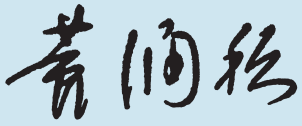
2022

Report on the State of the Ecology and Environment in China

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

The 2022 Report on the State of the Ecology and Environment in China is hereby released in accordance with the Environmental Protection Law of the People's Republic of China.

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



May 24, 2023

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Summary

The year 2022 was a crucial year in the history of the Party and the nation. The 20th National Congress of the Communist Party of China (CPC) was successfully convened, drawing a grand blueprint for building China into a modern socialist country in an all-round way. Over the past year, in the face of the complex and severe situation at home and abroad and the continuous and repeated shocks from the Covid-19 pandemic, the Ministry of Ecology and Environment, together with relevant departments and various localities, followed the guidance of Xi Jinping Thought on Socialism with Chinese Characteristics for a New Era, earnestly studied and implemented the guiding principles of the 20th CPC National Congress and Xi Jinping Thought on Ecological Civilization, and adhered to the general principle of seeking progress while maintaining stability. The Ministry of Ecology and Environment, together with relevant departments and various localities, implemented ecological and environmental protection in tandem with pandemic control and social and economic development, and promoted solid progress in building a Beautiful China. As a result, China's ecological and environmental protection achieved hard-won progresses, and the overall ecological and environment quality kept improving in China.

Quality of Atmospheric Environment: The ambient air quality across the country has been steadily improving. The concentration of fine particulate matter in cities at the prefecture level and above was 29 μg/m^3, down by 3.3% from 2021, better than the annual target of 4.6 μg/m^3. The proportion of days with excellent and good air quality was 86.5%, 0.9 percentage point better than the annual target; the proportion of days with heavy pollution or worse was 0.9%, down by 0.4 percentage point from 2021.

Quality of Freshwater Environment: The quality of the surface water across the country continued to improve. The proportion of sections with Grade I to III water quality was 87.9%, an increase of 3.0 percentage points from 2021, 4.1 percentage points better than the annual target; and the proportion of sections with water quality worse than Grade V was 0.7%, a decrease of 0.5 percentage point from 2021. The water quality of groundwater was generally stable. The proportion of groundwater sites with water quality of Grade I to IV was 77.6%.

Quality of Marine Environment: The water quality of sea areas under jurisdiction of China was generally stable. In summer, the sea areas meeting Seawater Quality Standard Grade I accounted for 97.4% of the total sea areas under jurisdiction, a decrease of 0.3 percentage point from 2021. The water quality of nearshore sea areas was getting better on the whole, with 81.9% of the total sea areas meeting excellent and good water quality (Grade I & II), up by 0.6 percentage point from 2021; and the proportion of sea areas with worse than Grade IV seawater quality was 8.9%, down by 0.7 percentage point from 2021.

Quality of Soil Environment: Nationwide, soil environmental risks were largely brought under control and the trend of aggravating soil pollution was preliminarily curbed. The safe use of key construction land was guaranteed, and the soil environment of agricultural land was generally stable.

Quality of Ecological Environment: The natural and ecological condition was generally

stable in China. The Ecological Quality Index (EQI) value was 59.6, and the ecological quality met Grade II standard, which showed no significant change compared with that of 2021. The forest coverage rate was 24.02%, and the land areas protected by ecological conservation red lines accounted for over 30% of our land territory.

Quality of Acoustic Environment: The overall quality of urban acoustic environment remained stable across China. In functional zones, the daytime and nighttime acoustic environment quality attainment rates were 96.0% and 86.6% respectively, up by 0.6 percentage point and 3.7 percentage points respectively compared with that of 2021. The average value of daytime equivalent sound levels of regional acoustic environment and traffic noises were 54.0 dB(A) and 66.2 dB(A) respectively, remaining basically stable compared with that of 2021.

Nuclear and Radiation Safety Status: The nuclear and radiation safety generally maintained stable in China. No events or accidents classified as Level 2 or above occurred according to the International Nuclear and Radiological Event Scale (INES). The incidence of radiation accidents from radioactive sources remained at a low level of less than 1 per 10,000 radioactive sources per year. The overall radiation environment quality across the country and that in the vicinity of key nuclear and radiation facilities were both generally good, and nuclear and radiation safety was solidly guaranteed.

Climate Change and Response: The average temperature across the country was relatively high and precipitation was relatively low compared with average years. According to preliminary calculations, CO_2 emissions per 10,000 yuan of GDP dropped by 0.8% compared with that of 2021, and energy consumption per 10,000 yuan of GDP dropped by 0.1% compared to 2021.

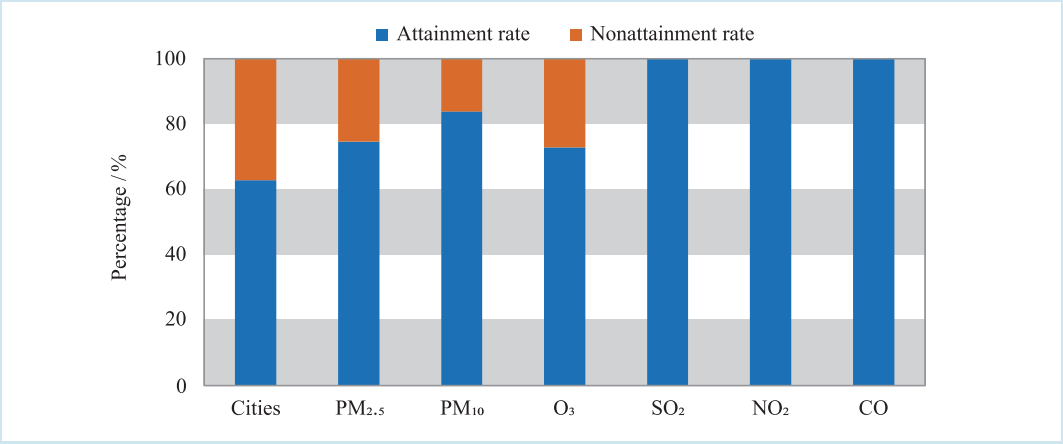
Ⅰ. Atmospheric Environment

1. Ambient air quality

(1) Air quality across China*

In 2022, out of all the 339 cities at and above prefecture-level (APL cities) (hereinafter referred to as the 339 cities) across the country, 213 met national air quality standard**, accounting for 62.8% of the total; 126 cities failed to meet national air quality standard, taking up 37.2%.

Among the 339 cities, 86 cities failed to meet the standard for fine particulate matter ($PM_{2.5}$), accounting for 25.4%; 55 cities failed to meet the standard for inhalable particulate matter (PM_{10}), accounting for 16.2%; 92 cities failed to meet the standard for ozone (O_3), accounting for 27.1%; all cities met the standards for nitrogen dioxide (NO_2), carbon monoxide (CO) and sulfur dioxide (SO_2). In terms of the number of pollutants exceeding the standard, 57 cities had one pollutant exceeding the standard, 31 cities had two exceeding the standard, and 38 cities had three exceeding the standard.

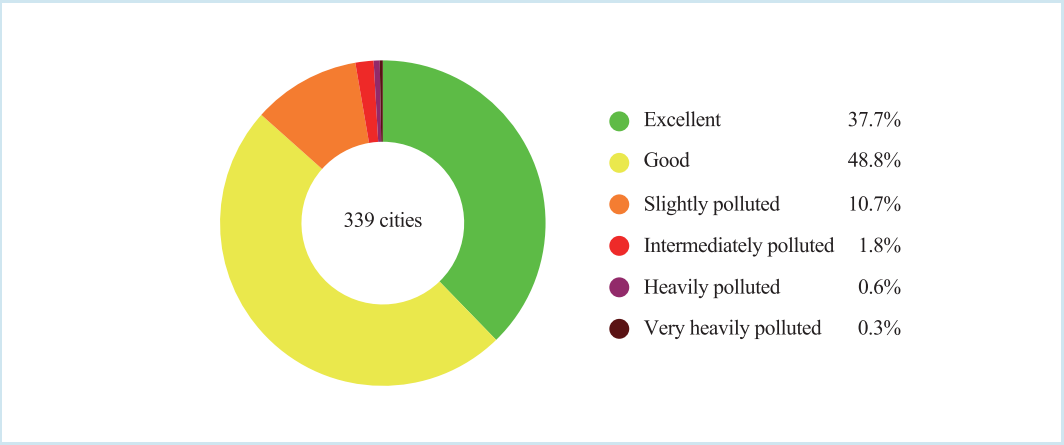


Air Quality of 339 Cities in 2022

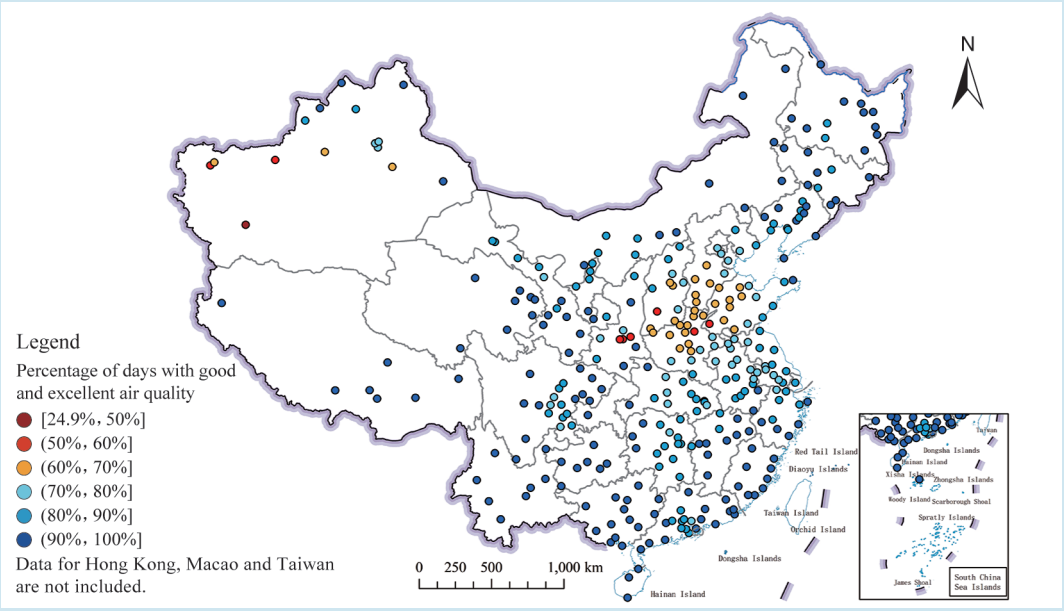
*During the 14th "Five-Year" Plan period, the national air quality monitoring scope includes a total of 1,734 national urban ambient air quality monitoring sites, covering 1,614 air quality assessment sites and 120 clean air reference sites (not included in the assessment). The monitoring covers 339 cities at and above prefecture-level (including municipalities, prefecture-level cities, regions, autonomous prefectures and leagues). The assessment of urban ambient air quality was based on the Ambient Air Quality Standard (GB 3095-2012) and the revision list, Technical Regulation for Ambient Air Quality Assessment (Trial) (HJ 663-2013), the Supplementary Regulation on Urban Air Quality Assessment Affected by Sandstorm Weather Process and Letter on Issues Related to Excluding the Impact of Sandstorm Weather.

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

The average percentage of days of the 339 cities meeting air quality standard* ranged between 24.9%~100%, with an average of 86.5% and a decrease of 1.0 percentage point from 2021. The ratio of average number of days failing to meet the



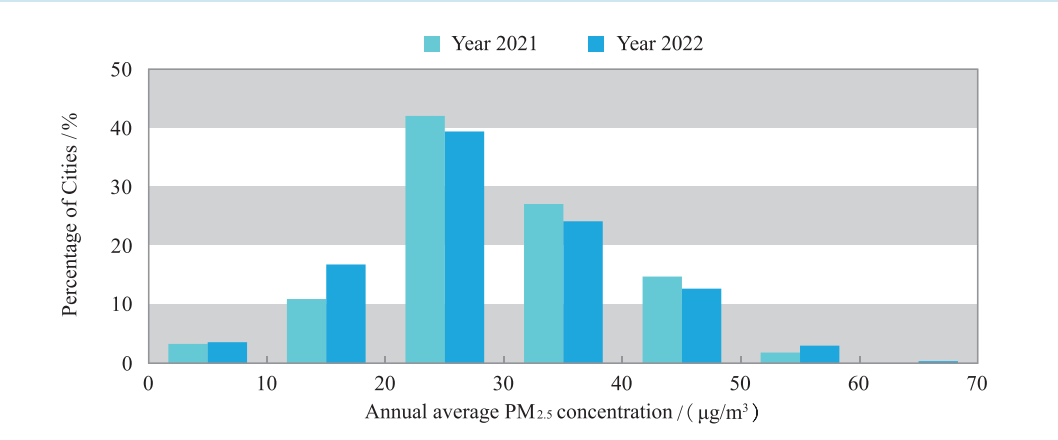
The percentage of days of various air quality standards of 339 cities in 2022



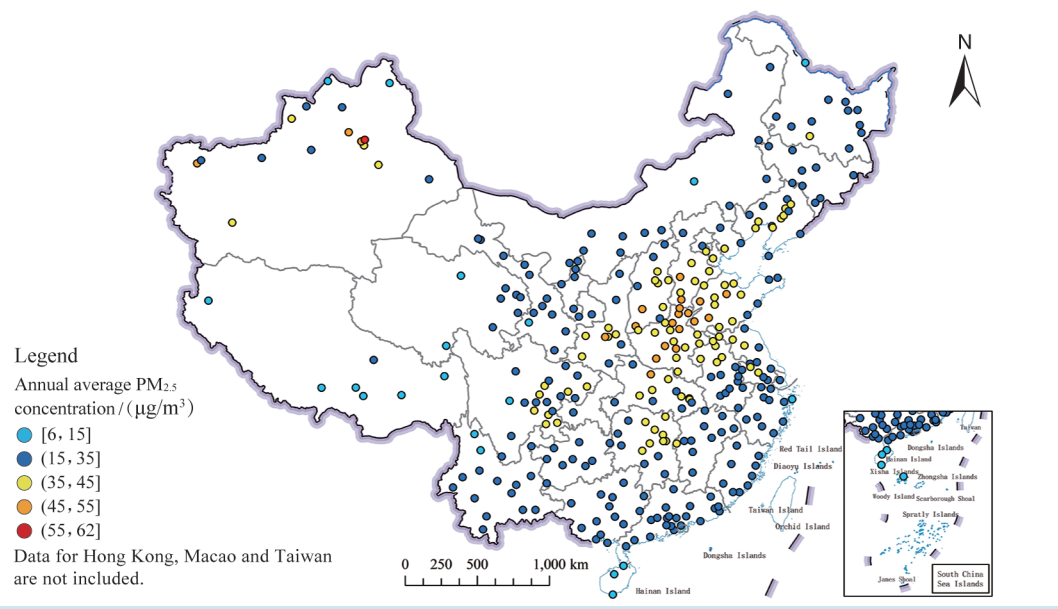
Percentage of days with good and excellent air quality of 339 cities in 2022

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

standard* took up 13.5% (days failing to meet the standard due to sand-dust weather took up 1.9%), among which, the number of days with $PM_{2.5}$, O_3, PM_{10}, and NO_2 as the primary pollutants** took up 36.9%, 47.9%, 15.2%, and 0.1%



Annual average $PM_{2.5}$ concentration in 339 cities in 2022 and interannual variation



Annual average $PM_{2.5}$ concentration in 339 cities in 2022

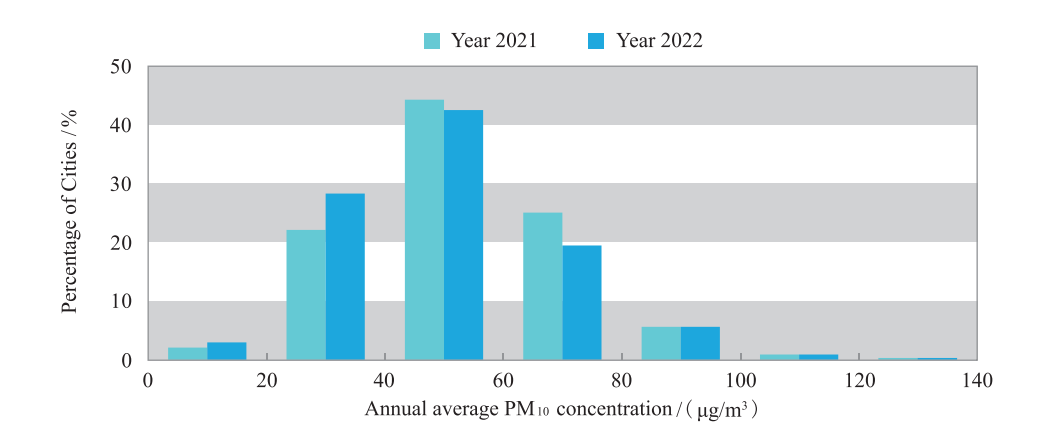
*The amount of nonattainment days refers to the number of days with AQI > 100. Among them, AQI within the range of 101~150 indicates slight pollution, 151~200 indicates intermediate pollution, 201~300 indicates heavy pollution and > 300 very heavy pollution.

**When AQI > 50, the pollutant with the biggest individual AQI is the primary pollutant. The primary pollutants may contain two or more pollutants at the same time, so the sum of the percentage of days may exceed 100%.

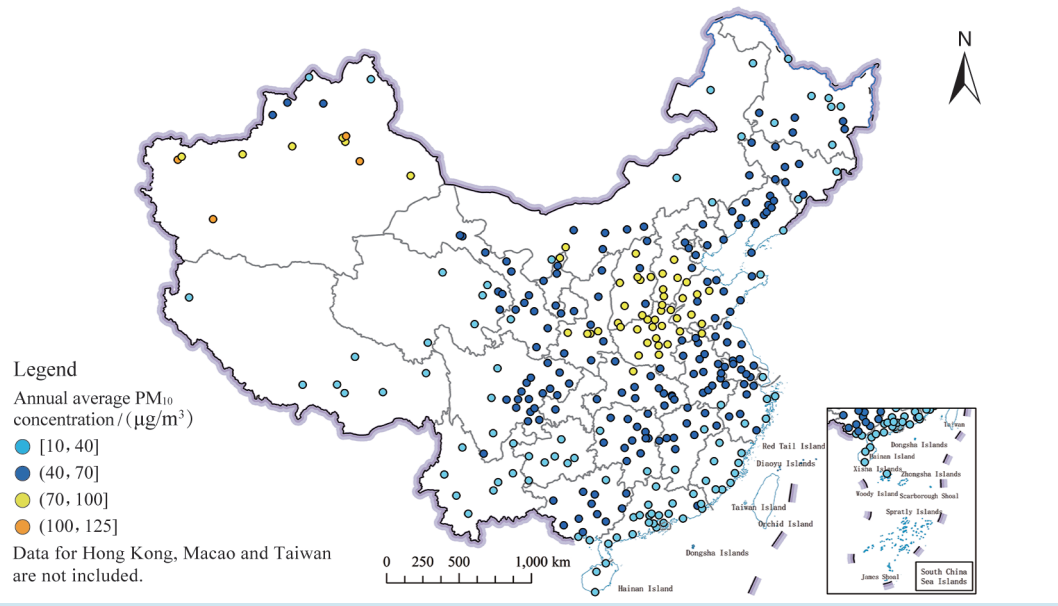
respectively. There was no occurrence of nonattainment days with SO_2 and CO as the primary pollutant.

The annual average concentration of $PM_{2.5}$ in 339 cities ranged from 6 to 62 μg/m^3, with an average of 29 μg/m^3, a decrease of 3.3% from 2021.

The annual average concentration of PM_{10} in 339 cities



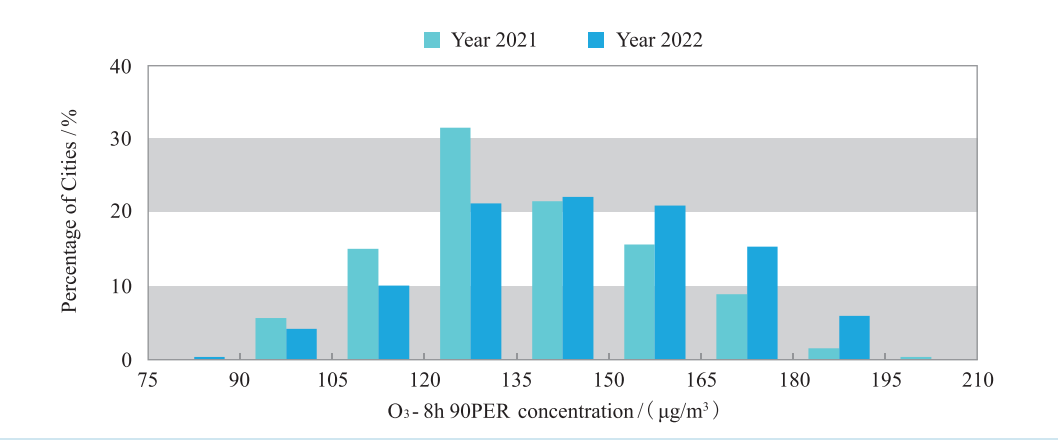
Annual average PM_{10} concentration in 339 cities in 2022 and interannual variation



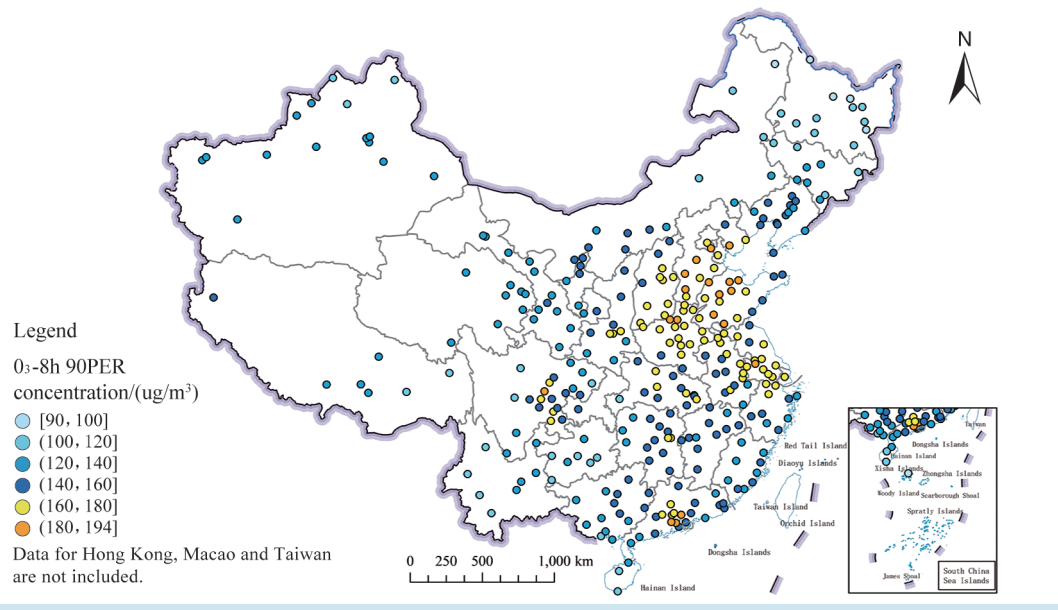
Annual average PM_{10} concentration in 339 cities in 2022

ranged from 10 to 125 μg/m^3, with an average of 51 μg/m^3, a decrease of 5.6% from 2021.

Of the 339 cities, the 90th percentile of the daily maximum 8-hour average concentration of O_3 ranged from 90 to 194 μg/m^3, with an average of 145 μg/m^3, an increase of 5.8% over 2021.



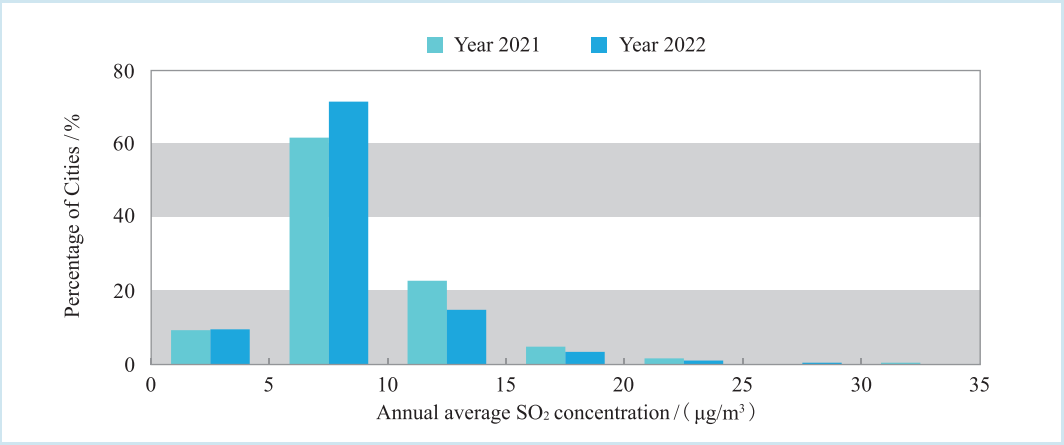
O_3–8h 90PER concentration in 339 cities in 2022 and interannual variation



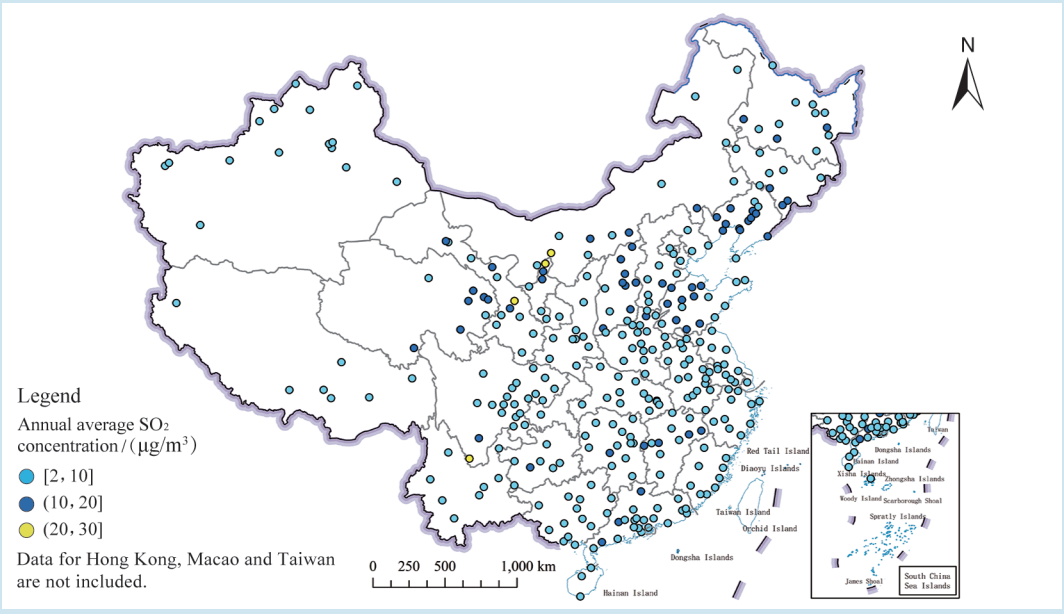
O_3–8h 90PER concentration in 339 cities in 2022

The annual average concentration of SO_2 in 339 cities ranged from 2 to 30 μg/m^3, with an average of 9 μg/m^3, which was the same as that of 2021.

The annual average concentration of NO_2 in 339 cities



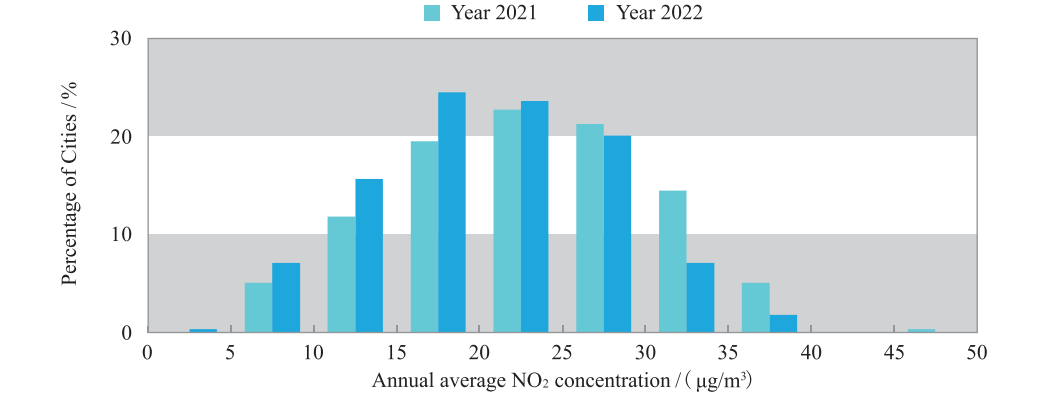
Annual average SO_2 concentration in 339 cities in 2022 and interannual variation



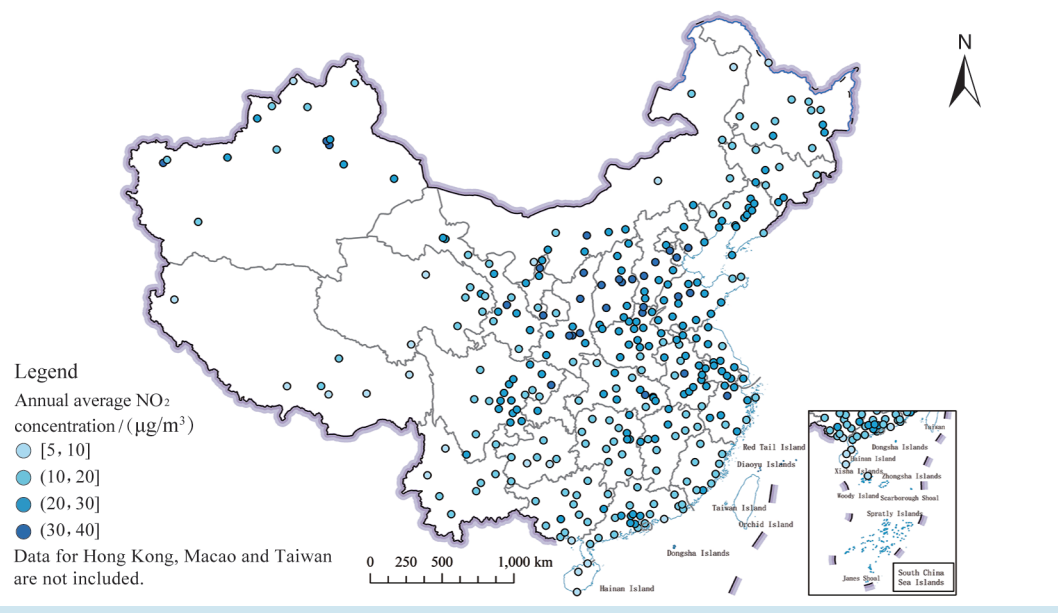
Annual average SO_2 concentration in 339 cities in 2022

ranged from 5 to 40 μg/m^3, with an average of 21 μg/m^3, a decrease of 8.7% from 2021.

Of the 339 cities, the 95th percentile of the 24-hour average concentration of CO ranged from 0.5 to 3.1 mg/m^3,

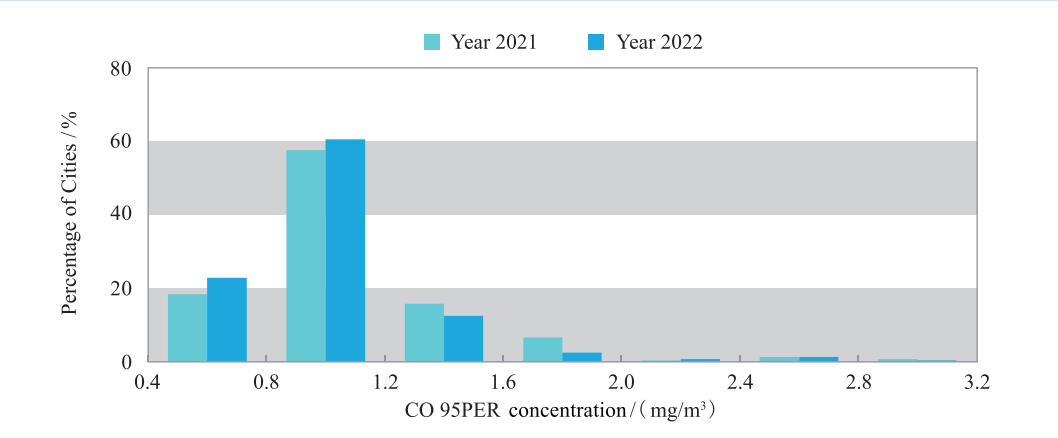


Annual average NO_2 concentration in 339 cities in 2022 and interannual variation

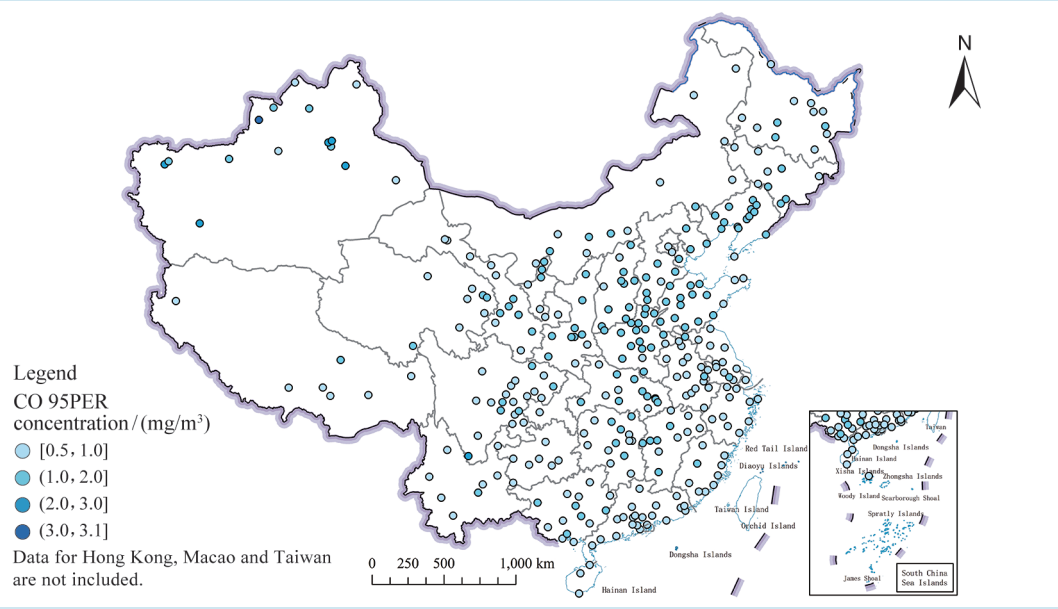


Annual average NO_2 concentration in 339 cities in 2022

with an average of 1.1 mg/m^3, the same as that of 2021.



CO 95PER concentration in 339 cities in 2022 and interannual variation



CO 95PER concentration in 339 cities in 2022

(2) Key Regions

Beijing-Tianjin-Hebei and surrounding areas[*] In 2022, the ratio of the number of days of "2+26" cities in Beijing-Tianjin-Hebei and surrounding areas meeting air quality standard fell within the range of 59.2% ~ 78.4% with the average rate of 66.7%, down by 0.5 percentage point compared with that of 2021. The average number of nonattainment days accounted for 33.3% of the total (the average number of nonattainment days due to sand-dust weather accounted for 1.9%), 25.1%, 6.0%, 1.9% and 0.2% of which was of slight pollution, intermediate pollution, heavy pollution and very heavy pollution respectively. The share of heavy pollution days and above decreased by 0.9 percentage point from 2021[**].

The average concentration of ambient air quality $PM_{2.5}$ in Beijing-Tianjin-Hebei and surrounding areas was 44 μg/m^3, 2.3% higher than that of 2021; the average concentration of PM_{10} was 76 μg/m^3, 2.6% lower than that in 2021; the 90th percentile of the daily maximum 8-hour average concentration of O_3 was 179 μg/m^3 on average, up by 4.7% from 2021; the average concentration of SO_2 was 10 μg/m^3, down by 9.1% from 2021; the average concentration of NO_2 was 29 μg/m^3, 6.5% lower than that in 2021; the 95th percentile of the 24-hour average concentration of CO was 1.3 mg/m^3, 7.1% lower than that of 2021.

The Yangtze River Delta[***] In 2022, 41 cities witnessed 70.7% ~ 98.4% share for the number of attainment days with the average ratio of 83.0%, down by 3.7 percentage points compared with that of 2021. The average number of nonattainment days accounted for 17.0% of the total (the average number of nonattainment days due to sand-dust weather accounted for 0.7%), 14.7%, 2.0%, and 0.2% of which was of slight pollution, intermediate pollution, and heavy pollution respectively. There was no occurrence of very heavy pollution. The number of days of or inferior to heavy pollution was down by 0.2 percentage point compared with that of 2021.

The average concentration of ambient air quality $PM_{2.5}$ in the Yangtze River Delta was 31 μg/m^3, the same as that in 2021; the average concentration of PM_{10} was 52 μg/m^3, 7.1% lower than that in 2021; the 90th percentile of the daily maximum 8-hour average concentration of O_3 was 162 μg/m^3 on average, up by 7.3% from 2021; the average concentration of SO_2 was 7 μg/m^3, the same as that in 2021; the average concentration of NO_2 was 24 μg/m^3, 14.3% lower than that in 2021; the 95th percentile of the 24-hour average concentration of CO was 0.9 mg/m^3, 10.0% lower than that in 2021.

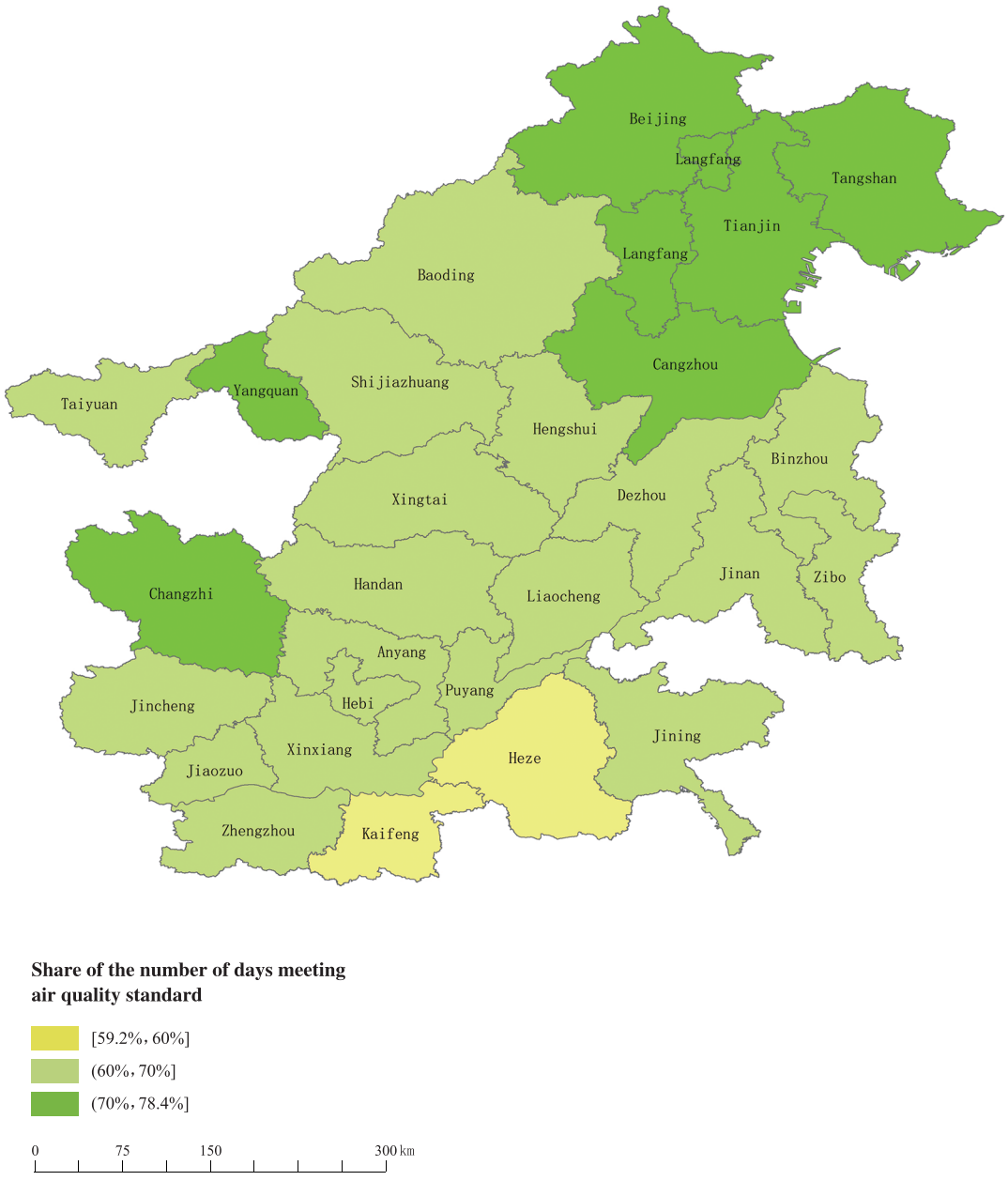
Fenwei Plain[****] In 2022, the percentage of the number of attainment days of 11 cities in Fenwei Plain was within the range of 50.4% ~ 87.4% with the average rate of 65.2%, down by 5.0 percentage points compared with that of 2021. The average ratio of nonattainment days was 34.8% (the average ratio of nonattainment days due to sand-dust weather was 4.4%), 27.6% of which were of slight pollution, 5.1% of intermediate pollution, 1.7% of heavy pollution and 0.4% of very heavy pollution, and the number of days of or inferior to heavy pollution was down by 1.0 percentage point compared with that of 2021.

[*]Including Beijing Municipality, Tianjin Municipality, Shijiazhuang, Tangshan, Handan, Xingtai, Baoding, Cangzhou, Langfang and Hengshui in Hebei province, Taiyuan, Yangquan, Changzhi and Jincheng in Shanxi Province, Jinan, Zibo, Jining, Dezhou, Liaocheng, Binzhou and Heze in Shandong Province, Zhengzhou, Kaifeng, Anyang, Hebi, Xinxiang, Jiaozuo and Puyang in Henan Province, collectively referred to as the "2+26" cities, which are included in the national urban ambient air quality monitoring scope.

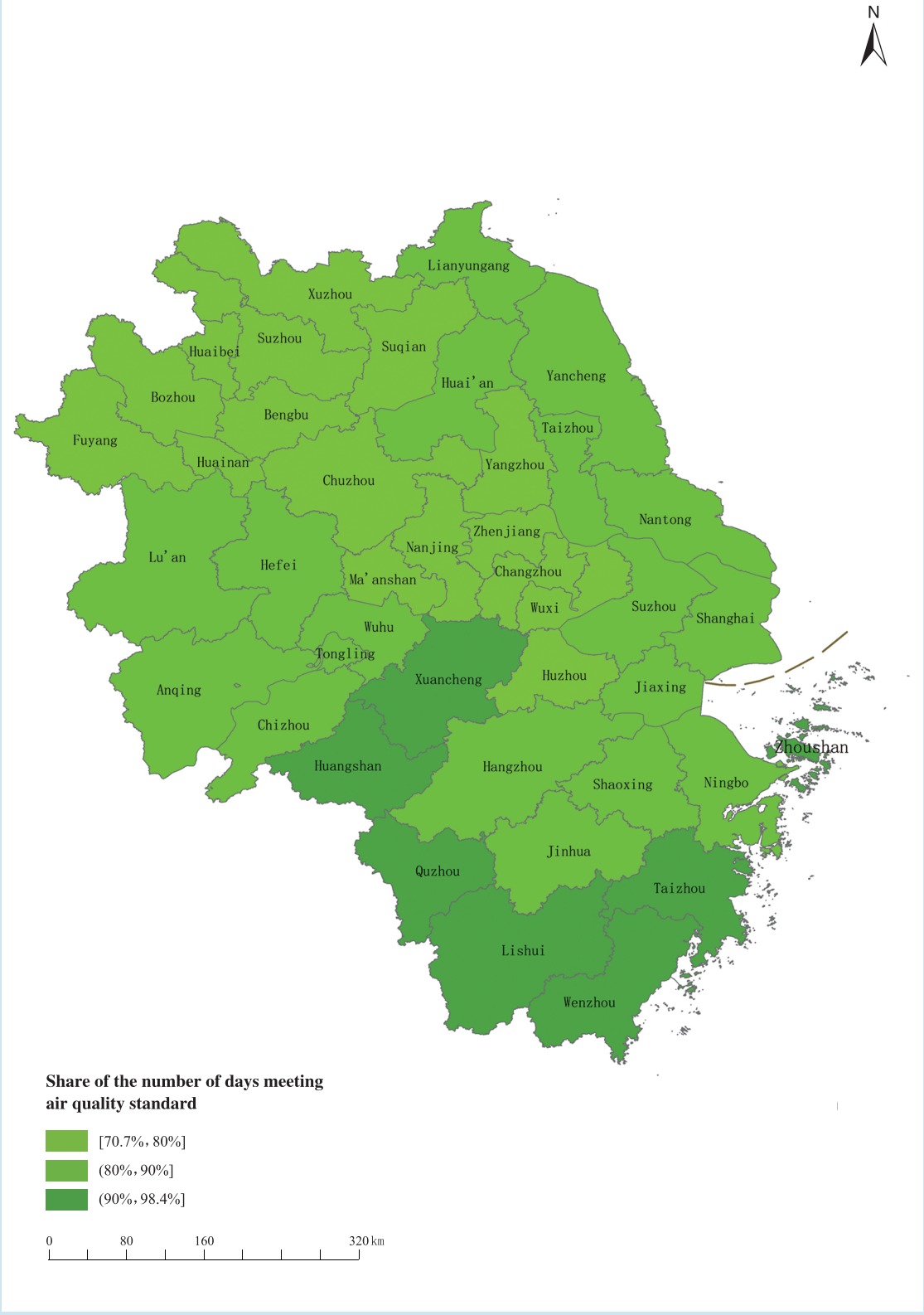
[**]Percentages presented throughout this report are calculated by dividing the number of the subcategory by the total number. Numerical Rounding is based on the Representation and Judgment of Numerical Rounding Rules and Limit Values (GB/T 8170-2008), consequently there may arise the situation where the overall percentage of two or more categories does not equal the adding up of the respective percentage of various categories, or the case where the percentages of all categories do not sum to 100% or the sum of the percentage changes from the same period does not equal 0, the same below.

[***]Including Shanghai Municipality, Jiangsu, Zhejiang and Anhui province, which are included in the national urban ambient air quality monitoring scope.

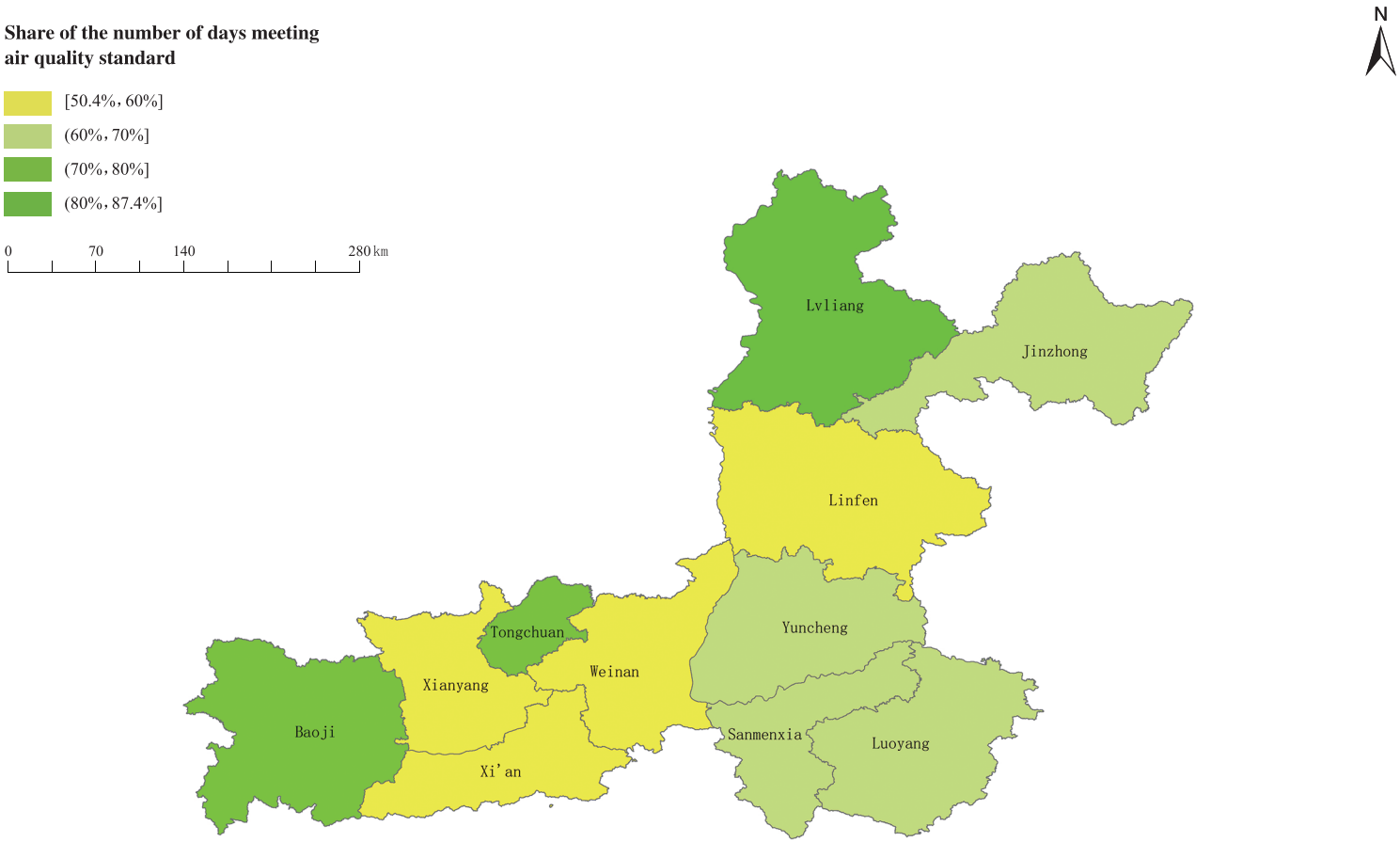
[****]Including Jinzhong, Yuncheng, Linfen and Lvliang in Shanxi Province, Luoyang and Sanmenxia in Henan Province, and Xi'an, Tongchuan, Baoji, Xianyang, and Weinan in Shaanxi Province, which are included in the national urban ambient air quality monitoring scope.



Share of the number of days meeting air quality standard in Beijing–Tianjin–Hebei and surrounding areas in 2022



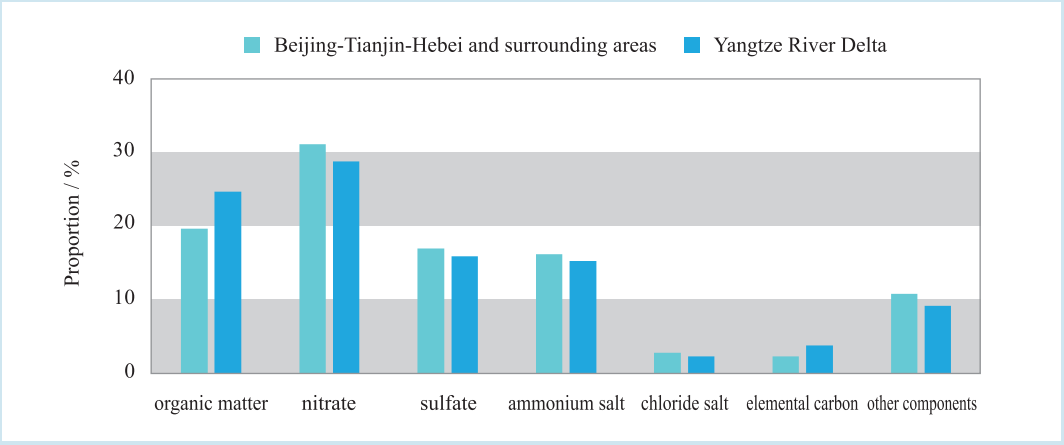
Share of the number of days meeting air quality standard in the Yangtze River Delta in 2022



Share of the number of days meeting air quality standard in Fenwei Plain in 2022

The average concentration of $PM_{2.5}$ in Fenwei Plain was 46 μg/m^3, up by 9.5% from 2021; the average concentration of PM_{10} was 79 μg/m^3, 3.9% higher than that in 2021; the 90th percentile of the daily maximum 8-hour average concentration of O_3 was 167 μg/m^3 on average, up by 1.2% from 2021; the average concentration of SO_2 was 9 μg/m^3, down by 10.0% from 2021; the average concentration of NO_2 was 31 μg/m^3, 6.1% lower than that in 2021; the 95th percentile of the 24-hour average concentration of CO was 1.3 mg/m^3, the same as that in 2021.

Particulate Matter Composition $PM_{2.5}$ was composed of organic matter, nitrate, sulfate, ammonium salt, chloride salt, elemental carbon, and other components (crustal substances, trace elements, etc.). In 2022, the automatic monitoring results of particulate matter compositions showed that the proportion of organic matter in Beijing-Tianjin-Hebei and surrounding areas was 19.7%, nitrate was 31.2%, sulfate was 17.0%, ammonium salt was 16.2%, chloride salt was 2.8%, elemental carbon was 2.3%, and the proportion of other components accounted for 10.8%; In Yangtze River Delta region, the proportion of organic matter accounted for 24.7%, nitrate 28.8%, sulfate 15.9%, ammonium salt 15.3%, chloride salt 2.3%, elemental carbon 3.8%, and other components 9.2%.

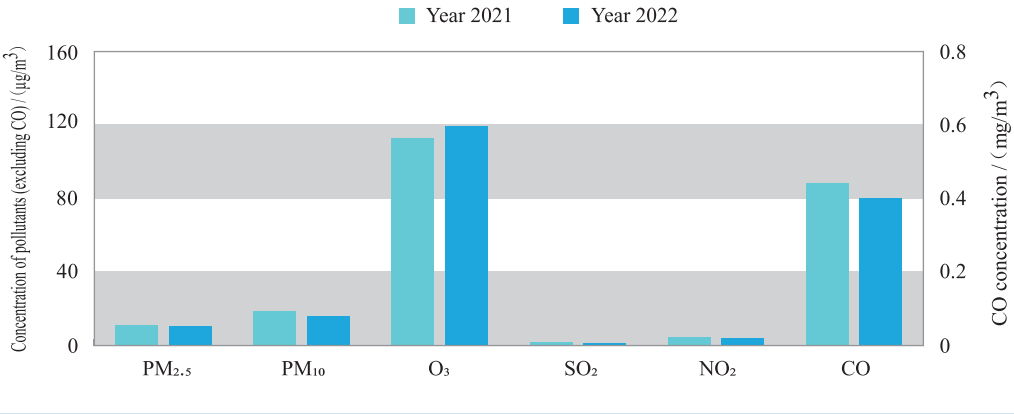


Composition of particulate matter in Beijing–Tianjin–Hebei and surrounding areas and the Yangtze River Delta in 2022

(3) Background monitoring sites

In 2022, the average concentration of $PM_{2.5}$ at the 16 background monitoring sites* across the country was 8.8 μg/m^3, down by 7.4% compared with that of 2021; the average concentration of PM_{10} was 16.7 μg/m^3, down by 13.0% compared with that of 2021; the 90th percentile of the daily maximum 8-hour average concentration of O_3 was 119.8 μg/m^3, up by 7.7% compared with that of 2021; the average concentration of SO_2 was 0.9 μg/m^3, down by 10.0% compared with that of 2021; the average concentration of NO_2 was 3.3 μg/m^3, down by 2.9% compared with that of 2021; the 95th percentile of the 24-hour average concentration of CO was 0.400 mg/m^3, down by 8.3% compared with that of 2021.

*A total of 16 national background ambient air quality monitoring sites have been set up for background monitoring of ambient air quality in Shanxi Province, Inner Mongolia Autonomous Region, Jilin Province, Fujian Province, Shandong Province, Hubei Province, Hunan Province, Guangdong Province, Hainan Province, Sichuan Province, Yunnan Province, Tibet Autonomous Region, Qinghai Province and Xinjiang Uygur Autonomous Region. The monitoring indicators include SO_2, NO_2, PM_{10}, $PM_{2.5}$, CO and O_3. These sites are not included in the national urban ambient air quality monitoring sites. The rounding off for data was based on the Rules of Rounding off for Numerical Value and Expression and Judgment of Limiting Values.



Average concentrations of six pollutants at national background monitoring sites in 2022 and interannual variation

2. Acid Rain*

(1) Acid rain distribution

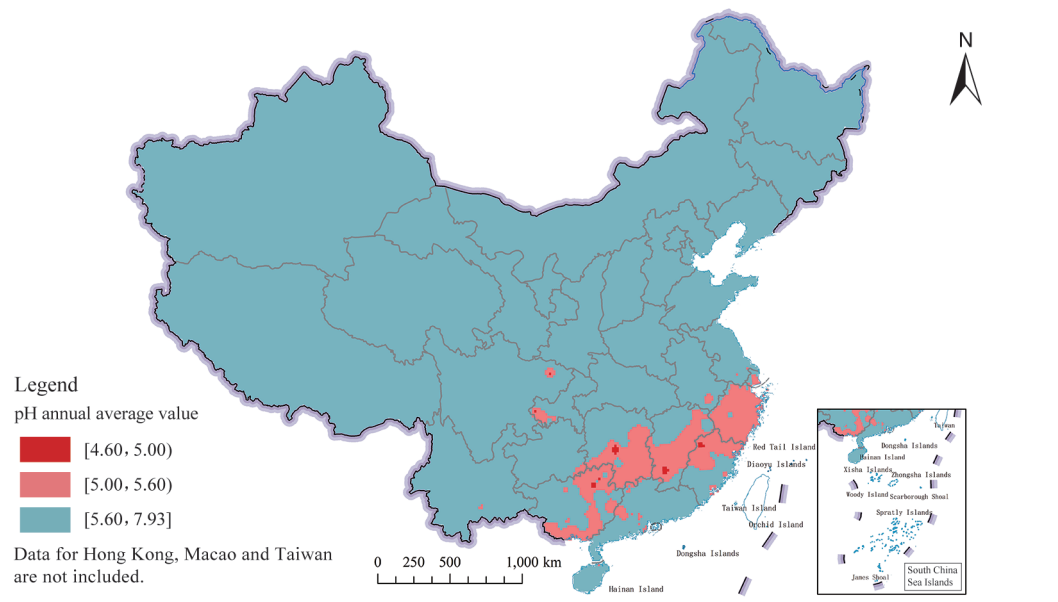
In 2022, the total area covered by acid rain was around 484,000 km^2, taking up 5.0% of total land area of China, up by 1.2 percentage points compared with that of 2021. Among them, the percentage of land area with relatively serious acid rain was 0.07%, with no serious acid rain area**. Acid rain was mainly distributed in the region south to the Yangtze River and east to Yunnan-Guizhou Plateau, mainly including Zhejiang, most parts of Shanghai, northern part of Fujian, central part of Jiangxi, central and eastern part of Hunan, southwestern part of Chongqing, northern and southern parts of Guangxi and parts of Guangdong.

(2) Precipitation acidity

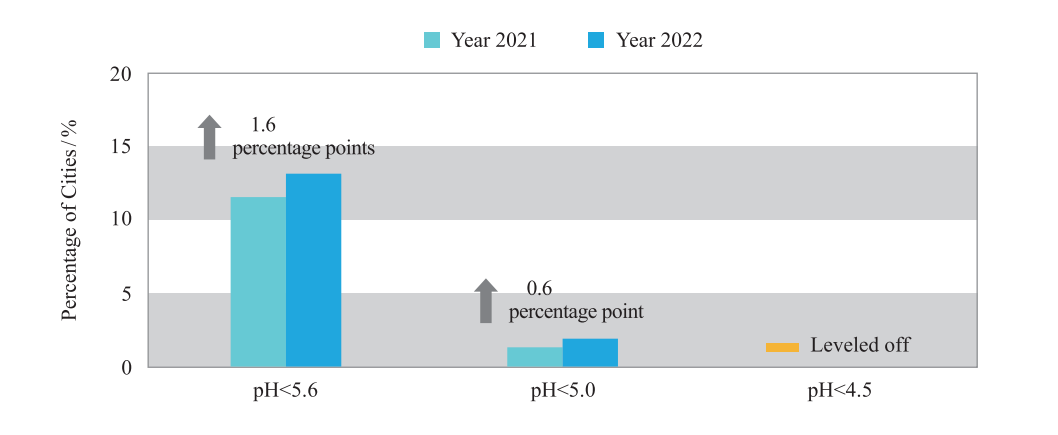
In 2022, the annual average pH value of precipitation across 468 cities (districts and counties) of the country ranged from 4.60 to 7.93, with the average value of 5.67, a decrease of 0.06 compared with that of 2021. The share of cities with acid rain and relatively serious acid rain was 13.2% and 1.9% respectively, an increase of 1.6 and 0.6 percentage points compared with that of 2021. There was no city experiencing serious acid rain, the same as 2021.

*In 2022, about 1,000 precipitation sites were monitored across 468 cities (districts and counties) (including 339 cities at or above prefecture level and some county-level cities).

**The acid rain is defined when the precipitation pH value is below 5.6; relatively serious acid rain is defined when the pH value is below 5.0; serious acid rain is defined when the pH value is below 4.5.



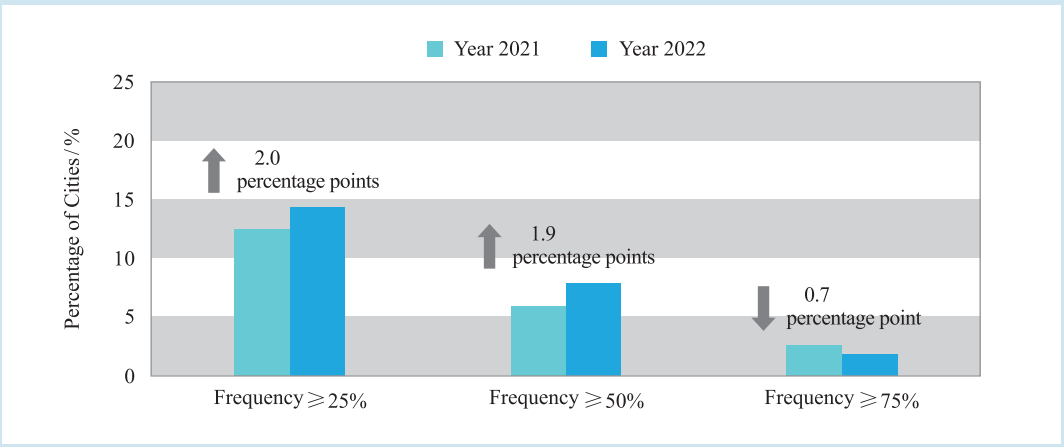
The isoline of annual average pH value of precipitation in China in 2022



Percentage of cities with different annual pH value of precipitation in 2022 and interannual variation

(3) Acid rain frequency

In 2022, the average acid rain frequency under precipitation monitoring across the country was 9.4%, up by 0.9 percentage point compared with that of 2021. The percentage of cities with acid rain occurrence was 33.8%, up by 3.0 percentage points compared with that of 2021. The percentage of cities with acid rain frequency over 25%, 50% and 75% was 14.5%, 7.7% and 1.9% respectively, 2.0 percentage points higher, 1.9 percentage points higher and 0.7 percentage point lower than that of 2021 respectively.

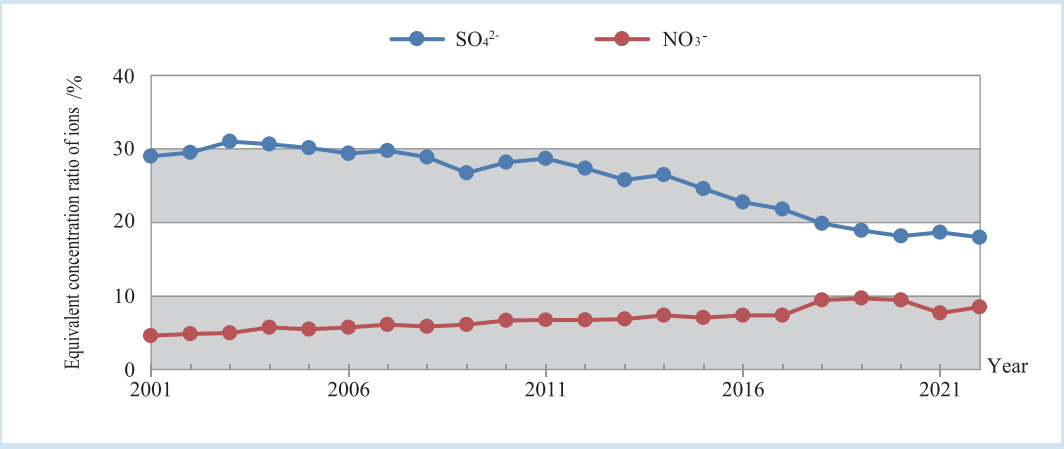


Percentage of cities with different acid rain frequency in 2022 and interannual variation

(4) Chemical composition

In 2022, the main cations in precipitation nationwide were calcium and ammonium ions, with an ionic equivalent concentration ratio of 29.9% and 13.6% respectively. The main anion was sulfate radical with an ionic equivalent concentration ratio of 18.0%.

From 2001 to 2022, while the proportion of equivalent concentration of sulfate ions generally decreased, that of nitrate ions increased. The ratio of equivalent concentration of nitrate and sulfate ions was on the rise, from 0.16 in 2001 to 0.47 in 2022, indicating that acid rain has gradually shifted from being sulfuric acid-based to sulfuric acid-nitric acid compound-based in recent years.



Interannual variance of the equivalent concentration ratio of nitrate and sulfate ions in precipitation 2001–2022

Special Column Straw burning

The burning of straw and other biomass generates large amount of greenhouse gases, trace gases, atmospheric particulate matter and heat, and can even cause fires, resulting in a significant decrease in regional air quality and visibility, which not only endangers public health and traffic safety, but also adversely impacts climate change. The use of remote sensing technologies such as satellite mid-infrared and thermal infrared bands, which are sensitive to the thermal information of straw burning, can effectively monitor the spatial distribution and range of straw burning fires.

In 2022, satellite remote sensing detected a total of 13,583 straw burning spots across the country (excluding fire point information under cloud cover), mainly distributed in Heilongjiang, Jilin, Inner Mongolia, Hubei, Shanxi, Liaoning, Hebei, Anhui, Guangxi and other provinces (autonomous regions). Among them, a total of 10,619 burning spots were in the four provinces (autonomous regions) of Heilongjiang, Jilin, Inner Mongolia and Liaoning, accounting for 78.2% of the total number of straw burning spots in the country.

Special Column

Solid progress had been made in winning the battle against air pollution

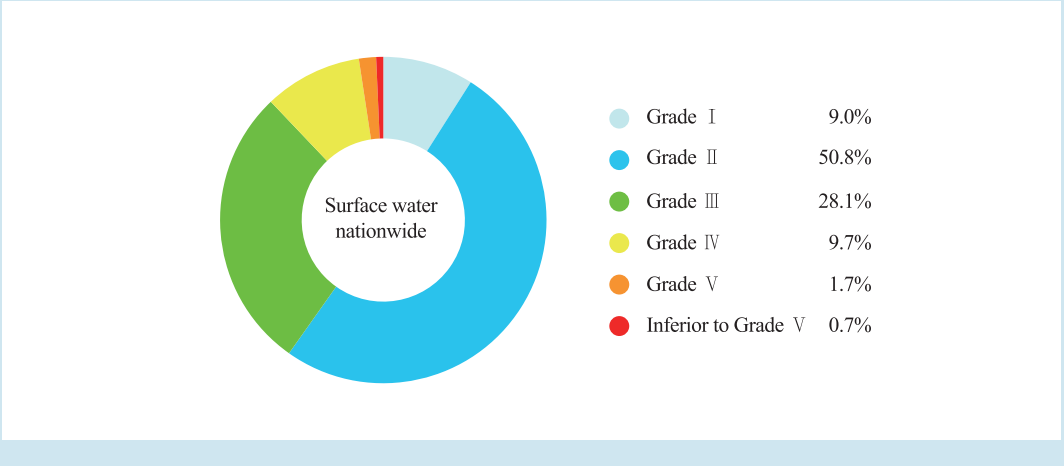
In 2022, a series of actions plans were issued as a further enhancement to the top-level design of air pollution prevention and control initiative, including the Action Plan for In-Depth Elimination of Heavy Pollution Weather and others. The Ministry of Ecology and Environment, in cooperation with relevant departments, has issued carbon peaking implementation plans for key industries of iron and steel, petrochemicals, non-ferrous metals, and building materials, as well as key sectors including industry, energy, and transportation. Synergistic requirements for pollution reduction and carbon reduction has been put forward such as the optimization and adjustment of industry, energy, and transportation structures, and the "1+N" policy system for carbon peaking and carbon neutrality had been improved. In the northern region, 25 cities have been newly added to the list of clean heating pilot cities financially supported by the central government. By the end of 2022, a total of about 37 million households employing heating by bulk coal had been renovated in the northern region. Bulk cargo transportation had seen "road-to-railway" and "road-to-waterway" shifts in an orderly manner. A total of 46,000 VOCs related problems in key industries such as petrochemical and chemical industries, industrial coating, packaging and printing have been identified, investigated and rectified. 210 million tons of crude steel production capacity had undergone the conversion to ultra-low emissions. Environmental management of ozone-depleting substances and hydrofluorocarbons had been strengthened. Efforts had also been made to ensure good air quality during major events such as the Beijing Winter Olympics and Paralympic Game, and the Fifth China International Import Expo held in Shanghai. The blue sky during these major events frequently made to the headlines on major media platforms, receiving high recognition from both home and abroad.

Ⅱ. Freshwater Environment

1. Surface water quality

(1) Nationwide

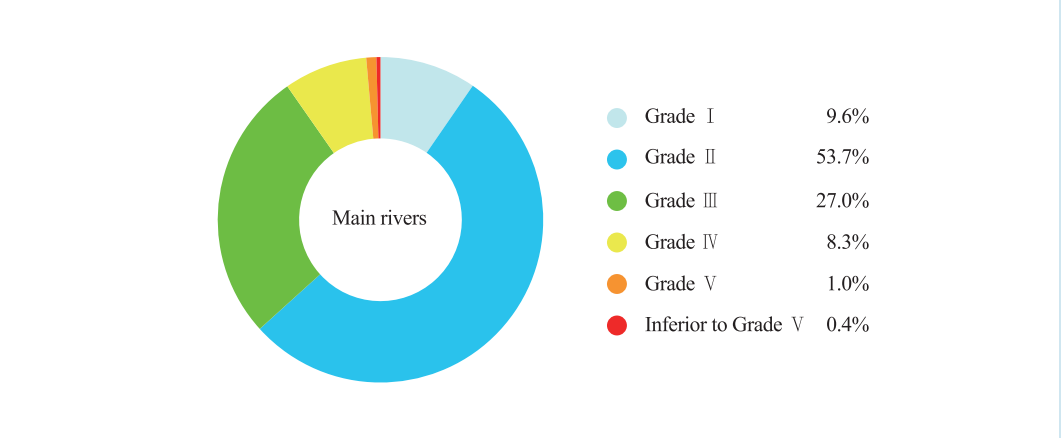
In 2022, of the 3,629 surface water sections monitored by the state*, those meeting Grade I – III water quality standard took up 87.9%, up by 3.0 percentage points compared with that of 2021; and sections that are inferior to Grade V standard** took up 0.7%, down by 0.5 percentage point compared with that of 2021. The major pollution indicators were chemical oxygen demand (COD), permanganate index (COD_{Mn}) and total phosphorus (TP).



General surface water quality of China in 2022

*During the 14th "Five-Year" Plan period, a total of 3,641 surface water sections (sites) were put under the national monitoring program for environmental quality evaluation, assessment and ranking (hereby referred to as the "surface water sections monitored by the state"). The monitoring scope covers the main streams and important tributaries, lakes and reservoirs of the ten major river basins in the country, cities at or above prefecture level, provincial and municipal boundaries of important water bodies, water function areas of important rivers and lakes in the country, etc. Among them, there are 3,293 river sections and 348 lake (reservoir) sites. The assessment of surface water quality was based on Environmental Quality Standards for Surface Water (GB 3838-2002) and the Measures on Assessment of Surface Water Quality (for trial implementation). In 2022, 3,629 surface water sections under national monitoring program were actually monitored.

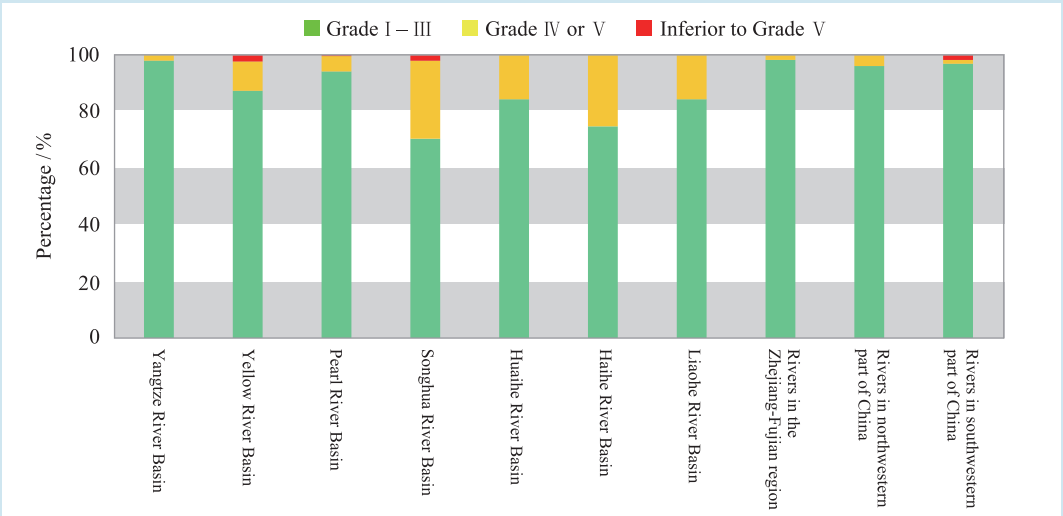
**The water quality of certain sections (sites) is subject to natural factors.



General water quality of 7 major river basins and rivers in Zhejiang and Fujian, rivers in northwestern and southwestern parts of China in 2022

(2) Main Rivers*

Overall status In 2022, out of the 3,115 surface water sections monitored by the state in 7 major river basins of the Yangtze River, Yellow River, Pearl River, Songhua River, Huaihe River, Haihe River and Liaohe River as well as rivers in Zhejiang and Fujian, rivers in northwestern and southwestern parts of China, those meeting Grade I – III standard took up 90.2%, up by 3.2 percentage points compared with that of 2021; those inferior to Grade V standard took up 0.4%, down by 0.5 percentage point compared with that of 2021; The major pollution indicators were COD, COD_{Mn} and TP.



Water quality of 7 major river basins, rivers in Zhejiang and Fujian, northwestern part and southwestern part of China in 2022

*The surface water quality of river basins refers to the water quality of the main rivers, excluding the lakes (reservoirs) in river basins.

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

The Yangtze River basin registered excellent water quality. In all the 1,017 surface water sections monitored by the state, 98.1% met Grade I – III standard, up by 1.0 percentage point compared with that of 2021; and there was no section inferior to Grade V standard, down by 0.1 percentage point compared with that of 2021. The water quality of the mainstream and major tributaries of the Yangtze River was excellent.

Water quality of Yangtze River Basin in 2022

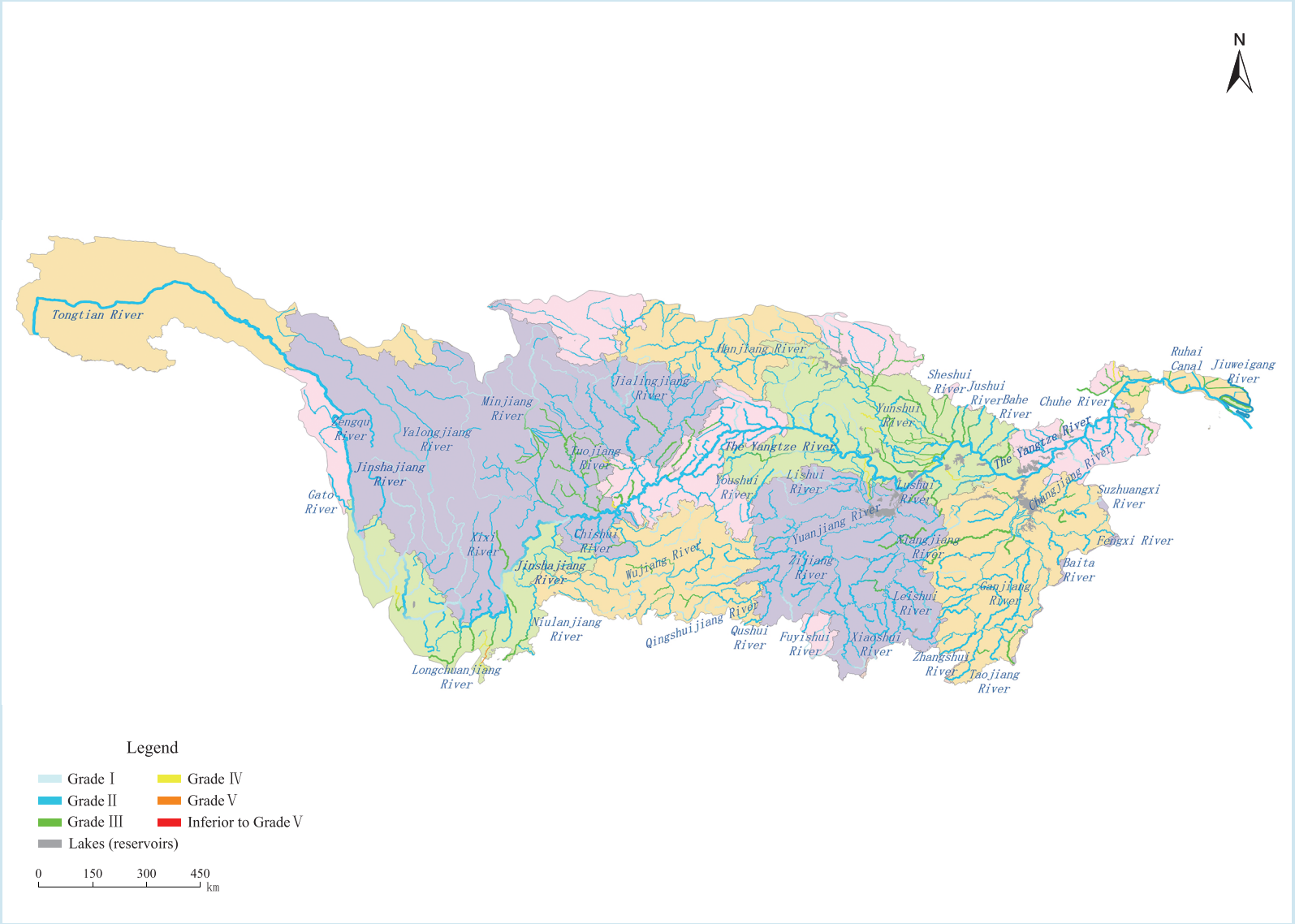
Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	1,017	11.8	69.8	16.5	1.8	0.1	0	4.3	−0.9	−2.4	−0.6	−0.4	−0.1
Mainstream	82	12.2	87.8	0	0	0	0	−1.2	1.2	0	0	0	0
Major tributaries	935	11.8	68.2	18.0	1.9	0.1	0	4.8	−1.1	−2.5	−0.7	−0.4	−0.1

The Yellow River basin was of fairly good water quality. Out of the 263 surface water sections monitored by the state, 87.5% met Grade I – III standard, up by 5.6 percentage points compared with that of 2021; and 2.3% was inferior to Grade V standard, down by 1.5 percentage points compared with that of 2021. The mainstream of the Yellow River was of excellent water quality and the water quality of major tributaries was fairly good.

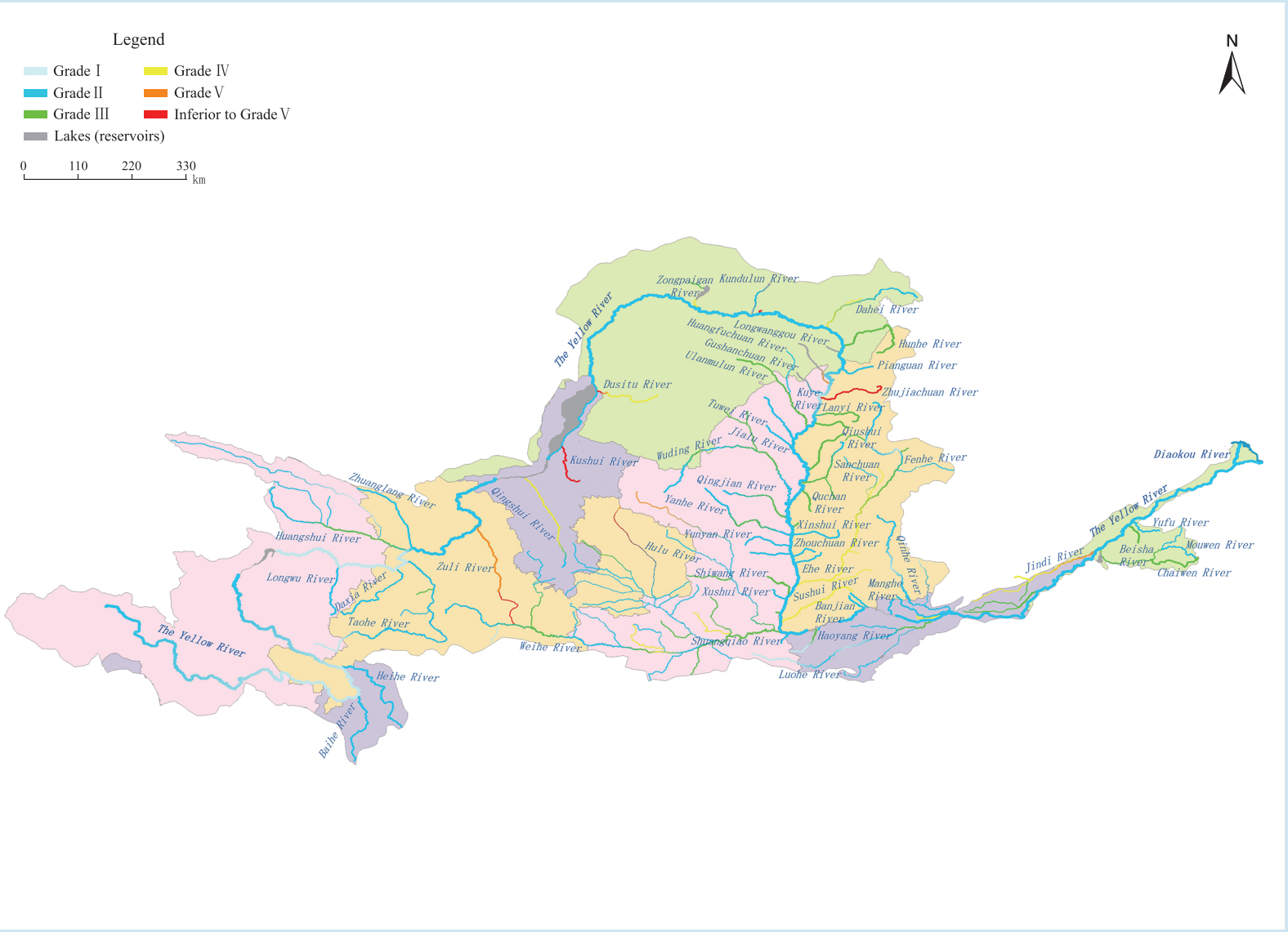
Water quality of Yellow River Basin in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	263	7.2	57.8	22.4	8.4	1.9	2.3	0.8	6.1	−1.4	−4.1	0	−1.5
Mainstream	43	14.0	86.0	0	0	0	0	0	4.6	−4.7	0	0	0
Major tributaries	220	5.9	52.3	26.8	10.0	2.3	2.7	0.9	6.4	−0.7	−4.9	0	−1.8

The Pearl River basin was of excellent water quality. Among the 364 surface water sections monitored by the state, 94.2% met Grade I – III standard, up by 1.9 percentage points compared with that of 2021; and 0.3% was inferior to Grade V standard, down by 0.8 percentage point compared with that of 2021. The mainstream and major tributaries of the Pearl River, the coastal rivers in Guangdong and Guangxi and the rivers in Hainan were all of excellent water quality.



Water quality distribution of Yangtze River Basin in 2022



Water quality distribution of Yellow River Basin in 2022

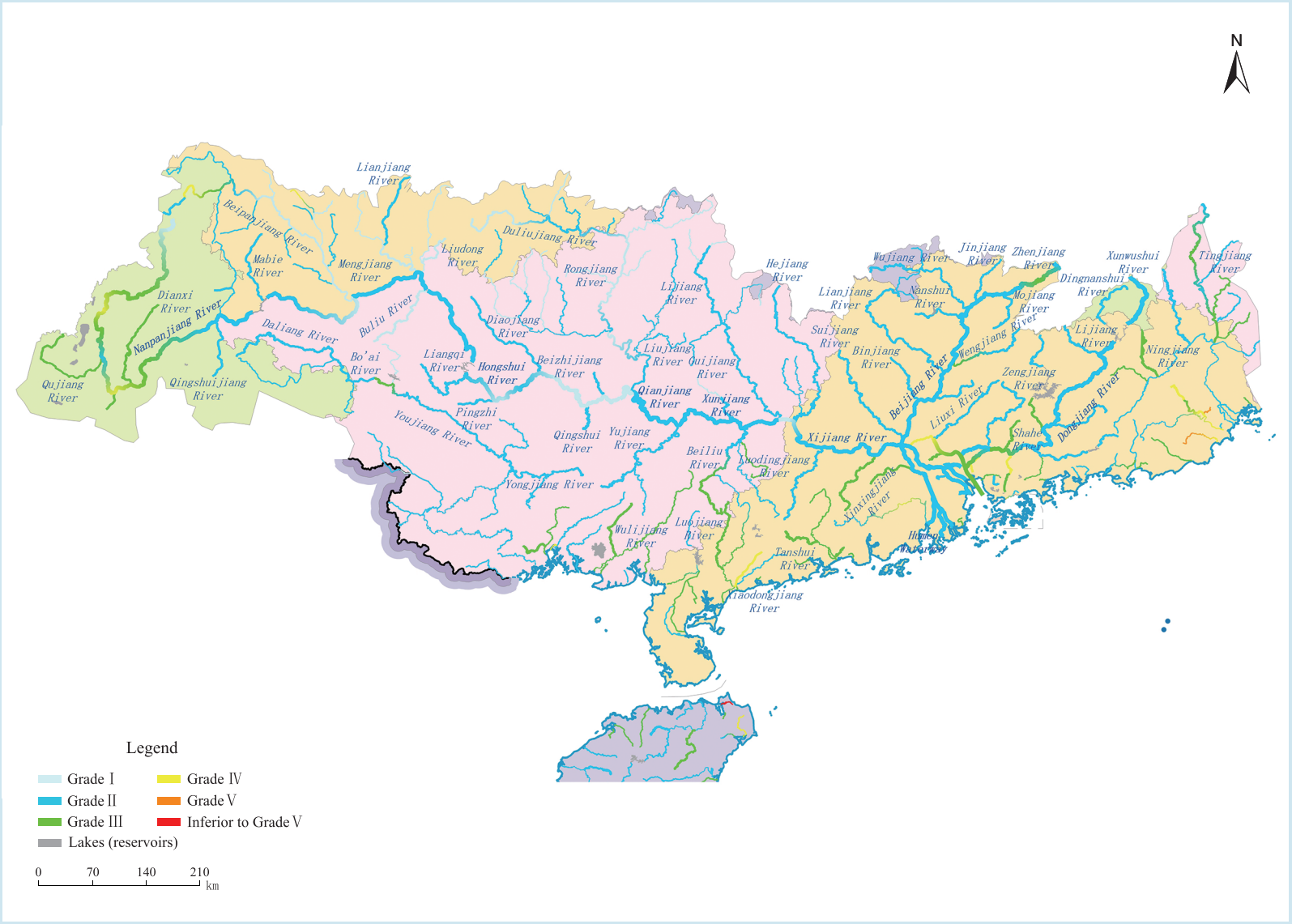
Water quality of Pearl River Basin in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	364	10.4	63.5	20.3	4.9	0.5	0.3	1.3	1.4	-0.9	-0.3	-0.9	-0.8
Mainstream	62	9.7	71.0	14.5	4.8	0	0	-8.0	8.1	1.6	0	-1.6	0
Major tributaries	180	17.2	68.3	10.6	3.9	0	0	6.1	-5.6	-0.5	1.1	-0.6	-0.6
Coastal rivers in Guangdong and Guangxi	79	0	44.3	46.8	6.3	2.5	0	-1.3	8.9	-1.3	-5.1	1.2	-2.5
Rivers in Hainan	43	2.3	67.4	20.9	7.0	0	2.3	0	6.9	-4.7	2.3	-4.7	0

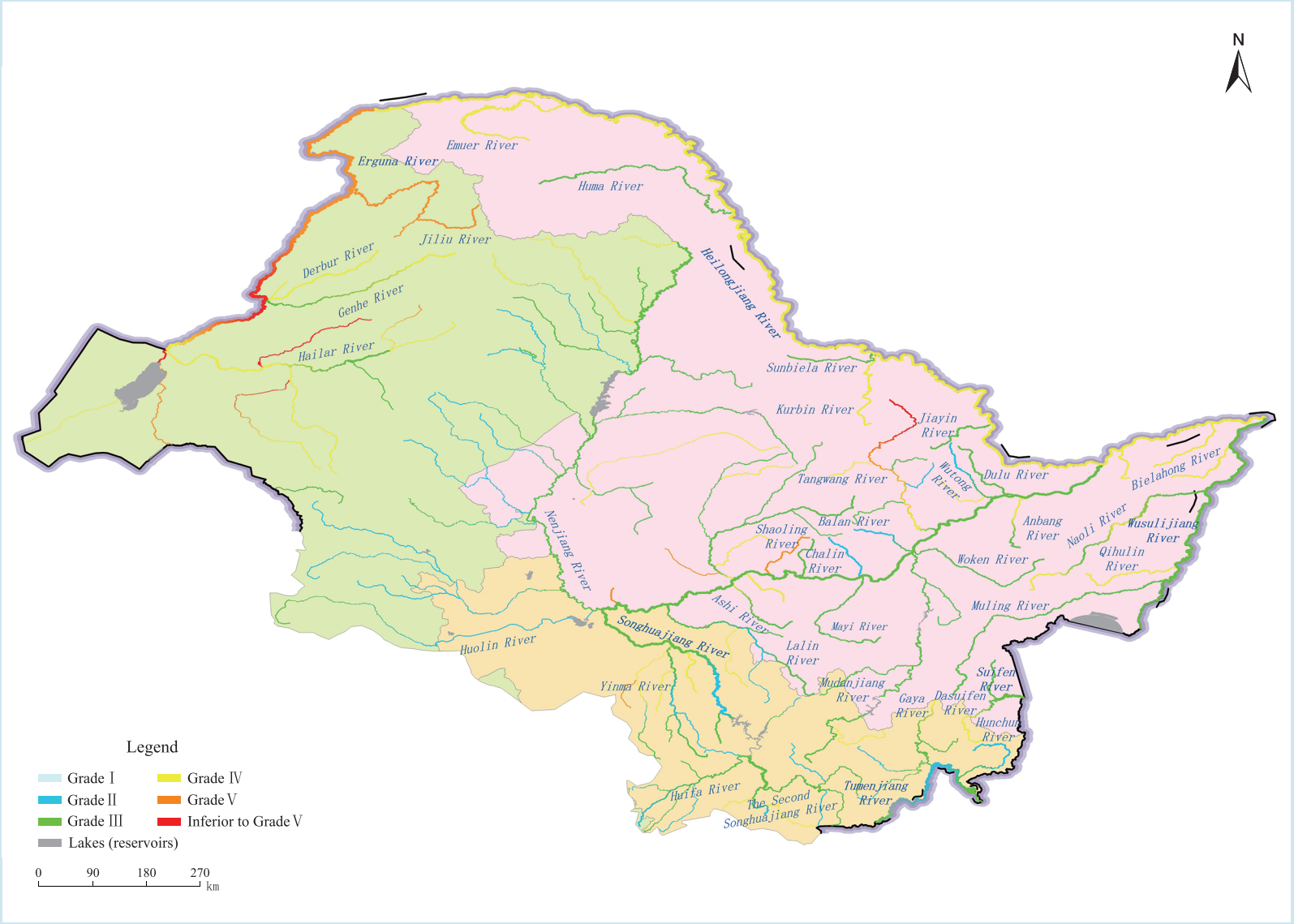
The Songhua River basin was slightly polluted. The major pollution indicators were COD_{Mn}, COD and TP. Among the 254 surface water sections monitored by the state, 70.5% met Grade I – III standard, up by 9.5 percentage points compared with that of 2021; and 2.0% was inferior to Grade V standard, down by 2.3 percentage points compared with that of 2021. The mainstream of the Songhua River basin and waters of Tumen River were of excellent water quality; the major tributaries of the Songhua River basin were of good water quality; and waters of Heilongjiang River, Wusuli River and Suifen River were slightly polluted.

Water quality of Songhua River Basin in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	254	0	20.1	50.4	23.6	3.9	2.0	0	5.1	4.3	-3.6	-3.6	-2.3
Mainstream	20	0	15.0	85.0	0	0	0	0	-0.8	16.6	-15.8	0	0
Major tributaries	155	0	28.4	51.6	16.1	3.2	0.6	0	7.1	5.1	-8.4	-2.6	-1.3
Waters of Heilongjiang	45	0	0	20.0	60.0	11.1	8.9	0	0	2.2	17.8	-11.1	-8.9
Waters of Wusuli River	15	0	0	66.7	33.3	0	0	0	0	0	0	0	0
Waters of Tumen River	14	0	28.6	64.3	7.1	0	0	0	15.3	-9.0	-6.2	0	0
Waters of Suifen River	5	0	0	60.0	40.0	0	0	0	0	0	0	0	0



Water quality distribution of Pearl River Basin in 2022



Water quality distribution of Songhua River Basin in 2022

The Huaihe River basin was fairly good in water quality. Of the 341 surface water sections monitored by the state, 84.5% met Grade I – III standard, up by 4.1 percentage points compared with that of 2021; and no section was inferior to Grade V standard, the same as that of 2021. The mainstream of Huaihe River and Yishu-Si waters were of excellent water quality; waters of major tributaries of Huaihe River were of good water quality; and the waters of rivers flowing into sea in Shandong Peninsula were slightly polluted.

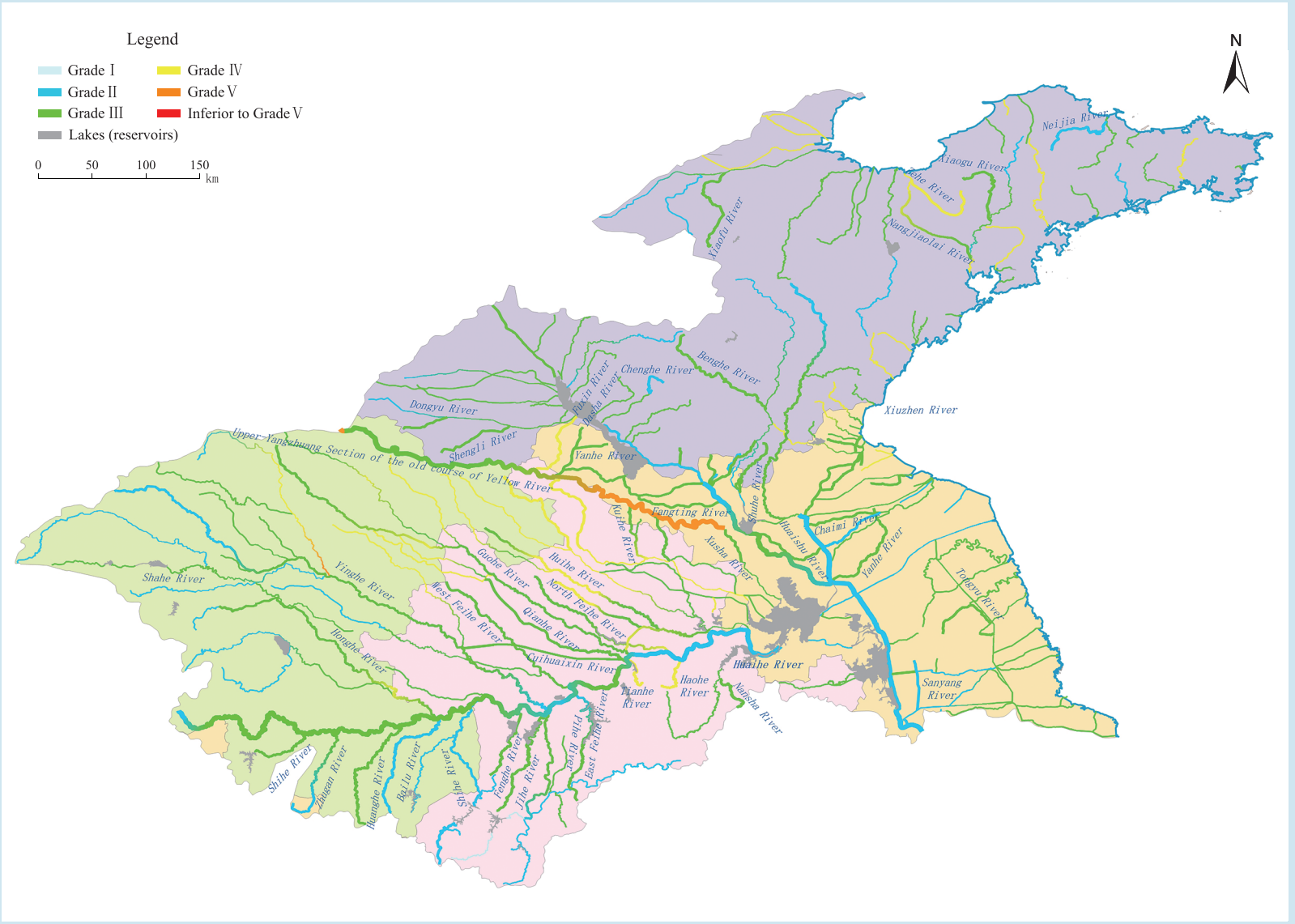
Water quality of Huaihe River Basin in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	341	0.3	23.2	61.0	15.0	0.6	0	-0.6	3.8	0.9	-4.1	0	0
Mainstream	13	0	46.2	53.8	0	0	0	0	-15.3	15.3	0	0	0
Major tributaries	182	0.5	23.6	57.7	17.0	1.1	0	-1.1	7.1	-2.2	-3.9	0	0
Waters of the Yishu-Si water system	98	0	22.4	71.4	6.1	0	0	0	7.1	-2.1	-5.1	0	0
Waters of rivers flowing into sea in Shandong Peninsula	48	0	16.7	54.2	29.2	0	0	0	-10.4	14.6	-4.1	0	0

The Haihe River basin was slightly polluted. The major pollution indicators were COD, COD_{Mn} and BOD_5. Of the 246 surface water sections monitored by the state, 74.8% met Grade I – III standard, up by 6.4 percentage points compared with that of 2021; and no water section was inferior to Grade V standard, down by 0.4 percentage point compared with that of 2021. Of the 3 sections of the mainstream of the Haihe River, the water quality of Sanchakou and Haijin Bridge met Grade III standard, and that of Haihe River tidal gate met Grade IV standard. The waters of Luanhe River were of excellent quality. The water quality of major tributaries, and waters in east Hebei and coastal areas were of good quality and that of the Tuhai River-Majia River was of slight pollution.

Water quality of Haihe River Basin in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	246	12.6	30.1	32.1	24.4	0.8	0	6.5	1.0	-1.1	-3.9	-2.1	-0.4
Mainstream	3	0	0	66.7	33.3	0	0	0	-33.3	33.4	0	0	0
Major tributaries	193	13.0	31.1	32.1	23.3	0.5	0	7.2	1.3	-0.4	-4.4	-3.2	-0.5
Waters of Luanhe River	21	23.8	47.6	28.6	0	0	0	4.8	4.7	-4.7	-4.8	0	0
Waters in east Hebei and coastal areas	7	0	28.6	57.1	14.3	0	0	0	14.3	0	-14.3	0	0
Waters of Tuhai River-Majia River	22	4.5	9.1	22.7	59.1	4.5	0	4.5	-4.5	-9.1	4.6	4.5	0



Water quality distribution of Huaihe River Basin in 2022

Water quality distribution of Haihe River Basin in 2022

The Liaohe River basin was fairly good in water quality. Of the 194 surface water sections monitored by the state, 84.5% met Grade I – III standard, up by 3.1 percentage points compared with that of 2021; and no section was inferior to Grade V standard, the same as that of 2021. The waters of Dalinghe River, Yalu River, and the coastal rivers in eastern and western Liaoning were of excellent quality. The waters of the mainstream and Daliaohe River were of good quality, and the waters of major tributaries of Liaohe River were of slight pollution.

Water quality of Liaohe River Basin in 2022

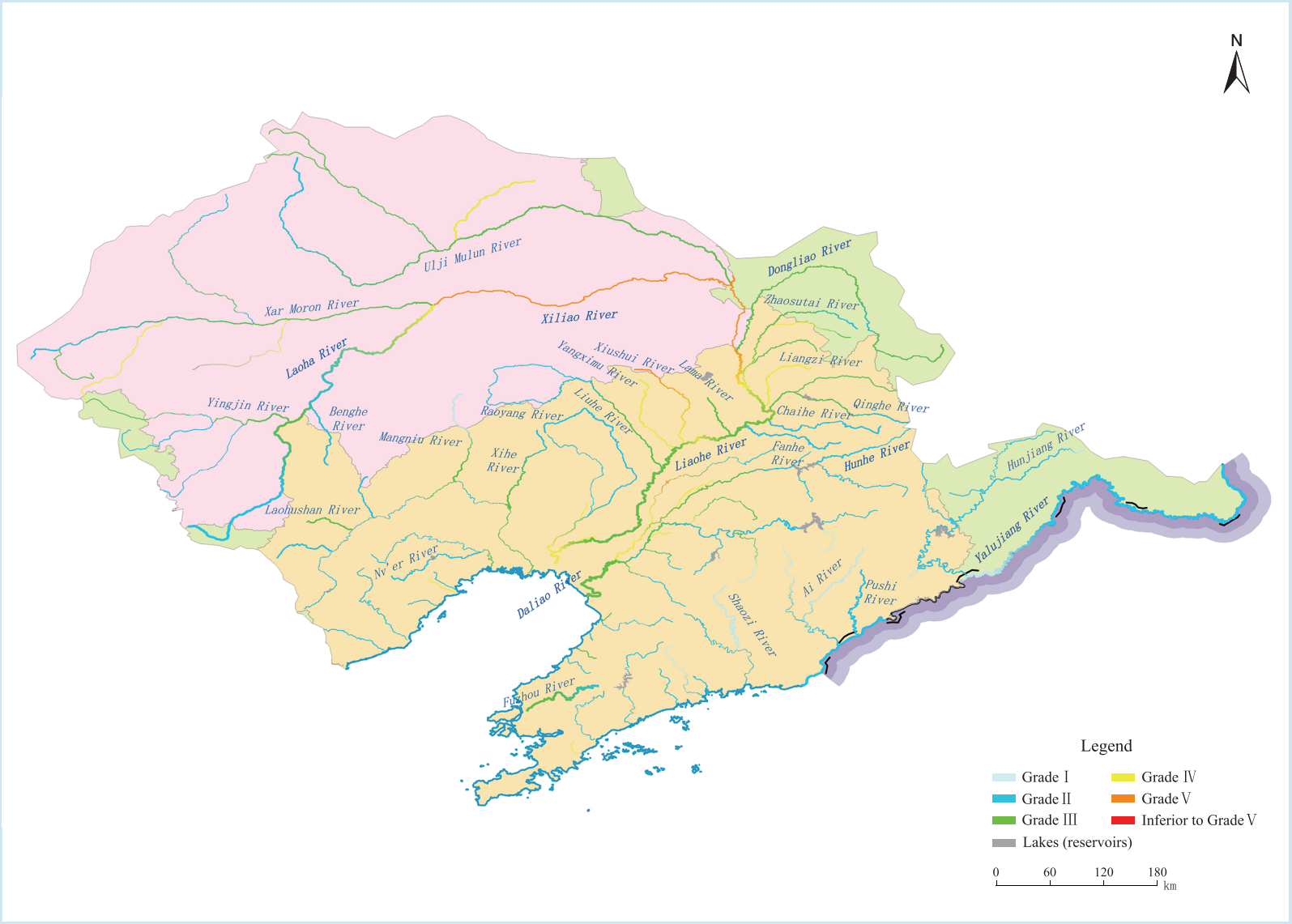
Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
Basin	194	5.7	52.1	26.8	12.4	3.1	0	1.1	4.2	-2.1	-4.1	1.0	0
Mainstream	16	0	18.8	31.2	31.2	18.8	0	0	-1.2	-8.8	-2.1	12.1	0
Major tributaries	62	0	37.1	40.3	19.4	3.2	0	0	11.7	-4.1	-9.2	1.6	0
Waters of Daliaohe River	38	7.9	47.4	28.9	13.2	2.6	0	2.6	-5.2	7.8	-2.6	-2.7	0
Waters of the Daling River	16	6.2	56.2	37.5	0	0	0	6.2	-18.8	25.0	-12.5	0	0
Waters of the Yalu River	27	18.5	81.5	0	0	0	0	-3.7	14.8	-11.1	0	0	0
Coastal rivers in eastern Liaoning	22	9.1	68.2	18.2	4.5	0	0	4.6	0	-4.5	0	0	0
Coastal rivers in western Liaoning	13	0	84.6	7.7	7.7	0	0	0	15.4	-23.1	7.7	0	0

Rivers in Zhejiang and Fujian Provinces were of excellent water quality. Of the 198 surface water sections monitored by the state, 98.5% met Grade I – III standard, up by 3.6 percentage points compared with that of 2021; and no section was inferior to Grade V standard, keeping the same with that of 2021.

Water quality of Rivers in Zhejiang Province and Fujian Province in 2022

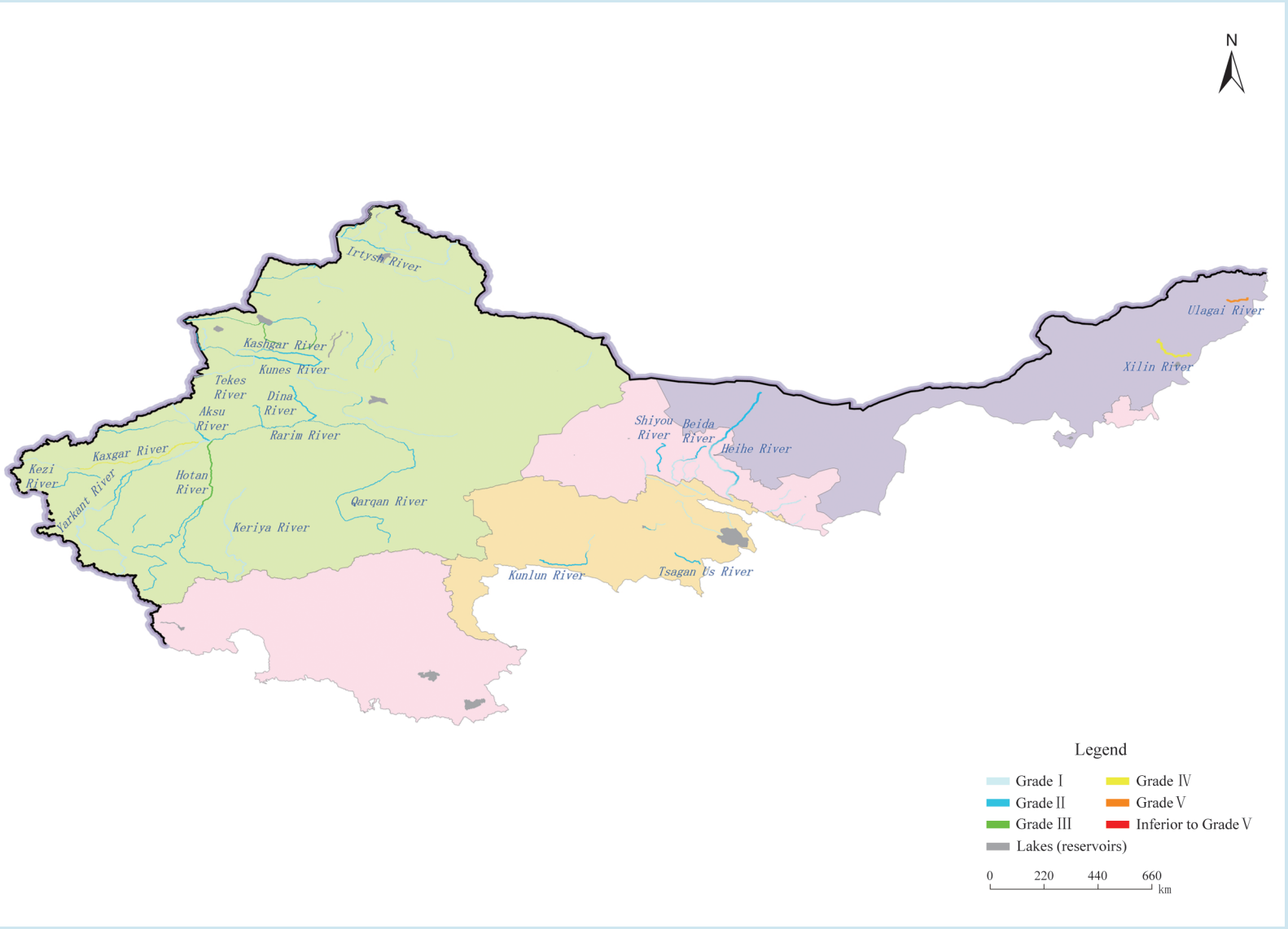
Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
River	198	9.1	62.6	26.8	1.5	0	0	0.5	0.5	2.6	-3.0	-0.5	0

Rivers in northwestern part of China were of excellent water quality. Of the 105 surface water sections monitored by the state, 96.2% met Grade I – III standard, down by 0.1 percentage point compared with that of 2021; and no water was inferior to Grade V standard, keeping the same with that of 2021.

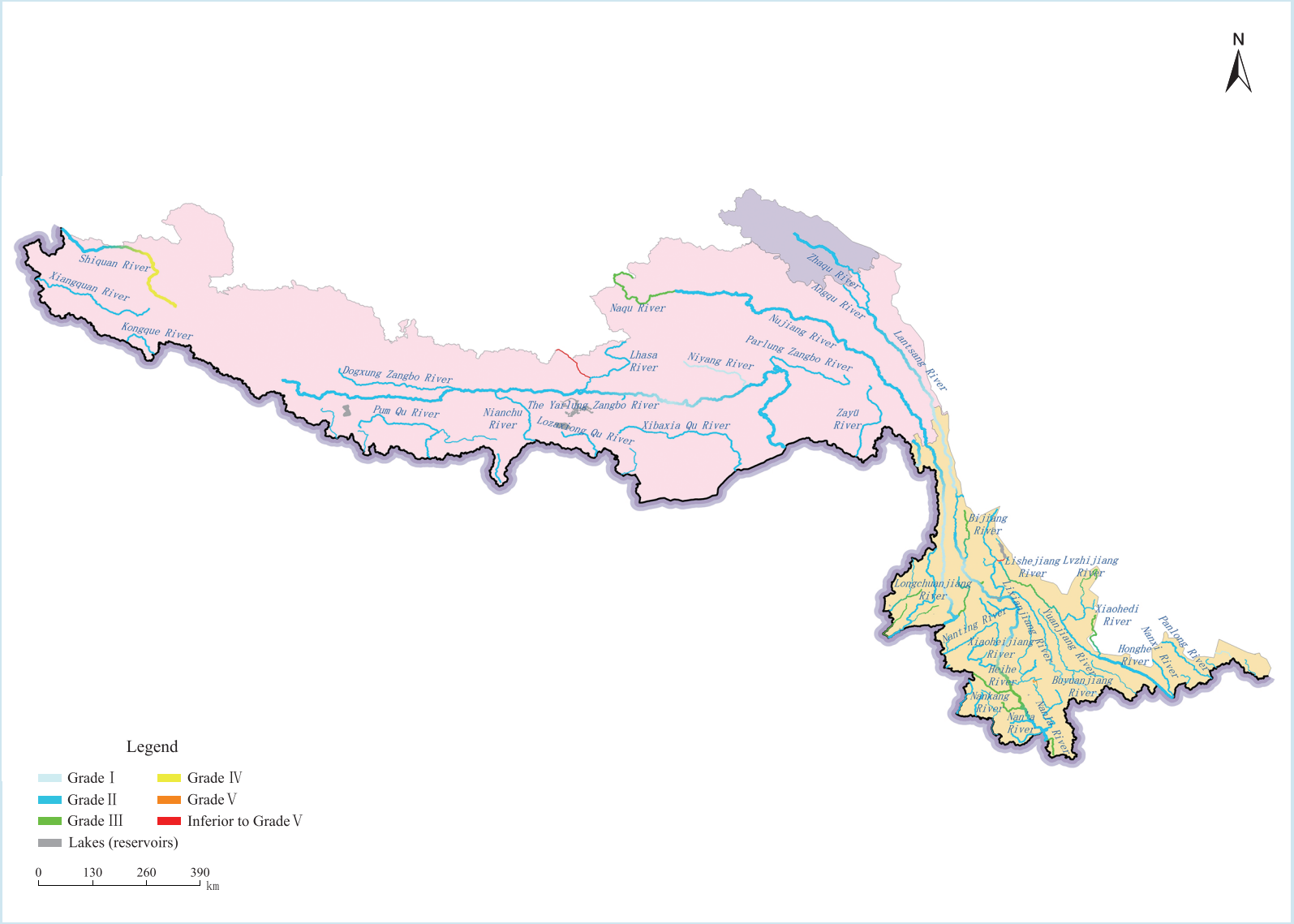


Water quality distribution of Liaohe River Basin in 2022

Water quality distribution of Rivers in Zhejiang Province and Fujian Province in 2022



Water quality distribution of Rivers in northwestern part of China in 2022



Water quality distribution of Rivers in southwestern part of China in 2022

Water quality of Rivers in northwestern part of China in 2022

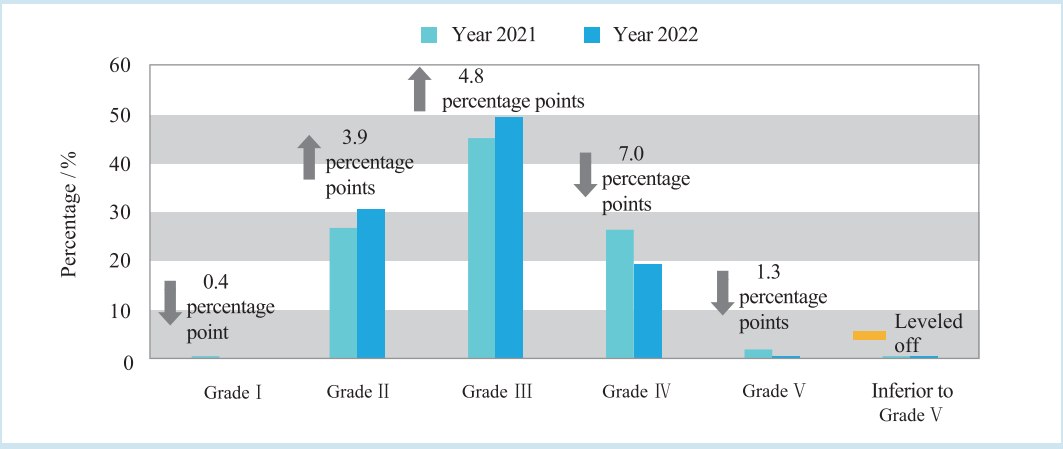
Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
River	105	46.7	45.7	3.8	2.9	1.0	0	6.5	-8.5	1.9	1.0	-0.9	0

Rivers in southwestern part of China were of excellent water quality. Of the 133 surface water sections monitored by the state, 97.0% met Grade I – III standard, up by 0.8 percentage point compared with that of 2021; 1.5% were inferior to Grade V standard, keeping the same with that of 2021.

Water quality of Rivers in southwestern part of China in 2022

Water body	Number of sections (items)	Percentage (%)						Compared with that of 2021 (percentage points)					
		Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ	Grade Ⅰ	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Grade Ⅴ	Inferior to Grade Ⅴ
River	133	9.0	76.7	11.3	0.8	0.8	1.5	0	0.8	0	-1.5	0.8	0

Rivers flowing into the sea In 2022, among the 230 surface water sections monitored by the state of rivers flowing into the sea*, 80.0% met Grade I – III water quality standard, an increase of 8.3 percentage points from that of 2021; and 0.4% was inferior to Grade V standard, the same as that of 2021. The major pollution indicators exceeding the standard are COD, COD_{Mn}, BOD_5, TP and ammonia nitrogen.



Water quality of rivers flowing into the sea in 2022 and interannual variation

*During the 14th "Five-Year" Plan period, a total of 230 sections of rivers entering the sea were put under the national monitoring system.

(3) Lakes (reservoirs)

Overall status In 2022, among the 210 major lakes (reservoirs) across the country under the national monitoring program, 73.8% met Grade I – III standard, up by 0.9 percentage point compared with that of 2021; and 4.8% were inferior to Grade V standard, down by 0.4 percentage point compared with that of 2021. The major pollution indicators were TP, COD and COD_{Mn}.

Of the 204 major lakes (reservoirs) monitored of nutritional status, 9.8% were under oligotrophic status, down by 0.7 percentage point compared with that of 2021; 60.3% were under mesotrophic status, down by 1.9 percentage points compared with that of 2021; 24.0% were under slight eutrophication, up by 1.0 percentage point compared with that of 2021; and 5.9% were under intermediate eutrophication, up by 1.6 percentage points compared with that of 2021.

The Taihu Lake was of slight pollution. The major pollution indicator was TP. In specific, the water quality of the eastern shore line was fairly good; and the central area, the northern shore line and western shore line were slightly polluted. The lake as a whole was under slight eutrophication. In specific, the eastern shore line was mesotrophic, and the central area, the northern shore line and western shore line were under slight eutrophication.

The rivers surrounding the Taihu Lake were of excellent water quality. Of the 133 surface water sections monitored by the state, 0.8% met Grade I standard; 36.8% met Grade II standard; 62.4% met Grade III standard; and none was inferior to Grade III standard. Compared with that of 2021, water sections meeting Grade II standard were up by 7.5 percentage points; those meeting Grade III, Grade IV and Grade V standards dropped by 5.3, 0.8 and 1.5 percentage points respectively; and others remained unchanged.

The Chaohu Lake was of slight water pollution. The major pollution indicator was TP. In specific, the eastern half and the western half of the lake were both slightly polluted. The lake as a whole was under slight eutrophication, while the eastern half was under slight eutrophication and the western half was under intermediate eutrophication.

The rivers surrounding the Chaohu Lake were of excellent water quality. Of the 21 surface water sections monitored by the state, 52.4% met Grade II standard, up by 4.8 percentage points compared with that of 2021; 42.9% met Grade III standard, down by 4.7 percentage points; 4.8% met Grade IV standard, the same as that of 2021; and no section met Grade I and Grade V standards or was inferior to Grade V standard, the same as that of 2021.

The Dianchi Lake was of slight water pollution. The major pollution indicators were COD and TP. In specific, the Caohai area of Dianchi Lake was slightly polluted, and the Waihai area was moderately polluted. The lake as a whole was under slight eutrophication. In specific, Caohai area was under intermediate eutrophication and the Waihai area was under slight eutrophication.

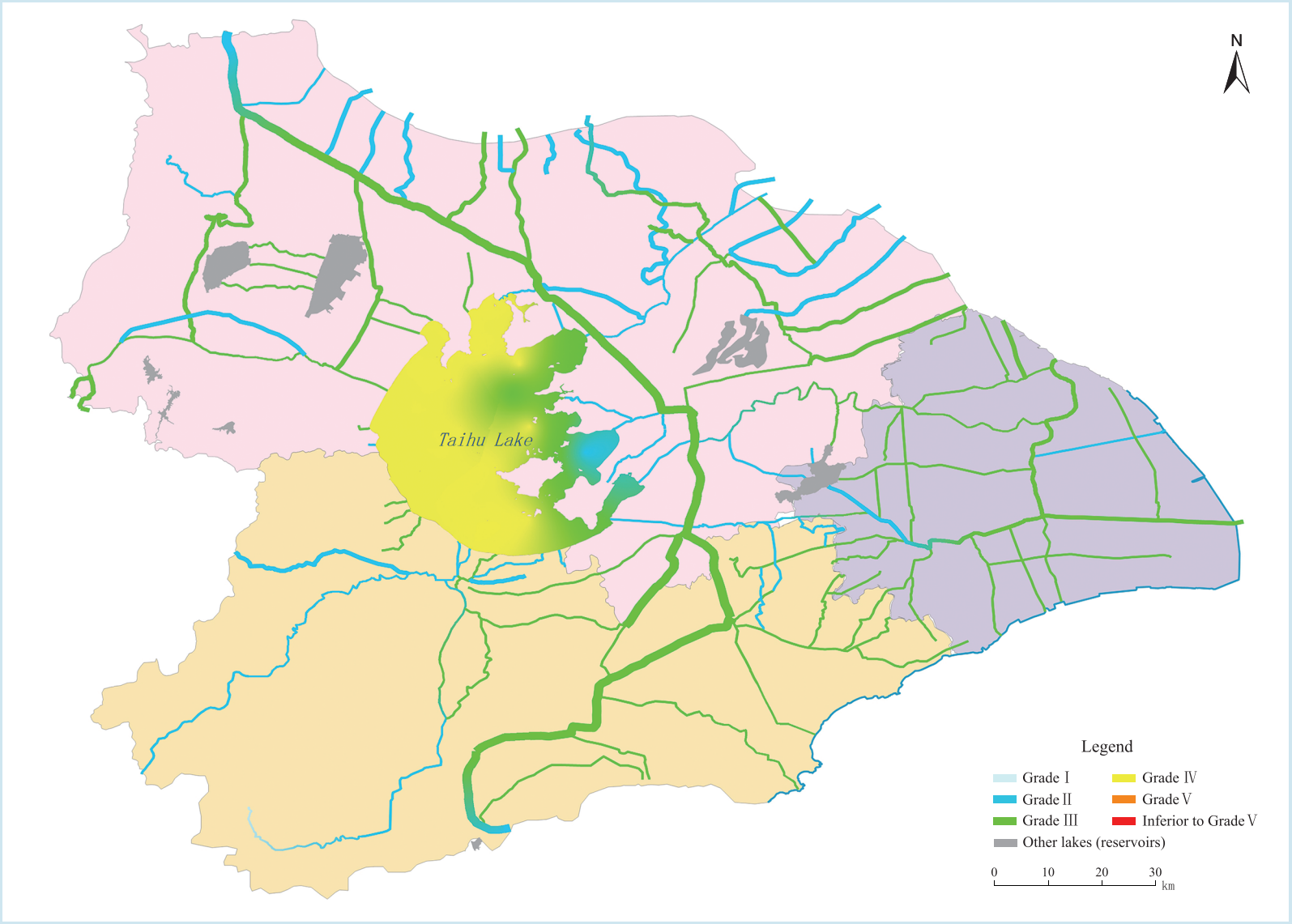
The rivers surrounding the Dianchi Lake were of excellent water quality. Of the 12 surface water sections monitored by the state, 33.3% met Grade II standard, the same as that of 2021; 58.3% met Grade III standard, up by 16.6 percentage points compared with that of 2021; and 8.3% met Grade IV standard, down by 16.7 percentage points compared with that of 2021. No section met Grade I standard or was inferior to Grade V standard, the same as that of 2021.

Danjiangkou Reservoir was of excellent water quality and was under mesotrophic state. Among the inflow sections of the 10 reservoir-entering rivers monitored, 20.0% met Grade I standard; 60.0% met Grade II standard; 10.0% met Grade III standard; 10.0% met Grade IV standard; and none was of Grade V standard or worse. Compared with 2021, the share of sections of Grade I water quality increased by 20.0 percentage points, that of Grade III decreased by 20.0 percentage points, and that of other grades remained the same.

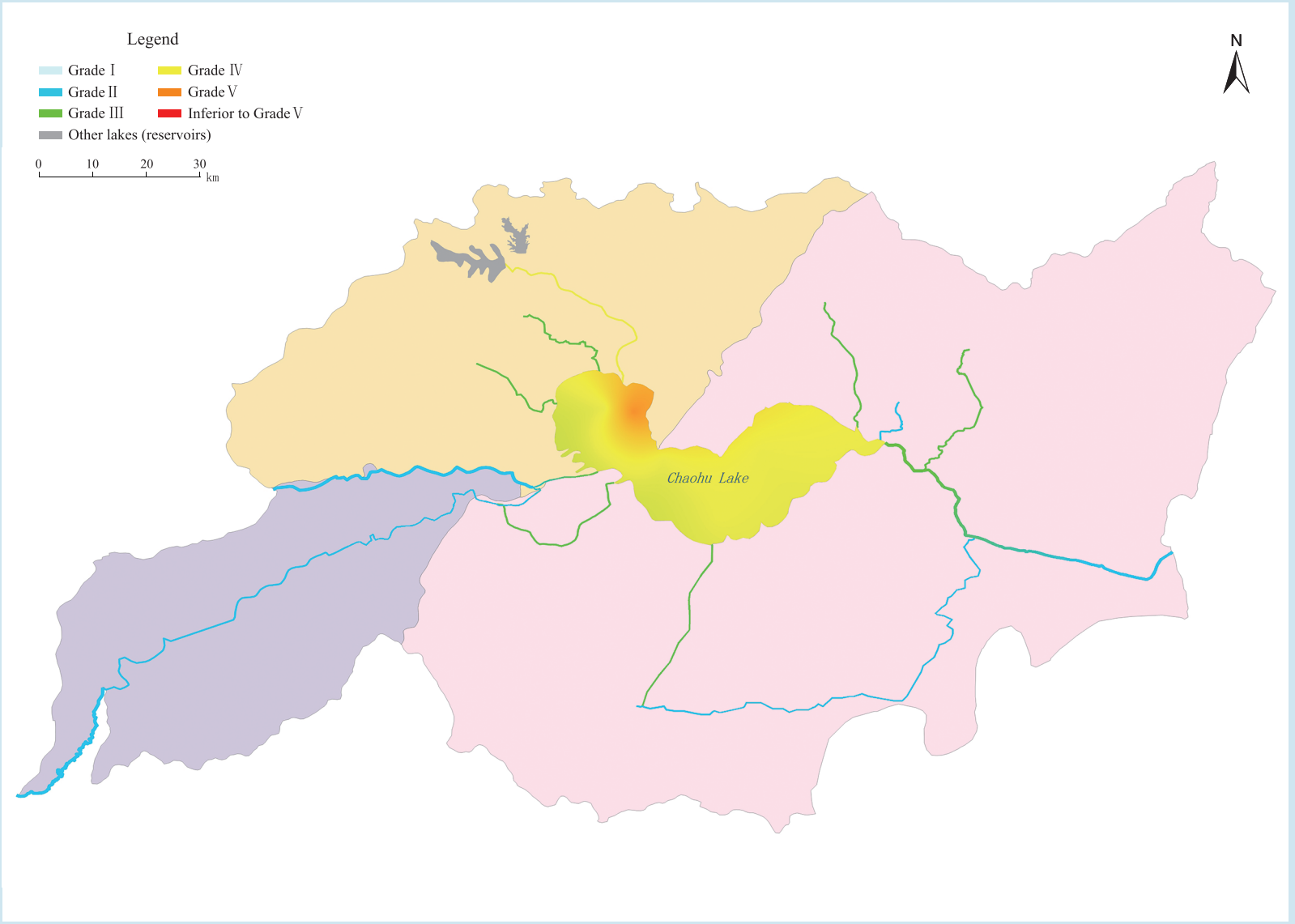
Erhai Lake was of excellent water quality and was under mesotrophic state. The inflow sections of the 2 lake-entering rivers monitored met Grade II standard. Compared with 2021, the water quality of the two sections was of no significant change.

Baiyangdian Lake was of fairly good water quality and was under mesotrophic state. Among the inflow sections of the 4 lake-entering rivers monitored, 2 sections met Grade II water quality standard and 2 sections met Grade III standard respectively. Compared with 2021, the water quality of 2 sections improved from Grade III to Grade II, and 1 section witnessed no significant change*.

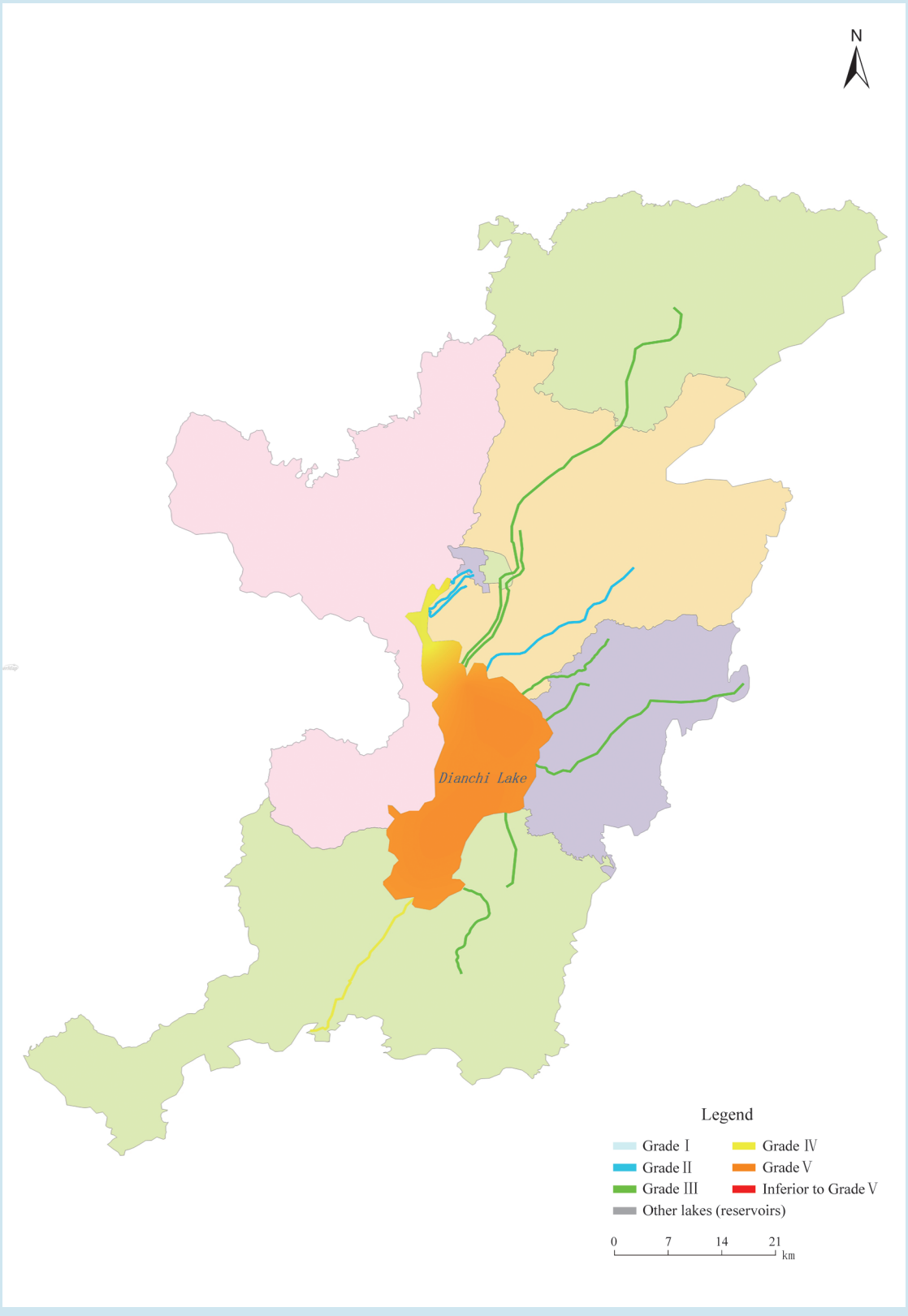
*1 section was not under monitoring in 2021.



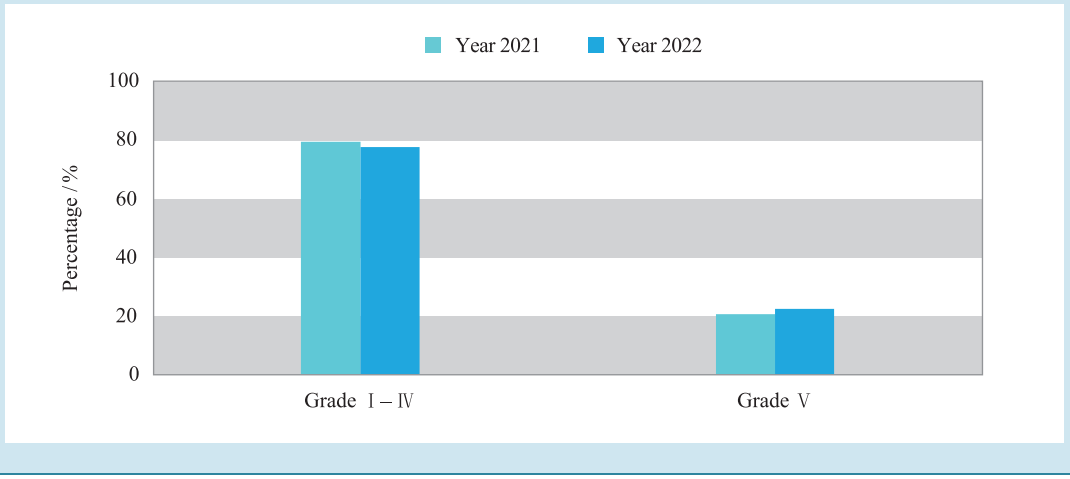
Water quality distribution of Taihu Lake in 2022



Water quality distribution of Chaohu Lake in 2022



Water quality distribution of Dianchi Lake in 2022



Water quality of the national groundwater in 2022 and interannual variation

2. Groundwater quality

In 2022, among the 1,890 groundwater environmental quality assessment sites monitored by the state*, 77.6% met Grade I – IV water quality standard, and 22.4% met Grade V standard. The major non-attainment pollution indicators were iron, sulfate, and chloride.

3. Water environment quality of major water-use zones

(1) Centralized drinking water source areas**

APL Cities In 2022, among the 919 sections (sites) of the centralized drinking water sources under the monitoring in APL cities across the country, 881 sections (sites) were up to standard throughout the year, taking up 95.9% of the total. In specific, 635 sections (sites) were surface drinking water source sections (sites), 624 of which were up to standard throughout the year, taking up 98.3%. Major nonattainment pollution indicators were COD_{Mn}, TP and sulfate. There were 284 groundwater drinking water source sites, 257 of which were up to standard throughout the year, taking up 90.5%, with major nonattainment pollutants being manganese, iron and fluoride, mainly attributable to the relatively high natural background value.

County-level Cities In 2022, among the 2,622 sections (sites) of the centralized drinking water sources under monitoring in county-level cities across the country, 2,461 sections (sites) were up to standard throughout the year, taking up 93.9% of the total. In specific, 1,731 sections (sites) were surface drinking water source sections (sites), 1,709 of which were up to standard throughout the year, taking up 98.7%. Major nonattainment pollution indicators were TP, BOD_5, fluoride and sulfate. 891 were groundwater drinking water source sites, 752 of which were up to standard throughout the year, taking up 84.4%, with major nonattainment pollutants being manganese, fluoride and iron, mainly attributable to the relatively high natural background value.

*During the 14th "Five-Year" Plan period, there are a total of 1,912 groundwater environmental quality assessment sites nationwide, covering the national first and second level hydro-geological divisions and 339 APL cities. The assessment was based on Standard for Groundwater Quality (GB/T 14848-2017). In 2022, 1,890 sites were actually monitored.

**The assessment of water quality of drinking water sources was based on Environmental Quality Standards for Surface Water (GB 3838-2002) and Standard for Groundwater Quality (GB/T 14848-2017).

Rural centralized drinking water sources serving a population of more than 10,000 or with a daily water supply of 1,000 tons In 2022, among the 10,345 sections (sites) of the rural centralized drinking water sources serving a population of more than 10,000 or with a daily water supply of 1,000 tons, 8,572 sections (sites) were up to standard throughout the year, taking up 82.9% of the total. In specific, 5,655 sections were surface drinking water source sections (sites), 5,396 of which were up to standard throughout the year, taking up 95.4%. Major nonattainment pollution indicators were TP, sulfate and COD_{Mn}. 4,690 were groundwater drinking water source sites, 3,176 of which were up to standard throughout the year, taking up 67.7%, with major nonattainment pollutants being fluoride, sodium and manganese, mainly attributable to the relatively high natural background value.

(2) Water bodies of key water conservancy projects

The Three Gorges Reservoir Area In 2022, the water quality of the main tributaries of the Three Gorges Reservoir Area was excellent. Among the 77 sections monitored, those meeting Grade I – III standard took up 98.7%, sections meeting Grade IV standard took up 1.3%, and no section met Grade V standard or was inferior to Grade V standard, all being the same as that of 2021. No section was under oligotrophic status, the same as 2021; sections under mesotrophic status took up 80.5%, up by 6.5 percentage points compared with that of 2021; and sections under eutrophic status took up 19.5%, down by 6.5 percentage points compared with that of 2021.

South-North Water Diversion Project (East Route) In 2022, the intake of the Yangtze River was of excellent water quality. The water quality of the Suqian section, Bulao section and Liangji section of the Beijing-Hangzhou Canal was fairly good, and that of Liyunhe section, Baoying section, and Hanzhuang section was excellent.

South-North Water Diversion Project (Central Route) In 2022, the water quality of the intake was excellent. All 9 tributaries flowing into the Danjiangkou Reservoir were of excellent water quality. Danjiangkou Reservoir was of mesotrophic status.

(3) Inland fishery waters*

Key Fishery Areas in Rivers In 2022, the leading non-attainment indicators of key fishery areas in rivers were TN. The areas of which the concentration of TN, TP, COD_{Mn}, petroleum, volatile phenol, non-ionic ammonia, copper, zinc, lead and cadmium was better than the assessment standard accounted for 0.4%, 55.6%, 72.0%, 99.9%, 99.7%, 95.2%, 97.7%, 99.8%, 99.3% and 99.9% of the monitored area respectively. The concentration of mercury, arsenic and chromium all met the assessment standards by the monitoring results.

Key Fishery Areas in Lakes (Reservoirs) The leading non-attainment indicators of key fishery areas in lakes (reservoirs) were TN and TP. The areas of which the concentration of TN, TP, COD_{Mn}, petroleum, volatile phenols, copper, and cadmium was better than the assessment standard accounted for 17.6%, 16.9%, 51.3%, 98.7%, 96.2%, 89.7% and 99.3% of the monitored area respectively. The concentrations of zinc, lead, mercury, arsenic and chromium all met the assessment standards by the monitoring results.

39 National Aquatic Germplasm Resources Conservation Areas The key non-attainment indicator in the water bodies of 39 national aquatic germplasm resources conservation areas was TN. The areas of which the concentration of TN, TP, COD_{Mn}, petroleum, volatile phenol, non-ionic ammonia, copper, zinc, mercury and chromium was better than the assessment standard accounted for 0.9%, 96.6%, 90.3%, 99.3%, 98.8%, 76.9%, 99.97%, 99.9%, 99.99% and 99.999% of the monitored area respectively.

(4) Farmland irrigation water

In 2022, among the 1,765 irrigation water sections (sites) with the scale at or above 100,000 mu monitored in farmland irrigation areas, 1,635 sections (sites) were up to standard, accounting for 92.6%. The main non-attainment indicators are suspended substance, fecal coliform and pH**.

*Including 115 important fish and shrimp spawning grounds, feeding grounds, migration channels, breeding areas, key protected aquatic habitats and aquatic germplasm resources protection areas in the Heilongjiang River Basin, Yellow River Basin, Yangtze River Basin, and Pearl River Basin.

**The assessment of farmland irrigation water quality was based on the Standard for Irrigation Water Quality (GB 5084-2021).

Special Column

Solid progress in promoting the battle against water pollution

A series of guideline documents had been issued including the Implementation Opinions of the General Office of the State Council on Strengthening the Supervision and Management of Sewage Outlets Entering Rivers and Seas, the Action Plan for In-depth Protection and Restoration of the Yangtze River, and the Action Plan for Yellow River Ecological Protection and Governance. The investigation and rectification of river sewage outlets entering rivers had been carried out persistently nationwide. By the end of 2022, a total of 245,000 kilometers of river and lake shorelines had been investigated across China, and more than 166,000 sewage outlets entering rivers had been registered, about 30% of which had been rectified. The plan was formulated for the division of authority for the approval of river-entering sewage outlets by various eco-environmental supervision bureaus covering different watersheds and sea areas, and the "one-stop service" was vigorously promoted to make the services easily accessible to the public and enterprises. In 2022, more than 2,600 river-entering sewage outlets were approved by the eco-environmental authorities at all levels. Efforts were intensified to prevent and control water pollution in industrial parks, with a special action launched to control water pollution in industrial parks along the Yangtze River Economic Belt. A total of 1,549 centralized sewage treatment facilities were installed in 1,174 industrial parks along the Yangtze River Economic Belt, and more than 400 problems such as unsound sewage pipeline networks and illegal sewage discharge had been identified and rectified. Similar efforts were also made to prevent and control water pollution in industrial parks along the Yellow River, through which 976 centralized sewage treatment facilities were built across 756 industrial parks. Guidance was provided to various localities to better control TP pollution in accordance with specific local conditions. As a result, six provinces (autonomous regions) of Hubei, Hunan, Jiangxi, Jiangsu, Guizhou and Guangxi issued their own plans for TP pollution control. Efforts were also made in addressing the inadequacy of sewage treatment facilities in medical institutions. Through the investigation into more than 24,000 medical institutions, over 6,400 problems have been pinpointed, and the localities were urged to rectify problems as soon as possible. In 2022, a campaign was launched for the treatment of urban black and odorous water bodies, to further consolidate the effective treatment of black and odorous water in prefecture-level and above cities across the country, and the annual target for the elimination of 40% of the black and odorous water in county-level cities had been achieved. Regional pilot projects for the recycling of recycled water were rolled out across 19 pilot cities as the first batch. The delineation of township-level centralized drinking water source protection zones was advanced steadily nationwide. By the end of 2022, a total of 19,633 township-level centralized drinking water source protection zones were delineated nationwide.

Ⅲ. Marine Ecological Environment

1. Marine environmental quality

(1) Marine water quality*

Sea areas under jurisdiction In the summer of 2022, the sea areas meeting Grade I standard took up 97.4% of the total area under jurisdiction, a decrease of 0.3 percentage point from 2021. Sea areas in the Bohai Sea, Yellow Sea, East China Sea, and South China Sea failing to meet Grade I standard were 24,650 km^2, 13,710 km^2, 28,940 km^2, and 9,540 km^2 respectively. Sea areas in the Bohai Sea and the Yellow Sea failing to meet Grade I standard have increased compared with that of 2021, while that of the East China Sea and South China Sea decreased.

The sea areas under jurisdiction of China failing to meet Grade I standard in 2022

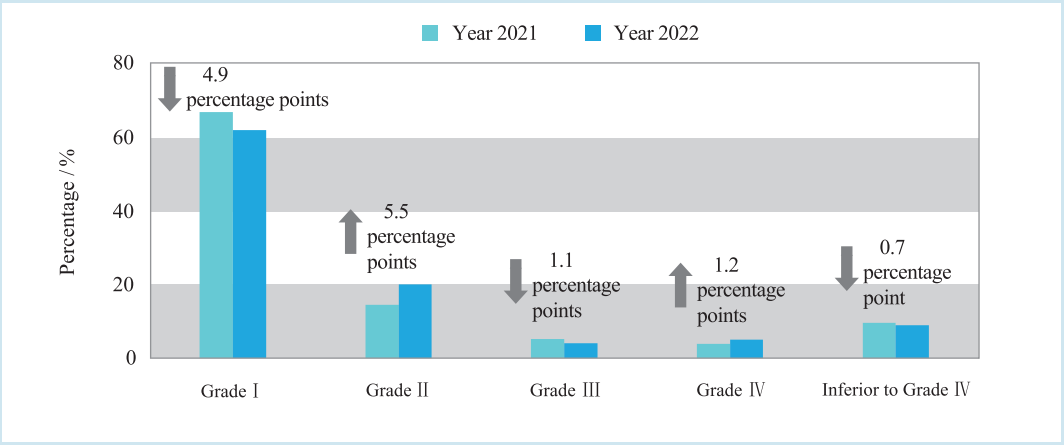
Sea area	Marine area (km^2)				
	Grade Ⅱ	Grade Ⅲ	Grade Ⅳ	Inferior to Grade Ⅳ	Total
Bohai Sea	10,910	3,790	2,150	7,800	24,650
Yellow Sea	9,850	1,650	1,000	1,210	13,710
East China Sea	11,190	4,030	2,370	11,350	28,940
South China Sea	2,440	1,560	1,020	4,520	9,540
Sea areas under jurisdiction	34,390	11,030	6,540	24,880	76,840

Nearshore sea areas In 2022, the overall water quality of nearshore sea areas in China maintained an improving trend. 81.9% of the total sea areas met Grade I & II water quality standards (namely of excellent or good water quality), up by 0.6 percentage point compared with that of 2021; 8.9% failed to meet Grade IV standard, down by 0.7 percentage point compared with that of 2021. The major indicators that exceeded standards were inorganic nitrogen and active phosphates.

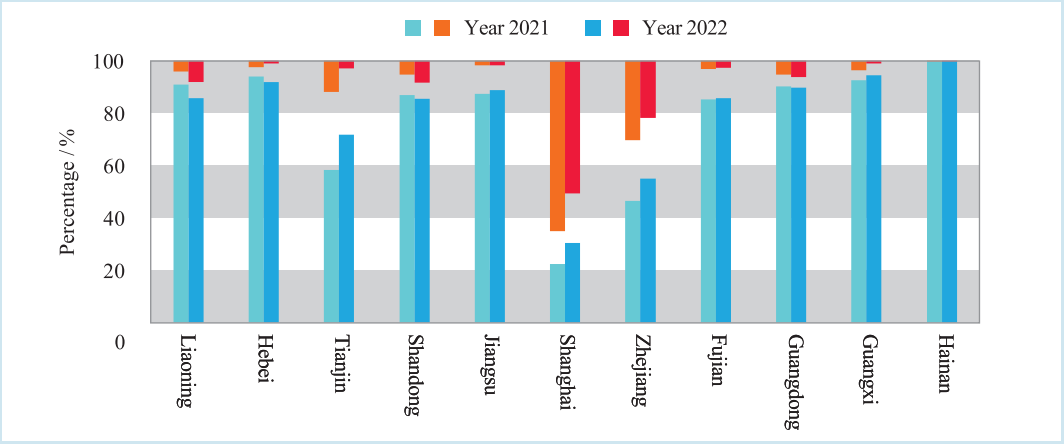
*A total of 1,359 national monitoring sites for seawater environmental quality in sea areas under the jurisdiction of China has been set up, including 1,172 sites in nearshore waters and 187 sites in offshore waters. Three-period monitoring were carried out in spring, summer and autumn in nearshore waters, and one-period monitoring was carried out in summer in offshore waters. The assessment of the jurisdictional sea area adopted the summer monitoring data, and the assessment of the coastal waters adopted the average monitoring data collected in spring, summer and autumn. The seawater quality assessment was based on Technical Regulation for Seawater Quality Assessment (Trial), Technical Specification for Offshore Environmental Monitoring (HJ 442-2020) and Sea Water Quality Standard (GB 3097-1997).

The percentage of seawater areas with excellent or good quality in nearshore waters in Tianjin, Jiangsu, Shanghai, Zhejiang and Guangxi increased slightly compared with that of 2021, that of Fujian, Guangdong and Hainan was basically the same, and that of Liaoning, Hebei, and Shandong decreased slightly. The percentage of seawater areas with quality inferior to Grade IV standard in nearshore waters in Hebei, Tianjin, Shanghai, Zhejiang and Guangxi decreased slightly compared with that of 2021, that of Jiangsu, Fujian, Guangdong and Hainan was basically the same, and that of Liaoning and Shandong increased to some extent.

Gulfs Among the 44 gulfs with each covering an area of more than 100 km^2, the water quality of 10 gulfs under monitoring was excellent or good during spring, summer and autumn in 2022. The seawater in 20 gulfs all met Grade IV standard or above during the same time span.



Seawater quality in nearshore waters across China in 2022 and interannual variation



Percentage of seawater with excellent or good quality (below) and inferior to Grade Ⅳ (above) in nearshore waters along coastal provinces (autonomous regions and municipalities) in 2022 and interannual variation

Eutrophic sea areas under China's jurisdiction in 2022

Sea area	Marine area (km^2)			
	Mild eutrophication	Moderate eutrophication	Severe eutrophication	Total
Bohai Sea	2,530	640	1,640	4,810
Yellow Sea	2,140	190	460	2,790
East China Sea	5,770	4,130	4,910	14,810
South China Sea	2,460	1,980	1,920	6,360
Sea areas under jurisdiction	12,900	6,940	8,930	28,770

(2) Seawater eutrophication status*

In the summer of 2022, the eutrophic sea areas under jurisdiction covered 28,770 km^2 with a decrease of 1,400 km^2 compared to 2021. Among them, the sea areas of mild, moderate and severe eutrophication were 12,900 km^2, 6,940 km^2 and 8,930 km^2 respectively. Severely-eutrophic sea areas were mainly concentrated in Liaodong Bay, Yangtze River Estuary, Hangzhou Bay and Pearl River Estuary and other nearshore waters.

(3) Marine debris**

In 2022, the average amount of floating marine debris visually observed at sea was 65/km^2; the average amount of floating marine debris monitored by surface water trawl nets was 2,859/km^2 with the average density of 2.8 kg/km^2. Among the floating debris, plastic items took up the largest proportion of 86.2%, followed by wood products and paper products, accounting for 6.4% and 6.0% respectively. Plastic waste mainly consisted of foam, plastic rope, plastic fragments, plastic film and plastic bottles. The average amount of beach debris was 54,772/km^2 with the average density of 2,506 kg/km^2, among which plastic items took up the largest proportion of 84.5%, followed by paper products, accounting for 4.5%. Plastic waste was mainly composed of cigarette filters, bottle caps, foam, plastic packaging, plastic fragments, plastic bags, and plastic ropes. The average amount of undersea trash was 2,947/km^2 with the average density of 54.7 kg/km^2, among which plastic items took up the largest proportion of 86.8%, followed by wood products and metal waste, accounting for 5.7% and 3.8% respectively. Plastic waste mainly contained plastic ropes and plastic bags.

2. Environmental status of sea areas for major use categories

(1) Marine dumping zones***

In 2022, the marine dumping volume totaled 323.66 million m^3 across the country with an increase of 19.9% from 2021, and the dumped materials mainly consisted of cleaning dredged materials. The water quality in the dumping zones and the surrounding sea area met Grade III seawater quality standard or above, and the sediment quality in the dumping zones met the Grade II marine sediment standard or above. Compared with 2021, the water depth, seawater quality, and sediment quality of the dumping zones remained basically stable.

*The seawater quality assessment was based on Technical Regulation for Seawater Quality Assessment (Trial) and Technical Specification for Offshore Environmental Monitoring (HJ 442-2020).

**A total of 60 near-shore marine debris monitoring zones had been set up across the country. The marine debris assessment was based on the Technical Regulation for Monitoring and Evaluation of Marine Debris (Trial).

***A total of 56 marine dumping zones were monitored across the country for environmental conditions and water depth topography. The assessment of marine dumping zones was based on Marine Water Quality Standard (GB 3097-1997) and Marine Sediment Quality (GB 18668-2002).

(2) Offshore oil and gas fields*

In 2022, the volume of industrial wastewater, domestic sewage, drilling mud and drilling cuttings discharged from offshore oil and gas platforms nationwide stood at 209.79 million m^3, 1.221 million m^3, 141,000 m^3 and 127,000 m^3 respectively. Compared with 2021, the amount of industrial wastewater discharged into the sea remained basically the same, and that of domestic sewage, drilling mud and drilling cuttings increased by 2.9%, 30.0% and 23.0% respectively. In the Bohai Sea, the proportion of offshore oil and gas fields with seawater quality meeting Grade I standard increased from that in 2021, with the petroleum, COD and cadmium in seawater all meeting Grade I standard; in a few marine oil and gas fields and adjacent waters, the mercury in seawater met Grade II standard. The seawater in the offshore oil and gas fields and the adjacent waters in the East China Sea and the South China Sea all met Grade I seawater standard. The sediments in offshore oil and gas fields and adjacent sea areas basically met Grade I marine sediment standard.

(3) Bathing beaches**

During the swimming and holiday seasons in 2022, among the 32 key bathing beaches under national monitoring, the water quality of 25 bathing beaches was excellent or good. Specifically, bathing beaches with excellent seawater quality during the monitoring period included Bangchui Island in Dalian, Tiger Stone and Pingshuiqiao in Qinhuangdao, Yantai Economic Development Zone, International Beach in Weihai, Zhujiajian in Zhoushan, Longwangtou in Pingtan, Xiasha in Dapeng Bay, Holiday Beach in Haikou and Yalong Bay in Sanya. Bathing beaches that occasionally experienced poor seawater quality during some monitoring periods included No. 1 Bathing Beach in Qingdao, and the ones located in Lian Island and Suma Bay in Lianyungang, Qing'ao Bay in Nan'ao of Shantou, Dameisha in Shenzhen, Silver Beach and Fangchenggang Golden Beach in Beihai. The main indicators affecting the water quality of bathing beaches were fecal coliforms and petroleum.

(4) Marine fishery waters***

Key natural marine fishery waters In 2022, the major indicator that exceeded standards in key natural marine fishery waters was inorganic nitrogen. The areas where the concentration of inorganic nitrogen, active phosphate, petroleum, COD, copper and zinc were better than the assessment standards accounted for 39.8%, 67.5%, 99.4%, 91.5%, 99.9% and 99.995% of the total monitored areas respectively. The monitored concentration of lead, cadmium, mercury, arsenic and chromium were all better than the assessment standards.

Key marine aquaculture areas The major indicator that exceeded standards in the key marine aquaculture areas was inorganic nitrogen. The areas where the concentration of inorganic nitrogen, active phosphate, petroleum and COD were better than the assessment standards accounted for 60.4%, 66.5%, 98.7% and 97.4% of the total monitored areas respectively. The monitored concentration of copper, zinc, lead, cadmium, mercury, arsenic and chromium were all better than the assessment standards.

7 national aquatic reserves of germplasm resources The major indicator that exceeded standards in the water bodies of the 7 national reserves of aquatic germplasm resources was inorganic nitrogen. The areas where the concentration of inorganic nitrogen, active phosphate, petroleum, COD, copper and mercury were better than the assessment standards accounted for 9.5%, 75.9%, 92.3%, 53.0%, 98.2% and 99.98% of the total monitored areas respectively. The monitored concentration of zinc, lead, cadmium, arsenic and chromium were all better than the assessment standards.

Some key natural marine fishery waters and key marine aquaculture areas Sediment was in good condition. The areas where the concentration of petroleum, copper, zinc, lead, cadmium, chromium, mercury and arsenic were better than the assessment standards accounted for 98.2%, 93.8%, 98.7%, 99.96%, 96.9%, 95.2%, 100% and 100% respectively.

*A total of 20 offshore oil and gas areas and adjacent sea areas had been monitored nationwide. The assessment was based on Technical Guidelines for Environmental Impact Assessment of Marine Engineering (GB/T 19485-2014), Marine Water Quality Standard (GB 3097-1997) and Marine Sediment Quality (GB 18668-2002).

**A total of 32 bathing beaches were monitored across the country. The assessment was based on Guidelines for Monitoring and Assessment of Bathing Beaches (HY/T 0276-2019) and Marine Water Quality Standard (GB 3097-1997).

***Including 35 important spawning grounds, feeding grounds, migration channels, key protected aquatic habitats and aquatic germplasm resource protection areas of fish, shrimp, and shellfish in the Yellow & Bohai Sea, East China Sea and South China Sea.

3. Marine ecosystem conditions

(1) Marine ecosystem*

In 2022, among the 24 marine ecosystems monitored, 7 were in a healthy state, and 17 were in a sub-healthy state. Among them, the 7 estuary ecosystems in sub-healthy state included the Yalu River Estuary, Shuangtaizi Estuary, Luanhe River Estuary-Beidaihe, Yellow River Estuary, Yangtze River Estuary, Minjiang Estuary and Pearl River Estuary. The 8 bay ecosystems in sub-healthy state included Bohai Bay, Laizhou Bay, Jiaozhou Bay, Hangzhou Bay, Yueqing Bay, areas along the coast of East Fujian, Daya Bay and Beibu Gulf. The ecosystems of northern Jiangsu shoal wetland were in a sub-healthy state and those of 4 coral reefs in the southwest coast of Leizhou Peninsula, Beihai of Guangxi, the east coast of Hainan and Xisha were in a healthy state. The mangrove ecosystems of Beihai and Beilun estuary of Guangxi were in a healthy state. The seagrass bed ecosystems in Beihai of Guangxi were in a healthy state, and those of the east coast of Hainan were in a sub-healthy state.

(2) Coastal wetlands of international importance

In 2022, monitoring was carried out on birds in 15 coastal wetlands of international importance, and 22 species of key national first-class protected birds and 47 species of key national second-class protected birds were monitored. According to the monitoring of spartina alterniflora in 6 coastal wetlands of international importance including Dongtan in Shanghai Chongming District, Shankou mangrove natural reserve in Guangxi, Dafeng elk natural reserve in Jiangsu, Zhangjiang Estuary in Fujian, Yellow River Delta in Shandong and Yancheng in Jiangsu, the area of spartina alterniflora was 219 hectares, 460 hectares, 60 hectares, 371 hectares, 5,424 hectares, and 20,000 hectares respectively.

*A total of 24 marine ecosystems had been monitored nationwide. The assessment is based on the Guidelines for the Assessment of Coastal Marine Ecosystem Health (HY/T 087-2005).

Special Column

The comprehensive pollution control in key sea areas had been further advanced

The Ministry of Ecology and Environment, together with relevant departments and local governments of coastal areas, intensified its efforts to fight the tough battle of comprehensive pollution control in key sea areas with continuous improvement of the eco-environment quality of coastal waters through the coordinated protection of land and marine environment based on the inter-department collaboration at various levels of government. Focusing on key sea areas, solid measures were stepped up for such key tasks as land and sea pollution prevention and control, ecological protection and restoration and environmental risk prevention in the Bohai Rim region, the Yangtze River Estuary-Hangzhou Bay, and the adjacent sea areas of the Pearl River Estuary. Coastal areas were also guided to improve the treatment and control of total nitrogen and other pollution in key rivers entering the sea. Consistent efforts were made to build beautiful bays, for which clear-defined requirements and easy-to-understand target indicators were put forward so that the public can understand and experience the beauty of the eco-environment and the effects of management on beautiful bays. Specific measures had been formulated and implemented across 40 bays, in a drive to accelerate the building of beautiful bays featuring clear water and clean beach, ideal home for fish and seabirds living in harmony with people. Efforts had been made to strengthen the supervision of the marine environment, and the monitoring of mariculture. Regulatory documents and supporting technical standards had been compiled to solidly investigate and rectify sewage outlets into the sea, fulfilling the key role of the “gatekeeper” to keep pollution from entering the sea.

Ⅳ. Soil Environment

1. Soil environmental quality

In 2022, the soil environmental risks nationwide were basically under control, and the increasing trend of soil pollution had been initially curbed. The safe utilization rate of contaminated agricultural land had been stabilized at over 90%. The soil environment of agricultural land nationwide was generally stable. The main pollutant affecting soil environmental quality of agricultural land was heavy metals. The safe utilization of key construction land had been effectively guaranteed.

According to the 14th "Five-Year" Plan on Soil Environment Monitoring, one round of monitoring is conducted in every five years by the National Soil Environment Monitoring Network. By the end of 2022, according to regular monitoring results of the national soil environment in 11 provinces (autonomous regions and municipalities) including Beijing, Shanghai, Jiangsu, Zhejiang, Fujian, Hunan, Guangdong, Guangxi, Guizhou, Yunnan and Hainan, the soil environmental quality in the above localities remained generally stable.

2. Quality of cultivated land

According to the national survey and assessment of the quality of cultivated land in 2019*, the average cultivated land quality nationwide was at the grade of 4.76, among which the areas of the 1st to 3rd grade accounted for 31.24% of the total cultivated areas; that of the 4th to 6th grade accounted for 46.81%; and that of the 7th to 10th grade accounted for 21.95%.

3. Soil environment conditions

(1) Soil erosion

According to the dynamic monitoring of soil erosion in 2021**, 2.6742 million km^2 of land were subject to soil erosion in China. Among them, 1.1058 million km^2 were under water erosion and 1.5684 million km^2 under wind erosion. In terms of the erosion intensity, the areas of mild, moderate, severe, extremely severe and fierce erosion accounted for 64.4%, 16.6%, 7.4%, 5.5% and 6.1% of the total area of soil erosion in the country respectively.

(2) Land desertification and sandification

According to the monitoring results of the 6th National Monitoring of Desertification Land and Sandy Land***, there were 2.5737 million km^2 desertification land and 1.6878 million km^2 sandy land across the country. According to the 4th Monitoring of Rocky Desertification in the Karst Area, the existing rocky desertification land area in the karst area of China was 72,230 km^2.

*The grade of cultivated land quality was based on Cultivated Land Quality Grade (GB/T 33469-2016) with the classification of ten grades. The quality of first-class cultivated land is the best, and the quality of the tenth grade is the worst. The first to third grades, the fourth to sixth grades, the seventh to tenth grades are categorized as high grade, medium grade and low grade respectively. Up to the time this Report was published, the results of the 2019 National Survey and Evaluation of Cultivated Land Quality Grades are the latest data.

**Up to the time this Report was published, the monitoring results of soil erosion in 2021 are the latest data.

***Up to the time this Report was published, the monitoring results of the 6th National Monitoring of Desertification Land and Sandy Land and the 4th Monitoring of Rocky Desertification in the Karst Area remain to be the latest.

Special Column

Solid progress had been made in fighting the battle against soil pollution

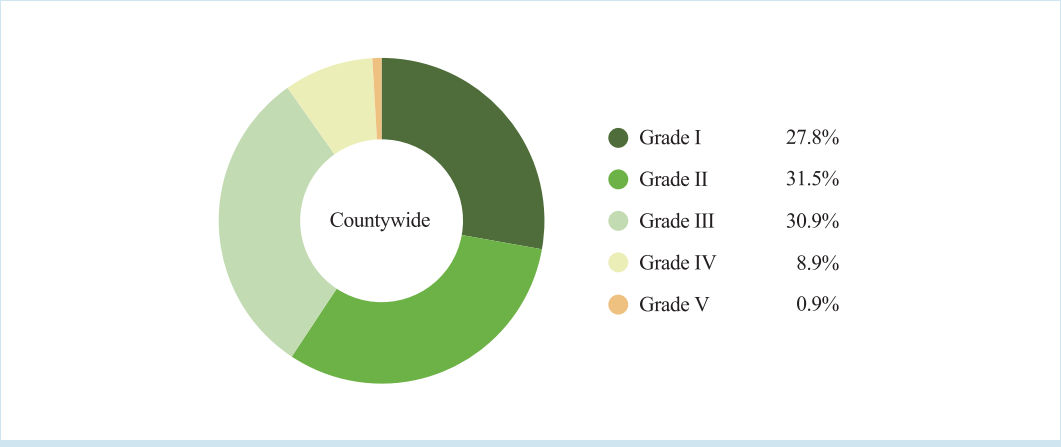
Major projects were carried out to control the source of soil pollution, and environmental supervision was stepped up among enterprises of key industries related to soil pollution. Access to construction land was strictly managed, and the control of soil pollution was strengthened for the land of closed and relocated enterprises to ensure land-related safety for residence. By the end of 2022, more than 20,000 enterprises had been included in the priority list of soil pollution supervision, and more than 1,700 land plots of construction land had been included in the list of soil pollution risk management, control and restoration. The investigation and remediation of soil pollution sources in cultivated land had been conducted in a continuous way, and a number of outstanding pollution problems affecting the quality of soil ecological environment had been addressed, so that food safety are guaranteed. Efforts were stepped up to implement the Regulation on Groundwater Management, which demonstrates continued improvement in the system of technical standard for groundwater pollution prevention and control. The Action Plan for the Battle of Agricultural and Rural Pollution Control (2021-2025) was issued. By the end of 2022, environmental renovation had been completed across another 16,000 administrative villages across the country, through which domestic sewage treatment capacity in rural areas had been improved and more than 900 relatively-large black and malodorous water bodies were treated.

Ⅴ. Natural and Ecological Environment

1. Ecological environment quality

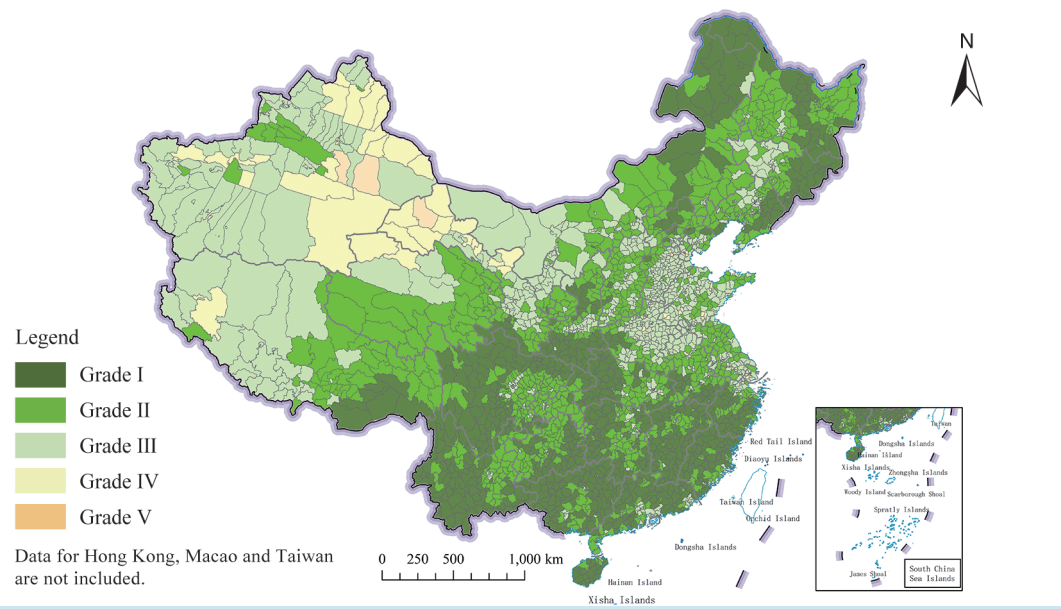
In 2022, the national Ecological Quality Index (EQI) value was 59.6, and the ecological quality fell into Grade II*, without notable change compared with that of 2021.

The total area of counties with ecological quality of Grade I took up 27.8% of total land area in China, mainly distributed in the Daxing'anling and Xiaoxing'anling Mountain areas, Changbai Mountain, the southeast of the Qinghai-Tibet Plateau, the west of Yunnan-Guizhou Plateau, Qinling Mountains and Jiangnan hilly areas. The total area of counties with ecological quality of Grade II took up 31.5%, mainly distributed in Sanjiang Plain, Inner Mongolia Plateau, Loess Plateau, the northwest of the Qinghai-Tibet Plateau, Sichuan Basin, Pearl River Delta and the middle and lower reaches of the Yangtze River. The total area of counties with ecological quality of Grade III took up 30.9%, mainly distributed in the North China Plain, the central Northeast Plain, the western Alxa in Inner Mongolia, the western Qinghai-Tibet Plateau and most parts of Xinjiang. The total area of counties with ecological quality of Grade IV took up 8.9%, and that of Grade V took up 0.9%, mainly distributed in central and northern Xinjiang and western Gansu.



General eco-environmental quality of counties in China in 2022

*In 2022, ecological quality monitoring and assessment was conducted among 2,855 county-level administrative units across the country. The assessment was based on the Regional Ecological Quality Assessment Methods (Trial). EQI ⩾ 70 falls into Grade I, 55 ⩽ EQI < 70 falls into Grade II, 40 ⩽ EQI < 55 falls into Grade III, 30 ⩽ EQI < 40 falls into Grade IV, and EQI < 30 falls into Grade V.



Map of eco-environmental quality of counties in China in 2022

2. Biodiversity

(1) Ecosystem diversity

China boasts various types of natural ecosystems including forests, grasslands, deserts, wetlands, islands, bays, mangroves, coral reefs, seagrass beds, estuaries and up-welling currents, as well as artificial and semi-artificial ecosystems such as cropland and urban ecosystems.

(2) Species diversity

In 2022, the Catalogue of Species in China registered a total of 138,293 species and subspecies (including 125,034 species and 13,259 subspecies). Among them, it has registered 63,886 animalia species, 39,188 botanical species, 463 bacteria species, 1,970 pigment species, 16,369 fungi, 2,503 protogenesis animalia and 655 viruses. 980 species and 8 categories of wild animals are included in the Catalogue of Wild Animals under Key State Protection, covering 234 species and 1 category of first-class national protected wild animals and 746 species and 7 categories of second-class national protected wild animals. Wild animals such as giant panda, Hainan gibbons, procapra przewalskii, brown-eared pheasant, Yangtze finless porpoise, Yangtze sturgeon, and Chinese alligator are unique to China. 455 species and 40 categories of wild plants are included in the Catalogue of Wild Plants under Key State Protection, including 54 species and 4 categories of first-class national protected wild plants, and 401 species and 36 categories of second-class national protected wild plants. Wild plants such as abies beshanzuensis, Metasequoia, Dendrobium huoshanense, and Yunnan agarwood are unique to China.

(3) 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 948 varieties of domestic animals are originated from China. By the end of 2022, more than 530,000 copies of crop germplasm resources and 568 local breeds of livestock and poultry had been preserved on a long-term basis.

3. Threatened species

The assessment results of 39,330 species of higher plants (including subspecies) across China showed that 11,715 species of higher plants require special attention and protection, taking up 29.8% of the total assessment amount, among which, 4,088 species were threatened, 2,875 species belong to near threatened (NT) Grade, and 4,752 belong to data deficient (DD) Grade. The assessment results of the 4,767 identified vertebrates (marine fishes were not included) showed that 2,816 vertebrates require special attention and protection, taking up 59.1% of the total assessment amount, among which 1,050 vertebrates were threatened, 774 vertebrates belong to NT Grade, and 992 belong to DD Grade. The assessment results of the 9,302 identified macro-fungi showed that 6,538 species of macro-fungi require special attention and protection, taking up 70.3% of the total assessment amount, among which 97 macro-fungi were threatened, 101 macro-fungi belong to NT Grade, and 6,340 belong to DD Grade.

4. Nature reserves

In 2022, a total of 49 national parks were shortlisted across the country, including five formally established national parks, namely Sanjiangyuan, Giant Panda, Siberian Tiger and Leopard, Hainan Tropical Rainforest, and Wuyi Mountain national parks. They cover a total area of about 1.1 million km^2. China is also home to 14 world natural heritage sites, 4 world natural and cultural heritage sites and 41 world geological parks.

Special Column

The protection and supervision of natural and ecological system had been continuously strengthened

The supervision system of ecological conservation red lines had been continuously improved. The Measures for Ecological and Environmental Supervision of Ecological Conservation Red Lines (Trial) were issued to identify the main body of responsibility, prominent issues and specific measures for ecological and environmental supervision, and guide and standardize such work. The Technical Guidelines for Effectiveness Assessment of Ecological Protection and Restoration (Trial) was released to tighten up the protection, restoration and supervision of the ecological environment. In addition, other documents including the Guiding Opinions on the Rectification and Cancellation of Ecological and Environmental Problems in National Nature Reserves, Technical Regulations for Remote Sensing Interpretation, Review and Quality Control of Human Activities in Nature Reserves, and the Opinions On Strengthening the Comprehensive Law Enforcement on Ecological and Environmental Protection in Natural Reserves were issued to consolidate the supervision and law enforcement system on nature reserves. A total of 106 national demonstration zones for building ecological civilization and 51 practice and innovation bases highlighting "lucid waters and lush mountains are invaluable assets" were unveiled. Candidate selection in this regard has been organized, in which 40 organizations and 60 individuals received the 3rd Chinese Ecological Civilization Award, and 10 people were honored as the 2020-2021 "Green China" Person of the Year with 20 people awarded as nominators. The campaign of "Green Shield 2022" was continued to intensify supervision on nature reserves. Assessment on effectiveness of ecological and environmental protection in national nature reserves was conducted. The land area under ecological conservation red lines took up more than 30% of the land area of the country, and marine ecological conservation red lines covered an area of no less than 150 thousand km^2.

Ⅵ. Acoustic Environment*

1. Acoustic environment of functional zones

In 2022, acoustic environment of functional zones of APL cities was monitored, 96.0% of which met the standard during daytime, up by 0.6 percentage point compared with that of 2021; the figure stood at 86.6% during nighttime, up by 3.7 percentage points compared with that of 2021.

The rate of urban acoustic environment of functional areas reaching standard during daytime across the country was higher than that during nighttime. In terms of the acoustic environment of functional areas that range from Type 1 to Type 4a**, the rate of Type 3 functional area reaching standard during daytime was the highest, and that of the Type 4a during nighttime was the lowest. Compared with 2021, the rate of various functional areas reaching standard during daytime and nighttime had increased to varying degrees, with an increase of 0.2 to 1.2 percentage points during daytime and 1.5 to 4.9 percentage points during nighttime.

Rate of different acoustic environment functional zones reaching standard in cities across China in 2022 (Unit: %)

Year	Type 1		Type 2		Type 3		Type 4a	
	Day	Night	Day	Night	Day	Night	Day	Night
2021	89. 9	78. 2	95. 4	89. 5	98. 5	93. 1	98. 3	66. 3
2022	91. 1	83. 1	96. 2	93. 2	98. 9	94. 6	98. 5	70. 4

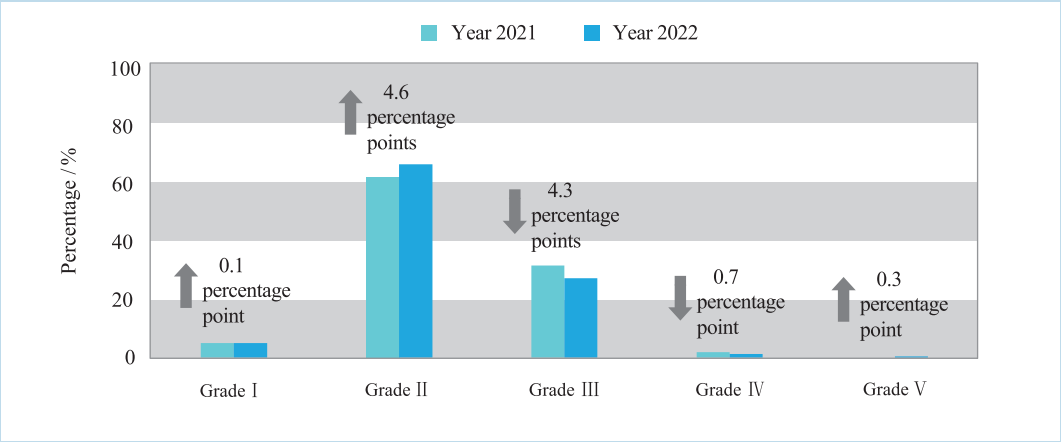
2. Regional Acoustic Environment

In 2022, regional daytime acoustic environment of APL cities was monitored, and the average value of equivalent sound level was 54.0 dB(A), basically the same as that of 2021. Among them, 5.0% of the cities met Grade I urban acoustic environment standard on the whole, up by 0.1 percentage point from 2021; 66.3% of the cities met Grade II standard, up by 4.6 percentage points; 27.2% of the cities met Grade III standard, down by 4.3 percentage points; 1.2% of the cities met Grade IV standard, down by 0.7 percentage point; 0.3% of the cities were at Grade V standard, up by 0.3 percentage point from 2021***.

*In 2022, urban acoustic environment monitoring was carried out among over 70,000 monitoring sites in APL cities across the country. The assessment of acoustic environment was based on Environmental Quality Standard for Noise (GB 3096-2008) and Technical Specifications for Environmental Noise Monitoring - Routine Monitoring for Urban Environmental Noise (HJ 640-2012).

**Type 1 function area refers to the areas with residential community, health care, culture and education, scientific research and development, and administration as the main functions, which need quiet environment. Type 2 function area refers to the areas with commerce, finance and market as main functions or areas mixing residential communities, commerce and industries, which need to maintain quiet environment for residential areas. Type 3 function area refers to the areas dominated by industrial production, warehouse and logistics in need of prevention of the strong impacts of industrial noise on surrounding environment. Type 4a function area refers to the areas along expressways, first-class highways, second-class highways, urban expressways, urban arterial roads, urban secondary arterial roads, urban rail transit (ground section), and areas on both sides of inland waterways.

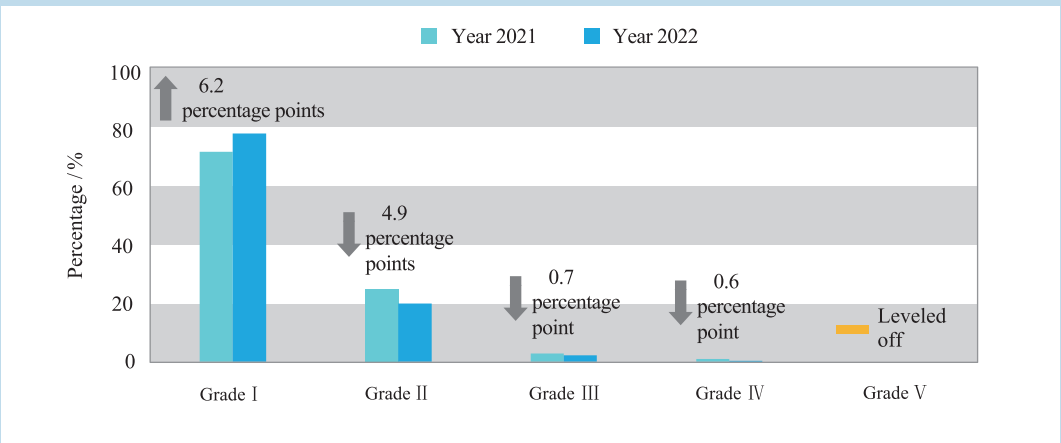
***The average equivalent sound level during daytime ≤ 50.0 dB(A) is excellent (Grade I); 50.1~55.0 dB(A) is good (Grade II); 55.1~60.0 dB(A) is average (Grade III); 60.1~65.0 dB(A) is relatively poor (Grade IV) and > 65.0 dB(A) is poor (Grade V).



Percentage of cities across China in terms of varying grades of overall environmental noise during daytime in 2022 and interannual variation

3. Acoustic environment of traffic noise

In 2022, the acoustic environment of traffic noise of APL cities was monitored in the daytime, and the average value of equivalent sound level was 66.2 dB(A), 0.3 dB(A) lower than that of 2021. Among them, 77.8% of the cities met Grade I urban traffic noise intensity standard in the daytime, up by 6.2 percentage points compared with 2021; 19.8% of the cities met Grade II standard in the daytime, down by 4.9 percentage points; 2.1% of the cities met Grade III standard in the daytime, down by 0.7 percentage point; 0.3% of the cities met Grade IV standard in the daytime, down by 0.6 percentage point; and no city was at Grade V standard, the same as that of 2021*.



Percentage of cities across China in terms with varying grades of traffic noise intensity during daytime in 2022 and interannual variation

*The average equivalent sound level during daytime ≤ 68.0 dB(A) is excellent (Grade I); 68.1~70.0 dB(A) is good (Grade II); 70.1~72.0 dB(A) is average (Grade III); 72.1~74.0 dB(A) is relatively poor (Grade IV) and > 74.0 dB(A) is poor (Grade V).

Special Column

The noise pollution prevention and control system had witnessed continued improvement

The Law of the People's Republic of China on the Prevention and Control of Noise Pollution was formally implemented and the 14th "Five-Year" Action Plan for Noise Pollution Prevention and Control was compiled. The noise pollution prevention and control standard system had been continuously improved, and a string of emission standards and monitoring specifications on urban rail transit noise, aircraft noise around airports, industrial noise and construction noise had been formulated and revised. The Noise Pollution Prevention and Control Report of China (2022) was released and the Opinions on Strengthening Noise Monitoring Work was compiled.

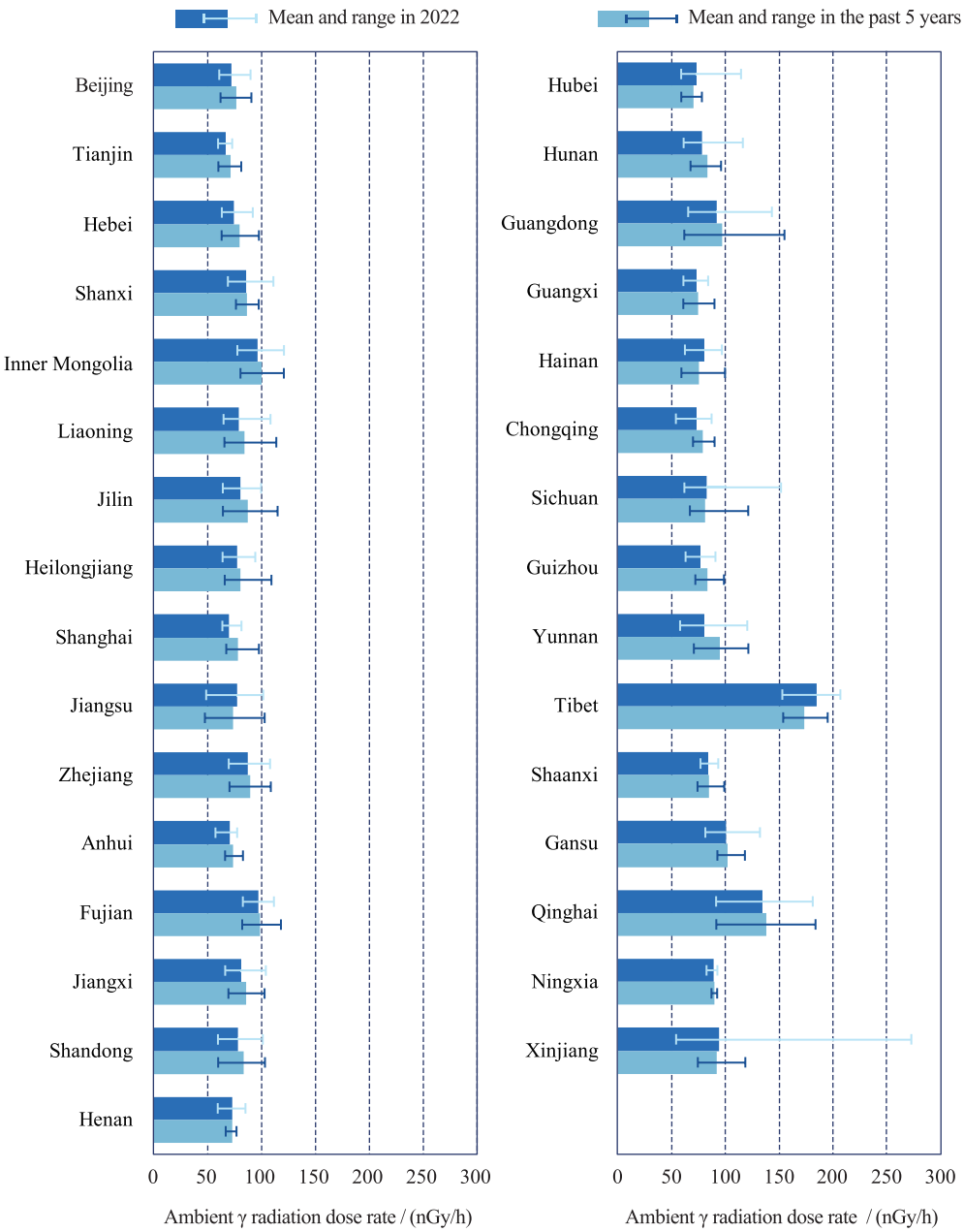
Ⅶ. Radiation Environment

1. Environmental ionizing radiation

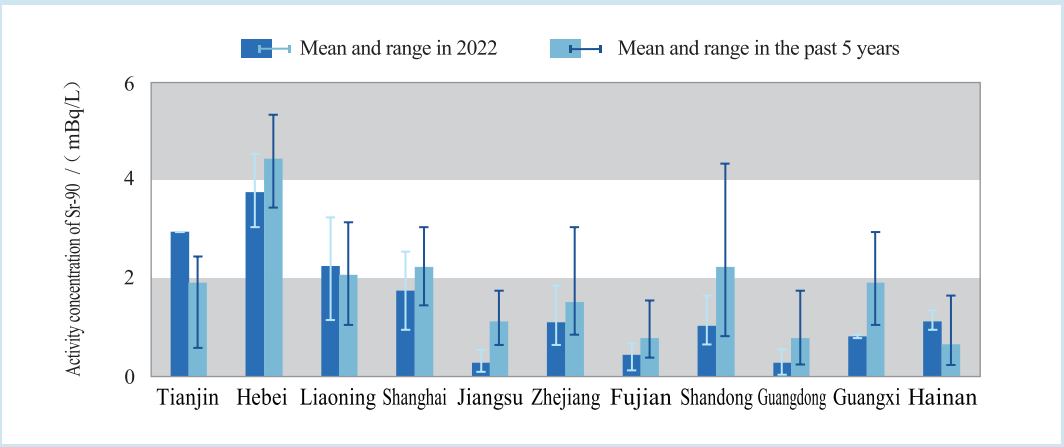
(1) Ionizing radiation in China*

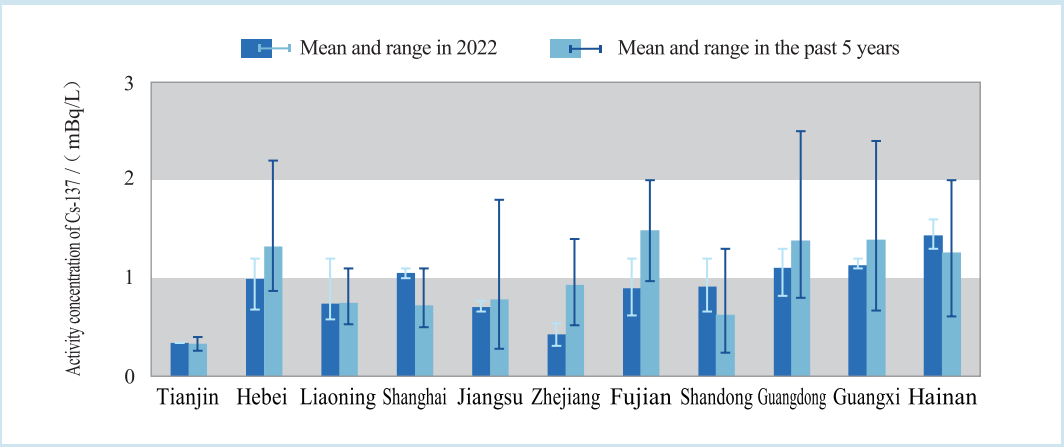
The environmental ionizing radiation level in China remained within the fluctuation range of natural background level in 2022. The ambient γ radiation dose rate was within the fluctuation range of natural baseline value. The natural radionuclide activity concentration in the air were within the natural background level and no abnormality was seen in artificial radionuclide activity concentration. The activity concentration of natural radionuclides remained at the baseline level, and that of artificial radionuclides was seen no abnormality in the following areas: the 7 major river basins (i.e. Yangtze River, Yellow River, Pearl River, Songhua River, Huaihe River, Haihe River, Liaohe River), rivers in Zhejiang and Fujian Provinces, Northwest and Southwest China, and major lakes (reservoirs). The activity concentration of gross α and gross β of urban centralized drinking water sources and groundwater for drinking met the guidance limit of radioactivity specified in the Standard for Drinking Water Quality (GB 5749-2006). The activity concentration of natural radionuclides in nearshore marine water and marine organisms was at the baseline level, and no abnormality was seen in the activity concentration of artificial radionuclides. In specific, the activity concentration of artificial radionuclides Sr-90 and Cs-137 in marine water was far below the limit specified for marine water quality. The activity concentration of artificial radionuclides Sr-90 and Cs-137 in marine organisms was lower than the limit specified in the Limit Concentration of Radioactive Materials in Foods (GB 14882-94). The activity concentration of natural radionuclides in soil was at the baseline level, and no abnormality was seen in the activity concentration of artificial radionuclide.

*A total of 497 automatic monitoring sites (including 234 newly-added sites in 2022) and 328 cumulative monitoring sites had been set up for the monitoring of ambient γ radiation dose rate. Monitoring of air included 459 aerosol monitoring sites, 391 sediment and gaseous radioactive iodine isotope monitoring sites, and 32 air (water vapor) and precipitation monitoring sites. Monitoring of water bodies included 81 river water monitoring sections, 21 lake and reservoir water monitoring sites, 344 urban centralized drinking water source monitoring sites, 31 urban groundwater monitoring sites, 48 seawater monitoring sites, and 35 marine organism monitoring sites. Monitoring of soil included 362 monitoring sites. Relevant methods in the series of standards for statistical processing and interpretation of data were used to assess background fluctuations, baseline value and abnormalities, as well as to compare with the limits specified in relevant standards.



Automatic monitoring results of the ambient γ radiation dose rate in 2022





Monitoring results of Sr–90 and Cs–137 in nearshore water of China in 2022

(2) Ionizing radiation in the vicinity of nuclear facilities*

The ambient γ radiation dose rate in the vicinity of operating nuclear power bases, civil research reactors, nuclear fuel cycling facilities and waste disposal facilities, together with the activity concentration of radionuclides in such environmental media as air, water, soil and organism related to facility activities were both within the range of fluctuations over the years on the whole. The assessment findings showed that the radiation dose resulting from the operation of the above-mentioned nuclear facilities to the public was far below the national limit, making no impact on environmental safety and public health.

*Including 13 nuclear power bases, 5 civil research reactors, 6 civil nuclear fuel cycling facilities and 3 waste disposal facilities as well as 17 uranium mining and metallurgy facilities. In principle, the monitoring work was conducted on the base of "Tailor-made monitoring plan for each individual premise". The relevant methods in the series of standards for data statistical processing and interpretation were used to assess the fluctuations over the years. The dose estimation methods in relevant standards such as Basic Standards for Protection against Ionizing Radiation and Protection of Radiation Source Safety were used to assess the effective dose to a representative person as a result of the operation of the facility.

(3) Ionizing radiation in the vicinity of uranium mines and metallurgical plants

Both the ambient γ radiation dose rate in the vicinity of uranium mining and metallurgical facilities, and the activity concentration of radionuclides in air, water and soil related to facility activities were within the range of fluctuations over the years.

2. Ambient electromagnetic radiation*

In 2022, the environment electromagnetic radiation level of state monitoring sites in 31 provinces (autonomous regions and municipalities), and that of radio and television signal emitting facilities, power transmission and transformation facilities and antenna of mobile communication base stations were all lower than the public exposure limit specified in the Controlling Limits for Electromagnetic Environment (GB 8702-2014).

Special Column Efforts had been stepped up in strict supervision on nuclear and radiation safety

The 3-year nationwide investigation on safety risk of nuclear and radiation was successfully completed, covering all facilities in order to identify all hidden dangers and weakness before rectification. According to incomplete statistics, the monitoring stations in various localities had carried out more than 6,100 supervision tasks and inspections for 43,000 man-days with more than 7,300 problems discovered. Most of the problems had been rectified, and a few problems were under rectification in line with relevant plans. Nuclear power plants reported a total of 28 operating events and 3 construction events, with average number of operating events of about 0.56/reactor year. Research reactor operators reported 6 operating events and 1 construction event. No events classified as Level 2 or above had occurred according to the International Nuclear and Radiological Event Scale (INES), and the average annual incidence rate of Level-0 (deviation) and Level-1 (anomaly) events was less than 1 event per unit. The incidence of radiation accidents from radioactive sources remained at a low level of less than 1 per 10,000 radioactive sources per year.

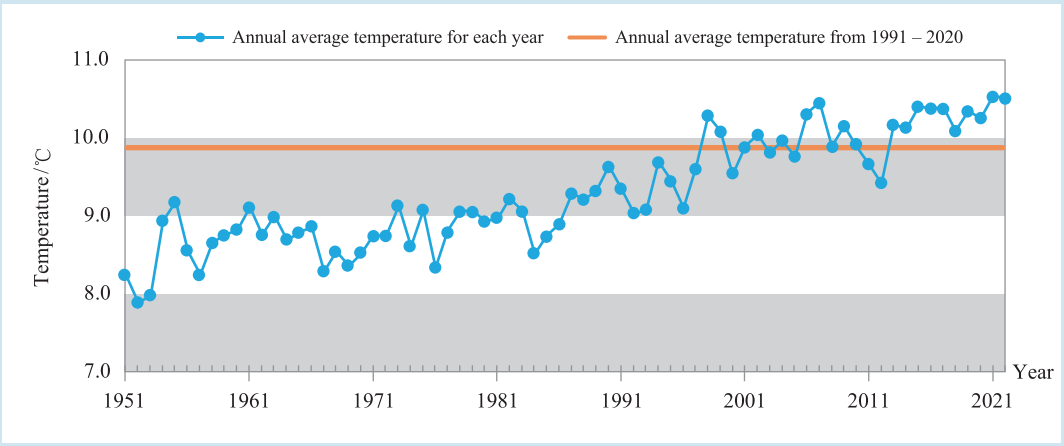
*Including 44 state monitoring sites for environment electromagnetic radiation, as well as 32 radio and television signal emitting facilities, 6 power transmission and transformation facilities and 2 mobile communication base stations.

Ⅷ. Climate Change and Natural Disasters

1. Climate change

(1) Air temperature

In 2022, the national average air temperature was 10.51 ℃, 0.62 ℃ higher than the average figure over the years (1991-2020), being the second highest in history since 1951. The temperature in each month was slightly higher or close to that of the same period of the years, except for February and December when the temperature was slightly lower than that of the same period over the years.

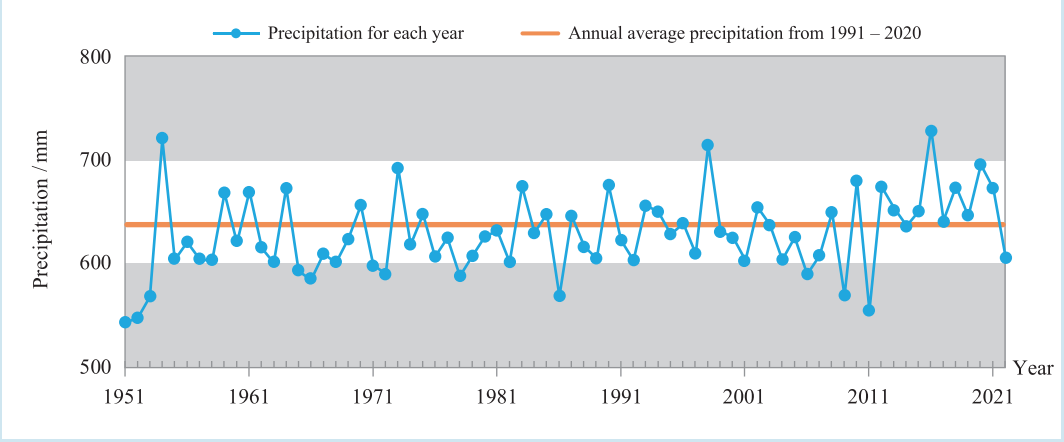


Interannual change of national average air temperature from 1951–2022

The temperature in all provinces (autonomous regions and municipalities) across the country was relatively higher, except for Jilin, Guangxi and Hainan where the temperature was slightly lower than the same period over the years. Gansu, Hubei, Sichuan and Xinjiang had experienced the highest temperature in history since 1961. Anhui, Henan, Hunan, Jiangsu, Jiangxi, Ningxia and Qinghai experienced the second highest temperature ever recorded.

(2) Precipitation

The national average precipitation was 606.1 mm in 2022, down by 5.0% compared with the average figure over the years (1991-2020), being the lowest since 2012. The precipitation was higher than usual in January-June and November and the precipitation in July-October and December was less than usual.



Interannual change of national average precipitation from 1951–2022

Compared with previous years, the precipitation was 20%-100% more in the central and southern part of Northeast China, central Shanxi, northern Shaanxi and most parts of Shandong. The precipitation was 20%-50% less than usual along the middle and lower reaches of the Yangtze River and in central Henan, northern Hebei, central and western Inner Mongolia, western Gansu, most of Xinjiang, and central Tibet, with some local areas 50%-80% less than usual. The precipitation in other parts of the country was close to usual.

2. Response to climate change

(1) Greenhouse gas

In 2021, the average concentrations of CO_2, CH_4 and N_2O in Waliguan Station in Qinghai were 417.0±0.2 ppm, 1,965±0.6 ppb and 335.1±0.1 ppb respectively. The annual average absolute increments over the past 10 years were 2.46 ppm, 10.4 ppb, and 1.05 ppb respectively*.

Based on preliminary calculations, the CO_2 emission per 10,000 yuan of GDP in 2022 nationwide dropped by 0.8% compared with that of 2021**.

(2) Energy

Energy output According to preliminary accounting, the total output of primary energy across the country in 2022 stood at 4.66 billion tons of standard coal, up by 9.2% from 2021. Among the major energy products covered in the accounting, the output of raw coal was 4.56 billion tons, an increase of 10.5% from 2021, crude oil 204.722 million tons, an increase of 2.9%, and natural gas 220.11 billion m^3, an increase of 6.0%. The power generation totaled 8,848.71 billion kWh, an increase of 3.7% from 2021. In specific, the production of thermal power*** registered 5,888.79 billion kWh, an increase of 1.4% from 2021, hydropower 1,352.20 billion kWh, a decrease of 1.0%, and nuclear power 417.78 billion kWh, an increase of 2.5%.

Energy consumption According to preliminary accounting, the total energy consumption in 2022 was 5.41 billion tons of standard coal, an increase of 2.9% from 2021. Coal consumption increased by 4.3%, crude oil consumption decreased by 3.1%, natural gas consumption decreased by 1.2%, and electricity consumption increased by 3.6%. Coal consumption accounted for 56.2% of total energy consumption, an increase of 0.3 percentage point from 2021. Clean energy consumption including natural gas, hydropower, nuclear power, wind power, and solar power accounted for

*Up to the time this Report was published, the monitoring results of greenhouse gas in 2021 are the latest data.

**CO_2 emission per 10,000 yuan of GDP was calculated at 2020 price.

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

25.9% of total, an increase of 0.4 percentage point from 2021. The energy consumption per 10,000 yuan of GDP nationwide was reduced by 0.1% compared with that in 2021*.

(3) Transportation

In 2022, the amount of motor vehicles reached 417 million. The total number of vehicles in operation was 12.2208 million, including 554,200 passenger cars and 11.666 million trucks. The comprehensive energy consumption per unit of railway transportation workload in China was 3.91 tons of standard coal per million converted ton-kilometers, a decrease of 4.2% from 2021. The total volume of freight transported by rail was 4.984 billion tons, an increase of 4.4% from 2021. The total number of new energy buses in the country reached 542,600, an increase of 6.6% from 2021, accounting for 77.2% of the total number of urban buses, an increase of 5.4 percentage points. About 450 LNG-powered inland ships and more than 200 electric ships had been built across the country.

(4) Carbon sink

In 2021, the national forest coverage rate reached 24.02%, and the forest stock volume reached 19.493 billion m^3. The total carbon stock of forest and grass vegetation in the country reached 11.443 billion tons, of which the carbon stock of forest vegetation was 10.723 billion tons, and that of grassland vegetation was 720 million tons. The annual carbon sequestration capacity of forest and grass vegetation was 349 million tons, and the annual absorption of CO_2 equivalent was 1.28 billion tons**.

3. Natural disasters

(1) Meteorological disasters

In 2022, floods and droughts occurred concurrently and successively across the country. A total of 38 regional torrential rains occurred nationwide, and 624 rivers in 28 provinces (autonomous regions and municipalities) experienced floods above the warning level, of which 89 rivers experienced floods exceeding the protection (safety) limits. Major rivers experienced 10 numbered floods, and the Pearl River Basin experienced two relatively large floods within their basins. Specifically, Beijiang River had seen the largest flood since 1915, and Liaohe River experienced the largest flood since 1995. Droughts occurred in 27 provinces (autonomous regions and municipalities). The main droughts included winter and spring droughts in the Pearl River Basin, spring and summer droughts in the Huanghuai Sea and Northwest China, and summer and autumn droughts in the Yangtze River Basin. The Yangtze River recorded the most severe meteorological and hydrological drought ever since the start of actual observation records in 1961, and the main stream of the Yangtze River, Dongting Lake, and Poyang Lake recorded the lowest water levels during the flood season compared with the same period of previous years. A total of 25 typhoons (maximum wind force $\geqslant$ 8 near the center) were generated in the Northwest Pacific Ocean and the South China Sea, which was close to the annual average (25.1), and 4 of them landed in China, 3.1 less than the annual average (7.1). A total of 38 regional strong convective weather processes occurred, which was less than the average of the past three years. In 2022, there were 14.3 days with high temperature (daily maximum temperature $\geqslant$ 35 ℃), 6.3 days more than usual, the highest in the same period in history. A total of 35 cold air processes (including 11 cold wave processes) occurred, and both cold air and cold wave processes were more than normal, of which cold wave processes were 6 more than usual. A total of 8 sand and dust weather processes occurred in the northern region, 2.7 times less than the same period average (10.7 times) from 2000 to 2021, including 1 sand and dust storm process.

(2) Earthquake disasters

In 2022, there were 27 earthquakes at or above magnitude 5.0, mainly concentrated in Qinghai, Sichuan, and Xinjiang. The largest earthquake was the Qinghai Menyuan earthquake on January 8th, with a magnitude of 6.9. The earthquake that caused heaviest loss was the Sichuan Luding earthquake on September 5th, with the magnitude of 6.8.

(3) Geological disasters

In 2022, 5,659 various kinds of geological disasters happened across China, including 3,919 landslides, 1,366 collapses, 202 debris flows, 153 ground collapse, 4 ground fissures, and 15 ground subsidence. Among them, 13 were

*Energy consumption per 10,000 yuan of GDP was calculated at 2020 price.

**Up to the time this Report was published, the results in 2021 are the latest data.

classified as extra-severe geological disasters, 22 severe ones, 156 moderate ones, and 5,468 mild ones respectively.

(4) Forest disasters

Forest pest hazard In 2022, a total of 11.871 million hectares of forests across the country suffered from forest pest hazards, down by 5.4% compared with that of 2021, among which 7.297 million hectares forests were affected by insect pest hazards, down by 6.0% compared with that of 2021, and 2.630 million hectares forests were affected by forest disease, down by 7.7%.

Forest fires In 2022, a total of 709 cases of forest fires took place across the country (including 4 big forest fires), up by 15.1% compared with that of 2021. The damaged forest area was about 6,853.9 hectares, up by 53.8% compared with that of 2021.

(5) Grassland disasters

Grassland pest hazard In 2022, a total of 726 million mu of grassland across the country had been damaged by grassland pest hazards, down by 34.7% compared with that of 2021. Among them, 532 million mu were damaged by rodent pest hazards, down by 40.4% compared with that of 2021, 112 million mu were damaged by insect pest hazards, down by 3.4%, and 78 million mu were damaged by poisonous and harmful plants, down by 24.2%.

Grassland fires In 2022, a total of 21 grassland fires occurred across the country, marking a decrease of 8.7% compared with that of 2021. The damaged grassland area was about 3,183 hectares, down by 24.2%.

(6) Marine ecological disasters

Red Tide In 2022, a total of 67 red tides occurred in China's waters, covering an area of 3,328 km^2 in accumulation. In terms of regional distribution, the East China Sea recorded the most frequent occurrence of red tides and the largest cumulative areas with 29 times and 1,815 km^2 respectively. In terms of time distribution, the highest frequency and the largest cumulative area were recorded in May with 15 times and 819 km^2 respectively. Red tides were triggered by 35 types of dominant organisms. Among them, 25 red tides were caused by Noctiluca scientillans as the dominant organism, and the largest accumulative area of red tides were caused by Prorocentrum donghaiense as the dominant organism, covering 655 km^2 in total.

Green Tide From April to August 2022, the green tide disasters occurred at the Yellow Sea of China, with the coverage reaching the highest on June 25th at about 135 km^2. The distribution area reached the highest on July 1st at about 18,002 km^2. Enteromorpha prolifra was the dominant algae triggering such large-scale green tides.

Special Column Active response to climate change

China implements a national strategy of actively addressing climate change, and unswervingly follows a pathway of prioritizing ecological conservation and pursuing green and low-carbon development. Measures taken also included adjusting industrial structure, optimizing energy mix, saving energy and improving its efficiency, perfecting market mechanisms and increasing ecosystem carbon sinks. The installed capacity of renewable energy power generation reached more than 1.2 billion kilowatts, and that of hydropower, wind power, and photovoltaic power exceeded 300 million kilowatts. The carbon market covering the largest amount of greenhouse gas emission globally, with an annual CO_2 emission coverage of over 4.5 billion tons, was launched for online transaction. The National Strategy for Climate Change Adaptation 2035 was issued to make an overall planning and deployment of climate change adaptation work from now to 2035.

Ⅸ. Others

1. Flue gas

According to preliminary calculation, in 2022, 394,604 sets of flue gas treatment facilities in flue gas-related industrial enterprises* had been surveyed nationwide, with SO_2 removal rate of 96.5% and nitrogen oxide removal rate of 75.1%.

2. Wastewater

(1) Industrial wastewater

According to preliminary calculation, in 2022, 72,854 sets of wastewater treatment facilities in wastewater-related enterprises** had been surveyed across the country, with COD removal rate of 97.9% and ammonia nitrogen removal rate of 98.9%.

(2) Urban sewage

According to preliminary calculation, by the end of 2022, the urban sewage treatment capacity across the country reached 215 million m^3 per day. The total discharge volume of urban sewage stood at 63.93 billion m^3, and overall sewage treatment volume reached 62.58 billion m^3 registering the sewage treatment rate of 97.9%.

3. Solid Waste

(1) General industrial solid waste

According to preliminary calculation, in 2022, the volume of general industrial solid waste generated was 4.11 billion tons nationwide, the integrated utilization volume was 2.37 billion tons, and the overall disposal volume was 890 million tons.

(2) Urban refuse

According to preliminary calculation, by the end of 2022, the decontamination capacity of urban refuse across the country was 1.092 million tons per day, the decontamination volume was 257.6722 million tons and the decontamination rate was up to 99.9%.

(3) Hazardous waste

According to preliminary calculation, in 2022, there were about 60,000 units nationwide with an annual generation volume of hazardous waste of or above 10 tons, declaring the generation of about 100 million tons of hazardous waste. By the end of 2022, more than 6,000 units across the country held hazardous waste operation permits, and the centralized utilization and disposal capacity of hazardous waste was about 180 million tons per year.

4. Environmental governance of agricultural production areas

In 2022, the fertilizer utilization rate of three major grain crops of rice, wheat and corn stood at 41.3%. The comprehensive utilization rate of livestock manure was over 78.0%. The national comprehensive utilization rate of straw was over 88%, and the national recovery rate of agricultural film steadily remained at the level over 80%.

*It refers to any industrial enterprise that generates or discharges any flue gas pollutant.

**It refers to any industrial enterprise that generates or discharges any wastewater pollutant.

Special Column Ecological and environmental risk prevention and control and related emergency response

In 2022, the environmental security situation was basically stable in China. A total number of 113 cases of environmental emergencies occurred, registering a reduction of 43.2% compared with that of 2021. In specific, 2 cases were classified as serious and 111 cases as moderate. All cases had been appropriately dealt with.

Special Column Generation and stockpiling of substances listed as new pollutants and controlled by international conventions for chemicals

In 2021, the national annual output of PFOS, its salts and PFOSF was about 12 tons with an end-of-year stockpile of about 0.6 ton; the annual output of hexabromocyclododecane was about 14,614 tons with an end-of-year stockpile of 0 ton; the annual output of decabromodiphenyl ether was about 6,040 tons with an end-of-year stockpile of about 864 tons. Based on the production of chlorinated paraffins, the estimated production of short-chained chlorinated paraffins in the products was about 88,096 tons with an end-of-year stockpile of about 1,468 tons; the annual output of perfluorooctanoic acid and related compounds was about 2,204 tons, with an end-of-year stockpile of about 86 tons (Note: As of the publication of this report, the 2021 results were the latest data.).

Special Column Building "zero-waste cities"

A total of 113 APL cities and 8 special areas were selected for the pilot program of the construction of "zero-waste cities" in line with the "Zero-Waste City" Construction Work Plan during the 14th "Five-Year" Plan period. An inter-ministerial coordination mechanism was put in place to guide local governments to formulate implementation plans based on science for the construction of "zero-waste cities". 9 provinces (municipalities) including Zhejiang, Jiangsu, Hebei, Shandong, Jilin, Hainan, Tianjin, Chongqing and Liaoning had issued provincial-level "zero-waste city" construction plans, and Henan and other provinces were also actively advancing the construction of "zero-waste cities". Sichuan Province and Chongqing Municipality jointly issued guidelines for the joint construction of "zero-waste cities" in the Chengdu-Chongqing economic circle. Guangdong Province began to promote the construction of a "Zero-waste bay area".

Special Column Pollution Treatment of Tailings Ponds

The Administrative Measures for the Prevention and Control of Environmental Pollution by Tailings and Guidelines for the Investigation and Treatment of Potential Pollution Hazards in Tailing Ponds (Trial) were released and implemented. A system for the investigation and management of potential pollution hazards in tailing ponds and the classification and grading of environmental supervision and management system for tailing ponds were established to standardize the targeted pollution prevention and control of tailing ponds in a science-based approach by focusing on the key issues of supervision. The environmental risk investigation over more than 10,000 tailing ponds had been completed across the country with a list of problems identified during investigation established. Rectification efforts were continued to ensure the safety of the ecological environment. The pollution control efforts of tailing ponds were intensified through re-inspection in the Yangtze River Economic Belt, pollution control of tailing ponds was further strengthened in the environmentally sensitive areas of the Yellow River Basin, and comprehensive treatment of tailing ponds was carried out in the upper reaches of the Jialing River. A national tailing environmental management information system was developed with the construction of relevant database so as to improve the efficiency of information management.

Explanations of Compilation

The current report was compiled by Ministry of Ecology and Environment, together with National Development and Reform Commission, Ministry of Public Security, Ministry of Natural Resources, Ministry of Housing and Urban-Rural Development, Ministry of Transport, Ministry of Water Resources, Ministry of Agriculture and Rural Affairs, Ministry of Emergency Management, National Bureau of Statistics, China Meteorological Administration, State Forestry and the Grassland Administration, National Railway Administration and National Administration of Disease Prevention and Control. The data in the current report mainly came from the monitoring data of Environmental Monitoring Network of Ministry of Ecology and Environment. Meanwhile, the report absorbed the environmental data provided by relevant ministries and commissions. Among them, the data on the number of motor vehicles was provided by the Ministry of Public Security, the information of geological disasters and marine ecological disasters were provided by Ministry of Natural Resources; the data on urban sewage treatment and urban refuse disposal were provided by Ministry of Housing and Urban-Rural Development; the data on new energy buses and vehicles in operation was provided by Ministry of Transport; the data on water and soil erosion and part of the content on meteorological disasters were provided by Ministry of Water Resources. The data on water quality of inland fishery waters, marine fishery waters, cultivated land quality, part of the content on genetic resource diversity and environmental governance of agricultural production areas were provided by Ministry of Agriculture and Rural Affairs. Part of the content of meteorological disasters, earthquake disasters, forest and grasslands fires were provided by Ministry of Emergency Management; carbon emission intensity and energy data were provided by National Bureau of Statistics; temperature, precipitation, meteorological disasters, and greenhouse gases data were provided by China Meteorological Administration; data on desertification and sandification, forest and grassland status, natural reserves, forest and grassland biological disasters and carbon sink were provided by State Forestry and Grassland Administration. The data on the national comprehensive energy consumption of railway per unit of transportation workload and railway freight volume were provided by National Railway Administration.

The national data in the current Report do not cover Hong Kong SAR, Macao SAR and Taiwan Province of China except that on administrative zoning, national land area or otherwise specified.

Map approval number: GS Jing (2023) No. 1107

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