

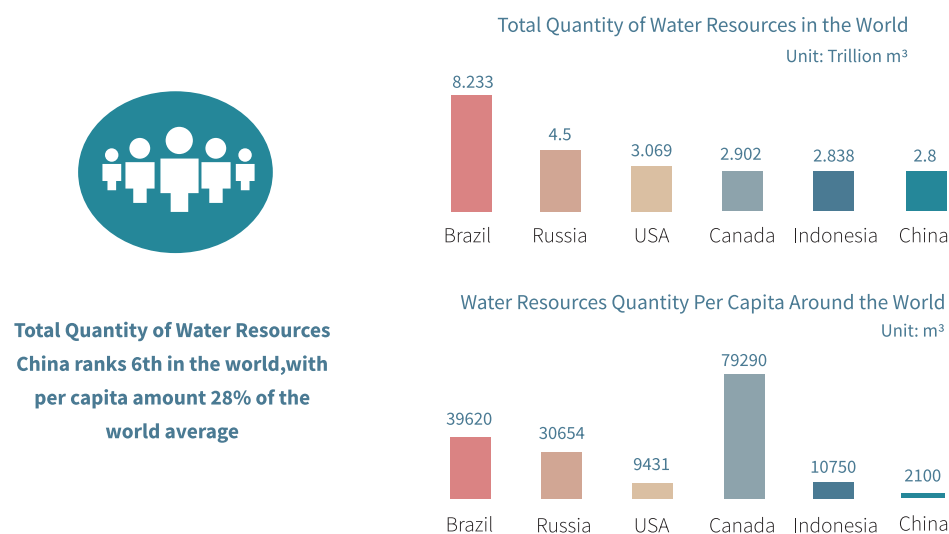
The background of the entire page is an abstract, artistic representation of water. It features dynamic, swirling patterns in various shades of blue, from light turquoise to deep navy. The water appears to be splashing or moving rapidly, with visible brushstrokes and splatters. The overall effect is energetic and fluid, suggesting the theme of water resources.

# Chapter 2

## *Water Resources Management and Protection*

# 1 An Overview of Water Resources

Total quantity of water resources in China stands at 2.8 trillion m<sup>3</sup>, ranking 6th in the world, whereas water resources per capita in China is around 2,000 m<sup>3</sup>, accounting for 35% of the world average.

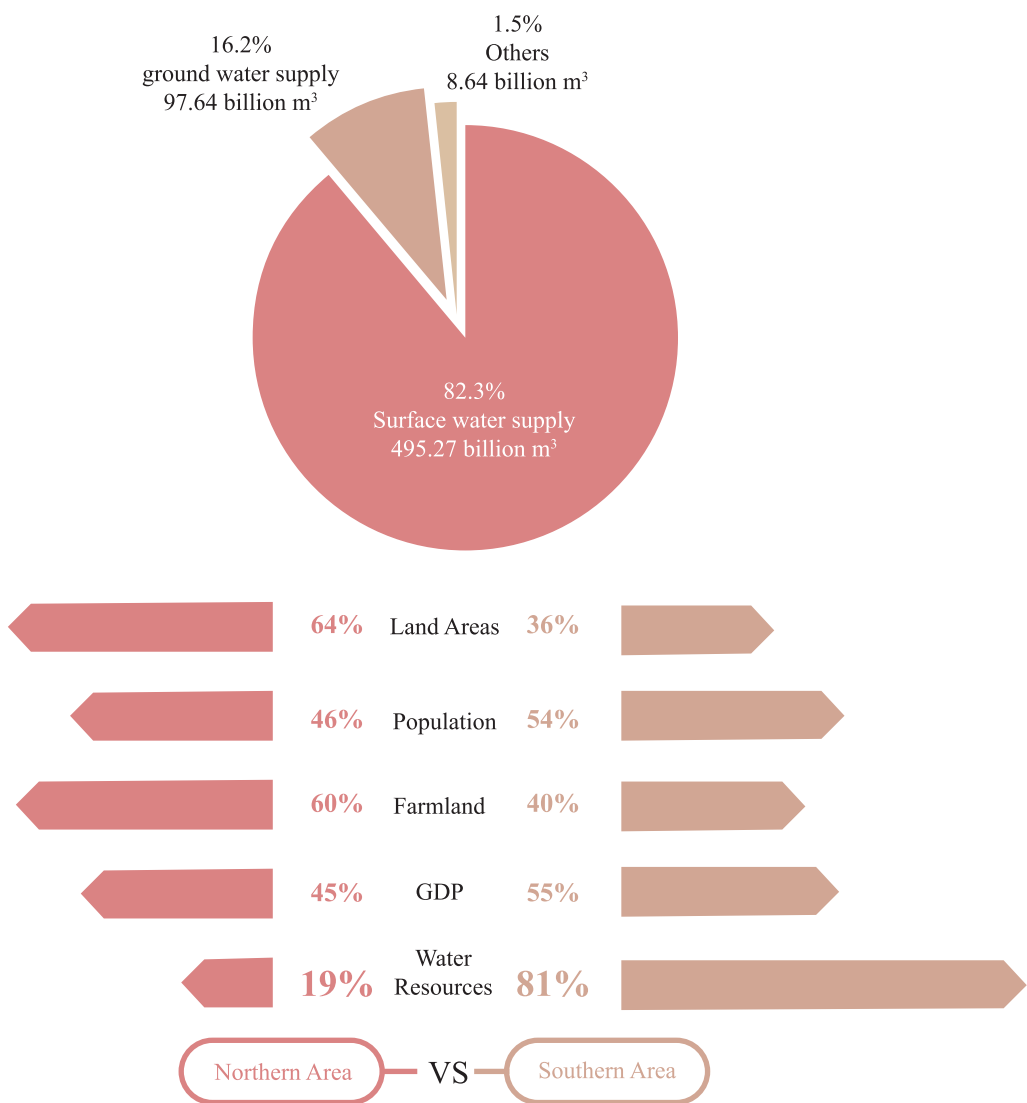


Water resources are unevenly distributed in space, and don't match the layout of land resources and production forces. North China takes up 64% and 46% of the total national land area and population but only 19% of national water resources.

Water resources are unevenly distributed in time. Precipitation and river runoff in China are relatively highly concentrated within a year. Precipitation from June to September in Northern China accounts for 70%-80% of the annual total and that in Southern China ranges from 50% to 65%.

## 2 Major Achievements

The Chinese government takes resource conservation and environmental protection as a fundamental policy, establishes the water control idea of “prioritizing water saving, spatial balance, systematic governance, and giving full play to the role of government and market” , and implements



Unmatched Layout between Water Resources and Economic Development

the most stringent water-resource management system. Focusing on the total quantity and strengthening the control of water consumed, the government promotes strong supervision of water resources to accelerate the construction of an ecological civilization and water-saving society. Since 2012, China's total annual water consumption has remained at about 610 billion m<sup>3</sup>, with GDP increasing from 54 trillion yuan to 121 trillion yuan. The rapid economic development of society has been supported by the micro-growth of total water consumption.

## 2.1 Development and Utilization of Water Resources

Since 1949, water development and utilization in China has gone through

3 phases: single-purpose development, multi-purpose development and sustainable development. In 2021, China recorded 592.02 billion m<sup>3</sup> of both water supply and consumption, 419 m<sup>3</sup> comprehensive water consumption per capita, 51.8 m<sup>3</sup> water consumption per RMB 10,000 GDP (at current year price), 28.2 m<sup>3</sup> water consumption per RMB 10,000 industrial added value (at current year price), 176 L/d domestic water consumption per capita (including municipal water use), and 124 L/d domestic urban-rural water consumption per capita.

## 2.2 Allocation of Water Resources

China has approved water allocation plans of 77 inter-provincial river basins at the end of 2022, defining the rights and interests in inter-regional areas. The unified water allocation of the Yellow River, Hei River, Tarim River, Han River and other river basins has been implemented. The main stream of the Yellow River has flowed continuously for 23 consecutive years. The East Juyanhai River in the lower reaches of Hei River hasn't dried up for 18 consecutive years. The unified water allocation of the first phase of the East Middle Route of the South-to-North Water Transfer Project has been strengthened. The total amount of water transferred by the South-to-North Water Transfer Project has exceeded 59 billion m<sup>3</sup>, benefiting more than 2,880 counties and districts in 42 large and medium-sized cities along the line. The direct beneficiary population has exceeded 150 million. Water resource augmentation in new urban areas, industrial parks and major industry layouts has been executed. Meanwhile, the country has implemented water-based city planning and water-based production planning with strict water permit management. Water-intaking permit granting has been basically completed in large and small-sized irrigated areas around the whole country.

## 2.3 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 water qualification rate in the water function zones throughout the country has been increased to 88.4% in 2021 from 63.5% in 2012. The directory of 618 important drinking water sources around

the country has been approved and promulgated. The directory of important drinking water sources in the Yangtze River Basin has been issued. Furthermore, the government has organized and conducted safety guarantee standard construction and inspection evaluation, bringing a significant enhancement of the safety guarantee level in water sources. The construction of 105 water ecological civilized cities around the country as a pilot project has been further promoted. Furthermore, the government has supported local implementation of a river-lake-reservoir water system connection project to effectively improve health conditions of rivers and lakes. Beyond that, the government has intensified ecological flow management of rivers and lakes, improved ecological flow management policy and technical system of rivers and lakes, and confirmed ecological flow (water yield) guarantee goals of 171 key trans-provincial rivers and lakes and 415 key intra-provincial rivers and lakes. Also, the government has formulated the ecological flow guarantee implementation plan, reinforced supervision warning and supervision evaluation, and facilitated the implementation of guarantee measures.

## 2.4 Comprehensive Treatment of Over-exploitation of Groundwater

The *National Groundwater Utilization and Protection Plan* has been issued to determine national groundwater protection and management goals, tasks and measures. The water level change notification mechanism of groundwater over-exploitation zones was established. By taking prefecture-level administrative districts with over-exploitation issues as units, groundwater level change on year-on-year basis has been notified quarter by quarter. Local governmental responsibilities have been consolidated to facilitate regional groundwater over-exploitation governance. Meanwhile, underground hydraulic production in water-receiving areas in the first-stage project in the East Middle Route of the South-to-North Water Transfer Project is being continuously implemented. At the end of 2021, water-receiving areas have accumulated 6.802 billion m<sup>3</sup> of groundwater. The mean water level of superficial and deep groundwater in water-receiving areas was dramatically rising. The *Action Plan for Comprehensive Control of Over-exploitation of Groundwater in North China* has been issued and implemented. Meanwhile, measures of “saving, control, replacement, supplement and





*Restored Wetlands in the Yellow River Estuary*

management” have been taken to reinforce comprehensive treatment for groundwater over-exploitation in North China. The treatment areas have accumulated 3.298 billion m<sup>3</sup> of annual hydraulic production. The groundwater level returned to rise as a whole. Since ecological water supplement pilot projects of rivers and lakes in North China were put into effect in 2018, rivers and lakes for supplement have been expanded to 48 (pieces) in 2022. Supplement has accumulated to over 24 billion m<sup>3</sup>. The dried-up riverways such as the Yongding River, the Hutuo River, and the Chaobai River have been completely linked up so that the Baiyang Lake could be revived. The Beijing-Hangzhou Grand Canal has been open for the first time in a century.

### *2.5 Reform of Water Resources in Key Areas*

The government has organized and completed seven water-rights pilot projects in Ningxia, Inner Mongolia, Guangdong, Henan, Gansu, Jiangxi and Hubei, made substantial exploration of the right to use water resources, transaction circulation and system construction. A variety of water-rights transaction models has been formed, which include water-rights among inter-basin, inter-region, upper and lower reaches of river basins, inter-industry and inter-user. The country has successively





launched pilot projects for tax reform of water resources in 10 provinces and areas including Hebei, Beijing, Tianjin and Shanxi, formulated and issued the *Opinions on Reform of the Paid Use System of Water Resources*, and made deployment and requirements on water-resource fee collection and management, pilot projects of tax reform in water resources, and water-rights confirmation and transactions. The National Development and Reform Commission and the Ministry of Finance have cooperated to formulate *Guidelines on the Reform of Water Rights* to do overall arrangements and deployments for work on water rights reform.

## 2.6 Basic Capability of Water Resources Management

*Opinions of the Ministry of Water Resources on Strengthening Supervision and Metering of Water Intake at Water Intakes* has been formulated and promulgated. *Technical Guidelines for Water Intake Metering* has been revised and improved to consolidate primary responsibilities of water users in water intake metering. The government has accelerated construction of non-agricultural water intake above designated-size and metering facilities for on-line measurement of water intake hubs in key irrigated areas above the medium size. Online metering water intake hubs have been realized in 50,000 mu key medium-sized irrigated areas.

The national water resource management system construction has been promoted, covering three-level deployments of the central, provinces, and cities and five-level application in city, county, town, village and neighbourhood. Online supervision has been implemented to 19,000 important water users around the country and focused on oversight of key water users' *over-permitted* water intake. Besides, the ecological flow control section of key trans-provincial rivers and lakes and the section water yield supervision warning platform of important provincial boundaries have been established to effectively support supervision on the allocation plan for ecological flow of rivers and lakes and water volume of river basins. The reasonable national-level groundwater supervision network was basically established and arranged, covering 31 provinces, autonomous regions, and municipalities around the country, and main plain terrains in Xinjiang Production and Construction Corps.

### 3 Future Development Strategies and Main Measures

With economic and social development, the problem of Chinese water-resource safety is more prominent. President Xi Jinping, standing at the height of the country's overall development with the aim of improving national water safety and promoting the development of an ecological civilization, puts forward the idea of “prioritizing water saving, spatial balance, systematic governance, and giving full play to the role of government and market” . In September 2019, President Xi Jinping proposed at the symposium on ecological protection and high-quality development in the Yellow River Basin that water resources should be considered as the most rigid constraint. With this in mind, we reasonably plan the development of population, cities and industry, and resolutely curb the unreasonable demand for water. China will continue adhering to the basic national policy of saving resources and protecting the environment. Meanwhile, China will completely, accurately and comprehensively run through the new development philosophy,



maintain development and security in line with high-quality development requirements, insist on water intaking and metering, and establish the rigid constraint system of water resources as the primary line. Under the premise of ensuring the basic ecological water consumption, the government should promote the layout, structure, and scale of economic and social development on the basis of available water consumption, improve the level of intensive and economical utilization of water resources, reinforce water resource protection, and solve the problem of overdevelopment and over-exploitation of water resources. Meanwhile, the government should limit economic activities within the scope of water resource to facilitate ecological civilization construction and high-quality development.

### *3.1 Work Goals*

During the period of “the 14th Five-year Plan” , the rigid constraint of water resources has been effectively implemented. Water use in economic and social scope has been controlled in the water resource carrying capacity as a whole. Water consumption of Gross Domestic Product (GDP) per 10,000 RMB dropped by more than 16% compared with that of 2020, showing that water consumption efficiency has been dramatically enhanced. Ecological water consumption of rivers and lakes has been greatly improved. The total groundwater over-exploitation has been contained. Besides, the overuse of water resources in the Yellow River, the Haihe River, inland rivers in northwest China, and other rivers could be relieved.

### *3.2 Main Measures*

#### **3.2.1 Reinforce Ecological Flow Management**

The government should improve the ecological flow management responsibility system level by level, reinforce ecological flow supervision responsibilities, and establish the ecological flow security work system of preliminary judgment, operational supervision, and responsibility tracing. Besides, it is necessary to implement the plan for ensuring the ecological flow of rivers and lakes, reinforce water intake supervision out of rivers, implement the regulation at the scale of whole water resources, reinforce the supervision on project operation in rivers and lakes, and feasibly ensure

the ecological flow of rivers and lakes. Besides, the government should accelerate the supervision facility construction for key control sections, establish the perfect ecological flow supervision warning mechanism, reinforce supervision evaluation, and include the implementation of ecological flow guarantee goals into the assessment in the strictest water resource management system. Meanwhile, the government should carry out ecological flow check in the established water resources and hydropower engineering and ensure first try, first pilot.

### **3.2.2 Promote the Water Distribution of Water Basins**

The government should accelerate the water distribution of trans-provincial rivers and further allocate the sharing of them with approved distribution into cities and counties. The government should intensify supervision of the implementation of the approved river distribution plans. According to plan for the water distribution in river basins, the government should formulate and implement the water dispatching plans in river basins and the annual water dispatching plans, unify the dispatching of the water in river basins and extremely important water projects, while the total quantity of regional water use and water release in river sections should be controlled, water permit supervision should be intensified, and various control goals and measures of water distribution should be implemented.

### **3.2.3 Strictly Implement Water Permit Supervision Management**

The government should implement the principle of “four kinds of

*Ecological Improvement by Integrated Water Resources Management in the Lower Reach of the Tarim River*



water for four kinds of determination” , promoting the plan for relevant industries, the layout of major industries and projects, the function of water resource argumentation in development zone and new districts and the rigid *restraint* role of water resource argumentation in planning decision-making. Besides, it is essential to reinforce a water resource rigid constraint argumentation and checking requirements in water resource allocation project, preventing excessive development and utilization of water resources. It is also necessary to reinforce water resource argumentation of construction projects and water permit management, reinforce water resource argumentation and water permit censor, and insist on restraining unreasonable water consumption demands. The policy of pausing the new water permit should be strictly executed in the Yellow River Basin where water resources are overused and the solution to the overuse of water resource should be accelerated. Meanwhile, it is necessary to comprehensively complete the special rectification action of water intake management in an all-round way, reinforcing the supervision on water users' intake behavior through special inspection, “internet+ supervision” , and “double random and one disclosure (randomly select inspection objects, randomly select law enforcement inspectors, *inspection situation is disclosed* to the public in a timely manner). Depending on the national integrated government affair service platform, the government should complete relevant water intake management system and information resource integration at all levels, basically construct the water intake management platform, realize data information collection and sharing, and facilitate “transaction in one website” and “supervision in one website” . Last but not least, it is essential to construct “One Map” of water resources management and







*A Pilot Project of Water-saving Society Development, Zhangye, Gansu Province*

control, and explore how to use remote sensor technology to support water intake supervision, comprehensively improving the supervision level.

### **3.2.4 Reinforce Groundwater Protection and Over-exploitation Governance**

The government should comprehensively implement total groundwater intake volume and water level control, confirm total groundwater intake volume and water level control indexes by taking counties as units, which are the management goals for groundwater development and utilization in each county. Also, the government will push forward a new round of delineation of over-exploitation areas, synchronously carry forward optimization and adjustment of restricted groundwater exploitation areas, and reinforce supervision in restricted exploitation areas. *The Implementation Plan for Comprehensive Treatment of Groundwater Over-exploitation in North China(2023-2025)* has been issued. The measures of “saving, control, replacement, supplement and management” should be arranged to consolidate and expand the governance effect. Besides, the government should continuously control groundwater exploitation of water-receiving areas in the South-North Water Transfer Project and promote comprehensive governance of groundwater over-exploitation

in 10 key areas, such as the Sanjiang Plain, the Songnen Plain, the Liaohe Plain, the West Liaohe River Basin, the Huanghuai Area, the Erdos Platform, the Fenwei Valley, the Hexi Corridor, North-South Hill of the Mount Tianshan, and the Beibu Gulf. Besides, the government should continue to put forward the construction of national groundwater supervision project (phase II), reinforce groundwater supervision on primary over-exploitation areas, and accurately master dynamic change of regional groundwater. At last, the government should further improve the standard groundwater regulation system, accelerate the groundwater management informationization process, and realize warning and prediction of groundwater over-exploitation governance and water level change.

### **3.2.5 Reinforce Drinking Water Resource Protection and Recovery of Rivers and Lakes**

The state should reinforce the primary responsibilities of local governments, improve drinking water source yield and water quality supervision, and facilitate sharing of water quality supervision data with relevant departments. Depending on the national construction project of water resource supervision capacity, the government should implement dynamic supervision on water sources, improve risk warning, prevention, and control of important drinking water sources, and improve the safety guarantee level of drinking water. Besides, the government should guide local governments to reinforce standby water source construction and improve capacity of water supply guarantee. The government ought to establish the mechanism of the joint prevention and control of sudden water pollution incidents in upstream and downstream in trans-provincial basins, guide the local governments to reinforce prediction warning, joint supervision, and information notification, scientifically dispatch water engineering, and implement pollution prevention and control. The government will carry out the recovery action for the mother river around the country, recover the ecological environment in more than 80 rivers and lakes, continuously carry out connection and supplement of the Beijing-Hangzhou Grand Canal, and concentrated supplement of rivers and lakes and normalized supplement in summer in North China.





*The Namco Lake, Tibet Autonomous Region*

### **3.2.6 Strengthen the Basic Work of Supervision, Measuring and Gathering Statistics of Water Resources**

The government should establish the perfect supervision system of water intake metering, reinforce water users' primary responsibilities of water intake metering, improve facilities, installation and management for water intake metering, and enhance supervision on water intake metering. Besides, the government ought to facilitate the issue of *Technical Guidelines for Water Intake Metering (Revised)*, perfect technical regulations and standard system of water intake metering, establish the basic unit directory for the sound national survey of water consumption statistics, and gradually expand the scope of sampling survey. At the same time, the government should improve the information system of direct reporting of water consumption statistics, strengthen water consumption statistics and analysis, and provide a reference for economic and social development as well as scientific decision-making of water resources. Lastly, the government ought to implement strict prevention and punishment on falsification of water conservancy statistics and fraud responsibility system, and reinforce the checking of statistical survey data





of water consumption and the responsibility system.

**3.2.7 Constantly Deepen the Water Resources Reform in Key Fields**

The government should accelerate initial allocation and clarification of water rights, standardize water right transactions of regional water rights, water intake rights, and water rights of irrigation users. Beyond that, the government ought to continuously implement water resource tax reform, develop the rigid role of taxation, force the standard water intake behavior, and facilitate water resources' saving and protection. It is necessary to promote reforms of streamline administration, delegate power and upgrade services in water intake permit, reinforce regional evaluation of water resource argumentation, and speed up the establishment of the credit system of the water resource management field. At last, the government should further develop the role of administrative law enforcement in the water resource management and feasibly enhance the efficacy of administrative law enforcement.

