2016
Report on the State of the Environment in China

Ministry of Environmental Protection
The People's Republic of China

The 2016 Report on the State of the Environment in China **is hereby announced in accordance with** ***the Environmental Protection Law of the People's Republic of China.***

Minister of Ministry of Environmental Protection,
the People's Republic of China

May 31, 2017

CONTENTS

On January 18, 2016, the seminar for the studying of the spirit of the Sixth Plenary Session of the Eighteenth CPC Central Committee was opened in Party School of the CPC Central Committee, and it was oriented for leaders and cadres at provincial and ministerial level. Xi Jinping, General Secretary of the Communist Party of China (CPC) Central Committee, Chinese President and Chairman of the Central Military Commission delivered an important speech at the opening ceremony. Xi held that we should firmly promote green development and bring about more value from natural capital. Good ecological environment will help improve people's life and showcase China's image. We should strive to make people enjoy fresh air, clean water, safe food and livable surroundings and make people really benefit from our economic development. Practical efforts and feasible measures will bring about clearer sky, greener land, cleaner water and a better environment, hence leading our country to enter a new era of ecological civilization.

Xi Jinping's speech at the opening ceremony of the seminar for the studying of the spirit of the Sixth Plenary Session of the Eighteenth CPC Central Committee

Photo by Xinhua News Agency

The Fourth Plenary Session of the 12th National People's Congress was opened in the Great Hall of the People in Beijing on March 5, 2016. Li Keqiang, Premier of the State Council presented the Report on the Work of the Government. The Report requires that we should strengthen the efforts to protect environment and promote green development. Pollution control and environmental protection are closely linked to people's health and China's sustainable development. We should address it with strong measures and achieve economic growth and environmental improvement as well.

2016 Report on the Work of the Government

Photo by Xinhua News Agency

Summary

Environmental Protection

2016 is the opening year of the key period for China to build a well-off society in an all-round way, and the crucial year of promoting structural reform. All regions and departments had firmly implemented the decisions and arrangements made by CCCPC and the State Council to scale up China's Five-in-one general strategy and promote Four-pronged Comprehensive strategy. Efforts have been made to carry out new concept of development. With the improvement of environment as the core, we have focused on solving prominent environmental problems and steadily promote environmental protection in all aspects so as to make substantial progress.

First, we have concerted our efforts in launching three major campaigns of prevention and control of pollution. China has carried out the Action Plan for Prevention and Control of Air Pollution and the Reinforced Action Plan for Prevention and Control of Air Pollution in Beijing-Tianjin-Hebei Region (2016-2017). The optimization and adjustment of energy structure has been promoted, the replacement of coal with electricity or gas and the phase-out of less than 10 T/h coal-fired boilers have been speeded up. The coal-fired units of 440 million kW have undergone technical reform for ultra-low emission, taking up 47% of gross installed capacity for coal-based power. The action plan had been made to cut down on VOCs in key sectors. The technology of clean production has been introduced to 11 key industries with the focus on petrochemical industry. The off-peak production of cement has been further emphasized. A total of 4.0458 million yellow-labeled as well as old and used vehicles have been phased out, exceeding the target for the whole year. The government has released the Stage VI Emission Standard for light-duty vehicles and the Stage I and II Emission Standard for ship engines. Since January 1, 2017, China has started to supply national stage V clean petroleum products across the country. It has carried forward the establishment of ship emission control areas, strengthened the construction of monitoring and early-warning evaluation system for heavy pollution weather and applied the consistent and uniform grading standard of early warning system for heavy air pollution weather in Beijing-Tianjin-Hebei region. Timely consultations for the predication and report of air quality have been held, and emergency measures and supervision have been strengthened so that joint actions can be taken to tackle heavy pollution problems. The government has fully implemented the Action Plan for Prevention and Control of Water Pollution. It has signed responsibility statements with various provinces (autonomous regions or municipalities) so as to set up coordination mechanism for relevant tasks. To emphasize the protection of the Yangtze River economic belt, the Layout Plan of Intakes, Drain Outlets and Emergency Water Sources of the Yangtze River Economic Belt has been issued, and the Ecological Protection Planning of the Yangtze River Economic Belt has been compiled. Specific actions have been taken to protect the drinking water sources along the Yangtze River, and the government has identified 319 conservation zones for collective drinking water sources distributed in 11 provinces (municipalities) and 126 cities at and above prefecture level ("APL cities"). It has examined the implementation of prevention and control of water pollution in key river basins formulated in the 12^{th} "Five-Year Plan". The Percentage of monitored water sections meeting the standard was 75.4%. The government has assessed over 3,300 urban collective drinking water sources and made sample survey of the environment status of over 3,800 rural water sources. The project to implement and promote the safety standard of rural drinking water has been carried out. The monitoring of drinking water quality has covered all APL cities and 80% counties and towns across the country. The government has specified working plan for the prevention and control of groundwater pollution and carried forward the national groundwater monitoring project. The treatment of black and putrid waters has been furthered promoted, and 1,285 projects aiming for the treatment of black waters have been kicked off, accounting for 62.4% of the total. The government has launched the campaign to control both the gross volume and intensity of water consumption and advocated the model activities of water efficiency pacemaker and carried out the joint water-saving management. It has implemented the Action Plan of Prevention and Control of Soil Pollution. The State Council has printed out and distributed the Plan, supporting the close investigation of soil pollution status across the country and intending to release 25 relevant polices and measures concerned. 31 provinces (municipalities) have laid out action plans for prevention and control of soil pollution and 13 branches or departments have provided the implementation plans for solving key problems. The government has issued the Management of Soil Environment in Contaminated Sites and set up experimental areas to promote the comprehensive management of soil pollution. The projects concerned with prevention and control of soil pollution and the restoration of pilot sites have been effectively carried out. The government has strengthened the prevention and control of heavy metal pollution in key regions, it has conducted the monitoring of heavy metal pollution in the production places of farm produce, and the grading system of the production places of farm produce has been under research. The government has promoted the facility construction for the incineration of domestic refuse and launched the investigation and management of illegal garbage sites.

Second, we strived to improve the prevention system for environmental protection. We have steadily pushed the structural reform of the supply side, actively built green manufacturing system and speeded up the elimination of outdated production capacity. We have found solutions to the oversupply of more than 65 million t steel and more than 290 million t coal. The government has issued the important strategy for energy production and consumption, the proportion of non-fossil energy consumption has further risen, and that of coal consumption has been declining continuously. More areas have been incorporated into national key ecological functional zones. The blacklist system for industrial access has been strictly carried out. We have further strengthened the strategic environmental impact assessment (EIA) in such regions as Beijing-Tianjin-Hebei region, the Yangtze River delta and the Pearl River delta. The Ministry of Environmental Protection (MEP) has approved 84 EIA documents of important projects involving the gross investment of 910.8 billion Yuan and has rejected 11 projects which failed to meet environmental access requirements involving the gross investment of 97 billion Yuan. The information of EIA approval has been submitted and released online on a weekly basis between the MEP and the environmental protection departments in 31 provinces (autonomous regions, municipalities), Xinjiang Production and Construction Corps and 420 APL cities. 358 EIA centers have all separated from government environmental protection departments across the country, and 59 national environmental protection standards had been released, augmenting the current valid environmental protection standards to 1,732 in total.

Third, we have deepened the reform of eco-environmental protection. The national inspection of environmental protection has been carried out in 16 provinces (municipalities), receiving 33,000 complaints and having had talks with 6,307 persons and held 6,454 persons accountable. The local Party committees, local governments and the relevant departments have been required to be responsible for environmental protection. General Office of the CPC Central Committee and the State Council have issued the Guidance of the Pilot Reform of Vertical Management of the Monitoring and Inspection of Environmental Protection Institutions below Provincial Level, and this reform has been implemented first in Hebei and Chongqing. The Central Leading Group of Deepening Reforms in an All-round Way has discussed and approved the Opinions on Identifying and Observing Red Lines of Ecological Conservation, and the identification of ecological red lines has been launched in 31 provinces (autonomous regions and municipalities). The State Council has printed out and distributed the Implementation Plan on Pollution Discharge Control Permits, and the application and approval of pollution discharge permits have been started in thermal power and papermaking industry. The authority of 1,436 air quality monitoring sites under national monitoring program has been taken back, and the national surface water monitoring network covering 2,767 monitoring sections has been set up. The national soil environment monitoring network has been preliminarily established. MEP has issued the Program of Cultivating and Developing Main Market Subjects in the Treatment of Agricultural Non-point Source Pollution and Disposal and Treatment of Rural Sewage and Refuse as well as the Implementation Program on the Reform of EIA in the 13^{th} “Five-Year Plan” Period. A range of technical specifications have been issued including Technical Guidelines on the Identification and Appraisal of Eco-environmental Damages. As a follow-up, seven provinces (municipalities) including Jilin have launched pilot reforms on the compensation system for eco-environmental damages, and the implementation program has been issued and put into practice in these 7 provinces (municipalities) following the approval by Central Leading Group of Deepening Reform in an All-round Way. MEP has also issued the Guidance of Constructing Green Financial System.

Fourth, we have reinforced the supervision on environmental law enforcement and risk responses. The Taxation Law of Environment Protection, the Law of Environment Impact Assessment and the Law of Marine Environment Protection have been amended as well as the Explanation by Supreme People’s Court and Supreme People’s Procuratorate of the Application of Laws for Handling Cases of Environmental Pollution Crimes. Activities on the Year for the Implementation of Environmental Protection Law have been conducted throughout the year, and MEP has publicly talked with the principles of 8 municipal governments due to their deteriorating environment. The enforcement of environmental laws has been remarkably strengthened. The environmental protection departments at different levels have meted out more than 124,000 decisions on administrative penalty with total fine of 6.63 billion Yuan, up by 28% and 56%

respectively compared with that of 2015. There were 22,730 cases across the country subject to consecutive daily penalty, sealing up or seizure, limit or stop of production, transfer to administrative detention or transfer cases suspected to involve environmental pollution crime, up by 93% compared with the same historical period. The establishment of real-time online environment monitoring system has been accelerated. The monitoring system of pollution sources has been set up incorporating 352 monitoring centers and 10,257 national key monitoring enterprises. The National Catalogue of Hazardous Wastes has been modified, and specific actions have been taken to crack down on law-breaking activities or crimes concerning hazardous wastes. MEP has directly dispatched and handled 60 environmental emergencies, thus effectively safeguarding environmental security and people's legitimate rights. The safety supervision of nuclear and radiation work has been stringently carried out, and the tasks of environmental radiation emergency response on the fourth and fifth nuclear tests by the DPRK have been completed successfully.

Fifth, we have stepped up efforts in eco-environmental protection and rural environmental improvement. The State Council has approved the establishment of 18 national nature reserves and adjusted 5 national nature reserves. The remote sensing monitoring of human activities has been carried out in 446 national nature reserves. Principles of 5 national nature reserves have been asked for a talk on pollution treatment. The pilot observation sites have been set up to examine biodiversity. More than 400 observation model sites have been set up with birds, amphibians, mammals and butterflies as indicators of biological groups. MEP has launched the first group of ecological protection pilot sites concerning the protection of mountains, waters, forests, farmland and lakes. The fiscal transfer payment for important ecological function zones has amounted to 57 billion Yuan to subsidize 725 key ecological counties and all the regions prohibiting development across the country. To promote the restoration of marine ecology, 18 "Blue Bay" programs and 10 "Ecological Island and Reef" projects have been debuted. 6 billion Yuan from central budget has been earmarked for the comprehensive improvement of rural environment.

Sixth, we have consolidated various supporting measures. The State Council has printed out and distributed the 13th "Five-Year Plan" on Eco-environmental Protection. The central budget has allocated 11.2 billion Yuan for the prevention and control of air pollution, 14 billion Yuan for the prevention and control of water pollution and 9.1 billion Yuan for the prevention and control of soil pollution. We have strived to extend the model effect of PPP demonstration projects, and over 630 projects in the field of eco-environmental protection have been approved in the inventory with the gross investment over 650 billion Yuan. Key projects have been promoted on S&T improvement for the prevention and control of water pollution with the implementation of special research on the causes of air pollution and related control technologies, the restoration and conservation of typical vulnerable ecosystems, etc. we have actively promoted the construction of eco-environmental big data project with positive progress having been made in the integration and application of data resources. MEP has launched its official Micro-blog and WeChat account both titled "Voice of MEP" so as to give timely release and interpretation of information. The regular news release system of MEP has also been set up.

Environment Status

In 2016, 84 cities of 338 APL cities across the country met national ambient air quality standard, taking up 24.9%; 254 cities failed to meet national ambient air quality standard, taking up 75.1%. On average, 78.8% of total amount of days of the year of the 338 APL cities across the country met national standard, 2.1 percentage points higher than that of 2015; while the rest 21.2% failing to meet relevant air quality standard. A total of 474 cities (urban districts or countries) have conducted monitoring of precipitation, 19.8% of which had acid rain with the average frequency of acid rain at 12.7%. In general, acid rain still was sulphric acid type and acid rain pollution mainly occurred in the regions south to the Yangtze River and east to Yunnan-Guizhou Plateau.

Water quality was monitored and assessed in 1,940 surface water sections (sites) across the country. The percentage of Grade I, Grade II, Grade III, Grade IV, Grade V and that failing to meet Grade V was 2.4%, 37.5%, 27.9%, 16.8%, 6.9% and 8.6% respectively. In 6,124 groundwater monitoring sites, 10.1%, 25.4%, 4.4%, 45.4% and 14.7% percent of them had excellent, good, relatively good, poor and very poor water quality respectively. The water quality of collective drinking water source areas (sites) has been monitored in 897 APL cities. 881 APL cities met the national standard all through the year, taking up 90.4%. The percentage of marine areas meeting Grade I national marine water quality standard accounted for 95% in spring and summer. 417 costal marine areas (sites) have been monitored, and the percentage of excellent, good, relatively good, poor and very poor water quality was 32.4%, 41.0%, 10.3%, 3.1% and 13.2%.

The average environmental noise of 322 APL cities with daytime regional acoustic environment monitoring was 54.0 dB (A). The average value of urban traffic noise of 320 APL cities under daytime traffic noise monitoring was 66.8 dB (A). The average attainment rate was 92.2% for daytime noise and 74.0% for night-time noise of functional areas of 309 cities.

National environmental ionizing radiation level was within the fluctuation range of background value. The environmental electromagnetic radiation level met relevant national limit.

Across China there were 208 million ha forests with the coverage at 21.63%. The total grassland area was nearly 400 million ha, taking up about 41.7% of total land area. A total of 2,750 nature reserves of various kinds at different levels have been established across the country. Their total area took up 14.88% of the total land area of China. There were 446 nature reserves at national level, taking up 9.97% of the total land area.

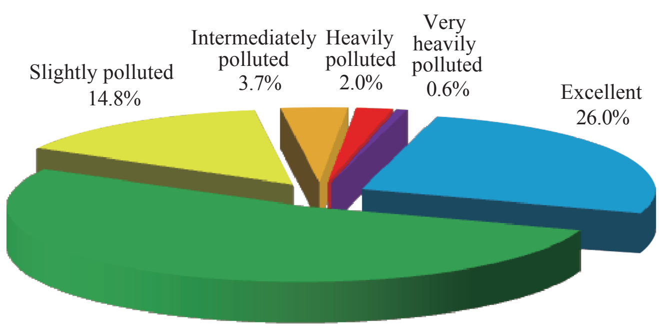
The counties with "excellent" or "good" ecological environment quality were mainly distributed in the region south to Qinling Mountain and the Huaihe River and Daxing'anling, Xiaoxing'anling areas in Northeast China. The counties with "ordinary" ecological environment quality were mainly distributed in regions such as North China Plain, central and western parts of Northeast China Plain, central part of Inner Mongolia, central part of Qinghai-Tibetan Plateau and northern part of Xinjiang. The counties with "relatively poor" or "poor" ecological environment quality were mainly distributed in western part of Inner Mongolia, northwestern part of Gansu, northern part of Qinghai-Tibetan Plateau and most of Xinjiang.

Atmospheric Environment

Air quality

Cities at or above prefecture level In 2016, all 338 APL cities* across the country conducted environmental monitoring. The monitoring results show that 84 cities met national air quality standard**, accounting for 24.9%; 254 cities failed to meet national air quality standard, taking up 75.1%.

The average percent of attainment days on air quality*** of the 338 cities was 78.8%, up by 2.1 percentage points compared with that of 2015. The amount of nonattainment days**** took up 21.2%. The percent of attainment days on air quality of 8 cities was 100%. The percent of attainment days on air quality of 169 cities was 80%~100%. The percent of attainment days on air quality of 137 cities was 50%~80% and the percent of attainment days on air quality of 24 cities was less than 50%.



The percentage of air quality standards of 338 cities in 2016

In 338 cities, 2,464 days were under heavy pollution and 784 days were under very heavy pollution. Among them, days with $PM_{2.5}$ as the primary pollutant***** took up 80.3% and those with PM_{10} as the primary pollutant took up 20.4% and with O_3 as the primary pollutant took up 0.9%. There were 32 cities suffering from more than 30 days under heavy or very

*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 pollutants under assessment meet the standard.

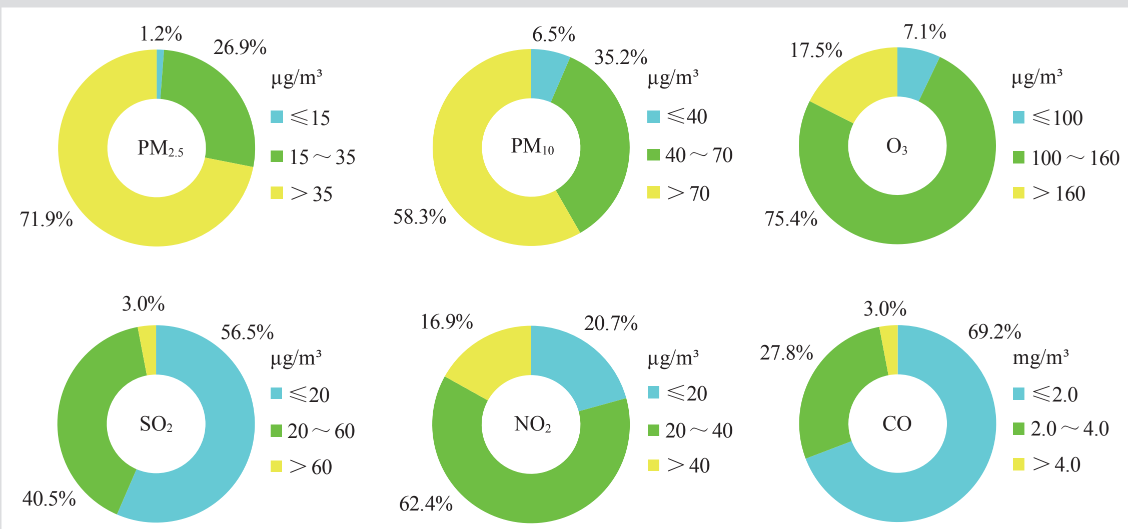
***The amount of attainment days: It refers to the amount of days with AQI at 0~100.

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

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

heavy pollution, and they were distributed in Xinjiang (some cities here were influenced by sandstorm), Hebei, Shanxi, Shandong, Henan, Beijing and Shaanxi.

The indicator analysis results show that the range of annual average $PM_{2.5}$ concentration was 12~158 μg/m^3 with the average level of 47μg/m^3, down by 6.0% compared with that of 2015. The amount of days with daily average concentration failing to meet relevant standard took up 14.7% of the total, down by 2.8 percentage points compared with that of 2015. The range of annual average PM_{10} concentration was 22~436 μg/m^3 with the average of 82 μg/m^3, down by 5.7% compared with that of 2015. The amount of days with daily average concentration failing to meet relevant standard took up 10.4% of the total, down by 1.7 percentage points compared with that of 2015. The range of 90^{th} percentile concentration of O_3 daily maximum 8-hour average* was 73~200 μg/m^3 with the average at 138 μg/m^3, up by 3.0% compared with that of 2015. The amount of days with daily average failing to meet the standard took up 5.2% of the total, up by 0.6 percentage point compared with that of 2015. The range of annual average SO_2 concentration was 3~88 μg/m^3 with the average at 22 μg/m^3, down by 12.0% compared with that of 2015. The amount of days with daily average failing to meet the standard took up 0.5% of the total, down by 0.2 percentage point compared with that of 2015. The range of annual average NO_2 concentration was 9~61 μg/m^3 with the average at 30 μg/m^3, same as that of 2015. The amount of days with daily average failing to meet the standard took up 1.6% of the total, same as that of 2015. The range of the 95^{th} percentile concentration of daily CO average was 0.8~5.0 mg/m^3 with the average at 1.9 mg/m^3, down by 9.5% compared with that of 2015. The amount of days with daily average failing to meet the standard took up 0.4% of the total, down by 0.1 percentage point compared with that of 2015.

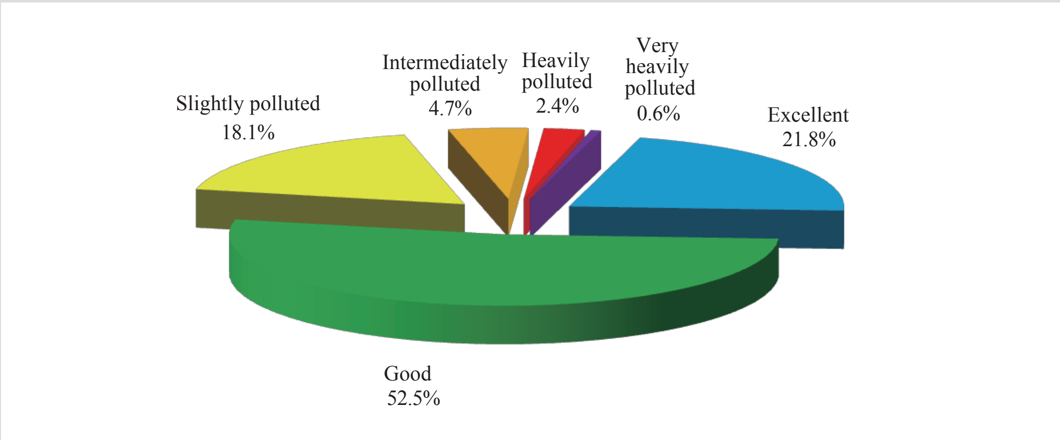


Percent of 338 cities with different concentrations of six pollutants in 2016

Cities under Stage I monitoring based on the newly amended ambient air quality standard In 2016, the monitoring results of 74 cities under Stage I monitoring based on the newly amended ambient air quality standard (including

*Percentile concentration: Based on the Technical Regulation for Ambient Air Quality Assessment (Trial) (HJ 63-2013), effective daily maximum 8-hour average of O_3 concentrations in the calendar year are ranked from small to big, compare the percentile value at 90% with the daily maximum 8-hour average of O_3 concentration of national standard date to judge if O_3 concentration meets the standard. The assessment of CO follows the same principle.

APL cities in key regions such as Beijing-Tianjin-Hebei, the Yangtze River delta and Pearl River delta, municipalities, provincial capital cities and cities under separate plan of the State Council) (the 74 cities) show that the percentage of days of the 74 cities meeting air quality standard was 74.2%, up by 3.0 percentage points compared with that of 2015. The average amount of days failing to meet the standard took up 25.8%. The attainment rate was 80%~100% for 26 cities, 50%~80% for 42 cities. The nonattainment percent of 6 cities was less than 50%. The amount of days with $PM_{2.5}$ as the primary pollutant took up 57.5% of the total non-attainment days, the amount of days with O_3 as the primary pollutant took up 30.8%, the amount of days with PM_{10} as the primary pollutant took up 10.5%, the amount of days with NO_2 as primary pollutant took up 1.6% and the amount of days with SO_2 as primary pollutant took up 0.1%.



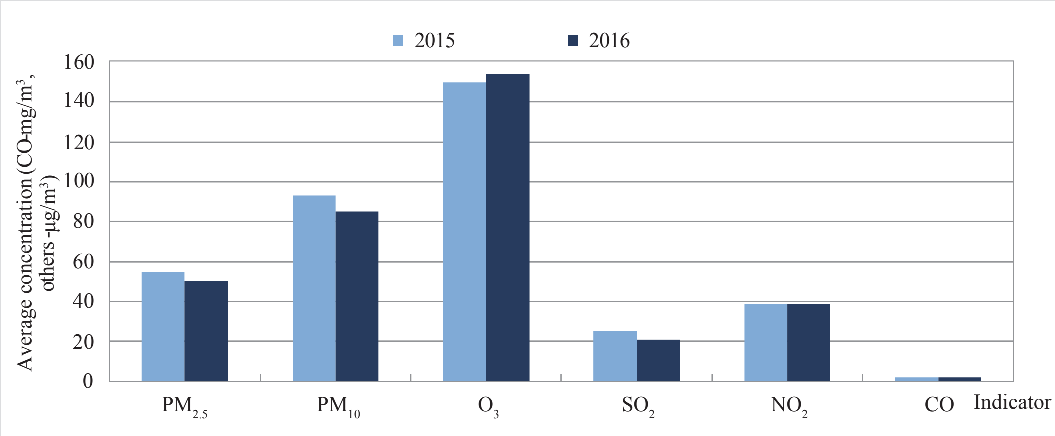
Percent of air quality levels of 74 cities in 2016

The analysis results of air quality comprehensive index* show that the top 10 cities with poor air quality (from No.74 to No. 65) in the 74 cities were Hengshui, Shijiazhuang, Baoding, Xingtai, Handan, Tangshan, Zhengzhou, Xi'an, Jinan and TaiYuan. The top 10 cities with relatively good urban air quality (from No.1 to No.10) were Haikou, Zhoushan, Huizhou, Xiamen, Fuzhou, Shenzhen, Lishui, Zhuhai, Kunming and Taizhou.

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

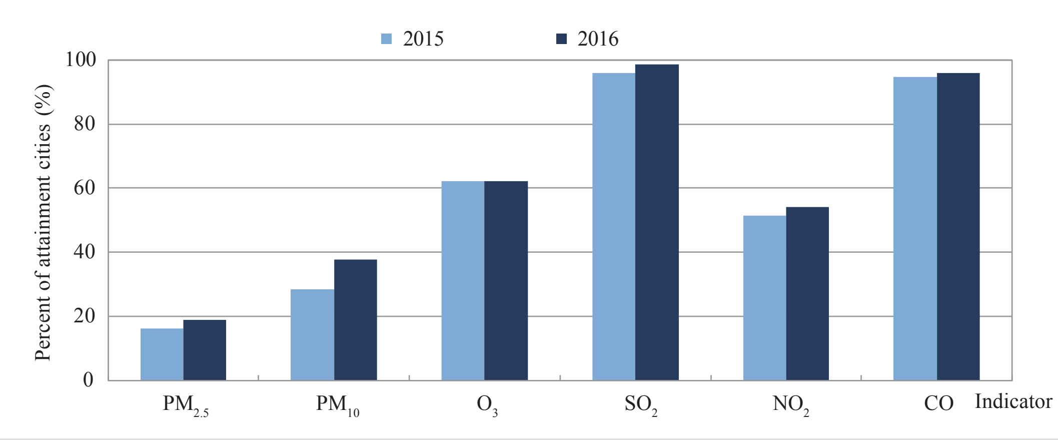
Air quality comprehensive index and primary pollutant of 74 cities in 2016

No.	City	Comprehensive index	The biggest index	Primary pollutant	No.	City	Comprehensive index	The biggest index	Primary pollutant
1	Haikou	2.55	0.67	O_3	38	Harbin	5.22	1.49	$PM_{2.5}$
2	Zhoushan	3.05	0.86	O_3	38	Huai'an	5.22	1.51	$PM_{2.5}$
3	Huizhou	3.25	0.83	O_3	40	Chongqing	5.24	1.54	$PM_{2.5}$
4	Xiamen	3.29	0.80	$PM_{2.5}$	40	Hangzhou	5.24	1.40	$PM_{2.5}$
5	Fuzhou	3.35	0.77	$PM_{2.5}$	42	Zhenjiang	5.28	1.43	$PM_{2.5}$
6	Shenzhen	3.44	0.84	O_3	43	Yangzhou	5.30	1.46	$PM_{2.5}$
7	Lishui	3.46	0.94	$PM_{2.5}$	44	Suzhou	5.32	1.31	$PM_{2.5}$
8	Zhuhai	3.47	0.90	O_3	45	Taizhou	5.40	1.57	$PM_{2.5}$
9	Kunming	3.71	0.80	$PM_{2.5}$	46	Suqian	5.45	1.60	$PM_{2.5}$
10	Taizhou	3.81	1.03	$PM_{2.5}$	47	Hefei	5.56	1.63	$PM_{2.5}$
11	Zhongshan	3.83	0.96	O_3	48	Nanjing	5.58	1.37	$PM_{2.5}$
12	Lasa	3.86	1.14	PM_{10}	49	Hohhot	5.67	1.36	PM_{10}
13	Nanning	3.95	1.03	$PM_{2.5}$	50	Wuhan	5.69	1.63	$PM_{2.5}$
14	Guiyang	4.00	1.06	$PM_{2.5}$	51	Changzhou	5.71	1.51	$PM_{2.5}$
15	Dongguan	4.09	1.04	O_3	52	Wuxi	5.79	1.51	$PM_{2.5}$
16	Jiangmen	4.14	1.01	O_3	53	Qinhuangdao	5.87	1.31	$PM_{2.5}$
17	Zhaoqing	4.23	1.06	$PM_{2.5}$	54	Shenyang	6.09	1.54	$PM_{2.5}$
18	Quzhou	4.35	1.20	$PM_{2.5}$	55	Xining	6.18	1.61	PM_{10}
19	Ningbo	4.41	1.09	$PM_{2.5}$	56	Chengdu	6.38	1.80	$PM_{2.5}$
20	Foshan	4.45	1.09	$PM_{2.5}$	57	Xuzhou	6.54	1.71	$PM_{2.5}$
21	Guangzhou	4.47	1.15	NO_2	58	Yinchuan	6.63	1.60	$PM_{2.5}$
22	Zhangjiakou	4.50	1.19	PM_{10}	59	Tianjin	6.65	1.97	$PM_{2.5}$
23	Wenzhou	4.52	1.09	$PM_{2.5}$	60	Lanzhou	6.79	1.89	PM_{10}
24	Yancheng	4.53	1.23	$PM_{2.5}$	61	Beijing	6.81	2.09	$PM_{2.5}$
25	Dalian	4.60	1.11	$PM_{2.5}$	62	Urumchi	6.95	2.11	$PM_{2.5}$
26	Jinhua	4.61	1.31	$PM_{2.5}$	63	Langfang	7.11	1.89	$PM_{2.5}$
27	Nanchang	4.70	1.23	$PM_{2.5}$	64	Cangzhou	7.13	1.97	$PM_{2.5}$
28	Shaoxing	4.76	1.31	$PM_{2.5}$	65	TaiYuan	7.66	1.89	$PM_{2.5}$
29	Shanghai	4.80	1.29	$PM_{2.5}$	66	Jinan	7.77	2.17	$PM_{2.5}$
30	Jiaxing	4.85	1.26	$PM_{2.5}$	67	Xi'an	7.82	2.17	$PM_{2.5}$
31	Huzhou	5.02	1.31	$PM_{2.5}$	68	Zhengzhou	7.96	2.23	$PM_{2.5}$
32	Nantong	5.04	1.31	$PM_{2.5}$	69	Tangshan	8.27	2.11	$PM_{2.5}$
33	Changsha	5.06	1.51	$PM_{2.5}$	70	Handan	8.56	2.34	$PM_{2.5}$
34	Qingdao	5.09	1.31	$PM_{2.5}$	71	Xingtai	8.85	2.49	$PM_{2.5}$
35	Lianyungang	5.11	1.31	$PM_{2.5}$	72	Baoding	9.05	2.66	$PM_{2.5}$
36	Changchun	5.17	1.31	$PM_{2.5}$	73	Shijiang-zhuang	9.30	2.83	$PM_{2.5}$
36	Chengde	5.17	1.16	PM_{10}	74	Hengshui	10.44	3.43	$PM_{2.5}$



Year–on–year comparison of the average concentration of six pollutants of the 74 cities in 2016

The analysis results show that the average $PM_{2.5}$ concentration was 21~99 μg/m^3 with the average at 50 μg/m^3, down by 9.1% compared with that of 2015. The percentage of days failing to meet national air quality standard was 16.7%, down by 4.1 percentage points compared with that of 2015. The average $PM_{2.5}$ concentration of 2 cities reached Grade I national air quality standard, taking up 2.7%. 12 cities reached Grade II national air quality standard, taking up 16.2%. 60 cities failed to meet Grade II national air quality standard, taking up 81.1%. The range of average PM_{10} concentration was 39~164 μg/m^3 with the average at 85 μg/m^3, down by 8.6% compared with that of 2015. The percent of days failing to meet national standard was 11.5%, down by 2.8 percentage points compared with that of 2015. The average PM_{10} concentration of 1 city reached Grade I national air quality standard, taking up 1.4%. 27 cities reached Grade II national air quality standard, taking up 36.5%. 46 cities failed to meet Grade II national air quality standard, taking up 62.2%. The 90th percentile concentration of O_3 daily maximum 8-hour average was 102~199 μg/m^3 with the average at 154 μg/m^3, up by 2.7% compared with that of 2015. The percent of days failing to meet the standard was 8.6%, up by 0.4 percentage point compared with that of 2015. 46 cities reached Grade II national air quality standard, taking up 62.2%. 28 cities failed to meet Grade II national air quality standard, taking up 37.8%. The range of the average SO_2 concentration was 6~68 μg/m^3 with the average at 21 μg/m^3, down by 16.0% compared with that of 2015. The percent of days failing to attain the standard reached 0.3%, down by 0.6 percentage point than that of 2015. The average SO_2 concentration of 48 cities reached Grade I national air quality standard, taking up 64.9%. 25 cities reached Grade II national air quality standard, taking up 33.8%. 1 city failed to meet Grade II national air quality standard in terms of SO_2, taking up 1.4%. The range of annual average NO_2 concentration was 16~61 μg/m^3 with the average at 39 μg/m^3, same as that of 2015. The percent of days failing to meet the standard was 4.2%, up by 0.1 percentage point compared with that of 2015. The average NO_2 concentration of 40 cities reached Grade I national air quality standard (same as the value of Grade II national air quality standard), taking up 54.1%. 34 cities failed to meet Grade II national air quality standard in terms of NO_2, taking up 45.9%. The 95th percentile concentration of daily average CO was 0.9~4.4 mg/m^3 with the average at 1.9 mg/m^3, down by 9.5% compared with that of 2015. The percent of days failing to meet the national air quality standard was 0.6%, down by 0.2 percentage point compared with that of 2015. The average CO concentration of 71 cities reached Grade I national air quality standard (same as the value of Grade II national air quality standard), taking up 95.9%. 3 cities failed to meet Grade II national air quality standard, taking up 4.1%.



Year–on–year comparison of the percent of cities with attainment of the six pollutants meeting national air quality standard in 74 cities in 2016

Beijing-Tianjin-Hebei region In 2016, the percent of days of the whole year of 13 APL cities in Beijing-Tianjin-Hebei meeting air quality standard ranged from 35.8% to 78.7%, with the average at 56.8%, up by 4.3 percentage points compared with that of 2015. The average percent of nonattainment days was 43.2%, and 25.3%, 8.8%, 7.0% and 2.2% of which was under slight pollution, intermediate pollution, heavy pollution and very heavy pollution respectively. The percent of days meeting air quality standard was 50%~80% for 9 cities. The percent of days meeting air quality standard was less than 50% for 4 cities. Among the nonattainment days, the amount of days with $PM_{2.5}$, O_3, PM_{10}, NO_2 and CO as the primary pollutant took up 63.1%, 26.3%, 10.8%, 0.3% and 0.1% respectively. There was no occurrence of nonattainment days with SO_2 as the primary pollutant.

For Beijing, the percent of days meeting air quality standard was 54.1%, up by 3.1 percentage points compared with that of 2015. There were 30 days under heavy pollution and 9 days under very heavy pollution, 7 days less than that of 2015. Among the nonattainment days, the amount of days with $PM_{2.5}$ as the primary pollutant was the most, followed by O_3.

Change of average concentration of primary pollutants in Beijing–Tianjin–Hebei region in 2016

Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2015
Beijing-Tianjin-Hebei	$PM_{2.5}$	71	-7.8%
	PM_{10}	119	-9.8%
	O_3	172	6.2%
	SO_2	31	-18.4%
	NO_2	49	6.5%
	CO	3.2	-13.5%
Beijing	$PM_{2.5}$	73	-9.9%
	PM_{10}	92	-9.8%
	O_3	199	-2.0%
	SO_2	10	-28.6%
	NO_2	48	-4.0%
	CO	3.2	-11.1%

The Yangtze River delta In 2016, 65.0%~95.4% of the total days of 25 APL cities met national air quality standard with the average at 76.1%, up by 4.0 percentage points compared with that of 2015. The average of days failing to meet air quality standard took up 23.9%; the percent of days with slight pollution was 19.0%, the percent of days with intermediate pollution was 3.9%, the percent of days with heavy pollution was 0.9%, and there was no days under very heavy pollution. The attainment rate was 80%~100% for 7 out of the 25 cities and 50%~80% for the rest 18 cities. In all the days failing to meet national air quality standard, the amount of days with $PM_{2.5}$, O_3, PM_{10} and NO_2 as the primary pollutant took up 55.3%, 39.8%, 3.4% and 2.1% respectively. There was no occurrence of nonattainment days with SO_2 and CO as the primary pollutants.

The percent of Shanghai's number of days meeting air quality standard was 75.4% around the year, up by 5.2 percentage points compared with that of 2015. There were 2 days under heavy pollution and no days under very heavy pollution, 6 days less than that of 2015. Among the nonattainment days, the amount of days with $PM_{2.5}$ as the primary pollutant was the most, followed by O_3.

Change of average concentration of primary pollutants in the Yangtze River delta in 2016

Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2015
The Yangtze River delta	$PM_{2.5}$	46	-13.2%
	PM_{10}	75	-9.6%
	O_3	159	-2.5%
	SO_2	17	-19.0%
	NO_2	36	-2.7%
	CO	1.5	0
Shanghai	$PM_{2.5}$	45	-15.1%
	PM_{10}	59	-14.5%
	O_3	164	1.9%
	SO_2	15	-11.8%
	NO_2	43	-6.5%
	CO	1.3	-13.3%

The Pearl River delta The percent of days of 9 APL cities in the Pearl River delta meeting air quality standard ranged from 84.4% to 96.7% with the average at 89.5%, up by 0.3 percentage point compared with that of 2015. The average percent of nonattainment days was 10.5%, with 8.9% of which under slight pollution, 1.4% under intermediate pollution and 0.2% under heavy pollution. There was no occurrence of very serious pollution. All the 9 cities had 80%~100% of the days of the year enjoying good or excellent air quality. Among the nonattainment days, the amount of days with O_3, $PM_{2.5}$ and NO_2 as the primary pollutants took up 70.3%, 19.6% and 10.4% respectively. There was no occurrence of nonattainment days with PM_{10}, SO_2 and CO as the primary pollutant.

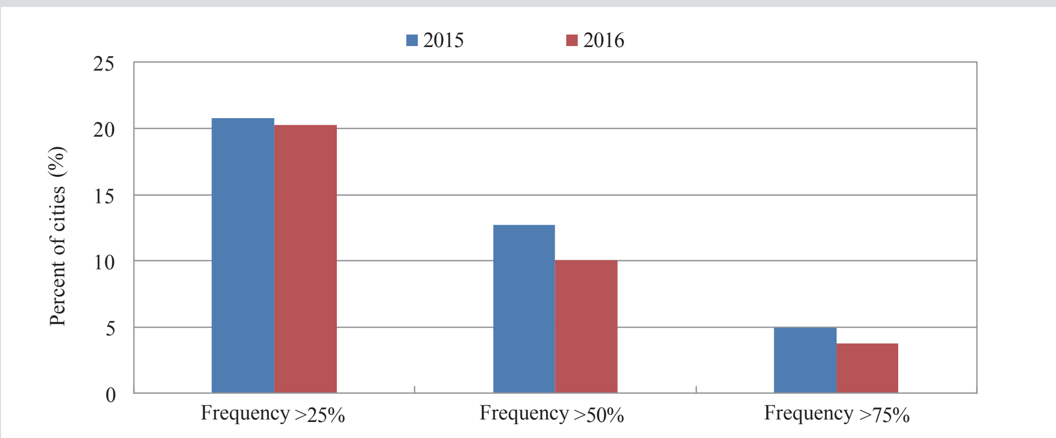
The percent of Guangzhou's days meeting air quality standard was 84.7%, down by 0.8 percentage point compared with that of 2015. There was 1 day under heavy pollution and no occurrence of very heavy pollution, 1 day more than that of 2015.

Change of average concentration of primary pollutants in the Pearl River delta in 2016

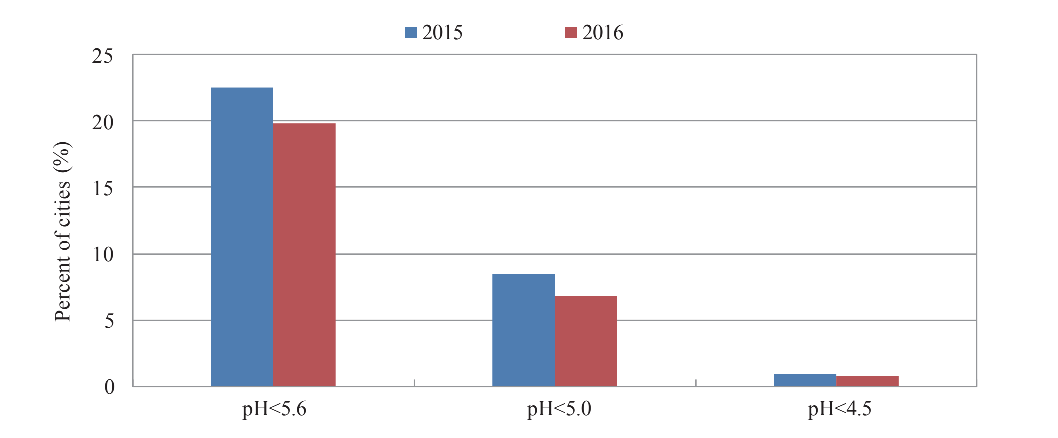
Region	Indicator	Average concentration (CO: mg/m^3, others: μg/m^3)	Change compared with that of 2015
The Pearl River delta	$PM_{2.5}$	32	-5.9%
	PM_{10}	49	-7.5%
	O_3	151	4.1%
	SO_2	11	-15.4%
	NO_2	35	6.1%
	CO	1.3	-7.1%
Guangzhou	$PM_{2.5}$	36	-7.7%
	PM_{10}	56	-5.1%
	O_3	155	6.9%
	SO_2	12	-7.7%
	NO_2	46	-2.1%
	CO	1.3	-7.1%

Acid Rain

Acid rain frequency In 2016 the average acid rain frequency of 474 cities (districts or counties) under precipitation monitoring was 12.7%. The percent of cities with acid rain was 38.8%, down by 1.6 percentage points compared with that of 2015. Among them, 20.3% of the cities had acid rain frequency over 25%, down by 0.5 percentage point compared with that of 2015. 10.1% cities had acid rain frequency over 50%, down by 2.6 percentage points compared with that of 2015. 3.8% cities had acid rain frequency over 75%, down by 1.2 percentage points compared with that of 2015.



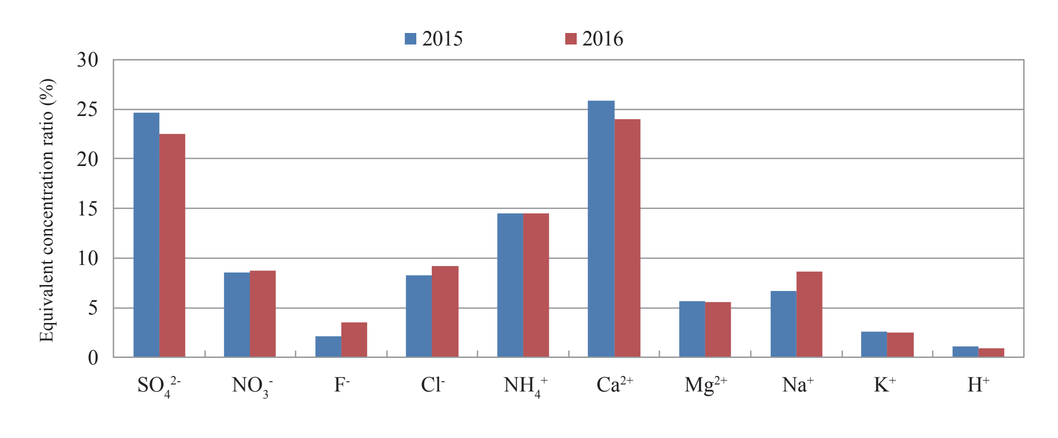
Year-on-year comparison of the percent of cities with different acid rain frequency in 2016



Annual comparison of the percent of cities with different annual pH of precipitation in 2016

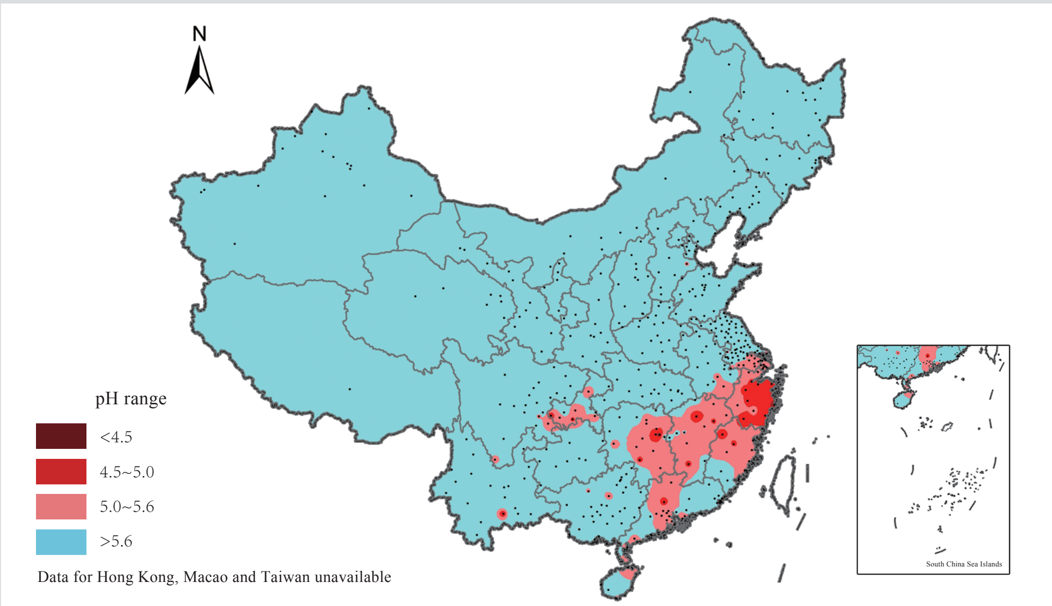
Precipitation acidity In 2016, the annual average pH of precipitation across the country was 4.1 (Zhuzhou in Hunan Province) ~8.1 (Korla in Xinjiang). Among them, the percent of cities with acid rain (annual average pH of precipitation < 5.6), relatively serious acid rain (annual average pH of precipitation < 5.0) and serious acid rain (annual average pH of precipitation < 4.5) was 19.8%, 6.8% and 0.8% respectively, down by 2.7, 1.7 and 0.2 percentage points respectively compared with that of 2015.

Chemical composition In 2016, the main cations in precipitation were calcium and ammonium, taking up 24.0% and 14.5% respectively of the total ion equivalent. The key anion was sulfate radical, taking up 22.5% of the total ion equivalent, while nitrate radical took up 8.7% of the total ion equivalent. In general, the type of acid rain still was sulphuric acid. Compared with that of 2015, both the percent of concentration of sulfate radical and chlorine ion went down, the percent of concentration of fluoride ions, chloride ion and Sodium chloride went up a bit, and the percent of concentration of other ion equivalents kept at a stable level.



Year–on–year comparison of main ion equivalent concentration ratio of precipitation in 2016

Acid rain distribution The total area of acid rain region was about 690,000 km^2, taking up 7.2% of total land area, down by 0.4 percentage point compared with that of 2015. Among them, the percent of land area with relatively serious acid rain or serious acid rain was 1.0% and 0.03% respectively of the total. Acid rain was mainly distributed in the region south to the Yangtze River and east to Yunnan-Guizhou Plateau, mainly including most of Zhejiang, Shanghai, Jiangxi and Fujian, central and eastern part of Hunan, central part of Guangdong, some areas of southern part of Chongqing, southern part of Jiangsu and southern part of Anhui.

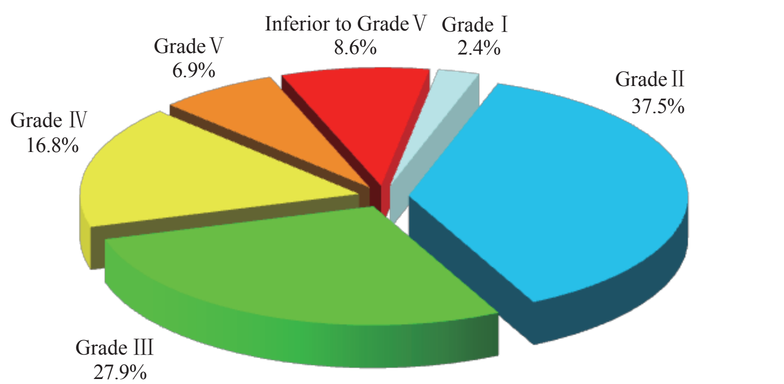


The isoline of annual pH of precipitation in China in 2016

Freshwater Environment

Surface waters

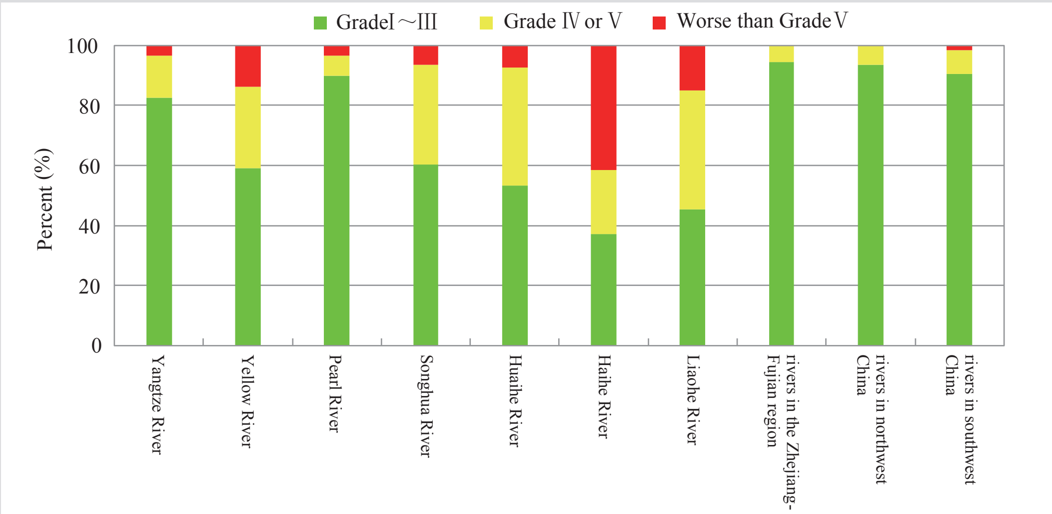
In 2016, there were 1,940 surface water sections (sites)* under national monitoring program. The monitoring results show that 47 water sections (sites) met Grade I water quality standard, taking up 2.4%; 728 met Grade II water quality standard, taking up 37.5%; 541 met Grade III standard, taking up 27.9%; 325 met Grade IV standard, taking up 16.8%; 133 met Grade V standard, taking up 6.9%; 166 failed to meet Grade V standard, taking up 8.6%**. Compared with that of 2015, the percent of sections meeting Grade I water quality standard was up by 0.4 percentage point, Grade II up by 4.1 percentage points, Grade III down by 2.7 percentage points, Grade IV down by 1.7 percentage points, Grade V up by 1.1 percentage points and the percent of sections failing to meet Grade V was down by 1.1 percentage points.



Water quality map of the national surface water in 2016

*Surface water sections (sites) under national monitoring program: In the 13th "Five-Year Plan" period, we will further improve national surface water monitoring network covering the mainstream and important tributaries and secondary tributaries of major rivers across the country with consideration of the tertiary and lower tributaries in key regions, important lakes and reservoirs. A total of 2,767 water sections (sites) have been established under national monitoring program (2,424 river water sections and 343 monitoring sites in lakes and reservoirs). Among them, 1,940 sections were for assessment, examination and ranking; 195 were control sections (85 of them were for assessment, examination and ranking at the same time) of rivers flowing into the sea and 717 were for research purpose.

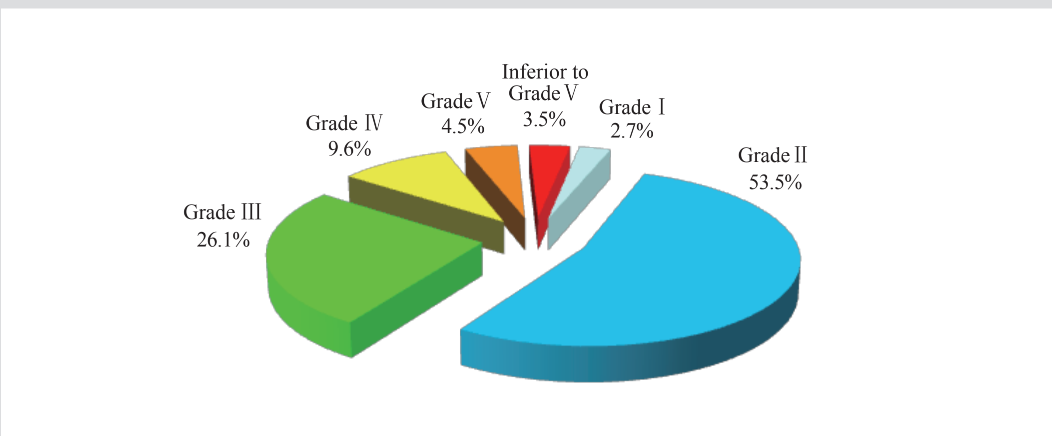
**Twenty one indicators of Table 1 of Environmental Quality Standard for Surface Water (GB 3838-2002) except water temperature, TN and E-coli are employed to assess the water grade based on each individual limit, and the highest grade from the single factor approach will be taken as the type of water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



Water quality of 7 major river basins, rivers in Zhejiang and Fujian, rivers in northwestern part and southwestern part in 2016

River basins

In 2016, out of the 1,617 water sections under national monitoring program in 7 major river basins such as 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, 34 met Grade I standard, taking up 2.1%; 676 met Grade II standard, taking up 41.8%; 441 met Grade III standard, taking up 27.3%; 217 met Grade IV standard, taking up 13.4%; 102 met Grade V standard, taking up 6.3%; 147 were of the quality inferior to Grade V standard, taking up 9.1%. Compared with that of 2015, the percentage of water sections meeting Grade I was up by 0.2 percentage



Water quality map of the Yangtze River basin in 2016 point. The percentage of water sections meeting Grade II was up by 5.5 percentage points. The percentage of water sections meeting Grade III was down by 3.5 percentage points. The percentage of water sections meeting Grade IV was down by 1.9 percentage points. The percentage of water sections meeting Grade V was up by 0.5 percentage point, and the percentage of water sections inferior to Grade V was down by 0.8 percentage point. The main pollutants were COD, TP and BOD_5, and 17.6%, 15.1% and 14.2% of the monitoring sections were respectively found having excessive COD, TP and BOD_5 .

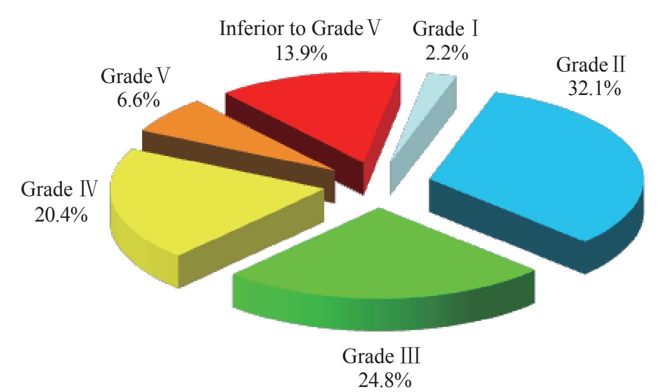
Among them, rivers in Zhejiang and Fujian, rivers in northwestern and southwestern parts of China met excellent quality standard. The Yangtze River and Pearl River met good quality standard. The Yellow River, Songhua River, Huaihe River and Liaohe River were under slight pollution, and Haihe River was under heavy pollution.

The Yangtze River basin witnessed sound water quality. In all the 510 water sections under national monitoring program, 2.7% met Grade I standard, 53.5% met Grade II standard; 26.1% met Grad III standard; 9.6% met Grade IV standard; 4.5% met Grade V and 3.5% were inferior to Grade V standard. Compared with that of 2015, the percentage of water sections meeting Grade I was up by 0.5 percentage point, the percentage of water sections meeting Grade II was up by 7.0 percentage points, the percentage of water sections meeting Grade III was down by 7.0 percentage points, the percentage of water sections meeting Grade IV was up by 0.2 percentage point, the percentage of water sections meeting Grade V was up by 1.8 percentage points and the percentage of water sections inferior to Grade V was down by 2.6 percentage points.

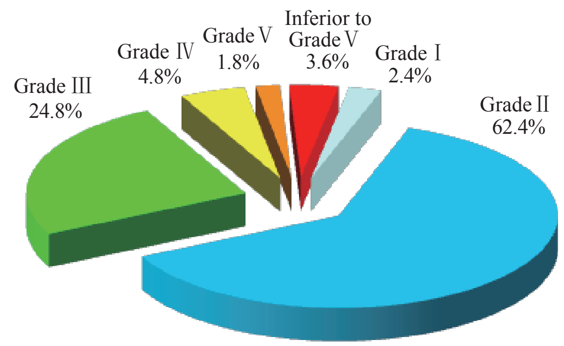
Water quality of the main stream of the Yangtze River was excellent. In 59 water sections under national monitoring program, 6.8% met Grade I standard; 50.8% met Grade II standard; 37.3% met Grade III standard; 5.1% met Grade IV. There was no occurrence of water sections with Grade V or failing to meet Grade V standard. Compared with that of 2015, the percentage of water sections meeting Grade II was up by 18.6 percentage points, those meeting Grade III down by 22.0 percentage points, those meeting Grade IV up by 5.1 percentage points, those meeting Grade V down by 1.7 percentage points, and those meeting Grade I and failing to meet Grade V kept unchanged.

The major tributaries of the Yangtze River were of good water quality. In 451 water sections under national monitoring program, 2.2% met Grade I standard, up by 0.6 percentage point; 53.9% met Grade II standard, up by 5.6 percentage points; 24.6% met Grade III standard, down by 5.1 percentage points; 10.2% met Grade IV standard, down by 0.4 percentage point; 5.1% met Grade V standard, up by 2.2 percentage points; 4.0% failed to meet Grade V standard, down by 2.9 percentage points compared with that of 2015.

The Yellow River basin was slightly polluted. The main pollution indicators were COD, ammonia nitrogen and BOD_5. Out of the 137 water sections under national monitoring program, 2.2% met Grade I water quality standard, same as that of 2015; 32.1% met Grade II standard, up by 3.6 percentage points; 24.8% met Grade III standard, down by 0.7 percentage point; 20.4% met Grade IV standard, up by 2.2



Water quality map of the Yellow River basin in 2016



Water quality map of the Pearl River basin in 2016

percentage points; 6.6% met Grade V standard, down by 2.2 percentage points; and 13.9% failed to meet Grade V standard, down by 2.9 percentage points compared with that of 2015.

The mainstream of the Yellow River was of excellent water quality. In 31 water sections under national monitoring program, 6.5% met Grade I standard, same as that of 2015; 64.5% met Grade II standard, up by 19.4 percentage points; 22.6% met Grade III standard, down by 16.1 percentage points; 6.5% met Grade IV standard, down by 3.2 percentage points; and there was no water sections meeting Grade V or failing to meet Grade V standard, same as that of 2015.

The major tributaries of the Yellow River were under slight pollution. In the 106 water sections under national monitoring program, 0.9% met Grade I standard, same as that of 2015; 22.6% met Grade II standard, down by 0.9 percentage point; 25.5% met Grade III standard, up by 3.8 percentage points; 24.5% met Grade IV standard, up by 3.8 percentage points; 8.5% met Grade V standard, down by 2.8 percentage points; and 17.9% failed to meet Grade V standard, down by 3.8 percentage points compared with that of 2015.

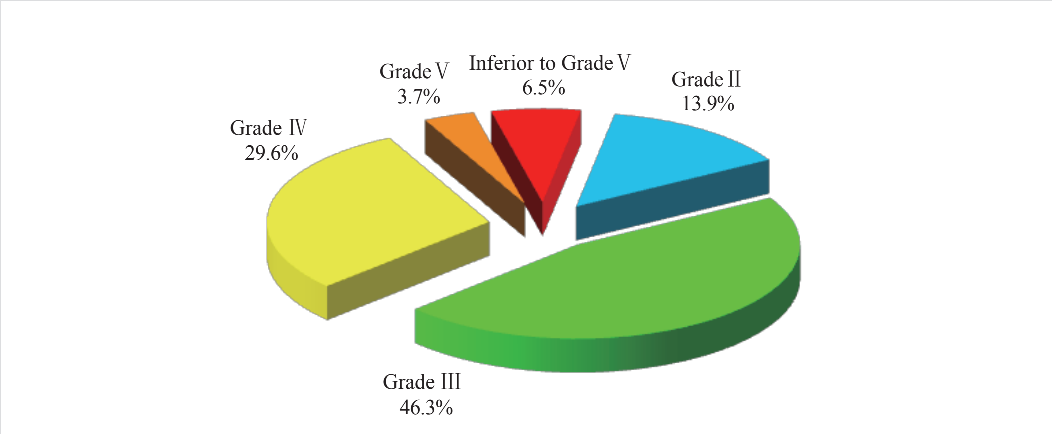
The Pearl River basin was of good water quality. Among 165 water sections under national monitoring program, 2.4% met Grade I standard, up by 0.6 percentage point compared with that of 2015; 62.4% met Grade II standard, up by 1.2 percentage points; 24.8% met Grade III standard, up by 1.2 percentage points; 4.8% met Grade IV standard, down by 3.6 percentage points; 1.8% met Grade V standard, up by 0.6 percentage point; and 3.6% failed to meet Grade V standard, same as that of 2015.

The mainstream of the Pearl River was of good water quality. In the 50 water sections under national monitoring program, the percent of Grade I, II, III, IV and V was 4.0%, 72.0%, 12.0%, 10.0% and 2.0% respectively. No water section failed to meet Grade V standard. Compared with that of 2015, the percentage of Grade I was up by 2.0 percentage points, Grade III down by 2.0 percentage points, Grade IV up by 2.0 percentage points and the category of inferior to Grade V was down by 2.0 percentage points. The percentage of Grade II and Grade V were the same as that of 2015.

The major tributaries of the Pearl River were of good water quality. In the 101 water sections under national monitoring program, 2.0% met Grade I standard, same as that of 2015; 56.4% met Grade II standard, up by 2.0 percentage points; 30.7% met Grade III standard, up by 3.0 percentage points; 3.0% met Grade IV, down by 6.9 percentage points; 2.0% met Grade V standard, up by 1.0 percentage point; and 5.9% failed to meet Grade V standard, up by 0.9 percentage point compared with that of 2015.

Rivers in Hainan Island were of excellent water quality. In the 14 water sections of Hainan Island under national monitoring program, 71.4% met Grade II standard, 28.6% met Grade III standard, and no water sections fell within the categories of Grade I, IV, V or inferior to Grade V standard, all the same as that of 2015.

The Songhua River basin was slightly polluted on the whole. The main pollution indicators were COD, permanganate index and ammonia nitrogen. In all 108 water sections under national monitoring program, 0% met Grade I standard, same as that of 2015. 13.9% met Grade II standard, up by 3.7 percentage points; 46.3% met Grade III standard,



Water quality map of the Songhua River basin in 2016

down by 7.4 percentage points; 29.6% met Grade IV standard, same as that of 2015; 3.7% met Grade V standard, up by 0.9 percentage point; and 6.5% failed to meet Grade V standard, up by 2.8 percentage points compared with that of 2015.

The mainstream of Songhua River was of excellent water quality. In 17 water sections under national monitoring program, no section met Grade I, Grade V or failed to meet Grade V national water quality standard, same as that of 2015; 23.5% met Grade II standard, down by 5.9 percentage points; 70.6% met Grade III standard, up by 17.6 percentage points; 5.9% met Grade IV standard, down by 11.7 percentage points compared with that of 2015.

The waters of major tributaries of the Songhua River were of sight pollution. In the 56 water section under the national monitoring program, no sections met Grade I standard, same as that of 2015; 14.3% met Grade II standard, up by 3.6 percentage points; 39.3% met Grade III standard, down by 17.9 percentage points; 32.1% met Grade IV standard, up by 8.9 percentage points; 5.4% met Grade V standard, up by 3.6 percentage points; and 8.9% failed to meet Grade V standard, up by 1.8 percentage points compared with that of 2015.

The waters of Heilongjiang River were of slight pollution. In 18 water sections under national monitoring program, 0% met Grade I or inferior to Grade V standard, same as that of 2015; 5.6% met Grade II standard, up by 1.9 percentage points; 38.9% met Grade III standard, down by 9.3 percentage points; 50.0% met Grade IV standard, up by 5.6 percentage points; and 5.6 met Grade V standard, up by 1.9 percentage points compared with that of 2015.

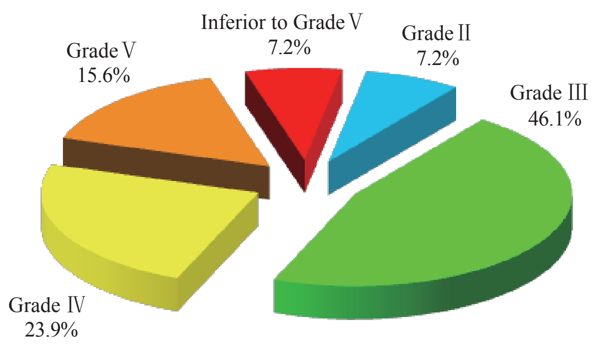
The waters of Tumen River were of slight pollution. In 7 water sections under national monitoring program, 0% met Grade I or II standard, both the same as that of 2015; 57.1% met Grade III standard, same as that of 2015; 14.3% met Grade IV standard, down by 14.3 percentage points; 14.3% met Grade V standard, same as that of 2015; and 14.3% failed to meet Grade V standard, up by 14.3 percentage points compared with that of 2015.

The waters of the Suifen River were of good quality. 1 water section under national monitoring program met Grade III standard, better than that of 2015.

The Huaihe River basin was slightly polluted. The main pollution indicators were COD, BOD_5 and permanganate index. In 180 water sections under national monitoring program, 0% met Grade I standard, same as that of 2015; 7.2% met Grade II standard, down by 2.8 percentage points; 46.1% met Grade III standard, up by 3.3 percentage points; 23.9% met Grade IV standard, up by 0.6 percentage point; 15.6% met Grade V standard, up by 2.2 percentage points; and 7.2% failed to meet Grade V standard, down by 3.3 percentage points compared with that of 2015.

The mainstream of Huaihe River was of excellent quality. In 10 water sections under national monitoring program, 0% met Grade I, II, V or inferior to Grade V standard; 90.0% met Grade III standard, 10.0% met Grade IV standard. Compared with that of 2015, the ratio of Grade II was down by 30.0 percentage points, Grade III up by 30.0 percentage points, and the rest were all the same as that of 2015.

The waters of major tributaries of Huaihe River were of slight pollution. In the 101 water sections under national monitoring program, 0% met Grade I standard, same as that



Water quality map of the Huaihe River in 2016

of 2015; 9.9% met Grade II standard, down by 1.0 percentage point; 35.6% met Grade III standard, same as that of 2015; 28.7% met Grade IV standard, up by 2.0 percentage points; 18.8% met Grade V standard, up by 4.9 percentage points; 6.9% failed to meet Grade V standard, down by 6.0 percentage points compared with that of 2015.

The waters of the Yishu-Si River System were of slight pollution. In 48 water sections under national monitoring program, 0% met Grade I and II standard, same as that of 2015; 72.9% met grade III standard, up by 6.2 percentage points; 18.8% met Grade IV standard, down by 6.3 percentage points; 2.1% met Grade V standard, down by 4.1 percentage points; and 6.3% failed to meet Grade V, up by 4.2 percentage points compared with that of 2015.

The waters of rivers flowing into sea in Shandong Peninsula were of slight pollution. In 21 water sections under national monitoring program, 0% met Grade I standard, same as that of 2015; 14.3% met Grade II standard, down by 4.8 percentage points; 14.3% met Grade III standard, same as that of 2015; 19.0% met Grade IV standard, up by 9.5 percentage points; 38.1% met Grade V standard, up by 4.8 percentage points; and 14.3% failed to meet Grade V standard, down by 9.5 percentage points compared with that of 2015.

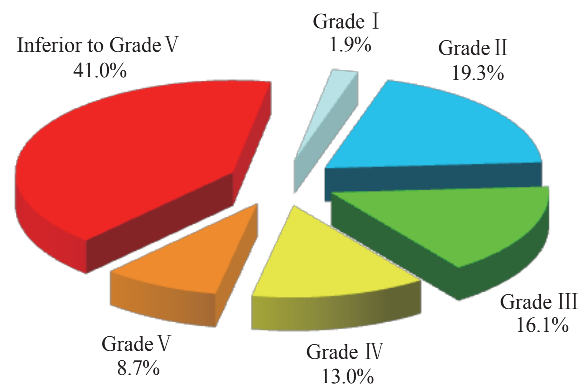
The Haihe River basin was heavily polluted. The major pollution indicators were COD, BOD_5 and ammonia nitrogen. In 161 water sections under national monitoring program, 1.9% met Grade I standard, down by 0.6 percentage point; 19.3% met Grade II standard, up by 3.2 percentage points; 16.1% met Grade III standard, down by 1.3 percentage points; 13.0% met Grade IV standard, up by 1.2 percentage points; 8.7% met Grade V standard, down by 5.6 percentage points; and 41.0% failed to meet Grade V standard, up by 3.1 percentage points compared with that of 2015.

In the 2 water sections of the mainstream of Haihe River under national monitoring program, the section of Sanchakou met Grade IV standard, much better than that of 2015; and the other section at the sluice of the River failed to meet Grade V standard, almost the same as that of 2015.

The waters of major tributaries of the Haihe River were of heavy pollution. In the 125 water sections under national monitoring program, 2.4% met Grade I standard, down by 0.8 percentage point; 18.4% met Grade II standard, up by 3.2 percentage points; 12.0% met Grade III standard, down by 1.6 percentage points; 10.4% met Grade IV standard, same as that of 2015; 7.2% met Grade V standard, down by 4.0 percentage points, and 49.6% failed to meet Grade V standard, up by 3.2 percentage points compared with that of 2015.

The waters of Luanhe River were of good quality standard. In the 17 water sections under national monitoring program, 0% met Grade I, V or inferior to Grade V standard; 41.2% met Grade II standard and 47.1% met Grade III standard. Compared with that of 2015, the percentage of Grade II was up by 23.6 percentage points, Grade III down by 23.5 percentage points and Grade I, IV, V and inferior to Grade V the same as that of 2015.

The waters of Tuhai River-Majia River were of intermediated pollution. In 11 water sections under national monitoring program, 0% met Grade I standard, 9.1% met Grade II standard, 18.2% met Grade III standard, 9.1% met Grade IV standard, 36.4% met Grade V standard and 27.3%



Water quality map of the Haihe River in 2016

failed to meet Grade V standard. Compared with that of 2015, the percentage of waters meeting Grade II was up by 9.1 percentage points, Grade V down by 18.1 percentage points, and inferior to Grade V up by 9.1 percentage points. The percentage of water sections meeting Grade I, III and IV was the same as that of 2015.

The waters of rivers in east Hebei and coastal areas were of slight pollution. In 6 water sections under national monitoring program, 16.7% met Grade III, 66.7% met Grade IV, 16.7% failed to meet Grade V, and no sections met Grade I, II and V standard. Compared with that of 2015, the percentage of waters meeting Grade III was up by 16.7 percentage points, Grade V down by 16.7 percentage points, and Grade I, II, IV and inferior to Grade V standard the same as that of 2015.

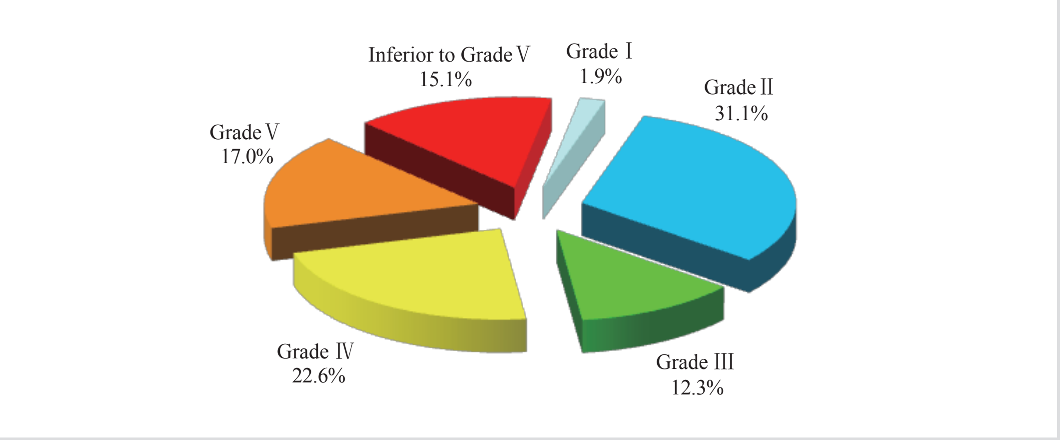
The Liaohe River basin was of slight pollution. The major pollution indicators were COD, BOD_5 and ammonia nitrogen. In 106 water sections under national monitoring program, 1.9% met Grade I standard, down by 0.9 percentage point; 31.1% met Grade II standard, up by 8.5 percentage points; 12.3% met Grade III standard, the same as that of 2015; 22.6% met Grade IV standard, down by 22.7 percentage points; 17.0% met Grade V standard, up by 10.4 percentage points; and 15.1% failed to meet Grade V standard, up by 4.7 percentage points compared with that of 2015.

The waters of the mainstream of the Liaohe River were of slight pollution. In the 15 water sections under national monitoring program, 0% met Grade I and Grade II standard, the same as that of 2015; 13.3% met Grade III standard, up by 6.6 percentage points; 46.7% met Grade IV standard, down by 26.6 percentage points; 33.3% met Grade V standard, up by 13.3 percentage points; and 6.7% failed to meet Grade V standard, up by 6.7 percentage points compared with that of 2015.

The waters of major tributaries of the Liaohe River were of intermediate pollution. In the 21 water sections under national monitoring program, 0% met Grade I, same as that of 2015; 9.5% met Grade II standard, up by 4.7 percentage points; 23.8% met Grade III standard, up by 23.8 percentage points; 14.3% met Grade IV standard, down by 47.6 percentage points; 23.8% met Grade V standard, up by 14.3 percentage points; and 28.6% failed to meet Grade V standard, up by 4.8 percentage points compared with that of 2015.

The waters of the Liaohe River were of slight pollution. In the 28 water sections under national monitoring program, 0% met Grade I or III standard, 35.7% met Grade II standard, 28.6% met Grade IV standard, 17.9% met Grade V standard, and 17.9% failed to meet Grade V standard. Compared with that of 2015, the percentage of water sections meeting Grade I was down by 7.2 percentage points, Grade II up by 21.4 percentage points, Grade III down by 10.7 percentage points, Grade IV down by 10.7 percentage points, Grade V up by 10.8 percentage points and that inferior to Grade V standard down by 3.5 percentage points.

The waters of the Daling River were of slight pollution. In the 11 water sections under national monitoring program, 0% met Grade I standard; 45.5% met Grade II standard; 9.1% met Grade III standard; 9.1% met Grade IV standard; 27.3% met Grade V, and 9.1% failed to meet Grade V standard. compared with that of 2015, the percentage of water sections

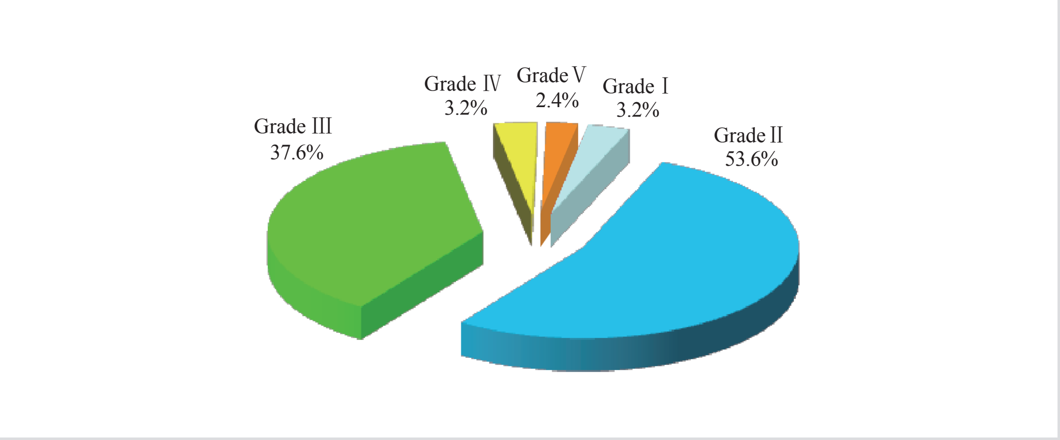


Water quality map of the Liaohe River basin in 2016

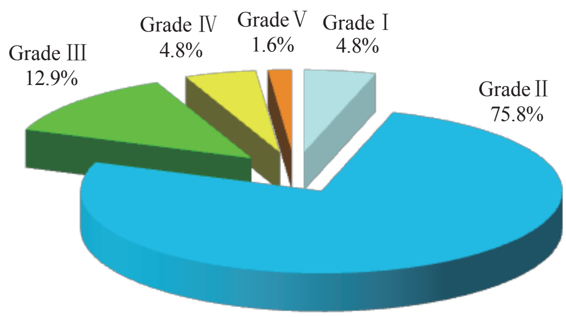
meeting Grade I standard was the same, Grade II up by 9.1 percentage points, Grade III down by 18.1 percentage points, Grade IV down by 27.3 percentage points, Grade V up by 27.3 percentage points and inferior to Grade V up by 9.1 percentage points.

The waters of the Yalu River were of excellent quality. In the 13 water sections under national monitoring program, 7.7% met Grade I standard; 84.6% met Grade II standard; 7.7% met Grade III standard; no section met Grade IV, V or inferior to Grade V standard. Compared with that of 2015, the percentage of waters meeting Grade II were up by 7.7 percentage points, Grade IV down by 7.7 percentage points while other grades stood the same as that of 2015.

Rivers in Zhejiang Province and Fujian Province were of excellent water quality. In 125 water sections under national monitoring program, 3.2% met Grade I standard, up by 0.8 percentage point; 53.6% met Grade II standard, up by 12.8 percentage points; 37.6% met Grade III standard, down by 6.4 percentage points; 3.2% met Grade IV standard, down by 2.4 percentage points; 2.4% met Grade V standard, down by 2.4



Water quality map of the rivers in Zhejiang Province and Fujian Province in 2016

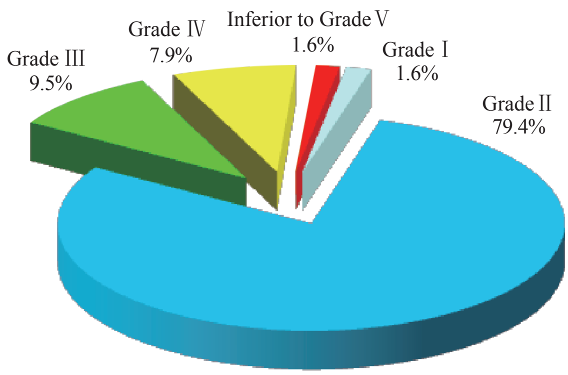


Water quality map of the rivers in Northwestern part of China in 2016

percentage points; and 0% failed to meet Grade V standard, down by 2.4 percentage points compared with that of 2015.

Rivers in northwestern part of China were of excellent water quality. In 62 water sections under national monitoring program, 4.8% met Grade I standard, down by 1.7 percentage points compared with that of 2015; 75.8% met Grade II standard, up by 1.6 percentage points; 12.9% met Grade III standard, up by 1.6 percentage points; 4.8% met Grade IV standard, the same as that of 2015; 1.6% met Grade V standard, down by 1.6 percentage points; and no sections failed to meet Grade V standard, the same as that of 2015.

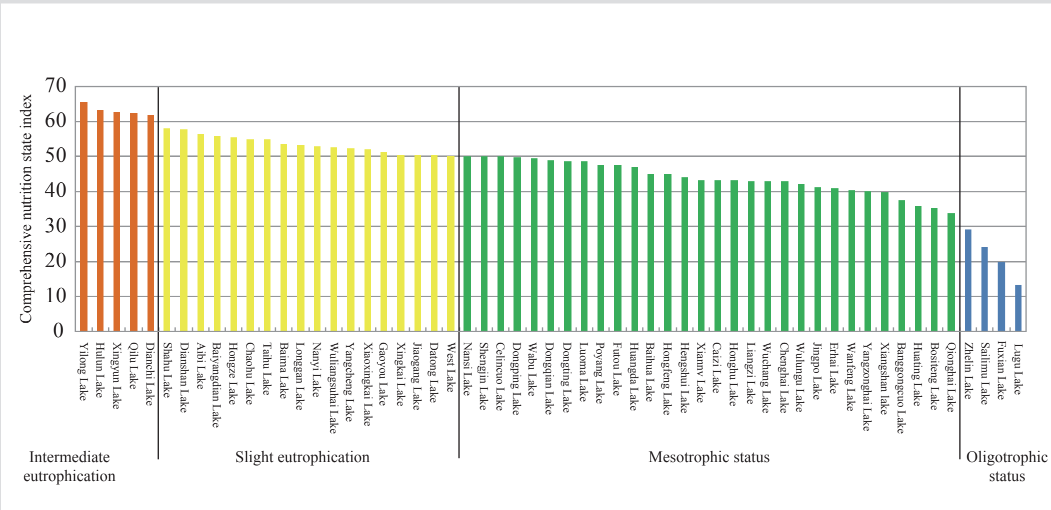
Rivers in Southwestern part of China were of excellent water quality. In 63 water sections under national monitoring program, 1.6% met Grade I standard, up by 1.6 percentage points compared with that of 2015; 79.4% met Grade II standard, up by 25.4 percentage points; 9.5% met Grade III standard, down by 17.5 percentage points; 7.9% met Grade IV standard, down by 7.9 percentage points; 0% met Grade V standard, down by 1.6 percentage points; and 1.6% failed to meet Grade V standard, the same as that of 2015.



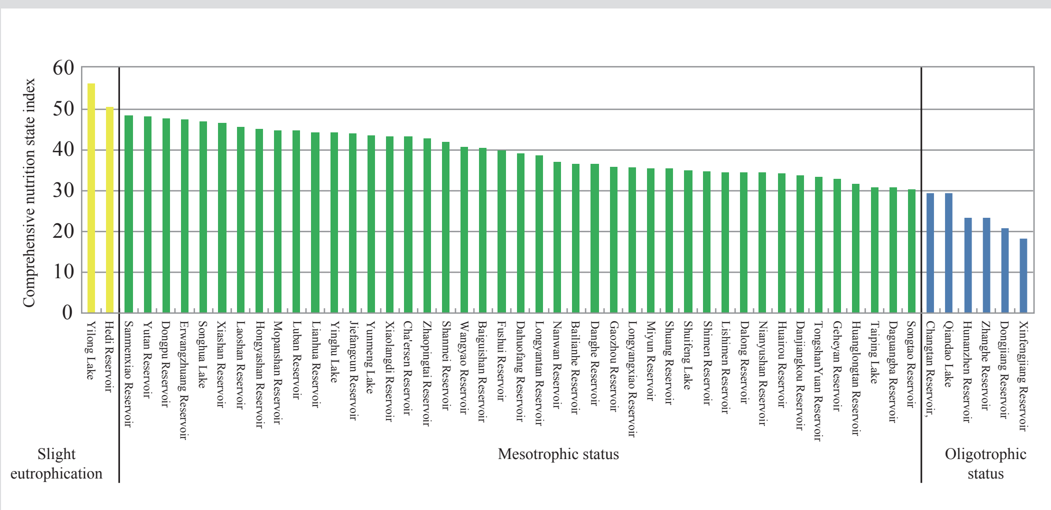
Water quality map of the rivers in Southwestern part of China in 2016

Lakes (reservoirs)

In 2016, among 112 major lakes (reservoirs) across the country, 8 lakes (reservoirs) met Grade I standard, taking up 7.1%; 28 met Grade II standard, taking up 25.0%; 38 met Grade III standard, taking up 33.9%; 23 met Grade IV standard, taking up 20.5%; 6 met Grade V standard, taking up 5.4%; and 9 failed to meet Grade V standard, taking up 8.0%. The main pollution indicators were TP, COD and permanganate index. In the 108 lakes (reservoirs) under the monitoring of nutritional status, 10 were under oligotrophic status; 73 were under mesotrophic status; 20 were under slight eutrophication, and 5 were under intermediate eutrophication.



Trophic Level Index of major lakes in 2016



Trophic Level Index of major reservoirs in 2016

Water quality of major lakes (reservoirs) in 2016

Water quality	The three lakes	major lakes	major reservoirs
Grade I and II standard	——	Liangzi Lake, Xiangshan Lake, Bangong Lake, Huating Lake, Qionghai Lake, Zhelin Lake, Sailimu Lake, Fuxian Lake and Lugu Lake	Laoshan Reservoir, Yinghu Reservoir, Jiefangcun Reservoir, Yunmeng Lake, Shanmei Reservoir, Baiguishan Reservoir, Dahuofang Reservoir, Bailianhe Reservoir, Danghe Reservoir, Miyun Reservoir, Shuangta Reservoir, Shimen Reservoir, Lishimen Reservoir, Dalong Reservoir, Huairou Reservoir, Danjiangkou Reservoir, Geheyan Reservoir, Huanglongtan Reservoir, Taiping Lake, Daguangba Reservoir, Songtao Reservoir, Changtan Reservoir, Qiandao Lake, Hunanzhen Reservoir, Zhanghe Reservoir, Dongjiang Reservoir and Xinfengjiang Reservoir
Grade III standard	——	Nanyi Lake, Xiaoxingkai Lake, Gaoyou Lake, Xingkai Lake, Jiaogang Lake, West Lake, Nansi Lake, Shengjin Lake, Selin Lake, Dongping Lake, Wabu Lake, Luoma Lake, Futou Lake, Hengshui Lake, Caizi Lake, Wuchang Lake, Jingpo Lake, Erhai Lake, Wanfeng Lake, Yangzonghai Lake and Yamdrok Lake	Hedi Reservoir, Yutan Reservoir, Dongpu Reservoir, Erwangzhuang Reservoir, Xiashan Reservoir, Hongyashan Reservoir, Mopanshan Reservoir, Xiaolangdi Reservoir, Zhaopingtai Reservoir, Wangyao Reservoir, Fushui Reservoir, Nanwan Reservoir, Gaozhou Reservoir, Longyangxia Reservoir , Nianyushan Reservoir , Tongshanyuan Reservoir and Yazidang Reservoir
Grade IV standard	Taihu Lake, Chaohu Lake	Baima Lake, Longgan Lake, Yangcheng Lake, Dongqian Lake, Dongting Lake, Poyang Lake, Huangda Lake, Baihua Lake, Hongfeng Lake, Xiannv Lake, Honghu Lake, Bosten Lake and Gaotang Lake	Yuqiao Reservoir, Sanmenxia Reservoir, Songhuahu Lake, Luban Reservoir, Lianhua Reservoir, Cha ersen Reservoir, Longyantan Reservoir and Shuifeng Lake
Grade V standard	Dianchi	Qilu Lake, Dianshan Lake, Baiyangdian Lake, Hongze Lake and Ulansuhai Nur	——
Inferior to Grade V standard	——	Yilong Lake, Hulun Lake, Xingyun Lake, Shahu Lake, Datong Lake, Chenghai Lake, Wulungu Lake, Namtso Lake and Ebinur Lake (the last four lakes due to relatively high natural background value)	——

The Taihu Lake was of slight pollution. The main pollution indicator was TP. Among the 17 water sections under national monitoring program, 4 met Grade III standard, taking up 23.5%. 12 met Grade IV standard, taking up 70.6%. 1 met Grade V standard, taking up 5.9%. No sections met Grade I, II or failed to meet Grade V standard. The percentage of water sections meeting different grades was the same as that of 2015. On average, the Taihu Lake was under slight eutrophication.

The rivers adjacent to the Taihu Lake were of slight pollution. The main pollution indicators were ammonia nitrogen, TP and COD. In 55 water sections under national monitoring program, 12 met Grade II standard, taking up 21.8%; 26 met Grade III standard, taking up 47.3%; 14 met

Grade IV standard, taking up 25.5%; and 3 met Grade V, taking up 5.5%. No sections met Grade I or failed to meet Grade V standard. Compared with that of 2015, the percentage of sections meeting Grade I remained unchanged, Grade II up by 3.6 percentage points, Grade III up by 9.1 percentage points, Grade IV down by 12.8 percentage points, Grade V up by 3.6 percentage points, and that inferior to Grade V down by 3.6 percentage points.

The Chaohu Lake was of slight pollution. The main pollution indicator was TP. In the 8 water sections under national monitoring program, 5 met Grade IV standard, taking up 62.5%. 3 met Grade V standard, taking up 37.5%. No sections met Grade I, Grade II, Grade III or failed to meet Grade V standard. The percentage of sections meeting different grades was the same as that of 2015. The Chaohu Lake was under slight eutrophication on average.

The rivers surrounding the lake were under intermediate pollution. The main pollution indicators were ammonia nitrogen, TP and BOD_5. In 14 water sections under national monitoring program, 1 met Grade II standard, taking up 7.1%. 9 met Grade III standard, taking up 64.3%. 4 failed to meet Grade V, taking up 28.6%. No sections met Grade I, Grade IV and Grade V. The percentage of sections meeting different grades was same as that of 2015.

The Dianchi was of intermediate pollution. The main pollution indicators were TP, COD and BOD_5. In the 10 sites under national monitoring program, all met Grade V standard. Both the Caohai Lake and Waihai Lake were under intermediate pollution. Compared with that of 2015, the percentage of sections meeting Grade V was up by 90.0 percentage points, inferior to Grade V was down by 90.0 percentage points, while other grades remained the same as that of 2015. The lake was under intermediate eutrophication on average.

The rivers surrounding the Dianchi were of slight pollution. The main pollution indicators were COD, BOD_5 and TP. In 12 water sections under national monitoring program, 1 met Grade II standard, taking up 8.3%; 2 met Grade III standard, taking up 16.7%; 7 met Grade IV standard, taking up 58.3%; 2 failed to meet Grade V standard, taking up 16.7%. No sections met Grade I or Grade V standard. Compared with that of 2015, the percentage of sections meeting Grade IV was down by 8.4 percentage points, Grade V down by 8.3 percentage points, inferior to Grade V up by 16.7 percentage points, and that of Grade I, II or III were the same as that of 2015.

Ground water

In 2016, national land and resource department had monitored water quality of groundwater of 6,124 monitoring wells (sites) (1,000 of them were national monitoring sites) of 225 administrative regions at prefecture level in 31 provinces (autonomous regions or municipalities) with groundwater aquifer system as a unit and shallow groundwater, which mainly consists of phreatic water, and middle deep groundwater, which mainly consists of confined water, as the targets. The assessment results show that zz The main nonattainment pollution indicators included manganese, iron, total hardness, total dissolved solids, “three kinds of nitrogen” (nitrite nitrogen, nitrate nitrogen and ammonia nitrogen), sulfate, fluoride and so on. There were the occurrence of nonattainment of heavy metals such as arsenic, Pb, mercury, hexavalent chromium and cadmium in individual monitoring sites.

In 2016, the Water Department monitored the groundwater quality of key regions in Songliao Plain, the Huanghuaihai Plain, Shanxi Province, the basin and plain areas of northwest China and Jianghan Plain, which basically covered all the areas under intensive development or heavy pollution. The main monitoring target was shallow groundwater. The assessment results of the data of 2,104 monitoring sites* show that the overall water quality was poor. The percent of monitoring sites with excellent, good, poor and very poor water quality was 2.9%, 21.2%, 56.2% and 19.8% respectively; there was no site with relatively good water quality. The main nonattainment pollution indicators included total hardness, total dissolved solids, manganese, iron and fluoride, which were relatively high due to possible relatively high background value of hydrogeological chemistry. In addition, the “three kinds of nitrogen” pollution was relatively heavy, and there was certain pollution of heavy metals and toxic organic pollutants in some regions.

*The assessment method is based on the comprehensive evaluation standard from The Quality Standard of Groundwater (GB/T 14848-93). The microbiological indicators such as total coliform group and total bacterial number were not included.

The assessment results of the groundwater quality of different river basins in 2016

River basin	The percentage of monitoring sites (%)		
	Excellent, good	Poor	Very poor
Songhua River	12.9	72.0	15.1
Liaohe River	10.6	60.6	28.8
Haihe River	31.1	52.0	16.9
Yellow River	25.5	44.1	30.5
Huaihe River	25.1	65.4	9.5
Yangtze River	20.0	65.7	14.3
Inland rivers	26.1	48.6	25.4
Nationwide	24.0	56.2	19.8

Centralized drinking water source areas of APL cities

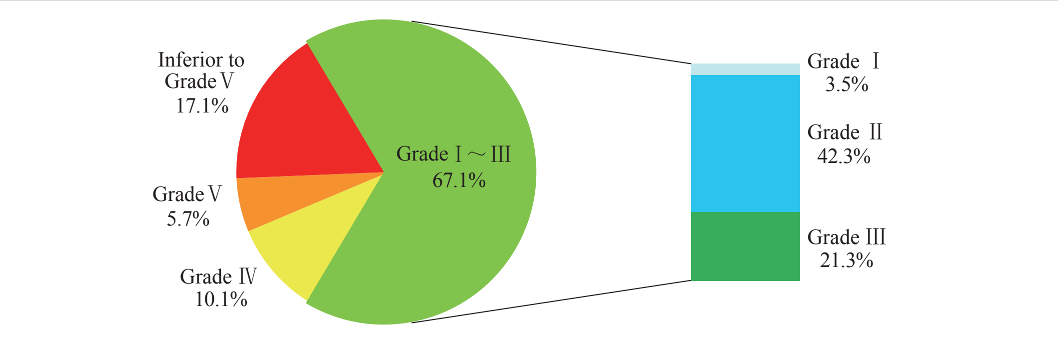
In 2016, among 897 monitoring sections (sites) of the centralized drinking water source in 338 APL cities across the country, 811 met water quality standard for the whole year, taking up 90.4% of the total. Among them, 563 were surface drinking water source areas, 527 of which met water quality standard for the whole year, taking up 93.6%. Major pollution indicators for nonattainment were TP, sulfate and manganese. There were 334 groundwater drinking water source areas, 284 of which met water quality standard for the whole year, taking up 85.0% with major nonattainment pollutants of manganese, iron and ammonia nitrogen.

Key water conservancy projects

Three Gorges Project Area In 2016, among 24 surface water monitoring indicators of main tributaries of Yangtze River in Three Gorges Project area, 9 indicators exceeded relevant quality standard. The nonattainment rate of TN for the monitoring sections was 89.5%, for TP 79.1%, for fecal coliform 5.7%, for COD 4.9%, for ammonia nitrogen 1.3%, for permanganate index 1.5%, for BOD_5 0.9%, for pH 0.3% and for anionic surfactant 0.3%. The comprehensive trophic state index of 77 monitoring sections was 14.8~79.2, among which 24.0% were under eutrophic state, 73.8% mesotrophic status and 2.2% oligotropich 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 water quality standard. The Liyun Section, Baoying Section, Suqian Section, Lunan Section, Hanzhuang Section and Liangji Section of Beijing-Hangzhou Canal in the Middle Route met Grade III standard. All the 6 monitoring sites of the Hongze Lake met Grade V standard and were under light eutrophication. 2 monitoring sites of Luoma Lake and 5 monitoring sites of Nansi Lake met Grade III standard and were under mesotrophic status, while Dongping Lake had 1 monitoring site meeting Grade III standard and 1 monitoring site meeting Grade IV standard and was under mesotrophic status.

South-North Water Diversion Project (Central Route) The Taocha Section, as the water intake of the Central Route of South-North Water Diversion Project, met Grade II standard. All the 5 sites in Danjiangkou Reservoir met Grade II standard and were under mesotrophic status. Among the 17 water sections of 9 tributaries flowing into the Danjiangkou Reservoir, 1 section of the Hanjiang River met Grade I water quality standard and the rest 5 sections met Grade II standard. 10 sections of the Tianhe River, Jinqian River, Langhe River, Duhe River, Laoguan River, Qihe River and Danjiang River met Grade II standard. 1 section of Guanshan River met Grade III standard.



Water quality map of water sections across provincial boundaries in 2016

Trans-province boundary waters

In 2016, the monitoring results of 544 important trans-province boundary waters across the country show that the percentage of sections meeting Grade I, Grade II, Grade III, Grade IV, Grade V and inferior to Grade V standard was 3.5%, 42.3%, 21.3%, 10.1%, 5.7% and 17.1% respectively. Major pollution indicators were COD, ammonia nitrogen and TP. The percentage of sections meeting Grade I~III was up by 2.3 percentage points and 0.8 percentage point reduction was witnessed for the sections failing to meet Grade V standard compared with that of 2015 (514 comparable trans-province boundary sections) .

Inland fishery waters

In 2016, National Fishery Ecological Environment Monitoring Network monitored 80 important spawning sites for fishes and shrimps, feeding grounds, migration waterways, culture areas and nature reserves of the Heilongjiang River basin, Yellow River basin, Yangtze River basin and Pearl River basin with the total monitoring area of 1.874 million ha. Major pollution indicators of important fishery waters of rivers were TN and TP. The ratio of water areas with the monitoring concentration of TN, TP, permanganate index, nonionic ammonia, copper, volatile phenol and petroleum better than assessment standard was 1.0%, 47.4%, 75.9%, 93.8%, 97.4%, 97.8% and 99.3% respectively of the total monitoring areas. The nonattainment range of TN, TP, permanganate index and copper increased compared with that of 2015. Major pollution indicators of important fishery waters of lakes and reservoirs were TN, TP and permanganate index. The percentage of water areas with the monitoring concentration of TN, TP, permanganate index, copper, petroleum and volatile phenol better than assessment standard was 3.4%, 23.0%, 35.4%, 86.1%, 91.4% and 99.6% respectively of the total monitoring areas. Compared with that of 2015, the nonattainment range of TN, TP, permanganate index, volatile phenol and copper increased at different degrees. Permanganate index increased by a relatively large margin and the nonattainment range of petroleum had some reduction. 41 national aquatic germplasm conservation areas (inland) were under national monitoring with the total monitoring area at 3.718 million ha. The major pollution indicator was TN. The percentage of water areas with the monitoring concentration of TN, petroleum, permanganate index, TP and copper better than assessment standard was 1.6%, 91.4%, 94.2%, 96.1% and 99.7% respectively of the total monitoring areas.

Marine Environment

All Sea Areas

The marine areas meeting Grade I standard took up 95% of total marine area under jurisdiction of PRC in spring and summer of 2016. The marine areas failing to meet Grade IV standard were 42,430 km^2 and 37,420 km^2 respectively, 9,310 km^2 and 2,600 km^2 less than those of 2015 respectively.

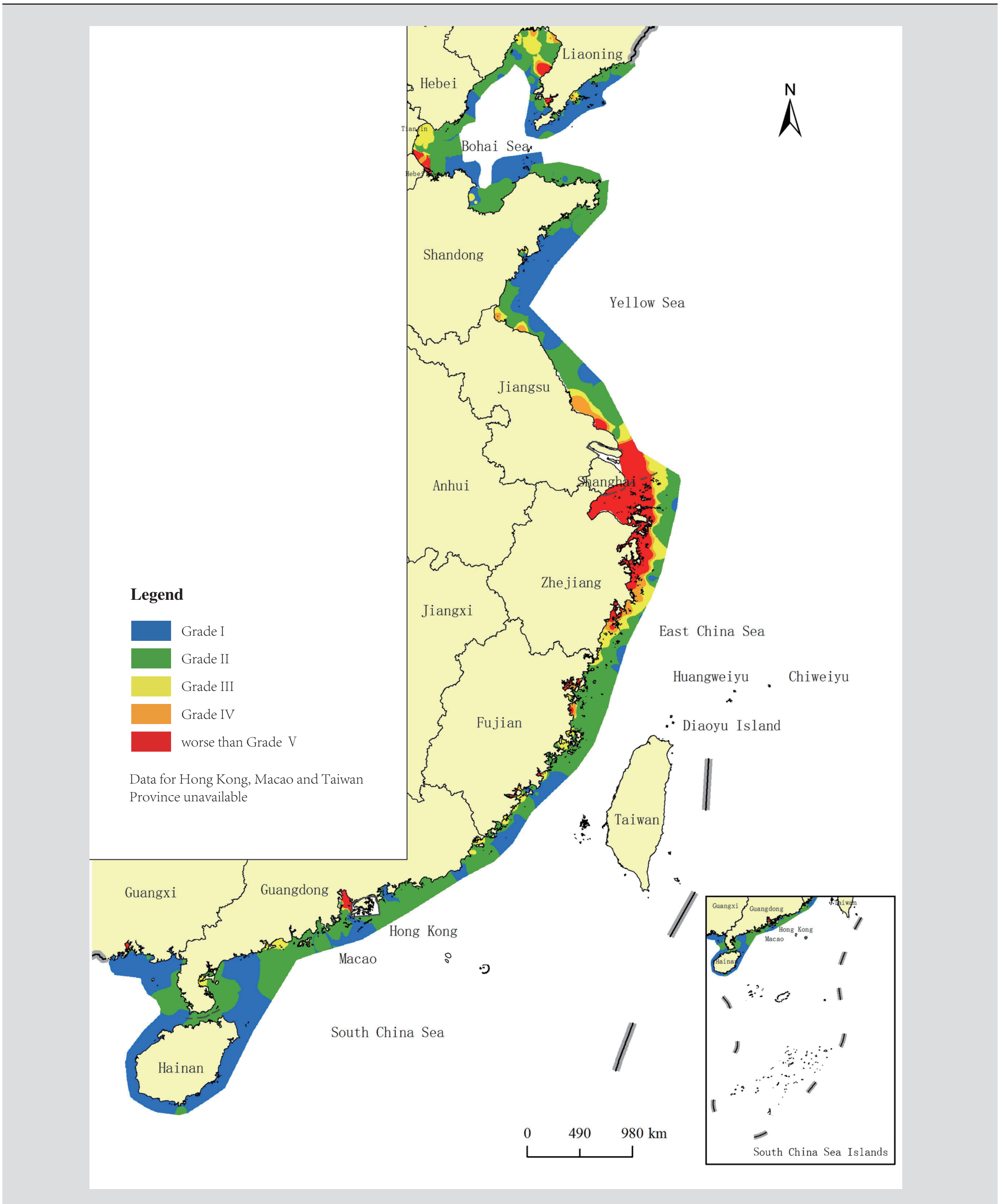
The marine areas failing to meet Grade I standard in 2016

Marine area	Season	Marine area of different grades (km^2)			
		Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Inferior to Grade Ⅳ
Bohai Sea	Spring	11, 660	6, 670	2, 340	3, 050
	Summer	9, 950	5, 690	3, 130	5, 000
Yellow Sea	Spring	7, 310	9, 980	5, 060	6, 420
	Summer	12, 160	7, 440	3, 260	2, 530
East China Sea	Spring	19, 510	17, 040	8, 590	27, 770
	Summer	22, 740	8, 070	8, 060	21, 950
South China Sea	Spring	6, 780	8, 730	1, 840	5, 190
	Summer	4, 460	9, 820	3, 320	7, 940
All sea areas	Spring	45, 260	42, 420	17, 830	42, 430
	Summer	49, 310	31, 020	17, 770	37, 420

Nearshore Marine Areas

In 2016, water quality of nearshore marine water remained stably good. Among 417 nearshore marine water monitoring sites under national monitoring program, 32.4% met Grade I* water quality standard, down by 1.2 percentage points compared with that of 2015; 41.0% met Grade II standard, up by 4.1 percentage points; 10.3% met Grade III standard, up by 2.7 percentage point; 3.1% met Grade IV standard, down by 0.6 percentage point; 13.2% failed to meet Grade IV standard, down by 5.1 percentage points compared with that of 2015. Major pollution indicators were inorganic nitrogen and active phosphates.

*Marine water percent: The percent of amount of certain types of marine water monitoring sites against the total amount is marine water percent.



Water quality of nearshore marine waters of China in 2016

Bohai Sea Nearshore marine water of Bohai Sea was relatively good, the same as that of 2015. 28.4% of nearshore marine water met Grade I quality standard, up by 14.1 percentage points compared with that of 2015; 44.4% met Grade II standard, down by 12.7 percentage points; 17.3% met Grade III standard, up by 3.0 percentage points; 4.9% met Grade IV standard, down by 3.3 percentage points; and 4.9% failed to meet Grade IV standard, down by 1.2 percentage points compared with that of 2015. The leading pollutant was inorganic nitrogen.

Yellow Sea Nearshore marine water of Yellow Sea was good, the same as that of 2015. 38.5% of nearshore marine water met Grade I standard, up by 1.5 percentage points; 50.5% met Grade II standard, down by 1.4 percentage points; 4.4% met Grade III standard, down by 1.2 percentage points; 5.5% met Grade IV standard, up by 3.6 percentage points; and 1.1% failed to meet Grade IV standard, down by 2.6 percentage points compared with that of 2015. The leading pollutant was inorganic nitrogen.

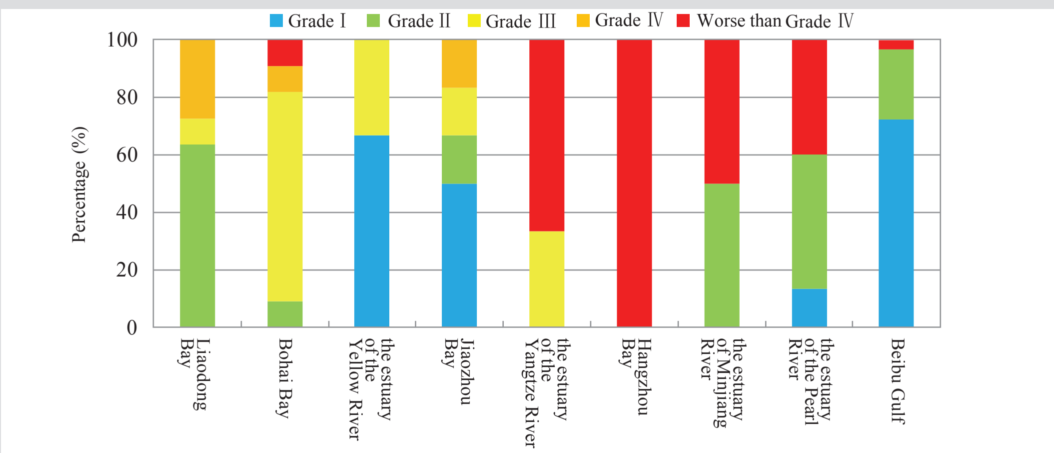
East China Sea Nearshore marine water of East China Sea was not so good but better than that of 2015. 12.4% of nearshore marine water met Grade I standard, down by 7.6 percentage points; 31.9% met Grade II standard, up by 15.1 percentage points; 15.0% met Grade III standard, up by 3.4 percentage points; 3.5% met Grade IV standard, down by 1.8 percentage points; and 37.2% failed to meet Grade IV standard, down by 9.1 percentage points compared with that of 2015. The leading pollution indicators were inorganic nitrogen and active phosphate.

South China Sea Nearshore marine water of South China Sea was of good quality, the same as that of 2015. 47.7% of nearshore marine water met Grade I standard, down by 5.7 percentage points; 40.2% met Grade II standard, up by 2.3 percentage points; 6.1% met Grade III standard, up by 4.2 percentage points; 0% met Grade IV standard, down by 1.0 percentage point; 6.1% failed to meet Grade IV standard, up by 0.3 percentage point compared with that of 2015. Major pollution indicators were pH, inorganic nitrogen and active phosphate.

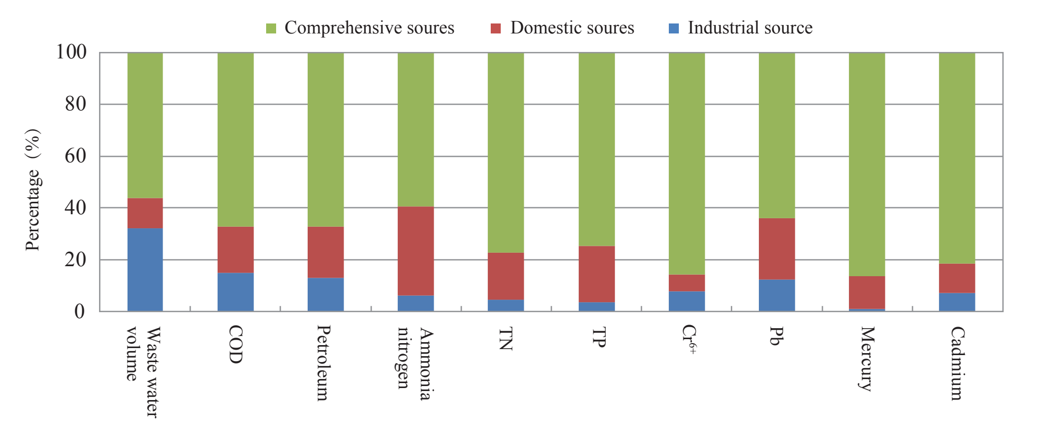
Important estuaries and gulfs Among 9 important bays, Beibu Gulf had excellent water quality. Liaodong Bay, the estuary of the Yellow River and Jiaozhou Bay were of general water quality; while the marine water quality of Bohai Gulf and estuary of the Pearl River was poor. The estuary of the Yangtze River, Hangzhou Bay and estuary of the Minjiang River had extremely poor water quality. The water quality of Liaodong Bay and the estuary of the Pearl River turned better; the water quality of estuary of the Minjiang River became worse, and water quality of other bays basically remained the same compared with that of 2015.

Sea-going rivers In 2016, out of the 192 monitoring sections of the rivers flowing into sea, no section met Grade I standard. 26 sections met Grade II standard, taking up 13.5%; 64 sections met Grade III, taking up 33.3%; 49 sections met Grade IV, taking up 25.5%; 20 sections met Grade V standard, taking up 10.4%; and 33 sections failed to meet Grade V standard, taking up 17.2%. The main pollution indicators were COD, BOD_5 and permanganate index.

Water pollution sources directly discharging into the sea In 2016, there were a total of 419 industrial pollution sources that directly discharged into the sea, domestic pollution sources and comprehensive drain outlets with



The percentage of different water quality of nearshore marine water of important estuaries and gulfs in 2016



The percentage of discharge of major pollutants from different types of pollution sources in 2016

daily discharge volume > 100 m^3 monitored. The total discharge volume of effluent was about 6.5743 billion t, while the discharge volume was 198,555 t for COD, 788.2 t for petroleum, 15,304 t for ammonia nitrogen, 64,466 t for TN and 2,739 for TP. Some of the sources discharged pollutants such as mercury, hexavalent chromium, Pb and cadmium in the sea.

Marine fishery waters

In 2016, the National Fishery Ecological Environment Monitoring Network monitored 40 key spawning grounds, feeding grounds, migration channels, nature reserves and marine culture areas for fish, shrimp, shellfish and alga, which were distributed in the Yellow Sea, Bohai Sea, South China Sea and East China Sea. The monitoring area reached 5.958 million ha. The monitoring results show that the major pollution indicators for spawning grounds, feeding grounds, migration channels, and nature reserves for fish, shrimp, shellfish and alga were inorganic nitrogen and reactive phosphate. The percentage of the monitoring area with concentration of inorganic nitrogen, reactive phosphate, COD and petroleum better than the assessment standard was 14.9%, 38.2%, 76.4% and 94.8% respectively of the total monitoring area. There was some increase in nonattainment area with inorganic nitrogen, reactive phosphate and COD and some reduction of petrol compared with that of 2015. The primary pollution indicators were inorganic nitrogen and reactive phosphate in key marine culture areas. The percentage of monitoring area with concentration of inorganic nitrogen, reactive phosphate, petroleum and COD better than the assessment standard was 17.1%, 22.8%, 60.8% and 74.3% respectively of the total monitoring area. There was evident rise of nonattainment area of inorganic nitrogen, reactive phosphate and COD and a bit rise of nonattainment area of petroleum compared with that of 2015. The monitoring of sediments of 29 important marine fishery waters showed that the nonattainment area of petroleum, copper, cadmium and arsenic took up 8.7%, 3.4%, 3.4% and 3.4% respectively, and the average concentration of zinc, Pb and mercury was better than the assessment standard. The monitoring of 8 national aquatic germplasm resource protection areas (seas) covering 326,000 ha. show that major pollution indicators were inorganic nitrogen and COD. The percentage of monitoring area with concentration of inorganic nitrogen, COD, reactive phosphate and petroleum better than the assessment standard was 23.1%, 46.2%, 78.8% and 89.0% respectively of the total monitoring area.

Land Environment

Land resource and farmland

Up to the end of 2015*, there were 645.4568 million ha. agricultural land across the country, and 134.9987 million ha. of which were farmland, 14.3233 million ha. were orchards, 252.9920 million ha. were forest, 219.4206 million ha. were pasture and grassland; and 38.5933 million ha. were construction land. 31.4298 million ha. construction land was used for cities, towns, villages, plants and mines. In 2015, there were 301,700 ha. reduction of farmland across the country due to reasons such as construction, disasters, grain for green and adjustment of agricultural structure. A total of 242,300 ha. farmland was created due to land control and adjustment of agricultural structure. As a result, there was a net decrease of 59,500 ha. farmland in the year.

The average quality of farmland across the country in 2016 was at Grade 5.11**. A total of 36.5846 million ha. farmland were high grade land, taking up 27.1% of total area; 60.8844 million ha. were intermediate land, taking up 45.1% of the total; and 37.5296 million ha. were low grade land, taking up 27.8% of the total.

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**** show that up to 2014, there were 2.6116 million km^2 desertification land and 1.7212 million km^2 sandy land across the country. Compared with that of 2009, there was a net decrease of 12,120 km^2 desertification land with annual average reduction of 2,424 km^2; 9,902 km^2 net reduction of sandification area with annual reduction of 1,980 km^2 over the past 5 years. There has been reduction of both desertification area and sandification area across the country in three consecutive monitoring periods since 2004, indicating positive signs and effectiveness in these control efforts where the overall degradation situation was basically under control, the desertfied and sandified areas are continuously shrinking, and their ecological functions are strengthening. However, the situation of prevention and control of desertification is still grave.

*By the time this Report was published, 2015 data was employed due to 2016 data under review.

**Based on *National Assessment of Quality of Farmland* (GB/T 33469-2016), there are 10 grades for assessing the quality of farmland. Grade 1 is the best and Grade 10 is the poorest. Grade 1~3 is high grade land, Grade 4~6 is intermediate land, Grade 7~10 is low grade land.

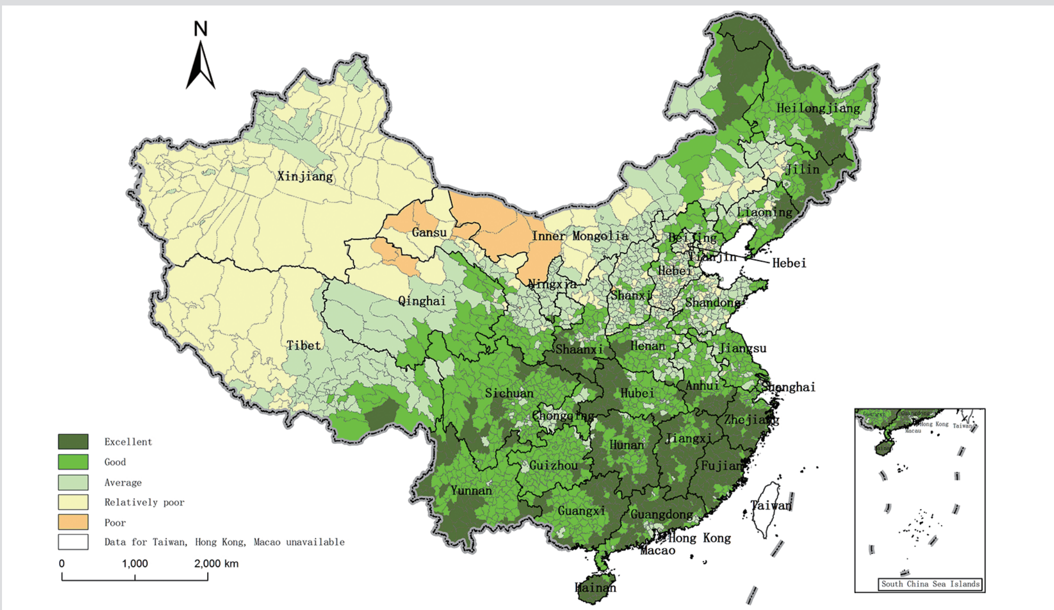
***Up to the time this Report was published, the findings of water and soil conservation of the First National Census on Water remain to be the latest data, so they are adopted here.

****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 data, so they are adopted here.

Natural and Ecological Environment

Ecological environment quality

In 2015*, out of the 2,591 county cities, 548, 1,057, 702, 267 and 17 had excellent, good, ordinary, relatively poor and poor ecological environment quality** respectively. The total area of counties with “excellent” or “good” ecological environment quality took up 44.9% of total land area. They are mainly distributed in the region south to Qinling Mountain and the Huaihe River, Daxing’anling, Xiaoxing’anling areas and Changbai Mountain region in Northeast China. The total area of counties with “ordinary” ecological environment quality took up 22.2%, mainly distributed in regions such as North China Plain, central and western parts of Northeast China Plain, central part of Inner Mongolia, central part of Qinghai-Tibetan Plateau and northern part of Xinjiang. The total area of counties with “relatively poor” or “poor” ecological environment quality took up 32.9% of the total, mainly distributed in western part of Inner Mongolia, northwestern part of Gansu, northern part of Qinghai-Tibetan Plateau and most part of Xinjiang.



Map of countywide eco environment quality of China in 2015

*The assessment of eco environment quality lags behind the assessment of other environmental elements by one year due to time required for data collection.

**Eco environment 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 at 55~75 indicates good environment with relatively high vegetation coverage, relatively rich biodiversity and suitable for human life. Ecological Index 35~55 refers to ordinary eco environment with intermediate vegetation coverage, general biodiversity and relatively suitable to human life but with some constraining factors unsuitable to human life. Ecological Index at 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.

Biodiversity

In ecosystem diversity, China has all kinds of terrestrial ecosystem on Earth. There are 212 types of forest, 36 types of bamboo forest, 113 types of shrubs, 77 types of meadows and 52 types of deserts. The freshwater ecosystems in China are complex. Natural wetlands include 4 types: marsh, nearshore and coastal wetland, riparian wetland and lake wetland. For nearshore marine waters, there are 4 big marine ecosystems such as the Yellow Sea, East China Sea, South China Sea and Kuroshio Basin, distributed with typical marine ecosystems such as coastal wetland, mangrove, coral reef, estuary, gulf, lagoon, island, upwelling and seagrass bed; natural landscape such as submarine ancient forest, marine-abrasion and marine accumulation geomorphy as well as natural relics. There are also artificial ecosystems such as cropland ecosystem, artificial forest ecosystem, artificial wetland ecosystem, artificial grassland ecosystem and urban ecosystem.

In terms of biodiversity, 86,575 species and subspecies have been found in China. Among them, 35,905 belong to animalia species, 41,940 belong to botanical species, 469 belong to bacteria species, 2,239 belong to pigment species, 3,488 belong to fungi, 1,729 belong to protogenesis animalia, and 805 belong to virus. A total of 420 precious endangered wildlife species are included in the National Catalogue of Wildlife under Key State Protection. Several hundred animal species are unique in China including giant panda, crested ibis, golden monkey, South China tiger and Yangtze alligator. More than 10,000 fungi species have been identified in China.

In terms of genetic resource diversity, 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 show that 3,767 species were endangered, taking up 10.9%. 2,723 species belong to nearly-threatened (NT) Grade and 3,612 belong to data deficient (DD) Grade. 10,102 species of higher plants are in urgent need of close attention and more protection, taking up 29.3% of the total assessment number.

The endangerment assessment results of the 4,357 identified vertebrates (marine fishes were not included) show that 932 vertebrates were endangered, taking up 21.4%; 598 vertebrates belong to NT Grade and 941 belong to DD Grade. 2,471 vertebrates are in urgent need of close attention and more protection, taking up 56.7% of the total assessment number.

Alien invasive species Over 560 alien invasive species have been identified, and they appeared to be on the rise year by year. The invasion of alien species has exerted serious impacts on China's ecological environment, economic development and people's health.

Nature reserves

Up to the end of 2016, 2,750 nature reserves of various kinds at different administrative levels had been established across the country with total area of about 147.33 million ha., of which 142.88 million ha. were land, taking up 14.88% of total land area. There were 446 national nature reserves with a total area of 96.95 million ha., taking up about 9.97% of total land area.

Wetland In 2016, the total number of national wetland parks reached 836, and 134 new national wetland parks (trial) were approved with the increase of 235,000 ha. wetland protection area. Measures were taken for the protection and compensation of wetland area. Over 300 wetland projects were funded by central budget, 300,000 mu deteriorating wetland has been recovered, and 200,000 mu farmland had been returned to wetland.

National Marine Nature Reserves Out of the 65 national marine nature reserves under national monitoring, the protection targets in 36 national marine nature reserves were specially monitored and water quality in 54 national marine nature reserves were specially monitored. The monitoring results show that protection targets and water quality in most of the reserves basically kept stable. Among the protection targets under monitoring, coral, mangroves and algae remained basically stable. The area of shell ridge decreased and ancient stumps above the sea level were mostly eroded.

Typical marine ecosystems There were 21 typical marine ecosystems under monitoring. Among them, 23.8% were under health status, 66.7% were under sub-health status and 9.5% were under non-health status.

Scenic spots Up to the end of 2016, 225 scenic spots at national level had been established with total area of about 103,600 km^2, taking up 1.08% of the total land area of China. 737 scenic spots at provincial level covered the area of 92,000 km^2, and scenic spots at and above provincial level took up 2.03% of the total land area of China. 40 scenic

Various types of nature reserves of China in 2016

Type	Amount	Area (ha.)
Forest	1,427	31,728,927
Grassland and meadow	41	1,654,155
Desert	31	40,054,288
Inland wetland	383	31,105,732
Sea coast	68	716,828
Wild animals	529	38,770,689
Wild plants	153	1,769,717
Geological relics	85	982,564
Ancient biological relics	33	549,557
Total	2,750	147,332,457

The status of typical marine ecosystems in 2016

Types of ecosystem	Name of ecosystem under monitoring	Area of ecosystem under moni–toring (km^2)	status
Estuary	Shuangtaizi	3,000	Sub-health
	Luanhe river-Beidaihe	900	Sub-health
	The Yellow River	2,600	Sub-health
	The Yangtze River	13,668	Sub-health
	The Pearl River	3,980	Sub-health
Bay	Jinzhou Bay	650	ill health
	Bohai Bay	3,000	Sub-health
	Laizhou Bay	3,770	Sub-health
	Hangzhou Bay	5,000	ill health
	Leqing Bay	464	Sub-health
	Coastal area of East Fujian	5,063	Sub-health
	Daya Bay	1,200	Sub-health
Tidal flat wetland	Tidal flat wetland in North Jiangsu	15,400	Sub-health
Coral reef	Southwestern costal area of Leizhou Peninsula	1,150	health
	Beihai of Guangxi	120	health
	East costal area of Hainan	3,750	Sub-health
	Coral reef in Paracel	400	Sub-health
Mangrove forest	Beihai of Guangxi	120	health
	Beilun estuary	150	health
Sea grass bed	Beihai of Guangxi	120	Sub-health
	East costal area of Hainan	3,750	health

spots at national level and 9 scenic spots at provincial level were added to the UNESCO World Heritage List.

Forest Environment

Forest Resource According to the findings* of the Eighth National Investigation on Forest Resources (2009-2013), the total forest area of the country was 208 million ha with forest coverage at 21.63%. The total stumpage volume was 16.433 billion m^3, and the total forest reserves were 15.137 billion m^3. China ranked No.5 in forest area and No. 6 in forest reserves in the world. The artificial forest area of China ranked No.1 in the world.

The total biomass of forests in the country was 17.002 billion t, and total carbon reserve reached 8.427 billion t. There were 580.7 billion m^3 for annual water conservation, 8.191 billion t for annual soil fixation, 430 million t for annual conservation of nutrients, and 38 million t for annual absorption of pollutants and 5.845 billion t for annual dust retention.

Forest biological hazards In 2016, 11.8669 million ha forests across the country were subject to relatively heavy impacts of forestry pest, down by 1.15% compared with that of 2015. The forest area with serious harmful pests was 660,300 ha, down by 17.18%, but it was still under relatively heavy disaster. A total of 8.5704 million ha forests were under insect hazards, up by 1.23%. A total of 1.3414 million ha forests were under tree disease, down by 3.53%. A total of 1.9551 million ha forests were subject to rat and rabbit hazards, down by 8.99% compared with that of 2015. In 2016, 7.9553 million ha forests across the country had finished the prevention and control of forestry pest, and the total prevention and control area reached 23.4937 million ha. The disaster rate of major forestry pest was controlled under 4.5‰ and over 85% of total forests had no forestry pests.

The invasion of a total of 42 alien species has caused serious damages to forestry. Among them, North American pinewood nematode (Bursaphelenchus xylophilus), American white moth (Hyphantria cunea), pine greedy scale (Hemiberlesia pitysophila Takagi) and Lobdelly Pine Mealybug (Oracella acuta (lobdell) Ferris) affected 1.5888 million ha forests and severely threatened China's forest resources.

Forest fire In 2016, there were a total of 2,034 forest fires across the country affecting 6,224 ha forests with 36 casualties (20 deaths). There were no super large forest fires and accidents involving heavy casualties. Compared with that of 2015, the number of forest fires went down by 30.7%, the affected forest areas went down by 51.9%, and the number of casualties went up by 38.5% (the number of deaths went down by 13.0%).

Grassland Environment

Grassland resource In 2016, grassland area across the country was about 400 million ha, accounting for about 41.7% of total land area. It is the biggest terrestrial ecosystem and ecological security barrier. North China and West China are the main areas of natural grassland. The total grassland area of 12 provinces (autonomous regions or municipality) in West China stood at 331 million ha, taking up 84.2% of the total. The total grassland area of the 6 big pasture regions of Inner Mongolia, Xinjiang, Tibet, Qinghai, Gansu and Sichuan was 293 million ha, accounting for 3/4 of total grassland area of China. The grassland in southern part of China was dominated by grass hills and slope grass land, mostly located in mountain and hill areas with total area about 67 million ha.

Grassland productivity In 2016, the percentage of comprehensive vegetation coverage of grassland amounted to 54.6%, up by 0.6 percentage point compared with that of 2015. The total fresh grass output of natural grassland was 1,038.6486 million t, up by 1.03% and equivalent to 320.2943 million t dry grass; the carrying capacity for livestock was about 251.7559 million sheep, both up by 0.93% compared with that of 2015. The total fresh grass output of 23 major provinces (autonomous regions or municipality) was 965.2613 million t, taking up 92.93% of the total and equivalent to 301.9487 million t dry grass, and the carrying capacity for livestock was about 237.3825 million sheep.

Grassland disaster In 2016, there were 56 grassland fires across the country. Among them, 53 were ordinary grassland fires, 2 were relatively big fires and 1 was

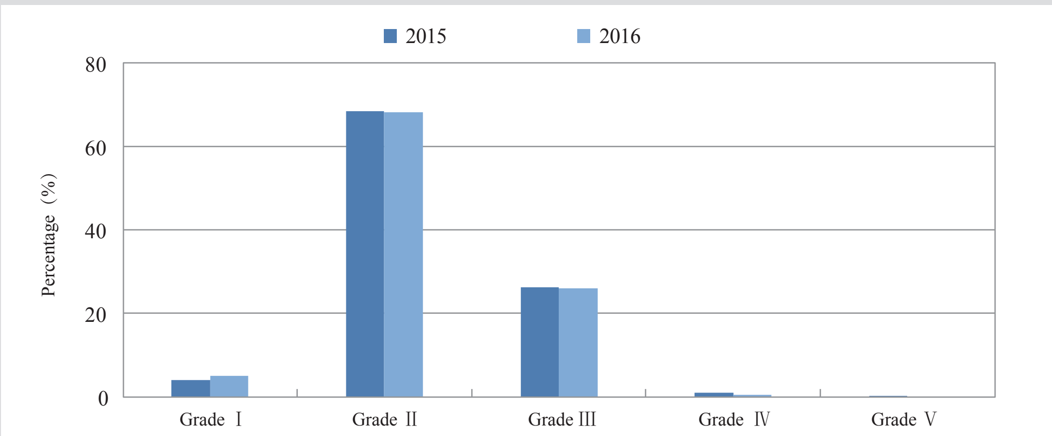
*Up to the time this Report was published, the findings of the *Eighth National Investigation on Forest Resources* (2009-2013) remained to be the latest data, so they are adopted here.

especially big fire. A total of 36,916.8 ha grassland in accumulation was on fire with 6.073 million Yuan of economic loss and loss of 3,075 heads of livestock. There were 32 times of reduction of grassland fires, 81,200 ha reduction of fire affected area and 101.537 million Yuan reduction of economic loss compared with that of 2015. A total of 28.07 million ha grassland across the country was under rat damage, down by 3.5% and taking up about 7.1% of total grassland area. A total of 12.515 million ha grassland across the country was under insect damages, basically the same as that of 2015 and accounting for about 3.2% of total grassland area nationwide.

Acoustic Environment

Regional Acoustic Environment

In 2016, regional acoustic environment of 322 APL cities covering 55,449 sites was under monitoring, and the average regional noise was 54.0 dB (A). Among them, 16 cities met Grade I daytime environmental noise standard, taking up 5.0%; 220 cities met Grade II daytime environmental noise standard, taking up 68.3%; 84 cities met Grade III noise standard, taking up 26.1%; 2 cities met Grade IV daytime noise standard, taking up 0.6%; and no city met Grade V daytime noise standard[*].



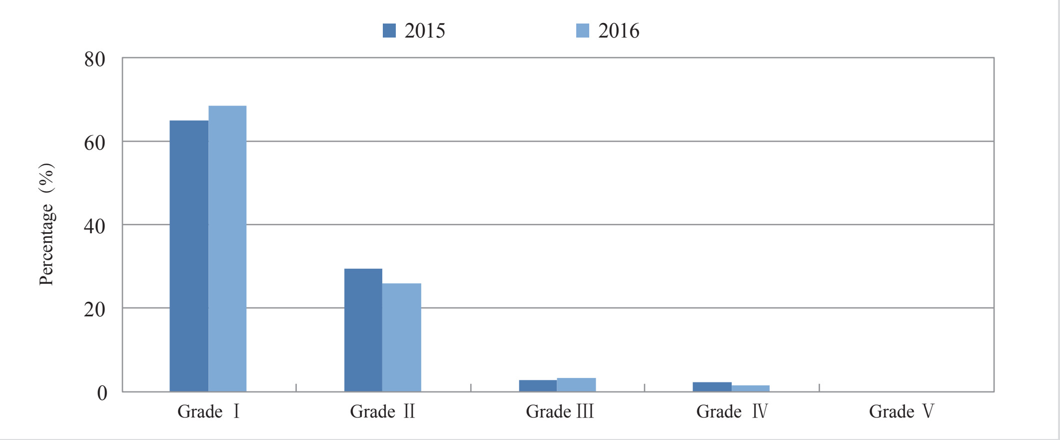
Annual comparison of urban daytime regional noise of cities across China between 2015 and 2016

Traffic noise

In 2016, the average traffic noise of 320 APL cities covering 20,981 monitoring sites on daytime noise monitoring was 66.8 dB (A). Among them, 220 cities met Grade I traffic noise standard, taking up 68.8%; 84 cities met Grade II traffic noise standard, taking up 26.2%; 11 cities met Grade III traffic noise standard, taking up 3.4%; 5 cities met Grade IV traffic noise standard, taking up 1.6%; not a city met Grade V traffic noise standard[**].

[*]The average equivalent sound level of regional acoustic environment ≤ 50.0 dB (A) is at Grade I; 50.1~55.0 dB (A) at Grade II; 55.1~60.0 dB (A) at Grade III; 60.1~65.0 dB (A) at Grade IV and > 65.0 at Grade V.

[**]The average equivalent sound level of traffic noise ≤ 68.0 dB (A) is at Grade I, 68.1~70.0 dB (A) at Grade II, 70.1~72.0 dB (A) at Grade III, 72.1~74.0 dB (A) at Grade IV and > 74.0 dB (A) at Grade V.



Annual comparison of urban daytime traffic noise of cities across China between 2015 and 2016

Acoustic environment of urban functional zones

In 2016, acoustic environment of urban functional zones of 309 cities at or above prefecture level was under monitoring, covering 21,624 sites for different functional zones* and 10,812 sites both for daytime monitoring and night monitoring. On the average, 9,964 daytime monitoring sites met noise standard with the attainment rate of 92.2%; 7,999 night noise monitoring sites met noise standard with the attainment rate of 74.0%.

Annual comparison of attainment rate of different functional zones across China between 2015 and 2016 (Unit: %)

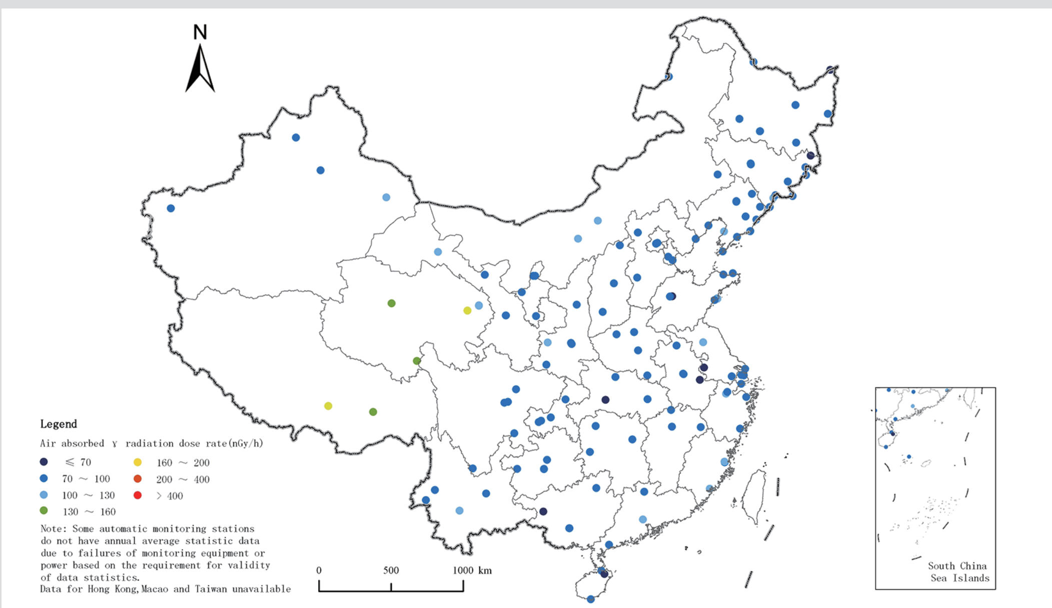
Year	Type 0		Type 1		Type 2		Type 3		Type 4a		Type 4b	
	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night	Day	Night
2016	78. 6	57. 3	87. 4	72. 8	92. 5	83. 4	97. 2	88. 3	92. 6	50. 5	95. 3	72. 1
2015	80. 7	64. 9	87. 3	74. 7	93. 0	83. 3	97. 3	88. 1	93. 3	50. 7	93. 8	64. 1

*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 where residential communities, commerce and industries are mixed, 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.

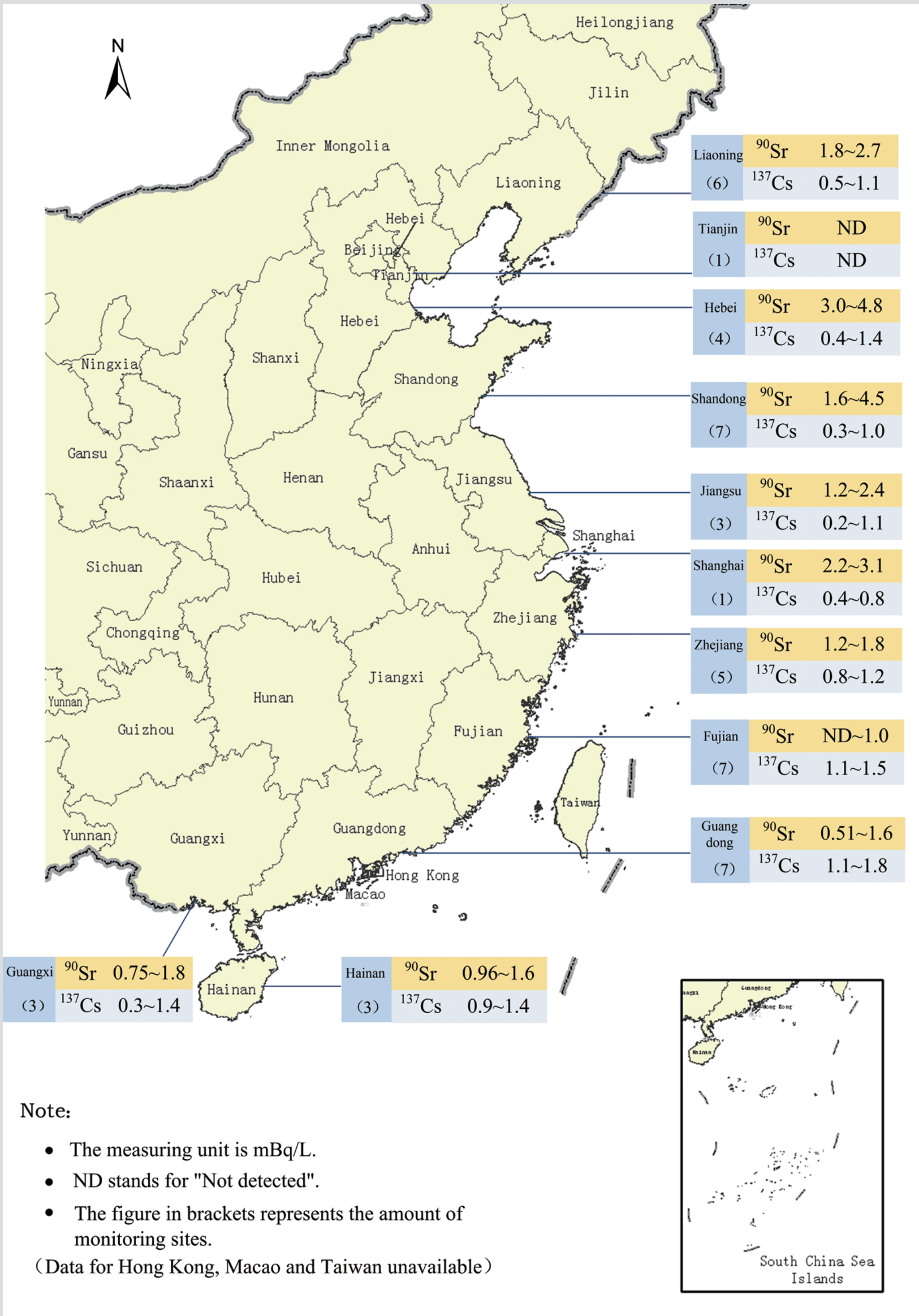
Radiation Environment

Ionizing Radiation

The environmental ionizing radiation level in China remained within the fluctuation range of natural background level in 2016. 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. The activity concentration of natural radionuclides of the Yangtze River, Yellow River, Pearl River, Songhua River, Huaihe River, Haihe River, Liaohe River, 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. Among them, the activity concentration of artificial radionuclides of marine water was lower than 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 radionuclide.



The real–time consecutive air absorbed γ radiation dose rate monitored at radiation environment automatic monitoring stations in China in 2016



Note:

- The measuring unit is mBq/L.
- ND stands for "Not detected".
- The figure in brackets represents the amount of monitoring sites.

(Data for Hong Kong, Macao and Taiwan unavailable)

Activity concentration of Sr–90 and Cs–137 of nearshore water in China in 2016

Environment ionizing radiation in the vicinity of in-service nuclear power plants In 2016, there was no abnormal real-time consecutive air absorbed γ radiation dose rate caused by in-service nuclear power bases. There was no abnormal activity concentration of radionuclides in air, water, soil and organisms in the vicinity of Yangjiang Nuclear Power Base, Hongyanhe Nuclear Power Base, Fuqing Nuclear Power Base, Fangchenggang Nuclear Power Base and Changjiang Nuclear Power Base. Trace content of artificial radionuclides such as cobalt-60 was detected in some aerosol samples in the vicinity of Qinshan Nuclear Power Base and Tianwan Nuclear Power Base. There was some rise of activity concentration of tritium in some environmental media in the vicinity of Qinshan Nuclear Power Base, Dayawan Nuclear Power Base, Tianwan Nuclear Power Base and Ningde Nuclear Power Base compared with the background value before the operation of those nuclear power plants. The assessment findings show that their radiation dose to the public was far below the national limit.

Environment ionizing radiation in the vicinity of civil research reactors In 2016, there was no abnormal situation of air absorbed γ radiation dose rate and activity concentration of radionuclides in aerosol, sediments, water and soil in vicinity of research facilities such as 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 China Institute of Atomic Energy Science and Nuclear Power Institute of China. The assessment findings show that its radiation dose 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 2016, 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 abnormal activity concentration 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 2016, 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, gross α activity concentration of aerosol, total uranium and Ra-226 concentrations in surface water were similar to the historical average. 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 2016, the environment electromagnetic radiation level of provincial capital cites was far lower than the public exposure limit 12 V/m (frequency at 30~3,000 MHz) specified in the Controlling Limits for Electromagnetic Environment (GB 8702-2014). The environmental electromagnetic radiation levels of large electromagnetic radiation 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 transformers were lower than the public exposure limit specified in the Controlling Limits for Electromagnetic Environment (GB 8702-2014).

Transport and Energy

Transport

Transport infrastructure Up to the end of 2016, the total mileage of railway in operation across the country was 124,000 km with 80,000 km of electric mileage. The total road length of China reached 4.6963 million km with 131,000 km of highway. The total length of navigable inland river channels across the country was 127,100 km. There were 30,388 berths in all ports and harbors across the country. There were a total of 218 civil airports with certificate in the country.

Transport services In 2016, the railway across the country completed 2.814 billion people passenger traffic volume with 1,257.929 billion person·km turnover of passenger traffic. It had finished 3.332 billion t of total shipments of goods with total freight volume at 2,379.226 billion t·km. The business coaches across the country had finished 15.428 billion people highway traffic with 1,022.871 billion person·km of turnover volume of passenger transportation. The commercial freight vehicles across the country have finished transport of 33.413 billion t freight volume with 6,108.01 billion t·km freight mileage. The country finished waterway transport of 272 million people with 7.233 billion person·km turnover volume of passenger transportation. The country finished 6.382 billion t waterway freight volume with 9,733.88 billion t·km freight mileage. The civil aviation across the country had finished 488 million person·times volume of passenger traffic with 835.954 billion person·km turnover volume of passenger transportation. The government has finished 6.669 million t freight volume with 22.113 billion t·km freight turnover. In the whole year, urban passenger transport system had carried 128.515 billion passengers. Among them, buses and trolleys transported 74.535 billion people with mileage of 35.832 billion km; rail transport system transported 16.151 billion people with mileage of 433 million train·km; patrolling taxis finished transport of 37.735 billion people with mileage of 155.250 billion km. Moreover, passenger ferries had transported 94 million people.

Energy

Based on preliminary accounting, the total consumption of primary energy across the country was 4.36 billion t coal equivalent, up by 1.4% compared with that of 2015. Among them, coal consumption went down by 4.7%, crude oil consumption went up by 5.5%, natural gas consumption went up by 8.0%, and electricity power consumption went up by 5.0%. Coal consumption took up 62% of total energy consumption, and the consumption of clean energies such as hydropower, wind power, nuclear power and natural gas took up 19.7% of the total energy consumption. The energy consumption per 10,000 Yuan GDP went down by 5.0%.

The annual comparison of output of major energy products in 2016

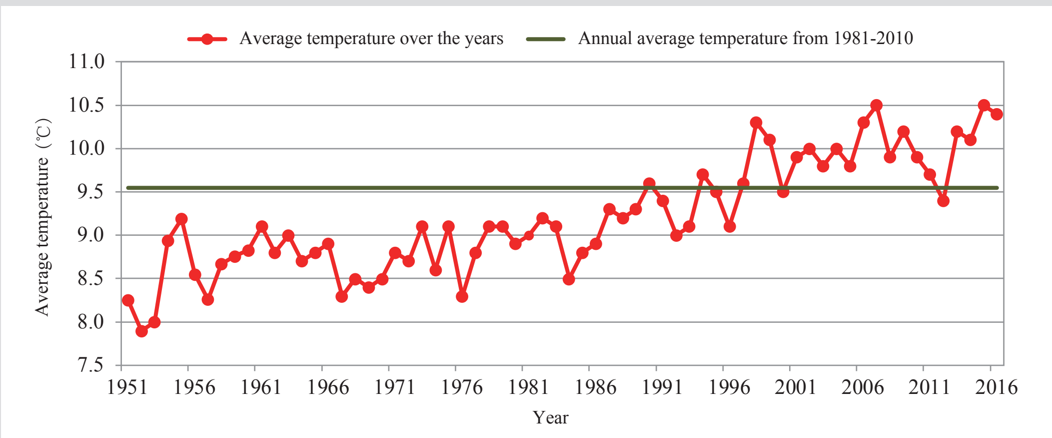
Product name	Unit	Output	Change compared with that of 2015 (%)
Total output of primary energy	100 million t coal equivalent	34.6	-4.2
Raw coal	100 million t	34.1	-9.0
Crude oil	10,000 t	19,968.5	-6.9
Natural gas	100 million m^3	1,368.7	1.7
Power generation	100 million kW•h	61,424.9	5.6
Thermal	100 million kW•h	44,370.7	3.6
Hydro	100 million kW•h	11,933.7	5.6
Nuclear power	100 million kW•h	2,132.9	24.9

Climate and Natural Disasters

Air temperature

In 2016, the national average air temperature was 10.36 ℃ , 0.81 ℃ higher than the historic average (9.55 ℃), the third warmest since 1951, only second to 10.49℃ in 2015 and 10.45℃ in 2007. The air temperature of each season was higher than historic record with that of the summer reaching the highest; the air temperature of each month was higher than historic average, with 2.6 ℃ higher in December which was higher than the previous record for the period.

Except 0.2℃ lower in Heilongjiang, the average air temperature of 31 provinces (autonomous regions or municipalities) was higher than the historic average. The average air temperature of 4 provinces of Qinghai, Gansu, Henan and Guizhou was the highest in the history.



The annual change of the national average air temperature from 1951–2016

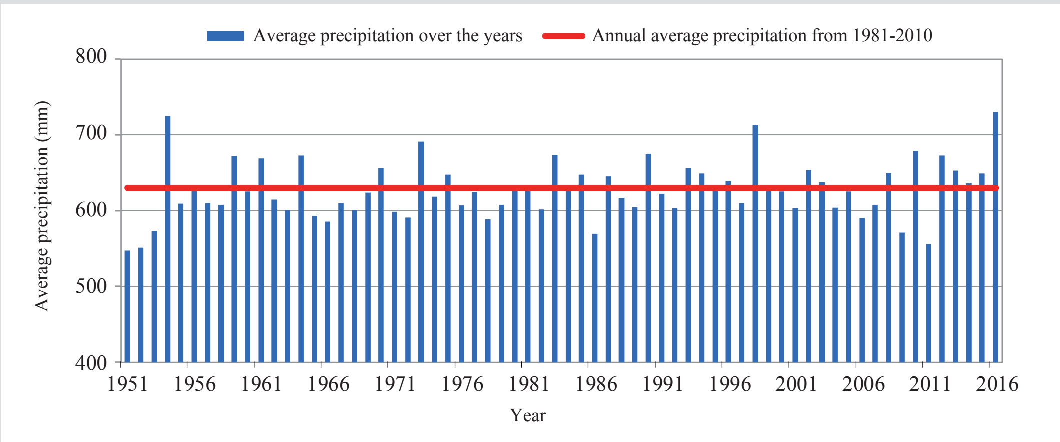
Precipitation

In 2016, the range of annual precipitation across the country was 3.5 mm (Toksun in Xinjiang) ~3,494.4 mm (Mount Huang in Anhui). The national average precipitation was 730.0 mm in 2016, up by 16% compared with the historic average (629.9 mm) and up by 13% compared with that of 2015 (648.8 mm), ranking the highest since 1951. The precipitation went down in February and August, similar to the historic average in March and more in other months with 94% increase in January and 55% increase in October, both higher than the previous records of the historical period.

The findings of spatial distribution analysis show that the precipitation was 1,200~2,000 mm in regions such as mid and lower reaches of the Yangtze River as well as the regions south to the river, most of Chongqing, eastern part of Guizhou and southern part of Yunnan, with the precipitation over 2,000 mm in regions of southern part of Anhui, southeastern part of Jiangxi, Fujian, most parts in Guangdong and Hainan. The precipitation was 400~1,200 mm in regions of Northeast

China, Northern China, southeastern part of Northwest China, the Yellow River and the Huaihe River, north to the Yangtze River and Huaihe River, north to the Yangtze River and Hanjiang River, Sichuan, eastern and northern part of Yunnan, western part of Guizhou, central and western parts of Tibet and southeastern part of Qinghai. The precipitation was 100~400 mm in regions like most parts of Inner Mongolia, Ningxia, central and western part of Qinghai, western part of Tibet and northern part of Xinjiang. The precipitation was less than 100 mm in regions such as southern part of Xinjiang and northwestern part of Gansu.

Compared with the historical average, the precipitation of most parts of China was similar to or higher than the historical average. There was 20%~50% increase of precipitation in regions including the central part and northeastern part of Northeast China, western part of North China, the middle and lower reaches of the Yangtze River, southern part of the region south to the Yangtze River, the central and eastern part of South China, southern part of Chongqing, central and southern part of Hubei, most parts of Xinjiang, northwestern part of Gansu, western part of Inner Mongolia and western part of Tibet. There was 150%~200% precipitation in regions of southern part of Jiangsu, southeastern part of Anhui and southern part of Fujian.



The annual change of national average precipitation from 1951–2016

Meteorological disaster

Rainstorm and flood In 2016, it entered the flood season 16 days earlier than the normal years, 45 days earlier than that of 2015, being the earliest in recent 7 years. There were 46 regional disastrous rainstorms across the year, the fourth most since 1961. 3/4 of cities and prefectures across China suffered from rainstorms with the days of rainstorm ranking the first since 1961. 26 provinces (autonomous regions, municipalities) were stricken by water logging due to heavy rainfall. The floods resulted in the water levels of 473 rivers higher than the warning level, 118 rivers higher than the safety level and 51 rivers reaching the highest level in the history. The flood disasters led to the damage of 139 million mu crops, 102 million affected people, and the collapse of 430,000 houses with direct economic loss of 366.1 billion Yuan. There was 14% reduction of disaster-hit areas of crops, 27% reduction of affected population, 49% reduction of death and 57% reduction of collapsed houses compared with the historical average since 2000. There was 150% increase of economic loss.

Drought There was no large-scale and long-term severe drought in 2016, so drought across the country in 2016 was lighter than that of historical average. The drought-hit areas across China took up 37% of the total areas suffering from meteorological disasters. Summer drought hit Northeast China and eastern part of Inner Mongolia. The regions of the Yellow River and Huaihe River, the Yangtze River and Huaihe River, and Shaanxi suffered from drought both in summer and autumn. The regions such as Hubei, Hunan, Guizhou and Guangxi suffered from drought in autumn. A total of 303 million mu crops across the country were under drought, 148 million mu were affected, 91.96 million mu caused disaster. A total of 4.69 million people and 6.5 million livestock suffered from tentative difficulty in access to drinking water due to drought. There was 31% reduction of drought affected cropland area, 51% reduction of damaged area and 80% reduction of population with difficulty in access to drinking water due to drought compared with that of the historical average since 2000.

Typhoon In 2016, there were 26 typhoons (the maximum wind ≥ Grade 8) in the Northwest Pacific Ocean and South China Sea, similar to the historical average (25.5). 8 of them landed in China, 0.8 more than the historical average (7.2). The intensity of them was stronger and 6 of them were violent typhoons or even above the level. Such intensity was the highest in the history and the average intensity when landing was the third most violent since 1973. The landing time of the first typhoon Nepartak was the second latest but with violent intensity, being the most violent first typhoon since 1949 and causing the greatest casualties in 2016. Meranti was the strongest typhoon of those landing in China in 2016 and led to the most severe economic loss. All through the year, typhoons caused 174 deaths and 24 missing with direct economic loss of 76.65 billion Yuan. There was more direct economic loss but evidently less deaths or missing due to typhoons in 2016 compared with the annual average of 2006-2015.

Strong convective weather In 2016, strong convective weather such as heavy wind, hail, tornado, thunder and lightning occurred frequently, causing relatively heavy loss. There were 59 large-scale strong convective weather processes, being the most of the same historical period since 2010. Over 2,000 counties (cities) suffered from hail or tornado. Compared with the annual average of 2001-2015, there was evidently more hails with severe damage caused by hail in North China, and there was more disaster-hit area and economic loss but less deaths. The worst-hit regions were Jiangsu, Shanxi and Xinjiang. On June 23, the most violent tornado hit Yancheng, Jiangsu province, which caused the largest number of deaths due to tornado in the last 25 years.

High temperature There were 5 to 10 high-temperature days more in South China. The average amount of days with high air temperature (daily maximum air temperature ≥ 35℃) in summer across the country was 9.9 days, 3 days more than that of normal years, the second most since 1961 and only second to that of 2013. The average high-temperature days in summer were 24.6 in South China, the most since 1961. Among cities in South China, the high-temperature days in Guangdong and Guangxi are the most since 1961. In summer, 4 regional high temperature weather processes occurred across China. From July 20 to August 26, a total of 1,653 counties (cities) in 30 provinces (autonomous regions, municipalities) suffered from over 35℃ high temperature days. Among them, the highest temperature of 103 counties (cities) surpassed 40℃ and the highest temperature of 64 counties (cities) went beyond the local historical maximum.

Low temperature In 2016, there were less low-temperature freeze damages and snow disasters leading to 12 deaths, 2 million ha affected cropland area, 263,000 ha cropland with no yield and the consequent economic loss of 17.9 billion Yuan. There were less deaths, affected area and direct economic loss compared with the annual average of 2010-2015. In late January, South China suffered from freezing rain and snow weather with 69 counties (cities) reaching the lowest temperature in recorded history and severe impacts on agriculture, forestry, transportation, power supply and communication. From mid-February to early March, central and eastern part of China suffered from cold wave successively which adversely affected Spring Festival travel rush and the normal growth of crops. In late November, central and eastern part of China suffered from cold wave again, and the low temperature, rain and snow caused damages to some facility-based agriculture in the Yangtze River and Huaihe River, the Yangtze River and Hanhe River and Henan.

Sandstorm In spring of 2016, there was less sand and dust weather and the overall impacts of sand & dust weather was less compared with that of 2015. There were 8 times of sand and dust weather, 9 times less than the historical average. The average amount of sand & dust days in North China was 2.4 days, 2.7 days less than the historical average, the third least since 1961. The days from May 10 to May 11 witnessed the strongest sandstorm in 2016, and blowing sand and floating dust occurred in southern Xinjiang basin, central part of Inner Mongolia, northern part of Ningxia, western part of Liaoning and western part of Jilin with strong sandstorm sweeping some parts of southern Xinjiang basin.

Earthquake disaster

In 2016, there were 33 earthquakes at or above 5.0 Richter Scale (18 happened in Mainland and 15 happened in Taiwan). Among them, 9 earthquakes were at 6.0~6.9 Richter Scale, and 24 earthquakes were at 5.0~5.9 Richter Scale, and the earthquake in Gaoxiong, Taiwan on June 2 and the earthquake in Aketedu county, Xinjiang were at 6.7 Richter Scale, being the strongest in 2016. In Mainland there were 16 earthquake disasters. According to the grading standard of

National Earthquake Contingency Plan, there were 3 relatively severe earthquake disasters and 13 general earthquake disasters, totally resulting in 2 deaths and 103 injuries with direct economic loss of 6.687 billion Yuan. The earthquake of 6.7 Ricer Scale in Gaoxiong, Taiwan on February 6 caused 117 deaths and 559 injuries.

Geological disaster

In 2016, there were 9,710 various kinds of geological disasters across the country, causing 370 deaths, 35 missing, 209 injuries and the consequent direct economic loss of 3.17 billion Yuan. There were 18.1% increase of the occurrence of geological disasters, 41.1% rise of death & missing and 27.4% rise of direct economic loss compared with that of 2015. There were 21 super-large geological disasters causing 97 deaths, 10 missing, 29 injuries and direct economic loss of 1.27 billion Yuan. There were 41 large geological disasters causing 25 deaths, 5 missing, 7 injuries and direct economic loss of 280 million Yuan. There were 307 mid-sized geological disasters causing 107 deaths, 11 missing, 64 injuries and direct economic loss of 640 million Yuan. There were 9,341 small geological disasters causing 141 deaths, 9 missing, 109 injuries and direct economic loss of 980 million Yuan.

Marine disaster

In 2016, various kinds of marine disasters brought about 5 billion Yuan direct economic loss and 60 deaths (including missing). Among them, storm surges caused the most severe direct economic loss, taking up 92% of the total direct economic loss due to marine disasters. The deaths (including missing) were all caused by sea waves. As for the serious direct economic loss caused by a single marine disaster, the storm surge of 1614 Super Typhoon Meranti and 1616 Super Typhoon Malakas caused the economic loss of 919 million Yuan, the storm surge of 1617 Super Typhoon Megi 892 million Yuan, and 160720 extratropical storm surge 856 million Yuan.

Data Sources and Explanations for Assessment

The data on the state of environmental quality in the current report is dominated by the monitoring data of National Environmental Monitoring Network. Meanwhile, the report applies the environment data provided by relevant ministries and commissions. Among them, the information about groundwater quality of 225 APL cities, land resource and arable land as well as geological disasters is provided by Ministry of Land and Resources. Data on scenic spots and historic sites is provided by Ministry of Housing and Urban-Rural Development. The data on transportation is provided by Ministry of Transport. The data on groundwater environment quality assessed with river basin as a unit, water quality of trans-province boundary waters, water and soil erosion, and flood and drought disasters is provided by Ministry of Water Resources. The data on the status of inland and marine fishery waters, the quality of farmlands and grassland is provided by Ministry of Agriculture. The data of energy chapter is provided by National Bureau of Statistics and National Energy Administration. The data of the chapter on desertification and sandification, forest and wetland protection is provided by State Forestry Administration. The data on earthquake disaster is provided by China Earthquake Administration. The data on air temperature, precipitation and meteorological disasters is mostly provided by China Meteorological Administration. Finally, the data on the state of marine water environment, national marine nature reserves, typical marine ecosystems and marine disasters is provided by State Oceanic Administration.

National Environmental Monitoring Network includes the national ambient air quality monitoring of 1,436 sites covering 338 APL cities; the assessment, exanimation and ranking of 1,940 water sections (sites) covering 978 rivers and 112 lakes (reservoirs); national acid deposition monitoring of nearly 1,000 monitoring sites covering 338 APL cities and some county-level cities; water environment monitoring network of centralized drinking water source area covering 338 APL cities; coastal marine environment monitoring of 417 monitoring sites across the coastal waters of the country; urban noise monitoring covering nearly 80,000 monitoring sites in 338 APL cities; and national eco-environment monitoring network including 645 ecological monitoring sites, 10 regional key monitoring stations and 1 positioned monitoring station in 31 provinces (autonomous regions or municipalities).

In the current Report, the assessment of urban ambient air quality is based on the Ambient Air Quality Standard (GB 3095-2012) with assessment indicators including SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO and O_3. The assessment of surface water quality is based on Environmental Quality Standards for Surface Water (GB 3838-2002) and Measures on assessment of Surface Water Quality (Trial) with 21 assessment indicators such as 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) are chlorophyll-a, TP, TN, SD and permanganate index. The assessment of water quality of centralized drinking water source areas of cities at or above prefecture level is based on Environmental Quality Standards for Surface Water (GB 3838-2002) and Quality Standard for Groundwater (GB/T 14848-93). The assessment of the quality of groundwater is based on Quality Standard for Groundwater (GB/T 14848-93). The assessment of the quality of off-shore marine waters is based on Marine Water Quality Standard (GB 3097-1997) and Specification for Offshore Environmental Monitoring (HJ 442-2008) with 29 assessment indicators such as 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, E-coli and fecal coliform. The assessment of sound environment is 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 eco environment quality is based on Technical Criterion for Ecosystem Status Evaluation (HJ 192-2015). The rounding off of data is based on the Rules of Rounding Off for Numerical Value and Expression and Judgment of Limiting Values (GB/T 8170-2008).

Note: National data in the current Report does not cover Taiwan Province, Kong Kong SAR and Macao SAR except administrative zoning, national land area and earthquake disasters.

Contributors to the 2016 Report on the State of the Environment in China

Leading Department

Ministry of Environmental Protection

Contributing Ministries and Administrations

Ministry of Land and Resources

Ministry of Housing and Urban–Rural Development

Ministry of Transport

Ministry of Water Resources

Ministry of Agriculture

National Health and Family Planning Commission

National Bureau of Statistics

State Forestry Administration

China Earthquake Administration

China Meteorological Administration

National Energy Administration

State Oceanic Administration