2.2 China

1 | Country Information

Table 2.2.1 Basic indicators

Land Area (km²)		9.6 million (approx.) (2018)
Total Population		1.4 billion (2019)
GDP (current USD)		14,723 billion (2020)*
GDP per capita (current USD)		10,484 (2020)*
Average Precipitation (mm/year)		651.3 (2019)**
Total Renewable Water Resources (km³)		2,904.1 (2019)**
Total Annual Freshwater Withdrawals (billion m³)		602.12 (2019)
Annual Freshwater Withdrawals by Sector	Agriculture	61.16% (2019)**
	Industry	20.22% (2019)**
	Municipal (including domestic)	14.48% (2019)**

(Source: National Bureau of Statistics of China 2020, *IMF 2020, **MWR 2019)

2 | State of Water Resources

China's total freshwater resources are the fourth largest in the world. However, due to its large population, water resources per capita are only about 2,300 m³, which is only a quarter of the global average (Chinese Hydraulic Engineering Society 2016). Moreover, water resources are unevenly distributed – rich in the southern areas and poor in the northern areas. In 2019, precipitation across China tended to be low in the northwest and high in the southeast (MWR 2019).

There are 45,203 rivers in China, with a total length of 1.51 million km (MWR 2011a). Of these, the Yangtze River, Yellow River, Pearl River, Songhua River, Huai River, Hai River, and Liao River constitute the seven major river basins. There are also numerous lakes, over 2,800 of which are 1 km² or larger, covering a total area of about 78,000 km². The five largest freshwater lakes are Boyang Lake, Dongting Lake, Taihu Lake, Hongze Lake, and Chao Lake, all located around the middle and lower reaches of the Yangtze River.

Most of China's water resources are surface water, with groundwater resources amounting to 819.15 billion m³ in 2019. Looking at the breakdown of water use by source, 80% of the total water use was surface water and about 20% was groundwater, but groundwater use was higher in some regions. In the Yellow River basin, many cities experienced problems such as land subsidence due to over-pumping of groundwater.

Table 2.2.2 Overview of China's seven major rivers

	Drainage Area (km²)	Length (km)	Annual Flow (100 million m³)
Yangtze River	1,782,725	6,300	9,857
Yellow River	752,773	5,464	592
Songhua River	561,222	2,308	818
Liao River	221,097	1,390	137
Pearl River	442,527	2,214	3,381
Hai River	265,551	1,090	163
Huai River	268,957	1,000	595

(Source: National Bureau of Statistics of China 2020)

3 | State of Ambient Water Quality

According to the 2020 Ecological and Environmental Status Bulletin of China's Ministry of Ecology and Environment (MEE), surface water pollution across China has reduced. Assessments were conducted for surface water quality, which is classified according to five categories of water resources (Grade I to Grade V) based on the environmental standards for surface water (see Table 2.2.3). Figure 2.2.1 shows surface water quality in 2020, broken down by percentage. Seawater and

Table 2.2.3 Classification of water quality standards for surface water

Grade	Description
I	Mainly for headstreams and national nature preserves
II	Mainly for drinking water resources in first-class protected areas, protected areas for precious fish, and spawning areas for fish and shrimp
III	Mainly for drinking water resources in second-class protected areas, protected areas for fish, and swimming areas
IV	Mainly for industrial water resources and recreational use with no human contact with water
V	Mainly for agricultural water resources and water areas required for landscapes

(Source: MEE 2002)

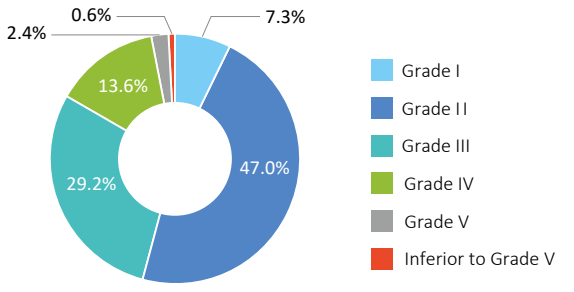

Figure 2.2.1 Surface water quality, by percentage
(Source: MEE 2020)

groundwater were also assessed based on surface water categories according to their respective water quality standards (see Table 2.2.4 and Table 2.2.5).

Table 2.2.4 Classification of seawater quality standards

Grade	Description
I	Suitable for marine fishing, marine nature preserves and protected areas for rare or endangered marine organisms
II	Suitable for marine cultivation, bathing, marine sports or recreation activities involving direct human contact with marine water, and for sources of industrial use of water related to human consumption
III	Suitable for water resources for general industrial use
IV	Suitable only for harbors and ocean development activities

(Source: MEE 1997)

Table 2.2.5 Classification of groundwater quality standards

Grade	Description
I	Reflects the low content of chemical components of groundwater, applicable to various purposes
II	Reflects the relatively low content of chemical components of groundwater, applicable to various purposes
III	Reflects the medium content of chemical components of groundwater. Based on GB5749-2006, primarily applicable to concentrative drinking water sources and industrial and agricultural use water
IV	Reflects the relatively high content of chemical components of groundwater. Based on industrial and agricultural use water requirements and benchmark value of human health, primarily applicable to agricultural water and partial industrial use water. After being properly processed, applicable as drinking water
V	Reflects the high content of chemical components of groundwater. Not applicable as drinking water. Selection of such category of water depends on other purposes

(Source: Standardization Administration, 2017)

3.1 Rivers

According to the national monitoring results, the overall water quality of 10 major water systems (Yangtze River, Yellow River, Pearl River, Songhua River, Huai River, Hai River, Liao River, rivers flowing through Zhejiang and Fujian provinces, rivers in the northwest, and rivers in the southwest) was between Grade I to Grade III for 87.4%, and inferior to Grade V for 0.2% (MEE 2020), which represents a broad-based improvement compared to 2013 (see Table 2.2.6). Figure 2.2.2 shows the water quality in 2020 for 10 major water systems. Rivers in northwest China, Zhejiang and Fujian region and southwest China and river basins of the Yangtze River and Pearl River were of excellent quality. The water quality of Yellow River, Songhua River, Huai River was fairly good, and Liao River and Hai River were slightly polluted.

Table 2.2.6 Water quality of 10 major water systems in China (2013, 2020)

Year	Grade I–III	Grade IV–V	Inferior to Grade V
2013	71.7%	19.3%	9.0%
2020	87.4%	12.3%	0.2%

(Source: MEE 2020)

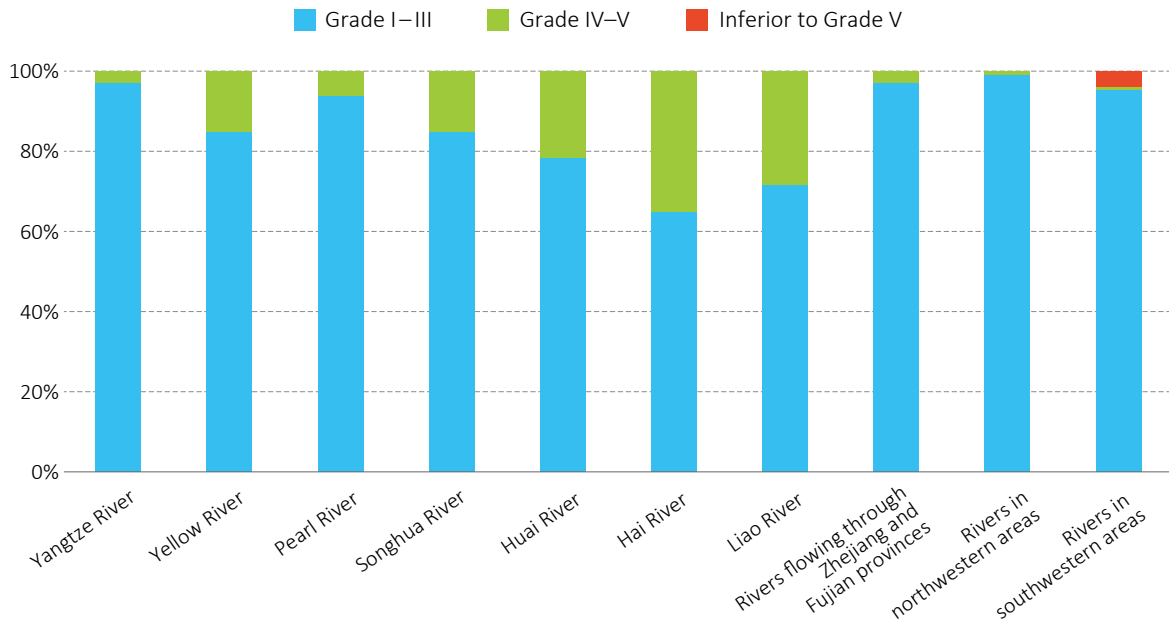

Figure 2.2.2 State of water quality of 10 major water systems in China (Source: MEE 2020)

3.2 Lakes and Reservoirs

In 2020, 76.8% of the 112 major lakes and reservoirs across the country met the criteria for environmental standards of Grade I-III and 5.4% of Inferior to Grade V. The main indicators used to signify the existence of pollution were total phosphorus, COD (chemical oxygen demand), and Permanganate index. Of the 110 lakes and reservoirs where nutrients were monitored, 9.1% were under oligotrophic status, 61.8% were under mesotrophic status, 23.6% were under slight eutrophication, 4.5% were under intermediate eutrophication, and 0.9% were under severe eutrophication (MEE 2020).

3.3 Nearshore sea areas*1

The water quality of coastal waters has steadily improved. According to the 2020 monitoring results, 77.4% of areas were classified as Grade I or II (National Seawater Quality Standards), an improvement of 0.8 percentage points compared to the previous year. Moreover, 9.4% of the water bodies were below Grade IV, representing a drop (improvement) of 2.3 percentage points compared to the previous year. Major pollutants were inorganic nitrogen and active phosphate (MEE 2020).

3.4 Groundwater

According to the results of the 2020 groundwater quality monitoring, of the 10,171 monitoring sites, 13.6% were classified as of Grades I–III, 68.8% as Grade IV, and 17.6% as Grade V. Among the 10242 shallow groundwater monitoring sites, 22.7% were classified as Grades I-III, 33.7% as Grade IV, and 43.6% as Grade V. Major indicators exceeding the standard were manganese, water hardness, and total dissolved solids.

4 | State of Wastewater Treatment

Since 2011, the Chinese Government started monitoring COD and ammonia nitrogen from agricultural plantations, fisheries, and livestock farms. Total COD discharge in 2018 was 5,842,000 tons, and of this amount, 81.6 % resulted from household discharge. Furthermore, 90.5% of the ammoniacal nitrogen discharge results from household discharge (China Statistical Yearbook on Environment 2019*2). In 2019, there were 2,471 urban domestic wastewater treatment facilities nationwide, with a capacity of 178.63 million m^3/day in 2019, and the volume of annual urban domestic treated wastewater was 52,585 million m^3, with a treatment rate of 96.81%.

5 | Frameworks for Water Environmental Management

5.1 Legislation

The Constitution of the People's Republic of China stipulates that the protection and improvement of the ecological and living environment and the prevention of pollution are responsibilities of the state. The Environmental Protection Law of the People's Republic of China stipulates that "the State shall strengthen the protection of air, water and soil, and establish and improve corresponding investigation, monitoring, appraisal and restoration systems." The Environmental Protection Law of the People's Republic of China was revised in 2014 and went into effect on 1 January 2015. With regard to the prevention of water pollution in surface water and groundwater, the Law on Water Pollution Control sets surface water environmental standards, groundwater environmental standards, and water pollutant discharge standards. The Water Pollution Control Law was also amended in 2017. As for seawater, the Law of the People's Republic of China on the Protection of the Marine Environment was enacted in 1982, which established water quality standards for seawater; this law was amended in 2017. In addition to the above laws, the Environmental Protection Tax Law was enacted in 2018, and regulations and administrative orders/regulations related to water pollution prevention also exist, such as the collection of an environmental protection tax from companies that directly discharge pollutants, based on discharge amount. Provinces and cities have also set their own environmental standards.

5.2 Institutional arrangements

The Ministry of Ecology and Environment (MEE) was established in 2018 by the 13th National People's Congress, subsequent to formation of the Ministry of Environmental Protection (MEP), by upgrading the State Environmental Protection Administration (SEPA) in 2008 and amalgamating with sections responsible for environmental protection in the National Development and Reform Commission, the Ministry of Land and Resources, Ministry of Agriculture, State Oceanic Administration, and others.

MEE is responsible for establishing and improving the fundamental system in China with respect to the ecological environment. Its roles include forming collaborations with other governmental departments to

*1 Nearshore waters: refers to the sea area stipulated in the National Marine Functional Zoning (2011-2020).
*2 NBS and MEE. China Statistical Yearbook on environment 2019. https://navi.cnki.net/KNavi/YearbookDetail?pcode=CYFD&pykm=YHJSD&bh=

initiate the formulation and implementation of national ecological and environmental policies and plans as well as to draft laws and regulations, and to formulate departmental rules; forming collaborations with other governmental departments to compile and supervise the implementation of ecological and environmental plans and water functional zoning plans for key regions, river basins, sea areas, and drinking water source areas; and to organize the formulation of ecological environmental standards and formulate ecological environmental benchmarks and technical specifications (MEE 2021a).

Provinces and municipalities also play an important role in pollution control through establishing local laws and standards.

5.3 Ambient Water Quality Standards

The surface water environmental quality standards set five categories for 24 basic parameters. Groundwater quality standards set standards for 39 parameters, and the seawater quality standards set standards for 35 parameters. Separate water quality standards exist for fisheries and irrigation.

Water Quality Monitoring

In 2020, there were 1,937 surface water sections (sites) under the national monitoring program, including 1,614 water sections in seven 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, and rivers in northwestern and southwestern parts of China. In addition, water quality monitoring was carried out in 112 major lakes (reservoirs), at 10,171 groundwater quality monitoring points of natural resources authority (7,923, 910, and 1,338 groundwater monitoring points in plain basins, karst mountainous areas, and bedrock in hilly mountainous areas respectively), and at 10,242 groundwater quality monitoring points of water resources authority (mainly shallow groundwater) (MEE 2020)*[3]. Analytical methods for water quality are described in the respective water quality standards; i.e., Surface Water Environmental Standards (GB3838-2002), Groundwater Quality Standards (GB/T14848-2017), and Seawater Quality Standards (GB3097-1997).

5.4 Effluent standards

The effluent quality of municipal wastewater treatment plants is regulated by the Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant (GB 18918-2002), which sets effluent standards for 19 basic parameters and 43 optional parameters for municipal wastewater treatment plants nationwide. Certain regions have independently introduced their own effluent standards at the local level. Discharge concentration limits of industrial wastewater pollutants are stipulated by the discharge standards of water pollutants of corresponding industries, such as steel, meat processing, etc. If there is no industrial discharge standard for any given industry, the limits shall be implemented in accordance with the Integrated Wastewater Discharge Standard (GB 8978-1996). At present, there are 65 national water pollutant discharge standards in China.

Measures against non-compliance

The 2017 amendments to the Water Pollution Control Law have strengthened the penalties for violations. In response to a violation, the government's environmental protection section issues an order to the violating company to correct the situation, as well as restricts or suspends production operations, and imposes a fine of not less than 100,000 yuan and not more than 1 million yuan, in cases of (1) discharging pollutants without obtaining a pollutant discharge permit in accordance with the law; (2) exceeding discharge standards or total volume control indicators; (3) falsifying wastewater quality data; and (4) discharging pollutants without properly operating sewage treatment facilities (Lin 2020).

5.5 Measure Policies on Water Environmental Management

The Five-Year Plan for China's National Economic and Social Development is China's basic policy document, and also sets targets for achieving water environment management. The National Five-Year Plan on Water Pollution Control in Major River Basins has also been formulated as an important water environment management policy document.

In April 2015, China's State Council released the Water Pollution Prevention Action Plan (Water Ten Articles) and has made efforts to resolve certain issues. The Water Ten Articles call for: (1) overall control of pollutant discharge; (2) promotion of transformation and updating of economic structure; (3) a focus on water resources saving and conservation; (4) strengthening of scientific and technological support; (5) giving full play to the function of market mechanisms; (6) tightening of

*3 http://www.mee.gov.cn/hjzl/sthjzk/zghjzkgb/202105/P020210526572756184785.pdf

environmental law enforcement and supervision; (7) effective strengthening of water environmental management; (8) providing a full guarantee of water ecological environment safety; (9) defining and fulfilling the responsibilities of each party; and (10) strengthening of public participation and social supervision (MEE 2015). The articles also set numerical targets such as limiting the national water consumption to 670 billion m^3 or less by 2020, increasing the percentage of water quality of Grade III or higher in seven river basins including the Yangtze and Yellow Rivers to 70%, and increasing the urban sewage treatment rate to 95% (MEE 2015).

6 | Recent Developments in Water Environmental Management

During the 13th Five-Year Plan period adopted by the National People's Congress in March 2016, China formulated the Ecological Environmental Protection Plan to further improve the quality of the environment and enhance governance capacity. The government set a goal to improve the quality of the environment by 2020, to mitigate vulnerabilities in the ecological environment.

The water quality target set in the 13th Five-Year Plan for 2016–2020 was to increase areas of Grade III by 4% and reduce areas of Grade V and below by at least 4.7%. By the end of FY2019, the percentage of water bodies designated as Grade III and above had increased from 67.9% in 2017 to 74.9%, and the percentage of water bodies inferior to Grade V had decreased from 8.3% in 2017 to 3.4% (Chinese Academy of Environmental Planning, 2020). Moreover, COD and ammonia nitrogen had been reduced respectively by 13.8% and 15.0% by the end of 2020 (Chinawater net 2021).

7 | Challenges and Future Plans

Although the overall quality of China's water environment has been improving, there is still more work to be done. Some localities still have a relatively extensive development mode, and their environmental infrastructure needs to be improved; the country's overall water ecological condition still lags behind developed regions in the world; the water environment risks in some localities demand attention, including risks of environmental emergencies and sediment pollution (MEE 2021).

The 13th Five-Year Plan ended at the end of 2020, and the Outline of the 14th Five-Year Plan for National Economic and Social Development and the Long-Range Objectives Through the Year 2035 was approved by the National People's Congress in March 2021.

In the 14th Five-Year Plan, the following strategies to improve the water environment have been formulated (Xinhua News Agency, 2021).

- Improving the level of rural infrastructure and public services
  - Improve rural infrastructure, including water, electricity, roads, and gas (24-2)*4
  - Promote the treatment of domestic wastewater in rural areas (24-3)

- Improving the quality and stability of ecosystems
  - Strengthen ecological protection and management of major rivers, lakes and wetlands (37-1)
  - Improve policies on land and sea use for ecological protection and restoration (37-2)
  - Promote the establishment of basin-wide ecological compensation measures for major river basins (37-3)

- Environmental improvement
  - Improve water pollution prevention measures, watershed management and coordination (38-1)
  - Strengthen comprehensive management for major river basins, lakes, urban and coastal waters (38-1)
  - Reduce COD and total ammonia nitrogen emissions by 8% each (38-1)
  - Eliminate inferior to Grade V water bodies in principal (38-1)
  - Promote the relocation and renovation of industries with heavy pollution in major river basins (38-1)
  - Implement comprehensive prevention and management plans for water and soil environmental risks (38-1)
  - Strengthen the prevention and control of plastic pollution (38-1)
  - Promote full coverage of urban sewage pipe networks (38-2)
  - Upgrade sewage treatment (38-2)
  - Promote centralized sludge incineration and detoxification treatment (38-2)
  - Achieve 90% detoxification treatment rate for urban sludge (38-2)

*4 The number in the prentices indicates the section in the 14th Five-Year Plan.

- Achieve 25% or more of recycled water use in cities at and above the prefectural level with water shortages (38-2)
- Establish an ecological environment management system that integrates above and below ground as well as land and sea (38-5)
- Realize the issuance of pollution discharge permits for point source polluters (38-5)
- Improve management and protection systems for rivers and lakes, and strengthen the system of river chiefs and lake chiefs (38-5)
- Improve the vertical management system of monitoring, supervision and law enforcement of ecological and environmental institutions under provinces (38-5)
- Promote comprehensive law enforcement reform for ecological environment protection (38-5)
- Increase the disclosure of environmental protection information and strengthen the establishment of a corporate environmental governance system (38-5)
- Improve public supervision, and reporting and feedback mechanisms (38-5)
- Promote the participation of social organizations and the general public in environmental governance (38-5)