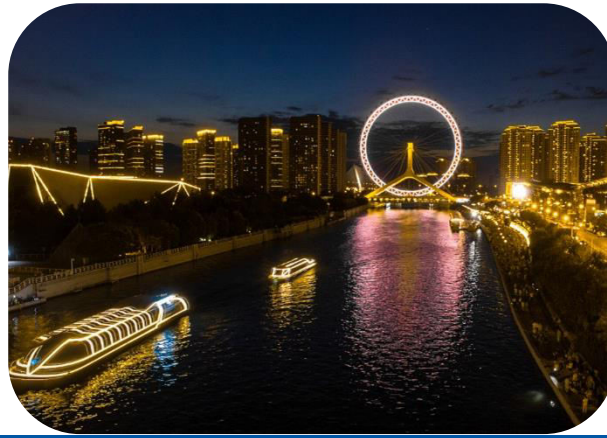


High-quality development of the follow-up project of the South-to-North Water Transfer Project



The water supply security study on important water-receiving cities of South-North Water Transfer Project

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Background

- ◆ Water supply security is a basic and strategic support for urban development.
- ◆ **The contradiction between water supply and demand in North China, especially in the Beijing-Tianjin-Hebei region, is particularly prominent**, such as the **ecological degradation of rivers and lakes**, and the serious **over-exploitation of groundwater**. Water resources have become one of the key constraints on the high-quality development of economy and society.
- ◆ After the first-phase of the eastern and middle routes of the South–North Water Transfer Project, the water supply security for the receiving cities has been greatly improved, but due to the inter-annual unevenness, the water supply can't meet the water demand when facing to the dry year.
- ◆ Facing the new stage, the urban development also puts forward higher requirements for water resources guarantee.



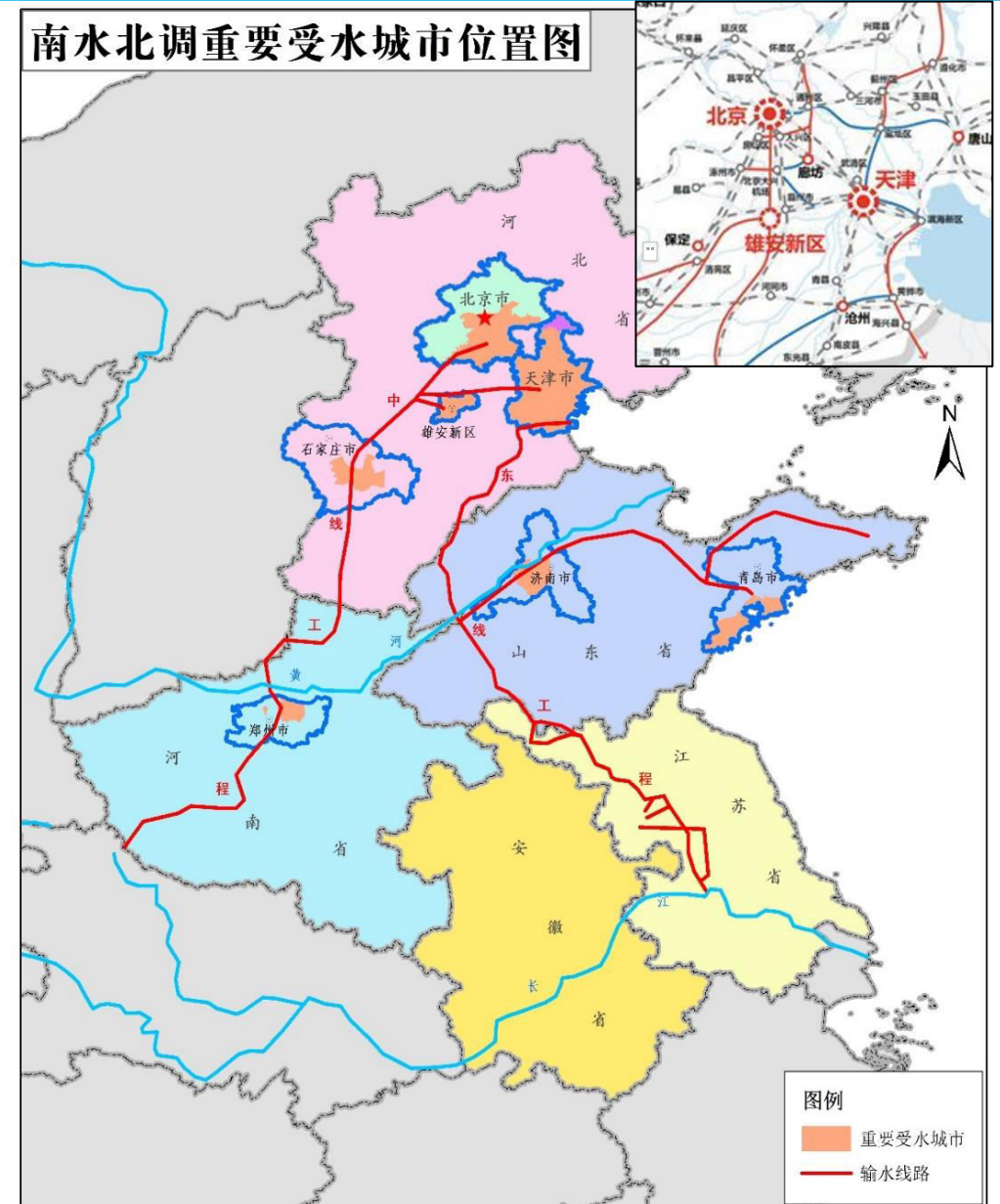


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1. Analysis range

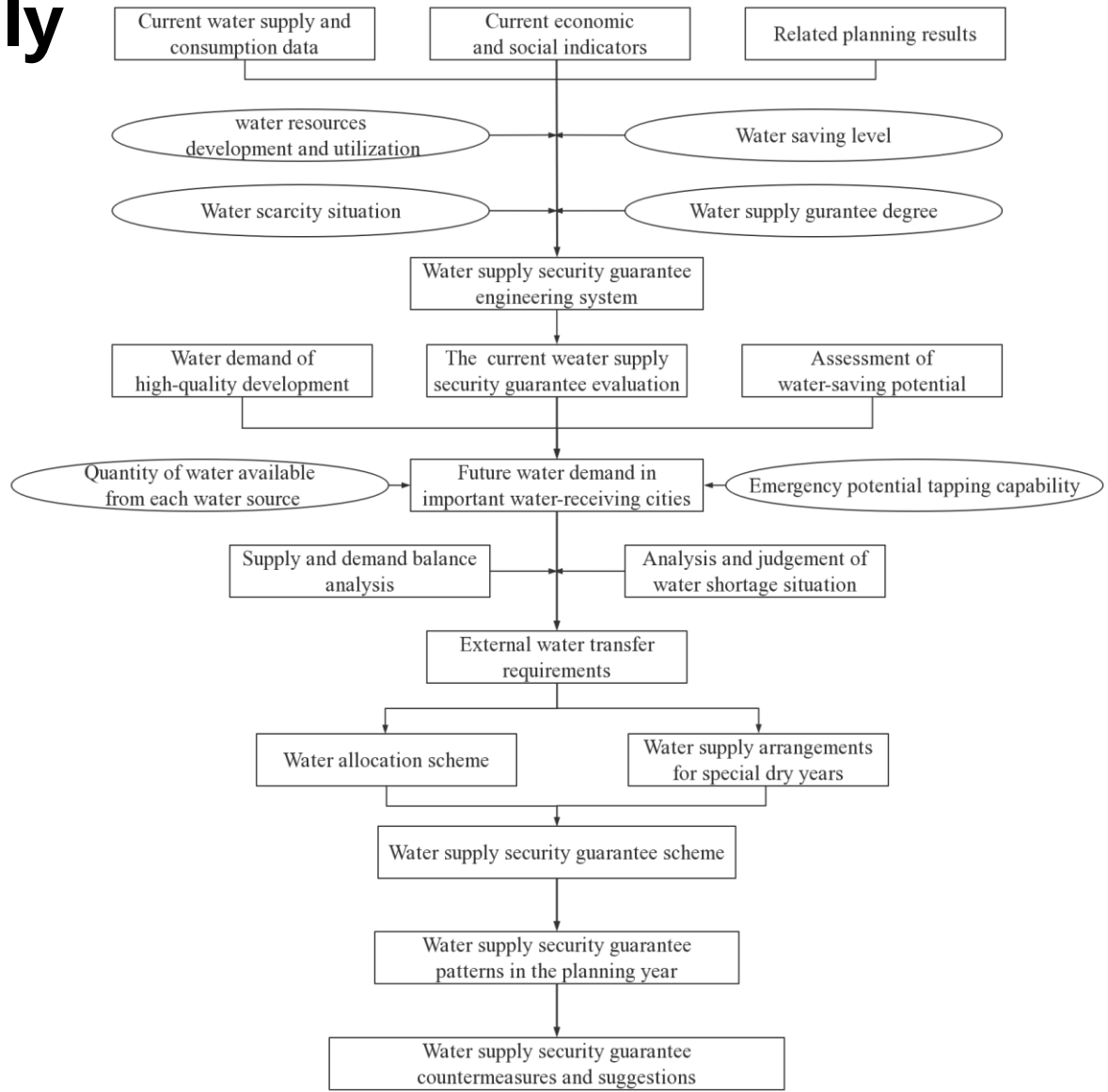
- **Research background:** The water-receiving cities of the first phase of the South–North Water Transfer Project involve 2 municipalities, 5 provinces including 40 prefecture-level cities and 202 counties. In the future the range will continue to be expanded.
- **Analysis range:** Combined with the geographical location, city type and distribution character, choose **Beijing, Tianjin, Xiongan New Area** in the Haihe River Basin as the **three typical analysis cities**, and introduce the level evaluation method and scheme on the water supply security guarantee.
- **Level year :** current year 2019
planning year 2035



2. Evaluation index system of water supply security guarantee

□ The connotation of water supply safety guarantee

The guarantee level of water supply security is the degree to which the rational water demand of the national economy and social development is met, as well as the ability to avoid damage and resist risks.

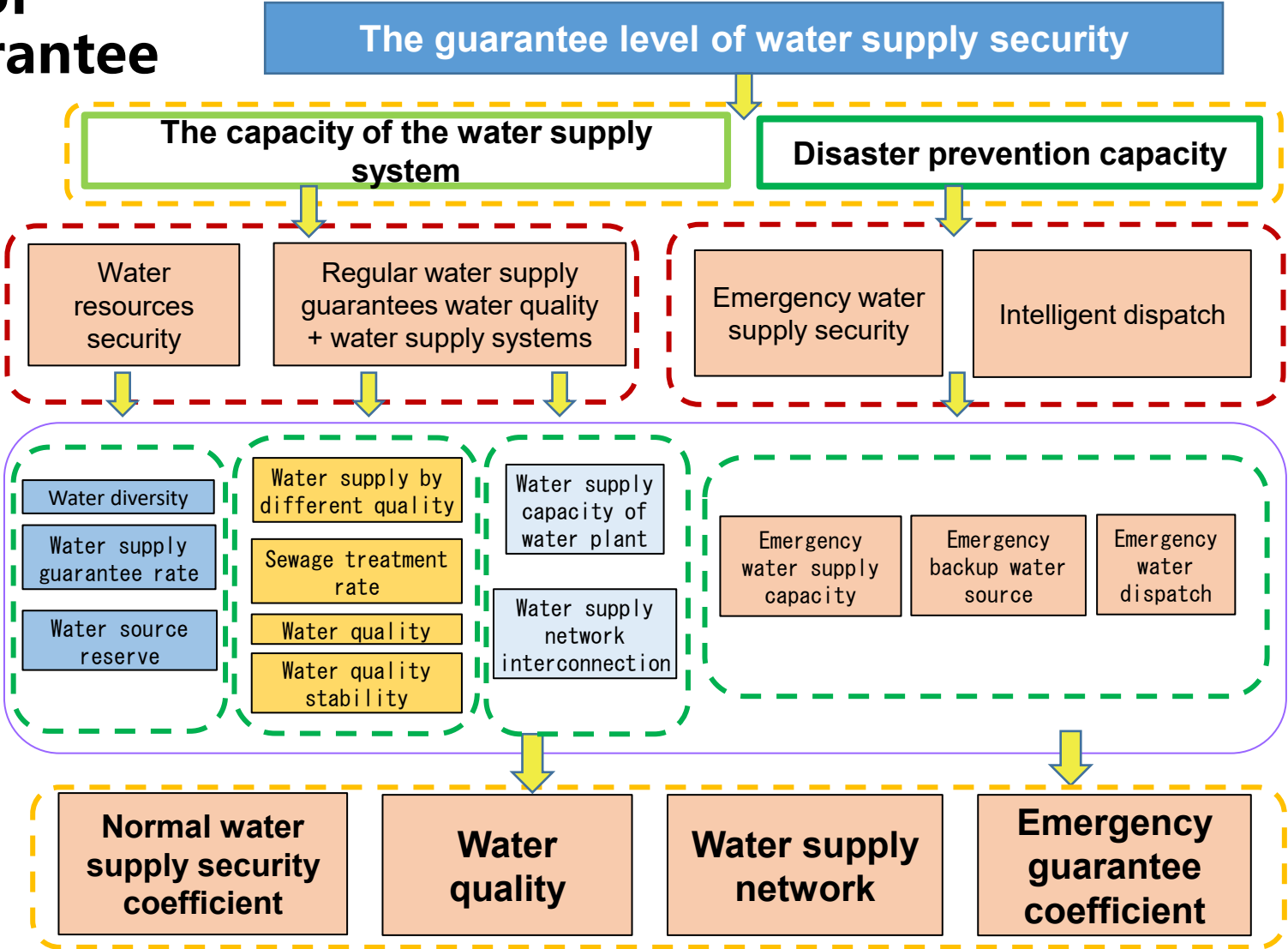


Technical routes of water supply security guarantee scheme

2. Evaluation index system of water supply security guarantee

□ Evaluation index system of water supply security guarantee

From the perspective of water resources security guarantee, combining with the connotation of urban water supply security, the water resource guarantee capacity, the normal water supply capacity and emergency water supply capacity are selected as the evaluation indexes.



2. Evaluation index system of water supply security guarantee

□ Evaluation index of water supply security guarantee

Considering the diversity and accessibility of each evaluation index and the reliability of data sources, the water supply security rate, water shortage rate, normal water supply security coefficient, water plant production capacity coefficient, water quality, water supply network leakage rate, and emergency water supply security coefficient will be selected as the comprehensive evaluation indexes for water supply security.

◆ Probability of water supply

$$\text{sign}(R(i) - P(i)) = \begin{cases} 0, & R(i) - P(i) \leq 0 \\ 1, & R(i) - P(i) > 0 \end{cases}$$

Where: $R(i)$ — is the annual water demand of different users; $P(i)$ — is the annual water supply of different users;

◆ Normal water supply security coefficient: S

$$N = \frac{S}{\overline{R}}$$

S — is the daily water supply capacity of the water transmission and distribution system, taking into account reservoir storage capacity and external water transfers; R —is the annual water demand of each user;

◆ The production capacity coefficient of Water plants :

$$P = \frac{F}{\overline{R}}$$

$F(i)$ —is the maximum production capacity of the water plant; R —is the annual water demand of each user;

◆ Emergency water supply security coefficient:

$$E = \frac{Y}{\overline{R}}$$

Y — is the water supply capacity under emergency conditions when one main source of water supply is out of service;

R —is the annual water demand of each user.

3. Water supply security guarantee scheme

(1) Water demand analysis

➤ The urban functional orientation, economic and social development dynamics

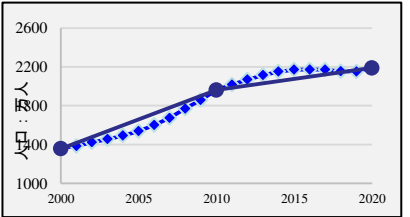
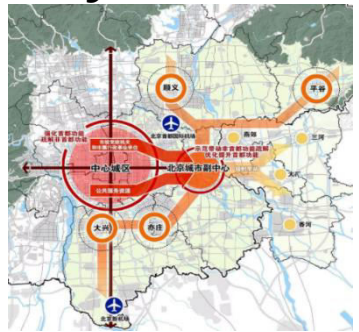
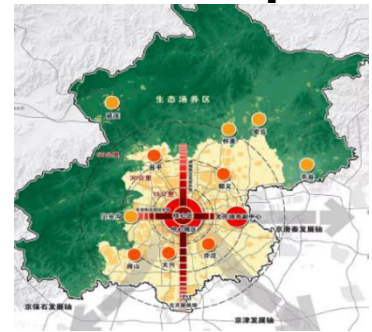


Beijing:

National political center, cultural center, international communicated center, science and technology innovation center.

Population and Cultivated Land: The future population will be controlled at 23 million, and farmland will be controlled at 1.5 million mu.

Overall judgment: Future high-quality development will focus on "habitat" and "ecology".

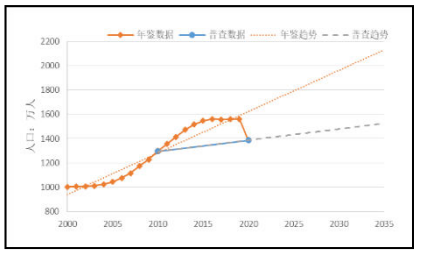
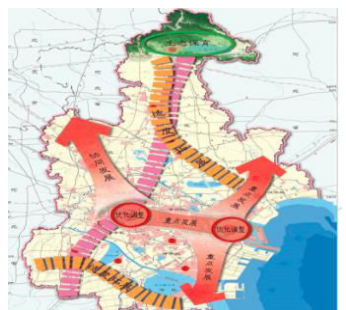


Tianjin:

National advanced manufacturing R&D base, northern international shipping core area, financial innovation and operation demonstration area, reform and opening-up pioneer area.

Population and Cultivated Land: The future population will be controlled at 17 million, and the farmland will be controlled at 3.8 million mu of effectively irrigated area.

Overall judgment: Part of Beijing's non-capital functions will be relocated, and **the future high-quality development will focus on "advanced manufacturing" and "pioneer and pilot implementation"**.

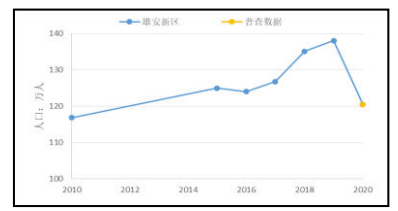
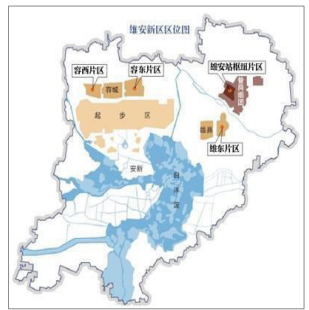
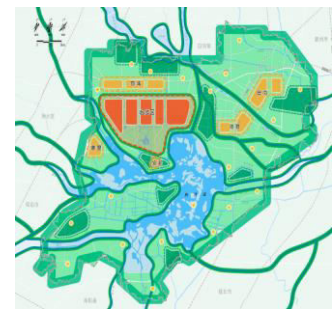


Xiongan New Area:

The concentrated bearing place of Beijing's non-capital function, Beijing-Tianjin-Hebei urban agglomeration important pole, socialist modernization city with high quality and level.

Population and Cultivated Land: The future population will be considered at 3 million and the farmland at 480 thousand mu.

Overall judgment: Focusing on relieving Beijing's non-capital functions, optimizing and exploring new modes for densely populated and economically areas, and fostering a new engine of innovation-driven development, **the future high-quality development will focus on "wisdom" and "green"**.



3. Water supply security guarantee scheme

(1) Water Demand analysis

➤ **The urban functional orientation, economic and social development dynamics**

- From 2001 to 2014, China’s economy was in a phase of rapid development, (the growth is more than 8%) . After 2014, the GDP growth rate slowed down and kept at about 5%, **the rate of economic development from high-speed growth to medium-to-high-speed growth.**
- As the strategy of a strong manufacturing country is implemented, industrial transformation and upgrading in water cities, intelligent manufacturing and other future industries will flourish, **it is predicted that the future industrial development of the 3 cities will gradually pick up and maintain a medium-high growth rate.**

Results of the economic and social indicators forecast of important water receiving cities from the South-to-North Water transfer project in 2035

City	current to 2035 GDP growth rate	Current to 2035 Growth rate of industrial added value
Beijing	5%	4%
Tianjin	5%	6%
Xiongan New Area	/	/

Water use levels in 2035

City	Water consumption per ten thousand yuan of GDP (m ³)	Water consumption per ten thousand yuan of industrial added value (m ³)	Industrial water reuse rate (%)	Leakage rate of public water network (%)	Effective irrigation utilization coefficient
Beijing	6	4	97	9	0.79
Tianjin	14	7	95	9	0.78
Xiongan New Area	11	4	95	6	0.79

3. Water supply security guarantee scheme

(1) Water demand analysis

➤ The water demand of high quality development

- Comprehensively considering development strategies, groundwater over-exploitation management in the North China and ecological civilization construction, and combining with the current situation and future development, **it puts forward the water resources demand for the high-quality development under the deep water conservation.**



Domestic, agricultural: Quota method.

Domestic water demand: The actual water quotas of cities at the same level of development at home and abroad are benchmarked, while the future economic, social development and living standards are taken into account in forecasting living quotas, and **the population and living quotas are integrated to determine water demand.**

Agricultural water demand: Based on the irrigation quota under the deep water conservation, analyzing and forecasting the agricultural water demand according to the general principle that **the agricultural water consumption maintains the average water consumption of many years.**



Industrial water demand:

Combined with the change trend in recent years, considering the industrial reservation, based on the **quota method, using the trend method and the elastic coefficient method to decide the industrial water demand.**



Ecological water demand:

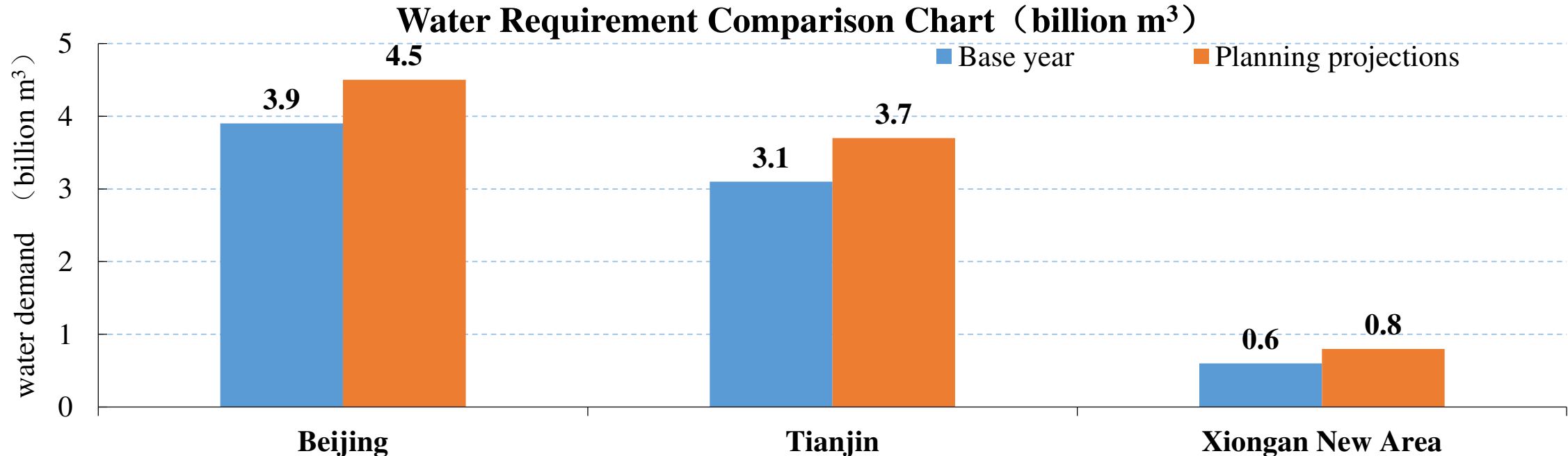
Ecological water is measured separately for sanitation, green areas and rivers and lakes. Water for sanitation is measured according to per capita road area and water quota; green space water demand is measured according to per capita green space and irrigation quota, and water for artificial rivers and lakes is calculated according to the recovery water demand of different standard.

3. Water supply security guarantee scheme

(1) Water demand analysis

➤ The water demand of high quality development

- The total water demand of the three cities is about 9 billion m³, in which about 5.0 billion m³ is domestic and industrial water demand, which account for more than 80%. The total water demand increased by about 1.5 billion m³ from the base year.



3. Water supply security guarantee scheme

(2) Water Scarcity judgments

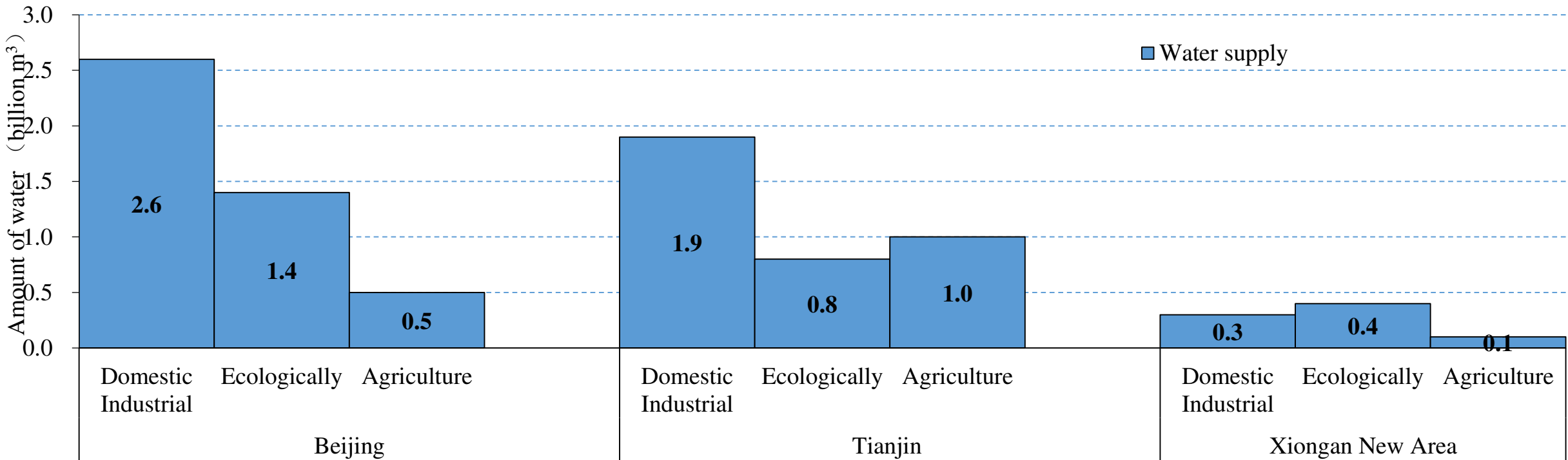
Establish an optimal allocation model of water resources (based on ROWAS model), taking into account the planned annual water demand and the planned water supply capacity of the existing project, and under the conditions of maintaining the water supply scale of the first phase of the South-to-North Water transfer project and maintaining a good ecological condition, and in accordance with different principles of allocation, adopt a long series to calculate the amount of water shortages, and put forward the external water transfer demand.

After optimized allocation, the average multi-year water shortage of the three cities in 2035 will be about 2.1 billion m³, which is mainly about urban and ecological water shortage which need to be solved by external water transfer.

3. Water supply security guarantee scheme

(3) Water Supply Security guarantee scheme

- Analyze the water supply capacity of external water transfer, combined with local water to allocate different users. Then put forward the water supply security guarantee scheme.
- Under the implementation on the follow-up project of the South-to-North water transfer project, the total allocation will reach about 9.0 billion m³, an increase of 2.0 billion m³ of external water transfer, used for urban domestic and industry, the guarantee rate of which will reach more than 98%.



4. Water supply security guarantee countermeasures

- Implement the Rigid constraint's system of water resources.
- Deeply protect and control water resources.

With the principle of "three first, three second", focusing on the county water-saving society up to standard, control the total amount and intensity of water resources. Deeply implement the sponge city construction.

- Construct the national water supply network and accelerate the implementation on the follow-up project of the East-Middle route.

Promote the construction of the river diversion project to replenish the Hanjiang River. Start the phase II construction of the Eastern Route. Improve the East-Middle Route Regulation Reservoir.

- Accelerate the construction of urban water supply security guarantee network from multiple sources.

Accelerating the improvement of the urban water supply security guarantee pattern for important water-receiving cities such as Beijing Municipality, Tianjin Municipality and Xiongan New Area.

- Upgrade the joint scheduling level of water supply projects.

Promote the unified scheduling of water resources in important water-receiving cities, and optimize the joint use of multiple water sources project, such as the eastern-middle line, the Yellow River and Luanhe River, local water and recycled water.

- Strengthen the protection of water supply sources in important water receiving cities.

Promote the water sources protection in important water-receiving cities, and implement security standards construction and assessment of water sources in various cities.

5. Conclusions-Water supply level evaluation

(1)Comprehensively analyze the water supply level. Under the implementation of the river diversion project to replenish the Hanjiang River and the second phase of the Eastern Route, the guaranteed rate of urban domestic and industry consumption in Beijing, Tianjin and Xiongan New Area will reach more than 98%, and the rate of water shortage will be less than 1%.

(2) In terms of normal water supply capacity guarantee, Beijing has slightly improved, and Tianjin and Xiongan New Area have improved more. The normal water supply guarantee coefficients will increase from 1.7 and 1.5 in the current year to 2.3 and 2.6 in the panning year. The emergency water supply guarantee coefficients will rise to more than 1.5.

(3) In the future, under the implementation of the follow-up project of the South-North water transfer project, the water supply is safe and the guarantee rate of different users will meet the requirements.



That's all.

Thanks !