

**REPORT OF THE CCICED WORKING GROUP ON
ENVIRONMENTAL ECONOMICS**

By

Working Group on Environmental Economics



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Executive Summary and Conclusions¹

The General Context

The Environmental Economics Working Group

This report provides summaries of some of the key activities that have occupied the attention of the Environmental Economics Working Group of the CCICED over the ten years since the inception of CCICED in 1992. The studies reported here however represent just the tip of an iceberg, as the actual work involved an extensive series of workshops, training courses, meetings and field work that took place in various parts of China.²

A characteristic of this endeavor has been that participants in the program were able to share their ideas and evolution of thinking with a wide cross section of Chinese society, ranging from summary presentations of their work at the annual meetings of the CCICED at which the very highest government officials were present, to workshops at Provincial, Municipal and County levels attended by local government officials, scholars, and others interested in environmental policy matters.

Much has changed in China over the period of this work. The rapid transition from an administered to a market economy continues to be of dominant importance, and rapid strides have been made in implementing economic reforms designed to sustain the extremely high rates of economic growth that have been observed in recent years. At the outset of its work, the Working Group felt it important to emphasize that while market liberalization was a necessary condition for rapid economic growth, it could not necessarily be relied upon to handle all problems, in particular, the two closely interrelated areas of environmental protection and equitable income distribution. In contrast to the general trend established by conventional adjustment policies, government structures in these areas should be strengthened rather than weakened. This initial view set the scene for subsequent work and indeed characterized the whole of the program. In effect much of the concern surrounded policy decisions

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² Full meetings of the CCICED were held in Beijing, Shanghai and Hangzhou. Working Group meetings took place in Beijing, Yunnan, Anhui, Fujian, Guizhou, Heilongjiang, and Qinghai, while the studies themselves involved case surveys and analyses in numerous locations, as indicated in the relevant reports of the Workgroup.

about the pace of policy reform, particularly in the use of economic instruments as a means of addressing environmental problems in a transition economy such as that in China

When the work started, the study of environmental economics, an immature component of academic endeavor elsewhere in the world, was in its infancy in China, and the first few years were a major experience for all participants, both Chinese and foreign. As predicted however, Chinese scholars soon began to absorb the subject, and are now frequent contributors to the leading academic journals specializing in environmental matters. However, in common with experience in other countries, economic theory in this area has expanded at a much more rapid rate than the application of basic principles. Aware that this might become an issue, the program of the Environmental Economics Working Group was designed from the outset to concentrate on assessment of the relevance of basic principles of Western economics, and their practical application to real issues in the Chinese context. The studies summarized in this report were thus aimed at providing policy-relevant information and ideas for the Chinese government, and were not aimed at advancing theory.

Environmental Impacts of Economic and Sector Policy Reform

The country-wide economic reforms that continue to take place in China, and in particular the country's recent accession to the World Trade Organization, undoubtedly have major implications for the environment. The leverage exerted by sectoral and macro level economic policies as well as other institutional, legal and social policies is of fundamental significance in determining environmentally related behavior. Economy-wide policy reform, and specifically the adjustment process, should therefore be carefully assessed in light of its environmental consequences. However, due to the large number of physical, social, and economic variables involved, these linkages remain imperfectly understood. In the last few years, considerable efforts in China and elsewhere have been made to improve understanding of the ways in which economic incentives impinge upon environmentally-related behavior, with attention increasingly focusing on the impact of macroeconomic and sectoral policies. Nevertheless, much remains to be done.

It is now generally recognized that most environmental problems are less the result of individual large-scale development projects that have gone wrong than the combined consequences of many relatively small-scale activities, such as unsustainable agricultural practices, pollution caused by large numbers of small, inefficient, factories, and decisions made by innumerable companies and individuals to exploit tropical rainforests. Subjecting each such decision to social cost-benefit analysis,

environmental impact assessment or regulation, or indeed to a system of environmental taxes that requires monitoring of individual actions, is rarely administratively feasible.

The foregoing implies the need to search for the underlying causes of such activities, and identify policy interventions (which will often have to be somewhat blunt instruments) aimed at the source, rather than the symptom of the problems. Priority should be given to amending government interventions in the market that are economically and environmentally perverse, and introducing interventions (such as pollution taxes) when market forces are inadequate. These actions should be accompanied by efforts to address underlying causes of natural resource degradation and to improve understanding of what affects the environment and how.

It follows that the traditional project-by-project approach, while important and deserving of more effort, must be supplemented by the integration of environmental management into economic policy making at all levels of government. Policies with a wide ranging impact - i.e. those of a sector-wide or macroeconomic nature - are especially relevant. A variety of government policies may have a profound impact - for good or ill - on the environment. Fiscal, exchange rate, energy and agricultural pricing, or land tenure policies might be expected to have major environmental implications. It follows that not only individual investment projects, but also economic policies should be subjected to environmental evaluation. It is apparent that the sheer scale of the structural changes now taking place in China's economy makes this task both highly complex and highly important.

Understanding the chain of causality leading to environmental degradation is required. Proximate causes are relatively easy to identify; much more difficult, but of primary importance, is the analysis of underlying causes. Typically these will be found in economic incentives, often combined with a complex mix of social and political factors. For example, it may be easy to identify the source of air pollution as the inefficient productive processes of certain industrial enterprises. It is however more difficult to understand the forces that bring this about, and to determine the policy reforms that will not simply affect individual plants, but have pervasive effects, impacting on a wide variety of industrial operations.

China's reform program recognizes that environmental degradation has often stemmed from market distortions, which may be explained by externalities or "commons" problems. It also recognizes that other problems have been created where those who demand environmental goods are not required to pay for the true social costs involved. This is exemplified by the subsidization of irrigation and municipal water, electricity, and agricultural chemicals.

In the case of public utilities such as water supply and electricity, it is essential that pricing be used as a serious management tool. Artificially low prices encourage wasteful use, and generate inadequate revenues for system operation and expansion. Decline in service quality is accompanied by greater difficulty in raising prices, resulting in a vicious circle of underfunding and shortages. The cost to consumers of a service not being available is often more than the cost of expanding the service, even when costs are rising. Underpricing - or subsidization - of resource use is therefore typically unjustified in economic and financial terms. It frequently has perverse income distributional consequences, places a fiscal burden on government, and is often environmentally unsound as it encourages wasteful use. In such cases, the scope for policy reform with multiple advantages is therefore considerable, but due to an established tradition of subsidizing public services is often difficult to achieve.

Some aspects of China's move toward a market economy, which includes the above type of reform, are therefore likely to be environmentally beneficial. Equating prices to the real economic costs of supply of key natural resources can be expected to yield environmental benefits by discouraging wasteful resource use. Other elements of the reform process such as improved efficiency of credit markets and greater trade openness may also be environmentally benign to the extent that technological innovation and the establishment of cleaner, modern industry, is encouraged.

However, the environmental consequences of China's economic reform process may not always be favorable. It is clear that while "getting prices right", a key element of the adjustment process, is a necessary condition for sustainable development, it is far from sufficient. For example, at the sector level, electricity price reform may not be effective if consumers lack adequate information about energy-saving devices, if industrial management structures do not contain incentives to use resources efficiently, or if in general there are distortions in the prices of substitutes or complements to electricity. Adverse environmental consequences due to inefficiencies or inequities elsewhere in the system, compounded by the scale effects induced by successful economic growth policies, may therefore result. For example, in China the pollution levy system has been in place for a number of years, but until recently price and profit incentives in general did not exist, so they had little effect.

Adoption of "second best" solutions will therefore frequently be required; introduction of price incentives in situations where prices in general do not reflect real resource costs, are likely to have perverse results, and a gradual replacement of command and control mechanisms by price incentives will often have to take place gradually. Considerations of social equity reinforce this conclusion. While extremely rapid, unevenness in the pace of development has meant that the poor have failed to

benefit proportionately. During the on-going transition period from a command and control to a market economy, the economic efficiency and growth objectives must be modified to consider distributional issues.

In the short term, therefore, economic reforms may have unanticipated effects which require complementary or compensatory interventions. In some countries, the very success of the adjustment process in stimulating industrial growth has itself been the cause of environmental problems where pollution control measures have been inadequate. Trade reforms may be of special concern: encouraging exports, if not accompanied by adequate pricing policies in the country concerned, could lead to over-exploitation of underpriced natural resources, such as forests. In such cases, freer trade itself would not be the culprit, but failure to address inefficient conditions prevailing elsewhere in the economy would be. Compensatory intervention may also be required to remedy legal and institutional deficiencies.

Such constraints to the success of economic policy reform are a pervasive problem, and, as observed in other countries, they take many forms. One of them refers to the allocation of property rights, upon which the effectiveness of price reform ultimately depends. Whether in relation to farmers' security of land tenure, or to the right to abstract water by riparian users, uncertainty typically results in environmental degradation. Price reform, if unaccompanied by adequate legal and institutional frameworks, including regulatory capacity, may have perverse results in both economic and environmental terms. This appears to be a particularly important issue in China in its current transition period.

Although reforms might be complicated by the presence of such inefficiencies elsewhere in the system, there are nevertheless many opportunities for policy reform in China. Indeed, environmental considerations typically provide additional reason for policy reforms that are justified in their own right. As noted earlier, improved pricing for electricity and water supply would be justified on environmental and economic efficiency grounds. It also has potentially major fiscal implications, and should be a central element of any policy of "green taxation" aimed at shifting the tax burden from productive activities such as labor and enterprise toward unproductive activities such as depletion of resources and generation of waste.

In principle, the wide-ranging and complex linkages between economic activities and the environment imply that a general equilibrium approach is required if economic policy is to be managed in a sustainable way. However it is already possible to make rough assessments, not simply of the social

and environmental impacts of projects, but also of certain economic and sector policies. The use of standard economic techniques combined with existing natural resource information can improve the way environmental issues are addressed by policies at the sector and macro levels. Where the environmental impact of the economic reform process is potentially adverse, such assessments would form the basis for identifying measures to counteract these effects; where on the other hand they are likely to be positive, complementary measures might be devised to maximize this impact. A conclusion from the foregoing is that, while environmental impact assessments are now conducted routinely for large-scale development projects, it is now even more important to develop institutional capacity to conduct environmental assessment of economic policy reform, with special attention being paid to its income distributional implications.

The Studies

The studies summarized in this report all employ the concept of willingness to pay as a guide to valuation and identification of resource allocation priorities. This is however subject to an awareness of the theoretical shortcomings of this concept, as well as the difficulties involved in its estimation. In each case, it is shown or implied that free market forces must be complemented by public action if socially desirable outcomes are to result. It is convenient to summarize the highlights of the studies' findings under the three generic headings of sector pricing; valuing the environment; and environmental taxation. Explicitly or implicitly, detailed policy recommendations are made in all the above studies. Since the studies took place over a number of years, the cost and other information are sometimes out of date; nevertheless, the general principles and conclusions remain valid.

Sector Pricing

Typically outside of the control of environmental authorities, nevertheless pricing policies in a range of sectors have major impacts on the environment. Specific studies under the program focusing on water supply, coal, timber, rice, fisheries and grasslands, show that environmental and depletion costs are systematically ignored in pricing policy.

The studies show that differences between the true environmental costs of such resources and the prices paid for them are often extremely large, thereby encouraging wasteful consumption and resource degradation. Clearly, energy and water price reform are essential if clean production technology and

energy efficiency is to be achieved; pricing policies are of critical importance in addressing issues such as deforestation and soil erosion. And urban air pollution and traffic congestion are also symptoms of pricing policies that inadequately reflect environmental damage costs.

Valuing the Environment

All aspects of policy making in the environmental field require some notion of the value of the environment, or the cost of environmental damage. This has to be the standard by which pricing of natural resources, as well as environmental taxes, regulations and investments should be measured. The studies acknowledge that it is extremely difficult to place monetary values on the environment; indeed, the most important issues in life are probably not susceptible to monetary valuation. Nevertheless, it is clear that it is a serious mistake to treat, albeit implicitly, environmental damage costs as zero.

One of the studies estimates that quantifiable costs of air and water pollution in China amounted to about ten percent of GDP in the late 1990's. Although undoubtedly a crude estimate, it does indicate the seriousness with which environment should be treated in macroeconomic policy making in China. More detailed evidence, using tourists' estimated willingness to pay to protect the panda, provide some indication of value, and more importantly of a technique of valuation and fund raising that is of more general applicability.

Environmental Taxation

In some way, virtually all the studies address the topic of environmental taxation. The sector pricing studies essentially propose that price increases to reflect differences between production costs and true environmental costs should take the form of taxation. The study on industrial pollution control focuses almost entirely on pollution taxation, although there are references to the role of other market based instruments. However, beyond these sector-by-sector recommendations, the studies also address cross-sectoral issues, specifically concerning the relationships between environmental taxation and more ultimate objectives of development policy, namely poverty alleviation and health. The case for developing a more comprehensive system of green taxation is also considered.

The poverty case study shows that there are circumstances in which some forms of environmental taxation, in this case levied on the consumption of water, transportation and coal, may avoid damage to the poor. This would apply where the poor do not participate in the market economy, or where

compensatory financial mechanisms can be designed. However, this is a complex topic, and there are obviously many cases where these circumstances do not apply; for example, increasing the price of rice to include environmental costs may be expected to be a regressive tax since rice consumption tends to be a much larger item in family budgets for the poor than for the rich. Another study, perhaps of more general applicability, shows that pollution taxes are likely to be good for public health. If indeed the poor tend to live in the most polluted areas, such a policy would also contribute positively to poverty alleviation, certainly within a given urban area.

General Recommendations from the Studies

The following general recommendations emerge from the studies, the details being shown in the relevant reports or research papers of the Workgroup:

- A system should be developed in which pricing of natural resources, and the design of pollution taxes or regulations are based on the principle of full cost recovery, where costs are defined to include all costs incurred by society, including, where appropriate, those of incremental production, environmental degradation, and resource depletion. Prices, taxes and charges are typically too low; on-going reforms should be accelerated, but implementation should still be introduced gradually in light of income distributional implications, and in line with overall trends in market liberalization in China.
- Efforts should be made to develop capacity in relevant government agencies, at all levels, to appreciate the implications of their activities and policies for environment, and to develop incentives for public officials to be environmentally responsible. This applies not only to agencies directly involved in the management and utilization of natural resources, but also to those with responsibilities for strategic economic, sectoral, and financial management. This will be necessary if environmental issues are to be integrated fully into economic policy making.
- Specifically, environmental impact assessment should be applied, not only to individual projects, but also, where feasible, to economic policies in general.
- The sector-by-sector analyses demonstrate the potential role that green taxation can play in China's overall fiscal system. The complex linkages between economic and environmental policies and actions require the development of computable general equilibrium models in

which the impact of green taxation can be assessed.

- Specific skills that need to be developed in public agencies therefore include: (a) economic evaluation of the costs of environmental degradation and of remedial actions, (b) the impact of sectoral policies (particularly pricing) on the environment, (c) the role of environmental taxes, in particular the potential for wide-ranging “green taxation” as an integral element of fiscal policy, and (d) linkages between environment, poverty, and public health.

Building upon these general recommendations, specific priorities for future work in environmental economics in China are proposed below.

Next Steps: Priority Areas for Environmental Economics

Most of the topics listed below have already been identified as of high priority for China, and other scholars and agencies are heavily involved in such work. China has in fact been extremely innovative in the application of economic analysis to the solution of environmental problems, its experimentation with various forms of market-based instruments for industrial pollution control being a case in point. Particularly in light of the lack of co-ordination between external aid agencies, it is difficult to keep pace with these efforts. A useful contribution of the CCICED would therefore be to monitor, synthesize and update results and policy recommendations in a form that is readily accessible to high-level decision makers.

In addition however there may be specific aspects that CCICED may wish to address itself in detail; in particular adding a poverty alleviation dimension to its overall program, and involvement in the multi-faceted aspects of Strategic Environmental Assessment are areas in which CCICED can make a unique contribution.

Environment and the Poor

The Working Group believes that inequitable income distribution and the need to reduce poverty is possibly the most critical economic and social issue facing China today. While on average incomes may be expected to continue to increase in the future, there is no reason to believe that market liberalization will improve income equality. In fact, evidence from other countries undergoing the

adjustment process suggests that the reverse is likely to be true. In China the widening gap between rich and poor is already evident both between regions (with the Western region being left behind) as well as within regions. On grounds of equity and political stability there is a particular need to take measures to ensure that the poorest members of society receive a fair share of the benefits of China's rapid economic growth.

As in the case of economy-environment linkages, much work has been done in recent years by Chinese and development institutions in addressing the relationships between development and poverty, and also as in the case of environment this has been primarily on a project-by-project basis. Much knowledge has been gained but comprehensive integration of income distribution and particularly poverty reduction objectives into overall environmental policy still remains far off. Efforts that have been made to integrate environment into development policy making – itself still unrealized in practice – need to be complemented by the still more ambitious goal of integrating growth, environment and poverty objectives into a comprehensive approach. This has not been achieved satisfactorily in any country to date, but in view of China's observed willingness to take innovative measures in the general area of environmental development, it is believed that the country could become a leader in this area.

It is therefore recommended that the linkages between environment and income distribution should be an absolute priority of the CCICED in its future work. The approach should take two basic forms. First would be the inclusion of a poverty reduction element in all other activities and Task Forces commissioned by the Council, whether they relate to energy, clean production, sustainable agriculture, or any other sector, and including the sector-specific studies referred to in the preceding section as well as in the other cross-cutting activities indicated below, i.e. those referring to valuation, green taxation, and green accounting.

Second would be a series of studies explicitly addressing the linkages between environment, growth and poverty. Building upon and complementing recent work carried out by a variety of external agencies and numerous Chinese scholars, further empirical and analytical work is required on the nature of the relationship between environmental degradation and poverty in China – i.e. who suffers from it and who causes it. Then environmental policy measures need to be designed in a systematic way to take account of their impact upon different income groups, and especially the poor. Case study illustrations, leading to policy recommendations for the general case, may be applied to topics that are especially important in their own right, such as the impacts of environmental policies associated with water resources, urban management, energy, and so on.

The above would be addressed by analysis of national level and selected local level data, probably using household surveys, and certainly involving special attention to the problems facing Western regions of the country.

The importance of this topic can hardly be overestimated. However, both domestic and external researchers who wish to address this issue on more than a project-by-project basis face a number of constraints, not least of which is the large number of constituencies, including government agencies, that are involved. The issue is politically sensitive, value judgments are unavoidable, and empirical difficulties surround the identification of relationships, which vary by sector and region. For example, while it is generally argued that the poor suffer most from environmental degradation, this is not always the case. Within cities probably the poorest suffer most from environmental degradation and thus tend to benefit most from environmental measures, but cities have higher incomes but more air pollution than rural areas. And, for detailed policy-making purposes, there is no simple answer to the question as to whether poverty or wealth is a cause or consequence of environmental degradation; individual case studies may give misleading results for general application.

It is for this reason that the Working Group strongly recommends that a theme that should run throughout Chinese development policy in general and the future work of the CCICED in particular should be to integrate distributional and in particular poverty alleviation objectives fully into ongoing efforts to achieve rapid and environmentally sustainable growth. Indeed, it is considered that CCICED has a comparative advantage in addressing this issue in view of its wide mandate, the fact that its members include Ministers from virtually all key agencies, and that it reports directly to the highest levels of government. It is thus ideally suited to the analysis and development of policies in a multidisciplinary context, and can address and involve multiple constituencies in its deliberations.

Economic Policy and the Environment

Strategic Environmental Assessment. Economic growth and associated changes in the structure of economic activity in China – in particular changes associated with accession to the WTO - are expected to exert a major influence on the environment in future years, and it is possible that environmental constraints may pose a barrier to sustainable and equitable growth. A precondition to the development of appropriate environmental policy responses is thus the need to better understand the structure of economic growth that will take place, and the environmental pressures and constraints that may be

expected to result.

Although efforts should be made to be as rigorous as possible in the use of analytical and empirical tools for predictive purposes, it is important not to lose sight of the fact that the future will remain extremely uncertain. It is important to identify a broad set of priority issues so that institutional and policy reforms as well as strategic investment priorities can be made now. Above all these should be designed to allow the government to be able to respond flexibly, to be able to monitor changes, and to be able to adapt to whatever environmental challenge that may be faced in the future.

In view of the size of the country, initial work in this area should be at the Provincial level, and a Strategic Environmental Assessment (SEA) should be designed to identify the environmental implications of the pattern of economic growth expected at the Provincial level. Important determinants of the scale and structure of economic development include market reforms now underway or proposed both for the Province itself and for China as a whole, as well as a variety of other domestic policy reforms and exogenous influences.

Required studies to achieve the above objectives should be designed to extend the frontiers of what is normally considered feasible for SEA, and should move beyond analysis of the environmental aspects of sector operations to assessment of the implications of more wide-ranging macroeconomic policy reforms for individual sectors and sub sectors. For example, building upon existing knowledge about the industrial and agricultural sectors and of the comparative advantages of the Province, efforts should be made to assess the likely impact of predicted economic growth and macro reforms on industrial and agricultural structures, i.e. what kind of industrial product and crops are likely to be encouraged or discouraged by the reforms. This would be followed by analysis of the pollution loads and pressure placed on natural resources implied by such changes; estimation of pollution control and resource management priorities; and finally, the environmental policy and institutional requirements stemming therefrom. Social aspects are integral to the study.

Analytical work would be comprised of a review of existing macro- and sector-level studies relating to the expected changes in scale and structure of the economy of the selected Province over the next ten years, in particular those that can be used to highlight environmental linkages. This would be followed by estimation of the environmental impacts likely to stem from the predicted pattern of economic growth, and would form the basis for policy conclusions and recommendations.

Estimated changes in the scale and structure of economic activity in the Province over the next ten years should be predicted in order to identify the pressure on natural resources and other threats to environmental quality - primarily urban and industrial pollution – that will be faced. Existing macroeconomic and sector studies should be used as a basis upon which various growth estimates are made. In each case, disaggregation of economic models and definition of sectors should be in terms of their relevance for the environment. Thus while the main expertise to be employed would be macroeconomists or sector specialists, determination of categories for specific analytical attention would be based on advice from environmental specialists.

A key element of the analysis should be to determine the relative emphasis that should be placed upon macroeconomic/general equilibrium, or sector/partial equilibrium analysis. At the sector level, a comprehensive review should be conducted of the various studies which assess current levels of activity, and in particular make predictions of future growth. At the macroeconomic level, review should be conducted of existing econometric and other models to predict economic growth, disaggregated as necessary to facilitate subsequent linking with environmental aspects, in particular identifying the impact upon particular sectors or other impacts which may have a traceable environmental consequence. Computable general equilibrium and partial equilibrium models should be considered, in each case aimed at identifying future trends in things like energy, water resources, demographic and income distributional changes, including urban-rural shifts, regional impacts, changes in the scale of GNP components such as the sources of growth, as well as the impact of decline in some industrial and agricultural sub-sectors. Assessment should be made of the extent to which current models and predictions made by Chinese authorities or external agencies are sufficient to draw conclusions for the environment from predicted growth, and the degree to which new models and data collection are required.

Green Taxation. A particularly important aspect of the foregoing is the potential contribution that environmental taxation can make in an overall fiscal context. Work in this area is particularly opportune in light of the on-going modernization of the Chinese tax system. A good deal of empirical and analytical work has been done in this area in China in recent years. Much of it has taken an essentially partial equilibrium approach, and has encompassed the inclusion of environmental and depletion costs in pricing policies as well as explicit environmental taxes such as the pollution levy system. Recently however, increased efforts have been made to develop general equilibrium models of the Chinese economy; the next challenge is to integrate environmental linkages into such models so that the impacts

of environmental taxes and other environmental policies on economic growth and its distribution can be traced.

Previous and on-going analysis as well as the lessons from actual policy reforms at the sector level is essential in providing the “building blocks” for refinement of such efforts at the aggregate or macroeconomic level. Similarly, the results of recent experimentation with various market-based instruments, such as tradable permits, emission fees, and compensatory payments, also need to be reviewed in order to accelerate the development of more general policies.

Green Accounting. Highlighting the impact of environmental degradation at the national economic planning level is required, since conventional national accounting methods inadequately reflect environmental concerns. For example, expenditures on pollution clean-up programs are treated as additions to GNP, while depletion of natural resources is typically not reflected as an offset to income; increased efforts are required to estimate “genuine” investments, where such depletion is estimated as disinvestment. In recognition of this, many countries are now experimenting with "green" national income accounting. It should however be noted that national income accounts are inadequate in many ways as indicators of human welfare, and will remain so even after such adjustments have been made. In particular, many of the most important environmental impacts are not quantifiable in economic terms, and therefore can never be fully commensurate with traditional components of GNP. Of special concern are the complex interrelationships between income distribution and the environment. Complementing the adjustment of national income accounts themselves, it would therefore be appropriate for China to continue its efforts, already assisted by UNDP, to develop systems of satellite accounts, by which physical changes in the natural environment can be related to conventional national income measures.

Sector-Specific Activities

The emphasis of environmental economics for policy decisions at the sector level in China should correspond to the priority problems themselves, which in practice are determined in large measure on scientific, political and social criteria, with remedial actions being determined essentially in terms of their perceived affordability and administrative feasibility. The application of environmental economics in aiding this process refers mainly to two main aspects of decision-making, namely (a) identification of priority actions, i.e. using valuation techniques to rank the most serious environmental problems and (b) identification of ways to bring about change, including the behavioral and financial aspects of economic incentive systems. Economic analysis is thus necessarily an important component of policy analysis in

all sectors. Indeed, this has been recognized in the CCICED program, in which much of the effort of the Economics Working Group consisted of technical support to other Working Groups in order to achieve overall consistency in policy recommendations.

The whole range of environmental problems is of course evident in China, these being mirrored to some extent in the titles of other CCICED working groups – e.g. energy, clean production, sustainable agriculture, biodiversity, transportation, and so on.. Specific feedback that the Working Group has received from Council members and other high ranking officials in China is that major attention should be paid to the water resources issue. Pricing policy and valuation issues would be of central concern, since water resources tend to be highly subsidized at a time when water scarcity is already threatening economic development in some areas and intersectoral allocation raises major political and social concerns. In addition to intersectoral allocation issues, choices between alternative energy sources require cost comparisons of hydro and thermal projects to be made on a “level playing field” in which environmental as well as other costs are compared on a consistent basis.

Other areas that have been presented to the Working Group as of high priority for economic analysis include valuation and incentive systems for urban traffic congestion and pollution, and the need to promote public transport, as well as the interrelated areas of deforestation, desertification and soil erosion. Means of protecting biodiversity and in particular the development of eco-tourism have also been indicated as priorities.

In view of the strategic importance of the areas concerned, updating of some of the earlier sectoral pricing and taxation studies undertaken by the Working Group should be considered.

Refinement of some of the tools used at the sectoral level, and extension of their use to intersectoral choice and as building blocks for macroeconomic level analysis and policy is also required. Valuation issues, which pose a special problem for environmental policy, require special attention. Almost by definition, monetary evaluation of the services provided by the environment is difficult, since what is defined as “environmental” usually falls outside of conventional markets. And market indicators (willingness to pay) are essential elements of cost-benefit analysis. Considerable work is still needed to improve the use of conventional cost-benefit analysis of environmental impacts in China, but this should be done in full recognition of the shortcomings of the technique as normally practiced. Although monetary indicators alone can never be relied upon, the cost-benefit framework is nevertheless an indispensable discipline in setting out the implications of a policy or investment in a systematic manner

and should remain a central element of multicriteria analysis in which value judgments and assumptions are made transparent. Institutional means of involving concerned stakeholders in this process in an effective way continues to be a priority in China, as in other countries.

Enabling Conditions

Experience in other countries indicates that the success of policy reforms initiated at the central level depends heavily upon the existence of a number of other factors, or enabling conditions. For example, with regard to the reform of pricing policy, there should be an ability to respond to economic incentives in an efficient and well informed manner. This may require the removal of constraints such as access to credit, inadequacy of technical education and public awareness, ambiguous allocation of water and other property rights, or indeed inefficient pricing policies elsewhere. Consequently other reforms of an economic, social or institutional nature may be required in parallel with those identified for environmental policy. Indeed during the early years of the CCICED the Working Group heavily emphasized the need for gradualism in introducing price reforms related to the environment since market imperfections were so prevalent elsewhere in the economy. Clearly however, this issue has become less and less important, although distortions and inequities in the system still provide constraints to rapid improvements.

There remain important issues concerning education. A generic recommendation is that capacity should be developed on a sector-by-sector basis to employ economic analysis relating to environmental aspects of the activities of concerned ministries and agencies. This would involve development of evaluation techniques in order to identify priority actions, as well as the design of economic incentives to achieve cost-effective and equitable solutions to environmental problems and to promote environmentally benign activities. In order for this to be a useful recommendation it is also necessary in parallel to develop a set of incentives and institutional mechanisms for officials in a wide range of public agencies to systematically consider the environmental and social implications of their policies and projects and to take measures that are consistent with the common good.

In practice, the actions of many government agencies whose primary mandates do not refer to the environment may sometimes be even more important for the environment than the actions of agencies (SEPA and EPB's) which have solely environmental mandates. The foregoing suggests continuation of work initiated during the Second Phase of the CCICED by the Task Force on Environmental Management and Economic Planning, which studied the institutional issues associated with the

integration of environment into the overall economic planning process. Paralleling this, SEPA and EPB technical staff themselves should continue to receive training in applied environmental economics along the lines provided several years ago with UK financial assistance.

Environmental economics is spreading rapidly in University faculties of economics, but increased efforts are required to introduce environmental economics as an integral part of business education, as well as in schools of engineering and indeed environment itself.

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