and yet to be optimized, multiple market players do not have energy-saving awareness, price hike can only have a limited control on demand.[23]

2. Energy conservation and emission reduction of enterprises is confronted with policy-related obstacles and inadequate impetus.

Enterprise is the main player for energy conservation and development of low-carbon economy. It has been proved by international experiences that the enterprises initiative to substantially reduce emission will be worn out if only market is engaged without the policies which encourage and subsidize the investment for more advanced energy-saving equipments, technologies and management mechanism. As a result, a large number of projects, technologies and even investments opportunities of great developing potential in energy will slip off. Currently, Chinese enterprises are facing the problems that can hardly be solved by themselves or market mechanism. These problems are as following:

First is the cost issue, especially in the investment of renewable energy. Without government policy support covering price, taxation and financial subsidy, market by itself can not push forward the industry of new energy against high cost nowadays. By enacting ***Renewable Energy Law*** 2005 and series of supporting practices including earmarked fund, power generation policy, price and expense sharing, price subsidy and coordinated transaction, China has generally set up its policy framework for renewable energy. But current subsidy for renewable energy projects is relatively small whether in terms of scope, amount or its proportion to the total investment in energy which basically is no more than 10% (above 40% in developed countries). At present, government policy stipulates that the renewable energy-generated power should be integrated into grid compulsorily, purchased in full with price difference shared by all regional grids. Government buys electricity at a preferential price commonly higher than that of the conventional. But the problem is that the

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Daily Telegraph，September，5，2008.

[23] Wei Yiming, Liao Hua, Fan Ying, Liang Qiaomei, *China Energy Demand and Energy Saving Potential Estimate During 11th 5 Year Period*, (《"十一五"期间我国能源需求及节能潜力预测》), one of series of report on energy and environment policy by Research Center of Energy and Environment Policy of Institute of Scientific Policy and Management Science of China's Academy of Science, China/s Research Center of Forecasting Science, 2007.

preferential pricing mechanism of renewable energies is to not flawless. For instance, in terms of power generated from wind energy, there two pricing practices: pricing upon government approval and pricing through tendering. The latter encourages market competition but any possible hostile price squashing during the process will dampen investors' enthusiasm. However, the former will constrain market competition. Taxation regime is also to be improved in terms of tax favor. Still look at wind energy-generated power, for conventional enterprises which can be deducted by input VAT for buying materials, VAT rate for them is kept around 4%. While wind farms, without need to buy any materials, consume less and do not have input VAT deduction. Therefore, VAT rate for them, after being halved, remains at 8.5%, which is higher than that of their conventional counterparts. Taxation finally fails to encourage the growth of renewable energy industry.

Second are the difficulties in financing. Energy-saving and emission reducing projects need substantial investment at one time and have a long cost recovering cycle. For example, when fulfill energy management contract, it is usually the energy-saving entities that pay first. Without policy support, these entities will find it difficult to finance. The major problems facing energy management contract are: first, insufficient is the knowledge of its pattern; second, the emerging and potential energy service companies lack required capacity and financing channels. Meanwhile, some technical problems including surveying, measuring and cost recovering also exist. Generally speaking, the obstacles in front of these companies are: long development cycle, immediate profiting inability, high liability rate and financing difficulties. Besides, the mindset of enterprises and entrepreneurs is, of course another bottleneck.

Third is the certification of standards. According to ***Energy Conservation Law of People's Republic of Chin***a, China has established its certification system for energy-saving products by setting up China Commission of Certification and Management for Energy-saving Products and Certification Center, promulgating ***Regulations of Management and Certification of Energy-saving Products*** and symbols of energy-saving products. ***Government Procurement List of Energy-saving Products*** was released in 2004 and revised twice later. The policy framework provided by it is following: (1) to implement compulsory energy-efficiency standard for some products such as automobiles, home appliances and so on. (2) to authenticate energy-saving products so that consumers will choose these products after comparison with non energy-saving ones. (3) to make list of government procurement with priorities. The policies above, largely instructive have some flaws with these policies in terms of results, such as inconsistency of different certification standards and lack of economic incentives. On one hand, the domestic energy-saving products market is far from being standardized, full of diversified certificates and products of intermingled quality, posing inconvenience for consumers to choose and use these products. On the other hand, though advanced, highly energy-efficient products may, inevitably cause high cost, making price far exceed ordinary products. Since this price difference can not be compensated because of inadequate supporting incentives, these energy-saving products in fact are not so welcomed in the market.

Last, the external infrastructure is to be enhanced. ‘Carbon Strategy’ in enterprises calls for external support. For instance, thermal and power co-generation is met with problems like integrating into grid and providing centralized heating to neighboring areas. Without support from government policy, these problems can hardly be solved only by enterprises.

3. Energy conservation and emission reduction depends on administrative mean, market-oriented approach is seldom.

Current energy conservation and emission reduction is still in the transition stage from depending on administrative means to market means. During this process, the leadership of central government and administrative means is the mainstay. By fulfilling targets in a multi-tier way, the local government and enterprises are better motivated to implement energy conservation policies. This facilitates realization of speedy results and short-term targets. Take power generation as an example, through energy conservation control, fire-hydro power exchange, launching large power generation projects while constrain small ones or replacing them with larger ones, encouraging results are yielded in this industry. In 2007, the power plants with generation capacity over 6000 kw/h(inclusive of 6000 kw/h), the standard coal consumption of power supply is 357g/kw/h, 9g/kw/h less year on year, also the largest fall in recent years. This amount means an annual saving of coal equivalent 243.2 million tons in the production of these coal fire plans, 2.75% of total consumption.

But for middle and long term, the energy conservation and emission reduction in power industry must be based on a lasting mechanism pillared by market and complimented by government. The domestic and international research of energy-saving mechanism is focused on three areas: market access, market trading and market withdrawing. They get broad concern from internationally but new to China. Based on the situation in china now, market access and withdrawing is easy to carry out through government mandate while market trading requires some particular measures to maximize its potential.

V. Preliminary Policy Suggestions

First, conduct a systematic research for the strategies, channels and related policies for development of low-carbon economy. Internationally, reducing greenhouse gases emission is becoming from a scientific consensus to global action. A Large number of industrialized countries have set their targets for emission reduction and adjusted their social and economic policies substantively. Some developing countries have also responded to climate change. It is a clearer trend that the global economy is

transforming into low-carbon economy whose influence to international economy pattern and trade rules is revealing. A low-carbon and sustainable development model is what China must choose no matter if China wants to proactively address the global issue of climate change or domestic issue of energy, resources and environment or seize the opportunities created by the transition of international economy to low-carbon to forge its new competitive edge. Therefore, China should launch the research in this field as soon as possible to be fully prepared in related knowledge.

Second, consider to integrate developing low-carbon economy into The Twelfth Five-year Plan. An early development of low-carbon economy is better than a delayed one. To integrate developing low-carbon economy into the Twelfth Five-year Plan as one of targets for social and economic development will be not only conducive to the transformation of economic growth model, but also to the solution of problems of energy, resources and environment. This integration is also a gesture to the world that China is resolute in tackling climate change. As a result, China will enjoy an improved image and status in the international community.

Third, pay close attention to the influence of climate change to the growth of international economy and international trade rules. We should promote the research and international exchange of the calculation methods of carbon emission of products. Keep track of the proceeding and consultation of international trade issues like Border Tax Adjustment for a more favorable trade climate and alleviated impact of changes in international trade policy to China's export industries. Watch the development of international low-carbon technologies and industries by which to inject new impetus into domestic counterparts.

(The Report was Provided by Task Force)

BRIEF REPORT OF IUCN WORLD CONVERSATION CONGRESS OUTCOMES AND LINKS TO THE CHINA COUNCIL'S WORK

Julia Marton-Lefèvre
Director General
International Union for Conservation of Nature (IUCN)
12 November 2008

Every four years IUCN convenes a World Conservation Congress, which includes a forum of events organized by IUCN members and partners and an IUCN Members' Assembly. The 2004 Congress took place in Bangkok and was attended by some 4,500 people.

The 2008 Congress, in Barcelona, was attended by nearly 8000 participants, and was hosted by four levels of the Spanish Government: The Ministry of Environment of Spain and three levels of the Catalonia Government. The overall theme of the Congress was '*A Diverse and Sustainable World'.* The principal underlying questions of the Congress were how to meet the growing needs of populations and expanding markets without sacrificing nature, and how to get conservation messages to new audiences.

The Congress is the world's only democratic environmental forum where the more than 1,000 IUCN members – both States and non-governmental organizations – define the conservation agenda for the years ahead. It was held against a backdrop of unprecedented loss of species and natural systems as well as a dramatic financial crisis that touched every corner of the planet. In spite of this, people decided to come to the Congress and were clearly seeking ways to solve problems together.

The Congress was divided into several parts:

- **FORMAL OPENING** on 5 October, which celebrated IUCN's 60th birthday. IUCN was founded on 5 October 1948 in Fontainebleau, France. Present at this gala opening were the Spanish Crown Prince the Prince of Asturias, Princess Sirindhorn of Thailand (passing the torch from the 2004 Congress) His Serene Highness Prince Albert of Monaco, Nobel Peace Prize Laureate Mohammad Yunus, the UN Foundation's Ted Turner, ministers of governments, CEOs of major companies, and high level officials from foundations and most countries and organizations in the world.

- **FORUM**: from 6 to 9 October nearly 1000 events took place organized by IUCN members, the IUCN Secretariat, and partners. The Forum allowed the conservation world and its partners to discuss issues, ideas and solutions. It included debates, workshops, dialogues, art and film roundtable discussions, training courses, music and exhibitions. Forum events were offered in three Forum themes:

- **A New Climate for Change** aimed to address questions such as:
  - How can we mitigate and adapt to climate change while integrating the opportunities and challenges provided by linking in biodiversity?
  - How can we respond to increasing global energy demand?
  - Can we put a value on nature? How do we market the true importance of nature in today's world?

- **Healthy Environments: Healthy People**
  - How to reduce poverty and vulnerability through sustainable management of natural resources?
  - How can ecosystem management reduce vulnerability to natural hazards and conflicts?
  - How to integrate biodiversity and ecosystem conservation in economic policy, finance and markets?

- **Safeguarding the Diversity of Life**
  - How should we decide where our limited resources can be most effectively applied to conserve biodiversity?
  - Should we sacrifice some species so that others may live, or vigorously oppose the loss of any species?
  - What are the best ways to deal with conflicts between people and wildlife in different situations?
  - Is sustainable use a myth or a reality?

- During the Forum there were also a variety of **Dialogues and Journeys**:

  - **SUSTAINABILITY DIALOGUES** were designed specifically to explore a new era of sustainability for the 21st Century. These included topics such as:
    - The Economics of Environment and Biodiversity
    - Transition to Sustainability: Towards a Human and Diverse World
    - Philanthropy for a Sustainable Future
    - Greening Development to Address Climate Chante
    - Local Action for Biodiversity – the Ignored Solution
    - Human Health and the Environment
    - Spirituality and Conservation
    - Green Construction for Sustainable Living

  - **JOURNEYS** were designed as targeted guides identifying events and providing platforms for networking around a single theme:

    - Energy
    - Islands
    - Marine
    - Forests
    - Species
    - Water
    - Protected Areas
    - Mediterranean
    - Markets and Business
    - Law and Governance

- ✧ Rights and Conservation
- ✧ Bio Cultural Diversity and Indigenous People

- **PAVILIONS**

  The ground floor of the Congress centre held eight Pavilions: multi activity areas presenting the work of IUCN and its partners. The pavilions hosted exhibitions, conversation corners, book launches, press events, informative sessions and debates. These were designed to encourage people to take a breather from the formal Congress programme for networking and encountering the cutting edge issues of the environment world.

  There were pavilions on:
  - ✧ Species
  - ✧ Marine
  - ✧ Forests
  - ✧ Energy/Climate Change
  - ✧ Water
  - ✧ Business (WBCSD)
  - ✧ Spain
  - ✧ Future (IUCN's Programme

The scope of the topics examined during the Forum is indicative of the challenges the world is facing. From climate change, threatened species forest management, from the impact of climate change on infectious diseases to the need for private sector involvement, or from indigenous rights to fisheries governance, participants were exposed to a great deal of new research, new approaches and new partnerships.

Concrete announcements were made regarding species and habitat protection. The IUCN Red List showed that we are facing an extinction crisis in nearly 40% of the species assessed, but that properly funded and well planned conservation measures can be successful – with close to 40 species of mammals showing signs of recovery.

Announcements of millions of dollars dedicated to species conservation made by the Abu Dhabi Environment Agency, by the GEF and by the Living Oceans Foundation have shown that more and more people understand the need to invest in conservation.

Important initiatives, such as the work with Google Earth, will also help raise awareness for the general public and give new tools for conservation experts around the world. The MacArthur Foundation announced a US$50 million commitment for climate change adaptation measures. Three scientific marine expeditions were announced, with the goal of increasing our knowledge about the state of our oceans.

Far-reaching agreements were also concluded. Agreement on key principles on high-seas governance were achieved; new working relationships with fishermen's association and conservation groups were established; an historical agreement on principles guiding forest management to face climate change was announced by a group including business, indigenous and conservation groups, international financial institutions and trade unions and the categories system for protected areas was agreed and adopted.

While the world seems to be entangled in the turmoil of a financial crisis, civil society, environmentalists, governments and business were busy defining a different way to do things. With initiatives such as The Economics of Ecosystems and Biodiversity (TEEB), or Integrated Biodiversity Assessment Tool (IBAT), collaboration between the conservation and business world is taking on a new and promising meaning.

The World Conservation Congress allowed NGOs to have direct access to decision makers – governmental or from the private sector. A session with 10 African Ministers, allowed participants to raise their concerns, their ideas directly; panel discussions allowed spiritual leaders, philanthropists or climate change specialists to share their thoughts to a wide and varied audience.

MEMBERS' ASSEMBLY: 10-14 October 2008

Immediately following the World Conservation Forum, IUCN's members met as the highest level decision-making body of this huge bi-cameral (governments and NGOs) organization to approve IUCN's four year programme, its financial plans, elect IUCN's governing body (Council, President and Treasurer) and pass resolutions addressed to IUCN itself, its members and partners.

- I**UCN's Programme for 2009-2012: Shaping a Sustainable Future:** The IUCN Progamme was adopted by IUCN Members. This Programme was described as the result of more extensive consultations with IUCN members than any other previous programme. The four-year programme, to be carried out by the IUCN Secretariat in close collaboration with the IUCN Commissions and members, has a core programme area and four complementary thematic programme areas.

    - Core Programme Area: Conserving Biodiversity
    - Thematic Programme Areas:
        - Changing the climate forecast
        - Naturally energizing the future
        - Managing ecosystems for human well-being
        - Greening the world economy

- **Financial Plan for 2009-2012**: Congress approved the proposed financial plan that would support the Programme. .

- **Resolutions:** IUCN members proposed some 150 motions addressed to IUCN itself, or to its partners concerned with IUCN's programme, governance, partnerships and various specific areas of the conservation agenda.

- **Elections:** IUCN's members elected the members of IUCN's governing body, its Council. Dr. Ashok Khosla (India) is the new President of the Union and Mr. Kurt Ramin (Germany) is the new Treasurer. 24 Regional Councillors were elected from all the world's regions, as were Chairs of IUCN's six Commissions dealing with:

    - Ecosystem Management
    - Education and Communication
    - Environmental, Economic and Social Policy

- Environmental Law
- Species Survival
- Protected Areas

These Commissions have more than 10,000 experts as members, contributing their knowledge and wisdom to IUCN.

WHO CAME:

Nearly 8000 people from 180 countries attended the Congress, including

- Ministers
- Government officials
- Intergovernmental officials
- NGO leaders big and small
- Indigenous People
- Youth leaders
- Women leaders
- Business leaders
- Media
- Philanthropists
- General public

TRANSITION TO SUSTAINABILITY AND LINKS TO CHINA'S HARMONIOUS SOCIETY[1]

We launched our Transition to Sustainability Book at the Congress. This was the culmination of a project entitled the Future of Sustainability, begun in 2005 and in which hundreds of experts participated. This work began with a decision for IUCN 'to review the conceptualization of conservation and sustainable development as it stands today and to help set direction of the evolution of the field and serve as a clarion call for the Union, the environmental movement and society at large'

Two Global and Multi-Sector Meetings were held iin 2006 and 2008, along with a public debate (e-discussion) and 10 IUCN regional meetings.

The Transition to Sustainability, which is the result of all this, is very similar to and complementary with China's Harmonious Society process, as is the entire movement represented at the World Conservation Congress. It would be good if all these similar efforts would now join forces.

The study begins by stating that the transition to sustainability is urgent, but asks whether it is really possible? It then charts how the environmental movement has a decisive role to play in planning and inspiring a transition to sustainability – a transition to a world that allows humanity as a whole to maintain and extend quality of life through the diversity of life.

[1] From Transition to Sustainability flyer, 2008

The book poses three important questions: Why? What? and How?

WHY DO WE NEED TO CHANGE?

Human beings are having an unprecedented impact on the planet. The scale of change is so great that some scientists have suggested that we are entering a new geological epoch which could be identified as the 'Anthropocene'. The world's ecosystems — our life support systems — are degraded and being used unsustainably. Evidence for climate change, resulting from carbon dioxide emissions from human activities, is now unequivocal with unpredictable and potentially catastrophic results for people and nature. The era of cheap oil is also coming to an end, as demand for oil increases and supplies plateau, with profound implications for the global political economy. All these issues are interdependent and have an impact on nature and people through their cascading effects on food, water, energy and resource security. They are also all coming to a head together, and at a faster pace than most policy makers could have predicted. No one is immune from their influences, although they hit the poorest and most vulnerable groups the hardest. It is clear that we are facing profound changes to life as we knew it in the last century and there are no clear road maps for the future. To survive the twenty-first century we need to make a rapid and effective transition to sustainability. The environmental movement has a key role to play in this transition.

WHAT DO WE NEED TO DO?

We need to do three things to rebalance human development with the protection of nature:

- We must help 'decarbonise' the world economy. Society needs to reduce, redirect and redistribute global consumption, and achieve dramatic reductions in carbon use. This can be done by increased technical efficiency and by de-linking energy generation from carbon production.
- We must commit the environmental movement to a path of global equity and social justice as central to the transition to sustainability. We must recognize the links between biodiversity and cultural diversity, address the links between poverty and environmental and work for social justice in practice as well as on paper.
- We must protect the biosphere. A transition to sustainability must first and foremost protect life. The conservation of nature is the fulcrum for wider change towards sustainability. But efforts to conserve biodiversity must be comprehensive and not confined to the rare and threatened. Conservation must be integrated with wider concerns about wider ecosystem health and human wellbeing.

HOW DO WE MAKE THE CHANGES?

The scale of impact is so great that 'business as usual' is no longer an option. The environmental movement needs to step-up to the challenges to play amore effective role in the transition to sustainability.

Living Lightly on the Earth: We need a new era of conservation that relates to the nature of everyday living, and that embraces sustainable livelihoods and lifestyles as well as threatened species and spaces.

Build a One Planet Economy: we need to help build a new economy that tells the ecological truth. Bydeveloping new values, markets and metrics, and rethinking the way we design and make things we can help people consume smarter and less.

Rejuvenate the Environmental Movement: we need to embrace a wider social movement for change. Much of the creativity and energy for a sustainable future is bubbling up from the grassroots.
Build the Wider Architecture of Change:we need to build responsive, dynamic and equitable institutions that are resilient enough to cope with uncertainty, and encourage collaborative actions of government, business and civil society, as well as develop practical tools and approaches.

Inspire Sustainability Transitions: above all the environmental movement must go beyond 'counting theproblems' and doom and gloom messages to foster the vision that gives us hope, encourages creativity, and inspires us to change. Times like these require an evolutionary leap in consciousness. .We have the science and knowledge we need. We now need the wisdom to direct our collective action.

MAJOR OUTCOMES of the WORLD CONSERVATION CONGRESS:

The most obvious outcome of the Congress was the **demonstration of the wide interest in conservation issues** from people from all walks of life and the indications that **a mass movement is emerging** calling for the changes IUCN has been working on for 60 years. IUCN itself has done the diagnosis on the state of the planet, and is now determined to be a part of the treatment that calls for a broad change in our relationship to nature. The clear message coming out of this meeting is that **biodiversity underpins the well-being of human societies and their economies**. But conservation can only succeed if we attack the underlying causes of biodiversity loss, and action is taken at the same time to reduce the impacts of that loss.

Major general outcomes included

- **Greater appreciation of Nature's values**:

  The current crisis in the financial world over billions of dollars of loss includes little understanding of loss of trillions in services from ecosystems. TEEB (The Economics of Ecosystems and Biodiversity) study led by Pavan Sukhdev with inputs from IUCN and others, shows that the world is losing natural capital worth between US$2 – 4.5 trillion every year. To put this figure in perspective, the recent capital loss to financial firms in the City of London and Wall Street is estimated at US$1 to $1.5 trillion. Why is it that a one-off loss of $1.5 trillion in financial capital to a group of Wall Street firms attracts so much attention, whereas the ongoing loss per annum of twice this amount of natural capital is barely reported?

- **Conservation and climate**

  Conservation has finally staked its claim on the climate agenda. Conservation requires multi-level action including mitigation and adaptation and biodiversity makes important contributions to both. The conservation community is developing tools for climate change mitigation in order to help the ability of ecosystems to bounce back to health.—through such instruments as Reduced Emissions from Deforestation and Degradation (REDD), coastal and fisheries resilience plans and sustainable management of wetlands and watersheds among others.

  A clear message was sent by IUCN to the UN's Climate Change Summit that will take place in Poland in December. IUCN is demanding more specific goals in line with the Bali Plan of Action – calling for a 50 to 85 percent reduction in CO2 emissions by 2050 and keeping rises in temperature below 2°C - and actions on biodiversity, ecosystem services and livelihoods protection.

- **Ethical framework for conservation**

  An ethical framework for conservation has emerged – we have evolved from conservation for nature's sake to conservation for both nature and human beings and never at the cost of local communities. A good example of this is The Forest Dialogue (TFD) which brings large forest companies, governments, unions ,indigenous groups and conservation experts together, agreeing on key principles such as supporting transparent, inclusive and accountable forest governance, or encouraging local processes to clarify and strengthen tenure, property and carbon rights. This ethical framework was a part of much of the discussions in the Congress.

- **Indigenous communities**

  The rights of vulnerable and indigenous communities received high priority at the World Conservation Congress as IUCN's members called on governments to take into account human rights implications, in all conservation-related activities. Congress saw the beginning of an ethical framework to guide conservation activities, where poverty reduction, rights-based approaches and "Do No Harm" principles can be applied to help redefine our relation with nature.

- **Energy options**

  An agreement was reached that not all biofuels are alike. There are some that provide real options for future energy, while others have more impact on nature than their potential to mitigate CO2 emissions. Biofuels currently operate in a relatively unregulated world with uncertain economic benefits and potentially disastrous environmental impacts. IUCN is calling on governments to regulate and manage biofuels to limit their potential impacts on people and nature. A call was also made to develop guidelines and improve standards used when considering biofuels projects.

- **Conservation and the private sector:**

  Although some reluctance to engage remains on both sides, there is an express interest in working together to decrease the impact of business operations on biodiversity.

- **Threatened Species**

  The IUCN Red List of Threatened Species™ for 2008 was launched at the Congress in Barcelona and revealed that 44,837 species have been assessed of which 38% have been classified as threatened. Comprehensive assessments of every known species of mammal, bird, amphibian, shark, reef building coral, cycad and conifer have been conducted. There are ongoing efforts to complete the assessment of all reptiles, all fishes, and selected groups of plants and invertebrates. Although, only a small proportion of the world's species has so far been assessed, this sample indicates how life on earth is faring, how little is known, and how urgent the need is to assess more species.

  The most comprehensive assessment of the world's mammals has confirmed an extinction crisis, with almost one in four at risk of disappearing forever.

BARCELONA COMMITMENTS

Even during these difficult financial times, the Congress was the occasion of announcements of substantial investments in conservation funding.

The high profile commitments made to support IUCN's mission during the Congress included:

- The MacArthur Foundation will invest $50 million in climate change mitigation and adaptation;
- The Mohammad Bin Zayed Species Conservation Fund will invest Euros 25 million for worldwide biodiversity;
- The Alcoa Foundation announced a $9 million five-year extension of its Sustainability Fellows Programme;
- France committed 7 million Euro to renew its support for IUCN's programme 2009-2012 and protected 60 hectares of forest in Fontainebleau to mark IUCN's 60 years;
- Multiple donors launched Phase Two of the Water and Nature Initiative to improve river basin management;
- With Nokia and WWF we will continue the social platform network, Connect2Earth, to engage youth;
- With ENERGIA we improve women's access to electricity and reduce dependence on biofuels;
- Francophone governments will better integrate biodiversity issues into their development policy;
- Russia pledged to protect 80 million new hectares;
- Sumatran provinces agreed to stop clearing old-growth;

- With Google we launched an interactive map of marine protected areas;
- With National Geographic and the UN Foundation, we established the first long-term streaming system that connects anyone, anywhere, to a coral reef in Belize.
- At this Congress we created the International Association of Wildlife Magazines to coordinate conservation campaigns;
- The Government of Paraguay announced zero net deforestation by 2020.
- Regional heads of state agreed to a summit at Manado, Sulawesi next May to launch the Coral Triangle Initiative to protect the world's richest coral reefs;

IUCN'S OWN COMMITMENT

We will use IUCN's knowledge and networks to influence decision-makers to secure a future for nature and better integrate biodiversity concerns into policies and practices of climate change, energy, development, human security, markets and trade

Name List of Council Members of CCICED Phase Ⅳ

（as of November 2008）

Mr. Li Keqiang	Vice Premier, State Council, **Chairperson of the Council**
Mr. Zhou Shengxian	Minister, Ministry of Environmental Protection **Executive Vice Chairperson of the Council**
Ms. Margaret Biggs	President, Canadian International Development Agency **Executive Vice Chairperson of the Council**
Mr. Xie Zhenhua	Vice Chairman, National Development and Reform Commission (NDRC), **Vice Chairperson of the Council**
Mr. Klaus Töpfer	Former Executive Director, UNEP **Vice Chairperson of the Council**
Mr. Børge Brende	Managing Director, World Economic Forum; Norway **Vice Chairperson of the Council**
Mr. Zhu Guangyao	Former Vice Minister, State Environmental Protection Administration, **Secretary General of the Council**
Ms. Jiang Zehui	Vice Chairwoman, Committee of Population, Resources and Environment, the National Committee of the Chinese People's Political Consultative Conference
Mr. He Yafei	Vice Minister, Ministry of Foreign Affairs
Mr. Zhang Shaochun	Vice Minister, Ministry of Finance
Mr. Li Ganjie	Vice Minister, Ministry of Environmental Protection
Mr. Yi Xiaozhun	Vice Minister, Ministry of Commerce
Ms. Wang Jirong	Vice Chairwoman, Environment Protection and Resources Conservation Committee, National People's Congress
Mr. Ning Jizhe	Vice Minister, Research Office, the State Council
Mr. Ding Zhongli	Vice President, Chinese Academy of Sciences (CAS); Academician of CAS
Mr. Shen Guofang	Professor, Former Vice President of Chinese Academy of Engineering (CAE); Academician of CAE Chinese Chief Advisor of the Council
Mr. Liu Shijin	Vice President, Development Research Center, the State Council
Mr. Feng Zhijun	Professor, Counsellor of the State Council
Mr. Li Xingshan	Former Academician Dean, Central Party School of the

	Communist Party of China
Mr. Zhou Dadi	Senior Research Fellow and Former President, Energy Research Institute, NDRC
Mr. Lu Yaoru	Professor, Chinese Academy of Geological Sciences, Ministry of Territory and Resources; Academician of CAE
Mr. Zou Deci	Professor and Senior Urban Planner, China Academy of Urban Planning and Design, Ministry of Construction; Academician of CAE
Mr. Zhou Wei	Professor and President, Research Institute of Highway, Ministry of Transport
Mr. Wang Hao	Professor and Director, Department of Water Resources, China Institute of Water Resources and Hydropower Research, Ministry of Water Resources; Academician of CAE
Mr. Ren Tianzhi	Professor and Deputy Director, Institute of Agricultural Resources and Regional Planning, Chinese Academy of Agricultural Sciences, Ministry of Agriculture
Mr. Wang Wenxing	Professor and Senior Advisor, Chinese Research Academy of Environmental Sciences; Academician of CAE
Mr. Niu Wenyuan	Professor and Chief Scientist, Institute of Policy and Management, Chinese Academy of Sciences
Mr. Ma Xiangcong	Senior Research Fellow, Institute of Law, Chinese Academy of Social Sciences
Mr. Ding Yihui	Professor and Senior Advisor, China Meteorological Administration; Academician of CAE
Mr. Hao Jiming	Professor and Dean, Department of Environmental Science & Engineering, Tsinghua University; Academician of CAE
Ms. Sarah Liao	Former Secretary to the Environment, Transport and Works of the Hong Kong Special Administrative Region Government
Mr. Roger Beale	Senior Associate, the Allen Consulting Group; Former Portfolio Secretary, the Department of Environment and Heritage, Australia
Ms. Soledad Blanco	Director, International Affairs and LIFE, DG Environment,

	European Commission
Mr. Corrado Clini	Director General of Sustainable Development and Research Department, Ministry for Environment, Land and Sea, Italy
Mr. Gordon Conway	Chief Scientific Advisor, Department for International Development, UK
Ms. Linda Cook	Board Member of Executive Committee and Chief Executive Officer for Gas and Power, the Royal Dutch/Shell Group
Mr. Daniel J. Dudek	Chief Economist, Environmental Defense Fund, USA
Mr. John Forgách	Group Chairman, the Equator LLC in New York; Brazil
Mr. Arthur Hanson	Distinguished Fellow and Former President, International Institute for Sustainable Development, Canada; International Chief Advisor of the Council
Mr. Stephen B. Heintz	President, Rockefeller Brothers Fund
Mr. Masami Ishizaka	Advisor, Overseas Environmental Cooperation Center, Japan
Mr. James Leape	Director General, WWF
Ms. Julia Marton-Lefevre	Director General, IUCN
Mr. Lars-Erik Liljelund	Director General, the Swedish Primeminister Office
Mr. Dirk Messner	Director, German Development Institute
Mr. Mark Moody-Stuart	Chairman, Anglo American plc; UK
Mr. Mohammed Valli Moosa	Former Minister of Environmental Affairs and Tourism of the Republic of South Africa
Mr. R.K. Pachauri	Director General, the Energy & Resources Institute, India Chair of UN Intergovernmental Panel on Climate Change (IPCC)
Mr. Achim Steiner	Executive Director, UNEP
Mr. Björn Roland Stigson	President, World Business Council for Sustainable Development
Mr. Hau-sing Tse	Senior Vice President, CIDA, Canada
Ms. Laurence Tubiana	Director, Institute of Sustainable Development and International Relations, France
Mr. Hans van der Vlist	Vice Minister, Ministry of Housing, Spatial Planning and the Environment, the Netherlands

Participants List of the CCICED 2008 AGM

Chairperson

Li Keqiang	Vice Premier, State Council

Council Members

1.	Zhou Shengxian	Minister, Ministry of Environmental Protection (MEP) **Executive Vice Chairperson**
2.	Margaret Biggs	President, Canadian International Development Agency **Executive Vice Chairperson**
3.	Xie Zhenhua	Vice Chairman, National Development and Reform Commission (NDRC) **Vice Chairperson**
4.	Klaus Töpfer	Former Executive Director, UNEP **Vice Chairperson**
5.	Børge Brende	Managing Director, World Economic Forum; Norway **Vice Chairperson**
6.	Zhu Guangyao	**Secretary General**
7.	Jiang Zehui	Vice Chairwoman, Committee of Population, Resources and Environment, National Committee of CPPCC *Absent*
8.	He Yafei	Vice Minister, Ministry of Foreign Affairs
9.	Zhang Shaochun	Vice Minister, Ministry of Finance *Absent*
10.	Yi Xiaozhun	Vice Minister, Ministry of Commerce
11.	Li Ganjie	Vice Minister, Ministry of Environmental Protection
12.	Ning Jizhe	Vice Minister, Research Office, State Council
13.	Wang Jirong	Vice Chairwoman, Environment Protection and Resources Conservation Committee of NPC
14.	Ding Zhongli	Vice President, Academician Chinese Academy of Sciences (CAS) *Absent*
15.	Shen Guofang	Former Vice President of Chinese Academy of Engineering(CAE); Academician of CAE; Chinese Chief Advisor of the Council
16.	Liu Shijin	Vice President, Development Research Center, State Council
17.	Feng Zhijun	Professor, Counsellor of the State Council
18.	Li Xingshan	Former Academician Dean, CPC Central Party School
19.	Zhou Dadi	Senior Research Fellow and Former President, Energy Research Institute, NDRC
20.	Lu Yaoru	Professor, Chinese Academy of Geological Sciences, Academician of CAE
21.	Zou Deci	Professor, China Academy of Urban Planning and Design, Academician of CAE

22.	Zhou Wei	Professor and President, Research Institute of Highway, Ministry of Transport
23.	Wang Hao	Professor, China Institute of Water Resources and Hydropower Research; Academician of CAE *Absent*
24.	Ren Tianzhi	Professor, Chinese Academy of Agricultural Sciences, Ministry of Agriculture
25.	Wang Wenxing	Professor and Senior Advisor, Chinese Research Academy of Environmental Sciences; Academician of CAE
26.	Niu Wenyuan	Professor and Chief Scientist, Institute of Policy and Management, CAS
27.	Ma Xiangcong	Senior Research Fellow, Institute of Law, Chinese Academy of Social Sciences
28.	Ding Yihui	Professor and Senior Advisor, China Meteorological Administration; Academician of CAE
29.	Hao Jiming	Professor and Dean, Department of Environmental Science & Engineering, Tsinghua University; Academician of CAE
30.	Sarah Liao	Former Secretary, The Environment, Transport and Works of Hong Kong Regional Government
31.	Roger Beale	Senior Associate, the Allen Consulting Group; Former Portfolio Secretary, the Department of Environment and Heritage, Australia
32.	Soledad Blanco	Director, International Affairs and LIFE, DG Environment, European Commission
33.	Corrado Clini	Director General of Sustainable Development and Research Department, Ministry for Environment, Land and Sea, Italy *Absent*
34.	Gordon Conway	Chief Scientific Advisor, Department for International Development, UK
35.	Linda Cook	Board Member of Executive Committee and Chief Executive Officer for Gas and Power, the Royal Dutch/Shell Group *Absent*
36.	Daniel J. Dudek	Chief Economist, Environmental Defense Fund, USA
37.	John Forgách	Group Chairman, the Equator LLC in New York; Brazil
38.	Stephen B. Heintz	President, Rockefeller Brothers Fund
39.	Arthur Hanson	Distinguished Fellow and Former President, International Institute for Sustainable Development, Canada; International Chief Advisor of the Council
40.	Masami Ishizaka	Advisor, Overseas Environmental Cooperation Center, Japan
41.	James Leape	Director General, WWF *Absent*
42.	Julia Marton-Lefevre	Director General, IUCN
43.	Lars-Erik Liljelund	Director General, the Swedish Primeminister Office
44.	Dirk Messner	Director, German Development Institute
45.	Mark Moody-Stuart	Chairman, Anglo American plc; UK
46.	Mohammed Valli Moosa	Former Minister of Environmental Affairs and Tourism of the Republic of South Africa
47.	R.K. Pachauri	Director General, the Energy & Resources Institute, India Chair of UN Intergovernmental Panel on Climate Change (IPCC)

		Absent
48.	Achim Steiner	Executive Director, UNEP
49.	Björn Roland Stigson	President, World Business Council for Sustainable Development
50.	Hau-Sing Tse	Senior Vice President, CIDA, Canada
51.	Laurence Tubiana	Director, Institute of Sustainable Development and International Relations, France
52.	Hans van der Vlist	Vice Minister, Ministry of Housing, Spatial Planning and the Environment, the Netherlands

Task Forces Co-Chairs

53.	Chen Yiyu	President of National Natural Science Foundation of China, Academician of CAS *Absent*
54.	Pu Hongjiu	Vice President, China Coal Industry Association
55.	Jiang Yi	Head of Department of Building Science and Technology, Tsinghua University; Academician of CAE *Absent*
56.	Lin Erda	Professor ,Institute of Environment and Sustainable Development in Agriculture, Chinese Academy of Agriculture
57.	Ye Ruqiu	Counsellor of the State Council of China
58.	Guo Xinbiao	Director, Department of Environment and Health, Health Science Center of Peking University
59.	David Strangway	President of Quest University, Canada
60.	Seiji IKKATAI	Professor, The Research Center for Advanced Policy Studies, Institute of Economic Research, Kyoto University
61.	Ernst von Weizsäcker	Dean, Bren School of Environment, UC Santa Barbara
62.	Knud Pedersen	Vice President, Group R&D, DONG Energy, Denmark
63.	Lee Tzu Yang	Chairman, Shell Companies in Singapore
64.	Mark Jaccard	Professor, School of Resource and Environmental Management, Simon Fraser University, Canada *Absent*
65.	Beate Jessel	President, the Federal Agency for Nature Conservation (BfN), Germany *Absent*

Special Guests

66.	Liu Xirong	Member of the NPC Standing Committee, Former Deputy Secretary of the CPC Discipline Committee
67.	Zhang Yong	Deputy Secretary General, State Council
68.	Ding Xuedong	Vice Minister, Ministry of Finance
69.	Svein O. Sæther	Ambassador, Embassy of Norway
70.	Mikael Lindstrom	Ambassador, Embassy of Sweden
71.	Lim Haw Kuang	Executive Chairman, Shell Companies in China
72.	Brendan Gillespie	Head, Environment and Globalization Division, Environment Directorate, Organization for Economic Cooperation and Development (OECD)

73.	Nay Htun	Professor, Stony Brook University, State University of New York; Former UN Assistant Secretary General, UNDP, UNEP
74.	Tomas Kåberger	Director, Swedish Energy Agency

Chinese Observers

75.	Xie Yiya	Director General, Policy Research Office of the CPC Central Committee
76.	Zhao Jiarong	Director General, National Development and Reform Commission
77.	Ma Yanhe	Director General, Ministry of Science and Technology
78.	Hu Baolin	Director General, Ministry of Environmental Protection
79.	Kan Baoguang	Director General, Ministry of Environmental Protection
80.	Zhao Hualin	Director General, Ministry of Environmental Protection
81.	Lu Xinyuan	Director General, Ministry of Environmental Protection
82.	Xu Qinghua	Director General, Ministry of Environmental Protection
83.	Tao Deliang	Director General, Ministry of Environmental Protection
84.	Zhang Lian	Director General, Ministry of Environmental Protection
85.	Zhang Kening	Director General, Ministry of Commerce
86.	Chen Zuxin	Director General, Research Office of the State Council
87.	Feng Fei	Director General, Development Research Center of the State Council
88.	Xia Guang	Director General, Policy Research Center, MEP
89.	Chen Yanping	Director General, Sino-Japan Friendship Center for Environmental Protection, MEP
90.	Yang Mingsen	Director General, China Environment News, MEP
91.	Wu Bo	Director General, Assessment Center of Environmental Engineering, MEP
92.	Li Jinghui	Deputy Director General, Ministry of Finance
93.	Tao Qingfa	Deputy Director General, Ministry of Land and Resource
94.	You Yanxin	Deputy Director General, Ministry of Environmental Protection
95.	Bie Tao	Deputy Director General, Ministry of Environmental Protection
96.	Chen Liang	Deputy Director General, Ministry of Environmental Protection
97.	Liu Zhiquan	Deputy Director General, Ministry of Environmental Protection
98.	Mu Guangfeng	Deputy Director General, Ministry of Environmental Protection
99.	Chen Lifeng	Deputy Director General, Ministry of Environmental Protection
100.	Yue Ruisheng	Deputy Director General, Ministry of Environmental Protection
101.	Zhang Lei	Deputy Director General, Ministry of Environmental Protection
102.	Liu Youbin	Deputy Director General, Ministry of Environmental Protection
103.	Ye Hongjun	Deputy Director General, Ministry of Transport
104.	Sun Xuetao	Deputy Director General, Ministry of Water Resources
105.	Zou Ruicang	Deputy Director General, Ministry of Agriculture
106.	Li Nuyun	Deputy Director General, State Forestry Administration
107.	Feng Renguo	Deputy Director General, Chinese Academy of Sciences
108.	Cheng Jiayi	Deputy Director General, Chinese Academy of Engineering
109.	Wang Fengchun	Deputy Director General, the Environment Protection and Resources Conservation Committee, NPC
110.	Song Xiaozhi	Deputy Director General, Foreign Economic Cooperation Office, MEP
111.	Ren Yong	Deputy Director General, Policy Research Center, MEP
112.	Wang Jinnan	Deputy Director General, Academy of Environmental Planning, MEP

113.	Wang Shancheng	Director, National Development and Reform Commission
114.	Li Jingxi	Director, Ministry of Environmental Protection
115.	Chen Ning	Director, Ministry of Commerce
116.	Liu Mingming	Director, Ministry of Commerce
117.	Yang Xia	Director, Ministry of Health
118.	Zhuang Xuliang	Director, Chinese Academy of Sciences
119.	Gao Zhanjun	Director, Chinese Academy of Engineering
120.	Wang bin	Director, State Oceanic Administration
121.	Zhao Hongju	Director, the All-China Women's Federation
122.	Xiang Dihai	Deputy Director, Ministry of Finance
123.	Zhang Hongxing	Deputy Director, Ministry of Water Resources
124.	Zhao Yuechao	Deputy Director, Ministry of Health
125.	Yuan Yangang	Deputy Director, Research Office, State Council
126.	Guo Lishi	Officer, Research Office, State Council
127.	Zhang Junyan	Officer, China Meteorological Administration
128.	Liu Xielin	Professor, Chinese Academy of Sciences
129.	Mao Qizhi	Professor, Tsinghua University
130.	Lin Borong	Associate Professor, Tsinghua University
131.	Zhang Jianyu	Visiting Professor, Tsinghua University, China program head of EDF
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133.	Zhao Xiaohong	Professor, Central Party School of the Communist Party of China
134.	Lv Jianhua	Professor, Central Party School of the Communist Party of China
135.	Hu Zhenqi	Professor, China University of Mining and Technology
136.	Zhai Qi	Deputy Secretary General, China Business Council for Sustainable Development
137.	Li Yuhua	Deputy Director, Department of Sustainable Development, China Federation of Industry Economics
138.	Kang Rong	Director, China Coal Industry Association
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141.	Song Xiujie	Research Fellow, Beijing Academy for Environmental Protection
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145.	Zhu Shouxian	Associate Research Fellow, Chinese Academy of Social Sciences
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152.	Wang Hao	Project Manager, China Business Council for Sustainable Development

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155.	Li Xing	Program Officer, Embassy of Australia
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160.	Nicolas St-Pierre	Second Secretary, Embassy of Canada
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167.	Thomas Helfen	Counsellor, Head of Economic Cooperation and Development Department, German Embassy
168.	Michaela Abels	First Secretary, Industry and Environment, German Embassy
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177.	Aya Horiuchi	Researcher, OECC, Japan
178.	Koji Narita	First Secretary, Embassy of Japan to China
179.	Hideaki Koyanagi	Director, Sino-Japan Cooperation Project Office, Institute for Global Environmental Strategies (IGES)
180.	Akimitsu Okubo	Assistant Resident Representative, Japan International Cooperation Agency China Office
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182.	Lucy Naydenova	Senior Policy Officer, Ministry of Housing, Spatial Planning and the Environment, the Netherlands
183.	Ilse Elizabeth Pauwels	First Secretary, Embassy of the Kingdom of the Netherlands
184.	Turid Sand	Deputy Director General, Norwegian Ministry of the Environment
185.	Jannicke Graatrud	Adviser, Norwegian Ministry of Foreign Affairs
186.	Nina Rør	Environmental Counsellor, Royal Norwegian Embassy
187.	Monika P. Thowsen	Counsellor (Development), Royal Norwegian Embassy

188.	Tom Preststulen	Elkem-Senior Vice President and Corporate Governor Asia, Norway
189.	Knut H. Alfsen	Head Research Director, Center for International Climate and Environmental Research-Oslo (CICERO), Norway
190.	Glen Peters	Senior Research Fellow, CICERO, Norway
191.	Anna George	First Secretary, Embassy of Sweden
192.	Ping Höjding	First Secretary, Embassy of Sweden
193.	Nicolas Week	Second Secretary, Embassy of Sweden
194.	Jonathan Joo-Thomson	Head of Climate Change Section, British Embassy Beijing
195.	Bernice Lee	Head, Energy, Environment and Development Program, The Royal Institute of International Affairs, Chatham House, UK
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198.	Brett Pierce	Second Secretary of Environment, Science & Technology and Health, The United States of American Embassy, Beijing
199.	Nicholas Costello	Head of the Cooperation Section, European Commission Delegation to China
200.	Magnus Gislev	First Secretary, European Commission Delegation to China
201.	Wang Zhijia	Deputy regional Director, UNEP
202.	Maxwell Gomera	Executive Assistant to the Executive Director, UNEP
203.	Nick Nuttall	Spokesperson, Office of the Executive Director, UNEP
204.	Zhang Shigang	Coordinator, UNEP China Office
205.	Muralee Thummarukudy	Programme Officer, UNEP
206.	Zhang Jinhua	Programme Officer, Division of Early Warning and Assessment, UNEP
207.	Zhang Wenjuan	Executive Assistant, UNEP China Office
208.	Brent Powis	Advisor on Environmental Health, WHO China Office
209.	Mao Jixiang	Program Officer, WHO China Office
210.	Sajjad Ajmal	Representative and Head, UNIDO Regional Office
211.	Alessandro Amadio	Industrial Development Officer, UNIDO Regional Office
212.	Aban Marker Kabraji	Regional Director, IUCN Asia
213.	Zhuang Hao	Program Coordinator, IUCN China
214.	Shannon Qian	Program Assistant, IUCN China
215.	Dermot O' Gorman	Country Representative, WWF Beijing Office
216.	Zhou Lidong	Program Officer, WWF Beijing Office
217.	Eija Kiiskinen	Head of Accession Unit, OECD
218.	Marcel Engel	Managing Director, Regional Network, World Business Council for Sustainable Development (WBCSD)
219.	Philip Reuchlin	Assistant Manager, Regional Network, WBCSD
220.	Christophe Weber	Chief Representative, World Economic Forum Beijing Representative Office
221.	Qu Pengcheng	Senior Manager, World Economic Forum Beijing Representative Office

222.	Shenyu G. Belsky	Program Director, Rockefeller Brothers Fund
223.	Beverly Zhao	Government and SOEs Communication Manager, Shell (China) Ltd.
224.	Phillip Dobbs	Chief Representative, Anglo American plc Beijing Office
225.	Tina Meng	Head of Sustainable Development and Communications, Anglo American plc Beijing Office
226.	Cathy Tai	Vice President, PepsiCo China
227.	Zhao Zheng	Government Affairs Manager, PepsiCo China
228.	Zheng Shiwen	Country Environmental Advisor, ABB China Ltd.

CCICED Secretariat

229.	Guo Jing	Director, CCICED Secretariat
230.	Chris Dagg	Director, CCICED Secretariat International Support Office
231.	Dai Yichun	Deputy Director, CCICED Secretariat International Support Office
232.	Wang Kezhong	Secretariat Deputy Director
233.	Lu Xueyun	Secretariat Program Officer
234.	Zhang Ou	Secretariat Program Officer
235.	Li Yong	Secretariat Program Officer
236.	Lucie Mcneil	Consultant, Canada
237.	Jean Marchand	Interpreter, Canada

THE CHINA COUNCIL
FOR INTERNATIONAL COOPERATION
ON ENVIRONMENT AND DEVELOPMENT

ANNUAL GENERAL MEETING
2008

Shangri-La Hotel, Beijing

November 12 - 14 2008

SUMMARY RECORD

December 2008

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ABBREVIATIONS

AGM	Annual General Meeting
CA	Chief Advisor
CCICED	China Council for International Cooperation on Environment and Development
CDM	Clean Development Mechanism
CIDA	Canadian International Development Agency
CO_2	Carbon Dioxide
COD	Chemical Oxygen Demand
CPC	Communist Party of China
DC	Developed Country
EIA	Environmental Impact Assessment
EU	European Union
FYP	Five-Year Plan
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GOC	Government of China
IPR	Intellectual Property Rights
IUCN	International Union for the Conservation of Nature
LCE	Low Carbon Economy
LDC	Less Developed Country
LED	Light Electric Diode
MDG	Millennium Development Goals
MEP	Ministry of Environmental Protection
NDRC	National Development and Reform Commission
NOx	Nitrogen Oxide
NPC	National People's Congress
OECD	Organization for Economic Co-operation and Development
R&D	Research and Development
RMB	Renminbi, China's currency
S&T	Science and Technology

SD	Sustainable Development
SEPA	State Environmental Protection Administration
SERI	CCICED Secretariat
SISO	CCICED Secretariat International Support Office
SME	Small and Medium Enterprise
SO_2	Sulphur Dioxide
TF	Task Force(s)
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
US	United States
WTO	World Trade Organization

THE CHINA COUNCIL
FOR INTERNATIONAL COOPERATION ON
ENVIRONMENT AND DEVELOPMENT

ANNUAL GENERAL MEETING
2008

Shangri-La Hotel, Beijing
November 12 – 14 2008

SUMMARY RECORD[1]

I. INTRODUCTION

1. The China Council for International Cooperation on Environment and Development ("the Council" or CCICED) was established by the State Council of the Government of China (GOC) in 1992 to support cooperation in the areas of environment and development between China and the international community.

2. The Council is a high-level advisory body that puts forth recommendations on environment and sustainable development for the Chinese Government's consideration. It has so far held five annual meetings in each of the First(1992-1996), Second(1997-2001) and Third Phases (2002-2006), and convened two meetings in the Fourth Phase (2007-2012), which was officially inaugretaed in 2007. There are seventeen international donors supporting the Council's operations during Phase IV: Australia, Canada, Denmark, the EU, France, Germany, Italy, Japan, The Netherlands, Norway, Rockefeller Brothers Fund, Shell, Sweden, UK, UNDP, Environmental Defense Fund, and WWF.

3. The Council supports the development of an integrated and coherent approach to sustainable development and environment, while promoting closer cooperation between China and other countries. While being non-profit, the Council has strong government involvement and support. At present the Council is composed of 28 Chinese Members and 25 International Members, all chosen from different background and for their experience and expertise.

[1] This Summary Record of the CCICED 2008 Annual General Meeting was prepared by Ms Lucie McNeill for SISO. It was compiled on the basis of more detailed notes recorded during the Annual General Meeting (AGM).

4. The Council is chaired by Mr. Li Keqiang, Vice Premier of China's State Council and a member of the Political Bureau's Standing Committee of the CPC.

5. The host institution is the Ministry of Environmental Protection (MEP) of China. Previously known as the State Environmental Protection Agency (SEPA), MEP has been made responsible for the Council and for ensuring inter-ministerial coordination. It has established a Secretariat (SERI) to maintain and develop international and domestic contacts. The Secretariat ensures follow-up in China to CCICED recommendations, and deals with routine matters when the Council is not in session. The Secretariat is assisted by the Secretariat International Support Office (SISO), located at Simon Fraser University in Burnaby, Canada, and is funded by the Canadian International Development Agency (CIDA).

6. To encourage frank and direct exchanges it has been agreed that the Summary Record of the Meeting, which represents an attempt to record proceedings in as accurate way as possible, should present an overview of the discussions without attribution to individual speakers

II. AGENDA ITEMS

ITEM 1. ADOPTION OF THE AGENDA

7. The 2008 Annual General Meeting was called to order by Executive Vice-Chair and MEP Minister Zhou Shengxian who presided over this first session of the AGM. He remarked on the presence of Council Chair, Vice Premier Li Keqiang. He introduced the International Executive Vice-Chair and CIDA President Margaret Biggs; Vice-Chairs Børge Brende, Klaus Töpfer, and Xie Zhenhua; and the CCICED Secretary General Zhu Guangyao. He welcomed guests, Council members, and observers to the 2008 AGM.

The 2008 AGM's theme is Innovation for a Harmonious Development. The agenda was presented and adopted as circulated to the Council.

ITEM 2. OPENING CEREMONY

8. Mr. Zhou Shengxian invited CIDA President and Council Executive Vice-Chair Margaret Biggs to address the assembly. During the course of her remarks, Ms Biggs made the following points.

1) The Council, founded in 1992, has a successful history of bringing the best Chinese and international expertise to bear on China's pressing problems. It is a unique forum for collaboration between policy makers, scientists, academics, practitioners and experts, demonstrating not only international commitment to cooperation, but also China's

determination to meet these challenges. The work of the Council is as relevant as it has ever been. The Council will endeavour to produce sound recommendations to the Government of China.

2) The current global recession will require renewed strategies for economic growth. The world's economy and its ecology are interlinked but the present crisis threatens to derail current efforts on the environmental front. Council recommendations will need careful crafting to avoid this pitfall and embrace environmental investment as a key component of the new economic growth paradigm.
3) The Task Force report on Innovation for an Environmentally Friendly Society calls for an Environmental Innovation Action Plan and Program that can quickly move innovative technologies from the laboratory to the market, thereby curtailing pollution and environmental degradation, and boosting competitiveness. The development of markets is key to innovation, and recommendations will deal with market development and the role of international cooperation in this area.
4) The Task Force on Environment and Health indicates there is more research needed in China on the full extent of the damage to human health from environmental sources. The announcement by China's MEP and the Ministry of Health on an Action Plan to address these issues is noted. The AGM will discuss recommendations to provide a much stronger and publicly available information base on toxic substances, as well as mechanisms required to make the Action Plan effective. The experience of other countries in the area of compensation for environmental damage to health will be presented.
5) Early consideration will be given to progress made by Task Forces addressing environment and energy – a vitally important issue for China and the world. The Council has been exploring the Low Carbon Economy for the past two years and preliminary Task Force recommendations will be presented, with suggestions that these be taken into account as China prepares its 12th Five Year Plan (FYP).
6) The Council, by helping China safeguard its own sustainability achievements including reaching many of the Millennium Development Goals (MDG), restoring forests and grasslands, and improving environmental sanitation, is also helping the rest of the world move closer to the concept expressed by China as *Ecological Civilization.* China's continued seriousness and determination in facing its environment and development challenges are impressive. One of the measures taken was the creation in 2008 of the Ministry of Environmental Protection (MEP) and the Council offers its continued cooperation and support to Minister Zhou Shengxian and his colleagues.

9. Mr. Zhou Shengxian invited China's Vice Premier and CCICED Chair Li Keqiang to address the Council. On behalf of the GOC, Vice Premier Li thanked those who contribute to the work of the Council and welcomed CCICED members to China. He highlighted these issues during the course of his remarks.

1) The world economy is going through dramatic changes, with the current global financial crisis starting to affect physical markets, almost certainly bringing about a slowdown of development. Countries around the world must work in concert to maintain stable growth. China is also affected by the global downturn, and has had to deal with disasters last year, such as the Sichuan earthquake.
2) While China's economy is expected to continue to grow, it is taking proactive measures to maintain stability such as its flexible monetary policy and the recently announced rescue package which will provide significant funds for infrastructure and ecological construction. Although it is increasing investment in order to spur consumption, the GOC is taking into account the protection of the environment. The economic crisis presents an opportunity to transform China's development model and adjust its industrial structure while improving livelihoods. It is also an opportunity to strengthen weak links between the economy and the environment, nurturing promising new ventures such as green technologies, products and processes. China is hoping to enter a new development paradigm.
3) As China celebrates the 30th anniversary of the Reform and Opening Policy, the GOC is emphasizing sustainable development and ecological protection, while not neglecting economic growth. Its efforts are paying off in the form of reduced Chemical Oxygen Demand (COD) and sulphur dioxide (SO_2) in 2007. The Sichuan earthquake triggered additional environmental problems such as unsafe drinking water. The Beijing Olympics galvanized government action at all levels, with resulting improvements in air quality during the Games.
4) China is still a less developed country (LDC), going through rapid processes of industrialization, urbanization and growth, and experiencing regional gaps in terms of economic and social development. The GOC realizes how central environmental protection is to its own people's and the world's wellbeing. China is committed to a scientific approach to development, and to putting people first; it will intensify the coordination between the environment, economic development and social considerations, promoting ecological civilization, realizing energy conservation and supporting an environmentally-friendly industrial structure. This will require institutional innovation and mobilizing the population.
5) The GOC believes market mechanisms can be powerful levers. It has decided to adopt energy pricing that reflects supply and demand, as well as the scarcity of the resource and environmental costs. Enterprises and households will thus be encouraged to reduce

consumption and emissions. Gradually, ecological compensation mechanisms will be strengthened in order to improve our capacity to protect the environment. This will require the development of emerging energy efficient industries. Expect the government to support innovation, to develop environmental technologies, to disseminate them and to speed up the development of energy conservation facilities and services. We hope these measures will also grow the economy.

6) The GOC intends to conduct more campaigns focusing on energy conservation and environmental protection in order to inform people and enterprises; it is felt environmental awareness will help China become an energy conserving and environmentally friendly society. The government believes the Reform and Opening Policy has proven effective in promoting environmental protection through international cooperation and the introduction of advanced technologies.
7) Climate change is an issue facing the whole globe. Even with a slowing economy, no country can relent in the struggle. China will continue to shoulder its common but differentiated responsibility in this matter.
8) The CCICED started in 1992 and has been an important window to showcase China's achievement in the area of environmental protection. It has been a vital platform for cooperation and exchange. It is hoped the Council will continue to provide the GOC with targeted recommendations that can be implemented and benefit the whole planet, humanity's common home.

ITEM 3. SPECIAL SPEECHES AND GENERAL DEBATE

a) CCICED Vice-Chairs' Opening Statements

10. With CCICED Executive Vice-Chair Margaret Biggs presiding, Council Vice-Chairs Xie Zhenhua, Klaus Töpfer and Børge Brende addressed the AGM.

11. In his remarks Mr Xie Zhenhua, National Development and Reform Commission (NDRC) Vice-Chair, underlined the following points:

1) The GOC has continued its efforts to reduce emissions and increase energy efficiency since the last AGM and in preparation for the Copenhagen conference. China had to overcome serious challenges and hardships over the past year due to natural disasters. The Beijing Olympics saw improved performance on emissions and energy conservation. Many laws and regulations related to the environment were improved; work is now starting on major revisions of the country's main Environmental Law.

2) Resource conservation must be a basic principle of China's development; a responsibility system will be set up to deal with emissions reduction and energy conservation. Next January, a new law will be enacted to implement the circular economy; it includes rules on energy consumption in public buildings. These and other measures, such as incentives to adopt more energy efficient technologies and hard targets for emissions, present a systematic approach to reducing energy consumption and encouraging conservation. Twelve major emissions reduction, conservation and energy efficiency projects have been initiated. By the end of 2008, 80% of China's new buildings must comply with energy efficiency criteria; similarly, 113 priority cities have been mandated to reach set standards for surface water collection, as well as improve their performance in waste reduction and energy efficiency.

3) In 2006 and 2007 despite a rapidly growing economy, cumulative energy savings reached the equivalent of 147 million tonnes of coal. By the end of last year, China had desulphurization equipment installed on some 120 million kilowatt of thermal power generation across the country; new urban waste water treatment capacity had reached 13 million tonnes per day; COD emissions were down 3.2% from 2006, to 13.82 million tonnes; total SO_2 emissions were 4.7% less than last year, falling to 24.68 million tonnes. In the first half of 2008, COD and SO_2 have both decreased by 3.96% and 2.48% respectively, compared with the same period in 2007.

4) There has been tighter management of energy-intensive enterprises. China has decommissioned a significant capacity of its highly polluting and energy consuming enterprises, promoting instead more benign investments such as the service sector. The GOC is also implementing significant reforms in resource pricing, as well as its tariff and subsidy structure. Generally, it is adopting incentives for energy efficient and environmentally friendly products and industries, while providing disincentives targeting heavy polluters, energy users and producers of resource-inefficient products. For example, tariffs have been cut on highly efficient vehicles. Financial measures have also been taken, ensuring credit markets favour energy-efficient and environmentally friendly enterprises; China now approves of bond issues to finance environmental infrastructure such as water treatment plants.

5) Despite progress made, China's current development model has yet to be transformed. Energy and resource consumption are high and will continue to grow due to the rising population, continuing urbanization and industrialization. Efforts will have to intensify if China is to achieve the mandatory intensity-based emissions and energy targets set out in the 11th FYP. In order to deal with the current global economic crisis, the GOC has put forth a 4 trillion RMB stimulus package, comprising 10 major measures to boost domestic demand and improve quality of life; some of the measures deal with post-earthquake reconstruction, and

some target environmental infrastructure projects. The GOC sees this stimulus package as an opportunity to tackle climate change and other environmental challenges.

6) Currently, 8.3% of China's total energy is supplied by renewable sources; the target for 2010 is 10% and for 2020, 15%. In order to achieve the targets, China is investing in wind farms, hydropower generating stations and nuclear stations. China has become more efficient in its use of coal, reducing CO_2 emissions by 835 million tons. And it is playing an active role in rallying international consensus and momentum around the Paris Roadmap and the Copenhagen Conference. The GOC has released a working paper on climate change, detailing China's relevant policies and measures. The CCICED is well positioned to contribute to the GOC's thinking in this area at this critical time.

12. Council Vice-Chair and the former Executive Director of the United Nations Environment Programme (UNEP) Mr Klaus Töpfer made the following points as he addressed the Council:

1) The past year has been fruitful on the environmental world stage for China. President Hu Jintao articulated clearly at the Communist Party of China (CPC) Congress the paradigm shift that is sought as China moves to implement its goals of a harmonious society and ecological civilization. Legislation is now in place to support the circular economy, renewable energy and urban planning. International members of Council should contribute to the greater dissemination of information about China's commitments.
2) The current global economic recession will cause job losses, stagnation and social dislocation. This will be felt especially deeply in developing countries and among the poorest of the poor. With its recent stimulus package, China is demonstrating it is a responsible global citizen. This crisis must spur us to realize a green economic structure; otherwise this cycle is doomed to repeat itself. China could be one of the countries taking the lead in developing this new structure and integrating the principle of fairness. The implementation of China's US $500 million stimulus package is a good opportunity to implement Premier Wen's *Three Transformations*.
3) China's White Paper on Climate Change shows China will not be a victim, rather it intends to use the crisis as an opportunity to improve energy efficiency, build new infrastructure and conserve resources. China's actions are bound to make a significant contribution to the Copenhagen Conference.
4) China is to be commended for hosting the Green Olympics in Beijing. The next major event with be the 2010 "*Better Cities, Better Life*" World Exhibition in Shanghai. Sustainable development as a concept can only succeed if it is applied in cities. It is expected that 30% of China's population will live in cities by 2030. China is exploring actively many sustainable

processes and solutions. Thanks to a Clean Development Mechanism (CDM) project, methane collected in a Shanghai landfill is burned, contributing to the regional power grid. China is also researching using the sludge that is a bi-product of sewage treatment plants.

5) The most visible sign of China's commitment to the environment is the creation of the Ministry of Environmental Protection. It is hoped MEP will be granted the necessary staff and budget.

13. Vice-Chair Børge Brende, who is the Managing Director for World Economy Forum, addressed the AGM and stressed these ideas:

1) Premier Wen Jiabao has announced a brave and timely stimulus package that also includes important environmental measures. Past downturns saw a corresponding destruction of the environment but the world can no longer afford to rescue the economy at the expense of forests, land and other resources.
2) China has shown it is an economic innovator; it will prove to be so as well in environment and development. The path taken by 1.3 billion people cannot but have an impact on the rest of the world. The global financial crisis is the right time for China to move to a low carbon growth path, with investment in renewable and low carbon technologies. Two lessons were learned during the recent World Economic Forum in Dubai: first, the longer the delay in mitigating risk, the greater the crisis. Secondly, the growth engine the world needs now could be investment in low carbon infrastructure and energy efficiency.
3) Enormous markets will develop for environmentally friendly technologies and products. China, with its large domestic market, its manufacturing strength and in some cases with international cooperation in the area of research and development, could support the development, testing and large-scale production of climate friendly products. This collaboration between LDCs and developed countries (DCs) could complement the negotiations that will take place in the context of the Copenhagen Conference, allowing for greater trust between LDCs and DCs.
4) A low carbon economy will put greater emphasis on efficiency, conservation and recycling of materials – reducing resource shortages. A growing number of countries are taking action to reduce greenhouse gas (GHG) emissions. Consumers in many countries have a rising awareness of the carbon footprint of their consumption. The new US administration is already signalling it will support the transformation of blue collar work into green collar opportunities. UNEP is to be commended for having launched the concept of a New Green Deal to get the markets back to work – a very timely initiative.

b) Special Remarks by the Minister of Environmental Protection

14. On behalf of the CCICED, Vice-Chair Margaret Biggs congratulated Council Executive Vice-Chair Zhou Shengxian on the promotion of SEPA to a full ministry. She invited him to address Council and during his special remarks, Minister Zhou made the following points.

15. During the first three quarters of 2008, COD and SO_2 emissions decreased by 2.7% and 4.2% respectively as a result of concerted efforts and despite the ice storm, the earthquake that hit Sichuan province and the current economic crisis. Coordinated development is at the core of China's promotion of a scientific approach to development; this concept encompasses the economy, the environment and population. Pollution is essentially the result of an imbalance between the environment and a human activity; the history of environmental protection is the history of seeking to balance these forces. Humans cannot live without air and their health depends on clean air.

16. When Premier Wen Jiabao met Council members last year, he mentioned aspiring to be a Green Premier, a guarantor of China's clear skies and white clouds. The GOC had promised that the air would be clean for the 2008 Olympics. Beijing is surrounded by mountains, making it difficult to flush out air pollution and there were concerns that the GOC would not deliver on that promise. Success was achieved however, thanks to the efforts of the central and local governments, to the stringent measures adopted and the 1 trillion RMB that was spent. Major polluters, such as Capital Steel, were forced to move away or shut down. The rivers within the city's sixth ring road were cleaned up. Citizens were highly aware of these efforts and have become better defenders of the environment as a result of the Green Olympics. In 2006, the 6 provinces surrounding Beijing Municipality established the Air Quality Control Leading Group to support the effort. Research was conducted involving China's foremost experts; measures taken included the installation of desulphurization facilities in power plants, to clean up air pollution. The results have been remarkable, with decreased emissions of NO_x and SO_2, and with an increasing number of days with high air quality standards.

17. The achievement of the Green Olympics is a case study in sustainable development. In recent years, quality of life for urban and rural residents has improved continuously thanks to rapid economic and environmental improvements. The Green Olympics demonstrates how people and nature can coexist in harmony. Coordinated development is the way to generate a benign cycle where an energy efficient and environmentally friendly society is established.

18. However, efforts must be strengthened and accelerated on environmental protection at all levels of China's society. Clean production, improved incentives and better results are sought. Enterprises must be encouraged to conserve energy, cut emissions and grow in sustainability and competitiveness. China must adopt advanced technologies, improve efficiency and productivity,

ensure laws and regulations are obeyed, retire redundant technologies and transform the industrial structure. This will facilitate accelerated adoption of technologies that are resource efficient and clean.

19. As the world faces a global financial tsunami, China has launched a 1 trillion RMB, three-year stimulus package which will also benefit the environment. China will not allow low efficiency, high emissions enterprises to start production; rather, it will use the crisis as an opportunity to increase domestic consumption and promote structural change. It will focus on environmental products, new technologies, renewable energy, and generating greener engines of economic growth. China also plans to develop the service sector and create a level playing field for burgeoning small and medium enterprises (SME). The Green Olympics will be used as a springboard, increasing consumer awareness of, and demand for green products. Regional efforts for environmental protection will be encouraged; for instance, a new management system for areas like the Pearl River Delta will be proposed, supporting regional planning and supervision, and encouraging more benign industries and sectors.

20. China also needs to pay as much attention to the rural environment as it does the urban environment since both are interdependent. Safe drinking water, pollution control and environmental protection are critical in the countryside. China plans to mobilize its entire population to build an ecological civilization. People can make wise choices as consumers and protect the environment; limiting certain behaviours and ensuring greater awareness will also bring about ecological civilization.

21. The environment must come first if China is to achieve its goals of resource conservation, efficiency and sustainable development; sustainable consumption at the household level is essential to reaching this goal. Compensation measures, new regulations and setting up a responsibility system will contribute to the restoration of China's rivers and lakes. President Hu Jintao emphasized, in the case of the Huai River, the need to let nature rest so regeneration can occur.

22. Humanity has focused on development, but now we face severe environmental challenges. All countries need to take a long-term perspective, and realize that cooperation amongst nations is essential. Greater common efforts are needed to ensure a better future, especially as the issues to manage are complex and the global economy is slowing down. Barriers preventing technology transfer must be abolished in order to ensure efficient flows of knowledge and funding. This CCICED AGM is occurring at a critical time and its input is needed as never before.

c) Presentation of the CCICED Issues Paper

23. Vice-Chair Margaret Biggs presided over the presentation of the Issues Paper by CCICED Chief Advisors Shen Guofang and Arthur Hanson. During their remarks, they highlighted the following:

24. The theme of the 2008 Issues Paper is *Environment and Development for a Harmonious Society.* China is experiencing rapid urbanization, industrialization and strong economic growth. Environmental degradation is severe in some areas, exposing glaring imbalances between environment and development. In October 2007, the CPC Congress was held; a theory of openness and scientific development was put forth, within the context of building socialism with Chinese characteristics, and with added emphasis on ecological civilization. Transformation and innovation will allow China to resolve the long-standing conflict between environment and development.

25. Many in the international community hope that China can be a "*leader*", while some Chinese specialists prefer the less emphatic "*take the lead*". Leadership needs to be understood in the context of Premier Wen's statement, that China's development will continue to be prosperous, harmonious and democratic, and that China will continue to champion world peace and progress.

26. 2008 has been an unusual year for China. It marks the 30th anniversary of the Reform and Opening Policy, the 30th year since the promulgation of China's Environmental Law and the creation of the Ministry of Environmental Protection. This year numerous natural disasters occurred, the successful Beijing Olympics were held, and more recently we were hit by a global financial crisis. The Council must bear these in mind in its work.

27. Shortly after the finalization of the Issues Paper, the State Council announced its 4 trillion RMB stimulus package in the coming two years to encourage domestic consumption, putting the accent on environmental protection. China is trying to learn from past mistakes, using the concept of ecological civilization in resolving the conflict between development and environment. The Issues Paper considered the notion of justice in tackling rural issues and recommending compensation schemes. Similarly, the policy of *Putting People First* is relevant to public health and environmental challenges.

28. The term *Harmonious Society* is not used in the international community. Harmonious society in Chinese understanding takes into account five major elements: harmony between urban and rural development, generating more equality for rural people in terms of wealth, health and opportunity; harmonious regional development with emphasis on assistance to less developed regions; harmony between economic and social development; harmony between economic development and the environment; and a harmonious interaction between the domestic economy and international trade. There are interactions among all of these elements.

29. China is both rich and poor; it is in need of ecological restoration, but also in need of an educated and healthy population. The past 30 years have heralded amazing changes for China since Deng Xiaoping's *Reform and Opening*. The past year's earthquake demonstrated China's new capacity for emergency response.

30. This year also marks the 20th anniversary of the Brundtland Report, which coined the phrase *sustainable development*. This concept is not yet a reality globally, and a new paradigm is needed. Harmonious development could prove to be this paradigm. Harmony is an ancient concept in China; China's decision-makers are integrating in it the notion of democracy, which in China embodies both public participation and stability. Harmonious development includes the notion of a steady course, of an ecology in balance, but also of dynamism and ecological innovation. The concept also integrates the notion of putting people first, which includes the rule of law, environmental statutes and regulations, fairness and justice through schemes such as ecological compensation.

31. It remains a challenge to determine whether the harmonious society concept is simply aspirational, or whether it can be operational and its progress can be measured. Possible indicators are the MDGs, which China already reports to the UN; the mandatory environmental targets included in the 11th FYP; and Green GDP. Monitoring remains a serious challenge.

32. Ecological civilization is a grand vision signifying in China the harmony between people and nature. But China has credibility challenges in advancing this notion internationally because of recent scandals such as melamine in milk products and lead found in paint and toys. There is a global perception that China is not making progress on environment and development. This could be reflected in consumer resistance to "Made in China" products.

33. The international challenge posed by the financial crisis can be related to harmonious society in that the global recession could lead to a rethinking about the need for further regulations correcting the imbalances of globalization. This could bring effective action on international trade agreements, including the World Trade Organization (WTO). This could pose challenges for China.

34. China's future economic growth model will include difficult adjustments such as new approaches for sustainable domestic consumption, rural reforms and correction of income inequalities. The baseline created by the Beijing Olympics in August has generated expectations in China and the world; supervision and enforcement of environmental measures require a given level of deterrence which in turn produces compliance. Adequate information and monitoring, with coordination and cooperation from relevant authorities and levels of government, are key to enforcement.

35. The GOC announced important rural environmental reforms in October. By 2020, rural incomes are to be raised, with food security a central preoccupation and planned investments in public utilities. Rural reform is key to the achievement of a harmonious society in China.

36. The ongoing environmental challenges including climate change can create opportunities. Stability will depend on ensuring the public is kept well informed and participates, and on sustained efforts to reduce environmental degradation suffered by the poor, providing mechanisms such as ecological compensation.

37. What if world trade rules were based on ecological civilization principles? China is a world leader in achieving the MDGs, but it still has trouble meeting environmental goals. Examples such as Hebei Province's city of Baoding that has become a centre of innovation for alternative energy could be useful.

38. The Issues Paper lays out eight essential breakthroughs: the radical adjustment of the relationship between the environment and the economy; making trade, investment and financial sector reform consistent with sustainable development; long-term transition to a Low Carbon Economy (LCE); environment and health actions that reflect the alarming range and level of toxic impacts, potential for pandemic diseases and other environmental risks; new ecosystem protection approaches yielding substantial and lasting economic, environmental and social benefits for rural people; accelerating the pace of development and commercialization of technological innovation for environment and sustainable development; re-orienting and strengthening the existing environmental management system to integrate public participation and respect for public environmental rights; shifting international environmental cooperation towards integrated sustainable development solutions.

39. China's frequent use of words such as friendship, peace, cooperation and development can be dismissed as rhetoric, but the international community stands to gain by trying to understand what these mean in China and how they could be useful to all countries. The Council is in a position to understand how environment and development contribute to these broad concepts guiding the future of China.

d) Special Remarks by the Director General of IUCN

40. Vice-Chair Margaret Biggs invited Council Member and Director General of the International Union for the Conservation of Nature (IUCN), Ms Julia Marton-Lefèvre, to address the AGM. The following issues were presented to members by the speaker.

41. IUCN's World Conservation Congress, held every four years, concluded last month in Barcelona. Despite the current financial crisis, the Congress attracted 8,000 participants representing a wide range of stakeholders. It was the largest ever, which demonstrates there is now a mass movement eager to build what China calls a harmonious society. The vision of the Congress is to support a diverse and sustainable world; biodiversity is essential to the health of human beings and their societies. IUCN put its principles in action by staging a green meeting in a sustainable convention centre, pushing hotels to provide environmentally-friendly services, going paperless, and offsetting the carbon footprint of delegates.

42. The Congress encompassed a Forum and an Assembly. The Forum included events such as workshops, knowledge cafés, exhibition pavilions showcasing IUCN and its partners' work, a women entrepreneurs' fair and firm commitments by donors. Discussions focused on the challenges to establish a sustainable economy; how to address climate change; how to stage local actions for biodiversity; philanthropy for sustainable development; green buildings; and sustainable living. A global Platform of Action was agreed upon.

43. The Assembly was held for the members of IUCN; the organization's high level decision-making body approved the 2009 – 2012 Programme, financial plans and resolutions. In its new Programme, IUCN remains committed to the conservation of biodiversity and is focusing on promoting the greening of the world economy. Attention was paid to the economics of ecosystems and biodiversity because humans depend on nature to provide resources but pricing remains problematic.

44. IUCN's Assembly agreed to pay attention to the ethics of conservation, calling on governments to take into consideration the rights of vulnerable and indigenous communities, poverty reduction, land tenure rights, and the "*Do No Harm*" principle. The link between conservation and climate was underlined, since healthy ecosystems are powerful agents to combat climate change. IUCN is demanding more specific goals from the next UN Climate Change Summit to take place in December. It endorsed the need to proceed with climate change mitigation actions such as reducing emissions from deforestation and degradation. The Assembly recognized the private sector is interested in reducing impacts on biodiversity.

45. The most publicized result of the Congress was the publication of the Red List of Threatened Species. The news is not good, with almost one in four of the world's mammals on the brink of extinction. However, some species that were on the threatened list in years past are now showing signs of recovery. IUCN also considered energy options and concluded that not all bio-fuels are alike. It called on governments to regulate them in order to limit their impacts on people and nature.

46. A study on the transition to sustainability was launched in Barcelona. The premise is that ecosystems are life support systems. We are in what some writers have called the *Anthropocene,* the Age of Man. Humanity's use of resources since 1750 shows dramatic trends, with available data revealing that humanity's ecological footprint is huge. We are called upon to "*decarbonize*" the world economy, de-linking economic growth from carbon, while at the same time addressing poverty and protecting our biosphere. The crucible of evolution is biodiversity, and this needs to be better communicated. IUCN's knowledge and influence will be brought to bear on decision-makers in order to ensure biodiversity considerations are integrated in the measures taken to fight climate change, increase security, stabilize markets and promote trade.

e) General Debate and Comments

47. With Vice-Chair Margaret Biggs presiding, Council members took part in a brief general debate on the AGM's theme, the Issues Paper and other points raised by the speakers. Members had this to say:

48. In the context of the current global financial crisis and the rescue packages that have been announced by various countries, what China decides to do will have an impact. There is a debate in Europe with sceptics questioning the push for a green economy, despite the consensus among leading specialists that this crisis is a golden opportunity. China's actions could help tip the debate currently raging in Europe.

49. China's policy articulates not only the need to clean up the environment but also to drive future economic growth towards a sustainable paradigm – the *green economy*. China is not hampered as western democracies are; other countries will try to stabilize their steel and car industries. These measures will not help the poor. We should consider how the trillions of dollars mobilized can serve us better than merely stabilizing the economy. China is leading the thinking in this area, more than any of the Organization for Economic Cooperation and Development (OECD) countries, yet the world knows little about this.

50. Substantial research funds are going to carbon sequestration technologies, while little money is spent on the planet's natural potential as a carbon sink in forests, peat lands, grasslands and marine areas. Roughly 15% of the carbon is already sequestered in some 100,000 protected areas around the world covering 11% of the earth's surface. The present crisis shows us that economic resources can be marshalled; these resources could be re-directed towards conservation, or to technology transfer to LDCs in order to support GHG emissions reductions and adaptation to climate change. The current debate around climate change needs to shift from the lose-lose perspective to offering the kind of win-win view that China is now taking. The rise in carbon emissions, faster than was predicted, lends urgency to this.

51. The term *resilience* should be added to those already mentioned in the Issues Paper. It embodies elements of stability; but it also describes how systems withstand and recover from stress and shock. It is also crucial to understand there are non-linear causes to catastrophes; there are tipping points beyond which the rate of change accelerates. A lot of these have been identified in climate change research. This is something that the Council could study under the heading of ecological civilization.

52. The need to move towards a LCE has been discussed. But the price of crude oil is an important aspect that should not be overlooked. A few months ago when the price of a barrel of crude oil stood at US$ $150, there was a significant change in consumption patterns and some owners were

selling their more inefficient vehicles. The price of crude oil is now at $ 60 per barrel and consumption is again on the rise. The price of crude oil is one of the key elements determining how fast and how far we can go in shifting to a LCE.

ITEM 4. TASK FORCE REPORTS – FIRST SESSION

a. Task Force on Innovation and Environmentally-Friendly Society

53. Vice-Chair Xie Zhenhua presided over the presentation of the Task Force on Innovation and Environmentally-Friendly Society. Co-chairs David Strangway and Professor Feng Zhijun provided Council members with a summary of their work.

54. Three main themes were explored in the Task Force (TF) report: technology innovation for environment and sustainable development; regulations, standards and enforcement; and public participation.

55. A key finding is that China has the capacity and the need to become a global leader in innovation technology. China has mandatory intensity targets for emissions reduction, based on per unit of Gross Domestic Product (GDP); while this is good, it is time to look at absolute pollutant reduction, not just intensity reductions since the rate of growth of China's economy ensures that total emissions continue to rise.

56. The TF visited three cities: Baoding, Ningbo and Wuhai. It noted that the intensity of pollution is inversely correlated with public participation and sustainability in these cities. For instance, Baoding where pollution is the lowest is also where public participation and sustainability are greatest.

57. The central conclusion of the report is that regulations are key to innovation; clear, stable and uniformly enforced regulations are necessary to the creation of markets. Without regulations, there is no market – hence no incentive for innovation in the first place. The elements creating innovation are not in a linear progression – rather they are interrelated in a network and encompass institutions such as government research institutions, universities, private research facilities and firms. The process follows a series of steps: basic research, applied research, pre-commercial research and in some cases creation of a new company, demonstration with niche deployment, and widespread deployment and diffusion.

58. The environmental innovation system in China is comprised of: government and public involvement; universities and research institutes; and regulations and standards. In the universities, a gap has been identified between basic research and the delivery of marketable research products. The TF recommends MEP create industry sector R&D institutes focusing on problem solving; they have

existed in the past but now are inadequate to handle the sector related to environmental technologies. There are also problems associated with SMEs and the TF proposes the creation of innovation support networks.

59. There has been substantial growth in the provision of capital to SMEs through venture capital markets and private equity. Many of China's new regulations and standards are moving towards international levels. There is inadequate enforcement which has hindered the development of markets. Full, open reporting to independent third parties is essential in order to foster environmental innovation. The TF recommends that MEP be authorized to create a National Environmental Information System which would allow for free access to information on pertinent regulations. An open and transparent process would help drive innovation.

60. The TF emphasizes in several passages the importance of effective enforcement, and calls on China to give further thought to the enforcement of Intellectual Property Rights (IPR) protection measures. Green procurement policies can also stimulate innovation.

61. These various elements are proposed by the TF as forming a National Innovation Action Plan. Public involvement is necessary as China continues to develop. Civic groups and Non-Governmental Organizations (NGOs) are not yet fully empowered in China; the TF believes that wider access to information would empower local groups.

62. China is playing an important role in the bio-science and technology area; it is playing a lead role in the information and communications technologies, as well as in nanoscience and materials' technologies. Revolutions have taken place in these fields, driven by scientific research. China is also well positioned to play a lead role in the new clean technologies sector. The fields that will be essential to establish this include: clean transport technologies such as electrical vehicles; enhanced geothermal systems; photovoltaic cells; wind energy; new nuclear power systems; carbon capture and sequestration; clean coal; desalination of sea water; biofuels and bio-products. If China were to leapfrog in any of these areas, it stands to gain from significant export potential. Other interesting areas are the circular economy, clean building technology and recycling.

63. One area of opportunity is the research to improve cellulosic biofuel production. This is driven by innovations in genomics, with knowledge now passing from basic science to commercial applications. The time cycle for the development of biofuels has been very short. The Inter-Academy Council has demonstrated that there is a close relationship between basic research and commercialization.

64. The TF recommends there be strengthening of the basic research platform; China has a Science and Technology (S&T) Medium to Long Term Plan, and rapid improvements are taking place in this context. Incentives to meet standards can be powerful levers for innovation, as is international cooperation. China is now in a position to lead this cooperation process, bringing other parties to the

table. The Academy-Industry linkage needs to be strengthened, but this is not unique to China. The creation of internationally-recognized prizes could stimulate breakthroughs. The TF is uncertain whether or not the CDM per se has led to innovation; another platform may be needed in order to produce this result.

65. An Enterprise Forum sponsored by the CCICED was held in April this past year during the first CCICED Roundtable Meeting. The TF believes it may be time to convene another session in 2009, bringing together enterprises and investors to discuss the barriers to innovation and commercialization. China must create the environment for an innovation culture; unless people are allowed to fail, they will not truly innovate. China's education system needs to focus more on creativity than on rote learning.

66. Looking at innovation as being created by the public, government and industry, the TF finds that the public involvement side of the equation needs to be strengthened considerably. With proper information and channels of participation, the public can help protect the environment. This transition time presents China with a good opportunity to push for innovation in environmental technologies.

67. China is already starting to work on reducing total pollutant loads. It is formulating an evaluation and performance system that would provide incentives for this; public participation should be a key part of this mechanism. Innovation must also be people-centred, not simply focus on the economy or high technologies. The goal of a harmonious society also guides this development. Before China can take the lead internationally, it will have to ensure improved management of innovation domestically.

b) Task Force on Environment and Health

68. Vice-Chair Xie Zhenhua called upon the Co-Chairs of the Environment and Health Task Force, Professor Seiji Ikatai and Guo Xinbiao, to present their report to Council. In the course of their comments, the TF Co-Chairs underlined the following issues.

69. The TF held a number of meetings where significant understanding gaps among all participants, international and Chinese, were bridged. The TF determined to limit the scope of its work to health damage caused by human-induced pollution.

70. International experience and lessons from the US, the EU and Japan were reviewed. The TF concludes that cost-effectiveness dictates that prevention be the first priority in environment and health management. Secondly, proper intervention is necessary to deal with inevitable pollution threats. There should be government intervention in the case of priority pollutants to which serious health effects are linked; health impact assessments should be conducted as a matter of course. Thirdly, government coordination mechanisms are important, given the number of stakeholders involved.

Fourth, adequate legislation is necessary to support health and environment management. Fifth, financial and human resources need to be adequate to the task. In addition, information disclosure and public access are essential. Regarding compensation and relief mechanisms, all three countries studied have different schemes. A compensation mechanism, as well as a dispute resolution mechanism, is needed. Good research and data gathering systems are the foundations of this management system. A performance measurement system to monitor the behaviour of main actors is found in all studied countries and is valuable.

71. TF members conclude that in order to avoid tragedies such as Japan's Minamata disease, concrete action must be taken to prevent health effects; if there are such effects, pollution victims must be quickly treated and compensated; and the establishment of an effective health management system is recommended.

72. Health effects from pollution are serious in China, with numerous areas where air, water and soil pollution is serious. Some research has been conducted, but the surface has barely been scratched. Preliminary findings suggest the situation may differ between rural and urban areas.

73. China faces a challenge in tackling these issues because there is no clear division of responsibility among relevant government departments, not enough staff have been tasked to deal with these issues, nor is there a solid environmental health management system. Moreover, there is a severe lack of reliable data on environment and health. Various authorities are jealous of the data they possess and do not share information. There is no tradition of public disclosure of sensitive information on environment and health in China.

74. The recommendations to the GOC comprise six main areas: strengthen the responsibility of the government and set up an environment and health management system, in which the government plays the lead role and the public participates extensively; improve environment and health legislation, policies and regulations, and form an effective management system; focus on prevention and take effective measures to avert environment and health risks; increase relevant budgets and build the capacity of staff to manage the environment and health system; ensure information disclosure and support public participation; finally, focus on environment and health work and take targeted intervention measures.

75. China is still an LDC and measures imposed must be gradual. Work could start in cities by focusing on air pollution, and in rural areas with drinking water as well as indoor air quality. In addition, immediate action should be taken to halt the spread of known pollutants with known serious health effects. Research must be conducted on emerging pollution problems that have potential health effects. Prevention must be the GOC's prime directive.

c) General Debate and Comments

76. With Vice-Chair Xie Zhenhua presiding, members of Council engaged in the following discussion.

77. The recommendations from the Innovations TF relevant to regulations, standards and enforcement are most welcome from the perspective of the business community. Business is often thought antagonistic to regulation, but in fact this is essential to the creation of markets. This point could be further emphasized in the recommendations. Good regulations specify the performance that is required; they encourage innovation and stimulate markets to deliver results in the most efficient way. Poor regulations are overly prescriptive and destroy innovation. It would also be good to pay attention to the steps needed to improve compliance; energy efficient building regulations have been said to receive only 25% compliance; China would like this to increase to 80% in a few years.

78. Regulations, standards and enforcement must be performance-based, providing the incentives and generating the demand for pushing industry beyond present standards. Within enterprises, a culture of continuous environmental innovation must be created; they must be allowed to reap from the marketplace the rewards of reduced costs and the gains from the deployment of new technologies. A good example is the US government's SO_2 control measures; the regulations stipulated certain flue gas desulphurization technologies and as a result, there were no innovations generated. In 1995 when the Acid Rain Program was implemented, along with an emissions trading system, there were substantial improvements in the removal of SO_2 from flue gas emissions because companies were rewarded for innovation.

79. It is also true for Europe that sound standards and regulations generated innovation. This is linked with the report on economic instruments that will be submitted to Council during this AGM. The proper economic instruments are also key to creating the enabling environment for innovation. International cooperation has an important role to play in supporting pilot and demonstration projects. Task Forces need to coordinate their recommendations where they overlap.

80. It is right to design environmental policies that focus on human health considerations; greater knowledge on environment and health interactions is necessary to ensure such policies get widespread support. However, a step by step approach is recommended; the first steps should focus on policy and enforcement, because building extensive administrative systems in the environment and health field is much more demanding and complex.

81. The Innovations TF identifies three types of innovations. The first is incremental, the second is transformational, and the third is radical innovations that are spurred by the climate change threat. The TF should consider whether or not there is a need for specific instruments, institutions and strategies to generate radical innovations.

82. In the case of biofuels innovation, the lag time between the basic scientific idea and commercialization is getting increasingly shorter. But all three categories of innovation are happening at the same time – it would be difficult to isolate the conditions that favour one over the others. All options should be kept open.

83. The Innovations TF report questions whether the CDM has led to significant innovations; this is a correct assessment. China uses 60% of the CDM credit to implement projects. The CDM should continue as a project-based mechanism, but other complementary, and easier to implement mechanisms could be put in place. Such mechanisms could be based on energy intensity in given sectors or on specific technology. China could play a role in championing this view as we move towards a new global climate agreement.

84. The Enterprise Forum is an excellent innovation of the CCICED. The first Forum was held this spring, with strong participation from business, government, industry and experts. The Council should consider holding another one in 2009.

85. One of the central recommendations of the Innovations TF is the launch of a National Environment Innovation Action Plan. Environmental technologies have the potential to reduce the pressure on natural resources and stimulate competition. However, barriers are hindering their development and uptake. In 2004, the EU adopted its own Environmental Technologies Action Plan to overcome such challenges. It includes measures to get innovations to market more rapidly, and to improve the chances of successful commercialization. In this regard, China should not neglect the role that green public procurement can play in creating attractive markets for innovators. In 2006, the EU decided to achieve a 50% quota of green public procurement by 2010.

86. Two EU initiatives that could be of interest to China deal with SMEs and should perhaps be integrated in the report. In both China and the EU, over 90% of enterprises are SMEs. Creative financial instruments are essential to increase the chances that SMEs will get a foothold in the market for their environmental innovations. The EU has a 400 million Euro fund earmarked to support eco-innovative SMEs. The monies flow through two channels: the Growth Initiative Facility, which allows for participation in venture capital funds during start-up or expansion phases; and the Pilot and Market Replication Instrument which provides grants to SMEs ready to commercialize eco-innovations. For 2008 and 2009, the funds target SMEs involved in materials recycling, sustainable building, and food and beverage; other sectors will be added in future.

87. The environment and health nexus is of paramount importance. China asked the government of Japan to support this TF because of the worrisome rise in pollution-related health problems. The thorough work of the TF yielded agreement on key principles and measures, such as the precautionary principle, preventive measures, "polluter pay", government coordination, information disclosure, public participation, environment and health monitoring, compensation mechanisms, financing and

accountability. In order to realize the recommendations put forth by the TF, Japan is considering a bilateral project that would support the adoption of these measures.

88. Regulations are certainly necessary to enhance the market for innovations, but an education system that encourages creativity is also essential. Hong Kong's Innovation Committee set up a centre where individual innovators can process IPR registrations – a one-stop-shop. The process can be daunting for SMEs, tempting them to forego IPR protection and jeopardizing the full rewards of innovation.

89. The report on Environmental Health was comprehensive. Although this issue is sensitive in China, an epidemiological baseline for rural and for urban environmental health indicators needs to be established in order to assess the challenges that are faced and the targets that could be set. Catastrophic, one-time events need to be distinguished from endemic issues. Academia would gladly take up such data gathering and research challenges.

90. China's new energy standards for buildings represent a 50% improvement in efficiency over previous years; but while building design has improved, construction does not yield energy-efficient buildings. There is much potential to be realized from the ongoing research into improved materials.

91. Regarding innovation and the CDM in the context of the Kyoto Protocol, there are currently over 1,600 CDM projects in China; only one-fourth are internationally registered. These projects have reduced GHG emissions, but certainly China would benefit from increased emphasis on innovation. Were the transfers of technologies be made easier, emissions could be further reduced.

92. The Innovations TF proposes an Action Plan and market-based instruments to stimulate innovation. China has long been conscious of the need to install desulphurization equipment, but until new technologies were introduced, costs were prohibitive. The introduction of new technologies led to broader adoption of desulphurization by thermal power plants; government incentives also played a role. Similar incentives can be used to improve sewage treatment and other pollution issues.

93. China has been attempting to coordinate its investment and its development strategies; good results have been achieved for sewage treatment plants. Similar instruments have been developed to encourage the decommission of highly polluting enterprises, antiquated machinery and equipment.

94. At present, the GOC provides a 50% subsidy on compact fluorescent light bulbs, making them more affordable and increasing their market penetration. The GOC has found that market instruments and incentives are more powerful than propaganda and slogans. China has adopted a green procurement policy. China's policy is to ensure that the land used for biofuels should not encroach on the land needed to produce food; rather, China is encouraging the conversion of waste straw and rotted grain into biofuels.

ITEM 5. TASK FORCE REPORTS – SECOND SESSION

a) Task Force on Economic Instruments for Energy Efficiency and Environment

95. Vice-Chair Klaus Töpfer presided over the presentation of the TF Background Reports, inviting Co-Chairs Ernst Ulrich von Weizsacker and Ye Ruqiu to address the Council. During their remarks, the Co-Chairs emphasized the following issues.

96. This is an interim report resulting from the initial work of the international and Chinese TF members on issues that are related to climate change. The CCICED is already familiar with the challenges this will pose: the rise of sea levels leading to dramatic changes in coastlines; ice melting faster than predicted in Greenland; increased fresh water coverage. In a matter of a few decades, it is now predicted that the sea level will rise by seven meters.

97. In order to stabilize GHG concentrations, emissions need to be cut by 50% - but even if this was achieved, GHG concentrations would continue to grow in absolute numbers for 150 years. The world stands a better chance if we learn how to extract more energy and wealth from the fossil fuels, the water and other resources. Bold thinking is urgently needed. A four-fold increase in energy productivity is possible if we are more efficient. We are already seeing this progress in vehicles, passively heated houses and LED lights. China is now the leader in the adoption of compact fluorescent light bulbs, which improve energy efficiency by a factor of four. Business travel can also be replaced with video-conferencing.

98. The TF is suggesting a change in the technological paradigm, from seeking labour productivity gains only to adding the dimension of resource productivity. Labour productivity has increased 20-fold in DCs and China is rapidly catching up; labour productivity has increased in tandem with labour costs because there is a mutual causality between the two.

99. Resource productivity could increase 10-fold in 100 years; rising resource prices can be expected to be a key factor in this. But resource prices have actually been dropping, and falling prices cannot generate efficiency gains. In order to increase energy productivity, governments will have to increase energy prices. If prices and productivity rise together, there would be no economic hardship. Wildly fluctuating energy prices over the past months have had much more severe impacts. Predictability and smoothness are valuable to business and individuals, allowing for planning and adjustments. High energy prices should not be feared. Studies show countries with the highest prices performed best, while those with the lowest prices had poor economic performance.

100. The TF's preliminary recommendations are that China should adopt as a national goal the strategic increase of energy productivity. China made a start in its 11th FYP, but this is only a short term commitment. Energy prices should rise gradually, in concert with productivity gains; the TF

refers to this as the *long-term price escalator*. This measure should be initiated in the 12th FYP. The predictability would attract investors interested in energy innovations.

101. Free energy markets are not harmonious. The short-term elasticity of energy prices is virtually zero, while long-term elasticity is much greater. The proposed *escalator* makes use of this difference and is based on the positive experience OECD countries have had with energy taxation. Perverse energy subsidies should be eliminated first; channelling energy tax revenues into reducing the Value Added Tax (VAT) could avoid inflationary effects, a concern in China. Were China to become a pioneer in energy efficiency, it would become a technology pioneer. Similar price escalators are conceivable for water extraction, raw minerals and other resources, and their adoption could bring about the circular economy.

102. The TF is still making progress on its remaining study program and a full report will be submitted to Council in 2009.

b) Task Force on Energy Efficiency and Urban Development

103. With Vice-Chair Klaus Töpfer presiding, the Energy Efficiency and Urban Development TF Co-Chair Ms Laurence Tubiana and TF member Professor Mao Qizhi briefed Council on their preliminary findings.

104. The Factor Four concept discussed in the previous presentation is an inspiring one; optimizing systems is the thought that guides much of this TF's work; there are also parallels with the work of the TF on the Low Carbon Economy. Collaboration among the three groups will be useful.

105. Cities are at the core of the transformation of the economy. Cities are where lifestyles take shape, changes occur and new ideas for the future are defined. Choices made in cities today will influence tomorrow's production and consumption levels. The TF is focusing mostly on the building and transport sectors; in DCs over the past 40 years, cities' share of energy has been growing steadily, in tandem with per capita GDP. In OECD and EU countries, the energy used in buildings and transport represents two thirds of total energy consumption and of GHG emissions. This is largely due to consumption patterns and urban sprawl.

106. Today's pattern of urban development and infrastructure choices will determine energy demand trends in the future. China has the opportunity to make wise choices based on high energy prices and thus avoid being locked into inefficient urbanization and transport patterns; DCs have less flexibility. In France, urban planning is no longer a policy tool, whereas China can still innovate in urban design.

107. The TF will endeavour to incorporate urbanization, climate change and energy considerations in its work. It will conduct surveys and case studies in several cities, comparing different urban

models. Strategies, frameworks, policies and urban design that decrease the energy demand of the building and transport sectors will be proposed.

108. Total floor space in China has doubled in five years. As China's per capita floor space approaches that of OECD countries, energy used in this sector is rapidly rising and taking a greater proportion of total energy consumption.

109. Cities that have greater density of population support different lifestyles and energy consumption patterns. The link between urban density, transportation and energy consumption is well established. Studies conducted in Paris show that in the inner city where most residents do not use private vehicles, energy used for transport is 80% less than in the surrounding zone between the first and the second ring roads. The TF identified three different pathways of energy use in terms of buildings and transportation, exhibited by typical North American, European and Asian cities; Tokyo, Amsterdam and Hong Kong have been built along the most sustainable pathway and can be models. Urban design and policy decisions rather than income are the main determinants. These high-density urban design choices are open to China.

110. The TF will examine three main dimensions of urban design, planning and energy efficiency: economic, that is optimizing the energy bill of China; environmental, that is improving conditions in cities by minimizing energy demand; and social, that is optimal lifestyles to minimize energy consumption and reduce inequalities in such a way as to foster inclusion and optimize social harmony. The TF will look at two levels that governments should address: the micro level of the urban citizen; and the macro level of the city as a whole. The TF will consider transport and building issues from the perspective of service provision.

111. When considering examples from DCs, technology is not the only response to energy challenges. While technology has brought significant energy efficiencies, these have been negated by the overall growth in energy consumption per capita. Rather, responsible lifestyles are key to energy efficient cities, as well as systemic approach to key elements of urban design and transport options. Responsible lifestyles have to encompass issues such as floor space per inhabitant, desired indoor temperatures, indoor management of energy requirements in various parts of a dwelling, the wise use of cars and indeed the development of alternatives to private car ownership. European cities are experimenting with fleets of vehicles that can be accessed as a service.

112. Chinese surveys have shown that there are significant differences in energy consumption depending on housing types. The TF also notes vastly different energy consumption patterns depending on citizen's choices in terms of living, working or leisure.

113. This coming year, the TF will focus on an analysis of policies at various levels, and in a set of major Chinese cities, in order to determine the main drivers of energy efficiency in building and transport. It will pay particular attention to urban design and management. It will analyze the

effectiveness of existing policies, assess the financial stimuli of energy efficiency, examine institutional and organizational frameworks, and will develop a set of policy recommendations.

c) Task Force on Pathways towards a Low Carbon Economy

114. Co-Chair Klaus Töpfer presided over the presentation of a progress report from TF Co-Chairs Liu Shijin, Gordon Conway and Björn Stigson. During their remarks, they highlighted the following.

115. The TF initiated its work in June, held several meetings and developed preliminary findings; however, more debate is needed to further elucidate key questions.

116. Initial work focused on defining terms; the word "low" is relative and implies the need to agree on a certain baseline, for example a set amount per unit of GDP that could be equated with reaching the LCE standard. It was argued that the TF focus on a more qualitative definition, with due consideration to the stage of China's overall development that is characterized by high levels of industrialization and urbanization. It might be difficult for China to adhere to the LCE goal while its economy is still in full expansion. It has been suggested that a more general concept integrating high energy efficiency and low GHG emissions could be more workable. There is as yet no consensus on these issues among TF members.

117. The TF will take into account three core elements that need to be balanced if LCE is to be a workable concept in China: the country's development targets, the reduction of CO_2 emissions and cost considerations. Having agreed on a balanced view of the three core elements, the TF could consider the optimal mix of technologies, production modes, incentives and policies to support a gradual lowering of emissions. Therefore, an acceptable definition of LCE from the Chinese perspective would be that LCE promotes sustainable development, reduces emissions and lowers costs.

118. Other scenarios have to be considered: what if there is a decrease in GHG emissions and the economy is "low carbon", but development targets are not reached? Or if emissions are indeed reduced but at too great a cost, this pathway would be hard to sustain. If China is to achieve LCE, it will need to gain access to specific technologies, techniques, incentives, government policies – ensuring costs remain reasonable. And this transition needs to be gradual – with progress measured in relative rather than absolute terms. It could perhaps best be understood as a paradigm that leads to systemic, transformative choices.

119. Areas that will need to be addressed by the TF in the specific Chinese context are industrial production, energy efficiency, power from renewable sources, energy conservation measures throughout the economy, low energy transport options and others. The TF will also need to consider that China is at present at the lower end of the industrial chain; this explains to a great extent why

energy efficiency remains low. China has taken on the burden of high GHG emissions because of its current comparative advantage; insufficient levels of technical innovation and existing barriers to technological transfer are hampering the progress China could make in energy efficiency. China's choice of administrative rather than market mechanisms to cut emissions has limited the scope of the reductions; State-set oil prices have discouraged energy efficiency.

120. China's GHG emissions are therefore very high and the country faces heavy pressure to take action. The international community will, next year, work on a new emissions reduction agreement. According to international figures, China and the US were close in terms of total GHG emissions in 2007; however, if cumulative energy consumption is considered, China has only emitted 8.5% while the US is responsible for 27.2% of total global emissions; when considered on a per capita basis, China's historic emission rate still ranks very low. China believes it must share part of the burden of global emissions reduction, but the GOC also believes that history, per capital emissions, and the fact that it has a very large export sector must all be taken into account.

121. It is inevitable that China embarks upon a LCE pathway. The TF has some preliminary recommendations for the GOC. The country should develop technologies, policies and mechanisms to support the LCE. China should consider exploring the concept of a Developing Country LCE; specific sectors or industries could be selected to pilot new approaches, testing them for sustainability, economic and operational factors. Special features of the LCE model need to be better understood, including the needs for technological and institutional innovation and policies; this is where international cooperation and communication have important roles to play.

122. Three initial chapters have been completed; three more will be written in the coming year. Various scenarios and pathways will be explored and policy recommendations will be finalized. The LCE is an evolutionary process, a continuation and expansion of approaches and policies already in place. Components of the LCE, such as low carbon intensity per unit of energy or GDP, make for a challenging list because of cost constraints and because of considerations for human well-being and welfare.

123. The TF hopes the report will be of use in the preparation of the 12th FYP, and that some of the stimulus package just announced could be spent on the infrastructure needed to realize a LCE. The TF is thinking of the LCE as an end and as a means; China has the capacity to be a world leader in clean technologies, and is indeed at the forefront of some technologies – as the TF on Innovations emphasized. This and other TFs provide opportunities for good cooperation.

124. No one knows what a LCE should look like; it is not only about technology or design, but also about social change involving lifestyles and behaviours, of individuals and organizations. The LCE could be seen as the cornerstone of a new harmonious society for China.

125. The move towards the LCE will be important to the global business community; it sees the LCE as a new driver for economic growth, for innovation and for investment. The timeline for action is critical; how quickly the existing asset base – energy generation, transport, production, buildings – can be turned around and at what cost are key questions. At present, China is rapidly building an asset base which does not conform to any definition of LCE. It will become increasingly urgent to harmonize present investments with LCE requirements in order to limit costs.

126. Lifestyle and consumption patterns will be critical to realizing LCE objectives. Low carbon countries occupy one tenth the footprint of big consumers; comparing the footprint of a rural Chinese family with that of a suburban American family reveals dramatic differences. The ability of China and other countries to achieve LCE will depend on their ability to influence consumption patterns and lifestyles. Human habits and behaviours have proven very hard to change.

ITEM 6. DRAFT AGM RECOMMENDATIONS AND DISCUSSION

127. With Vice-Chair Klaus Töpfer presiding, the Chief Advisors Shen Guofang and Arthur Hanson highlighted key points of the draft Recommendations circulated to Council members. During their comments, they made the following points.

128. The Recommendations follow the thinking outlined in the Issues Paper. They meet the principles of the *scientific approach to development* and adopt as main theme that of the *Harmonious Society*. China is at a critical point, on the cusp of key transformations. In this context, four main groups of recommendations are put forward: one deals with the challenges brought forth by this unusual year of 2008; one addresses technological innovation; the third comprises environment and health issues; and the fourth focuses on energy efficiency and the LCE.

129. Regarding new challenges in environment and development in the specific context of 2008 – its successes and problems – recommendations emphasize the need to adhere to the scientific approach to development and to take a long-term strategic perspective. Seven specific recommendations are made under this heading: economic growth should not be achieved at the expense of the environment; efforts to restructure the economy should be accelerated; there should be greater investments in environmental infrastructure; key investments in rural and urban areas should focus on new environmental industries. A balance between regulation, enforcement and market mechanisms should be sought. Greater efforts need to be made to protect the rural environment. The Green Olympics' example of strong environmental management and systems should be emulated, with greater public information, disclosure and participation. The newly established MEP and other ministries need to better coordinate and distinguish their responsibilities, capacities and efficiencies.

130. The second set of recommendations deals with innovation. It includes sub-recommendations for a National Action Plan for Environmental Innovations 2010 - 2020 covering 9 aspects: strengthening indigenous innovation capacity, setting up a program for clean technology innovation, a national centre for innovation management, sectoral innovation research institutes, inter-disciplinary innovation institutions and laboratories, and systematic approaches to management, institutions and capacity building. Stronger incentives, standards and regulations are needed to create more ideal market conditions for innovation. Financial support needs to be strengthened. Stronger international linkages are also recommended.

131. The third set of recommendations deals with environment and health. International experience illustrates that mishandling this area could lead to serious political and social consequences for China. Protecting citizens' health from environmental threats is critical to realizing a harmonious society. The CCICED proposes a National Action Plan on Environment and Health 2007 – 2015; a national management system for environment and health should be adopted; prevention needs to be the guiding principle, and priority must be given to reducing existing serious environmental health risks; government must take the lead in this work; public information and participation needs to be encouraged; legislation, increased budgets and capacity building are required; compensation should be investigated and established; government needs to take targeted action against the most grievous environmental threats to human health.

132. Recommendations on energy efficiency encompass the preliminary work of five TFs. More comprehensive recommendations will be issued in 2009, and it is hoped this work can be integrated into the 12th FYP which is currently being drafted. Two main sub-recommendations are proposed in order to enable China to embark on the LCE path: strategies, approaches and policies need to be further studied; LCE targets need to be developed for inclusion in the 12th FYP. Three issues need to be considered in putting forth energy efficiency suggestions: a long term strategy on energy efficiency is essential; both theory and experience have proven that price is the most powerful lever for reducing energy demand, driving technological innovation and raising productivity. Caution must be exercised in energy price increases however; the steady, predictable *escalator* approach is recommended.

Discussion

133. A holistic approach to environment management is called for, especially when it comes to legislation and regulations – including the selection of economic instruments. Legislation needs to be powerful enough to generate results; it should be backed with supervision, monitoring and reporting. Government has to increase its capacity for inspection and control.

134. In reporting to the GOC, there are overarching themes emerging from the work of the TFs that should be underlined. One is the need for China to take the lead in environmentally-friendly technologies; it has demonstrated its capacity this year by dealing with emergency situations at home and by hosting the Olympics. The second is the importance of an informed public that participates actively and that has access to the information it needs. The third is the critical nature of our chosen lifestyles where responsible, sustainable choices and shifts in our perceptions of comfort and necessities are urgently needed.

135. In considering the LCE in the context of China, with its current stage of development and the needs of its people, it might perhaps be more useful to talk about *Low Carbon Prosperity,* a concept that captures the human element. There is a tension in the recommendations between the gradualist approach and the need for transformative change. The world is now changing at a dramatic pace and we are called upon to push ourselves towards the transformative end of the scale. There is also a tension between policy and performance – a complex issue in the context of a country as large as China. Building the capacity for delivery will be key to policy effectiveness at the local levels.

136. A number of reports emphasize the difficulty with monitoring, enforcement and compliance. In countries around the world, compliance is directly correlated with the degree of public awareness and interest in environmental protection. In China, the right level of public education and awareness could contribute a great deal to enforcing the rules. This needs to be more clearly emphasized in the final recommendations, although it is highlighted in TF reports. The CCICED should consider proposing a massive public education campaign to protect the environment; in countries such as South Africa where efforts were made in this regard, pressure is brought to bear on decision makers from their own family members.

137. The section of the recommendations dealing with China's contribution to global sustainable development needs strengthening. The paradigm for environmental protection and sustainable development has been developed in DCs; LDCs are reacting to something they have not contributed to creating. China now has the ability and the responsibility to set the global agenda. Just as in the recent global financial crisis, the world has turned to China. This changed context should be more strongly reflected in the Council's suggestions. Further, greater dialogue needs to be encouraged between China and LDCs in these areas.

138. In considering the LCE, it is key to ensure integration and coordination among TFs and their recommendations. High level planning would allow China to leapfrog into the LCE. For example, the Council recommends the integration of urban and transport planning; a dimension that is not mentioned is the energy infrastructure planning – which allows for zone heating or cooling in cities. If global energy prices were directly reflected in China, better signals would be sent; while China's coal

prices have gone up significantly, market signals cannot be effective if thermal power plants get access to coal at subsidized prices.

139. Regarding the recommendations dealing with regulations, the plans proposed are ambitious and costly. Money has become more expensive and scarce over the past few months; we should ensure that what we propose is pragmatic and operational. It is therefore important to consider what attracts private equity. No markets were created 30 years ago when the US brought in measures to protect wetlands and clean air; now, there is a booming market for wetland mitigation and wildlife protection in a country that has not endorsed the Kyoto Protocol. Private equity players should be included in TF discussions in order to provide greater insights into what makes regulations effective. It is important to talk about policies to the people who will end up financing them.

140. The Draft Recommendations would benefit from the integration of key lessons found in the TF reports, such as the importance of solid, accurate, reliable data on key environmental indicators. China is one of the world's great savers and has exported its savings; now is perhaps the time to fund some of its own investment. Leapfrogging is in China's strategic long term interest.

141. Regarding the recommendation on environmental management in the context of the creation of the MEP, it would be useful to be clear about the need for the MEP to be adequately funded, staffed and trained in order to fulfill its new responsibilities.

142. The GOC's 1 trillion RMB stimulus package should be guided by an enhanced green procurement policy. The overall environmental footprint of the stimulus package should be minimized in terms of the investments made and the inputs used. Regarding the eco-compensation process the Council recommends that there is a need to go beyond water-borne pollution to air pollution, addressing climate change, the impact of pollution on agriculture production and rural livelihoods. The key lesson from the Beijing Olympics is regional environment cooperation; the five provinces surrounding Beijing contributed to the quality of the air. Regional mechanisms are a priority for the management of China's environmental challenges and should be emphasized through items such as regional carbon trading and other instruments.

143. The LCE is both evolutionary and transformative. While no country is clear on the shape it might take in the future, a common vision should be developed. Recommendations should stress that this common vision could be accomplished by taking different pathways.

144. Consistency among TF reports is important. The challenge this represents is illustrated when we talk about LCE – or low carbon prosperity as has been suggested. The costs of reducing CO_2 have been studied; options that represent win-win situations at the macro level need to be favoured even if they are not yet cost effective. This can be accomplished by adopting fiscal measures that reduce costs and allow for their widespread adoption by enterprises or households. Emphasis must be put on transformational change that is pursued through incremental yet predictable measures.

ITEM 7. PARALLEL GROUP DISCUSSION

a) Chinese Language Group

145. Secretary General Zhu Guangyao chaired the session. A report on Premier Wen's remarks during his meeting with the Council's foreign members was outlined.

146. Lead Speaker Ms Wang Jirong, National People's Congress (NPC) Environment Protection and Resources Conservation Committee Vice-Chair briefed participants on the NPC's recent efforts to remedy the lack of enforcement of laws and regulations. This enforcement gap has three basic reasons:

147. Twenty-nine environment-related laws have already been enacted. Drafted by line ministries in accordance with their respective mandate and without coordination with other concerned agencies, these laws lack specific enforcement regulations and have proven hard to implement. Legislation has not been amended to take into account the sweeping changes of the last thirty years. And enforcement agencies lack institutional capacity.

148. Participants of the Chinese Language Parallel Group made the following comments on the TF reports, as well as on the draft Recommendations.

149. There was consensus on the relevance and appropriateness of the research topics with regard to the pressing needs and challenges facing China's environment and development. The treatment of the topics was concrete, factual and more focused than last year. The reports were deemed to be of high quality.

150. In order to make the maximum impact on China's busy decision-makers, participants suggested policy recommendations be further condensed. The introduction and background information should be minimized, while the focus of specific recommendations should be sharpened. The content of some sub-sections could also be minimized.

151. More research is needed on agricultural issues. There are good data on agricultural pollution, but impacts have yet to be fully understood. Standards for agricultural technologies and inputs are still inexistent. In the countryside, there is little environmental awareness. Rural infrastructure is still insufficient. There are no regulations covering rural waste, which is largely organic and could be reused if transportation problems were solved.

152. In dealing with emergencies and natural disasters such as this year's major snowstorm and earthquake, the GOC should focus on resource use as well as on risk mitigation and management. There is a need for environmental assessments of possible disasters on drinking water, sewage treatment, nuclear plants and other possibly toxic industries. Further research and policy work are needed in this respect.

153. More research is needed on environment and health, a major concern of the general population. There is a serious gap between legislation and enforcement in this area. The GOC should establish effective platforms for public participation in environment and public health management.

154. People are not aware of the dangers of indoor air pollution in rural households. Numerous surveys indicate that, despite wide-scale government intervention, traditional open-hearth fires are still used widely in Southern China and they cause serious health problems.

155. Birth defects are on the rise, accounting for 4 - 6% of live births; annually, roughly 100,000 infants are born with defects; China now has 80 million disabled persons – due to both genetic and environmental factors. This needs to be underlined in the Council report.

156. The milk contamination incident should be characterized as an enterprise social responsibility issue, not as an environment and human health issue. Convincing examples are needed to better document and illustrate environment and health issues. But it illustrates the fact that, in the absence of high moral standards, even the best legislative framework will prove to be ineffective.

157. In China, environmental problems are also triggered by poverty. Resource conservation and improving citizens' livelihoods need to be addressed in order to solve environmental problems. The first priority of the UN MDGs is poverty eradication. In a country such as China, it is necessary to focus on environmental and social livelihood issues in tandem.

158. The main difference between China's and DCs' environmental problems is that China has to satisfy the basic needs of a rising population, increase living standards, and at the same time protect the environment. This enormous challenge has not been sufficiently explored by TFs. This should be one of the Council's main tasks in the coming years.

159. While energy issues need to be studied in the larger international context of climate change, there is a need to focus more closely on environment protection in China. The Council could help resolve differences over key indicators. For instance, CO_2 is used internationally, while China's 11th five-year plan focused on $S0_2$. China also has other major pollutants related to energy use, such as NO_X. But China does not want to select indicators that make its performance look worse.

160. In order to engage China's leadership on the LCE, the TF report should describe the various pathways towards this goal, and outline the concrete strategies and measures to realize this goal. Research on the development and deployment of new and clean energy technologies should also, at an early stage, take into account the environmental efficiency and impact of hydro-power, solar, wind and other types of clean and new energies. For example, during the planning stage of the Three-Gorges dam project, environmental impacts should have been researched and identified.

161. There is a need for research and recommendations on green design for both public and residential buildings, the present regulatory environment impeding the full deployment of green design building technology. Wealthy people are investing massively in real estate; no limits have been

imposed as yet. The TF should research the management and control of commercial housing, including the taxation of secondary domiciles and possible limits on housing purchases; recommendations should take into account the need to provide housing solutions for all urban residents.

162. Further research and policy recommendations are needed on public transportation using clean energy technologies. Rail transportation, including light rail, is only possible in larger cities; other solutions need to be put forward. Further policy support is needed for the use of clean energy in public and private transportation. At present, there are no limits imposed on the number of vehicles an individual may own. The TF should consider researching vehicle ownership management, as is practiced in some Chinese cities, while taking into account employment and growth repercussions.

163. Beijing's Green Olympics have left a positive environmental legacy, albeit at heavy cost. This legacy should be promoted in other cities and Shanghai's 2010 World Expo provides an excellent opportunity to do so. Still, more research is required on the economic costs of environmental protection.

164. While some TFs have completed their study program, the Council needs to ensure there is proper follow-up, including linkages to new research areas. There is a need for better coordination and collaboration among TFs. A mechanism should be established to allow for more engagement of Council members in the TFs. The Secretariat could provide members with information and financial support.

165. MEP will face the challenge of promoting interdepartmental, inter-provincial and trans-boundary collaboration. For instance, cleaning up the Huaihe River was on the agenda in the 1950's; this cannot happen without a concerted effort of the provinces in that watershed. Internationally, the success of the Columbia River management is due to the establishment of a supra-national treaty body between Canada and the US.

166. MEP's website should be updated to facilitate better communication with the international community and create a better enabling environment for China's environmental work. Perhaps changing the MEP's name to Ministry of the Environment would reflect the broader, more pro-active approach that is needed.

167. Before borrowing models from the West, China first needs to look at its present economic, social and environmental situation, matching this to the corresponding phase Western countries experienced. Today's China resembles the North America and Europe of the 1960s and 1970s. This comparison is necessary in order not to underestimate the difficulties facing environmental work in China.

168. The international community has high expectations regarding environmental protection in China because of its present economic performance. Some members argue that China is in no position to take the lead, be it in terms of economic, social or environmental development.

b) English Language Group

169. With Vice-Chair Børge Brende presiding, English-speaking members convened to hear Leading Speaker Mr Hans van der Vlist, the Netherlands' Vice Minister of Housing, Spatial Planning and Environment. These initial comments were then followed by a general debate on the CCICED recommendations and comments on the Task Force reports. During the Parallel English Language Group Discussion, the following points were made.

170. We are not only facing a financial crisis but also a food crisis, a climate crisis, an environmental crisis. They have a common cause: economic activities that are not sufficiently regulated and failure of the markets to solve the emergent problems. The climate and the financial crises are daunting because of their global nature; only global governance and institutions have the necessary means to address the challenges. Unfortunately, these institutions have yet to be created and countries have to turn to existing international agreements.

171. Premier Wen Jiabao, in meeting with Council members, stated that the GOC's stimulus package would target consumer demand – yet with long term consumer confidence low in all countries, this lever may not be effective.

172. The necessary reform of the international financial system offers opportunities to finally promote sustainable development. Four changes need to be supported: the global governance of the financial systems is likely to become more transparent; secondly, governments, by acting together, can demonstrate their capacity to cooperate, thereby injecting much needed confidence; thirdly, long term thinking in the decision-making process will take precedence over the current short-term focus on profits, leading to the adoption of sustainable solutions and corporate social responsibility; fourthly, governments will start to look more critically at market operations and intervene earlier to prevent the occurrence of perverse incentives and ecological damage. Better regulated and more stable markets are likely to result from these changes.

173. Governments and the private sector should start putting together these new governance structures, invest in the LCE and in stable markets. The GOC's own stimulus package is an opportunity to take steps in this direction, investing for instance in low emissions technology. China's experience with state involvement in the financial sector could become valuable to other countries, unaccustomed to such interventions.

174. Four of the TF reports submitted to Council deal with one of the essential elements of transformation, energy efficiency. It will be useful for this discussion to ensure a consistent and coherent message is offered to the GOC on this issue. For instance, is the long-term, stable escalator principle for energy prices that have been put forward by one TF consistent with the need to spur innovation? Are price mechanisms sufficient, or are emissions caps and standards also necessary? Recommendations from the four TFs dealing with energy issues should be grouped together. Environment and Health is the other great theme of this AGM. The proposed recommendations were clear and can be presented separately from the LCE issues.

175. The current contraction of the global economy, not seen since the 1970s, should be taken into account in our recommendations. The GOC's stimulus package is to ensure continued growth in China, but the Council needs to stress the kind of opportunity this could be for the realization of sustainable development. The projects that are most likely to be launched immediately have no doubt been planned for some time and therefore are not necessarily ecologically sound. The Council can provide sound advice beyond suggesting Environmental Impact Assessments (EIA) be conducted. This is tricky, because EIAs will delay the necessary public works.

176. These projects, as described by China's Premier to Council members, include environmental infrastructure. However if a large impact is desired, this kind of investment is not always helpful because there can be long lags for employment and consumption effects. The GOC has no doubt already considered what will give a rapid boost to consumer demand and job creation. The Council could provide advice on two areas of public spending that would also build natural capital: environmental infrastructure works, such as watershed management or sewage treatment plants; and the investment in or expansion of ecological restoration work, such as aforestation, rehabilitation of wetlands and grasslands. Much of China's focus has been on cleaning up after the damage is done; the need is now to see the environment as a driver for economic growth, jobs and shoring up natural capital.

177. The current financial crisis presents risks and opportunities that have not been seen in over 60 years; this is not business as usual and it must be reflected in our recommendations. There seems to be a paradigm shift regarding the LCE and climate-oriented business models around the world. We are confronted with a huge power shift in terms of economics and innovation – China is leading the way in translating the new thinking modes into practice. Yet climate change indicators are more worrisome than ever, most specifically GHG emissions which continue to accelerate, a rising GHG intensity per unit of GDP globally, and a decreasing absorptive capacity of ecosystems. The Council's most important advice to the GOC should be on the actions to be prioritized, and the time frame required. This kind of consideration is lacking from the current TF reports and recommendations.

178. Previous economic downturns in various countries have corresponded with environmental degradation. It is critical to propose options that would allow China to avoid this during the current crisis.

179. It is expected that China's stimulus package will mostly be spent on cement and steel – this is the easiest option to stimulate domestic demand and job creation. But focusing instead on a green recovery and on an investment in human capital, namely health and education, could be very productive. There are also opportunities for infrastructure investment in climate-friendly transport such as public transit and rail. China's banking system does not have sound mechanisms to finance such long-term projects; international cooperation could prove valuable in this area.

180. The present crisis will require long-term public intervention in order to be effective; this is also the case for the LCE – a sensitive topic in China. Perhaps the Council could be the platform to convene a roundtable on "green recovery" and the need for a coordinated global LCE response. This would support future discussions on climate change in Copenhagen and elsewhere. Further, China needs help in developing the vision of what the LCE could look like in 2050 – beyond the short-term perspective of the FYPs; the CCICED could assist China in this regard.

181. The CCICED has to focus on assisting China integrate its recommendations into the next FYP. The previous FYP was also focused on the domestic market, seeking a transformation from manufacturer of cheap export goods, to domestic higher quality goods. The key will be to transform China's manufacturing forces into sustainable ones. China's investment into its transport network is to connect poor areas to markets; this will continue, but integration with rail infrastructure could be optimized. Investments will also continue into power generation and urbanization. Council recommendations need to target areas that are the focus of China's FYPs. The Premier is keen on market incentives and AGM recommendations can provide counsel in this area.

182. How Council amends recommendations remains a hazy process; open debate in Council tends to be monopolized by international members and the present discussions are being held in parallel sessions. It is felt that a joint discussion among international and Chinese members on TF reports and policy recommendations would have been more valuable.

183. This year's experiment with parallel discussions was instituted precisely to encourage a greater number of Chinese interveners to express their views while allowing for greater discussion time among international members. The experiment may need to be revisited next year.

184. The present stimulus package may be a transition between the 11th and the 12th FYPs; its objectives are to restore confidence despite a slowdown in growth, to increase domestic demand, and to reduce unemployment which is bound to rise. Much of this package will no doubt be composed in part of old commitments or ongoing projects. The key will be to push for energy efficient, low carbon infrastructure projects which at the same time can generate employment; environment projects such as

sewage plants and river clean-ups can be both labour intensive and yield environmental benefits. The Council's advice could be useful to the GOC in optimizing the use of the stimulus funds.

185. Any talk of LCE must be anchored in solid knowledge of the energy system; recommendations must take into account the blockages to energy efficiency and low emissions. The energy system comprises six elements: power generation, from renewable and non-renewable sources; industry and manufacturing; transport, where energy efficiencies will only be achieved through regulations and standards; buildings; land use; and finally consumption. Energy policies must focus specifically on each area in order to have impact. Discussions so far seem to imply one set of LCE policies will be sufficient.

186. Some 26% of China's carbon emissions are embedded in its export products; much of these exports are produced in plants which are partly or wholly owned by foreign investors; some reports indicate 70% of inputs used in Germany are produced in German factories in China. We need to consider whose carbon we are talking about, understand China's position and share the responsibility accordingly.

187. China is undergoing massive urbanization. Moving rural families to cities implies a 12-fold increase in carbon footprint due simply to a change in lifestyle. Hundreds of millions of rural people are relocating to cities with serious consequences for GHG emissions. This effect will be difficult to offset. Some studies indicate that carbon emissions by 2030 will be greater than had been projected a year ago in spite of slower economic growth and higher energy prices. Council recommendations do not take these forces into account and need to be more sophisticated.

188. Perhaps starting with a simple idea could be productive. Premier Wen Jiabao mentioned the mandatory target he must meet – a 4% reduction each year in energy intensity during this FYP. This is in itself a LCE concept and the Council should follow this lead. This would indicate China is already focusing on the demand side of the energy equation. Sustainable coal use will be one of the main topics of the LCE TF over the coming year.

189. It is unclear whether or not the stimulus package includes mostly "old" projects. Infrastructure investment implies greater use of power, steel and cement. Stimulating domestic demand means industries and manufacturing will proceed apace. The energy intensity targets during this FYP are to total 20% - but China is also committed to a minimum 8% GDP growth, which implies GHG emissions, will peak sometime between 2020 and 2030. Council recommendations should be more explicit on emphasizing the need for an efficient environmental management system; legislation, regulations, standards, monitoring, inspection and control are all still lacking, and increased resources and capacity building are urgently needed. These are concrete suggestions for making the use of funds in the stimulus package more environmentally-friendly.

190. Sustainable development does not happen quickly and requires careful consideration; it is not easily handled in crisis-driven spending plans. Spending on watershed management, reforestation and ecological construction can be both labour intensive and be rapidly planned. Such interventions would have desired impacts on environment and biodiversity conservation, if not on the achievement of a LCE. China, which has been visionary in so many areas throughout its history, needs to accept the mantle of leadership and innovate boldly in the area of sustainable development.

191. A key sector targeted in the stimulus package is agriculture and the rural economy; Premier Wen mentioned immediate spending on methane digesters for rural energy generation; it can represent significant spending in poor areas, reduce GHG emissions and create employment. While not as glamorous as large power plants, such small projects can have a significant cumulative impact. Members should also remember that China's Environmental Law is to be revised this year, with a focus on the penalty structure. At present, penalties are too low to be an effective deterrent. Environment officials need to be given powerful tools to enforce the laws.

192. Most of this parallel session has focused on energy issues; vast areas of the recommendations have yet to be discussed. Moreover, energy-related recommendations need to be better coordinated. Perhaps the 11th FYP mandatory energy efficiency targets could be the unifying principle for Council's suggestions in this area. China should stop investing in energy intensive industries and plants – today's dinosaurs – during the 12th FYP. Further, recommendations need to be consistent about the short term stimulus package versus the long-term vision that is the LCE; financing projects to stimulate domestic demand should not harm longer term environmental considerations.

193. The Council recommendations should aim to influence China beyond the immediate financial crisis. The stimulus package announced is to rebuild consumer confidence, stimulate demand and create jobs; it would be extremely fortunate if these funds were to serve environmental goals as well. In any event, none of the funds will be targeted at such a strategic goal as the LCE. Were Council recommendations to be too closely tied to the current crisis, they risk contamination. China has indicated a willingness to explore greater public information and participation – an important, systemic improvement; the Council needs to emphasize this as a pre-requisite for any success in environmental protection.

194. The Council needs to be realistic about its expectations of the stimulus package – the GOC is actually ahead of the curve, indicating the environment will be integrated in the public projects funded. Premier Wen was silent on the Council's health recommendations – in this area, Council is ahead of China and its contribution could be significant. Another area where Council can impact decision-making is the LCE which offers China the opportunity to leapfrog, and where international cooperation could be fruitful. The window of opportunity is the 12th FYP; the Council's next AGM could focus on this since the current FYP ends in 2010.

195. The areas where the Council provides value-added to China are immediate technical assistance for emergent issues, and collaborative thinking about longer term problems. During the parallel Chinese discussion, mention was made that international members focus too much on longer-term considerations, forgetting about China's immediate, practical needs. The Council's report on Environment and Health addresses short term priorities; while the LCE report deals with the future and could be the focus of more collaborative thinking between international and Chinese participants. China is starting to shift its thinking into a new paradigm, but programs and implementation remain stuck in the past – this has been referred to as "green thinking but brown reality." The Council is well placed to help China draft the roadmap from the brown present to the green future.

196. Members expressed some concern over the insufficient distribution of Recommendations drafts, and the lack of explicit connection between the Issues Paper and the Recommendations.

197. Council needs to take care not to focus uniquely on climate issues; livelihoods and quality of life, including health, are highly relevant to China. Focusing solely on climate change could lead to accusations that international members only care about issues that affect their countries directly.

198. China uses language for its broad concepts that is visionary: *Harmonious Society* and *Ecological Civilization* – expressions that are inconceivable in western societies. However, China needs to move from broad vision to operational issues and actions. The temptation of segmenting the response according to traditional sectors of the economy should be resisted. A systems approach is needed. It should also be remembered that the LCE is not only about emissions reduction, but also about carbon sequestration, something that natural ecosystems do very well.

199. Language is key and members need to be aware that much is often lost in translation.

200. An umbrella statement is needed at the beginning of the Recommendations, linking clearly the Issues Paper with the theme of the AGM and the recommendations that emerged from TF reports.

201. Council should be explicit in stating that the global leadership in sustainable development (SD) and real solutions will be coming from emerging economies such as China's.

202. Much has to happen domestically in order for the GOC and the people to address the country's own problems. This, rather than currying favour with the international community, is China's motivation. In recommending public participation, China's specific context, its need to maintain social stability, have to be respected and a gradual approach needs to be stressed. However, Council must be clear that although public participation may create ripples which on the surface appear negative, in the long run the genuine involvement of the public is the only hope for effective implementation of environmental laws and regulations.

203. The structure of the Recommendations paper and some of its language need to be tweaked. Members are reminded that the drafting group avoids repeating points that have been made to the GOC in previous Recommendations.

204. Members would profit from a report on the successful implementation of the 11th FYP, since much of this will provide subtext for the preparation of the 12th.

205. It is suggested the AGM be structured differently, providing thematic discussion groups where relevant officials and ministers of the GOC could dialogue freely with members.

206. It should be stressed that the AGM is an opportunity for international members to learn more about China and report back to their organizations, providing much needed context. Discussions should not be held separately for international and for Chinese members. Perhaps smaller discussion groups could be staged; assigned seating dinners would also facilitate greater exchange among Chinese and international participants.

ITEM 8. DISCUSSION AND ADOPTION OF AGM POLICY RECOMMENDATIONS

a) Briefing on the Parallel Group Discussions

207. Co-Chair Børge Brende presided over the presentation of discussion summaries from the Parallel Groups. The Rapporteur from the Chinese Language Parallel Group Mr. Ding Yihui summarized the main points made during the discussion.

208. China is inseparable from the rest of the world – it shares both opportunities and challenges when it comes to protecting the earth. China's determination and capacity to solve problems of environmental protection and economic development were reaffirmed. It is recognized that much of the legislative framework related to the environment is normative rather than actionable, hence is not effectively implemented; clear improvements are needed in this area and public participation should be integrated in new statutes.

209. The Chinese Language Parallel Group found that TF reports were detailed and contained specific recommendations; they are pertinent to China's current stage of development and in line with its goals of fostering a harmonious society. Specific suggestions for improvement were made.

210. A greater number of recommendations should focus on resource use, as well as on disaster mitigation, prevention and relief. In recommendations related to clean energy, the environmental effects of large-scale hydro dams and wind farms should be examined. The LCE sections need to be more specific and operational. One of China's main goals remains poverty reduction; it seems most recommendations do not take this factor into account. The recommendations do not reflect China's focus on environmental challenges in rural areas; any discussion of energy for instance should also address rural energy issues.

211. While it is important to address climate change in a global context, Chinese members would like to see the issues of atmospheric pollution control addressed more directly, especially at the

regional and local levels. Urban planning is a powerful tool; it would be best to integrate in relevant recommendations issues such as energy efficiency in buildings and vehicles. Law enforcement will require more coordinated action on the part of governments at all levels, as well as the cooperation of enterprises. TF reports should be more explicit in linking with previous and future TFs that deal with similar issues; there should also be improved coordination among all TFs. The Secretariat could play a role in involving members in TF activities.

212. While the Olympics were successful from an environmental perspective, the costs were quite high; cost effectiveness must also be taken into account when recommending models of environmental protection. The MEP website needs to be improved, with greater data availability and transparency. Finally, participants proposed text changes to the draft recommendations.

213. The Rapporteur of the English Language Parallel Group Mr. Roger Beale listed the following points made during the discussions.

214. International members reiterated the importance they attach to the meeting held with Premier Wen Jiabao. Members also acknowledge that the AGM is taking place in challenging times for the global community; recommendations need to reflect on the financial crisis and address the opportunities it presents in two ways. First, the crisis will impact on international and national governance; secondly, there are risks and opportunities associated with the stimulus packages being announced. Regarding governance, the participants believe the G20 and other meetings to be held on the crisis could generate greater confidence and spur concerted action; China's own stimulus package is contributing to this. It is hoped this good will can spill over into upcoming climate change negotiations.

215. Regarding stimulus packages, participants recognize many of the plans funded are pre-existent; but it is of utmost importance to ensure these short term interventions be guided by medium and long-term considerations of the environment and climate change. The principles to follow in selecting projects for funding should be: *"Do no Harm"* as efforts are made to stimulate consumer demand and jump-start economic growth; where possible, a systems approach should be taken to determining the contents of a stimulus package; consideration should be given to labour intensive projects that also support investments in natural capital, projects such as reforestation, or projects that support sustainable rural economies such as small scale public works to supply safe drinking water, produce methane from organic waste, or provide solar-heated hot water.

216. Implementation of environmental protection statutes remains a problem in China. A stimulus package can provide short term training and employment opportunities for people – recruiting them and building their capacity to do monitoring and surveillance. International members also see the stimulus package as a bridge between the 11th and the 12th FYPs. The next FYP could see China using

its considerable savings and building on its comparative advantage to develop, test, scale up and market new environmental technologies.

217. Sustainable development is a long-term effort and a vision for 2050 is needed; leadership in this area is shifting from Europe to emerging economies such as China. They will be called upon to find the right balance between economic, environmental and social development considerations. Leadership is not to be confused with the power to dictate, but rather should be understood as the capacity to develop a model for others to emulate.

218. Participants commended the TFs for their reports, but noted that greater linkages need to be drawn among their findings and recommendations. They are cognizant of the challenges posed by natural disasters, but believe that a focus on long-term issues will provide China with solid prevention strategies, and better serve the goals of the Council. They also noted the common theme in TF reports of the importance of reliable data, public information, strong regulations, effective enforcement and penalties, citizens' participation, and coordination – both horizontal and vertical – among government agencies.

b) Presentation of the Revised CCICED Recommendations

219. Vice-Chair Børge Brende asked the Chief Advisors Shen Guofang and Arthur Hanson to brief Council on the final draft document. During their remarks, they emphasized the following:

220. The drafting group incorporated several crucial elements, such as Vice Premier Li's speech and statements by Premier Wen Jiabao, in addition to the existing recommendations, summaries of the parallel group discussions, TF reports and members' suggested amendments. Members need to keep in mind that the AGM is an annual event focusing on a specific theme; AGM recommendations must avoid repetition of items covered in previous years.

221. Sections on energy and the LCE have been integrated in the first portion of the document for coherence's sake. Since next year's AGM recommendations will focus on energy issues, the more detailed recommendations is this area have not been included. The recommendations are more specific on environmental considerations that should prevail in projects funded through the newly announced stimulus package, including a recommendation on green procurement. Other changes in the text include an emphasis on the 12th FYP, energy pricing reform, LCE and climate change.

222. Members left detailed changes to the draft of the Recommendations tabled on 14 November to the drafting group.

ITEM 9. CLOSING SESSION

a) Secretary General's Report

223. Vice-Chair Margaret Biggs chaired the Closing Session of the CCICED 2008 AGM. Secretary General Zhu Guangyao was asked to brief Council on the accomplishments of 2008 and the workplan for 2009. During the course of his remarks, the Secretary General made the following key points.

224. The CCICED got solid support from the GOC in 2008; policy recommendations submitted were well received by relevant ministries and agencies. CCICED partnerships are expanding, with a greater number of domestic and international donors, laying a good foundation for future work. The organization of the CCICED is proving quite flexible; members and TF partners are able to maintain good communication. The first roundtable was organized during the past year and helped to disseminate the Council's work and recommendations.

225. In order for members to assess the impact of the Council's work, the Secretariat tasked the Chief Advisors to compile a report on the China's policy changes in 2007-2008 and the relevance of CCICED's recommendations that were adopted at the 2007 AGM; this report is distributed to the Council Members for their reference.

226. 2009 will be a busy year for the CCICED. The Bureau has authorized a number of TFs that will focus on energy issues, including the TFs on LCE, on economic instruments, on rural development, on sustainable use of coal and on urban development. A number of these have already submitted interim reports; all of these TFs will be reporting to Council at the 2009 AGM.

227. The Bureau has also approved two new TFs which are starting work in 2009 and are to submit their report in 2010: the TF on Ecosystem Service and Management Strategy, and the TF on Sustainable Development Strategy for Oceans. In addition, research cooperation will commence with India Council for Sustainable Development and a China Environment and Development Outlook project will be launched. The Secretariat this coming year will also prepare another Roundtable and the AGM; members will be kept informed on these events. In addition, the Secretariat will continue to strengthen relationships with other ministries of the GOC, as well as the private sector, universities and research institutes.

228. The Secretariat is working on a long term development plan for the Council. Members and partners are invited to put forward suggestions and recommendations.

b) General Discussion

229. At the invitation of Vice-Chair Margaret Biggs, members commented on the AGM and on the Secretary General's report. They made the following points.

230. IUCN would be interested in helping develop the work of the two new TFs on ecosystem services and on the oceans.

231. Working with the Council is a learning experience for members. It will be key to outline what the vision for the LCE is and future work will help better define this. Premier Wen mentioned that China could be the ideal place where new technologies can be tested and marketed; perhaps a roundtable on this issue could be organized.

232. It is most productive for all Chinese and international TF Co-Chairs to meet in a timely fashion in order to better coordinate their work. This meeting should be held early enough in the year to influence the course of each TF's work.

233. The launch of roundtables as a Council event should be lauded. This year's roundtable also included an Enterprise Forum where it was possible to engage the Chinese business community. It would be good to have Chinese business representation on Council as well.

234. The concept of Low Carbon Prosperity provides Council with the means as well as the ends – the end being prosperity, and the means being the successful implementation of the LCE. The two ideas could be explored over the coming year.

c) Closing Remarks by Council Executive Vice-Chair Zhou Shengxian

235. With Vice-Chair Margaret Biggs presiding, Executive Vice-Chair and MEP Minister Zhou Shengxian addressed Council. During his closing remarks, Minister Zhou emphasized these points.

236. The 2008 AGM was fruitful thanks to the contribution of members, experts and staff. When meeting with the Council, Premier Wen raised a central issue: in this time of crisis, it is more pressing than ever to protect the environment and ensure sustainable development. The current slowdown presents China with the opportunity to transform production and restructure industries in order to protect the environment.

237. The presence of Vice-Premier Li Keqiang and the meeting with Premier Wen demonstrate the importance given to the Council by the GOC. The agenda of the 2008 AGM was completed successfully and the Secretariat will work to ensure its recommendations get broad distribution. A report on the influence and relevance of the 2008 recommendations will be presented to Council in 2009; equally important will be an analysis of the reasons why some recommendations are not adopted by the GOC.

238. China has not, nor will it ever stop protecting the environment and supporting sustainable development through progress on production and energy efficiency and resource conservation.

239. China's successful handling of the current financial crisis can turn these difficulties into opportunities. The MEP will shoulder its responsibilities. It is believed that environmental protection

can stimulate further economic growth; there is significant potential demand for environmental technologies and products. China will support the development of a Green Economy, a LCE. Innovation, including in our institutional frameworks, is key to this process. International cooperation can be key to face the current global crisis. The CCICED is an ideal platform for China to learn from international experience, both its successes and failures.

240. The 2008 AGM of the CCICED was adjourned by Vice-Chair Margaret Biggs.

III RECOMMENDATIONS OF THE COUNCIL TO THE CHINESE GOVERNMENT (Final Version)

241. The 2008 Annual General Meeting of the China Council for International Cooperation on Environment and Development was held in Beijing from 12-14 November 2008 with the theme of "Harmonious Development through Innovation". This meeting occurred at a time of great turmoil in the world's financial markets, with the threat of severe global recession, but also a call for "re-regulation." This year is also a time of celebration of tremendous achievement in China—30 years after the *Reform and Opening Up*, and after the very successful Beijing Olympics.

These events, and also China's remarkable efforts during the snowstorm and earthquake disasters, and in response to the melamine contamination and other public health incidents have focused our discussions on how environment and development can play a stronger role in China's future harmonious relationships.

The 17th Party Congress of the CPC specified that scientific development, Harmonious Society, and promoting an *Ecological Civilization* should guide China's social values and progress. Now, a year after this historic meeting, there is growing evidence that transformative action is taking place towards building a resource conserving and environment friendly society in China.

It is particularly significant that progress is being made on the 11th Five Year Plan program for energy conservation and pollution reduction, that China leads the world on achieving many of the Millennium Development Goals, and that many of China's science and technology innovation goals are for sustainable development. Also, that necessary institutional strengthening including the formation of the Ministry of Environmental Protection (MEP) is taking place. CCICED applauds this evidence of domestic progress and also China's expanding role on international environment and development.

Despite these praiseworthy efforts and achievements, China's domestic program for environment and development still faces many challenges, and much corrective action before its full contribution to a Harmonious Society can be realized. The action taken at the 3rd Plenary Session (October 2008) of the 17th CPC Party Congress to reduce the imbalances between urban and rural development is an important opportunity where increased environmental efforts will lead a more harmonious society. The CCICED members are aware that public health problems induced directly or indirectly by pollution remain a serious factor for social advancement in China. This has been a priority area for CCICED research on harmonious development.

CCICED believes that an appropriate mix of incremental and transformative changes is needed to build a new relationship of environment and development in China and globally. It is

fortunate that China is well positioned for carrying out these changes. Environmental progress should intensify over time, first through incremental improvements, and later by leaps and bounds, as the investments now being made in sustainable development innovation produce better technical solutions. CCICED has examined how environment and sustainable development innovations could be fast tracked, since it is unlikely that incremental change alone will satisfy China's ambitious environmental targets and longer term needs.

Nowhere is this need for innovation greater than in addressing environment and energy relationships and the global need to address reductions in greenhouse gases. CCICED has started several task forces and other activities on these topics. While the main results will not be reported until the 2009 AGM, a few preliminary recommendations are provided in this document.

The global environmental situation continues to decline, with direct effects on China through trade, climate change and in other ways. The Beijing Olympics has created a level of awareness around the world of China's environmental problems and its capacity to address them. How China chooses to go about its efforts to promote an *Ecological Civilization* at a global level is therefore a significant matter, with implications for trade, market supply chains, and action on pressing concerns such as climate change. But China's domestic and international environment and development efforts could be threatened if the credit and financial crisis turns into a worse situation of recession.

The worsening global economic situation threatens social, economic and environmental progress of all nations, including China. This topic received special attention from both Chinese and international members. The CCICED AGM occurred just as China announced its substantial economic recovery package. Therefore there was a substantive basis for considering how China can turn the economic crisis into an opportunity for strengthening economic growth.

In the period of global crisis ahead there will be many opportunities where China and a few other major developing countries have advantages not found in more established industrial economies. This is particularly the case for sunrise industries and for green products, which will become of increasing significance in the second decade of this new century. In fact there may be a historic shift in leadership on environment and sustainable development from Europe and North America towards Asia. Trade and investment will be drivers for this to happen. Real solutions for global sustainable development are now as likely to arise from action in China as they are from other parts of the world.

Council members appreciated the Chinese position that the global economic slowdown therefore must not be allowed to stand in the way of environmental progress. And that the economic stimulus package developed by China has incorporated environmental aspects. During this time of rebuilding the world's financial system and new economic growth paths, China could benefit by positioning its investments towards activities that will allow it to shape the nature of future world growth, for example as a supplier of renewable energy products and services. These are examples of

what CCICED's Chairman, Vice Premier Li Keqiang, noted are actions that "promote development of the economy while taking good care of the earth that we share."

At the 2008 AGM CCICED reviewed final recommendations from Task Forces on *Innovation and an Environmentally Friendly Society*, and on *Environment and Health.* In addition, the Council received interim reports with some recommendations from three energy and environment Task Forces that will submit final recommendations in 2009 (*Pathway toward Low Carbon Economy, Economic Instruments for Energy Efficiency and Environment, Energy Efficiency and Urban Development).* In addition, the CCICED Issues Paper prepared for the 2008 AGM identified a number of urgent challenges facing China, in part the result of the international economic and environmental situation. Our three key recommendation topics draw upon these reports as well as on the views of Council members.

The Council's reports and discussions again underscore the need for effective implementation and enforcement of strong environmental legislation, greater use of credible economic instruments, and a more scientific approach to the development and dissemination of reliable environment and development information as means to build confidence and public trust in China's environmental decision making. Of these points, the first and last deserve particular attention. Enforcement of regulations at a level that will change behaviour is absolutely essential in order to foster innovative technologies and to improve environmental health conditions. But it is also vital to stress the need for public data that can be trusted by citizens and can become benchmarks for positive change via good standards.

RECOMMENDATION TOPICS

1. **Transform Challenges into Opportunities for Further Implementation of a Scientific Development Approach.**

2008 will surely be viewed as an exceptional year for China because of the devastating natural disasters, international financial turbulence, food safety incidents, successful Olympic and Paralympics Games as well as the 30th anniversary of the introduction of *Reform and Opening Up*. The year on the one hand gave rise to a number of new problems and challenges for China in the field of the environment and development, on the other hand, the great success and joy of the year left a precious legacy for China as well. As the year of 2008 draws to its end, it is now important for the Chinese government to face up to the problems and challenges, identify opportunities and potentials, review experiences and lessons, take positive actions and look into the future.

Therefore we recommend that China:

(1) Seek Opportunities in the Wake of the Financial Crisis, and Advance "Sound and Rapid" Environment and Development Initiatives.

To find a remedy for the financial market and achieve stable economic growth are undoubtedly the top priorities for the world right now. However, we must remain alert to prevent the environment from becoming the next victim of the financial crisis, as may occur in some parts of the world. Once it becomes a trend to neglect environmental factors, the world's sustainable development will take a significant step backward. Thus, China must work with unwavering determination to reduce emissions, improve energy efficiency and fight climate change. The Chinese government has recognized the risk from the current crisis and has integrated environmental protection in the domestic stimulus package. It must now transform the challenges to opportunities for sound and rapid sustainable development.

The stimulus package should follow four principles with respect to environment and development. First, do no harm to the environment in the implementation of the package. Second, take a systems perspective that will identify positive relationships for environment and economy. Third, highlight labour-intensive activities operating at an appropriate scale to help poor people while protecting local environmental conditions, especially in the countryside. And, fourth, seek co-benefits, especially for improving health and ecological restoration, as a consequence of energy improvements, disaster relief and reconstruction, and pollution reduction. It is recommended that the Chinese government should be fully aware of risks and opportunities, and take the following actions:

1) Strengthen supervision and environmental management in the execution of the domestic stimulus plan, so as to prevent regions from boosting economic growth at the expense of environment in their response to the financial crisis.
2) Consider not only environmental protection as one of the investment priorities of the stimulus package, but also carry out examination of supply chain environmental consequences and strengthen green procurement policies. These steps will boost the development of environmental protection industries and convey the strong determination of the government that environmental protection can be maintained even in the wake of the financial crisis
3) Take advantage of the opportunities arising from the financial crisis in order to advance transformation of the development mode for the domestic economy. This can be done by boosting the development of clean energy and technical innovation, low carbon economy and by strengthening capacities in the area of environmental protection and climate change in the remaining years of the 11th Five Year Plan, and particularly during the 12th Five Year development period.

4) Advance energy price reform and further internalize environmental externalities with the plunge of oil and commodities prices. It is advisable for China to adopt a long term "escalator" approach to gradually raise energy prices. It means small, but periodic and predictable rises of prices or introduction of additional environment or energy taxes, with information transparency to fully prepare the general public and reduce possible resistance.

5) And for the longer-term, develop Low Carbon Economy. The Chinese government should attach great importance to the development of Low Carbon Economy (LCE) and get prepared for action, particularly in terms of technology options and feasibility analysis. The development of a low carbon economy will benefit China both internally, in terms of addressing resources and environmental problems, and externally by contributing to the fight against climate change and raising international competitiveness. China should consider specifying low carbon economy related targets in the 12th Five Year Plan for economic and social development, and incorporate low carbon economy in current strategies and actions.

(2) Create a Better Mix of Government Regulation and Market-Based Mechanisms, and between Factors Favouring Innovation and Those Favouring Stability.

The world financial crisis and the infant formula incident have shown that excessive reliance on market forces without effective regulation will create huge risks. In fact, market failures such as environmental externalities are often hard to control. The government thus should strengthen its supervision while adopting market-based instruments. China is at the initial stage of a socialist market economy where both market function and government regulation await improvement. Therefore the government should step up its supervision while giving full play to market-based instruments suitable for environmental protection.

Some of the most important market based approaches will require significant levels of capacity building for adequate management and supervision, including improved emissions monitoring, consolidation and standardizing of emissions data, designating a legal registry for emissions reductions, and enforcing non-compliance with much stiffer penalties.

It is important for the Chinese government to maintain the balance between innovation and stability. Stability is a prerequisite for a harmonious society while innovation often entails reform to avoid unreasonable benefit distribution. Imbalance between the two will give rise to conflicts. But if innovation helps encourage public engagement, promotes fairer benefit distribution and betterment of social welfare, it will help promote the development of a harmonious society. For instance, environmental innovation could help to optimize the relations between the environment and economy,

resolve problems in the field of the environment and health, encourage wider public involvement, and give full play to the role of women in building a harmonious society.

(3) Step up Infrastructure Construction and Quality for Optimized Development and Harmonious Society.

In the face of such natural disasters as the snow storm and earthquake in 2008, the foundation for optimized development and harmonious society has proved fairly weak. Such weakness can be found in the relevant mechanisms, urban development patterns, the layout and quality of infrastructure, social security and emergency response. The weaknesses demonstrate that it is urgent for China to shift its growth pattern from quantitative expansion to quality development, and to achieve harmony between people and nature. The infant formula incident served notice that corporate social responsibility should be further stressed. A massive and systematic program is needed to achieve a more balanced development among various social and economic aspects. The foundations for harmonious society should be strengthened, including the moral and cultural basis for scientific development. If environmental factors are built into this more advanced approach to development, the chances for sustainability will be enhanced.

(4) Strengthen Rural Environmental Management and Help Improves Overall Environmental Protection of China.

The rural areas of China not only lag behind the cities in terms of economic and social development but also bear the brunt of environmental pollution and ecological damage. The countryside is thus a weak point in environmental protection and the building of a harmonious society. The central government of China is committed to the integrated development of urban and rural areas. In addition to the strategic goal of building a new socialist countryside, a comprehensive rural reform scheme was passed during the 3rd Plenary Session of the 17th Party Congress. Against this backdrop, China should create a bigger role for environmental protection as part of the overall strategic goal of building a new socialist countryside. The environmental priorities of rural areas should include greater attention to rural environmental management system and capacity building, environmental infrastructure, drinking water safety, soil contamination, indoor air quality management, and exploration of an integrated urban-rural environmental management mechanism and eco-compensation. The eco-compensation policies should be expanded to include climate change mitigation and adaptation needs, and damages cost by air pollution. Efforts on these priorities will improve overall environmental protection throughout China.

(5) Develop Innovative Environmental Management Systems and Mechanisms Based on the Successful Experiences of Green Olympic Games.

The successful Green Olympic Games has left China with valuable environmental legacies, including hardware such as demonstration projects, and infrastructure that help to improve the environment and serve the public, as well as software such as the concept of ecological civilization, improved environmental management, environmental information disclosure and wider public participation. All these may help to bring about deep changes in economic and social development patterns.

In its effort to host a Green Olympic Games, the Chinese government adopted successful measures to promote pollution prevention and control planning, environment friendly buildings and infrastructure, environmental information disclosure, public participation, commercialization of the innovation technologies employed in the Green Olympics, control of trans-boundary emissions through the establishment of a regional environmental management system, tail gas pollution control, the phase out of heavily polluting enterprises, etc. China should review these successful experiences and develop standardized and long-term mechanisms of environmental management to improve the environmental quality of Beijing and other parts of the country on a continuing basis.

The 2010 Shanghai Expo offers a new opportunity for the implementation of the "Green Olympics" experience, The Government of China should integrate more green measures in the planning and implementation of a "Better city; Better Life" Expo.

Also, China urgently needs to control trans-boundary emissions via regional environmental management systems operating on total emissions control, emissions trading and with appropriate institutions, such as coordinating groups comprised of the relevant provincial governors. The experience of the Olympics in reducing inflow of pollutants from provinces surrounding Beijing sets a remarkable precedent of cooperation that deserves to be emulated.

(6) Review the Experiences of the Past Three Decades and Continuously Improve the Environmental Management System.

Over the past 30 years, China has tried to keep pace with the international community when dealing with the field of environment and development. In light of its realities, and drawing upon international experiences and expertise, China has developed its own approach with Chinese characteristics to address environmental problems and has made significant progress in creating its environmental management system and, in some locations, for improving environmental quality.

Three decades on, China is now in an important period for strategic transformation of its environment and development relationship. It is now necessary to systematically review the strategic ideas, theories, policies and managerial practices in the field of environmental protection over the past 30 years. Such a review will not only help to consolidate successes achieved so far and further improve the environmental management system of China, but also contribute to the international community by sharing the Chinese experience.

The establishment of the Ministry of Environmental Protection in 2008 was a major step forward for the Chinese environmental management system, and reflects the commitment of the Chinese government to historical transformation in the environmental field. However, we note that environmental management system reform, perhaps leading to a super environment ministry, likely will be a gradualist process. The next step should be further integration of environmental responsibilities of different ministries, which optimizes the central government organization and helps raise capacity and efficiency. For the new environmental ministry, current attention should be focused on capacity building and financial resources. Responsibility, power, capacity and efficiency should be integrated in this super ministry, which can put people first and better serve the general public.

(7) Make New Contributions to Global Sustainable Development and the Building of a Harmonious World.

China and the world are mutually dependent. Given the large population and economic output as well as the important role of China in the global environment, the international community has higher expectations for China on issues like climate change and the financial crisis. China has made tremendous progress in development and now proposes concepts such as ecological civilization and harmonious society. These efforts should make the world more interested in China's ideas and experiences.

Therefore, it is the right time for China to make a more substantive contribution towards global sustainable development and a harmonious world. Stabilizing the financial system, sustaining rapid economic growth and resolving environmental problems in China are in themselves great contributions to the world. Meanwhile, based upon the principle of common but differentiated responsibility, China should make new contributions to the global fight against climate change and sustainable development; and expand its existing environmental international cooperation into cooperation for sustainable development, with strengthened cooperation between China and other developing countries.

2. Introduce a National Action Plan or Program for Environmental Innovation, 2010-2020.

China's complicated and unprecedented challenges as it works towards becoming an environmentally friendly society open the door to unprecedented innovation opportunities. Yet environmental innovation in China remains at a low level and lags behind innovations in other fields, and falls well short of the needs. There are several reasons for this situation:

Pollution clean-up rather than pollution prevention still dominates, and the institutions and mechanisms under which environmental protection and economic growth reinforce each other are yet to be established.

Incentives and enforcement action are still too weak and the command and control approaches still predominate. There is not a mechanism or policy system in place that encourages enterprises to invest spontaneously in environmental innovation.

A disconnect exists between research on environmental science and technology and the commercialization of research achievements due to the absence of technological application research institutes and supporting coordinating mechanisms.

Poorly developed technology and a limited system for collecting and publicizing environmental information accounts for low participation by the general public in environmental innovation and decision making.

China identified innovation as a core national strategy and mapped out the National Innovation Strategy and the Mid-to-long-term Plan for Development of Science and Technology in China 2006-2020. While this strategy and plan can produce some of the necessary indigenous research and technological applications for key environmental problems, there is a need for a specific environmental innovation approach that can ensure the sustained and integrative effort necessary to fully capture benefits and opportunities.

Therefore we recommend that China:

Introduce a *National Action Plan/Program for Environmental Innovation 2010-2020 for China.* The action plan should define the strategic goals, targets, and measures of environmental innovation of China, and address technological, institutional, social and organizational aspects of innovation. The Action Plan/Program should be supported by key projects and increased investment, and consideration should be given to the following two points.

(1) Strengthen Indigenous Innovation Capacity by Setting Up a Special Program for Clean Technology Innovation, National Research Centres for Environmental Innovation, Sectoral

Industrial Environment Research Institutes, and a System of Cross-disciplinary Sustainability Innovation Laboratories.

A *Special Program for Clean Technology Innovation* needs to be introduced, and this Program could cover technologies relating to vehicle pollution treatment, clean coal, solar power, wind power, nuclear power, carbon sequestration, energy efficient building, ecological restoration, and clean production. This Special Program would introduce Clean Technology as a major research platform in the same way as other fields such as nanotechnology have been fostered. It should be developed at a level equivalent to China's space program, with expectations that it will become an important part of China's future economic growth and exports as well as a key component of better environmental protection.

The Government of China should collaborate with relevant parties and jointly establish a number of high-level *National Research Centres for Environmental Innovation* in universities and research institutes. These Centres will bridge the gap between basic research institutes and market needs, and help introduce, absorb and utilize foreign technology. They should link research-intensive industries and China's most renowned research bodies to establish China as a major player for environmental innovation.

Common environmental problems within specific industrial sectors necessitate the establishment of research institutes for specific energy intensive and heavily polluting industries on a cooperative basis among the government, the industries and the industry associations.

Considering the ecological and environmental features of different regions in China, the State should collaborate with local governments, business and civil society to establish cross-disciplinary *Sustainability Innovation Laboratories* designed to demonstrate how to live at a high standard with minimum waste in rural and in urban settings. Their focus should be on practical demonstration of what can be done within the context of local social and economic circumstances and environmental conditions.

(2) Adopt an Integrated Approach to Address Mechanisms, Institutions and Capacity Development Required for Full Application of Environmental Innovation.

The following needs must be met. First, in the field of environmental innovation, the environmental protection authorities should lead the coordination among relevant parties and give full play to the bridging role of industry associations connecting government and the industry. Stronger regulatory rules and standards, incentives and supportive policies should be introduced to help build up innovation capacities of the enterprises, especially small and medium sized enterprises.

Second, to foster a market for environmental products, several measures could be taken: tighten environmental enforcement in order to create a potential demand market; and, where appropriate and for a limited time, subsidize environmental products used by enterprises and consumers so as to foster dissemination and application of environmental technology. Also needed are more effective *Green Public Procurement Regulations* which require government agencies to procure a certain percentage of environment friendly products will be particularly helpful in creating a sizable market for environmental products; also, action should be taken to raise resource and energy prices to expand the demand for environmental products that increase use efficiency.

Third, to considerably increase financial support for environmental innovation activities, *Environmental Innovation Funds* should be established with a focus on a Special Program for Clean Technology, and other components important for enhancing indigenous environmental and sustainable development technology innovation. The State should devise a financial supporting plan for environmental innovation and adopt financial measures including venture capital investment, preferential listing policies, green credit, and preferential loans etc., to support environmental innovation activities.

Fourth, China needs to strengthen IPR protection and international environmental cooperation and establish an *International Study Network on Environmental Technology* to facilitate learning from abroad and through joint efforts.

Fifth, drawing upon the experiences of OECD countries, China should establish an evaluation system for environmental innovation, covering the whole process from R&D to commercialization as well as such aspects as environmental, safety, health and life cycle impacts.

(3) Set Up an Improved National Information System for Environmental Quality, Environmental Pollution and Environmental Science and Technology Knowledge, with an Expanded Scope for Information Disclosure in order to Encourage Wider Public Involvement in Environmental Innovation Activities.

While China has made progress in environmental monitoring and public information disclosure, much work remains to be done before a full national environmental information system is in place and functioning well. This is a vital component for decision making of government, business, communities and the general public. The system must operate in a very transparent fashion, with regular reporting on key environmental problems and environmental performance. Knowledge access should be as direct as possible and at low cost so that people and institutions throughout China can access the information. Information needs to be packaged in ways that permit comparisons and easy understanding.

Improved information access will promote innovation in several ways: knowledge about environmental options will improve sustainable consumption, better public acceptance of new environmental technologies and environmental measures, place pressure on firms and local governments to improve environmental performance, and provide information helpful to environmental innovators, including SMEs.

3. Expedite the Establishment of a National Management System for Environment and Health.

China is faced with enormous challenges in the field of the environment and human health. First, a large number of its people are exposed to seriously polluted air, water and soil environment, which poses huge health risks. Second, because of the absence of systematic research, monitoring and statistics, there is not yet a clear picture of the full magnitude and range of public health risks posed by pollution. Hence it is extremely difficult to identify targeted measures to address the problem. Third, whether or not the economic growth pattern of China changes fundamentally within the near future, environmental pollution will remain a serious problem for a relatively long period of time, and this may give rise to more substantial health risks. Fourth, as the living standard increases, the general public will have higher expectations for a good and safe environment. Fifth, China has recently issued the National Action Plan for the Environment and Health 2007-2015, but concrete work under the action plan is yet to be carried out.

International experience illustrates that mishandling of environmental and health issues could generate complicated social and political problems that result in harm to public health, impaired government credibility, and heavy social and economic costs. China is currently in a critical period of building a harmonious society and consequently the issue of the environment and health should be given highest attention.

Therefore, we suggest:

On the basis of the National Action Plan for the Environment and Health 2007-2015, that the Government of China should accelerate the development of a national management system for the environment and health as well as an environmental management system based on "putting people first". In order to achieve this goal, efforts should be made in the following six areas:

(1) Stick to Prevention as the Main Approach and Take Effective Measures to Reduce Environmental and Health Risks.

A risk prevention system can be established by improving the environmental standards system, introducing a list of priority pollutants and enforcing stricter control of environmental access by harmful substances. The monitoring network for the environment and health should be strengthened, especially in the field of health impact monitoring relevant to human exposure. The government also should gradually set up an early warning system for environment and health, which will help to predict potential environmental and health risks, and will eradicate or reduce health damage by pollution.

(2) The Government Must Bear the Main Responsibility of Environmental and Health Issues. The Government Therefore Should Strengthen its Leadership in the Management System while Encouraging Extensive Public Participation.

Coordination mechanism between the relevant ministries should be strengthened. This could be realized through establishment of a national environment and health administrative coordination mechanism that is under the leadership of the State Council with participation by different ministries. It is also necessary to assess government performance to ensure laws and regulations are properly implemented. Based on their respective responsibilities, the environmental and health authorities should allocate sufficient staff and resources to establish specialized administrative system for managing environmental and health issues.

(3) Establish and Strengthen Legislation for Environment and Health based on the Polluter Pays Principle.

Legislation should address prevention, enforcement, and environmental rights of the Chinese public. A dispute settlement mechanism should be set up to help concerned parties to reach reconciliation over environmental and health disputes through mediation, administrative settlement, arbitration and litigation. The government also should gradually introduce a compensation system for human health damage by pollution so as to protect the environmental rights of the general public.

Improved coordination is needed between central and local authorities so that environmental health issues can be reported and assessed in a timely manner, with more effective action taken.

(4) Increase Financial Investment in Capacity Building for Environmental and Health Management, Research, and Compensation.

The central and local governments should increase their financial support for capacity building and basic research in the field of the environment and health. An *Environment and Health Fund* could be established to help compensate victims of historical environmental problems, or when the responsible party has no civil compensation capability and when it is hard to identify who should be responsible. The Fund could help victims during their recovery and support education and communications activities. Multi-sourced funding should be sought.

(5) Improve Disclosure and Access to Environmental and Health Information and Encourage Public Participation.

The government should make public environmental and health information available through accessible and comprehensible tools, such as government websites and the mass media. Prevention requires information on risks to be effective. The Government of China should launch a public access data base on pollutants and health risks. The government also should improve the public complaint mechanism and public announcement system, and create smooth channels for the public to participate in environmental and health management. Supervision by the general public, social organizations and the mass media should be strengthened and the reporting of environmental and health violations should be encouraged. Various kinds of hearings and consultation meetings should be held to hear the voices of the public and relevant stakeholders on environmental and health issues.

(6) Undertake Targeted Intervention Measures to Address Prominent Problems in the Field of the Environment and Health

Where pollution has already caused harm to human health or induced diseases, action to reduce harm and risk needs to occur quickly, and health intervention or medical care should routinely be provided to the victims. For the pollutants proved potentially dangerous to human health, the government should issue a catalogue of such pollutants as well as relevant risk evaluation system, environmental access standards and identification criteria. Such pre-intervention measures and health impact monitoring will help eradicate or reduce health risks caused by pollution. For other environmental factors with unclear health impact, China should step up research and adopt preventative measures.

IV. MEETING WITH PREMIER WEN JIABAO

242. ***Premier Wen Jiabao:*** The CCICED is 17 years old and I have taken part in 12 of your meetings. But this year's AGM is different because it is taking place in an unusual year, with as a backdrop the international financial crisis. All economies of the world are affected – yet we must not flag in our efforts to protect the environment. What is the relationship between this financial crisis, our rescue package and China's long term development? We have different questions facing us than in previous years. The fact that you have come from many countries around the world to Beijing this year shows your commitment to China's environmental protection and sustainable development. I'm confident that because we take care of environmental protection, including technical development and extension, energy conservation and emissions reduction, we will maintain our steady economic growth. I am interested now in hearing your views.

CCICED Vice-Chair – Margaret Biggs: On behalf of the Council Members we congratulate you on your return to a second term as Premier. And we want to take the opportunity to recall your personal commitment in our meeting last year to be a Green Premier, with a Green Cabinet. And the hope you expressed for CCICED to continue for a long time.

WJB: Yes I said this. I hope that when I step down, the China Council will be able to positively assess my tenure as Premier.

MB: It is a privilege for me to join CCICED, and to meet with you at this very significant point in China's development—30 years after the start of *Reform and Opening Up.* By any measure it has been a remarkable year for China. And now, as you said, we all face this threat of worldwide recession. This is not only a threat to economic progress, but it could seriously impact progress on climate change action, add to the world's growing ecological deficit, and make the poor more vulnerable. How can China seize this moment to build a new and productive relationship between the environment and economy? We see three key opportunities. First, CCICED members congratulate you for highlighting that within China economic slowdown will not be at the expense of environmental progress.

WJB: In fact, I reiterated those two firm commitments at a recent meeting we hosted jointly with the UN in Beijing on Climate Change. I said China would take action on climate change and that the Government of China would still meet the targets it had set regarding energy conservation and emissions reduction.

MB: In the economic stimulus package, the emphasis on green infrastructure such as sewage treatment and watershed conservation is a good start.

WJB: Yes, in this 4 trillion RMB package just announced to protect the continued growth of our economy, a good proportion of this will go to environmental projects – and not just to sewage treatment infrastructure. It will also include construction projects related to pipelines and networks, as well as our commitment to accelerate construction on ten major environment projects related to energy conservation. We will also take active measures to manage and treat our three major rivers and three major lakes.

MB: To extract maximum environment and development value from the entire package it will be helpful to specify green procurement procedures and identify potential environmental risks. This action will stimulate further growth of China's environmental industries. It will signal to many sectors that China values environmental protection even during difficult economic times.

WJB: You're right. Even during this economic slowdown and while we are experiencing a slowdown in the external demand for Chinese goods, we find opportunities in high technologies and new technologies in the environment-related industries that are emerging. Our wind and solar industries continue to develop – this is a sector with great growth potential in China.

MB: The second key opportunity is structural changes through pricing. Some of the high commodity prices, including oil have dropped. It is a good opportunity for China to undertake price reform that takes into account environmental damage. This can be done in an escalating fashion, providing greater predictability for business, and reducing consumer resistance.

WJB: This is correct and we are already preparing relevant plans and policies to this effect. In 20 days, you will be able to see this when China announces plans to reform our pricing of oil.

MB: Mr. Premier, the third opportunity is fundamental to China's future economy, and for the emergence of sustainable economic growth in the world. It is the right time for China to accelerate Clean Technology innovation.

WJB: Yes. This time as part of our economic stimulus package, and in the context of our program to improve rural people's lives, we will encourage farmers to produce and use biogas for rural energy – the government will be subsidizing this.

MB: CCICED is recommending that a major Program for Environmental Innovation be created. The outcome would be to elevate Clean Technology action to become a key engine of growth within China and in restructured world economic markets. This initiative could function in the same way as your Space Program, built around achieving specific objectives, and with firm timetables.

China's great advantage of huge domestic market potential, international competitiveness, and scientific development, and this can open the opportunity for China to set the direction, domestically and internationally for economic growth driven by Clean Technology. It will support new trends for sustainable rural and urban development, climate change mitigation, and industry based on green design and pollution prevention.

For the Program to be a success, markets for new technologies must be created. This will require: Strong, clear, uniformly enforced regulation and standards. Better and faster public access to credible information. And more public-private sector investment and incentives.

Mr. Premier, we know and admire your front-line approach taken in the recent crises. Environmental health threatens to become one of these issues requiring front-line attention. China has a serious, perhaps grim set of problems related to environment and health. We have studied the current situation carefully in close cooperation with your officials in the Ministry of Environment and the Ministry of Health. The full extent of problems in rural and urban communities does not appear to be known, so more monitoring is urgently required.

We are recommending that a National Management System for Environment and Health be established as soon as possible. This is needed if China is to benefit fully and quickly from its recently announced Environment and Health Action Plan. It is a way for central government to signal that it bears the main responsibility for reducing environment and health risks. Legislation needs to address prevention, enforcement and environmental rights of the Chinese public. Better alignment is needed between levels of government since it is apparent that local governments do not always see environment and health in the same way as the central government. And a well-funded, more focused research effort is required to find good solutions for a greater number of environment and health problems.

The primary focus should be prevention, but a strong case also can be made for setting in place a fair and just compensation scheme for victims of severe environmental damage. One way of doing this would be to set up an Environment and Health Foundation designed to assist victims in their recovery and to support education that would reduce risk. Action on environment and health within

China also will demonstrate to consumers abroad that China is building the standards, monitoring and other regulatory measures that can give assurance of safety in the products from this country. A significant conclusion from our work on environment and health is that China's goals in these areas will be difficult to meet without the full participation of the Chinese people. The public needs to be more fully informed and become participants in environment and health solutions.

Finally, Premier Wen, we were delighted to see the establishment of the Ministry of Environmental Protection. To ensure its success in fulfilling its broad mandate, this Ministry will have to build its capacity and influence. We look forward to seeing further progress next year on environment and development. We are certain that such progress will benefit China's effort to build a *Harmonious Society*, and will highlight to the world concrete ways and means towards an *Ecological Civilization.* We are eager to hear your views and response to our suggestions. And I hope there may be an opportunity for our other two international vice-chairs to provide a few additional observations on Council work currently underway—on Low Carbon Economy, and on sustainable urban development.

WJB: I'll respond briefly to some of the recommendations you have been putting forward. Your three major recommendations impressed me with their depth and usefulness. We are actually studying or implementing actions in these areas. First, the GOC is clear that China's economic growth cannot come at the expense of the environment, and China's development has to be sustainable development. China will continue to pursue a people-centred development, not only meeting people's material or cultural needs but also their health and the environment. There is no change in the basic views of the Chinese government here.

Now that we are in the midst of this international financial crisis, we are taking measures to expand domestic demand and invest in our economy. We see this as a golden opportunity to transform our economic growth pattern and to restructure our industries. We have announced 10 specific measures to promote economic development and they fall in 4 broad categories. Many of them are related to the environment. The first is a group of projects that will contribute to the wellbeing of our people – housing, health and education.

Secondly, we are funding infrastructure projects covering the management and control of our major rivers and lakes as well as other main environmental projects. Thirdly, we are spending on projects dealing with post-earthquake reconstruction following the disaster earlier this year. A major part of this will focus on ecological rehabilitation and on forests. The fourth category deals with the environment directly, in terms of ecological and technological improvements, energy conservation and emissions reduction.

We will never allow the launch of new projects that pollute heavily or use energy intensively. On the contrary, we will phase out outdated capacity in our industries. Perhaps during your meeting, my officials have already told you that last year we have closed down small coal fired power plants totalling a capacity of 14 million kilowatt, and we have closed down well over 1,000 small coal mines, and we phased out some 46 million tons of capacity of iron smelters, and 37 million tons of capacity in our steel smelters.

At the same time, we are also developing heavily our clean energy sources – hydro, wind, solar and nuclear. So in this time of economic crisis, we consider this our opportunity for economic development and for cleaning up our environment. I appreciate the views you have put forward. In times of crisis, we need innovation and China has a huge potential in terms of its domestic market and that for the environment.

We have this large domestic market potential because of the two basic imbalances we have in China, that between our regions, and that between our rural and urban areas. Because of these lags, and by seizing these two opportunities, China's economic performance will not be affected and in fact will contribute to greater growth. We must adopt strategies and plans based on your good ideas. When I met with you last year, I told you that we would change the administration of environmental matters and create a ministry. I have kept my word. But the key is not the title, the important point is the capacity built and the authority this confers them. We now need to improve our legislation in the environmental field.

***CCICED Vice-Chair Mr Klaus Töpfer**:* We discussed the huge success of the Green Olympics and the expectation this has raised in and out of China for environmental progress as a result. We are impressed today that there are blue skies over us. China will soon have another great opportunity, the 2010 World Expo in Shanghai, with the theme *Better Cities, Better Life.* This will allow for strong signals to be sent for environmental protection, waste management and water conservation in our big cities. This is a big challenge for China. We would like to ask for your support, putting as much effort with this as you have with the Olympics.

WJB: In fact, since the Olympics, Beijing's air has improved a lot. We took out about 40% of the cars off the road during the Olympics and to build on this success, we are now keeping every day some 800,000 cars off the road. To achieve this, we need the understanding and support of our citizens. We need to develop our buses, subways and inter-city rail systems in major ways. You have a good suggestion, that we use the 2010 Expo in Shanghai as an opportunity to clean the air there – but we should go beyond those two cities and expand this to cities all around China.

***CCICED Vice-Chair Mr Børge Brende**:* Next year we will be examining energy, environment and climate change. We will be making a full report on how China could benefit from a long term commitment to a low carbon economy and to low carbon prosperity. China's enormous manufacturing power represents the only way to drive down the price of renewable and new technologies. For now, the CCICED suggests that you look at the possibility of making the low carbon economy a part of the 12th Five Year Plan you are now preparing.

WJB: China is part of the UN Framework Convention on Climate Change and we are part of the Kyoto Protocol. Next year, we will also show a constructive attitude at the Copenhagen Conference. We believe that all countries in the world share a responsibility to achieve the low carbon economy and to fight climate change. But because of historical factors and because of our different levels of development, we believe that we have common but differentiated responsibilities.

Still, China as a major nation will never shy away from its responsibilities. This is why we have put in place our own climate change program. We have also set objectives to reduce the energy intensity per unit of GDP by 4% each year. These targets are mandatory and each year I must report on them to the National People's Congress. I agree that China's manufacturing prowess can play a role in the drive for the low carbon technologies. We are now world leaders in the production of photovoltaic cells – although we export most of them to Europe.

***CCICED Member Mr Achim Steiner**:* I add my voice to the chorus of admiration and the prospect of further emulation of the green Olympics. At UNEP, we are working with the Ministry of Environment Protection and the Beijing Environment Protection Bureau, on a study of the impacts and lessons of these Olympics so this can be replicated elsewhere. This touches upon what we have talked about at the Council regarding the green economy. The stimulus package includes investment in the economy. The meeting in Washington over the coming days will be key in determining how the trillions of dollars will be spent on, and whether it can be used on the environment and building a green economy. China's example is useful here. China can play a role in promoting a Green New Deal. This would provide a building block to the agreement in Copenhagen, from which we are at present very far away.

WJB: Thank you for coming to Beijing and taking part in the CCICED while the attention of the world is focused on Wall Street and the next big meeting (G20) in Washington DC. You show your commitment to the future of humanity, to the environment and to sustainable development. As the world grapples with the international financial crisis, we cannot lose sight of two objectives: environmental protection and climate change on the one hand, and the achievement of the Millennium

Development Goals on the other. Yet both of these objectives will affect heavily the majority of people and will affect the future of humanity.

I hope the Council will continue to operate in the future and that China's efforts to protect the environment will go on and expand. So that when you come back next year, you can see fresh progress on the environmental front. I hope you will not only witness progress in China's development but also witness China's efforts on the environmental front. Thank you.