2018

Report on the State of the Ecology and Environment in China

Ministry of Ecology and Environment,
the People's Republic of China

The 2018 Report on the State of the Ecology and Environment in China is hereby announced in accordance with the Environmental Protection Law of the People's Republic of China.

Minister of Ministry of Ecology and Environment,
the People's Republic of China

May 22, 2019

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Summary

The year 2018 was a milestone in the history of China's ecological environmental protection cause. In 2018, CPC Party General Secretary Xi Jinping attended the National Conference on Ecological and Environmental Protection in Beijing and delivered an important speech, officially establishing Xi Jinping Thought on Ecological Civilization. The Central Committee of the Communist Party of China (CPC) and the State Council jointly issued the *Opinions on Comprehensively Strengthening Ecological and Environmental Protection and Resolutely Fighting the Tough Battle of Pollution Prevention and Control*, and explicitly identified the roadmap, work breakdown and timetable for the battle. In 2018, the Constitutional Amendment was passed at the First Session of the 13th National People's Congress (NPC) to incorporate the "new development philosophy", "ecological civilization" and "building a beautiful China" into the Constitution. The Fourth Session of the Standing Committee of the 13th National People's Congress made a resolution on comprehensively strengthening eco-environmental protection and lawfully fighting the tough battle of pollution prevention and control. The Third Session of the Standing Committee of the 13th National Committee of the Chinese People's Political Consultative Conference discussed the challenges facing pollution prevention and control and proposed solution recommendations accordingly. The Ministry of Ecology and Environment, established following the national institutional reform, is responsible for supervising various types of pollutant discharge and law enforcement in both urban and rural areas. Meanwhile, law enforcement teams for eco-environmental protection were established to enhance the consistency, independency, authority and efficiency of law enforcement.

Guided by Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, various localities and departments have put into action the spirits embodied in the 19th National Congress of the CPC, the Second and Third Plenary Session of the 19th CPC Central Committee, Xi Jinping Thought on Ecological Civilization and the National Conference on Ecological and Environmental Protection and earnestly implemented the major policies and plans of the CPC Central Committee and the State Council. Focusing on improving ecological and environmental quality, various localities and departments have steadily sought progress, made overall plans and taken all factors into consideration, carried out integrated measures with coordinated efforts and marched forward with steady and solid steps in a pragmatic and orderly way. As a result, the battle against pollution got off to a good start.

First, we have comprehensively promoted the campaign on "Beat Air Pollution". The State Council issued and implemented the *Three-Year Action Plan on "Beat Air Pollution" Campaign*. The Standing Committee of the National People's Congress organized inspections on

the enforcement of the *Air Pollution Prevention and Control Law* and listened to and reviewed the inspection report. Different regions have stepped up their efforts in jointly preventing and controlling air pollution. A leading group for air pollution prevention and control in Beijing-Tianjin-Hebei and surrounding areas was established; a coordination mechanism for air pollution prevention and control in Fenwei Plain was set up; and the coordination mechanism for air pollution prevention and control in the Yangtze River Delta region was further improved. We have conducted comprehensive treatment of atmospheric pollution in key areas in the autumn and winter of 2018 and 2019, carried out intensified supervision in key areas engaged in the Campaign on "Beat Air Pollution", reported 23,000 air pollution cases to local governments and 38,900 problems identified in 2017 have been properly dealt with. The key industries in Beijing-Tianjin-Hebei and surrounding areas have fully implemented the regulation on special emission limits for atmospheric pollutants since October 1, 2018. About 810 million kilowatts of coal-fired generating units have achieved ultra-low emission, accounting for 80% of the total installed capacity of coal-fired units across the country. Non-fossil energy consumption accounted for 14.3% of the total, the number of winter clean heating pilot cities in northern China has increased from 12 to 35, and more than 4.8 million households have replaced coal heating with clean fuel heating. Bulk cargo such as coal has been increasingly transported by railway networks, and the volume of railway freight has increased by 9.1% compared with that of 2017. We have further expanded the shipping vessel emission control zones and promoted the development and use of shore power. The *Action Plan for Fighting the Tough Battle of Pollution Prevention and Control of Diesel Trucks* has been issued. We have formulated and introduced the National VI emission standard for heavy-duty diesel vehicles, and fully supplied the National VI vehicle gasoline and diesel to realize the "combination of three types of oil", namely vehicle diesel, ordinary diesel and part of bunker oil. We have actively worked to improve emergency response to heavily polluted weather and actively promoted the projects studying the causes of heavy air pollution and relevant solutions by sending work teams to "2+26" cities, the Fenwei Plain and the Xiong'an New Area for the promotion of tracked research model on tailor-made policies for individual cities. We also actively promoted the concerted treatment of greenhouse gases and pollutants, prepared to introduce carbon market to the entire country with the power industry as the starting point, launched many low-carbon pilot and demonstration sites nationwide and have promoted climate change adaptation relevant work.

Second, we have vigorously promoted the campaign on "Beat Water Pollution". The Standing Committee of the National People's Congress set up a team to supervise and inspect the enforcement of the *Law on Marine Environmental Protection*. We have fully implemented the

Action Plan on Water Pollution Prevention and Control. The *Implementation Plan of Incentive Policies to Support the Ecological Protection and Restoration of the Yangtze River Economic Belt by Central Budget* was issued. We have renovated 1,361 illegal docks along the mainstream of the Yangtze River. The *Measures for Monitoring and Early Warning of Water Environment Quality in the Yangtze River Basin (Trial)* was issued, and the Joint Research Center for Ecological Environment Protection and Restoration of the Yangtze River was established. We have launched the action plans or implementation plans on fighting the tough battles for urban black and malodorous water treatment, agricultural and rural pollution control, Yangtze River protection and restoration, comprehensive improvement of the Bohai Sea and water source protection. We have enhanced the control on ship pollution and issued the *Standard for the Discharge of Water Pollutants from Shipping Vessels (GB 3552-2018)*. Among the 1,062 black and malodorous water bodies in 36 key cities, 1,009, or 95% of the total, were cleaned up or significantly improved. We have supported 300 cities and counties as demonstration areas for fertilizer reduction and efficiency improvement. Integrated pollution treatment actions have been carried out in 25,000 constructed villages. The Green Rural Revival Program in Zhejiang Province won the 2018 Champions of the Earth Award, an environmental honor of the United Nations. We have strengthened the supervision of outlets of sewage discharge into the river and sea, promoted the prevention and control and monitoring of marine debris (micro-plastics) pollution, and launched the pilot mechanism of appointing "gulf chiefs". A nationwide campaign on improving centralized drinking water source areas was advanced and 99.9% of 6,251 problems in 1,586 water source areas were properly dealt with. Centralized sewage treatment facilities and automatic online monitoring devices have been built in 97.8% of industrial agglomerations at or above provincial level. 78% of underground oil tanks at gas stations had their anti-seepage renovations completed.

Third, we have steadily promoted the campaign on "Beat Soil Pollution". The *Law on the Prevention and Control of Soil Pollution of the People's Republic of China* was adopted by the Standing Committee of the National People's Congress. *Measures for the Management of Soil Environment in Industrial and Mining Land (Trial)* and *Soil Environmental Quality: Risk Control Standard for Soil Contamination of Construction Land (Trial)* were issued. 31 provinces and the Xinjiang Production and Construction Corps have conducted a detailed survey on the soil contamination of agricultural land. 26 provinces have established a joint monitoring and management mechanism for contaminated sites. We investigated and defused the contamination risks of cultivated land by heavy metal industries involving cadmium, and initially curbed the cultivated land in certain areas from further contamination. The pilot project of soil environmental

quality classification of cultivated land and the application of soil environmental management information system over contaminated land in China have been implemented, and a national soil environmental information management platform was established. We have continued to proceed with the construction of six major pilot regions for soil contamination prevention and control and more than 200 pilot projects in soil contamination control and restoration technology application have been advanced. The General Office of the State Council issued the *Work Plan for the Construction of Pilot Zero-waste City*. We have promoted the classification and disposal of household garbage and worked to clean up rubbish piles. We resolutely banned the import of solid waste with 22.63 million tons of import in 2018, down by 46.5% from that of 2017. Moreover, we have strived to boost the up-to-the-standard emission of the waste incineration power generation industry, and all the power plants with emission problems overhauled, which has significantly increased the up-to-the-standard emission rate. We have cracked down on the illegal transfer and dumping of solid wastes and hazardous wastes, and 1,304 of the 1,308 prominent problems targeted in the "Waste Disposal Action 2018" were dealt with, accounting for 99.7% of the total.

Fourth, we have carried out ecological protection and restoration. We drew up the ecological protection "red line" for 15 provinces and regions including Beijing-Tianjin-Hebei, provinces along the Yangtze River Economic Belt and Ningxia Hui Autonomous Region, and mapped out the designation plan for another 16 provinces including Shanxi province. Pilot projects for mapping ecological protection red line were launched to promote the building of the supervision platform of national ecological protection red line. Green Shield 2018, a special mission on supervising and inspecting nature reserves was carried out. A range of cases for violating ecological and environmental protection laws and regulations were earnestly investigated and dealt with. The number of national nature reserves increased to 474. We have implemented such projects as reclaiming farmland to forests and grasslands and reclaiming grazing land to grassland and launched large-scale campaign on forestation, expanding the afforestation area to 106 million mu (15 mu=1 hectare). A total of 1.07 million mu of degraded wetlands have been restored and 56 internationally recognized wetlands have maintained good ecological conditions. We have promoted the pilot work of the third batch of ecological protection and restoration project for mountains, rivers, forests, farmlands, lakes and grasslands. We have conducted survey assessing the ecological progress in China from 2010 to 2015 via remote sensing. We commended the second batch of innovation bases for practicing "clear waters and green mountains are invaluable assets" and the second batch of national demonstration cities and counties of ecological civilization.

Fifth, we have strengthened the supervision and law enforcement of eco-environmental

protection. We have adhered to supervise in accordance with relevant laws and regulations, issued the *Opinions on Further Strengthening the Supervision and Law Enforcement of Ecological and Environmental Protection* and other documents, and formulated *Regulations on the Supervision of Ecological and Environmental Protection by Central Government*. Altogether 20 provinces including Hebei were inspected and reviewed in two batches by the central government on the performance of ecological environmental protection. 103 typical cases were made public while 122 cases of ecological environmental damages were transferred to judiciary and held accountable, which further strengthened the responsibility and awareness of local party committees, local governments and relevant departments to protect ecological environment. We have taken great efforts to solve environmental problems affecting people's lives and have addressed over 70,000 environmental problems. We helped to solve a large number of typical and inter-regional environmental problems that are thorny and complex. A total of 186,000 cases have been punished by administrative laws nationwide, and the amount of fines reached to 15.28 billion yuan, up by 32% over 2017 and 4.8 times that of 2014, when the new environmental protection law was not yet in place. More than 8,000 environment-related criminal cases were concluded. The people's courts at various levels have altogether handled more than 1,800 environmental public interest litigation cases filed by social organizations and procuratorial organizations. We continued to organize large-scale exercises for environmental law enforcement teams throughout the whole country.

Sixth, we have promoted high-quality economic development. We have issued the *Guidance on Further Deepening the Reform to Streamline Administration, Delegate Powers and Improve Regulation and Services in the Field of Ecological Environment and Promoting High-Quality Development of the Economy*, and further introduced 15 key supporting initiatives. We also amended the guiding catalogue for industrial structure adjustment and published the guiding catalogue for industrial development and relocation. We reduced the production of crude steel by more than 3.5 million tons and phased out outdated coal production capacity by 270 million tons, achieving the target of the 13th Five-Year Plan ahead of schedule. Moreover, we have accelerated the reform of the examination and approval for environmental impact assessment (EIA). The *Decision on Amending Seven Laws Including Labor Law of the People's Republic of China* was passed by the Standing Committee of the National People's Congress. We have amended the *Environmental Impact Assessment Law*, canceled the administrative licensing of the "Accreditation of Technical Service Organizations for Environmental Impact Assessment of Construction Project", modified the *Law on Noise Pollution Prevention and Control* and canceled the administrative licensing for the examination and acceptance of noise reduction environmental protection facilities. We

have formulated the *Decision on Amending Part of the "Catalogue of Classified Management of Environmental Impact Assessment of Construction Projects"* to simplify the EIA documents for 35 categories of projects. With the green channel having been improved, the review and approval time span for major infrastructure construction projects has been cut to half of the time limit required by law. We have examined and approved the EIA of 221,000 projects with a total investment of about 26.8 trillion yuan nationwide. We have drafted the "Three Lines and One Catalogue" (the ecological protection red line, environmental quality baseline, resource utilization upper-line, and eco-environmental access catalogue) for 11 provinces along the Yangtze River Economic Belt and Qinghai Province. The construction of resource recycling bases has been advanced in an orderly manner, and the energy consumption volume per unit GDP dropped by 3.1% compared with that of 2017.

Seventh, we have implemented the measures of ecological environmental reform. We have completed the establishment of the Ministry of Ecology and Environment, integrating relevant responsibilities of 7 departments, and coupling pollution prevention with ecological protection. We also facilitated the establishment of Atmospheric Environment Administration in Beijing-Tianjin-Hebei and surrounding areas and the eco-environmental regulatory agencies of the river basins and sea areas, and improved the ecological environment management system of different regions, river basins and sea areas. The Standing Committee of the National People's Congress has passed the *Decision on Amending 15 Laws Including the Law of the People's Republic of China on the Protection of Wildlife*, revised the *Law on the Prevention and Control of Air Pollution*, and specified the legal status of law enforcement agencies. We have issued the *Guidance on Deepening the Reform of Comprehensive Administrative Law Enforcement of Ecological Environment Protection*, integrated relevant law enforcement duties and teams, and enhanced the comprehensive environmental protection law enforcement system and relevant capacity building. We have comprehensively promoted the reform of the vertical management system for the monitoring, inspection and enforcement of ecological and environmental institutions under the provincial level. The *Measures for the Administration of Pollution Discharge Permitting (Trial)* was also issued, and a total of over 39,000 discharge permits in 24 industries were approved and issued to enterprises in accumulative terms, meeting the target of issuing discharge permits for sewage treatment plants in the built-up areas of 36 key cities one year ahead of schedule. We have fully carried out the *Program on the Reform of Environmental Damage Compensation System.* We have unfolded the work of natural resources and assets audit for senior officials when they leave the post, and started the pilot work on the compilation of balance sheet of natural resources and assets. We completed

the construction and renovation of 1,881 automatic national surface water quality monitoring stations. Altogether 169 cities have been included in the air quality ranking system, regularly publicizing the list of top cities and bottom cities in terms of air quality or air quality improvement. We have issued the *Three-Year Action Plan for Supervision and Inspection of Ecological and Environmental Monitoring Quality (2018-2020), and* investigated, dealt with and made public the case of air quality automatic monitoring data cheating in Linfen, Shanxi Province and multiples cases of artificial interference of air quality by water spraying.

Eighth, we have prevented and defused environmental risks. We have standardized the environmental access of household refuse incineration-based power generation construction projects, carried out self-inspection of waste incineration power generation and PX projects, and lawfully promoted the construction of relevant projects. We promoted the building of the early warning system for toxic and hazardous gases in chemical parks nationwide, and 11 provinces along the Yangtze River Economic Belt have revised, compiled and filed the emergency response plans for enterprises engaging in dangerous operations and heavy industries along the Yangtze River. The national "12369" reporting platform for environmental pollution has received and handled more than 710,000 reports from the public with most of them having being properly addressed per schedule. We have dealt with 286 environmental emergencies throughout the country, among which 50 were directly managed and handled by the Ministry of Ecology and Environment. Moreover, we carried out activities for the first year of enforcing the *Nuclear Safety Law*, and effectively worked the national coordination mechanism and risk prevention mechanism for nuclear safety. The safety supervision of nuclear facilities has been undertaken in strict accordance with the law. In specific, the safety operation of 45 nuclear power units had a good record, the quality of 11 nuclear power units under construction was closely monitored, and 19 civil research reactors and critical devices have been in safe operation.

Ninth, we have comprehensively enhanced supporting capabilities. The central government has allocated 255.5 billion yuan to support the fighting of the tough battle of ecological and environmental protection and pollution prevention and control. The Gaofen-5 satellite was successfully launched. We have reinforced the construction of ecological and environmental information application and integrated the ecological and environmental information systems of the Ministry of Ecology and Environment in use with the ecological and environmental cloud platform. We have steadily advanced the second national census on pollution sources, and relevant investigation, database construction and household visits have progressed smoothly. A total number of 11,510 industrial-sourced effluent discharge enterprises, 4,343 sewage treatment plants and

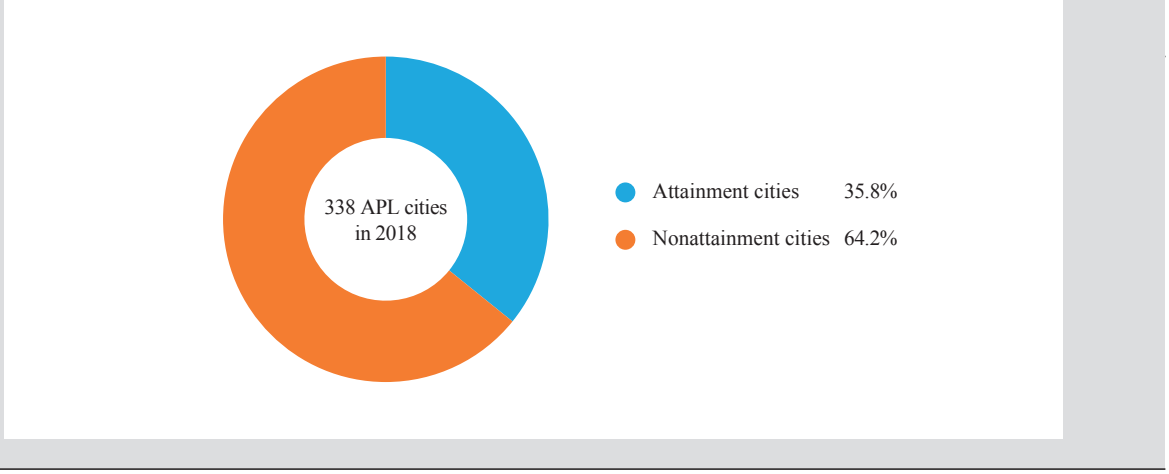
10,173 industrial-sourced waste gas discharge enterprises have undergone spot checks. There have been 1,970 items of effective national environmental protection standards. We have made great contribution to the success of the Katowice Conference of the United Nations Framework Convention on Climate Change and achieved a basket of comprehensive, balanced and effective outcomes. We have steadily promoted the construction of the green "Belt and Road", launched the Sino-French Environmental Year, and advanced the construction of the China-Africa Environmental Cooperation Center. The 2018 Annual General Meeting of the CCICED was held successfully. We also vigorously carried out environment campaign to step up public awareness, and promptly responded to social concerns. We have issued the *Code of Conduct for Environmental Protection of the Citizen (Trial)*, launched the themed activity of "Building A Beautiful China, I'm in Action", and organized Environmental Day celebration activities on June 5th and publicity on National Low-Carbon Day. We have formulated the *Measures for Public Participation in Environmental Impact Assessment* to encourage and regulate public participation in the process of environmental impact assessment. The first batch of 124 environmental protection facilities and urban sewage and garbage treatment facilities nationwide have been opened to the public for 5,218 times.

In 2018, the quality of national eco-environment has witnessed continuous improvement with further decrease of total discharge of major pollutants and CO_2 emissions per unit GDP. The annual target on ecological and environmental protection has been achieved, meeting the required schedule of the 13th "Five-Year" Plan.

Atmospheric Environment

Air quality

Cities at or above prefecture level In 2018, out of all the 338 cities at or above prefecture-level (APL cities)* across the country, 121 cities met national air quality standard**, accounting for 35.8% of the total, up by 6.5 percentage points compared with that of 2017; 217 cities failed to meet national air quality standard, taking up 64.2%***.

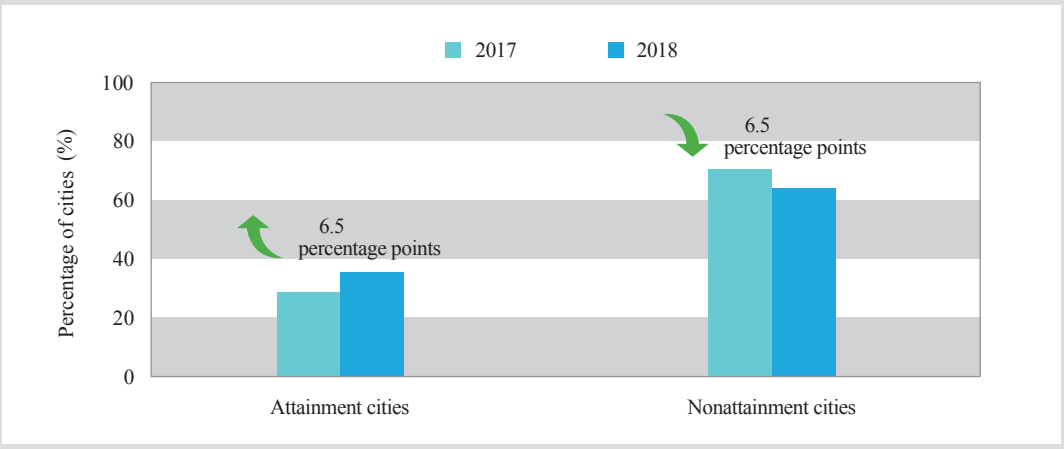


Environmental quality of 338 APL cities in 2018

*Cities at or above prefecture level (APL cities): including municipality, cities or regions at prefecture level, autonomous prefectures and league.

**Air quality meeting the standard: the ambient air quality meets the standard when the concentrations of all 6 pollutants under assessment meet the standard, among which, $PM_{2.5}$, PM_{10}, SO_2 and NO_2 were evaluated according to the annual average concentration, and O_3 and CO were evaluated according to the percentile concentration. According to the *Technical Regulation for Ambient Air Quality Assessment (Trial) (HJ 663-2013)*, effective daily maximum 8-hour average concentration of O_3 and 24-hour average concentration of CO in the calendar year are ranked from small to big, then the percentile value at 90% with the daily maximum 8-hour average concentration of O_3 is compared with the daily maximum 8-hour average concentration of O_3 of national standard date to judge if O_3 concentration meets the standard; and the percentile value at 95% with the 24-hour average concentration of CO is compared to the standard 24-hour CO concentration limit to judge if CO concentration meets the standard.

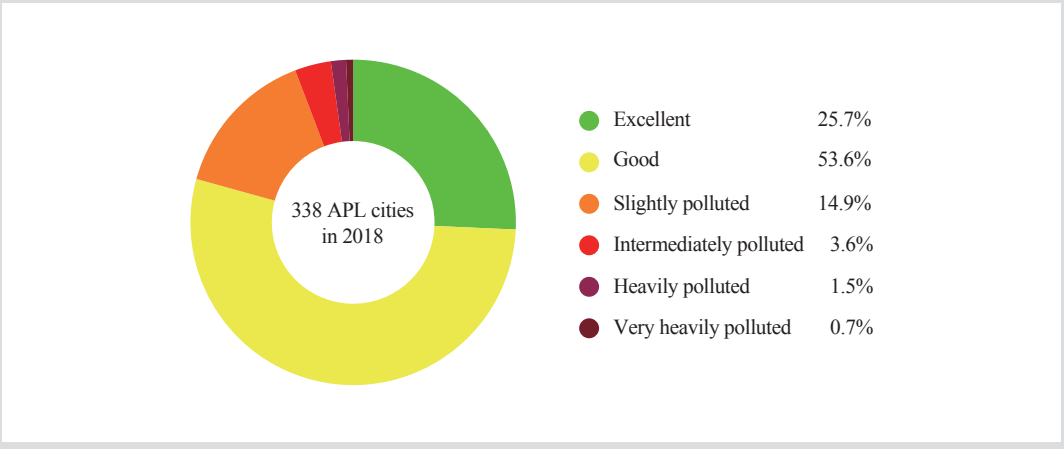
***The calculation of the percentage of all categories and grades in this report is based on the number of items divided by the total number. The results are revised according to the *Representation and Judgment of Numerical Rounding Rules and Limit Values (GB/T 8170-2008)*, consequently there may arise the situation where the combined proportion of two or more categories does not equal the sum of the proportions of the various categories, or the case where the sum of the proportions of all categories does not equal 100% or the sum of the percentage changes from the same period does not equal 0, the same below.



Interannual comparison of environmental air quality attainment in 338 APL cities in 2018

The average percentage of attainment days* on air quality of the 338 APL cities was 79.3%, up by 1.3 percentage points compared with that of 2017. The amount of nonattainment days** took up 20.7%. The percentage of attainment days on air quality of 7 cities was 100%. The percentage of attainment days on air quality of 186 cities ranged from 80%~100%. The percentage of attainment days on air quality of 120 cities ranged from 50%~80%, and the percentage of attainment days on air quality of 25 cities was below 50%.

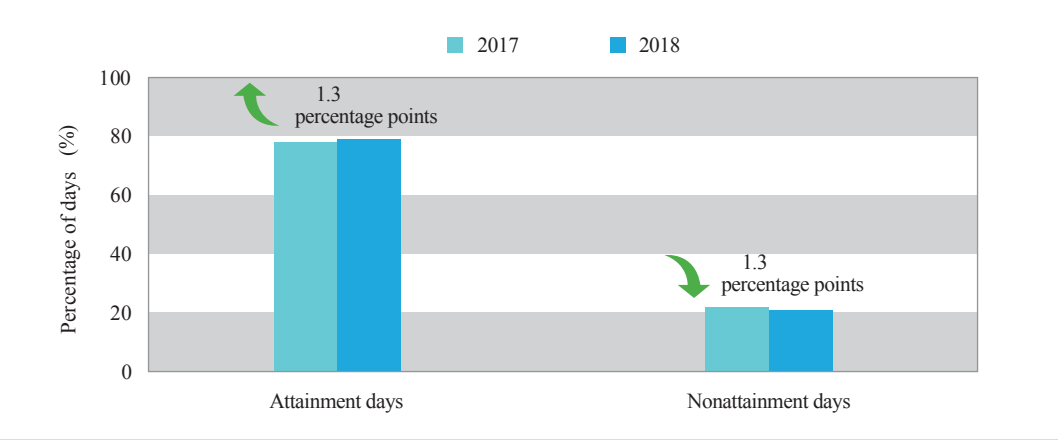
In 338 APL cities, 1,899 days were under heavy pollution,



The percentage of days of various air quality standards of 338 APL cities in 2018

* The number of attainment days: It refers to the amount of days with air quality index (AQI) ranging from 0~100, also referred to as attainment days.

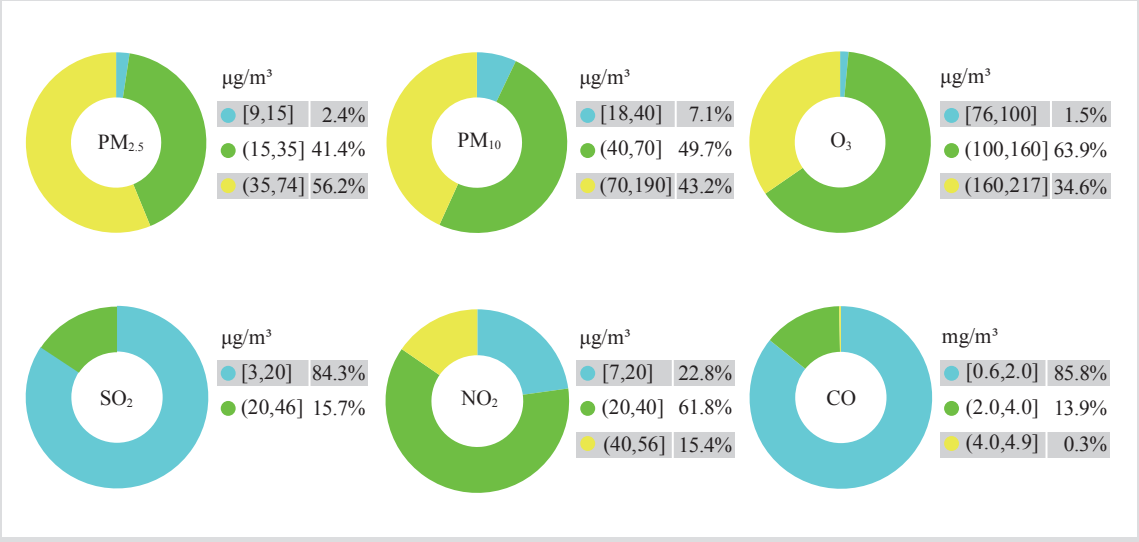
** The amount of nonattainment days: the amount of days with AQI > 100. Among them, AQI within the range of 101~150 indicates slight pollution, 151~200 indicates intermediate pollution, 201~300 indicates heavy pollution and > 300 very serious pollution.



Interannual comparison of the days of various air quality standards of 338 APL cities in 2018

412 days less than that of 2017; 822 days were under very heavy pollution, 20 days more than that of 2017. Among them, days with $PM_{2.5}$ as the primary pollutant* took up 60.0% and those with PM_{10} as the primary pollutant took up 37.2% and with O_3 as the primary pollutant took up 3.6%.

The concentration of $PM_{2.5}$, PM_{10}, O_3, SO_2, NO_2 and CO were 39 μg/m³, 71 μg/m³, 151 μg/m³, 14 μg/m³, 29 μg/m³ and 1.5 mg/m³ respectively, and the corresponding percentage of nonattainment days were 9.4%, 6.0%, 8.4%, less than 0.1%, 1.2% and 0.1%. Both the concentration and percentage of

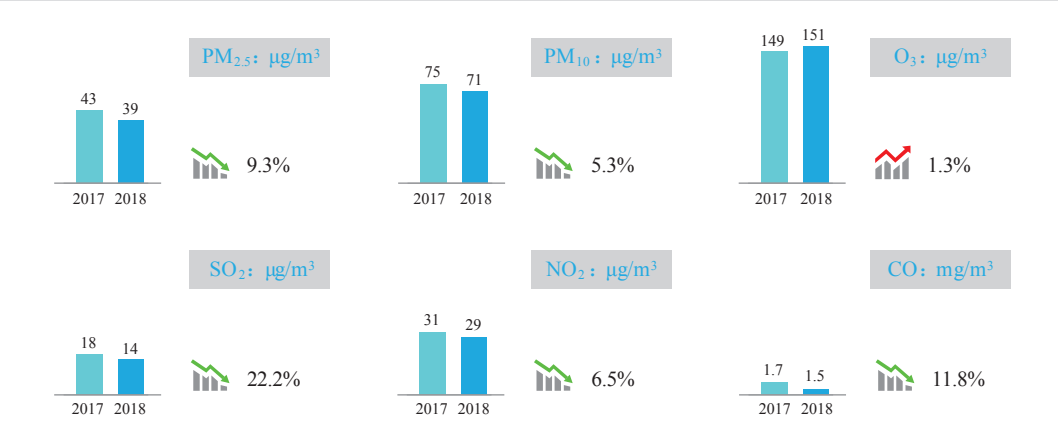


Percentage of 338 APL cities with different concentrations of six major pollutants in 2018

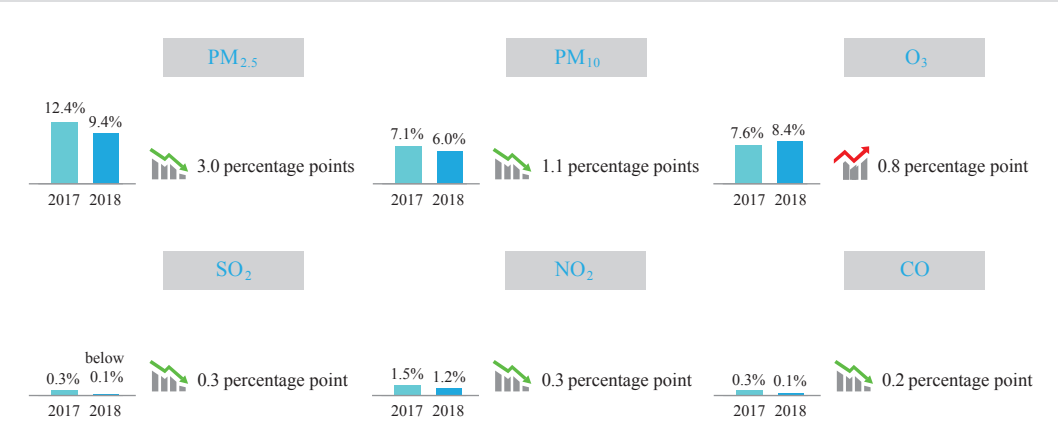
* Primary pollutant: When AQI＞50, the pollutant with the biggest individual AQI is the primary pollutant.

nonattainment days of O_3 increased compared with that of 2017, and the concentration and percentage of nonattainment days of the other five indicators saw some decrease.

If the impact of dust are not excluded, among the 338 APL cities, 33.7% met national air quality standard while 66.3% cities failed to meet national air quality standard; the average concentrations of $PM_{2.5}$ and PM_{10} were 41 μg/m^3 and 78 μg/m^3 respectively, down by 6.8% and 2.5% compared with that of 2017.

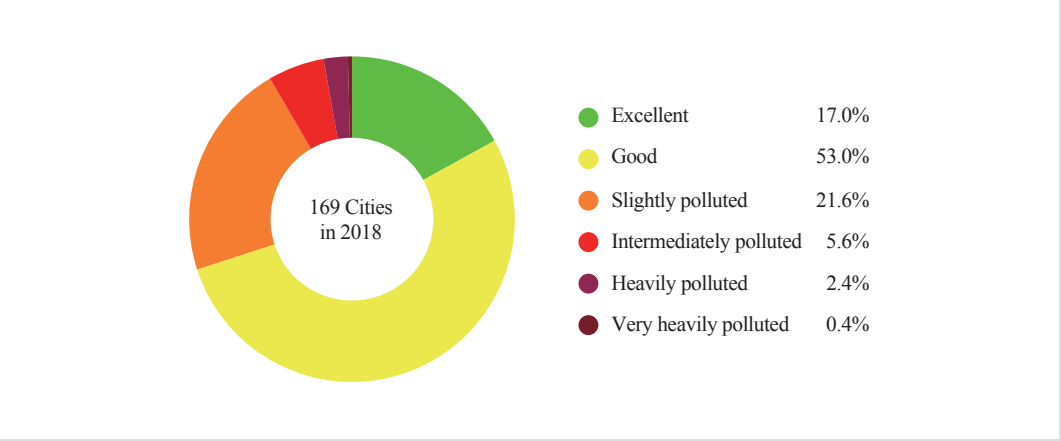


Interannual comparison of concentrations of six major pollutants in 338 APL cities in 2018

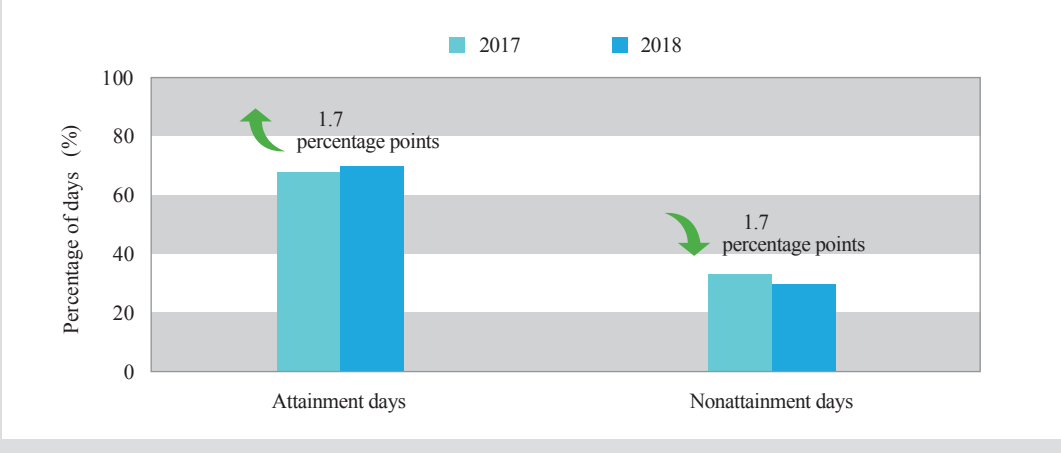


Interannual comparison of the percentage of nonattainment days of six major pollutants in 338 APL cities in 2018

169 Cities In 2018, the average percentage of days of the 169 cities at or above prefecture level* (hereinafter referred to as 169 Cities) meeting air quality standard was 70.0%, up by 1.7 percentage points compared with that of 2017. The average number of days failing to meet the standard took up 30.0%. The attainment rate stood between 80%~100% for 48 cities, 50%~80% for 100 cities and less than 50% for 21 cities.



The percentage of days of various air quality standards of 169 Cities in 2018



Interannual comparison of the days of various air quality standards of 169 Cities in 2018

* The number of cities has been expanded on the basis of 74 cities under Stage I monitoring following the enforcement of the newly amended ambient air quality standard, including cities at or above prefecture level in key regions such as Beijing-Tianjin-Hebei and surrounding areas, the Yangtze River delta region, the Fenwei Plain, Chengdu-Chongqing region, the middle reaches of the Yangtze River, the Pearl River Delta region, provincial capital cities and cities under separate plan of the State Council.

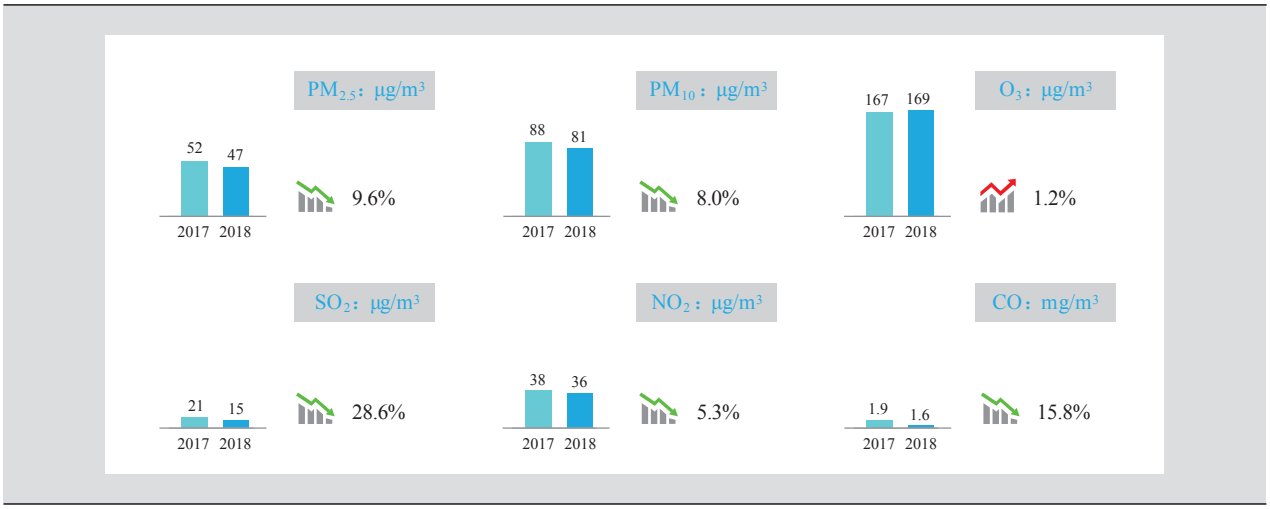
The number of days with $PM_{2.5}$ as the primary pollutant took up 44.1% of the total nonattainment days, the number of days with O_3 as the primary pollutant took up 43.5%, the number of days with PM_{10} as the primary pollutant took up 11.6%, the number of days with NO_2 as primary pollutant took up 1.1%, and the number of days with SO_2 and CO as primary pollutants took up less than 0.1%.

The evaluation results of comprehensive air quality index* showed that the top 20 cities with poor air quality (from No.169 to No. 150) in the 169 Cities were Linfen, Shijiazhuang, Xingtai, Tangshan, Handan, Anyang, Taiyuan, Baoding, Xianyang, Jincheng, Jiaozuo, Xi'an, Xinxiang, Yangquan, Yuncheng, Jinzhong, Zibo, Zhengzhou, Laiwu and Weinan. The top 20 cities with relatively good urban air quality (from No.1 to No.20) were Haikou, Huangshan, Zhoushan, Lhasa, Lishui, Shenzhen, Xiamen, Fuzhou, Huizhou, Taizhou, Zhuhai, Guiyang, Zhongshan, Ya'an, Dalian, Kunming, Wenzhou, Quzhou, Xianning and Nanning.

The concentration of $PM_{2.5}$, PM_{10}, O_3, SO_2, NO_2 and CO were 47 μg/m^3, 81 μg/m^3, 169 μg/m^3, 15 μg/m^3, 36 μg/m^3 and 1.6 mg/m^3 respectively, and the percentage of nonattainment days were 14.3%, 8.5%, 13.7%, 0.1%, 2.3% and 0.1% respectively. Both the concentration and percentage of nonattainment days of O_3 increased compared with that of 2017, and the concentration and percentage of nonattainment days of the other five indicators saw some decrease.

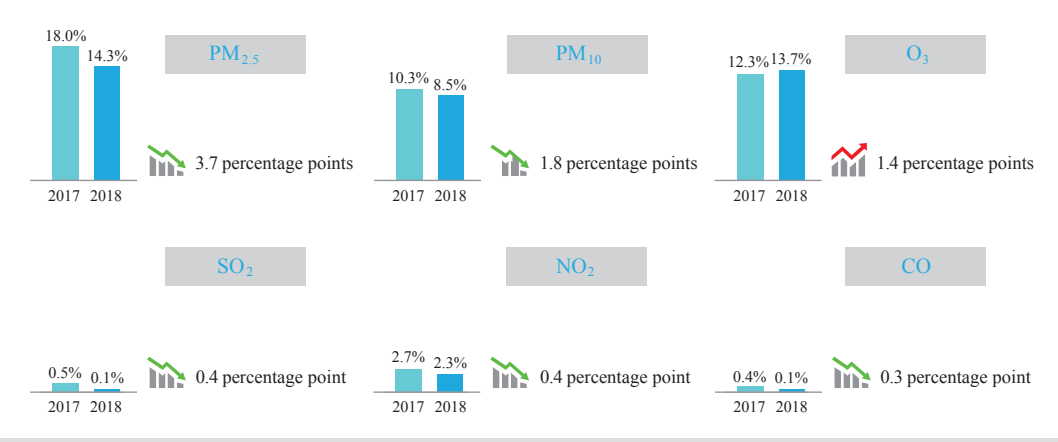
Percentage of 169 Cities of various standards of six major pollutants in 2018

Indicator	Standard Ⅰ (%)	Standard Ⅱ (%)	Exceeding Standard Ⅱ (%)
$PM_{2.5}$	0.0	17.2	82.8
PM_{10}	1.2	33.7	65.1
O_3	0.6	36.1	63.3
SO_2	81.1	18.9	0.0
NO_2	71.0 (same for Standard Ⅰ & Standard Ⅱ)		29.0
CO	100.0 (same for Standard Ⅰ & Standard Ⅱ)		0.0



Interannual comparison of concentrations of six major pollutants in 169 Cities in 2018

* Comprehensive air quality index: The sum of the quotients of concentration of the 6 air pollutants against corresponding Grade II limit within the assessment period is the comprehensive air quality index of the current city in that period, which is employed for ranking of urban air quality.



Interannual comparison of the percentage of nonattainment days of six major pollutants in 169 Cities in 2018

If the impact of dust are not excluded, the average concentration of $PM_{2.5}$ and PM_{10} of the 169 Cities were 48 μg/m^3 and 85 μg/m^3 respectively, down by 9.4% and 6.6% compared with that of 2017.

Beijing-Tianjin-Hebei and surrounding areas* In 2018, the number of days of "2+26" cities in Beijing-Tianjin-Hebei and surrounding areas of the whole year meeting air quality standard was within the range of 41.4%~62.2% with the average of 50.5%, up by 1.2 percentage points compared with that of 2017. The average number of nonattainment days accounted for 49.5% of the total; 32.0%, 11.5%, 5.2% and 0.8% of which was of slight pollution, intermediate pollution, heavy pollution and very heavy pollution respectively. The attainment days took up 50%~80% for 14 cities and less than 50% for other 14 cities. Among the nonattainment days, the number of days with O_3, $PM_{2.5}$, PM_{10} and NO_2 as the primary pollutant took up 46.0%, 40.7%, 12.8% and 0.8% respectively. The number of days with CO as the primary pollutant took up less than 0.1% of the total, and there was no occurrence of nonattainment days with SO_2 as the primary pollutant.

The percentage of the number of attainment days was 62.2% for Beijing, up by 0.3 percentage point compared with that of 2017. There were 14 days of heavy pollution and 1 day of serious heavy pollution, 9 days less than that of 2017.

The Yangtze River Delta** In 2018, 41 cities have witnessed 56.2%~98.4% of attainment days throughout the year with the average of 74.1%, up by 2.5 percentage points compared with that of 2017. The average number of days failing to meet air quality standard took up 25.9%; of which the percentage of days of slight pollution was 19.5%, the percentage of days of intermediate pollution was 4.5%, the percentage of days of heavy pollution was 1.9%, and the percentage of days of serious heavy pollution was less than 0.1%. The attainment rate was within the range of 80%~100% for 11 cities and 50%~80% for 30 cities. In all the nonattainment days, the number of days with O_3, $PM_{2.5}$, PM_{10} and NO_2 as the primary pollutants took up 49.3%, 44.3%, 4.5% and 2.2% respectively. There was no occurrence of nonattainment days with SO_2 and CO as the primary pollutants.

The percentage of attainment days was 81.1% for Shanghai around the year, up by 5.8 percentage points compared with that of 2017. There were 3 days of heavy pollution and no occurrence of very heavy pollution, which was 1 day more compared with that of 2017.

* According to the *Three-Year Action Plan on "Beat Air Pollution" Campaign*, the Beijing-Tianjin-Hebei and surrounding areas include Beijing, Tianjin, Shijiazhuang, Tangshan, Handan, Xingtai, Baoding, Cangzhou, Langfang, Hengshui and Xiong'an New Area in Hebei province, Taiyuan, Yangquan, Changzhi and Jincheng in Shanxi Province, Jinan, Zibo, Jining, Dezhou, Liaocheng, Binzhou and Heze in Shandong Province, Zhengzhou, Kaifeng, Anyang, Hebi, Xinxiang, Jiaozuo and Puyang in Henan Province, collectively referred to as "2+26" cities.

**According to the *Three-Year Action Plan on "Beat Air Pollution" Campaign*, the Yangtze River Delta region includes Shanghai municipality, Jiangsu, Zhejiang and Anhui provinces.

Change of average concentration of primary pollutants in the Beijing–Tianjin–Hebei and surrounding areas in 2018

Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2017 (%)
Beijing-Tianjin-Hebei and surrounding areas	$PM_{2.5}$	60	-11.8
	PM_{10}	109	-9.2
	O_3	199	0.5
	SO_2	20	-31.0
	NO_2	43	-8.5
	CO	2.2	-24.1
Beijing	$PM_{2.5}$	51	-12.1
	PM_{10}	78	-7.1
	O_3	192	-0.5
	SO_2	6	-25.0
	NO_2	42	-8.7
	CO	1.7	-19.0

Change of average concentration of primary pollutants in the Yangtze River Delta region in 2018

Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2017 (%)
The Yangtze River Delta region	$PM_{2.5}$	44	-10.2
	PM_{10}	70	-10.3
	O_3	167	0.6
	SO_2	11	-26.7
	NO_2	35	-5.4
	CO	1.3	-7.1
Shanghai	$PM_{2.5}$	36	-7.7
	PM_{10}	51	-7.3
	O_3	160	-11.6
	SO_2	10	-16.7
	NO_2	42	-4.5
	CO	1.1	-8.3

Fenwei Plain[*] The percentage of attainment days of 11 cities in Fenwei Plain was within the range of 37.8%~69.3% with the average of 54.3%, up by 2.2 percentage points compared with that of 2017. The average ratio of

[*] According to the *Three-Year Action Plan on "Beat Air Pollution" Campaign*, Fenwei Plain includes Jinzhong, Yuncheng, Linfen and Lvliang in Shanxi Province, Luoyang and Sanmenxia in Henan Province, and Xi'an, Tongchuan, Baoji, Xianyang, Weinan and Yangling Demonstration Zone in Shaanxi Province.

nonattainment days was 45.7%; 31.0% of which were of slight pollution, 9.4% of intermediate pollution, 4.2% of heavy pollution and 1.1% of very heavy pollution. The attainment rate was within the range of 50~80% for 6 cities and less than 50% for 5 cities. Among the nonattainment days, the number of days with $PM_{2.5}$, O_3, PM_{10}, NO_2 and SO_2 as the primary pollutants took up 44.7%, 36.4%, 18.7%, 0.5% and 0.2% respectively. There was no occurrence of nonattainment days with CO as the primary pollutant.

Change of average concentration of primary pollutants in Fenwei Plain in 2018

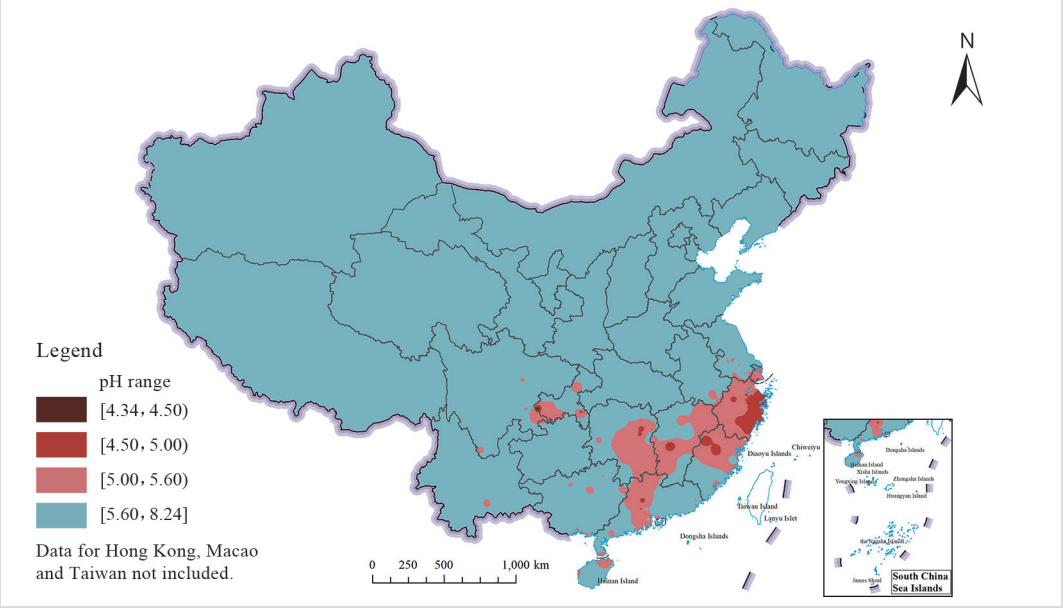
Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2017 (%)
Fenwei Plain	$PM_{2.5}$	58	-10.8
	PM_{10}	106	-7.0
	O_3	180	-2.7
	SO_2	24	-36.8
	NO_2	43	-4.4
	CO	2.3	-14.8

Straw burning In 2018, satellite remote sensing monitored a total of 7,647 straw burning points in the country (excluding fire point information under cloud cover), mainly distributed in Heilongjiang, Jilin, Inner Mongolia, Shanxi, Hebei and Liaoning. The number of fire points was 3,340 fewer than that in 2017.

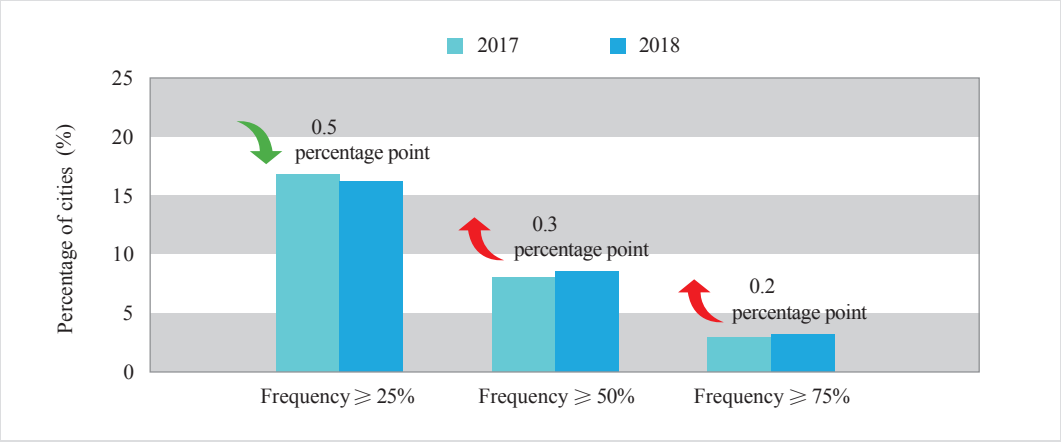
Acid Rain

Acid rain distribution In 2018, the total area covered by acid rain was about 530,000 km^2, taking up 5.5% of total land area of China, down by 0.9 percentage point compared with that of 2017. Among them, the percentage of land area with relatively serious acid rain was 0.6%. Acid rain was mainly distributed in the region south to the Yangtze River and east to Yunnan-Guizhou Plateau, mainly including Zhejiang, most of Shanghai, northern part of Fujian, central part of Jiangxi, central and eastern part of Hunan, central part of Guangdong and southern part of Chongqing.

Acid rain frequency In 2018, the average acid rain frequency of 471 cities (districts or counties) under precipitation monitoring was 10.5%, down by 0.3 percentage point compared with that of 2017. The rate of cities with acid rain occurrence was 37.6%, up by 1.5 percentage points compared with that of 2017. The percentage of cities with acid rain frequency over 25%, 50% and 75% was 16.3%, 8.3% and 3.0% respectively.

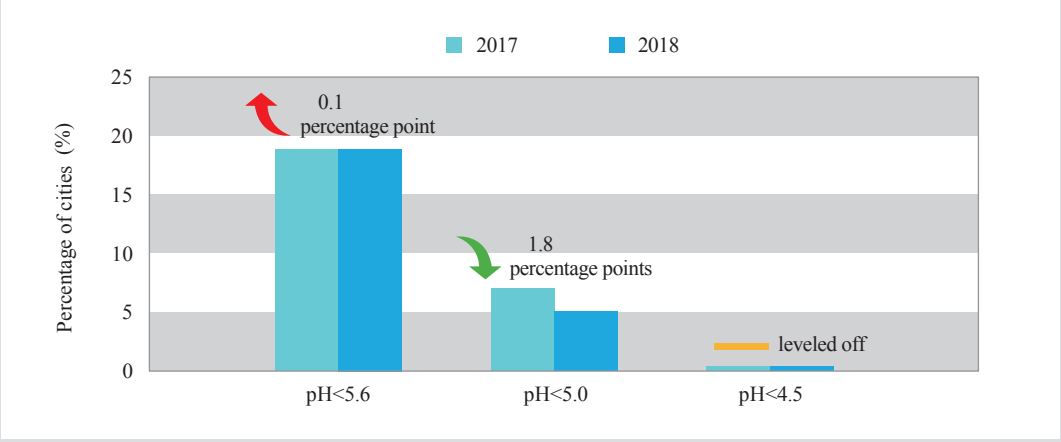


The isoline of annual pH value of precipitation in China in 2018



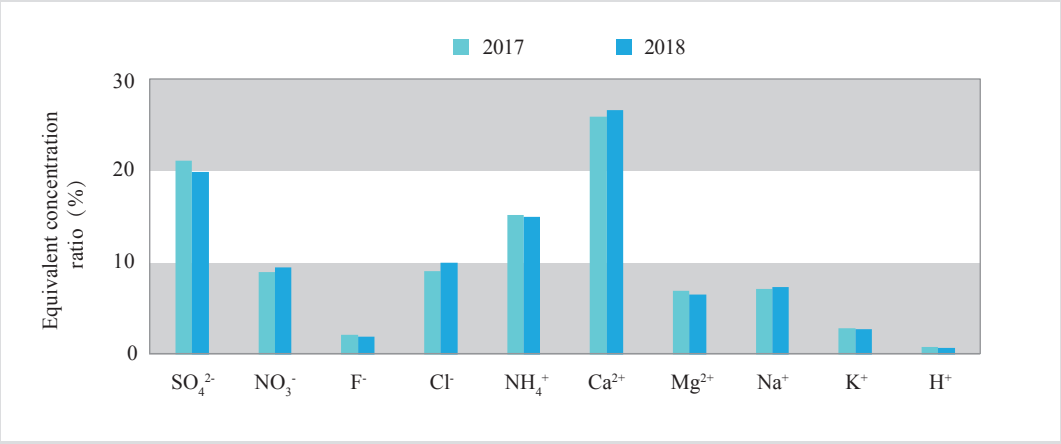
Interannual comparison of the percentage of cities with different acid rain frequency in 2018

Precipitation acidity In 2018, the annual average pH value of precipitation across the country was 4.34 (Dazu district in Chongqing) ~8.24 (Kashgar, Xinjiang) with an average value of 5.58. The rate of cities with acid rain, relatively serious acid rain and serious acid rain was 18.9%, 4.9% and 0.4% respectively.



Interannual comparison of the percentage of cities with different annual pH value of precipitation in 2018

Chemical composition In 2018, the main cations in precipitation were calcium and ammonium, taking up 26.6% and 15.0% respectively of total ion equivalent. The key anion was sulfate radical, taking up 19.9% of the total ion equivalent, while nitrate radical took up 9.5% of the total ion equivalent. In general, the type of acid rain can still be classified as sulphuric acid. Compared with that of 2017, the percentage of concentration of sulfate radical and magnesium ion went down, while the percentage of concentration of nitrate radical, chloride ion and calcium ion went up a bit and the percentage of concentration of other ion equivalents kept at a stable level.



Interannual comparison of main ion equivalent concentration ratio of precipitation in 2018

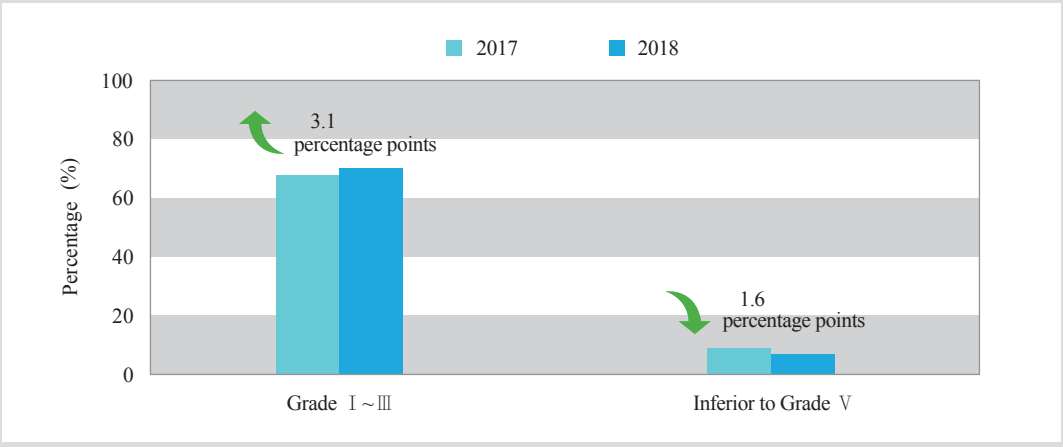
Freshwater Environment

Surface waters

In 2018, there were 1,935 surface water sections (sites) under national monitoring program, among which water sections (sites) meeting Grade I~III water quality standard took up 71.0%, up by 3.1 percentage points compared with that of 2017; sections failing to meet Grade V standard took up 6.7%, down by 1.6 percentage points compared with that of 2017*.

River basins

In 2018, out of the 1,613 water sections under national monitoring program in 7 big river basins of the Yangtze River, Yellow River, Pearl River, Songhua River, Huaihe River, Haihe River and Liaohe River as well as rivers in Zhejiang and Fujian, rivers in northwestern and southwestern parts of China, the water sections of Grade I standard took up 5.0%; Grade II standard 43.0%; Grade III standard 26.3%; Grade IV

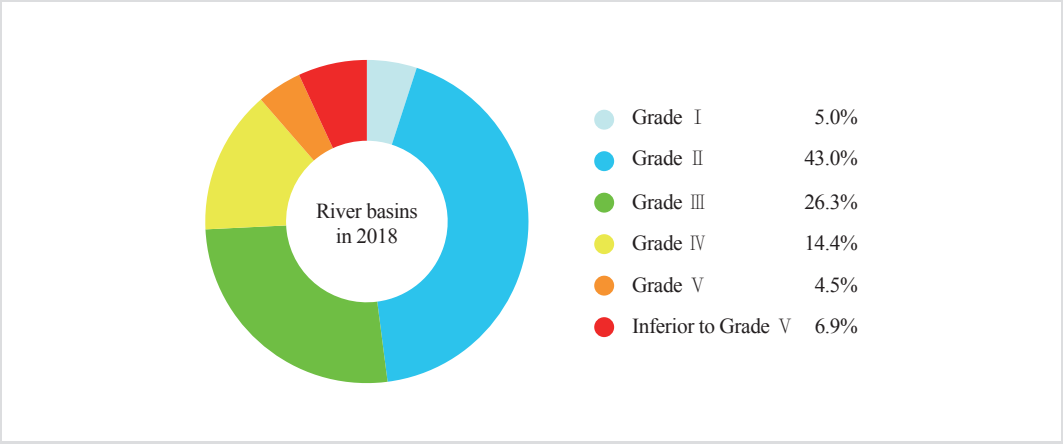


Interannual comparison of varying standards of surface water quality in 2018

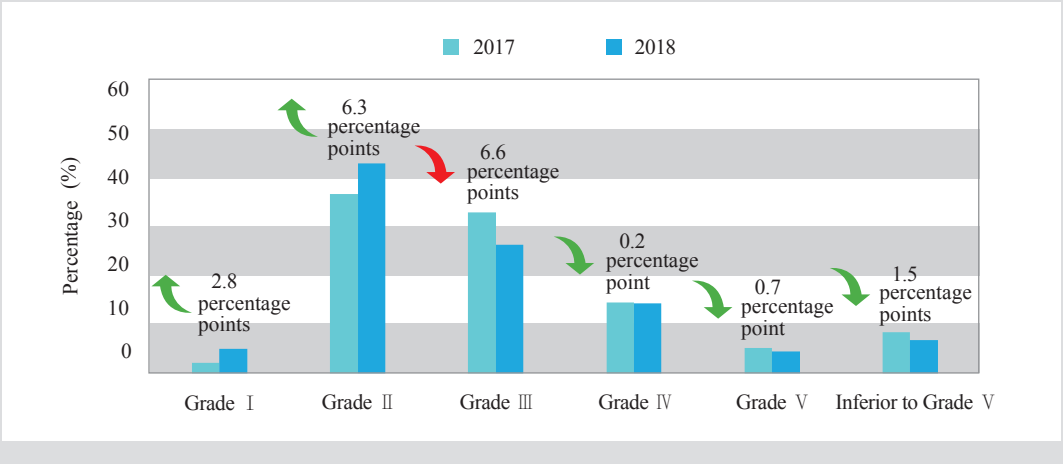
*Twenty-one indicators of Table 1 of *Environmental Quality Standard for Surface Water (GB 3838-2002)* except water temperature, TN and E-coli are employed to assess the water grade based on each individual limit, and the highest grade according to the single factor approach will be taken as the type of water quality of the section. Water of Grade I or II standard refers to the water in Class I protected areas of drinking water sources, habitats of rare aquatic species, fish and shrimp spawning grounds and feeding grounds of fry and young fish. Water of Grade III standard could be used for Class II drinking water source protected areas, fish and shrimp wintering grounds, migration channels, aquaculture areas and swimming sites. Water of Grade IV standard could be used for general industrial water use and recreation without any direct contact with human body. Water of Grade V standard could be used for agriculture and landscape. Water failing to meet Grade V standardhardly has any function except adjustment of local climate.

standard 14.4%; Grade V standard 4.5%; inferior to Grade V standard 6.9%. Compared with that of 2017, the percentage of water sections meeting Grade I standard was up by 2.8 percentage points; Grade II up by 6.3 percentage points; Grade III down by 6.6 percentage points; Grade IV down by 0.2 percentage point; Grade V down by 0.7 percentage point, and those inferior to Grade V down by 1.5 percentage points.

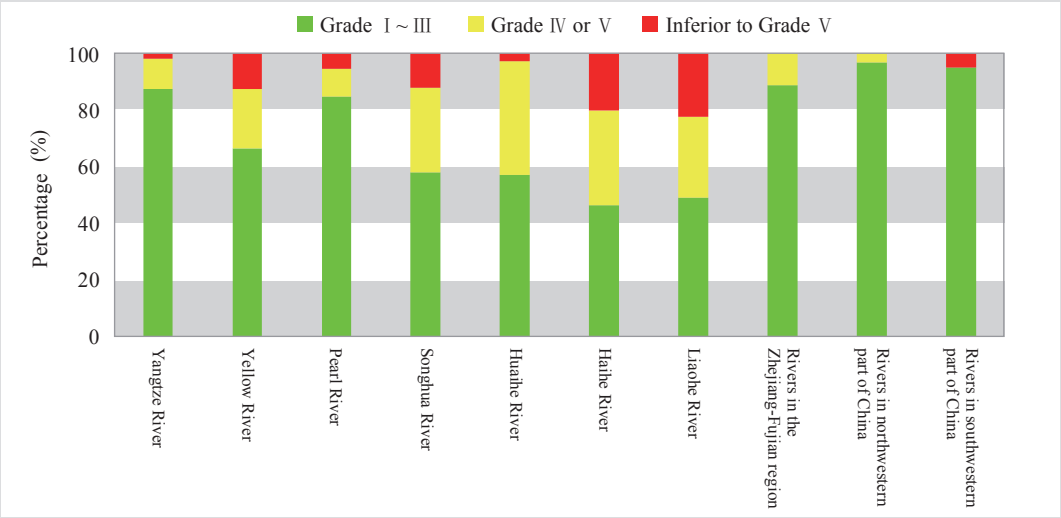
Rivers in northwest China and rivers in southwest China were of excellent quality. The water quality of Yangtze River, Pearl River and rivers in Zhejiang and Fujian were fairly good, while the Yellow River, Songhua River and Huaihe River were slightly polluted, and the Haihe River and Liaohe River were intermediately polluted.



General water quality of river basins of China in 2018

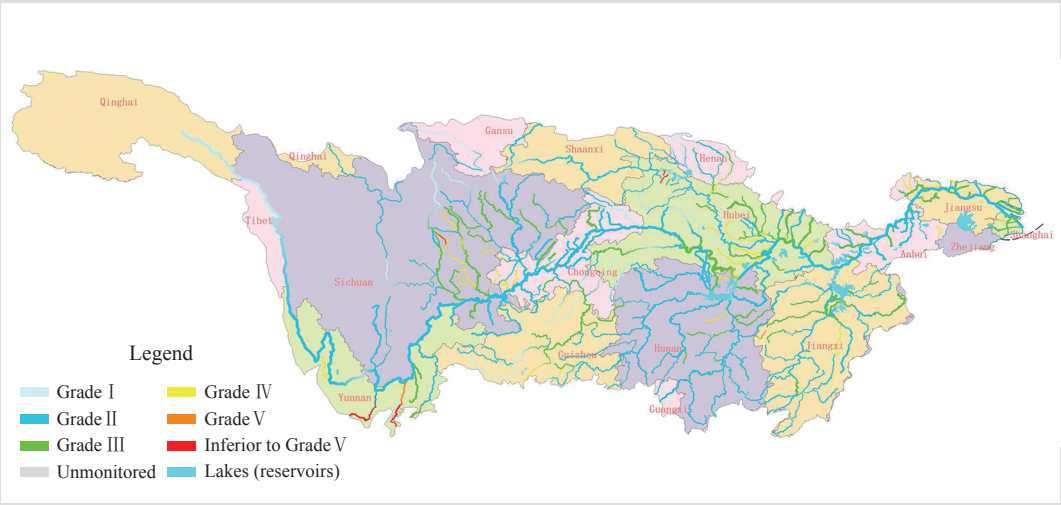


Interannual comparison of general water quality of river basins of China in 2018



Water quality of 7 big river basins, rivers in Zhejiang and Fujian, rivers in northwestern part and southwestern part of China in 2018

The Yangtze River basin witnessed sound water quality. In all the 510 water sections under national monitoring program, 5.7% met Grade I standard, 54.7% met Grade II standard; 27.1% met Grade III standard; 9.0% met Grade IV standard; 1.8% met Grade V and 1.8% were inferior to Grade V standard. Compared with that of 2017, the percentage of water sections meeting Grade I was up by 3.5 percentage points; Grade II up by 10.4 percentage points; Grade III down by 10.9 percentage points; Grade IV down by 1.2 percentage points; Grade V down by 1.3 percentage points and those inferior to Grade V down by 0.4 percentage point. The water quality of the mainstream of the Yangtze River was excellent, and that of major tributaries of the Yangtze River was good.

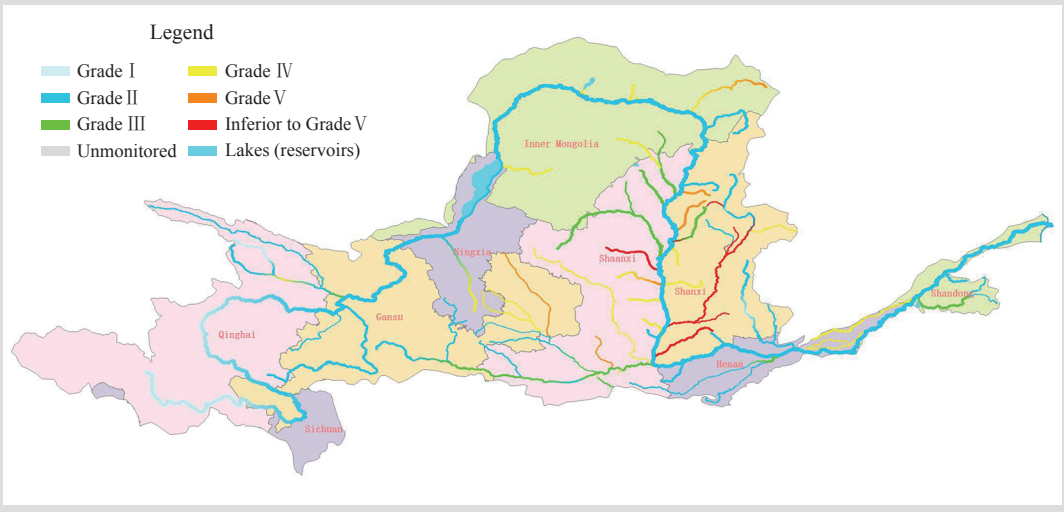


Water quality distribution of Yangtze River Basin in 2018

Water quality of Yangtze River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	510	5.7	54.7	27.1	9.0	1.8	1.8	3.5	10.4	-10.9	-1.2	-1.3	-0.4
Mainstream	59	6.8	78.0	15.3	0.0	0.0	0.0	0.0	37.3	-37.2	0.0	0.0	0.0
Major tributaries	451	5.5	51.7	28.6	10.2	2.0	2.0	3.9	6.9	-7.5	-1.3	-1.5	-0.4
Water sections across provincial boundaries	60	11.7	70.0	13.3	5.0	0.0	0.0	5.0	11.7	-15.0	-1.7	0.0	0.0

The Yellow River basin was slightly polluted. The major pollution indicators were ammonia nitrogen, COD and BOD_5. Out of the 137 water sections under national monitoring program, 2.9% met Grade I water quality standard, up by 1.4 percentage points; 45.3% met Grade II standard, up by 16.1 percentage points; 18.2% met Grade III standard, down by 8.8 percentage points; 17.5% met Grade IV standard, up by 1.4 percentage points; 3.6% met Grade V standard, down by 6.6 percentage points; and 12.4% failed to meet Grade V standard, down by 3.7 percentage points compared with that of 2017. The mainstream of the Yellow River was of excellent water quality and the major tributaries were slightly polluted.

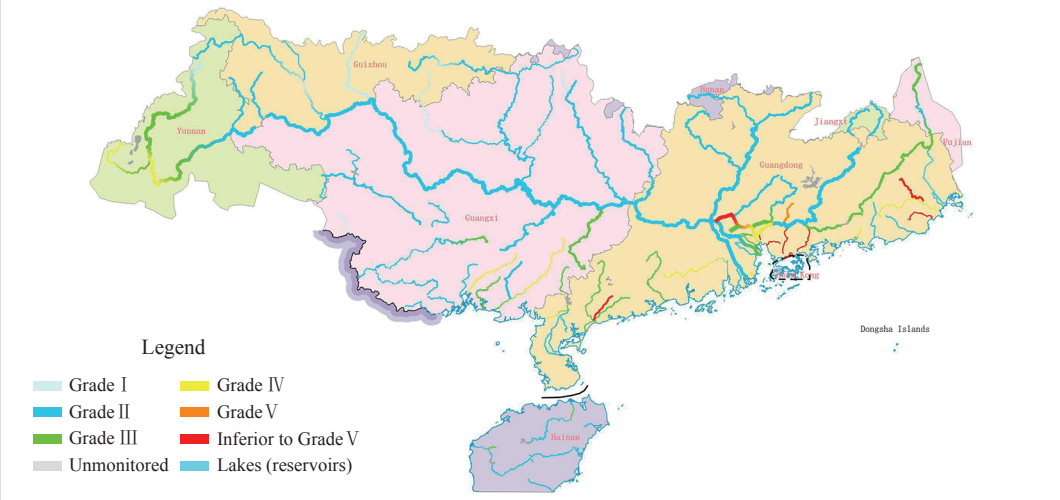


Water quality distribution of Yellow River Basin in 2018

Water quality of Yellow River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	137	2.9	45.3	18.2	17.5	3.6	12.4	1.4	16.1	-8.8	1.4	-6.6	-3.7
Mainstream	31	6.5	80.6	12.9	0.0	0.0	0.0	0.0	22.5	-19.4	-3.2	0.0	0.0
Major tributaries	106	1.9	34.9	19.8	22.6	4.7	16.0	1.9	14.1	-5.7	2.8	-8.5	-4.8
Water sections across provincial boundaries	39	2.6	59.0	7.7	15.4	7.7	7.7	0.0	35.9	-25.6	-2.5	0.0	-7.7

The Pearl River basin was of good water quality. Among 165 water sections under national monitoring program, 4.8% met Grade I standard, up by 1.8 percentage points compared with that of 2017; 61.8% met Grade II standard, up by 5.4 percentage points; 18.2% met Grade III standard, down by 9.7 percentage points; 7.9% met Grade IV standard, up by 1.8 percentage points; 1.8% met Grade V standard, down by 0.6 percentage point; and 5.5% failed to meet Grade V standard, up by 1.3 percentage points. The mainstream and major tributaries of the Pearl River were of good water quality, and the rivers in Hainan Island were of excellent water quality.

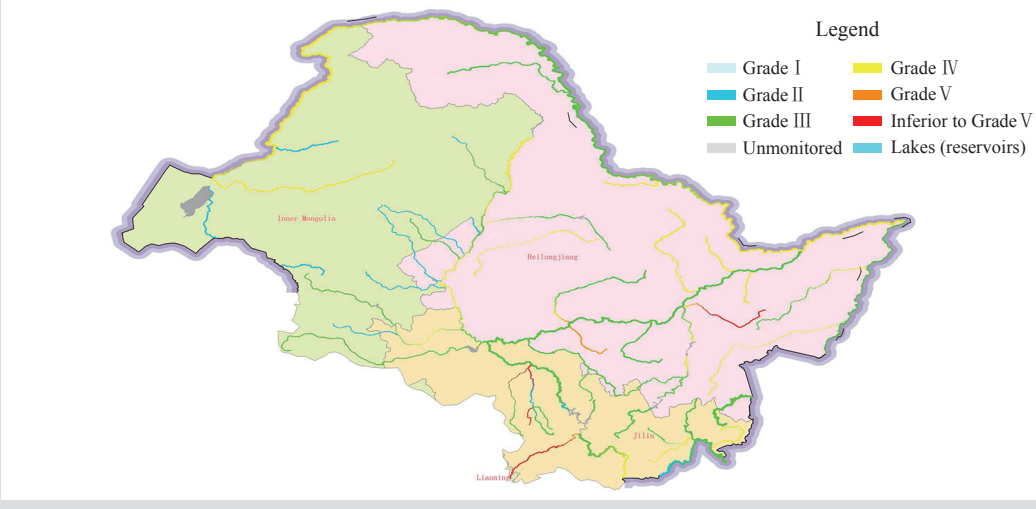


Water quality distribution of Pearl River Basin in 2018

Water quality of Pearl River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	165	4.8	61.8	18.2	7.9	1.8	5.5	1.8	5.4	-9.7	1.8	-0.6	1.3
Mainstream	50	2.0	64.0	20.0	10.0	2.0	2.0	0.0	4.0	-4.0	0.0	0.0	0.0
Major tributaries	101	6.9	58.4	16.8	7.9	2.0	7.9	2.9	7.9	-14.9	2.9	-1.0	2.0
Rivers in Hainan Island	14	0.0	78.6	21.4	0.0	0.0	0.0	0.0	-7.1	7.1	0.0	0.0	0.0
Water sections across provincial boundaries	17	11.8	76.5	11.8	0.0	0.0	0.0	5.9	17.7	-23.5	0.0	0.0	0.0

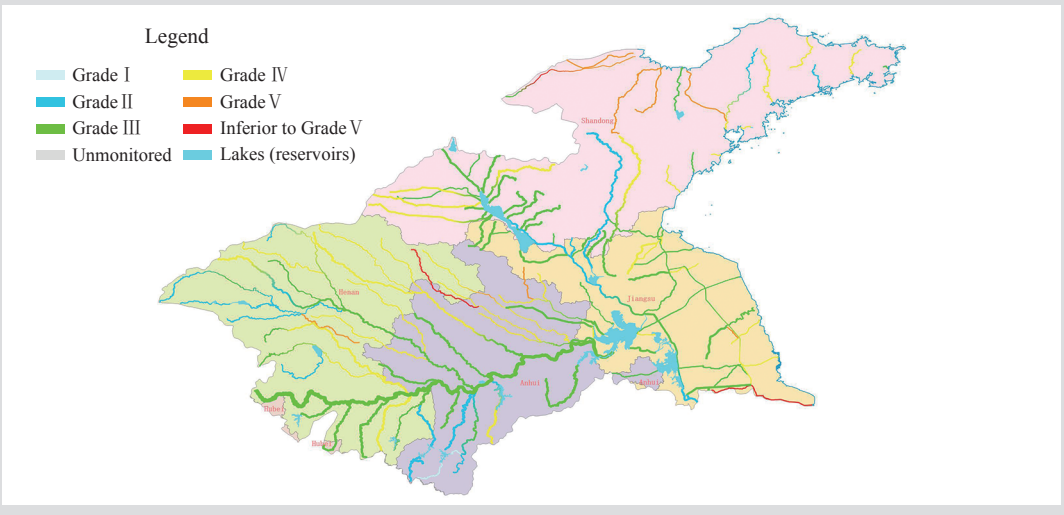
The Songhua River basin was slightly polluted on the whole. The major pollution indicators were COD, permanganate index and ammonia nitrogen. In all 107 water sections under national monitoring program, no section met Grade I standard, same as that of 2017; 12.1% met Grade II standard, down by 2.7 percentage points; 45.8% met Grade III standard, down by 7.9 percentage points; 27.1% met Grade IV standard, up by 2.1 percentage points; 2.8% met Grade V standard, up by 1.9 percentage points; and 12.1% failed to meet Grade V standard, up by 6.5 percentage points. The mainstream of Songhua River was of excellent water quality and the major tributaries were intermediately polluted. Heilongjiang River, Tumen River and Wusuli River were under slight pollution, and the Suifen River were of good water quality.



Water quality distribution of Songhua River Basin in 2018

Water quality of Songhua River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	107	0.0	12.1	45.8	27.1	2.8	12.1	0.0	-2.7	-7.9	2.1	1.9	6.5
Mainstream	17	0.0	17.6	76.5	5.9	0.0	0.0	0.0	5.8	0.0	-5.9	0.0	0.0
Major tributaries	56	0.0	12.5	41.1	19.6	3.6	23.2	0.0	-7.1	-7.1	-1.8	1.8	14.3
Waters of Heilongji-ang	17	0.0	11.8	23.5	58.8	5.9	0.0	0.0	-4.9	-20.9	25.5	5.9	-5.6
Waters of Tumen River	7	0.0	14.3	42.9	42.9	0.0	0.0	0.0	14.3	-14.2	0.0	0.0	0.0
Waters of Wusuli River	9	0.0	0.0	55.6	44.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Waters of Suifen River	1	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Water sections across provincial boundaries	23	0.0	26.1	60.9	13.0	0.0	0.0	0.0	-4.3	4.4	0.0	0.0	0.0



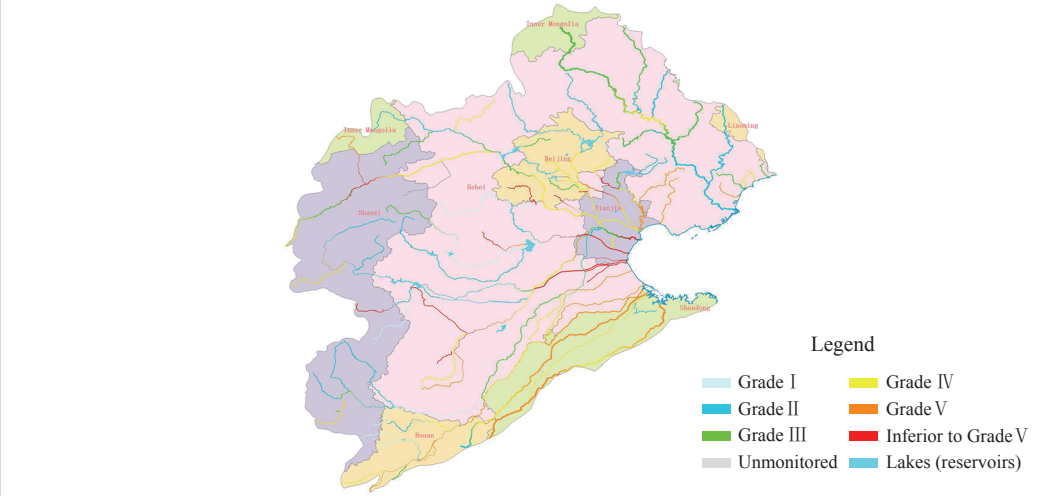
Water quality distribution of Huaihe River Basin in 2018

The Huaihe River basin was slightly polluted. The major pollution indicators were COD, permanganate index and TP. In the 180 water sections under national monitoring program, 0.6% met Grade I standard, up by 0.6 percentage point compared with that of 2017; 12.2% met Grade II standard, up by 5.5 percentage points; 44.4% met Grade III standard, up by 5.0 percentage points; 30.6% met Grade IV standard, down by 6.1 percentage points; 9.4% met Grade V standard, up by 0.5 percentage point; and 2.8% failed to meet Grade V standard, down by 5.5 percentage points compared with that of 2017. The mainstream of Huaihe River was of excellent water quality; the waters of major tributaries of Huaihe River and the waters of rivers flowing into sea in Shandong Peninsula were slightly polluted, and the waters of the Yishu-Si water system was of good quality.

Water quality of Huaihe River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	180	0.6	12.2	44.4	30.6	9.4	2.8	0.6	5.5	5.0	-6.1	0.5	-5.5
Mainstream	10	0.0	10.0	80.0	10.0	0.0	0.0	0.0	10.0	10.0	-10.0	0.0	-10.0
Major tributaries	101	1.0	12.9	37.6	35.6	9.9	3.0	1.0	3.0	3.9	-4.0	0.0	-3.9
waters of the Yishu-Si water system	48	0.0	14.6	62.5	22.9	0.0	0.0	0.0	12.5	6.3	-8.3	-6.2	-4.2
waters of rivers flowing into sea in Shandong Peninsula	21	0.0	4.8	19.0	33.3	33.3	9.5	0.0	0.0	4.7	-9.6	19.0	-14.3
Water sections across provincial boundaries	30	0.0	16.7	46.7	26.7	6.7	3.3	0.0	16.7	3.4	3.4	-13.3	-10.0

The Haihe River basin was intermediately polluted. The major pollution indicators were COD, permanganate index and BOD_5. In 160 water sections under national monitoring program, 5.6% met Grade I standard, up by 3.7 percentage points compared with that of 2017; 21.9% met Grade II standard, up by 1.4 percentage points; 18.8% met Grade III standard, down by 0.5 percentage point; 19.4% met Grade IV standard, up by 6.4 percentage points; 14.4% met Grade V standard, up by 2.0 percentage points; and 20.0% failed to meet Grade V standard, down by 12.9 percentage points compared with that of 2017. In the 2 water sections of the mainstream of Haihe River under national monitoring program, the section of Sanchakou met Grade III standard and the other section at the sluice of the River failed to meet Grade V standard. The waters of major tributaries of the Haihe River were of intermediate pollution. The waters of Luanhe River were of good quality. The waters of Tuhai River-Majia River and waters in east Hebei and coastal areas were of slight pollution.



Water quality distribution of Haihe River Basin in 2018

Water quality of Haihe River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade I	Grade II	Grade III	Grade IV	Grade V	Inferior to Grade V	Grade I	Grade II	Grade III	Grade IV	Grade V	Inferior to Grade V
Basin	160	5.6	21.9	18.8	19.4	14.4	20.0	3.7	1.4	-0.5	6.4	2.0	-12.9
Mainstream	2	0.0	0.0	50.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	0.0	0.0
Major tributaries	124	7.3	20.2	15.3	18.5	13.7	25.0	4.9	-2.2	0.1	9.7	1.7	-14.2
Waters of Luanhe River	17	0.0	41.2	47.1	11.8	0.0	0.0	0.0	17.7	5.9	-17.6	-5.9	0.0
Waters of Tuhai River-Majia River	11	0.0	27.3	0.0	36.4	36.4	0.0	0.0	18.2	-18.2	18.2	0.0	-18.2
Waters in east Hebei and coastal areas	6	0.0	0.0	33.3	33.3	33.3	0.0	0.0	0.0	0.0	-16.7	33.3	-16.7
Water sections across provincial boundaries	47	8.5	21.3	10.6	25.5	12.8	21.3	6.4	4.6	-4.0	19.2	-8.0	-18.3

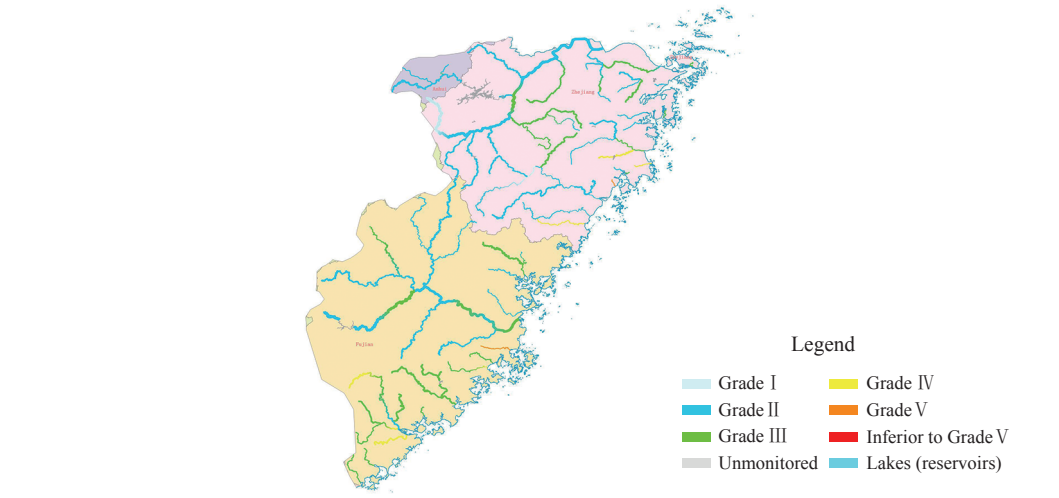
Water quality distribution of Liaohe River Basin in 2018

Water quality of Liaohe River Basin in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	104	3.8	28.8	16.3	19.2	9.6	22.1	1.0	5.2	-6.3	-5.3	2.1	3.2
Mainstream	14	0.0	14.3	7.1	35.7	21.4	21.4	0.0	14.3	-6.2	-11.0	-5.3	8.1
Major tributaries	20	0.0	10.0	20.0	15.0	20.0	35.0	0.0	10.0	5.7	-18.3	15.2	-12.6
Waters of Daliaohe River	28	7.1	25.0	14.3	10.7	7.1	35.7	7.1	-10.7	-10.7	3.6	0.0	10.7
Waters of the Daling River	11	0.0	36.4	27.3	27.3	0.0	9.1	0.0	9.1	-9.1	-9.1	0.0	9.1
Waters of the Yalu River	13	15.4	76.9	0.0	7.7	0.0	0.0	0.0	7.7	-15.4	7.7	0.0	0.0
Water sections across provincial boundaries	10	0.0	30.0	20.0	10.0	10.0	30.0	0.0	0.0	10.0	0.0	10.0	-20.0

The Liaohe River basin was of intermediate pollution. The major pollution indicators were COD, BOD_5 and ammonia nitrogen. In 104 water sections under national monitoring program, 3.8% met Grade I standard, up by 1.0 percentage point; 28.8% met Grade II standard, up by 5.2 percentage points; 16.3% met Grade III standard, down by 6.3 percentage points; 19.2% met Grade IV standard, down by 5.3 percentage points; 9.6% met Grade V standard, up by 2.1 percentage points; and 22.1% failed to meet Grade V standard, up by 3.2 percentage points compared with that of 2017. The waters of the mainstream and major tributaries of the Liaohe River and Daliaohe River were of intermediate pollution. The waters of the Daling River were of slight pollution and the waters of the Yalu River were of excellent quality.

Rivers in Zhejiang Province and Fujian Province were of good water quality. In 125 water sections under national monitoring program, 2.4% met Grade I standard, the same as that of 2017; 52.8% met Grade II standard, up by 12.0 percentage points; 33.6% met Grade III standard, down by 12.0 percentage points; 9.6% met Grade IV standard, up by 2.4 percentage points; 1.6% met Grade V standard, down by 1.6 percentage points; and no water sections failed to meet Grade V standard, down by 0.8 percentage point compared with that of 2017.

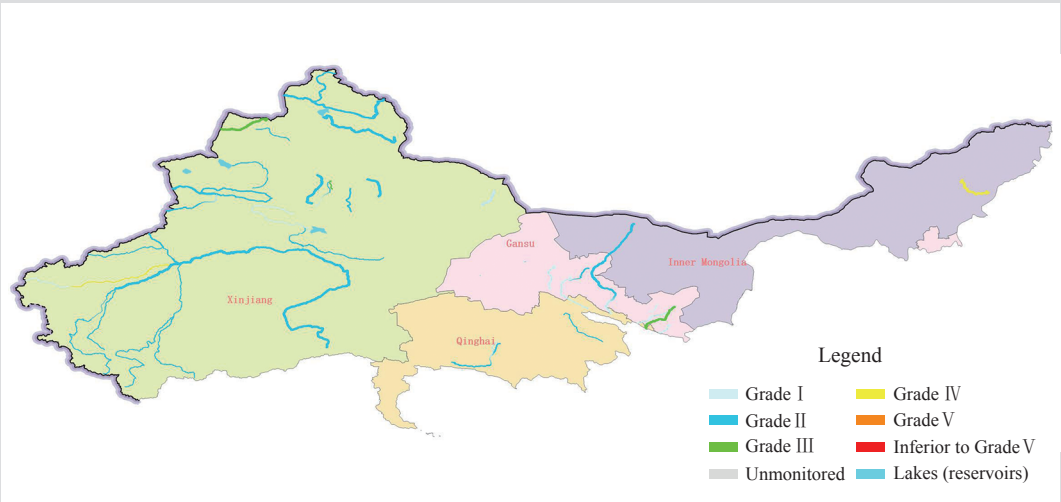


Water quality distribution of Rivers in Zhejiang Province and Fujian Province in 2018

Water quality of Rivers in Zhejiang Province and Fujian Province in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	125	2.4	52.8	33.6	9.6	1.6	0.0	0.0	12.0	-12.0	2.4	-1.6	-0.8
Water sections across provincial boundaries	2	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Rivers in northwestern part of China were of excellent water quality. In 62 water sections under national monitoring program, 25.8% met Grade I standard, up by 12.9 percentage points compared with that of 2017; 62.9% met Grade II standard, down by 14.5 percentage points; 8.1% met Grade III standard, up by 1.7 percentage points; 3.2% met Grade IV standard, up by 1.6 percentage points; no water sections met Grade V standard or failed to meet Grade V standard with water sections meeting Grade V standard down by 1.6 percentage points and the latter the same as that of 2017.

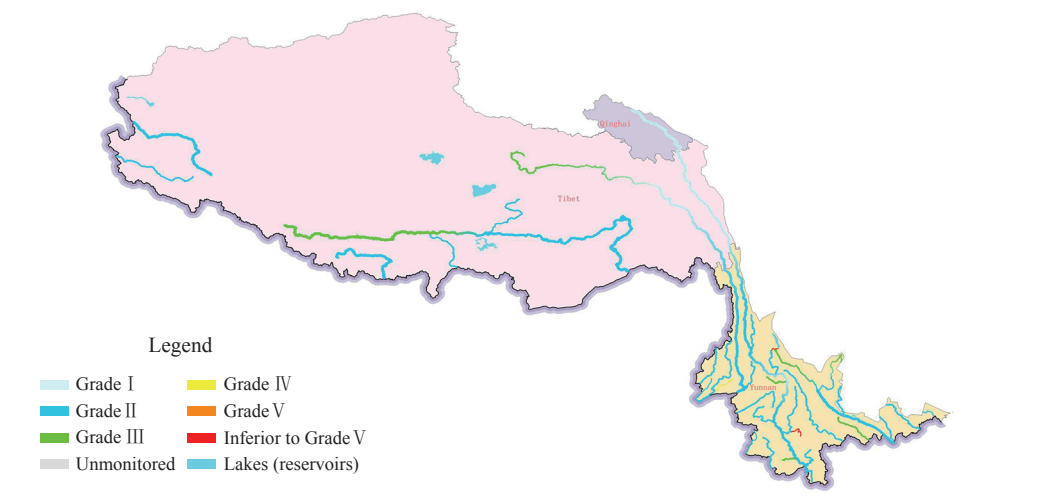


Water quality distribution of Rivers in northwestern part of China in 2018

Water quality of Rivers in northwestern part of China in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	62	25.8	62.9	8.1	3.2	0.0	0.0	12.9	-14.5	1.7	1.6	-1.6	0.0
Water sections across provincial boundaries	2	50.0	50.0	0.0	0.0	0.0	0.0	50.0	0.0	-50.0	0.0	0.0	0.0

Rivers in southwestern part of China were of excellent water quality. In 63 water sections under national monitoring program, 9.5% met Grade I standard, up by 9.5 percentage points compared with that of 2017; 73.0% met Grade II standard, down by 6.4 percentage points; 12.7% met Grade III standard, down by 3.2 percentage points; no water sections met Grade IV standard, down by 3.2 percentage points; no sections met Grade V standard, the same as that of 2017; 4.8% failed to meet Grade V standard, up by 3.2 percentage points compared with that of 2017.



Water quality distribution of Rivers in southwestern part of China in 2018

Water quality of Rivers in southwestern part of China in 2018

Water body	No. of sections (items)	Percentage (%)						Change compared with 2017 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	63	9.5	73.0	12.7	0.0	0.0	4.8	9.5	-6.4	-3.2	-3.2	0.0	3.2
Water sections across provincial boundaries	2	100.0	0.0	0.0	0.0	0.0	0.0	100.0	-100.0	0.0	0.0	0.0	0.0

Lakes (reservoirs)

In 2018, among 111 major lakes (reservoirs) across the country under the national monitoring program, 7 lakes (reservoirs) met Grade I standard, taking up 6.3%; 34 met Grade II standard, taking up 30.6%; 33 met Grade III standard, taking up 29.7%; 19 met Grade IV standard, taking up 17.1%; 9 met Grade V standard, taking up 8.1%; and 9 failed to meet Grade V standard, taking up 8.1%. The major pollution indicators were TP, COD and permanganate index. In the 107 lakes (reservoirs) under the monitoring of nutritional status, 10 were under oligotrophic status, taking up 9.3%; 66 were under mesotrophic status, taking up 61.7%; 25 were under slight eutrophication, taking up 23.4% and 6 were under intermediate eutrophication, taking up 5.6%.

Water Quality of Major Lakes (Reservoirs) in 2018

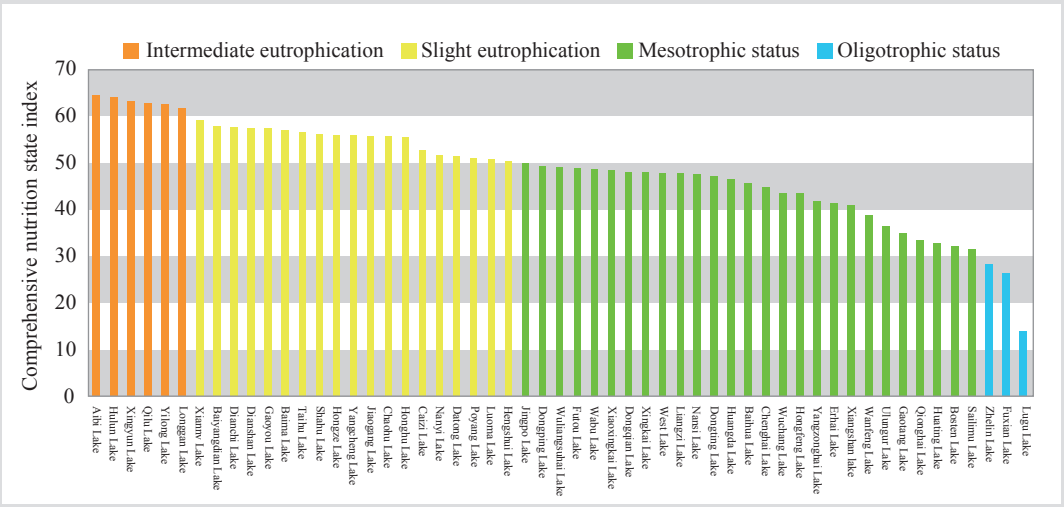
Water quality grade	The three lakes	Major lakes	Major reservoirs
Grade I and II standard	——	Bangongcuo Lake, Hongfeng Lake, Xiangshan lake, Gaotang Lake, Huating Lake, Zhelin Lake, Fuxian Lake, Lugu Lake, Erhai Lake, Qionghai Lake	Yunmeng Lake、Dahuofang Reservoir, Miyun Reservoir, Zhaopingtai Reservoir, Yinghu Lake, Wangyao Reservoir, Nanwan Reservoir, Daguangba Reservoir, Longyantan Reservoir, Shuifeng Reservoir, Gaozhou Reservoir, Lishimen Reservoir, Dalong Reservoir, Shimen Reservoir, Longyangxia Reservoir, Huairou Reservoir, Changtan Reservoir, Shuangta Reservoir, Danjiangkou Reservoir, Jiefangcun Reservoir, Huanglongtan Reservoir, Nianyushan Reservoir, Geheyan Reservoir, Qiandao Lake, Taiping Lake, Songtao Reservoir, Danghe Reservoir, Dongjiang Reservoir, Hunanzhen Reservoir, Zhanghe Reservoir, Xinfengjiang Reservoir
Grade III standard	——	Siling Lake, Luoma Lake, Hengshui Lake, Dongping Lake, Futou Lake, Wabu Lake, Dongqian Lake, Liangzi Lake, Nansi Lake, Baihua Lake, Wuchang Lake, Yangzong Lake, Wanfeng Lake, West Lake, Bosten Lake, Sailimu Lake	Yuqiao Reservoir, Cha'ersen Reservoir, Sanmenxia Reservoir, Laoshan Reservoir, Hedi Reservoir, Mopanshan Reservoir, Yazidang Reservoir, Hongyashan Reservoir, Shanmei Reservoir, Xiaolangdi Reservoir, Luban Reservoir, Erwangzhuang Reservoir, Dongpu Reservoir, Baiguishan Reservoir, Bailianhe Reservoir, Fushui Reservoir, Tongshanyuan Reservoir
Grade IV standard	Taihu Lake, Dianchi Lake	Baiyangdian Lake, Baima Lake, Shahu Lake, Yangcheng Lake, Jiaogang Lake, Caizi Lake, Nanyi Lake, Poyang Lake, Jingpo Lake, Wuliangsuhai Lake, Xiaoxingkai Lake, Dongting Lake, Huangda Lake	Songhua Lake, Yutan Reservoir, Lianhua Reservoir, Xiashan Reservoir
Grade V standard	Chaohu Lake	Qilu Lake, Longgan Lake, Xiannv Lake, Dianshan Lake, Gaoyou Lake, Hongze Lake, Honghu Lake, Xingkai Lake	——
Inferior to Grade V standard*	——	Ebinur Lake, Hulun Lake, Xingyun Lake, Yilong Lake, Datong Lake, Chenghai Lake, Ulungur Lake, Namsto Lake, Yamdrok Lake	——

*The fluoride of Chenghai Lake, Ulungur Lake and Namtso Lake has relatively high natural background value; while Chenghai Lake and Yamdrok Lake have relatively high pH natural background value.

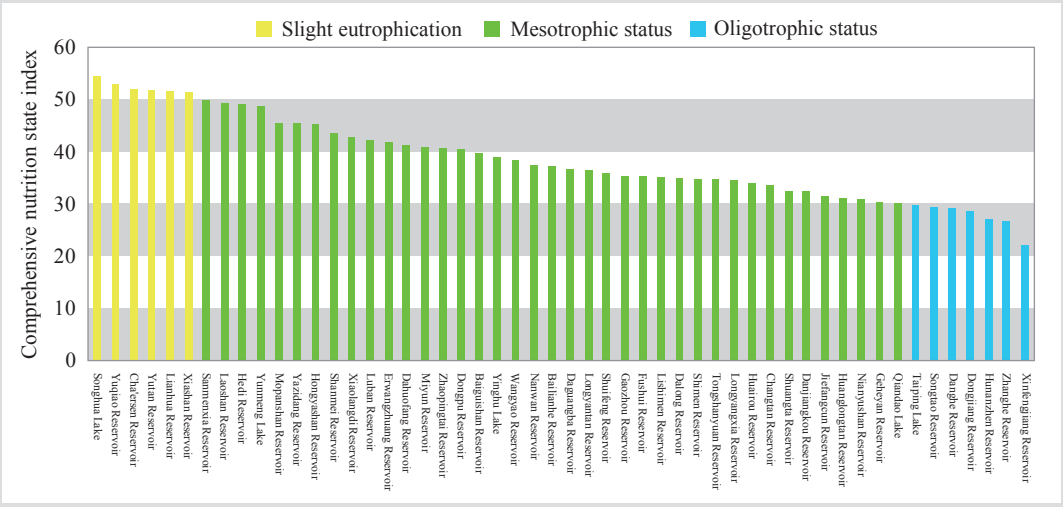
The Taihu Lake was of slight pollution on the whole. The major pollution indicator was TP. Among the 17 sites under national monitoring program, the sites of Grade III standard took up 5.9%, down by 5.9 percentage points compared with that of 2017; Grade IV standard 64.7%, up by 11.8 percentage points; Grade V standard 29.4%, down by 5.9 percentage points. No sites met Grade I, II or failed to meet Grade V standard, same as that of 2017. On average, the Taihu Lake was under slight eutrophication.

The rivers surrounding the Taihu Lake were of good water quality. In 55 water sections under national monitoring program, 32.7% met Grade II standard, up by 16.3 percentage points compared with that of 2017; 47.3% met Grade III standard, down by 7.2 percentage points; 20.0% met Grade

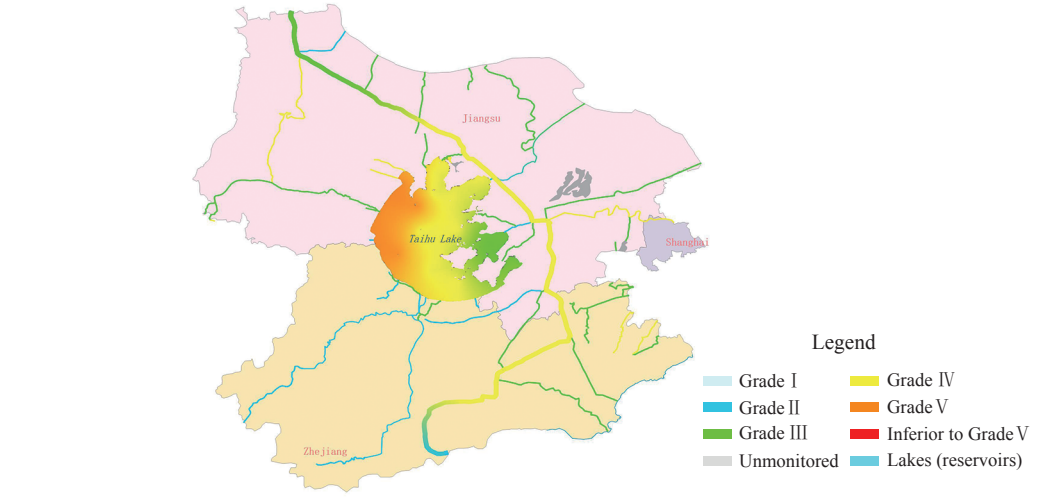
Ⅳ standard, down by 1.8 percentage points; no section met Grade V standard, down by 7.3 percentage points. No sections met Grade I or failed to meet Grade V standard, same as that of 2017.



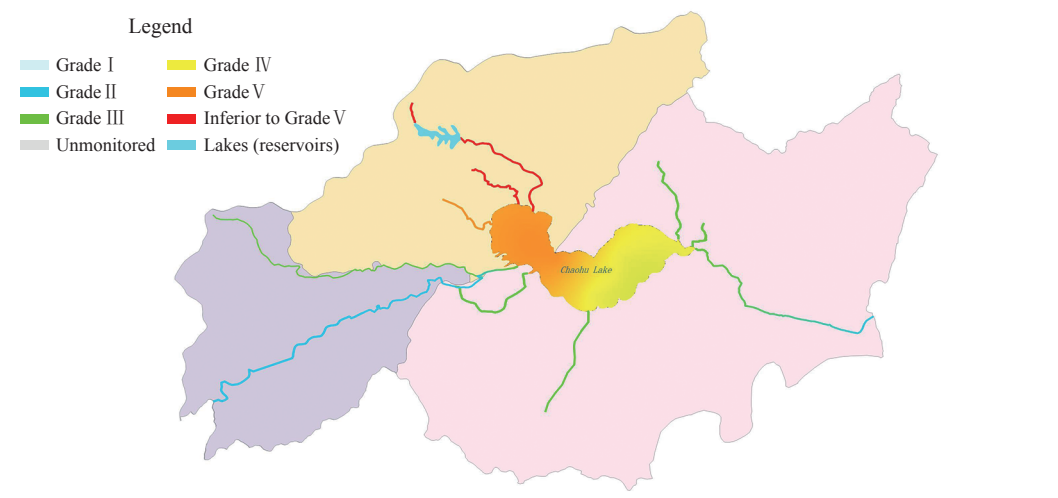
Trophic Level Index of major lakes in 2018



Trophic Level Index of major reservoirs in 2018



Water quality distribution of Taihu Lake in 2018



Water quality distribution of Chaohu Lake in 2018

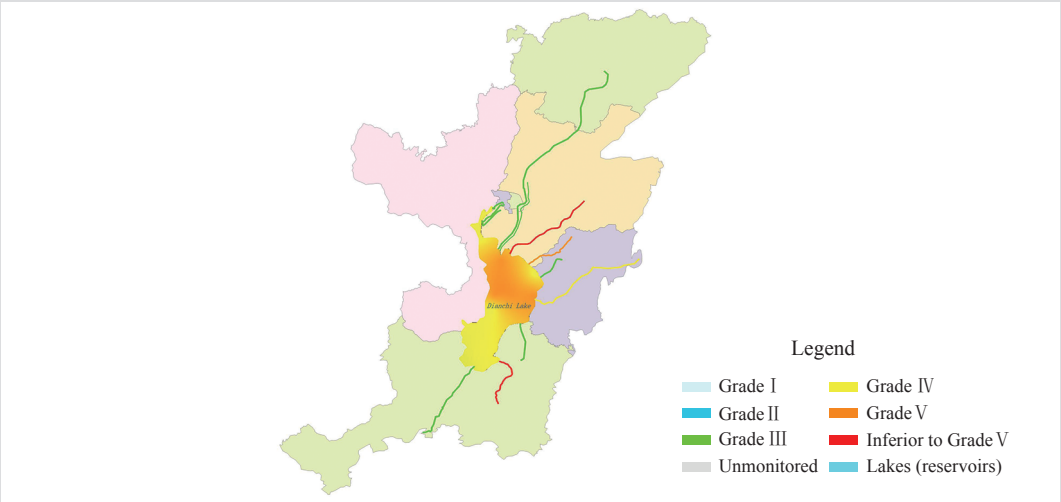
The Chaohu Lake was of intermediate water pollution. The major pollution indicator was TP. In the 8 water sites under national monitoring program, 50.0% met Grade IV standard, up by 12.5 percentage points compared with that of 2017; 50.0% met Grade V standard, down by 12.5 percentage points. No site met Grade I, Grade II, Grade III or failed to meet Grade V standard, same as that of 2017. The Chaohu Lake was under slight eutrophication on average.

The rivers surrounding the Chaohu lake were of good water quality. In 14 water sections under national monitoring program, 21.4% met Grade II standard, up by 14.3 percentage points; 57.1% met Grade III standard, down by 7.2 percentage points; no section met Grade IV standard, down by 7.1 percentage points; 7.1% met Grade V standard took up, up by

7.1 percentage points; 14.3% failed to meet Grade V standard, down by 7.1 percentage points compared with that of 2017. No section met Grade I standard, same as that of 2017.

The Dianchi Lake was of slight water pollution on the whole. The major pollution indicators were COD and TP. In the 10 sites under national monitoring program, 60.0% met Grade IV standard, up by 60 percentage points compared with that of 2017; and 40.0% met Grade V standard. No sites met Grade I, II, III or failed to meet Grade V standard. The number of sites failing to meet Grade V standard went down by 60 percentage points while other grades remained the same as that of 2017. The lake was under slight eutrophication on average.

The rivers surrounding the Dianchi Lake were of slight water pollution. The main pollution indicators were ammonia nitrogen, TP, COD and BOD_5. In 12 water sections under national monitoring program, 66.7% met Grade III standard, up by 41.7 percentage points; 8.3% met Grade IV standard, down by 41.7 percentage points; 8.3% met Grade V standard, same as that of 2017; 16.7% failed to meet Grade V standard, up by 8.4 percentage points, and no section met Grade I or II standard. Compared with that of 2017, the percentage of sections meeting Grade II standard was down by 8.3 percentage points, and that of Grade I remained the same as that of 2017.



Water quality distribution of Dianchi Lake in 2018

Trans-provincial boundary waters

In 2018, the monitoring results of 544 important trans-provincial boundary water sections across the country showed that the percentage of sections meeting Grade I ~ III, Grade IV~V and inferior to Grade V standard was 69.9%, 21.1% and 9.0% respectively. Major pollution indicators were TP, COD, BOD_5 and ammonia nitrogen. The percentage of sections meeting Grade I ~ III was up by 2.6 percentage points and those failing to meet Grade V standard was down by 3.9 percentage points compared with that of 2017 (543 comparable sections).

Water bodies of key water conservancy projects

Three Gorges Reservoir Area In 2018, among 77 water quality monitoring sections of the 38 main tributaries of the Yangtze River in Three Gorges Reservoir area, sections that met Grade I ~ III took up 96.1% and Grade IV took up 3.9%. No section met Grade V or failed to meet Grade V. Indicators like TP, COD and ammonia nitrogen exceeded relevant standard. The percentage of the sections with the indicators exceeding national quality standard was 2.6% for TP, 2.6% for COD and 1.3% for ammonia nitrogen.

The comprehensive trophic state index of 77 monitoring sections was within the range of 29.5~62.9, among which 18.2% were under eutrophic state, 76.6% mesotrophic status and 5.2% oligotrophic state.

South-North Water Diversion Project (East Route) The Sanjiangying Section of the Jiajiang River, an intake of the East Route of South-North Water Diversion Project, met Grade II standard. The Liyun Section, Suqian Section and Hanzhuang Section of Beijing-Hangzhou Canal in the Middle Route were of excellent water quality, the Baoying Section, Bulao Section and Liangji Section were of good water quality, and Hongze Lake and Luoma Lake were under light eutrophication. Nansi Lake and Dongping Lake were under mesotrophic status.

South-North Water Diversion Project (Central Route) The intake of Taocha section met Grade II standard. Among the 9 tributaries flowing into the Danjiangkou Reservoir, Hanjiang River, Danjiang River, Qihe River, Jinqian River, Tianhe River, Duhe River, Langhe River and Laoguan River were of excellent water quality; and Guanshan River was of good water quality. Danjiangkou Reservoir was under mesotrophic status.

Centralized drinking water source areas of APL cities

In 2018, among 906 monitoring sections (sites) of the centralized drinking water source in 337 APL cities across the country, 814 sites met the water quality standard throughout the year, taking up 89.8% of the total. Among them, 577 sites were surface drinking water source monitoring sections (sites), 534 of which met the water quality standard throughout the year, taking up 92.5%. Major pollution indicators for nonattainment were sulfate, TP and manganese. There were 329 groundwater drinking water source monitoring sections (sites), 280 of which met the water quality standard throughout the year, taking up 85.1% with major nonattainment pollutants of manganese, iron and ammonia nitrogen.

According to the statistics of the number of water sources, among the 871 centralized drinking water sources, 90.9% met relevant national standard.

Groundwater

In 2018, among the 10,168 national groundwater quality monitoring points nationwide, 1.9% of the total met Grade I water quality standard, 9.0% for Grade II, 2.9% for Grade III, 70.7% for Grade IV and 15.5% for Grade V. The indicators exceeding the standard include manganese, iron, turbidity, total hardness, total dissolved solids, iodide, chloride, "trinitrogen" (nitrite nitrogen, nitrate nitrogen and ammonia nitrogen) and sulfate. Heavy metals such as lead, zinc, arsenic, mercury, hexavalent chromium and cadmium in some individual monitoring points also exceeded the standard.

The water quality of 2,833 shallow groundwater wells under monitoring across the country was generally poor. The percentage of wells with Grade I ~ III water quality accounted for 23.9%, Grade IV 29.2%, and Grade V 46.9%. The indicators exceeding standard were manganese, iron, total hardness, total dissolved solids, ammonia nitrogen, fluoride, aluminum, iodide, sulfate and nitrate nitrogen. The value of the indicators of heavy metals such as manganese, iron and aluminum and inorganic anion such as fluoride and sulfate might be affected by the hydro-geological and chemical background.

Inland fishery waters

In 2018, the leading nonattainment indicator of key fishery water in rivers was TN. Compared with 2017, the standard-exceeding range of non-ionic ammonia and petroleum expanded slightly, that of TP, permanganate index, volatile phenol and copper narrowed down, and that of TN kept the same. The leading standard-exceeding indicators of key fishery water in lakes (reservoirs) were TN, TP and permanganate index. Compared with 2017, the standard-exceeding range of TN, TP and copper expanded slightly and that of permanganate index, petroleum and volatile phenol narrowed down. The key standard-exceeding indicator in the water bodies of 41 national aquatic germplasm resources conservation areas (inland) was TN.

Marine Environment

Sea Areas under China's Jurisdiction

In the summer of 2018, the marine areas meeting Grade I standard and inferior to Grade IV standard took up 96.3% and 1.1% respectively of the total marine areas under the jurisdiction of PRC.

Bohai Sea The marine area failing to meet Grade I standard was 21,560 km^2, an increase of 2,820 km^2 compared with the same period of 2017; and the marine area failing to meet Grade IV standard was 3,330 km^2, a decrease of 380 km^2 compared with the same period of 2017.

Yellow Sea The marine area failing to meet Grade I standard was 26,090 km^2, a decrease of 2,130 km^2 compared with the same period of 2017; and the marine area failing to meet Grade IV standard was 1,980 km^2, an increase of 740 km^2 compared with the same period of 2017.

East China Sea The marine area failing to meet Grade I standard was 44,360 km^2, a decrease of 16,120 km^2 compared with the same period of 2017; and the marine area failing to meet Grade IV standard was 22,110 km^2, a decrease of 100 km^2 compared with the same period of 2017.

South China Sea The marine area failing to meet Grade I standard was 17,780 km^2, a decrease of 5,110 km^2 compared with the same period of 2017; and the marine area failing to meet Grade IV standard was 5,850 km^2, a decrease of 710 km^2 compared with the same period of 2017.

The marine areas failing to meet Grade Ⅰ standard in the summer of 2018

Sea area	Marine area (km^2)				
	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Inferior to Grade Ⅳ	Total
Bohai Sea	10,830	4,470	2,930	3,330	21,560
Yellow Sea	10,350	6,890	6,870	1,980	26,090
East China Sea	11,390	6,480	4,380	22,110	44,360
South China Sea	5,500	4,480	1,950	5,850	17,780
Sea area under jurisdiction	38,070	22,320	16,130	33,270	109,790

Water quality of sea areas under jurisdiction of China in the summer of 2018

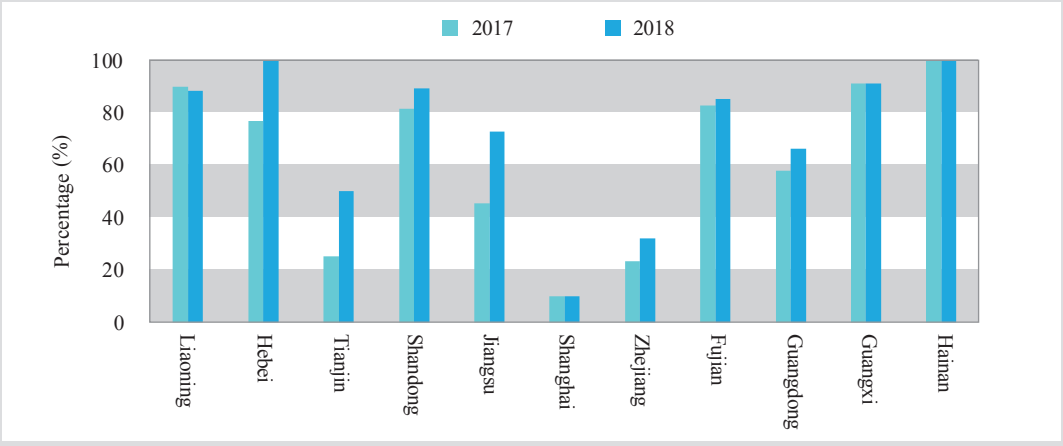
Nearshore Marine Areas

In 2018, water quality of nearshore marine water* in China has been relatively good with steady betterment. Major pollution indicators were inorganic nitrogen and active phosphates. Among 417 nearshore marine water monitoring sites under national monitoring program, 74.6% met Grade I & II water quality standard**, up by 6.7 percentage points compared with that of 2017; 6.7% met Grade III standard, down by 3.4 percentage points compared with that of 2017; 3.1% met Grade IV standard, down by 3.4 percentage points compared with that of 2017; 15.6% failed to meet Grade IV standard, the same as that of 2017.

Nearshore marine water quality of the Bohai Sea was relatively good with inorganic nitrogen as its major pollutant. Nearshore marine water quality of the Yellow Sea was good with inorganic nitrogen as its major pollutant. Nearshore marine water quality of the East China Sea was poor with inorganic nitrogen and active phosphate as its major pollution indicators. Nearshore marine water quality of the South China Sea was good with inorganic nitrogen and active phosphate as its major pollution indicators.

Interannual comparison of nearshore marine water quality ratio of the four sea areas in 2018

Sea area	Percentage (%)					Change compared with 2017 (percentage points)				
	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Inferior to Grade Ⅳ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Inferior to Grade Ⅳ
Bohai Sea	50.6	25.9	9.9	2.5	11.1	30.8	-22.2	-4.9	-4.9	1.2
Yellow Sea	38.5	53.8	4.4	1.1	2.2	1.1	8.7	-5.5	-4.4	0.0
East China Sea	21.2	31.0	10.6	4.4	32.7	5.3	0.0	-1.8	-5.3	1.7
South China Sea	69.7	10.6	3.0	3.8	12.9	12.1	-7.6	-2.3	0.0	-2.3



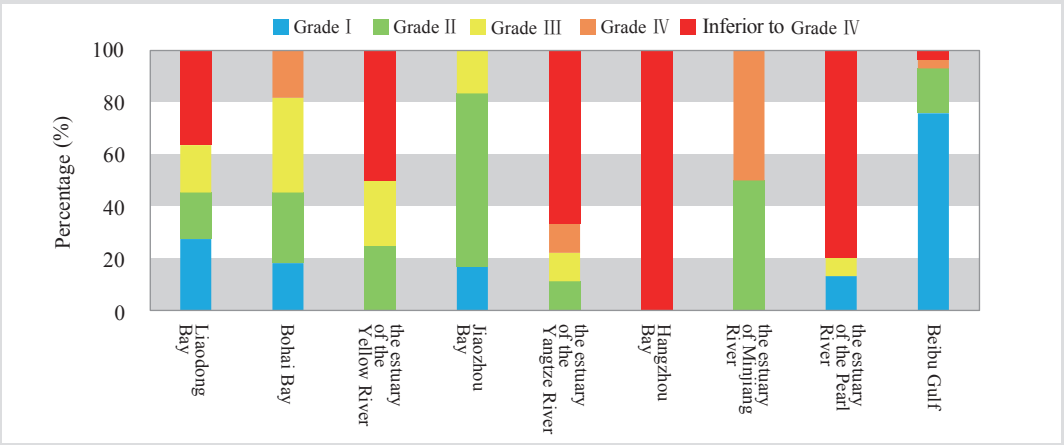
Interannual comparison of the percentage of excellent and good seawater in nearshore waters of coastal provinces in 2018

* Nearshore marine water: refers to the sea area determined by the *National Marine Functional Zoning (2011-2020)*.

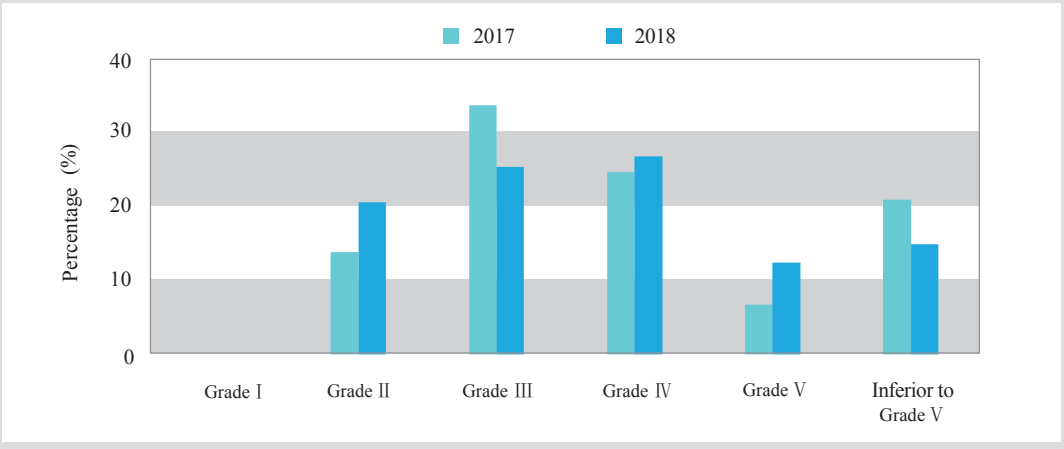
** The percentage of the number of certain types of marine water monitoring sites against the total number is marine water percentage.

Coastal Provinces Nearshore water quality of coastal provinces of Hainan, Hebei and Guangxi was excellent; nearshore water quality of Shandong, Liaoning and Fujian provinces was good; nearshore water quality of Jiangsu and Guangdong provinces was relatively good; nearshore water quality of Tianjin was poor; and nearshore water quality of Zhejiang and Shanghai was extremely poor.

Important estuaries and gulfs Among 9 important estuaries and gulfs, water quality of Beibu Gulf was excellent; water quality of Jiaozhou Gulf was good; the marine water quality of Liaodong Bay, Bohai Gulf and the Minjiang River estuary was poor; while the estuary of the Yellow River, Yangtze River, Hangzhou Bay and the Pearl River had extremely poor water quality. Water quality of Beibu Gulf has seen improvement; and water quality of the estuary of the Yellow River and Liaodong Bay worsened, and water quality of other important estuaries and bays remained basically the same with that of 2017.



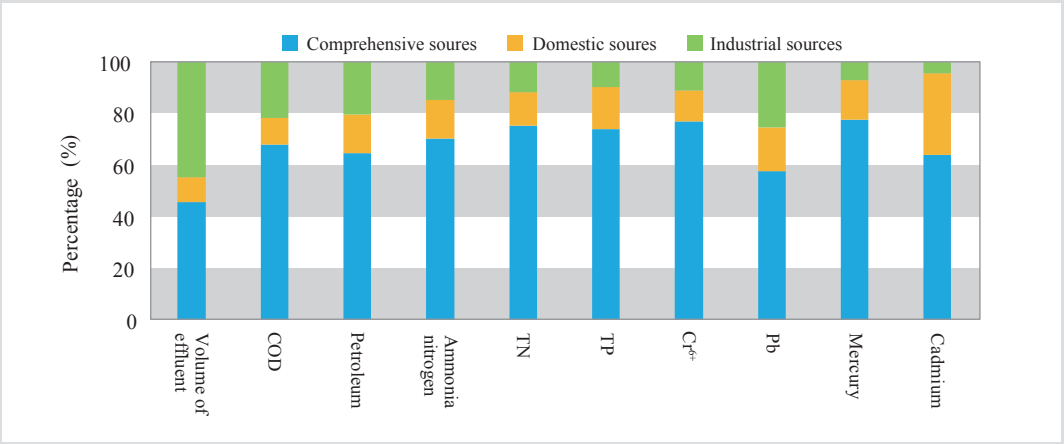
Water quality of nearshore marine waters of important estuaries and gulfs in 2018



Interannual comparison on water quality of sea–going rivers in 2018

Sea-going rivers In 2018, out of the 194 monitoring sections of the sea-going rivers, no section met Grade I standard. Sections meeting Grade II standard took up 20.6%; Grade III standard 25.3%; Grade IV standard 26.8%; Grade V standard 12.4%; and those failing to meet Grade V standard took up 14.9%. The main pollution indicators were COD, permanganate index and TP.

Pollution sources directly discharged into the sea The monitoring results of 453 pollution sources directly discharged into the sea with daily discharge volume >100 m^3 showed that the total discharge volume of effluent was about 8.66424 billion t, while the discharge volume of COD was 147,625 t, 457.6 t for petroleum, 6,217 t for ammonia nitrogen, 50,873 t for TN and 1,280 t for TP. Some pollution sources directly discharged into the sea included mercury, hexavalent chromium, Pb and cadmium.



Percentage of pollution sources directly discharged into the sea from different types of sources in 2018

Marine Fishery Waters

In 2018, the major pollution indicators of key spawning grounds, feeding grounds, and migration channels for fish, shrimp and shellfish, as well as in nature reserve areas for marine culture were inorganic nitrogen. A slight decrease of nonattainment area of inorganic nitrogen, active phosphate, petroleum and COD was seen compared with that of 2017. The primary pollution indicators were inorganic nitrogen and active phosphate in key marine culture areas. A slight decrease of inorganic nitrogen and COD in nonattainment area, and a slight increase of active phosphate and petroleum was seen compared with that of 2017. The major pollution indicator in 8 national aquatic germplasm resource protection areas (seas) was inorganic nitrogen. The sediments of 33 important marine fishery waters were in good condition.

Land Environment

Land Resources and Farmland

Up to the end of 2017*, there were 644.864 million ha. agricultural land across the country, 134.881 million ha. of which were farmland, 14.214 million ha. were orchards, 252.802 million ha. were forest, 219.320 million ha. were pasture and grassland; and 39.574 million ha. were construction land, among which 32.131 million ha. construction land was used for cities, towns, villages, plants and mines.

Agricultural Non-point Source

In 2017**, agricultural water consumption took up 62.4% of total water consumption, and the effective utilization coefficient of farmland irrigation water was 0.536. The utilization rate of fertilizers for the three major food crops of rice, corn and wheat was 37.8%, 2.6 percentage points higher than that of 2015. The utilization rate of pesticides was 38.8%, 2.2 percentage points higher than that of 2015.

Water Loss and Soil Erosion

According to the findings of the water and soil conservation of the First National Census on Water***, there were 2.949 million km^2 land subject to water and soil erosion in China, taking up 31.1% of the total area under the census. Among them, 1.293 million km^2 were under water erosion and 1.656 million km^2 were under wind erosion.

Desertification and Sandification

The monitoring results of the Fifth National Monitoring of Desertification Land and Sandy Land**** showed that there were 2.6116 million km^2 desertification land and 1.7212 million km^2 sandy land across the country. According to the results of the third rocky desertification monitoring in the karst area, the existing rocky desertification land area in the karst area of China is 100,700 km^2.

*By the time this Report was published, 2017 data was employed due to ongoing review of 2018 data.

** By the time this Report was published, 2017 data was employed due to ongoing review of 2018 data.

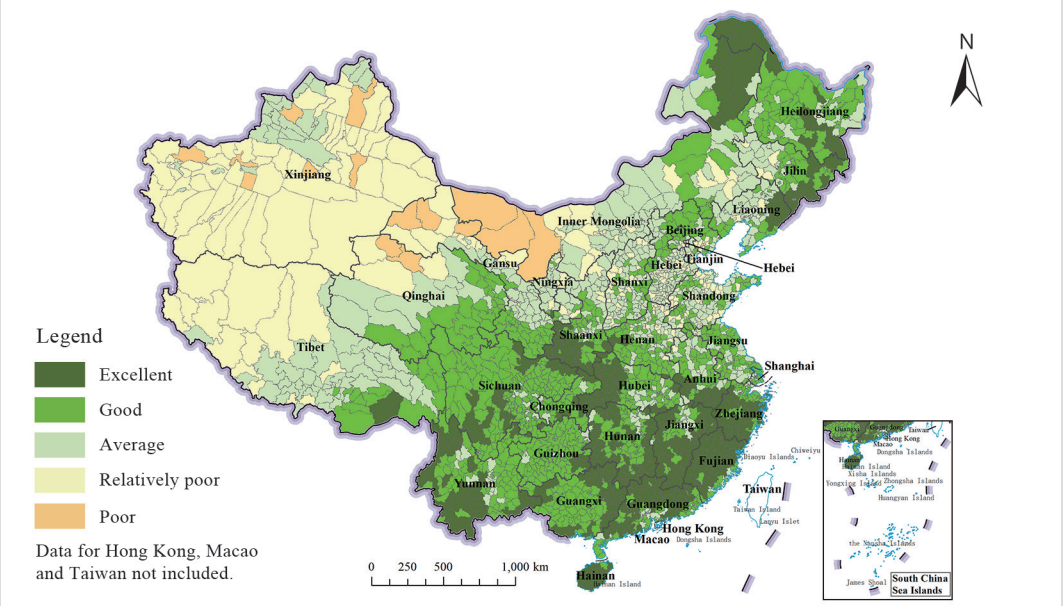
***Up to the time this Report was published, the findings of water and soil conservation of the First National Census on Water remain to be the latest, so they are employed here.

****Up to the time this Report was published, the monitoring results of the Fifth National Monitoring of Desertification Land and Sandy Land remain to be the latest, so they are employed here.

Natural and Ecological Environment

Ecological and Environmental Quality

In 2018, the total area of counties with "excellent" or "good" eco-environmental quality* took up 44.7% of the total land area, mainly distributed in the region east to the Tibetan Plateau, south to the Qinling Mountain and the Huaihe River, Greater Khingan and Lesser Khingan Mountain areas as well as the Changbai Mountain region in Northeast China. The total area of counties with average eco-environmental quality took up 23.8%, mainly distributed in regions such as the North China Plain, the HuangHuaiHai Plain, central and western parts of Northeast China Plain and central part of Inner Mongolia. The total area of counties with relatively poor or poor eco-environmental quality took up 31.6% of the total, mainly distributed in western part of Inner Mongolia, central and western part of Gansu, western part of Tibet and most parts of Xinjiang.



Map of countywide eco-environmental quality of China in 2018

*Eco-environmental quality: It is assessed according to the *Technical Criterion for Ecosystem Status Evaluation (HJ 192-2015)*. Ecological Index ≥ 75 indicates excellent environment with high vegetation coverage, rich biodiversity and stable ecosystems. Ecological Index ranges between 55~75 indicates good environment with relatively high vegetation coverage, relatively rich biodiversity and suitable for human life. Ecological Index within 35~55 refers to ordinary eco-environment with intermediate vegetation coverage, general biodiversity and relatively suitable to human life but with some factors constraining human life. Ecological Index within 20~35 refers to relatively poor eco-environment with poor vegetation coverage, severe drought, less species and factors evidently constraining human life. Ecological Index < 20 refers to poor eco-environment with bad conditions and constraints on human life.

In 2018, among the 818 counties of national key ecological functional areas, the eco-environmental quality of 9.5% of the counties turned better, that of 79.1% of the counties remained basically stable, and 11.4% of the counties turned worse compared with that of 2016.

Biodiversity

Ecosystem diversity China has all the types of terrestrial ecosystem on earth including 212 types of forest, 36 types of bamboo forest, 113 types of shrubs, 77 types of meadows, 55 types of prairies, 52 types of deserts and 30 types of natural wetlands. The nation boasts 4 big marine ecosystems including the Yellow Sea, East China Sea, South China Sea and Kuroshio Basin as well as artificial ecosystems such as cropland, artificial forest, artificial wetland, artificial grassland and urban ecosystem.

Diversity of species A total of 98,317 species and subspecies have been discovered in China covering 42,048 animalia species, 44,510 botanical species, 469 bacteria species, 2,263 pigment species, 6,339 fungi, 1,883 protogenesis animalia and 805 virus. A total of 406 rare and endangered wildlife species are included in the National Catalogue of Wildlife under Key State Protection, and several hundred animal species are unique in China including giant panda, golden monkey, tibetan antelope, crossoptilon mantchuricum and Yangtze alligator. 246 species of 8 categories of rare and endangered plants are included in the National Catalogue of Wildlife under Key State Protection, and a total of 9,302 types of macro-fungi have been identified.

Diversity of genetic resources China has 1,339 cultivated varieties of 528 species of cultivated crops with over 1,000 economic tree species. A total of 7,000 varieties of ornamental plants and 576 varieties of domestic animals are originated from China.

Endangered Species

The assessment results of 34,450 species of higher plants across China showed that 10,102 species of higher plants were subject to special attention and protection, taking up 29.3% of the total assessment number, among which 3,767 species were endangered, 2,723 species belong to NT Grade and 3,612 belong to DD Grade.

The endangerment assessment results of the 4,357 identified vertebrates (marine fishes were not included) showed that 2,471 vertebrates were subject to special attention and protection, taking up 56.7% of the total assessment number, among which 932 vertebrates were endangered, 598 vertebrates belong to NT Grade and 941 belong to DD Grade.

The endangerment assessment results of the 9,302 identified macro-fungi showed that 6,538 species of macro-fungi were subject to special attention and protection, taking up 70.3% of the total assessment number, among which 97 macro-fungi were endangered, 101 macro-fungi belong to NT Grade and 6,340 belong to DD Grade.

Alien Invasive Species

More than 560 alien invasive species have been found across the country, and the number was increasing year by year, of which 213 have invaded national nature reserves. 71 species of alien invasive species with relatively higher level of danger were included in the *List of China's Alien Invasive Species*, and 52 alien invasive species were included in the *List of National Key Management Alien Invasive Species (First Batch)*.

Nature Reserves

Up to the end of 2017*, 2,750 nature reserves of various kinds at different administrative levels had been established across the country with a total area of 1.4717 million km^2; 1.4270 million km^2 of which were land, taking up 14.86% of total land area. There were 463 national nature reserves with a total area of 974,500 km^2. In 2018, the number of national nature reserves increased to 474.

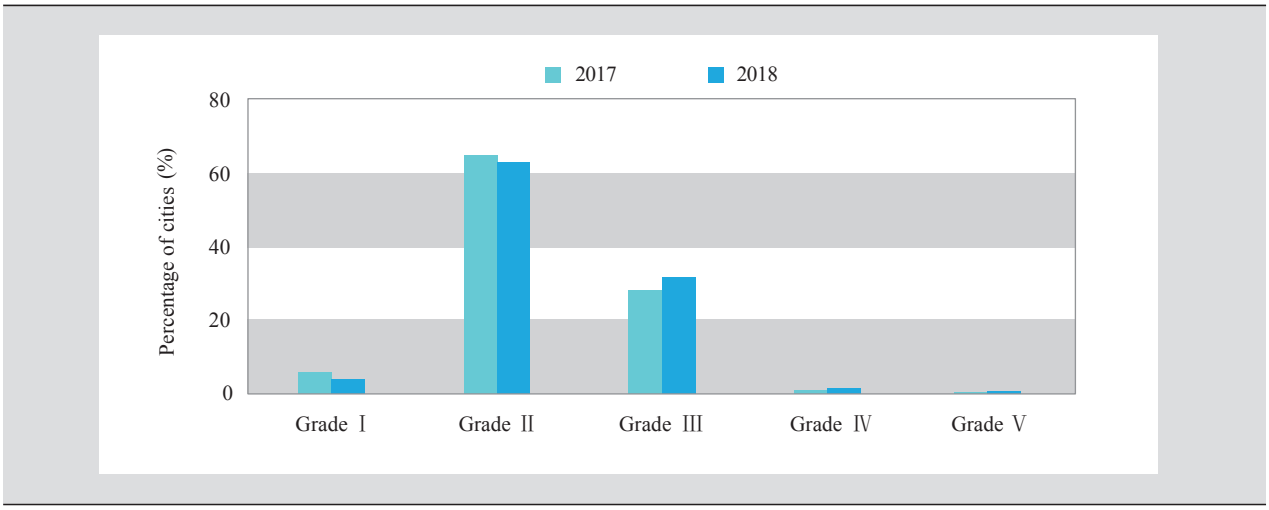
In the first and latter half of year 2018, 2,304 and 2,384 sites or areas were newly added or expanded in national nature reserves for human activities, with a total area of 13.97 km^2 and 11.16 km^2 respectively.

*By the time this report was published, all the data except the number of national nature reserves of 2018 are still under review, so the data of 2017 are employed here.

Acoustic Environment

Regional Acoustic Environment

In 2018, regional daytime acoustic environment of 323 APL cities has been monitored, and the average equivalent sound level was 54.4 dB(A). Among them, 13 cities met Grade I daytime environmental noise standard, taking up 4.0%; 205 cities met Grade II standard, taking up 63.5%; 99 cities met Grade III standard, taking up 30.7%; 4 cities met Grade IV standard, taking up 1.2%; and 2 cities met Grade V standard, taking up 0.6%*.



Interannual comparison of the percentage of cities with various grades of urban day-time regional acoustic environmental noise across China in 2018

Regional nighttime acoustic environment** of 319 APL cities has been monitored, and the average equivalent sound level was 46.0 dB(A). Among them, 4 cities met Grade I nighttime environmental noise standard, taking up 1.3%; 121 cities met Grade II standard, taking up 37.9%; 172 cities met Grade III standard, taking up 53.9%; 17 cities met Grade IV standard, taking up 5.3%; and 5 cities met Grade V standard, taking up 1.6%.

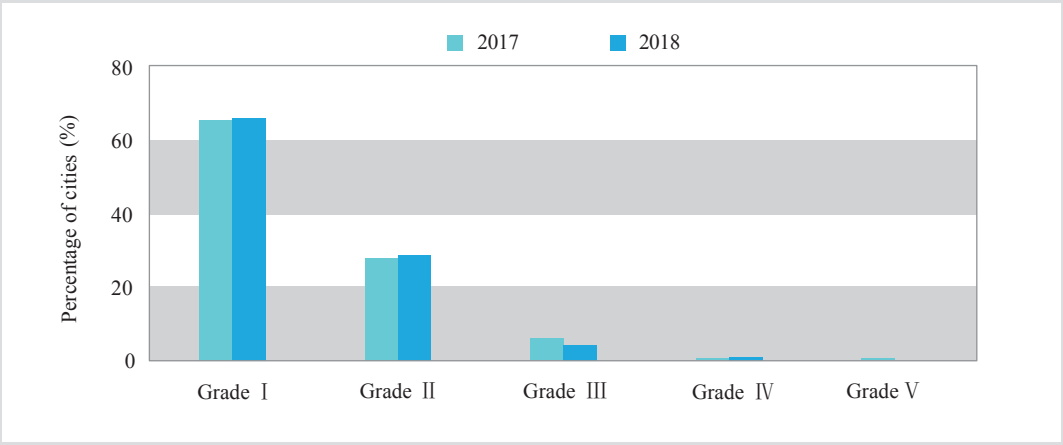
*The average equivalent sound level of regional daytime acoustic environment ≤ 50.0 dB(A) is excellent (Grade I); 50.1~55.0 dB(A) is good (Grade II); 55.1~60.0 dB(A) is average (Grade III); 60.1~65.0 dB(A) is relatively poor (Grade IV) and > 65.0 dB(A) is poor (Grade V). The average equivalent sound level of regional nighttime acoustic environment ≤ 40.0 dB(A) is excellent (Grade I); 40.1~45.0 dB(A) is good (Grade II); 45.1~50.0 dB(A) is average (Grade III); 50.1~55.0 dB(A) is relatively poor (Grade IV) and > 55.0 dB(A) is poor (Grade V).

**According to the *Regulations on Environmental Noise Monitoring Technical Specifications for Urban Acoustic Environments (HJ 640-2012)*, the acoustic environment monitoring in the daytime is carried out once a year; the acoustic environment monitoring in the nighttime is carried out once every five years and is monitored in the third year of each "Five-Year" Plan period.

Acoustic Environment of Traffic Noise

In 2018, acoustic environment of traffic noise* of 324 APL cities has been monitored in the daytime, and the average equivalent sound level was 67.0 dB(A). Among them, 215 cities met Grade I daytime traffic noise standard, taking up 66.4%; 93 cities met Grade II standard, taking up 28.7%; 13 cities met Grade III standard, taking up 4.0%; and 3 cities met Grade IV standard, taking up 0.9%.

Acoustic environment of traffic noise** of 321 APL cities has been monitored in the nighttime, and the average equivalent sound level was 58.1 dB(A). Among them, 151 cities met Grade I nighttime traffic noise standard, taking up 47.0%; 56 cities met Grade II standard, taking up 17.4%; 37 cities met Grade III standard, taking up 11.5%; 44 cities met Grade IV standard, taking up 13.7%; 33 cities met Grade V standard, taking up 10.3%.



Interannual comparison of the percentage of cities with various grades of urban day-time regional acoustic environmental traffic noise across China in 2018

*The average equivalent sound level of traffic acoustic environment in the daytime ≤ 68.0 dB(A) is excellent (Grade I); 68.1~70.0 dB(A) is good (Grade II); 70.1~72.0 dB(A) is average (Grade III); 72.1~74.0 dB(A) is relatively poor (Grade IV) and > 74.0 dB(A) is poor (Grade V). The average equivalent sound level of traffic acoustic environment in the nighttime ≤ 58.0 dB(A) is excellent (Grade I); 58.1~60.0 dB(A) is good (Grade II); 60.1~62.0 dB(A) is average (Grade III); 62.1~64.0 dB(A) is relatively poor (Grade IV) and > 64.0 dB(A) is poor (Grade V).

**According to the *Regulations on Environmental Noise Monitoring Technical Specifications for Urban Acoustic Environments (HJ 640-2012)*, the traffic acoustic environment monitoring in the daytime is carried out once a year; the traffic acoustic environment monitoring in the nighttime is carried out once every five years and is monitored in the third year of each "Five-Year" Plan period.

Acoustic Environment of Urban Functional Zones

In 2018, acoustic environment of urban functional zones* of 311 APL cities has been monitored, registering 21,904 occurrence of site/time and 10,952 each for daytime and night monitoring. For different types of functional zones, 10,140 daytime monitoring site/time met relevant standard with the attainment rate of 92.6%; 8,054 nighttime monitoring site/time met relevant standard with the attainment rate of 73.5%.

Interannual comparison of attainment rate of different functional zones of cities across China in 2018 (Unit: %)

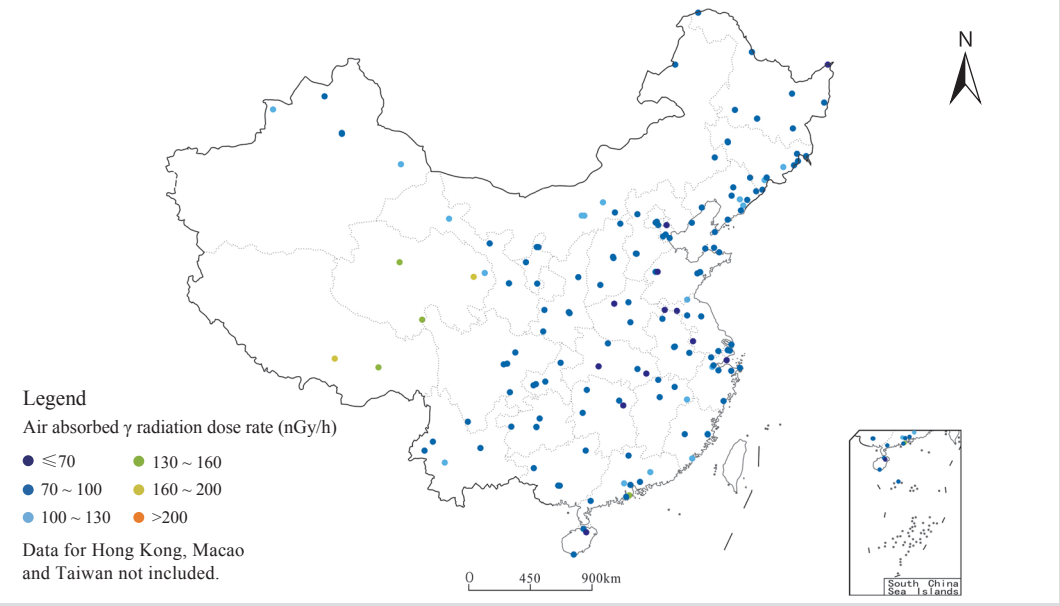
Year	Type 0		Type 1		Type 2		Type 3		Type 4a		Type 4b	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
2018	71.8	56.3	87.4	71.6	92.8	82.2	97.5	87.6	94.0	51.4	100.0	78.4
2017	76.7	58.3	86.7	73.3	92.1	82.5	96.7	86.9	73.3	52.0	97.7	71.6

*Type 0 function area refers to the areas requiring special quiet environment such as rehabilitation and recuperation area. Type 1 function area refers to the areas with residential community, health care, culture and education, scientific research and design, administration and offices as the main functions, which need quiet environment. Type 2 function area refers to the areas with commerce, finance and market as main functions or areas mixing residential communities, commerce and industries, which need to maintain quiet residential environment. Type 3 function area refers to the areas dominated by industrial production, warehouse and logistics and in need of prevention of the strong impacts of industrial noise on surrounding environment. Type 4a function area refers to the areas along highways. Type 4b function area refers to the areas along railways.

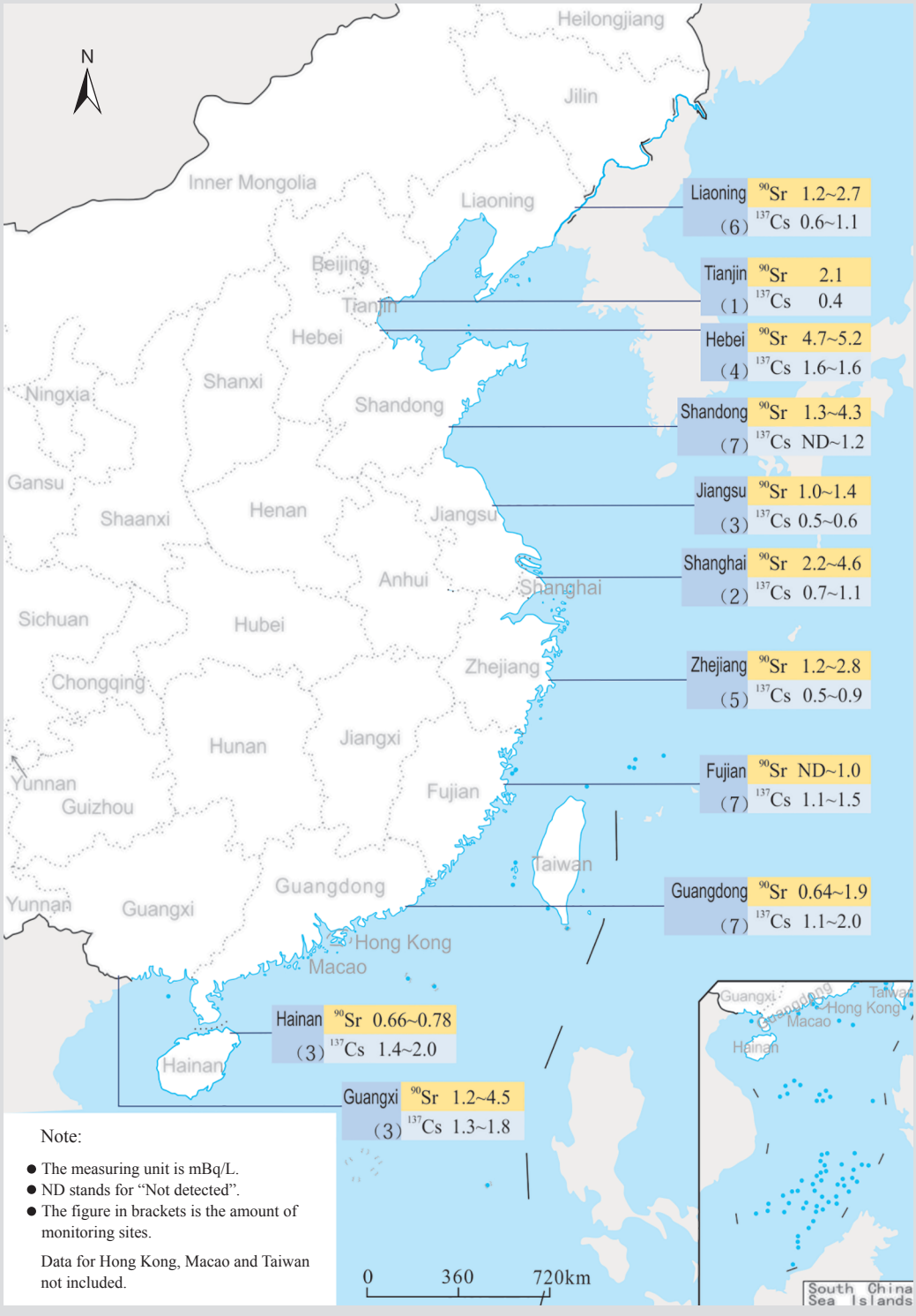
Radiation Environment

Ionizing Radiation

National environmental ionizing radiation level remained within the fluctuation range of natural background level in 2018. The real-time continuous air absorbed γ radiation dose rate and accumulated dose rate were within the fluctuation range of natural baseline value. The natural radionuclide activity concentrations in the air were within the natural background level. There was no abnormal situation of artificial radionuclide activity concentrations in the air. Activity concentration of natural radionuclides of the Yangtze River, the Yellow River, the Pearl River, the Songhua River, the Huaihe River, the Haihe River, the Liaohe River, as well as rivers in Zhejiang and Fujian, rivers in Northwest China, rivers in Southwest China and major lakes (reservoirs) remained at the baseline level, and there was no abnormal situation of the activity concentration of artificial radionuclides. The activity concentration of gross α and gross β of urban centralized drinking water sources and groundwater met the guidance limit of radioactivity specified in *the Standard for Drinking Water Quality (GB 5749-2006)*. The activity concentration of natural radionuclides of nearshore marine water and organisms was at the baseline level. There was no abnormal situation of the activity concentration of artificial radionuclides. In specific, the activity concentration of artificial radionuclides of marine water was far below the limit specified in *the Marine Water Quality Standard (GB 3097-1997)*. The activity concentration of natural radionuclide of soil was at the baseline level, and there was no abnormal situation of the activity concentration of artificial.



Map of the real-time consecutive air absorbed γ radiation dose rate monitored at radiation environment automatic monitoring stations in China in 2018



Map of the activity concentration of Sr–90 and Cs–137 of nearshore water in China in 2018

Environment ionizing radiation in the vicinity of in-service nuclear power plants In 2018, no abnormal real-time consecutive air absorbed γ radiation dose rate caused by operational nuclear power plants has been monitored in the surrounding areas of in-service nuclear power bases. There was no abnormal concentration of activity of artificial radionuclides in air, water, soil and organisms in the vicinity of Hongyanhe Nuclear Power Base, Ningde Nuclear Power Base, Fuqing Nuclear Power Base, Taishan Nuclear Power Base and Changjiang Nuclear Power Base. There was some rise of activity concentration of tritium in some environmental media in the vicinity of Tianwan Nuclear Power Base, Qinshan Nuclear Power Base, Dayawan Nuclear Power Base, Yangjiang Nuclear Power Base and Fangchenggang Nuclear Power Base compared with the background value before the operation of those nuclear power plants. The assessment findings showed that the radiation dose of the above-mentioned nuclear power bases to the public was far below the national limit.

Environment ionizing radiation in the vicinity of civilian research reactors In 2018, there was no detected abnormal situation of air absorbed γ radiation dose rate and activity concentration of radionuclides in aerosol, sediments, water and soil in the vicinity of research facilities such as the Institute of Nuclear and New Energy Technology of Tsinghua University and miniature neutron source reactor in Shenzhen University. Trace content of artificial radionuclides such as cobalt-60 and Iodine-131 was detected in some environmental media in the vicinity of the production and research areas of China Institute of Atomic Energy Science and Nuclear Power Institute of China. The assessment findings showed that the radiation dose of the above-mentioned civilian research reactors to the public was far below relevant national limit.

Environment ionizing radiation in the vicinity of nuclear fuel cycle facilities and waste disposal facilities In 2018, the γ radiation air absorbed dose rate of vicinity environment of CNNC Lanzhou Uranium Enrichment Co. Ltd., CNNC Shaanxi Uranium Enrichment Co. Ltd., CNNC North China Nuclear Fuel Element Co. Ltd., CNNC Jianzhong Nuclear Fuel Element Co. Ltd., CNNC 404 Co. Ltd.; Northwest Disposal Site for Low and Medium Level Radioactive Waste and Beilong Disposal Site of Guangdong for Low and Medium Level Radioactive Waste was within the fluctuation range of natural baseline value. There was no detected abnormal concentration of activity of radionuclides in environmental media in relation to the activities of the above enterprises.

Environment ionizing radiation in the vicinity of uranium mines and metallurgical plants In 2018, the overall radiation environment quality in the vicinity of uranium mines and smelting facilities was stable. The air absorbed γ radiation dose rate in ambient environment, radon activity concentration in air, total uranium and gross α activity concentration of aerosol, total uranium and Ra-226 concentrations in surface water and in soil were within the historical fluctuation range. The total uranium, Pb-210, polonium-210 and Ra-226 concentrations in the drinking water of surrounding environment were lower than relevant limits specified in the *Regulations for Radiation and Environmental Protection in Uranium Mining and Milling (GB 23727-2009)*.

Electromagnetic Radiation

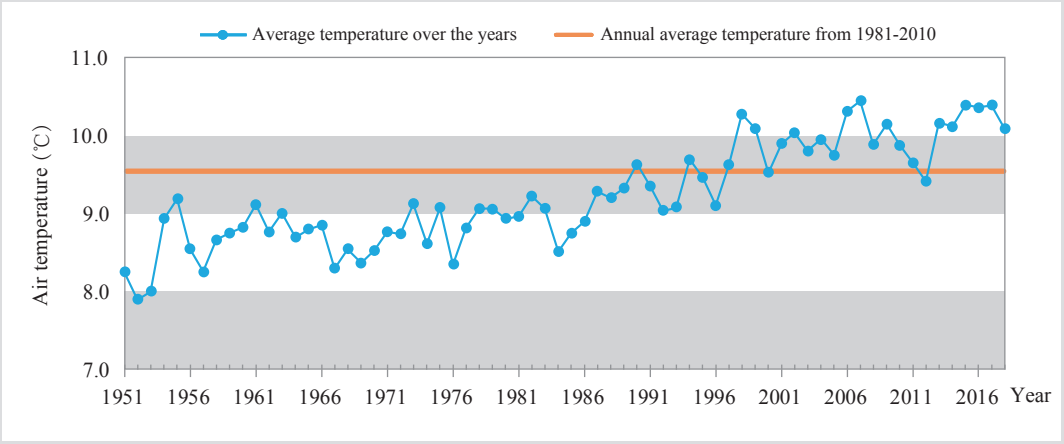
In 2018, the environment electromagnetic radiation level of state monitoring sites in 31 provinces was far below the public exposure limit specified in the *Controlling Limits for Electromagnetic Environment (GB 8702-2014)*. The environmental electromagnetic radiation levels of radio and television signal emitting facilities and antenna of mobile communication base stations as well as the power frequency electric field strength and magnetic induction intensity of environmental sensitive sites under monitoring such as power transmission lines and transformer stations were lower than the public exposure limit specified in the *Controlling Limits for Electromagnetic Environment (GB 8702-2014)*.

Climate Change and Natural Disasters

Climate Change

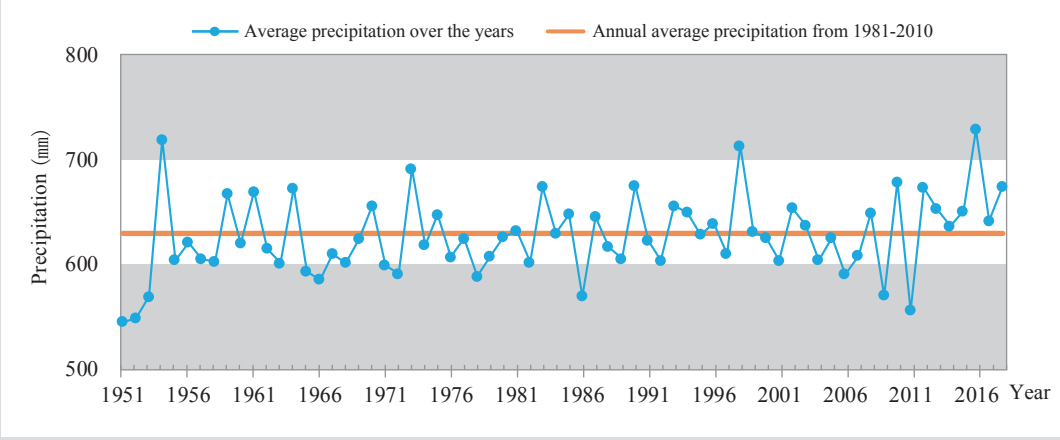
Air temperature In 2018, the national average air temperature was 10.09°C, 0.54°C higher than the historical average. Temperatures were lower than usual in January, February, October and December and higher than historical average in the rest months. The air temperature in March was 2.8°C higher than historical average, marking it the highest compared with the same period in historical records.

The average temperature in the six major regions of the country was higher than the historical average. Among them, temperatures in North China and the middle and lower reaches of the Yangtze River were 0.7°C and 0.8°C higher respectively. Except for the slightly lower temperature in some places of the northern part of Xinjiang, the temperature in other parts was close to normal or higher than the historical average, among which the temperatures were 1~2°C higher in central Huanghuai, eastern part of the regions south of the Yangtze River, central Inner Mongolia, southwestern and southeastern parts of Qinghai, western and northern parts of Tibet.



Interannual change of national average air temperature from 1951–2018

Precipitation National average precipitation was 673.8 mm in 2018, up by 7.0% compared with the historical average and up by 3.9% compared with that of 2017. Precipitations were higher than the historical average in January, July, August, September, November and December, among which the precipitation in December was 78.0% more than the historical average; precipitations in February, April, June and October were less than the historical average. In specific, the precipitation was 53.0% less in February, registering the third lowest in the same period since 1951; while precipitations in March and May were close to the same period of the historical average.



Interannual change of national average precipitation from 1951–2018

The annual precipitations of Guangdong Enping (3,182.9 mm) and Yangjiang (2,871.1 mm) were the highest and second-highest in the country, while Xinjiang Shisanjianfang (8.5 mm) and eastern Turpan (9.6 mm) were the lowest and second lowest in the country.

Distribution of precipitation in China in 2018

Precipitation (mm)	Distribution areas
＞2, 000	Parts of Southern Guangdong, Central and Eastern Hainan
1, 200～2, 000	Most parts of the region south of the Yangtze River, South China, southeastern Chongqing, southern Guizhou, southern and southwestern Yunnan, eastern Sichuan
400～1, 200	Most parts of Northeast China, most parts of North China, southeastern part of Northwest China, Huanghuai, Jianghuai, Jianghan, most parts of Sichuan, most parts of Yunnan, central and northern Guizhou, eastern Tibet, northeastern Inner Mongolia
100～400	Central Inner Mongolia, western Liaoning, most parts of Ningxia, central Gansu, central Qinghai, central and western Tibet, northern Xinjiang
＜100	Central and southern Xinjiang, western Gansu, western Inner Mongolia

Compared with average year, the precipitation in North China was higher, and the precipitation in South China was similar to the historical average. Among them, the precipitation in the central and eastern part of the northeast region, the central and eastern part of the northwest region, the central and western part of Inner Mongolia, the central part of Shandong, the northeastern part of Anhui, the central and eastern part of Sichuan, the southwestern part of Xinjiang, the central and western part of Tibet, and most parts of Hainan was 20% to 100% more than historical average, with some

local areas 1 to 2 times more than the historical average; the precipitation in central Liaoning and southeastern Xinjiang was 20% to 50% less; while the precipitation in other areas was close to historical average.

Carbon Intensity Based on preliminary calculations, the carbon dioxide emissions per unit GDP in 2018 has decreased by 4.0% compared with that of 2017, exceeding 0.1 percentage point of the predicted annual target. As the figure decreased by 45.8% than that of 2005, it exceeded the reduction target of 40%~45% of the carbon dioxide emissions per unit of GDP by 2020.

Sea level The sea level in China's coastal areas has been going upward with fluctuations. From 1980 to 2018, the sea level rise rate in China's coastal areas stood at 3.3 mm/year. In 2018, China's coastal sea level was 48 mm higher than the historical average, slightly lower than that of 2017, marking the sixth highest since 1980. The sea level has been at its highest in nearly four decades in the past seven years.

Natural Disaster

Meteorological disaster In 2018, there was no large-scale flood and rainstorm disaster in the country, which was generally better than normal. A total of 454 rivers in 24 provinces experienced alarming floods, of which 72 rivers suffered from over-protection floods and 24 rivers experienced floods that refreshed the historical records.

In 2018, drought conditions across the country were less severe than that of historical average with 25 provinces suffering from drought, but regional and periodic droughts were evident. Spring-summer droughts were seen in eastern Inner Mongolia, central and southern parts of Northeastern China, and periodical droughts were seen in Jianghan, south of the Yangtz River and Jianghuai areas, and autumn-winter-spring droughts were seen in Beijing.

There were 29 typhoons in the northwestern Pacific Ocean and South China Sea (the maximum wind strength near the center was ⩾ 8 grades), which was 3.5 more than the historical average (25.5). Among them, 10 landed in China, 3 more than historical average (7.2). The initial landing time of typhoon was 13 days earlier than usual, and the final landing time was 10 days later.

Strong convective weather such as heavy wind, hail, tornado, thunder and lightning occurred 43 times in 2018, which was obviously less than the average of the past five years (54 times).

There were 10.2 days with national average high temperature (daily maximum temperature ⩾ 35°C), 3.3 days more than the same period of the historical average, ranking the third highest in the same period since 1961. The number of high-temperature days in the southeastern part of North China, the central part of Huanghuai, the central and western parts of Jianghuai, most parts of Jianghan, most parts of the region south of the Yangtze River, the northern part of southern China, the northeastern part of Guizhou, Chongqing, eastern Sichuan, southeastern Shaanxi, eastern and southern Xinjiang, and western Inner Mongolia ranged from 20~40, and the number of high-temperature days in some parts of Zhejiang, Jiangxi, Hunan, Chongqing and Xinjiang were over 40.

In 2018, cryogenic disasters and snow disasters were heavier than the historical average. In January, large-scale low-temperature and snowy weather hit 14 provinces and caused damages; from April 3rd to 7th, there were periodic spring colds in the northwest and north China; from October 17th to 18th, Xinjiang experienced blizzard and cold wave; the large-scale low-temperature and snowy weather occurred twice in December.

A total of 10 times of sand and dust weather were seen in northern China, 7 times less than that of the same period of previous years (17 times). The average number of dusty days in northern China was 2.3 days, 2.8 days less than the same period of previous years. The first sand and dust weather in 2018 took place on February 8th, 6 days earlier than the 2000-2017 average (February 14th) and 14 days later than 2017 (January 25th).

Earthquake disaster In 2018, there were 31 occurrence of earthquakes at or above 5.0 Richter Scale (16 happened in Mainland China and 15 happened in Taiwan and in the Straits). An earthquake measured 6.5 on Richter stroke the Hualian County of Taiwan on February 6, which was the largest in 2018. No earthquake above 6.0 Richter Scale happened in Mainland China. 11 earthquake disasters happened in Mainland China, which were mainly in Yunnan, Sichuan, Jilin, Xinjiang, Qinghai and Hubei provinces.

Geological disaster In 2018, 2,966 geological disasters occurred across the country, among which 21 were extra-large geological disasters, 36 large ones, 259 mid-sized ones and 2,650 small ones.

Marine disaster In 2018, marine disasters were dominated by storm surges, waves, sea ice and coastal erosion. Storm surges occurred 16 times in 2018, and the Bohai Sea and the northern part of the Yellow Sea have been affected by sea ice disasters.

Forest disaster In 2018, a total of 181.901 million mu forests across the country suffered from forest hazards, down by 3.23% compared with that of 2017, among which 125 million mu forests were affected by insect pest hazards,

27.6597 million mu forests affected by forest rat and rabbit hazards, 2.6686 million mu forests affected by hazardous plants and 26.4468 million mu forests affected by forest disease. There were 43 invasive alien species that can cause serious damages to forestry.

In 2018, a total of 2,478 forest fires took place across the country, damaging a forest area of 16,309 ha. among which 1,579 were ordinary forest fires, 894 relatively big forest fires, 3 big forest fires, and 2 especially big forest fires. Compared with that of 2017, the number of forest fires and the area of damaged forests went down by 23.1% and 33.4% respectively. Compared with the average of the previous three years (2015-2017), the number of forest fires went down by 9.3% and the area of damaged forests went up by 12.0%.

Grassland disaster A total of 25.787 million ha. grassland across the country has been affected by grassland rat hazards, taking up about 6.6% of total grassland area and down by 2.66 million ha. compared with that of 2017. A total of 12.345 million ha. grassland across the country has been affected by grassland insect pest hazards, accounting for about 3.1% of total grassland area nationwide, 616,000 ha. less compared with that of 2017.

In 2018, 39 grassland fires occurred across the country, all were ordinary grassland fires with 2,550 ha. of area affected. Compared with that of 2017, the number of grassland fires and the area of damaged grassland went down by 32.8% and 16.4% respectively. Compared with the average of the previous three years (2015-2017), the number of grassland fires and the area of damaged grassland went down by 42.1% and 95.1% respectively.

Infrastructure and Energy

Infrastructure

Transport By the end of 2018, the total mileage of railway in operation across the country was 131,000 km with 92,000 km of electric mileage. The total road mileage of China reached 4.8465 million km with 142,600 km of highway. The total mileage of navigable inland river channels across the country was 127,000 km. There were 23,919 berths in all ports and harbors and a total of 235 certified civil airports across the country. In 2018, the passenger traffic volume of railway across the country was 3.375 billion with 1,414.658 billion person·km turnover of passenger traffic. It had finished 4.026 billion t of total shipments of goods with total freight volume of 2.882055 tillion t·km. The business coaches across the country had transported 13.672 billion passengers by highway traffic with 927.968 billion person·km of turnover volume of passenger transportation. The freight volume of commercial freight vehicles across the country was 39.569 billion t with 7.124921 trillion t·km freight mileage. Waterway transport was 280 million people with 7.957 billion person·km turnover volume of passenger transportation. Waterway freight volume was 7.027 billion t with 9.905282 trillion t·km freight mileage. The civil aviation across the country had finished 612 million person·times volume of passenger traffic with 1.071159 trillion person·km turnover volume of passenger transportation. Freight volume was 7.385 million t with 26.242 billion t·km freight turnover.

Sewage By the end of 2018, the urban sewage treatment capacity across the country reached 167 million m^3/day, and the accumulative sewage treatment volume reached 51.9 billion m^3, reducing 12.41 million t of COD and 1.19 million tons of ammonia nitrogen respectively.

Waste By the end of 2018, the decontamination capacity of municipal solid waste across the country was 720,000 t/day, and the decontamination rate of municipal solid waste reached 98.2%. Eight municipalities and provinces including Beijing, Tianjin, Shanghai, Jiangsu, Shandong, Guangxi, Hainan and Sichuan have passed the inspection of rural household waste treatment. Among the 100 demonstration counties (municipalities and districts) of rural household waste classification and recycling, 75% townships and 58% the administrative villages have started the work of waste classification; and 47% of the 24,000 non-official dumps across the country have been rectified properly.

Energy

Based on preliminary accounting, the total consumption of primary energy across the country was 4.64 billion tons of SCE equivalent, up by 3.3% compared with that of 2017. Among them, coal consumption went up by 1.0%, crude oil up by 6.5%, natural gas up by 17.7%, and electricity up by 8.5%. Coal consumption took up 59.0% of total energy consumption, down by 1.4 percentage points compared with that of 2017. The consumption of clean energies such as natural gas, hydropower, nuclear power and wind power took up 22.1% of the total energy consumption, up by 1.3 percentage points. The energy consumption per 10,000 Yuan GDP went down by 3.1% compared with that of 2017.

The output and growth rate of major energy products in 2018*

Product name	Unit	Output	Change compared with that of 2017 (%)
Total output of primary energy	100 million t coal equivalent	37.7	5.0
Raw coal	100 million t	36.8	4.5
Crude oil	million t	18,910.6	-1.3
Natural gas	100 million m^3	1,602.7	8.3
Power generation	100 million kW·h	71,117.7	7.7
Thermal**	100 million kW·h	50,738.6	6.7
Hydro	100 million kW·h	12,342.3	3.0
Nuclear power	100 million kW·h	2,943.6	18.7

*In 2017, the output data of some products were verified and adjusted. The growth rate of production in 2018 was calculated according to the adjusted comparable caliber.

**Thermal power includes coal-fired power generation, fuel-fired power generation, gas-fired power generation, waste heat, residual pressure, residual gas power generation, waste incineration power generation and biomass power generation.

Data Sources and Explanations for Assessment

Data in this report is based on the monitoring data of Environmental Monitoring Network of Ministry of Ecology and Environment. The report also cited the environmental data provided by relevant ministries and commissions.

Environmental Monitoring Network of Ministry of Ecology and Environment includes the national ambient air quality monitoring of 1,436 sites covering 338 APL cities; with around 1,000 precipitation monitoring sites in 471 cities (districts and counties) (including 338 APL cities and some county-level cities); the assessment, exanimation and ranking of 1,940 water sections (sites) covering 978 rivers and 112 lakes (reservoirs); 906 centralized drinking water source monitoring sections (sites) in 338 APL cities; 1,649 national environmental monitoring sites for seawater environmental quality; 2,583 ecological and environmental quality monitoring counties in 31 provinces; around 80,000 urban acoustic environment monitoring sites in 338 APL cities; 1,410 environmental ionizing radiation monitoring sites and 44 environmental electromagnetic radiation monitoring sites.

Data and information of 10,168 state-level groundwater monitoring sites for water quality, land resources and cultivated land area, sea level and marine disasters were provided by the Ministry of Natural Resources; data on sewage treatment and waste disposal were provided by the Ministry of Housing and Urban-Rural Development; data on transportation were provided by the Ministry of Transport; data on water quality of trans-provincial boundary waters, 2,833 groundwater monitoring well water quality, soil erosion, flood and drought disasters were provided by the Ministry of Water Resources; data on the inland fishery water quality, marine fishery water quality and agricultural non-point sources were provided by the Ministry of Agriculture and Rural Affairs; data on earthquake disasters, geological disasters, forest fires and grassland fires were provided by the Ministry of Emergency Management; data on energy were provided by the National Bureau of Statistics; data on most parts of the temperature, precipitation, and meteorological disasters were provided by China Meteorological Administration; and data on desertification and sandification, nature reserves, forest biological disasters, and grassland biological disasters were provided by the State Forestry and Grassland Administration.

In report, the assessment of urban ambient air quality was based on the *Ambient Air Quality Standard (GB 3095-2012)*, *Technical Specifications for Environmental Air Quality Assessment (Trial) (HJ 663-2013)* and *the Supplementary Provisions on Urban Air Quality Assessment Affected by Sandstorm Weather Process* with assessment indicators including SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO and O_3. The assessment of surface water quality was based on *Environmental Quality Standards for Surface Water (GB 3838-2002)* and the *Measures on assessment of Surface Water Quality (Trial)* with 21 assessment indicators of pH, dissolved oxygen, permanganate index, COD, BOD_5, ammonia nitrogen, TP, copper, zinc, cyanide, selenium, arsenic, mercury, cadmium, hexavalent chromium, Pb, cyanide, volatile phenol, petroleum, anionic surfactant and sulfide. The indicators assessing trophic status of lakes (reservoirs) include chlorophyll-a, TP, TN, transparency and permanganate index. The assessment of water quality of centralized drinking water source areas of cities at or above prefecture level was based on *Environmental Quality Standards for Surface Water (GB 3838-2002)* and *Quality Standard for Groundwater (GB/T 14848-2017)*. The assessment of the quality of groundwater was based on *Quality Standard for Groundwater (GB/T 14848-2017)* and the assessment indicators are 37 conventional indicators except the total coliforms and total bacteria specified in Table 1 of the *Quality Standard for Groundwater (GB/T 14848-2017)*. The seawater quality assessment of the sea under jurisdiction was based on the *Technical Regulations for Seawater Quality Assessment (Trial)* and the *Sea Water Quality Standard (GB 3097-1997)* and the assessment indicators are inorganic nitrogen (nitrite-nitrogen, nitrate-nitrogen and ammonia nitrogen), active phosphate, petroleum, dissolved oxygen, COD, pH, mercury, cadmium, lead, arsenic and copper; The assessment of the quality of offshore marine waters was based on *Sea Water Quality Standard (GB 3097-1997)* and *Specification for Offshore Environmental Monitoring (HJ 442-2008)* with 29 assessment indicators of pH, dissolved oxygen, COD, BOD_5, inorganic nitrogen, nonionic ammonia, active phosphate, mercury, cadmium, Pb, hexavalent chromium, total chromium, arsenic, copper, zinc, selenium, nickel, cyanide, sulfide, volatile phenol, petroleum, benzene hexachloride, DDT, malathion, methyl parathion, benzo[a]pyrene, anionic surfactant, coliform and fecal coliform. The assessment of eco-environment quality was based on *Technical Criterion for Ecosystem Status Evaluation (HJ 192-2015)*. The assessment of acoustic environment was based on *Environmental Quality Standard for Noise (GB 3096-2008)* and *Technical Specifications for Environmental Noise Monitoring-Routine Monitoring for Urban Environmental Noise (HJ 640-2012)*. The assessment of radiation environment quality was based on *Basic Standards for Protection of Ionizing Radiation and Radiation Sources (GB 18871-2002)*, *Electromagnetic Environment Control Limits (GB 8702-2014)*, and *Standards for Drinking Water Quality (GB 5749-2006)* and *Sea Water Quality Standard (GB 3097-1997)*. The rounding off for data was based on the *Rules of Rounding Off for Numerical Value and Expression and Judgment of Limiting Values (GB/T 8170-2008)*.

Censor code: No. GS (2019) 2410

Note: National data in this report does not cover Hong Kong SAR, Macao SAR and Taiwan Province except for administrative zoning, national land area and earthquake disasters.

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