Watershed Management Practices for Aquatic Ecosystem in China

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- Water has been the fundamental factor of production and living resource, and its spatial distribution determines the overall planning of economic and social development.
- As the spatial unit of water resources, watershed naturally becomes the primary site of human civilization process and social development.
- Due to high population density and highly dense economic activities, watershed has become the centralized place of aquatic ecological problems and many areas are faced with serious ecological environmental issues.

Outlines

1. Aquatic ecosystem problems of river basins in China

2. Framework of aquatic ecosystem management

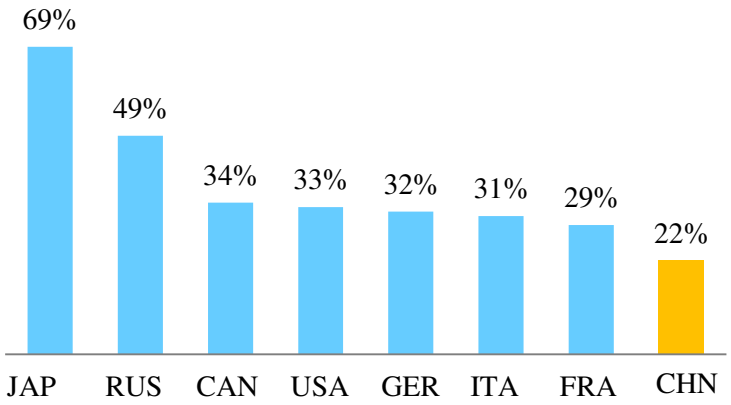
3. Practical of aquatic ecosystem management

1. Aquatic ecosystem problems of river basins in China

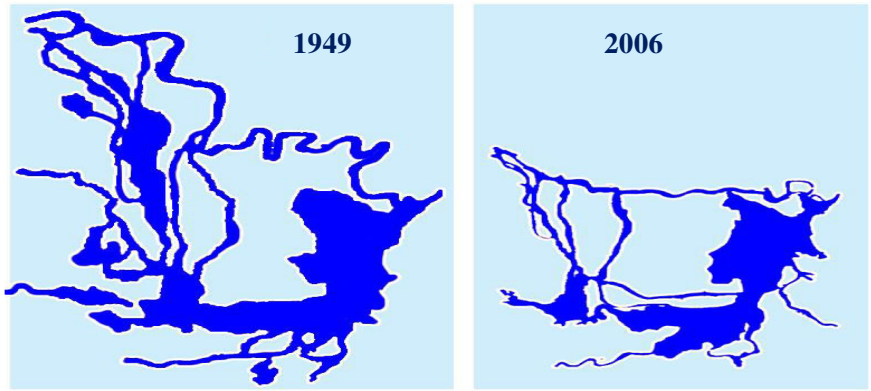
- Prominent watershed ecology space expropriation problems

Low forest coverage. In China, the forest coverage is no more than 22% in 2013, far lower than that of Japan, Canada and many other countries, and it is also behind the world average level 31%.

Rivers and lakes shrinking exacerbate. In the survey of 514 rivers in northern area(total length of 130 million meters), there were 49 rivers blanking in 2000, making up of 35% total river blanking length. From 1950s, more than 230 lakes, the area of each lake is large than 10 km^2, has shrunk. In particular, 89 lakes dried up and the total shrinking area is larger than 14000km^2.



Major countries' forest coverage



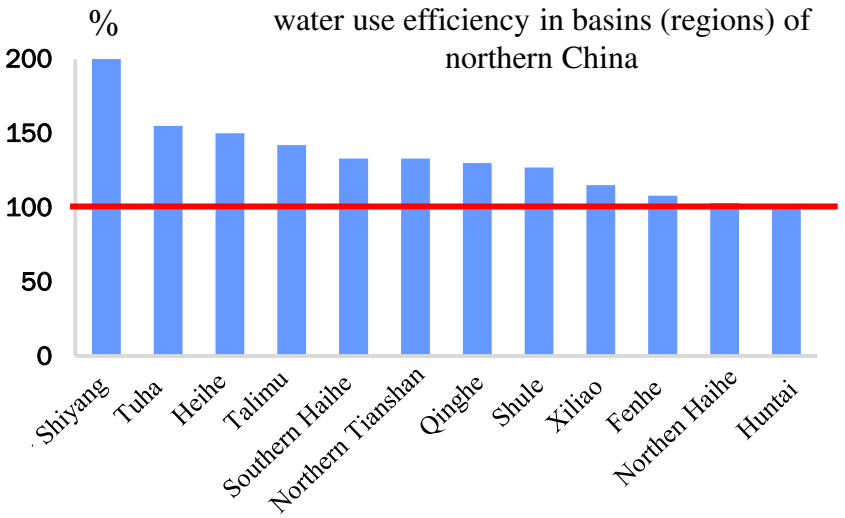
Area change of Dongting Lake

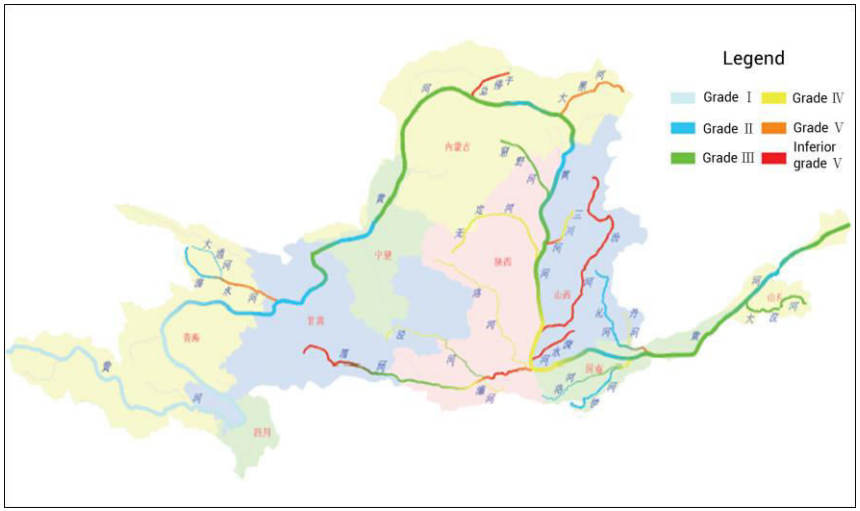
1. Aquatic ecosystem problems of river basins in China

- Bearing load increasing in watershed water resources

- **Over exploitation of water resources.**

  Utilization rates of Haihe River, Yellow river and Liaohe River basins are respectively 106%, 82% and 76%.





Water quality of Yellow River Basin in 2013

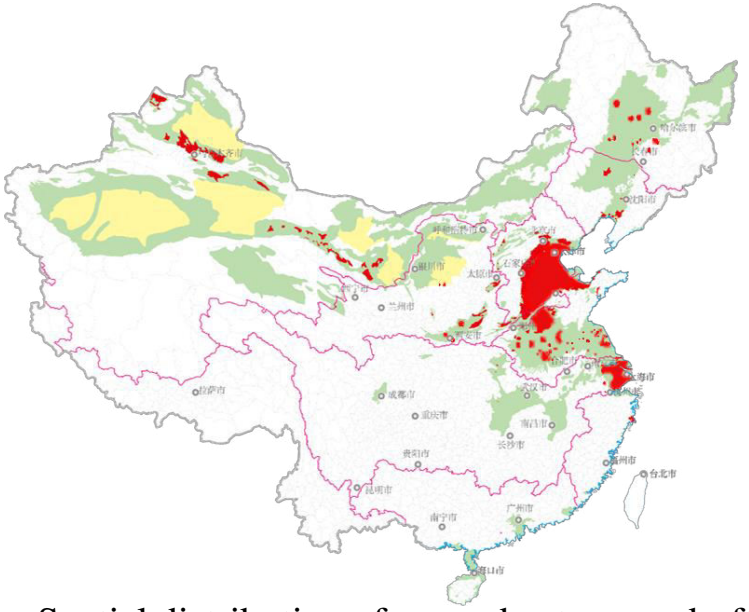
- **Serious pollution problems.**

  The amount of pollutant in 32% of rivers, 11% of lakes and 35% of Level One Water Function Zone exceeds water carrying capacity.

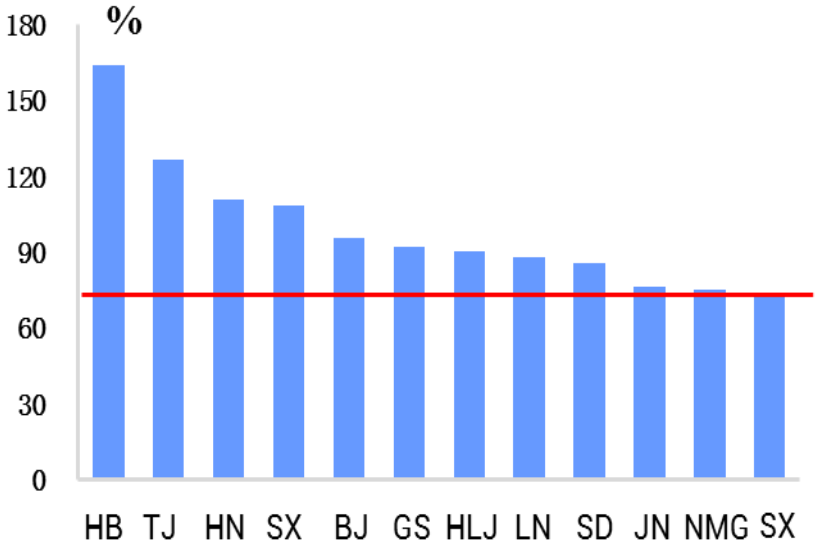
1. Aquatic ecosystem problems of river basins in China

- Bearing load increasing in watershed water resources

Prominent groundwater overdraft. More than 280 thousand km^2 exist groundwater overdraft and total volume is around 17billion m^3 in 21 provinces or cities in China.



Spatial distribution of groundwater overdraft in China (red)

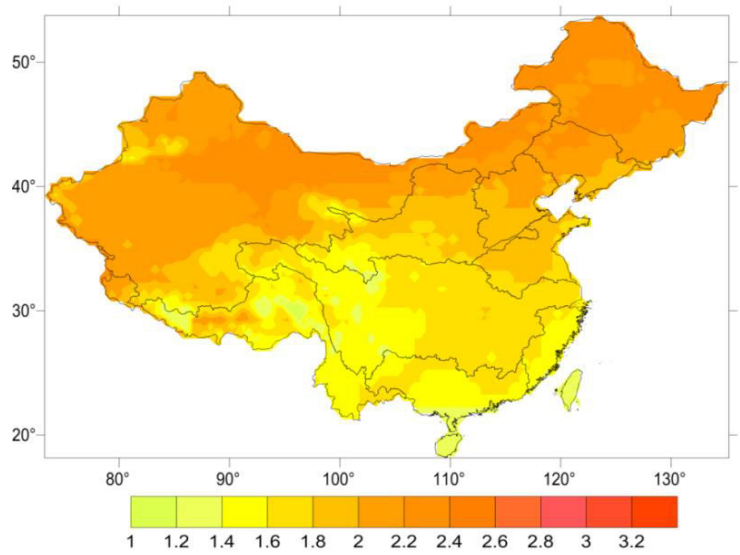


Development and utilization intensity of groundwater in plain areas

1. Aquatic ecosystem problems of river basins in China

- Dramatic change of eco-hydrological process in watershed
  - By now, there are more than 98 thousand reservoirs in China, and the total storage is over 970 billion m^3. While playing the significant role in social, economic and ecological fields, they have changed hydrological process to varying degrees.
  - Climate change intensifies the uncertainty of watershed hydrological process.

Baihetan hydropower station



Temporary change from 2010 to 2050 compared to the benchmark period(the darker, the higher)

Outlines

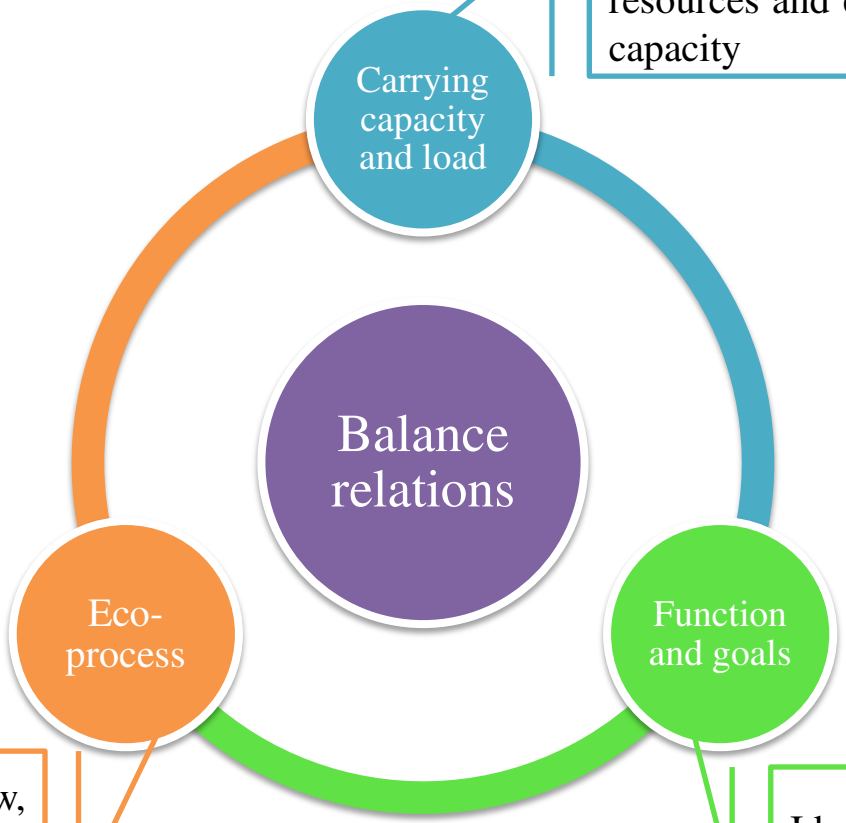
1. Aquatic ecosystem problems of river basins in China

2. Framework of aquatic ecosystem management

3. Practical of aquatic ecological management

2. Framework of aquatic ecosystem management

- Coordinating relations



Balance relations among water resources exploitation, land resources and environment carrying capacity

Energy flow, material flow, information flow, production, decomposition and etc.

Identifying watershed function and determining development goals

2. Framework of aquatic ecosystem management

- Some requires

Regulation of river basin cycle

- Obstacle of river basin cycle leads to various ecological problems

Control the development intensity and keep better environment quality

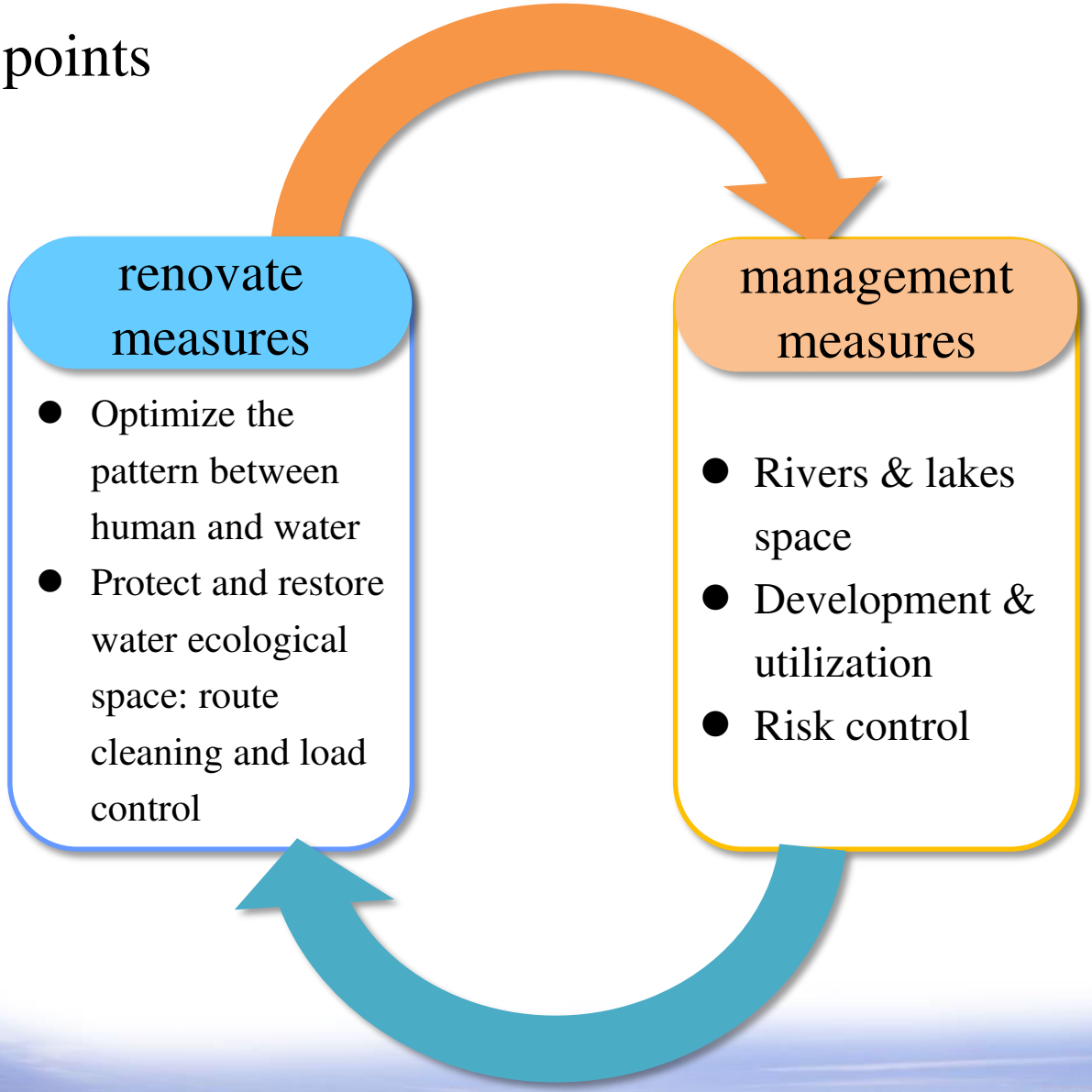
- Leaving space and external environment for the ecosystem

Restoration of river basin ecosystem service

- The validity check is to evaluate whether the ecosystem service is restored

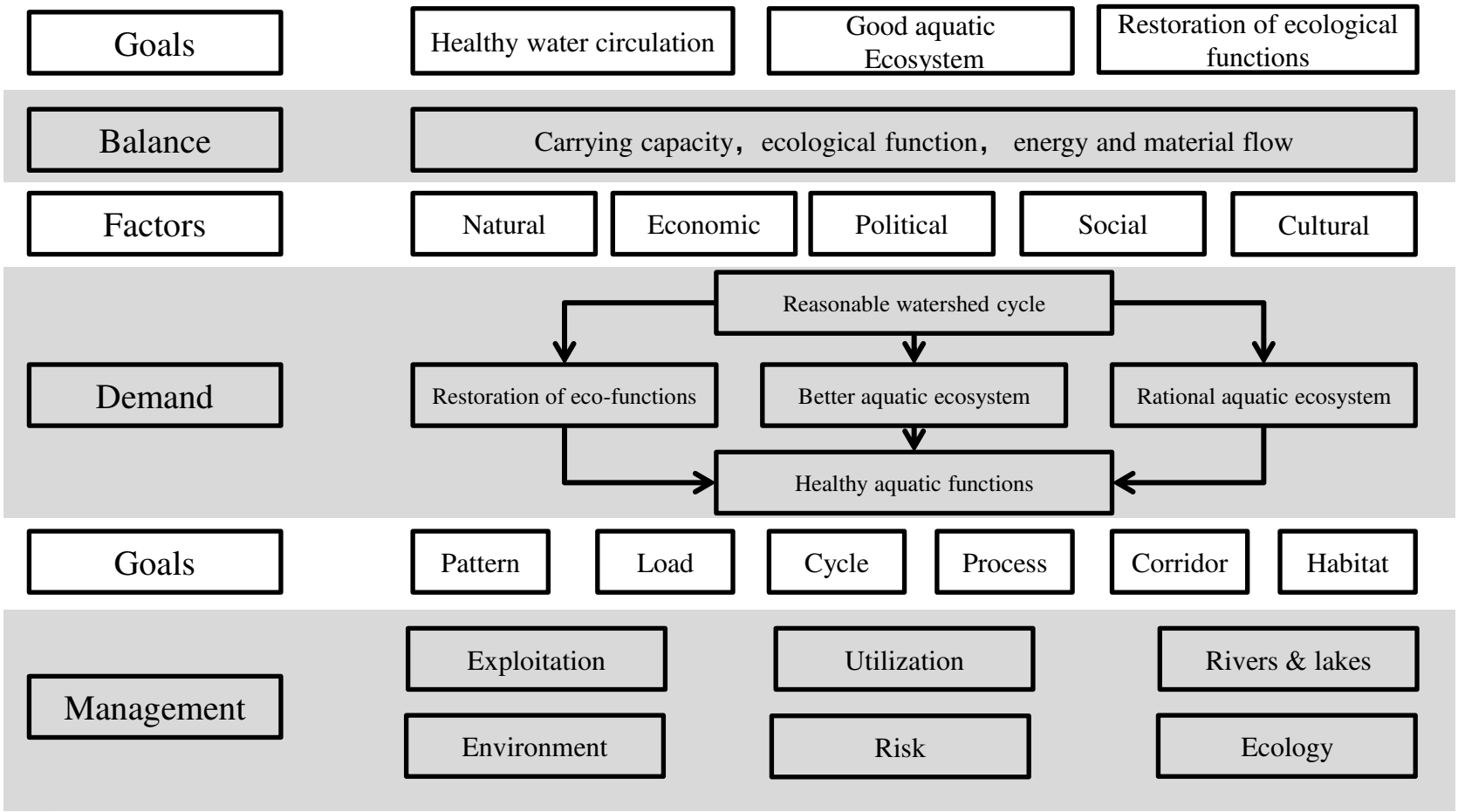
2. Framework of aquatic ecosystem management

- Key points



2. Framework of aquatic ecosystem management

Framework



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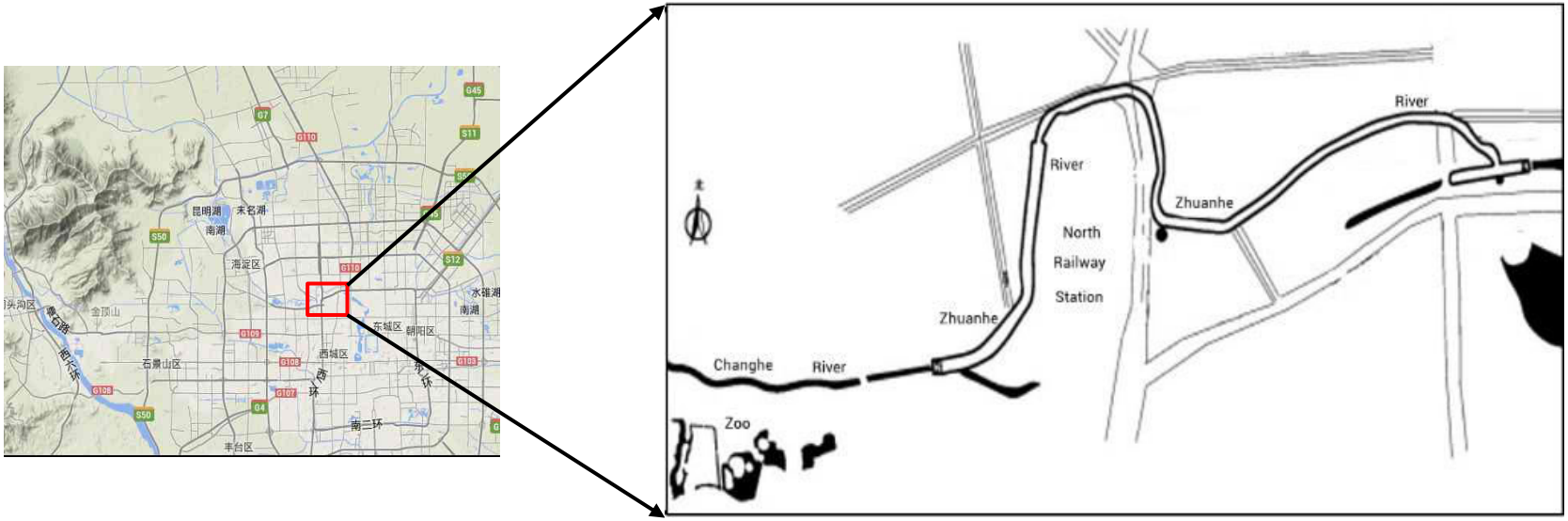
Space pattern restoration and remolding - Zhuanhe Basin

- **Profiles**. Zhuanhe River is located in the North Second Ring of Beijing. Its length is 3.7km and basin area is 13.6km^2.
- **Problems**. During 1975-1982，Zhuanhe River was cutoff and filled. It was connected with the western side of northern moat in the form of subdrain and lots of buildings were built above. It nearly lost all ecological functions.



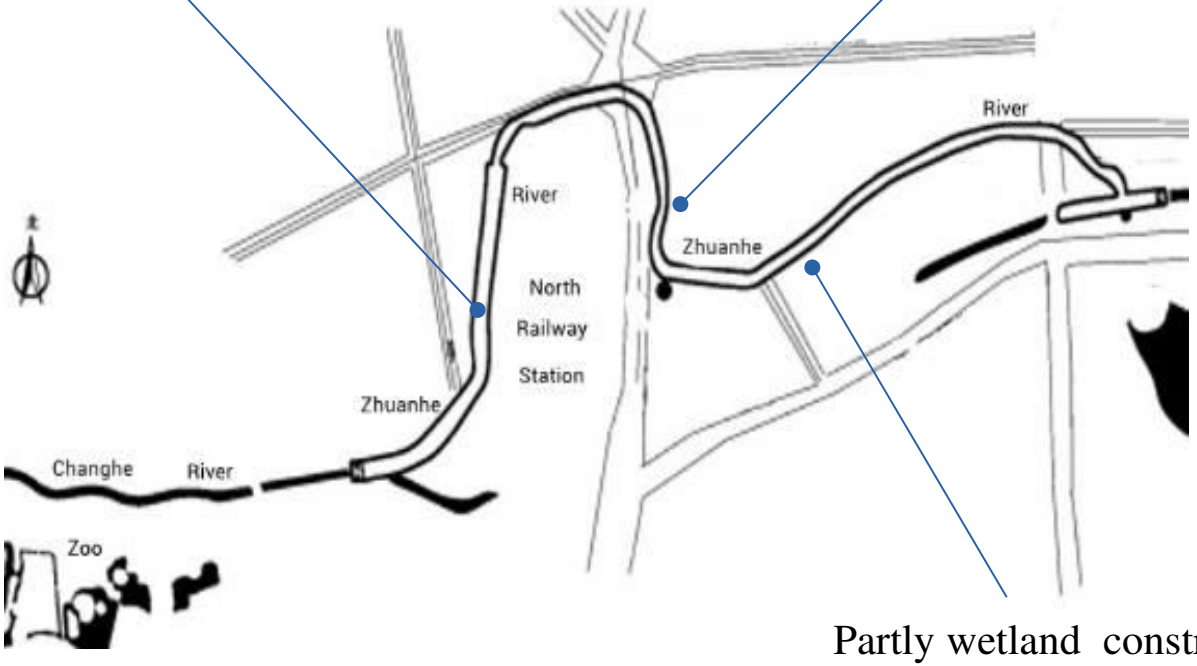
Location of Zhuanhe River

3. Practical of aquatic ecosystem management

- Space pattern restoration and remolding - Zhuanhe Basin

Channel excavation and keeping water system connected

Planting trees along the riverside and constructing ecological riverbed and channel

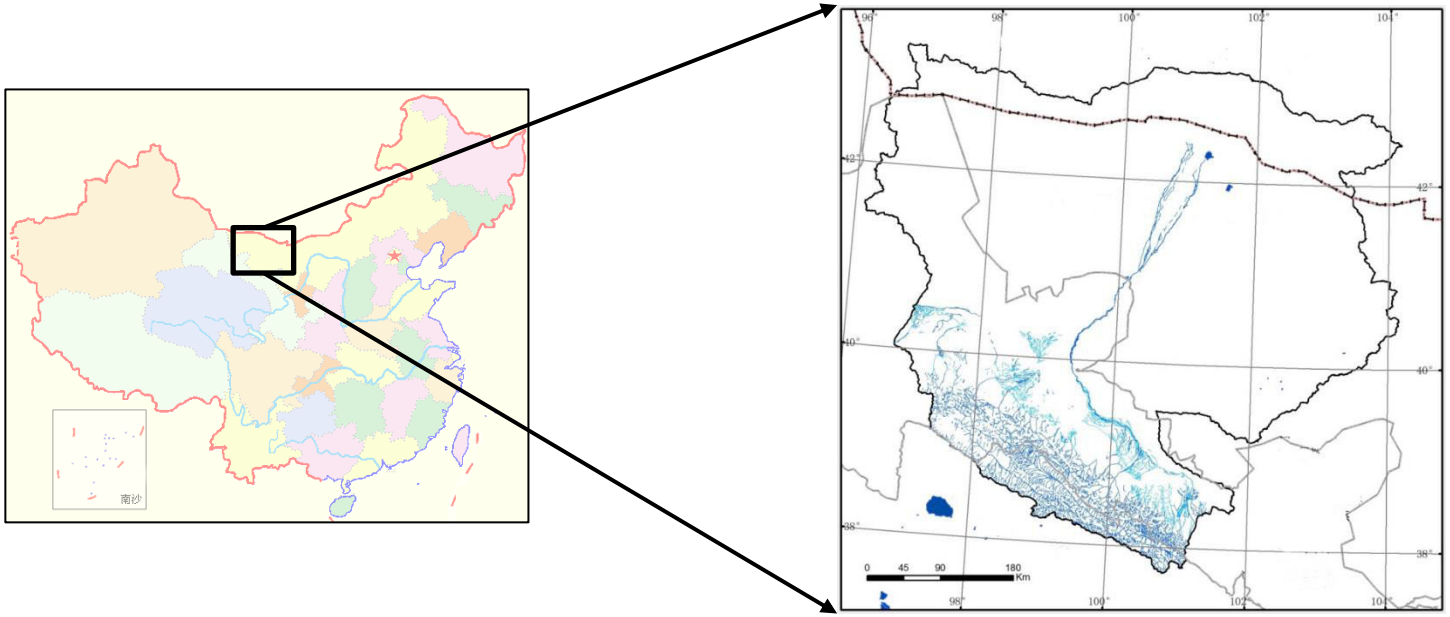


Partly wetland construction to enlarge water areas。

3. Practical of aquatic ecosystem management

Adjusting environmental load and capacity - Heihe Basin

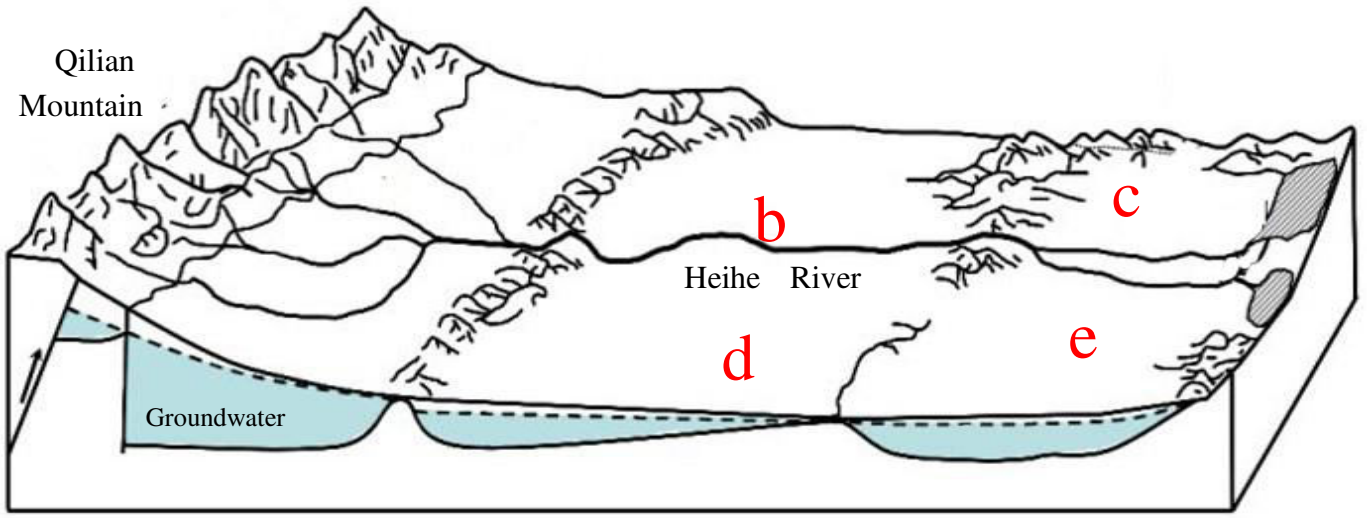
- **Profiles**. The second largest inland river in the northwest region of China.Main stream is 821 km and basin area is 142.9 thousand km^2. It is arid and have little precipitation, intense solar radiation.
- **Problems**. Since ecological water has been occupied heavily by agricultural irrigation in the middle reaches, the lower reaches have presented serious ecological problems, even presented blanking.



Location of Heihe Basin

3. Practical of aquatic ecosystem management

- Adjusting environmental load and capacity - Heihe Basin



a. *Heihe Basin Short-term Management Planning* approved by the State Council, China, in 2001

b. Annul or limit the filling of reservoirs in plain areas

c. Build new electro-mechanical wells

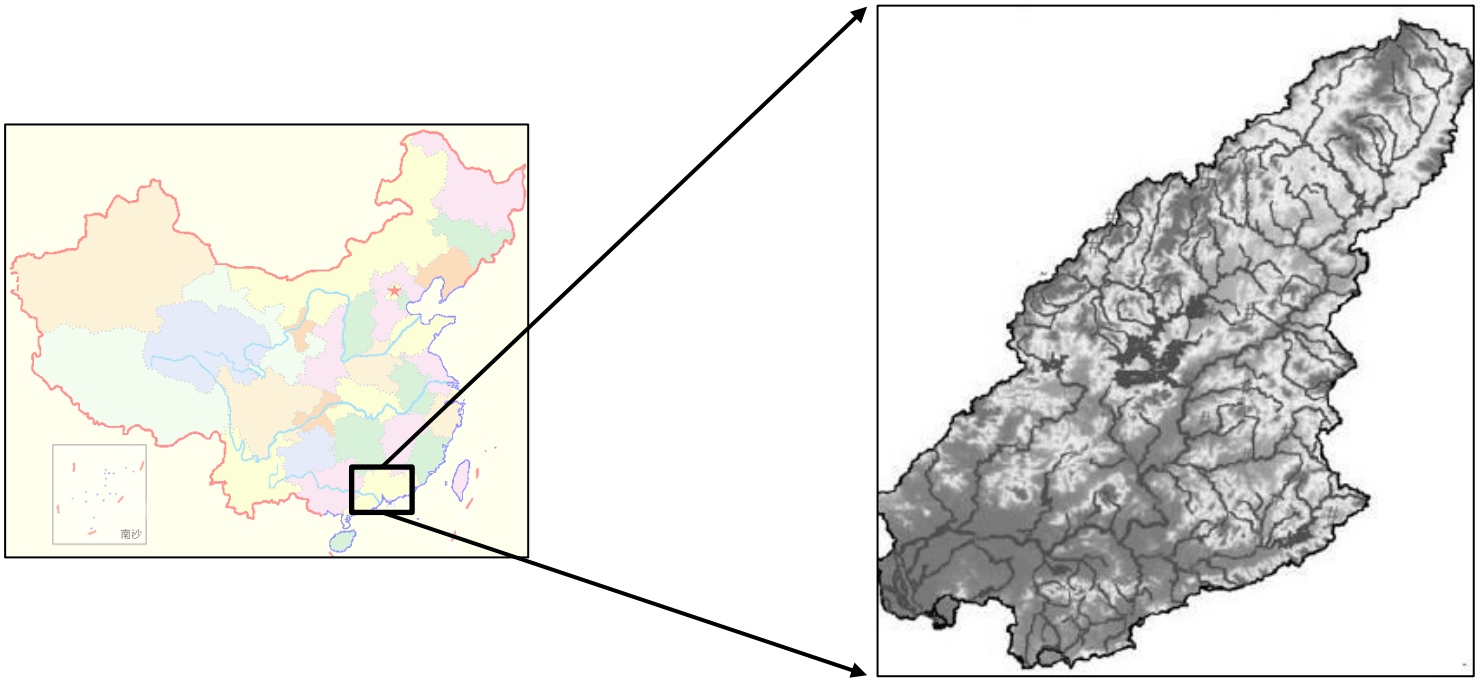
d. Develop advanced water-saving techniques and implement Grain For Green project

e. Economical utilization of water resources in the middle and lower reaches of the basin

3. Practical of aquatic ecosystem management

◆ Comprehensive improvement - Dongjiang Basin

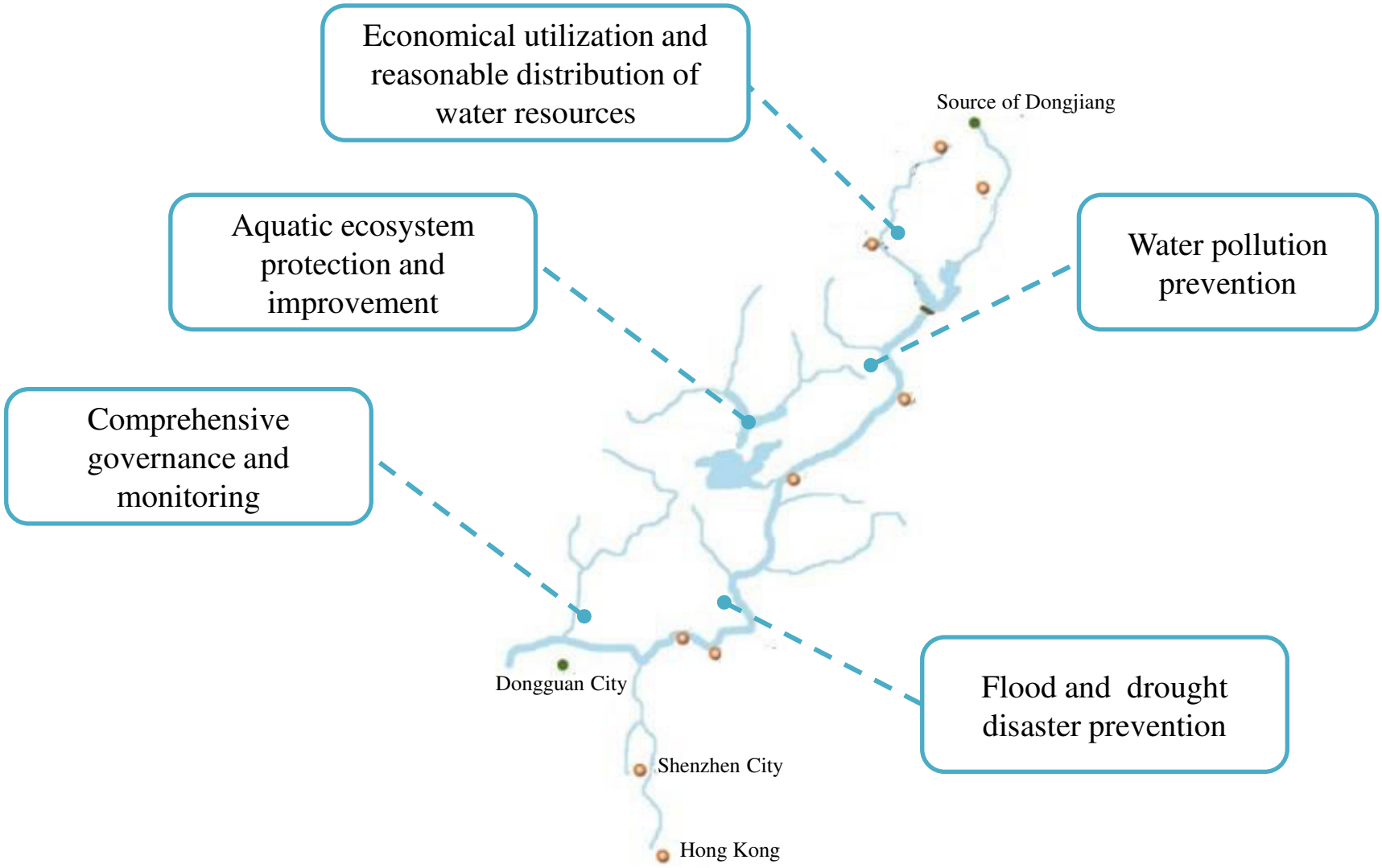
- **Profiles**. Dongjiang Basin is located in the northeast of the Pearl River Delta. Its main stream is 520 km, and basin area is 27 thousand km^2.
- **Problems**. Total water consumption has exceeded the control line. Serious water pollution, soil erosion aggravated in the upper reaches, local flood-control problems have been appeared in the basin.



Location of Dongjiang Basin

3. Practical of aquatic ecosystem management

Comprehensive improvement - Dongjiang Basin



Thanks for your attention