

Water Resources of Our Country

I. Overview of Water Resources

A. Definition and Distribution

Definition

- Water resources refer to freshwater available for human use, either directly or indirectly. This includes surface water (e.g., rivers, lakes, glaciers, and wetlands) and groundwater (e.g., shallow aquifers and deep confined water). Water is the foundation for all life and is essential for agricultural, industrial, and urban development.
- Water resources exhibit renewability (through precipitation recharge) and finiteness (limited by natural conditions and human activities).

Distribution

- Uneven Spatial Distribution

Water resources in our country are highly unevenly distributed, following the pattern of “richer in the south, less in the north; richer in the east, less in the west”. Around 80% of the total water resources are found in the southern regions, primarily in Chang Jiang, Zhujiang basins, and areas to the south. In contrast, the northern regions, such as Huang He and Hai He basins, hold 19% of the nation’s water resources but supports 46% total population, facing severe shortages (Figure 1).

Figure 1: Water Resources and Economic Development In the Northern Regions and Southern Regions of our Country

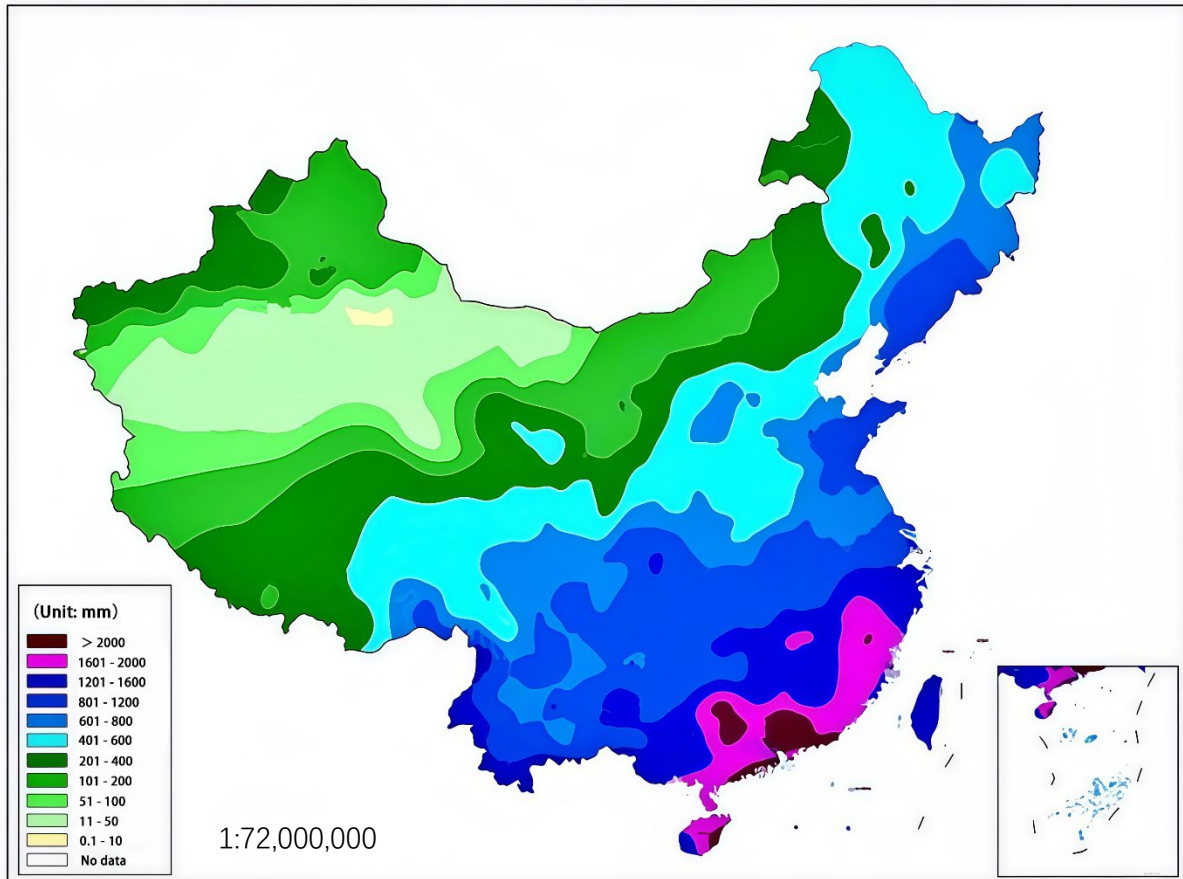
	Northern Regions	Southern Regions
Land areas	64%	36%
Population	46%	54%
Farmland	60%	40%
GDP	45%	55%
Water resources	19%	81%

Source: “Water resources and management”, Ministry of Water Resources. People’s Republic of China, 2024, <http://www.mwr.gov.cn/english/MainAchievements/>

- Difference in amount of annual precipitation

The annual precipitation in the southern regions typically exceeds 800 mm, e.g., 1,500 – 2,000 mm in the Jiangnan region. However, the northern areas receive less than 400 mm. In the north-western part of China, such as Tarim Basin, the annual precipitation is less than 50 mm (Figure 2).

Figure 2: Distribution of annual precipitation in our country



Reference: 2020 年中國氣候公報

Map reference: 中華人民共和國自然資源部審圖號 GS(2023)2767 號 (Date of reference: 16 February 2025)

- **Anomalies of Precipitation**

The precipitation anomalies in our country have increased since 1960s, with greater variability in winter than in summer, greater variability in NW, NE and SE China and has decreased significantly along the wet-dry transition belt from the north to SW China.

- **Groundwater Distribution**

Groundwater availability varies due to geological factors. The North China Plain has abundant groundwater reserves but faces over-extraction, while the Southwest Karst region has groundwater mainly in the form of underground rivers, making it difficult to access.

B. Major Rivers, Lakes, and Glaciers

Rivers

- **Chang Jiang**

With a length of 6,300 kilometers, Chang Jiang has an annual discharge of about 960 billion cubic meters, making it the longest river with the richest water resources in our country. The total basin area, which is over 1.8 million square kilometers, covers 18.8% of the nation's land area.

- Huang He

Stretching 5,464 kilometers, Huang He has an annual discharge of only 58 billion cubic meters. With a drainage area of more than 750,000 square kilometers, it is the second longest river in China. The lower course of Huang He is often referred to as the “suspended river” as the river bed is elevated above the flood plain due to the accumulation of heavy sediment load from Loess Plateau.

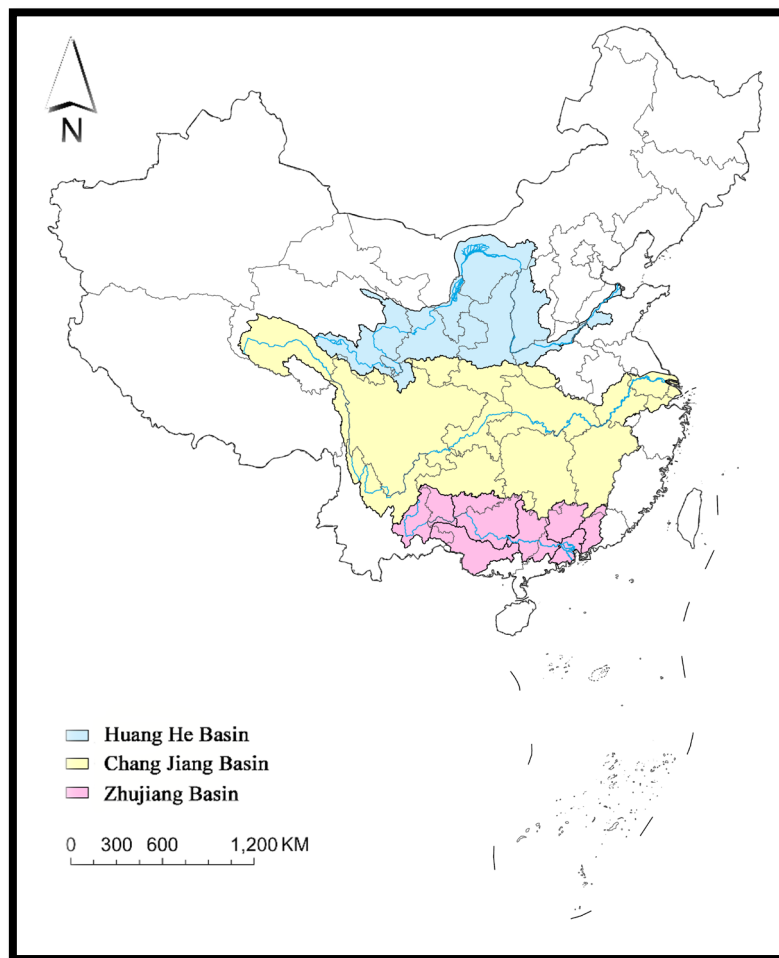
- Zhujiang

Zhujiang has an annual discharge of 330 billion cubic meters and experiences abundant precipitation in its basin, resulting in both floods and rich water resources.

- Other Major Rivers

Songhua He (a vital water source for the Northeast’s major grain-producing areas); Huai He (a transitional water resource zone between the north and south); Hai He (a core water-scarce area in North China); Liao He (an important river in NE China).

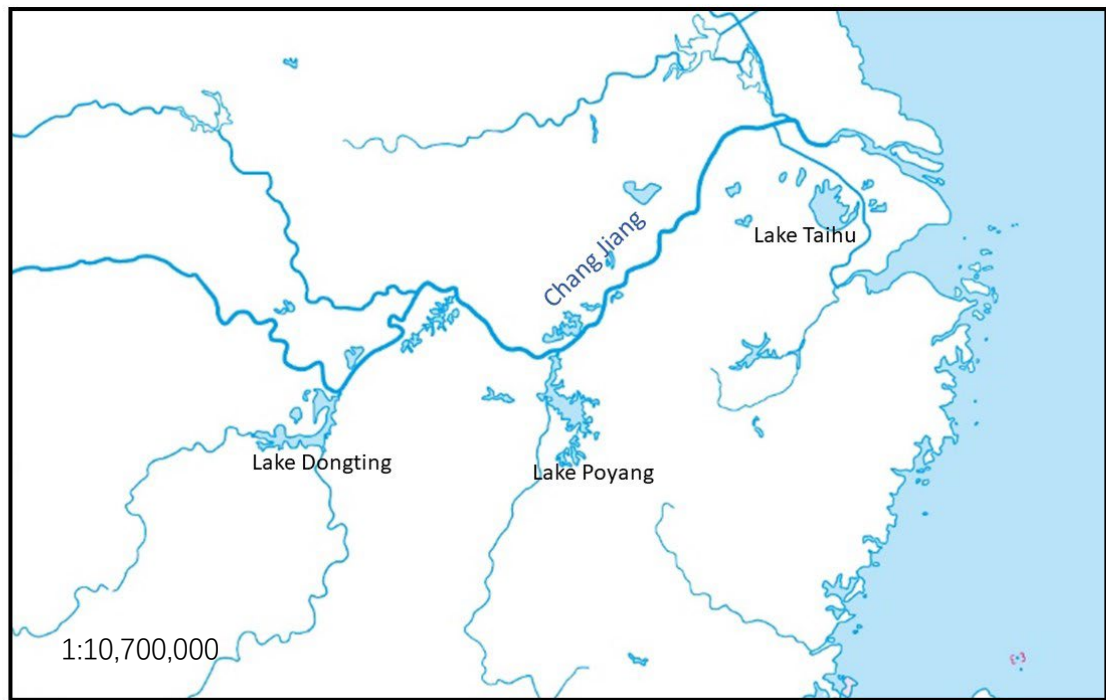
Figure 3: Drainage basin of major rivers in our country



Map reference: 中華人民共和國自然資源部審圖號 GS (2024) 0650 號 (Date of reference: 27 January 2025)

Lakes

Figure 4: Major Fresh Water Lakes along Chang Jiang



Map reference: 中華人民共和國自然資源部審圖號 GS(2019)4345 號 (Date of reference: 29 April 2025)

- **Poyang Lake**
Our country's largest freshwater lake, covering about 3,914 square kilometers during flood seasons, and helps regulate the water flow of the Chang Jiang.
- **Dongting Lake**
It is the second largest freshwater lake in our country. Historically known as the "800-mile Dongting," it now spans about 2,625 square kilometers, suffering from reclamation and sedimentation issues.
- **Taihu Lake**
Covering 2,438 square kilometers, it serves as a crucial water source for the Jiangnan economic region, though it faces severe water pollution problems.
- **Qinghai Lake**
The largest saline lake in our country, covering about 4,436 square kilometers. It is a natural barrier that controls the eastward spread of desertification in the west and holds significant ecological importance.
- **Nam Co Lake**
A famous high-altitude lake on the Qinghai-Tibet Plateau, situated at 4,718 meters above sea level, with water mainly sourced from glacial meltwater.

Glaciers:

- Glaciers are primarily distributed across the Qinghai-Tibet Plateau (known as the “Water Tower of Asia”), the Tian Shan Mountains, and the Qilian Mountains, covering a total area of about 59,000 square kilometers.
- The glaciers of the Qinghai-Tibet Plateau store about 860 billion cubic meters of water, serving as the source for major rivers such as Chang Jiang, Huang He, and Lancang River.
- In recent years, glaciers on the Qinghai-Tibet Plateau have continued to melt.

C. Total Water Resources and Per Capita Availability

Total Water Resources

- Annual water resources

Our country’s average annual total water resources are approximately 2.8 trillion cubic meters in 2024, accounting for 6% of the world’s freshwater resources, ranking sixth globally (behind countries like Brazil and Russia).

- Resource limitation

Despite the large total volume, the vast territory and massive population limit the actual availability of water resources.

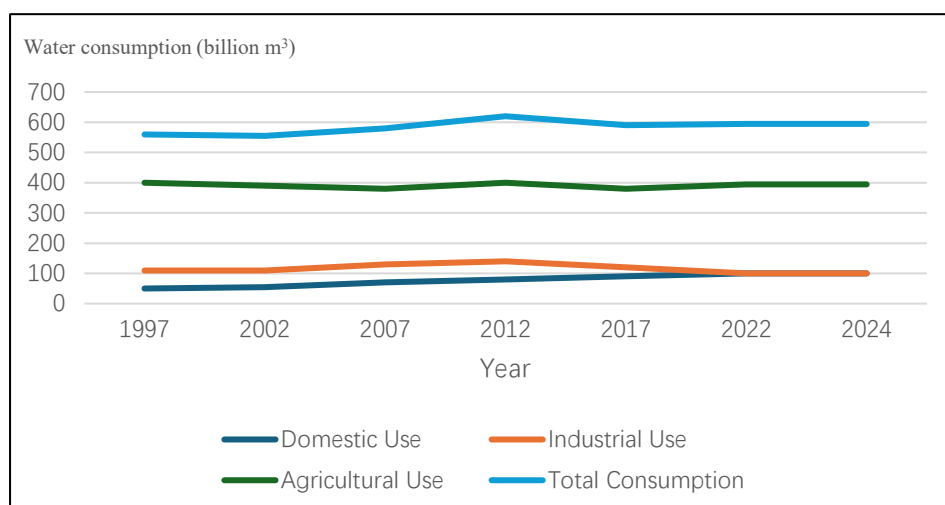
Per Capita Water Availability

Our country’s per capita water availability is about 2,220 cubic meters in 2024, which is only one-fourth of the global average (around 8,000 cubic meters). The United Nations classifies China as one of the 13 water-scarce countries.

D. Water Consumption in our country

The demand of water for industrial and agricultural uses fluctuates. However, the consumption of domestic water keeps on rising.

Figure 5: Consumption of water in 1997 – 2024



Source: China Water Resources Bulletin 2024

- **Agricultural water use**
Primarily for irrigating water-intensive crops like rice; Northern irrigation zones (e.g. North China Plain) heavily rely on groundwater extraction. The use of irrigation water fluctuates with the annual precipitation. Water consumption for agricultural use has been kept at around 370 billion m³ to 400 billion m³ from 1997 to 2024.
- **Industrial water use**
Concentrated in heavy industries such as steel and chemical manufacturing; Eastern coastal industrial regions consume most water. In 2012, water consumption rose with rapid industrial growth. However, in 2022-2024, the government encouraged the development of high-tech industries. In addition, with economic recession, the production of heavy industries slowed down. The consumption of industrial water declined.
- **Domestic water use**
The consumption of domestic water rose rapidly from 50 billion m³ in 1997 to 100 billion m³ in 2024 due to the increasing rate of urbanization and the improvement of living standard.

E. Causes of Water Shortage

1) Climatic Factors

Uneven spatial and temporal distribution

➤ **Seasonal imbalance**

With the influence of monsoon climate, 60%-80% of annual precipitation falls in summer, and it is drier in winter.

➤ **Regional disparities**

Our country's water resources are divided into ten Level-1 Water Resources Zones (WRZs), comprising six northern zones (Songhua River, Liao River, Hai River, Huang He, Huai River, and Northwest Rivers) and four southern zones (Chang Jiang including Taihu Basin, Southeast Rivers, Zhujiang River, and Southwest Rivers). In 2024, the total water supply in the northern six zones was 270.3 billion cubic meters, while the southern four zones had a significantly higher supply of 322.5 billion cubic meters. This disparity underscores the south's abundant water resources compared to the water-scarce northern regions (Figure 6).

Figure 6: Annual Precipitation, Water Resources and Water Supply for Consumption (2024)

	Annual precipitation (mm)	Water resources (billion m ³)	Annual supply of water (billion m ³)
Nationwide	717.7	3,112.3	592.8
North-west regions	198.7	162.9	73.56
6 Northern zones	398.8	673.5	270.3
4 Southern zones	1,281.5	2,438.8	322.5

Source : China Water Resources Bulletin 2024

2) Population Pressure

With a population of approximately 1.4 billion, accounting for 18% of the global total, the demand for water is immense, significantly reducing per capita water availability.

3) Improvement in Living Standard

With improvement in living standard, the demand for agricultural produces and industrial goods increase. It boosts the agricultural and industrial production, thus, the demand of water for agricultural and industrial uses rises. The consumption of domestic water also keeps on surging.

4) Waste of Water

- Agricultural inefficiency

Traditional irrigation (e.g., flood irrigation) has a wastage rate of up to 50%, far less efficient than modern techniques.

- Misuse of industrial water

Water recycling in Chinese industries is around 60%, significantly lower than 80% or more in developed countries like the United States.

- Urban infrastructure issues

In northern cities, an average water leakage rate from fresh water supply system is of 15%-20%, leading to substantial losses in municipal water systems.

- Illegal discharge of industrial and domestic sewage

Illegal discharge of industrial waste and domestic sewage as well as the agricultural runoff polluted the streams and rivers, reducing the supply of clean water. Thus, an imbalance of demand and supply of clean and fresh water results.

II. Major Projects on Water Resources Allocation

A. Three Gorges Dam

- Installed capacity: 22.5 million kW;
- Annual electricity generation: Approximately 100 billion kWh;
- Controls floods in the middle and lower reaches of the Chang Jiang.

B. South-to-North Water Diversion Project

- Eastern and central routes have transferred over 60 billion cubic meters of water;
- Alleviates water shortages in Beijing, Tianjin, and Hebei;
- Western routes are still under planning.

C. Building of large reservoirs:

- Danjiangkou Reservoir: Main water source for the central route of the South-to-North Water Diversion Project;
- Xiaolangdi Reservoir: Flood control and sediment management for the Huang He.

III. Challenges Facing Water Resources

A. Water Shortage

- The per capita water resources are low, especially in the northern region. For example, in Beijing, the per capita water resources are only 192.8 cubic meters in 2024, which is an extremely water-scarce level.
- The ecological flow of the Huang He Basin is insufficient and it was dry several times in the 1990s.

B. Water pollution

- Industrial pollution
Heavy metals (such as cadmium and lead) and chemical pollutants exceeded the standard. In 2013, Hezhou, Guangxi, experienced a significant water pollution incident involving exceeding standard limits of heavy metals, such as cadmium (Cd) and thallium (Tl), along with other chemical pollutants. The contamination primarily affected the Hejiang River, particularly from the Mawei River section to the river mouth, extending into Fengkai County in Guangdong Province.
- Agricultural pollution
The annual use of fertilisers is about 60 million tons in 2015, and pesticides is about 300,000 tons. Excessive use led to the outbreak of blue algae in Taihu Lake in 2007, upsetting the supply of drinking water in Wuxi. In 2015, Ministry of Agriculture launched a zero-growth campaign for the use of fertilisers and pesticides. Typical water pollution incidents caused by excessive use of fertilisers and pesticides have been reduced.

C. Climate Change and Natural Disasters

- Abnormal precipitation

Climate change brings frequent floods in the south (such as the 1998 Chang Jiang flood) and intensified droughts in the north (such as the successive years of drought in North China).

- Glacier retreat

The area of glaciers on the Qinghai-Tibet Plateau has decreased by about 15% (1980-2020), threatening the long-term water source of rivers.

IV. Management and protection of water resources

A. Policy and Law

- Water Law of the People's Republic of China (revised in 2002) established the basic framework for water resources management.
- “The most stringent water resources management system” (2011) set “three red lines” for total water use, efficiency, and pollution.
- Protection of water resources

The government has formulated and promulgated the National Water Resources Protection Plan and reinforced the supervision in water function zones. The government has supported local implementation of a river-lake-reservoir water system connection project to effectively improve quality of water and ecological environment in rivers and lakes.

B. Technical means

- Water-saving technology: The agricultural drip irrigation coverage rate increased from 5% in 2000 to 20% in 2020.
- Water recycling: The urban water recycling rate reaches more than 20%, such as the Beijing Qinghe Wastewater Treatment Plant.

C. International Cooperation

- Lancang-Mekong Cooperation: Our country and downstream countries share hydrological data and coordinate water resource utilisation.
- Heilongjiang Basin: Negotiate cross-border water management with Russia.

V. Sustainable use of water resources

A. Sustainable development of water resources

Sustainable development refers to the development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Sustainable use of water resources is an important part of sustainable development. Sustainable use of water

resources is an important foundation for ensuring sustainable economic and social development.

B. Water conservation

- Main measures: water source protection, soil and water conservation, water ecological restoration, etc.
- Cases: Comprehensive management of water environment in Taihu Lake Basin, ecological environment protection in Chang Jiang Basin, etc.

C. Improving water resource safety

With economic and social development, the problem of Chinese water resource safety is more prominent. The government put forward the policy of “prioritizing water saving, spatial balance, systematic governance” to enhance conservation of water resources and improve the quality of water, especially drinking water.

D. Public Engagement

- Importance: Public participation is an important force in water resource protection.
Ways and means: Save water, participate in environmental protection activities, supervise and report illegal activities, etc.

E. Achievements in Our Country’s Water Governance

Over the past decade, guided by the strategic principle of “prioritising water conservation, balancing spatial distribution, adopting systematic governance, and leveraging both government and market forces”, our country has made historic strides in water resource management and governance. These achievements can be summarised as follows:

- **Enhanced National Water Security Infrastructure**
From 2014 to 2024, our country has significantly expanded its water infrastructure, including the addition of 163.2 billion cubic meters in reservoir storage capacity and approximately 60,000 kilometers of levees at grade 5 or above. As a result, the ratio of flood-related economic losses to GDP decreased from 0.51% to 0.24% in that period. The annual water supply capacity of hydraulic projects has now exceeded 900 billion cubic meters in 2024.
- **Substantial Improvement in Efficiency of Water Use**
Total national water consumption has remained stable at around 610 billion cubic meters. Water use per 10,000 RMB of GDP and industrial added value has decreased by 42.8% and 58.2% in 2024, respectively. The effective utilisation coefficient of farmland irrigation water has increased, and agricultural water use has achieved “zero growth” despite increased crop yields.

- Comprehensive Development of a Water-Saving Society in 2024

A total of 1,763 water-saving counties, 145 water-saving cities, and over 21,000 water-efficient industrial enterprises have been established across the country. The industrial water reuse rate has surpassed 93%, and urban water supply leakage rates have fallen below 10%. Utilisation of unconventional water resources reached 21 billion cubic meters, 3.5 times the volume a decade ago. Water-saving contracts and financing tools such as “water-saving loans” have attracted over 95 billion RMB in private investment and over 210 billion RMB in bank lending.
- Accelerated Construction of the National Water Network

The main framework of the national water network is taking shape. Major inter-basin transfer projects such as the South-to-North Water Diversion (Eastern and Central routes) have delivered over 69.8 billion cubic meters of water, benefiting 176 million people. Projects like the Yangtze-Huaihe Diversion, Hanjiang-to-Weihe Diversion, and Pearl River Delta Water Resources Allocation have been completed or launched. All 31 provinces have implemented provincial water network plans, supported by city- and county-level pilot zones.
- Systematic River and Lake Ecosystem Governance in 2024

The management and protection of rivers, lakes, and reservoirs have been significantly strengthened. Targeted campaigns were launched to address major issues that obstruct flood discharge, including nationwide crackdowns on illegal sand mining. To enhance regulatory oversight, the Ministry of Water Resources promoted the delineation of river and lake management boundaries, establishing control zones for 1.33 million kilometers of rivers and 2,057 lakes. Furthermore, 7,280 rivers and lakes have undergone health assessments, and corresponding health archives have been established. Over 70,000 customized management plans under the "One River, One Policy" initiative have been developed and implemented in a rolling manner to support sustainable governance.

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