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Discussion on water ecological environment management strategy of water-deficient urban rivers

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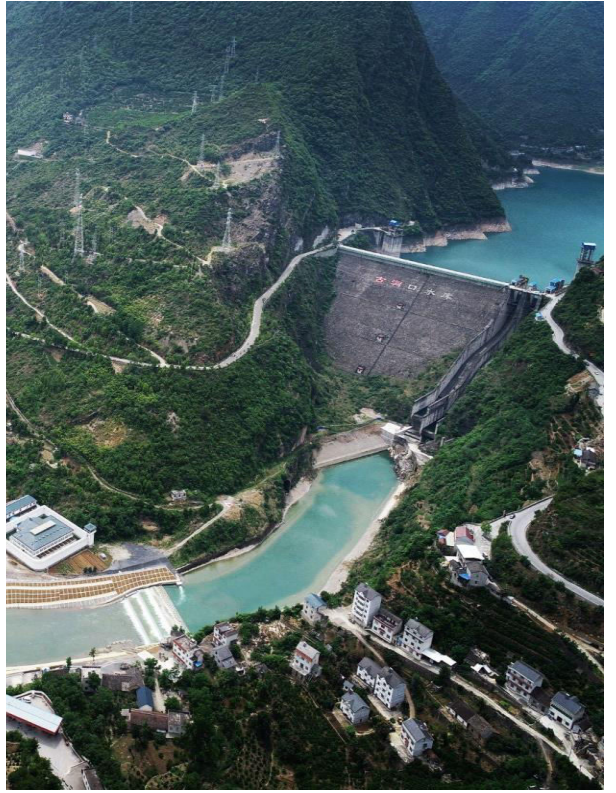
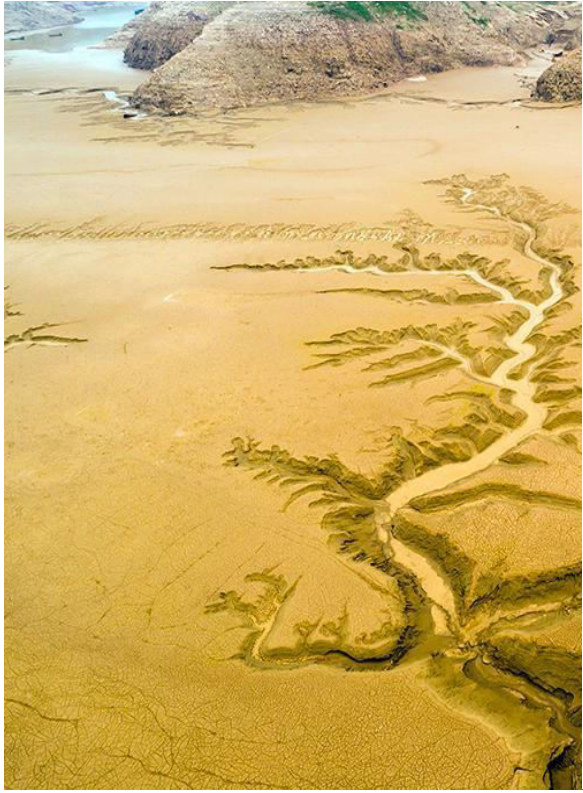
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water-deficient problem

Traditional : lack of water resource

Now : lack of ecological flow



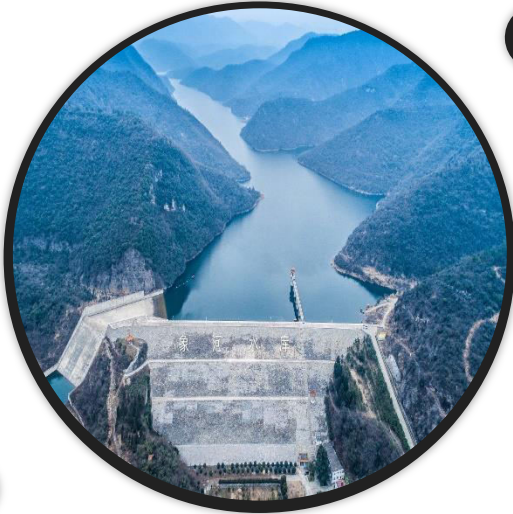
Problem:

Upstream : Stock up on clean water , No ecological flow discharge

Midstream : Not water saving , river bed exposure

Downstream : pollutant discharge , deterioration of water quality

Cause of formation



Water environment
Deterioration of water quality

Water resource

Water ecology

↓
Emission discharge from
sewage outfalls into environmental
water bodies (SOW)
↓
Point source

Lack of fresh water
Lack of 'good' water
VS
Wastewater discharge form MSTP

Degradation of water ecosystems
↓
Ecological buffer zone
Ecological treatment of sewage

Limitation for point source

Reuse of tail water from MSTP

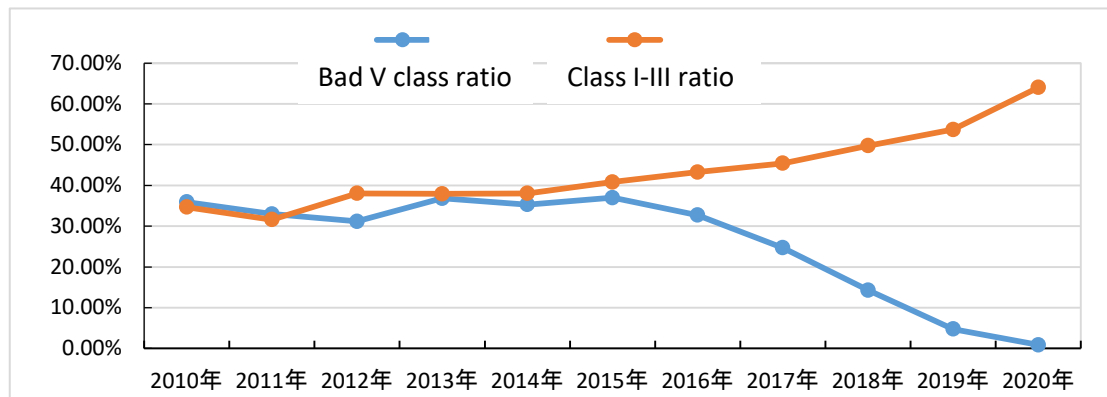
Ecological restoration

analysis

Case study in Beijing-Tianjin-Hebei region

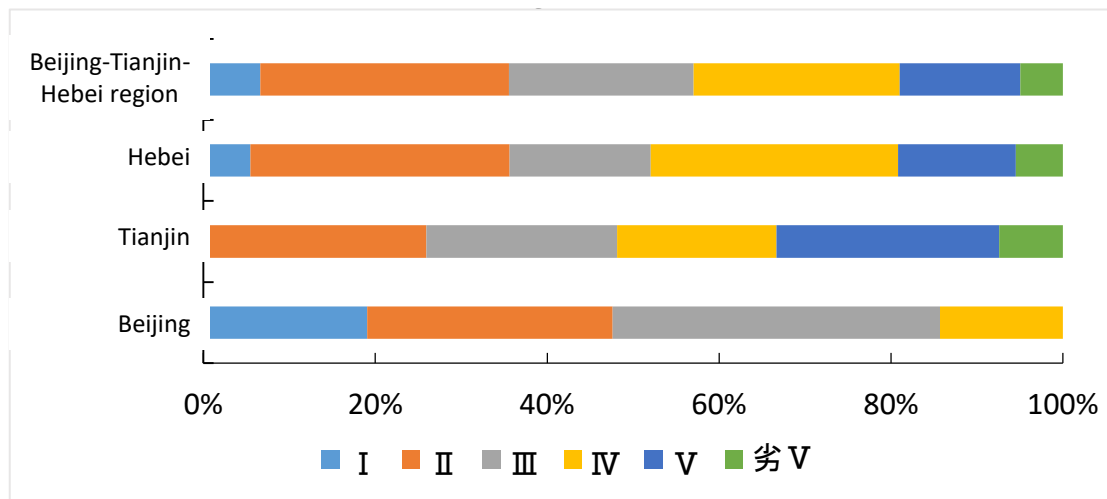
Water environment quality is generally good in China but the local water quality of tributaries has not yet improved

the monthly mean value of state-controlled sections in the Beijing-Tianjin-Hebei region exceeded the standard During the 13th Five-Year Plan period

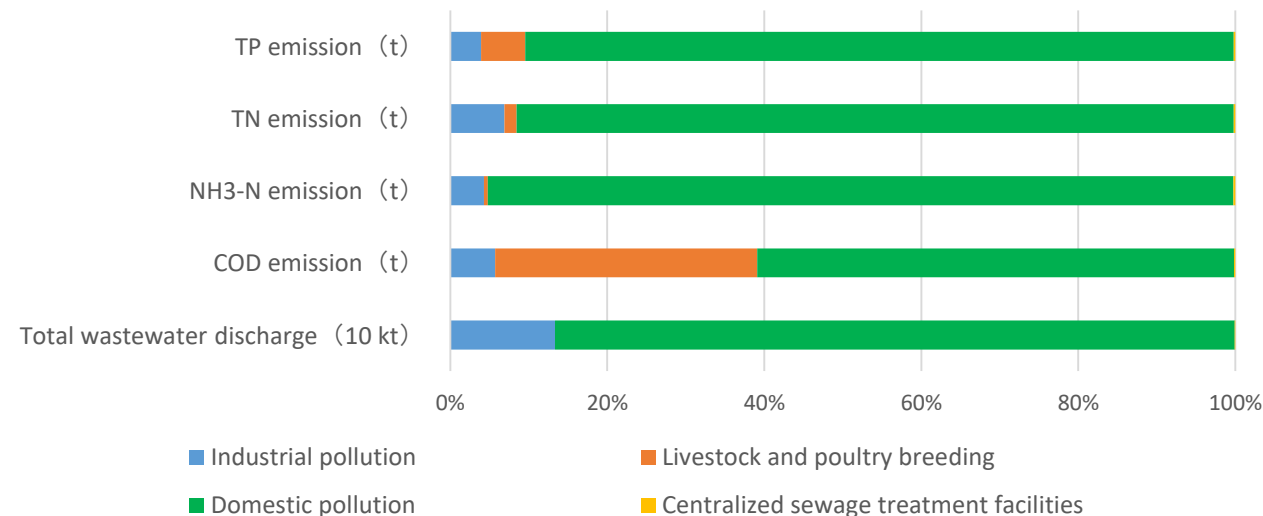


region	Number of state-controlled sections	Number of monthly monitoring sections	Number of standards reached in monthly monitoring sections	Average monthly compliance rate (%)
Beijing	21	252	231	91.7
Tianjin	27	324	292	90.1
Hebei	73	876	753	86.0
Beijing-Tianjin-Hebei region	121	1452	1276	87.9

Changes of surface water environmental quality in Haihe



Analysis of water quality in sections of provinces in the Beijing-Tianjin-Hebei region in 2019



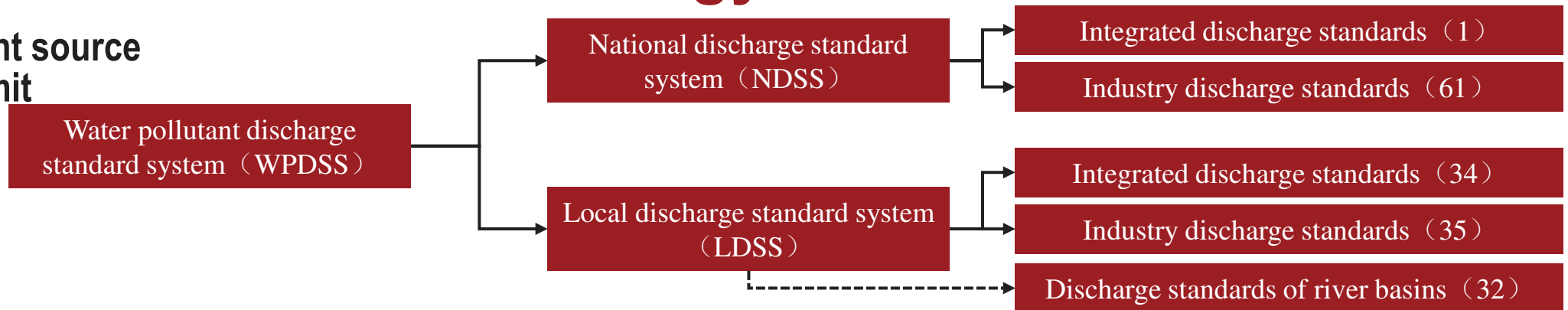
Proportion of pollution sources in the Beijing-Tianjin-Hebei region in 2018

Water environment

Limitation of point source

→ Emission permit

→ Enforcement



COD concentration limits of emission standards

Environmental quality standards for surface water (GB 3838) class III standard



20mg/L Close to the detection limit of COD

Environmental quality standards for surface water (GB 3838) class IV standard



30mg/L

Environmental quality standards for surface water (GB 3838) class V standard

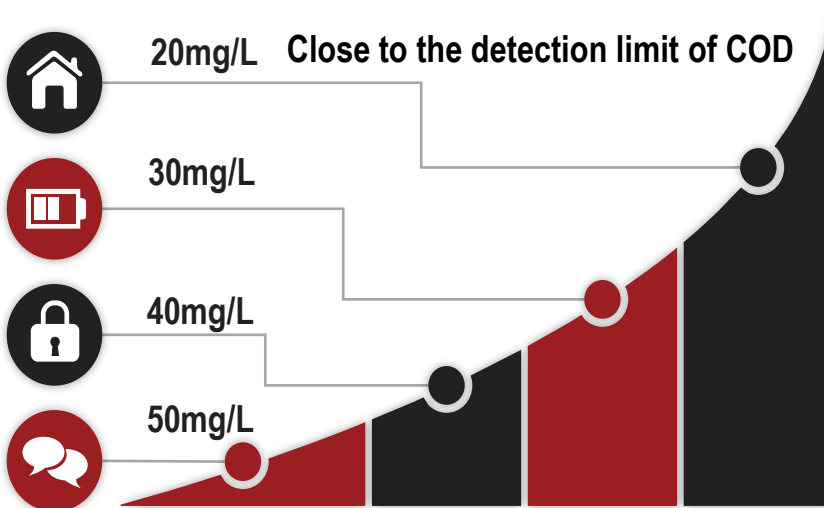


40mg/L

Discharge standard of pollutants for municipal wastewater treatment plant (GB 18918) First class A standard

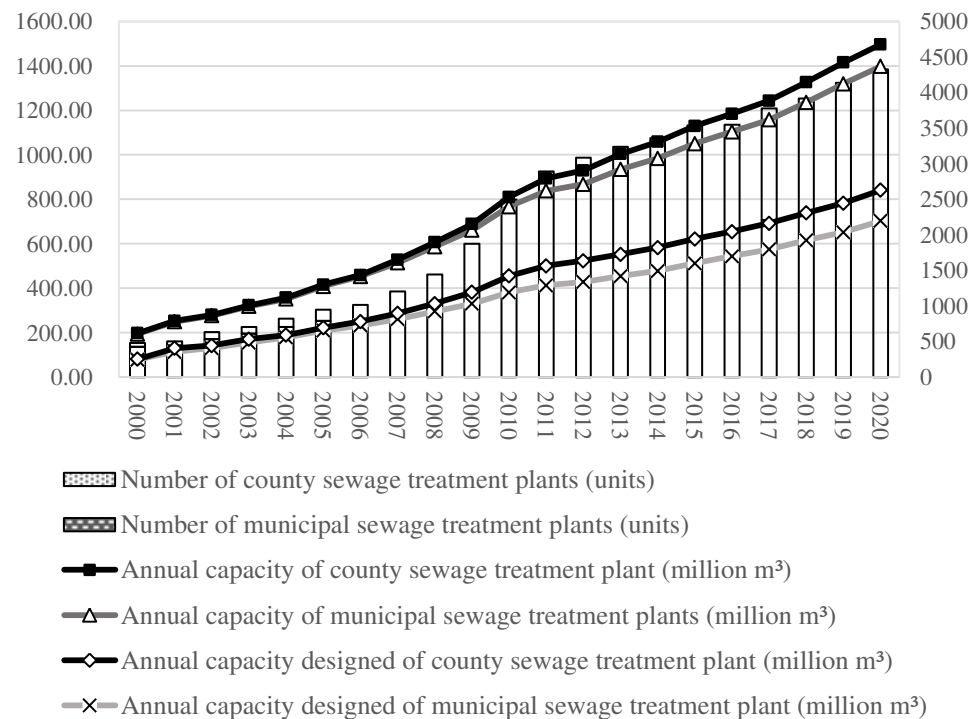


50mg/L



too much attention to physical and chemical indicators, less attention to ecological indicators

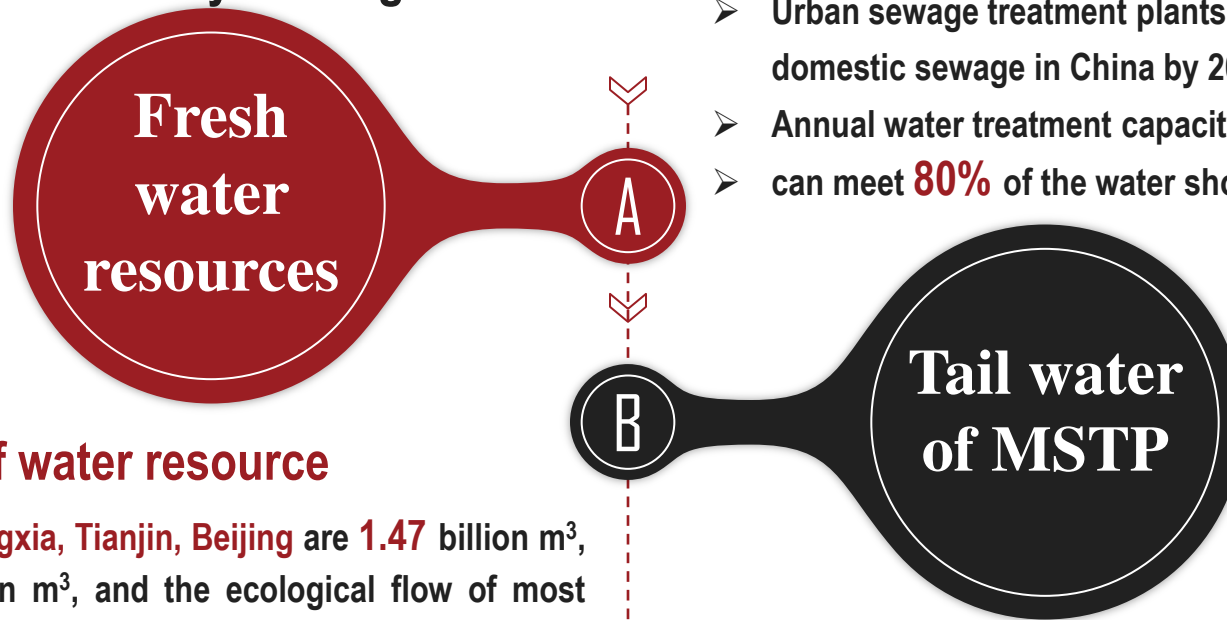
strategy



analysis

Water resources are extremely shortage in China

- The average annual water shortage in China is **53.6** billion square meters



- **Northern China: lack of water resource**

The total water resources of **Ningxia, Tianjin, Beijing** are **1.47** billion m³, **1.76** billion m³ and **3.55** billion m³, and the ecological flow of most rivers is seriously insufficient.

- **Southern China: lack of “good” water→lack of water resource**

Although **Shanghai, Guangzhou, Shenzhen, Zhoushan** and other southern cities have numerous rivers and lakes and abundant water resources, they are also faced with serious water shortage due to the pollution of river bodies.

- Urban sewage treatment plants and other treatment facilities that only treat domestic sewage in China by 2018 : **5,619**
- Annual water treatment capacity : **39.545** billion m³
- can meet **80%** of the water shortage demand if all recycled

- The amount of sewage treated in China is as high as **68** billion square meters every year, of which **58.9** billion square meters of domestic sewage from municipal sewage treatment plant
- most of the treated sewage is **directly discharged without effective use**

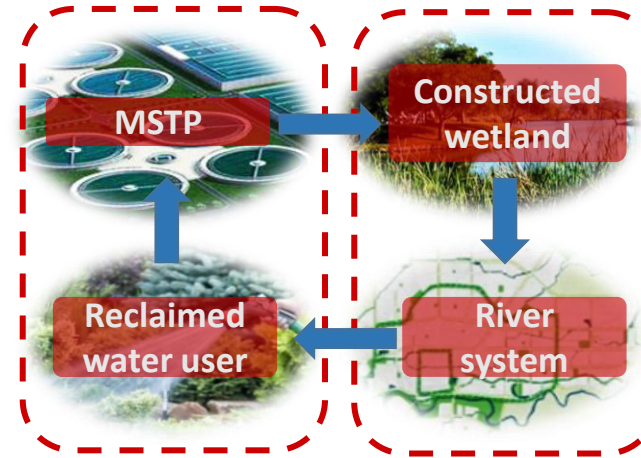
Water resource

Recycled water utilization in 2018

Province	Actual sewage treatment capacity (10,000 tons)	Renewable water consumption (10,000 tons)	Recycled water utilization rate (%)
Peking	205008.9	115956.7	56.60%
Tianjin	107221.2	3986.3	3.70%
Hebei	279893.3	51377.1	18.40%
Shanxi	115028.3	17371.1	15.10%
Inner Mongolia	89120.5	24658.4	27.70%
Liaoning	270097.4	25219	9.30%
Ji Lin	114441.3	1579	1.40%
Amur River	120238.8	1704.2	1.40%
Shanghai	264111.4	563.8	0.20%
Jiangsu	460050.6	42318.9	9.20%
Zhejiang	430013.6	22437	5.20%
Anhui	248450.1	12739.8	5.10%
Fujian	163907.5	4516.2	2.80%
Jiangxi	123353.6	343.9	0.30%
Shandong	516297.9	69179.4	13.40%
Henan	392277.9	34509.9	8.80%
Hubei	276392.8	4829.2	1.70%
Hunan	258999.7	2718.1	1.00%
Kwangtung	831671.3	44932	5.40%
Guangxi	176538.2	1579	0.90%
Hainan	37465.6	2326.1	6.20%
Chongqing	138301.8	1489.9	1.10%
Sichuan	263558.4	610.3	0.20%
Guizhou	102036.2	1510.7	1.50%
Yunnan	129894.8	36822.4	28.30%
Tibet	7213.8	1.3	0.00%
Shaanxi	170214.7	7423.6	4.40%
Gansu	52483.1	3659.7	7.00%
Qinghai	19165.7	776.7	4.10%

strategy

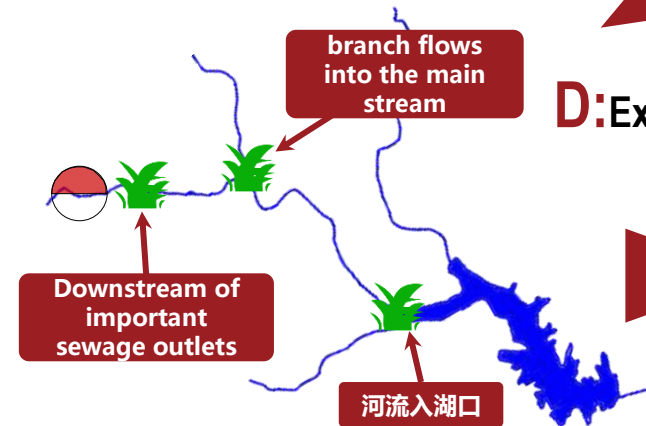
A: Rational planning and distribution



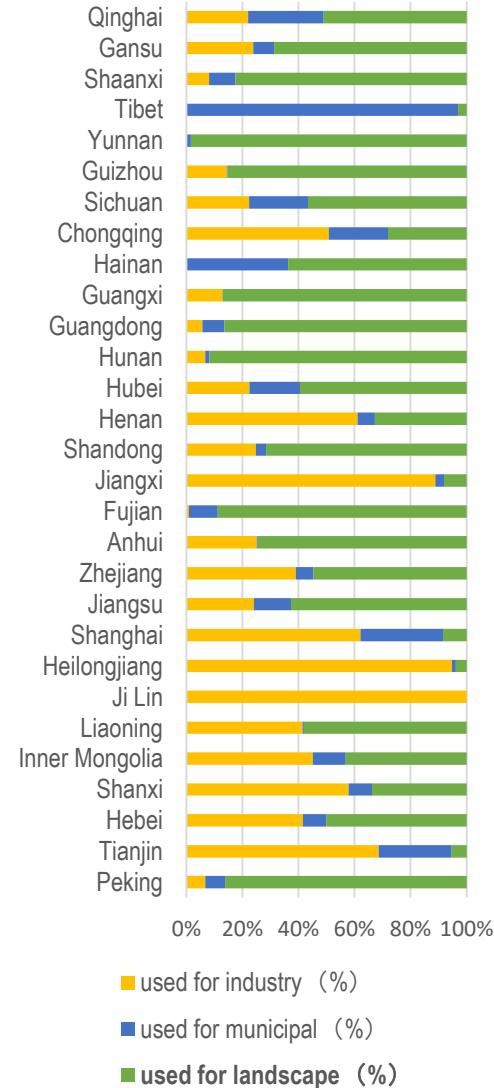
B: Strengthen the operation and management of sewage treatment plants



C: Construction of constructed wetland water purification project according to local conditions



D: Expand the use of reclaimed water



analysis

Water ecology

<Water ecological environment protection plan for key river basins>

Problem	Cause
<ul style="list-style-type: none">◆ Decrease of the biological integrity index◆ Reduction of self-purification capacity in rivers and lakes◆ Eutrophication of lake and reservoir	<ul style="list-style-type: none">• The mode of production is not reasonable<ol style="list-style-type: none">1. feeding culture2. Trawling3. Overfishing aquatic organisms (spiral snails, etc.)• Ecological space damage<ol style="list-style-type: none">4. Damage to aquatic habitats caused by destructive dredging5. wetlands, water conservation areas, water and buffer zones and other Spaces are occupied• Poor connectivity of rivers and lakes<ol style="list-style-type: none">6. Water facilities interrupt the hydraulic link between rivers and lakes• Others



analysis

Water ecology

<Water ecological environment protection plan for key river basins>

Indicators of closeness not only to the environment but also to the people

"There are fish and grass" water ecological target index

Index	2025 target
Aquatic integrity Index	Continuous improve
Restoration length of river and lake ecological buffer zone(km)	An increase of 0.77 million
Construction area of constructed wetland water purification project(sq. km)	An increase of 213
Number of waterbodies targeted for reproduction of native fishes (per)	107
Number of waterbodies targeted for reproduction of native aquatic plant (per)	20

- effectively improve the protection of **aquatic biodiversity**
- Initial progress in protecting and restoring **water ecological Spaces** such as the headwaters of major rivers, water conservation areas, and ecological buffer zones between rivers and lakes
- Restored the **water ecosystem functions** of major rivers, major lakes and wetlands gradually



West Tiaoxi river in Huzhou

Characteristics

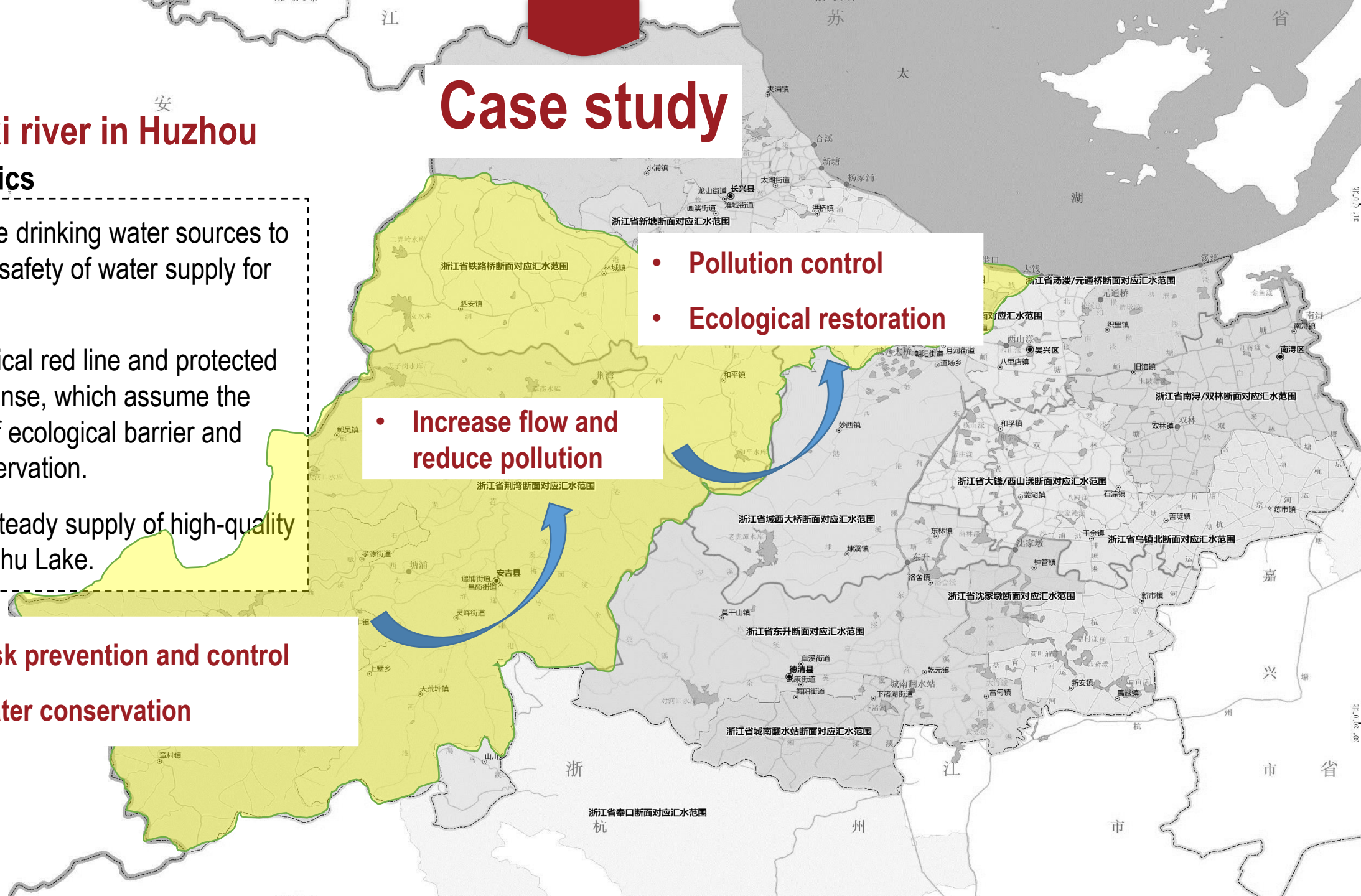
- Concentrate drinking water sources to ensure the safety of water supply for the the city
- The ecological red line and protected area are dense, which assume the functions of ecological barrier and water conservation.
- Provide a steady supply of high-quality water to Taihu Lake.

Case study

- **Pollution control**
- **Ecological restoration**

- **Increase flow and reduce pollution**

- **Risk prevention and control**
- **Water conservation**



Catchment range of Tangpu section



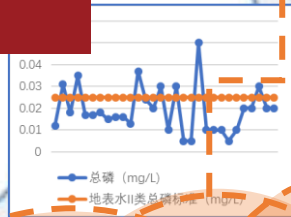
Case study

Upstream: Achieve the target of water source protection
(Risk prevention and control, water conservation)

Drinking water source risk prevention and control

Ecological flow guarantee

Farmhouse sewage treatment capacity improved

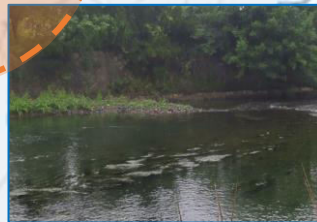
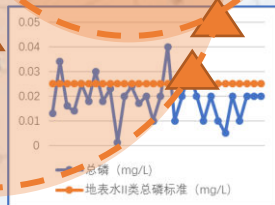


西溪

南溪

赋石水库

老石坎水库



◆ Problems:

- exceedance risk above class II to the water quality of the reservoir
- ecological base flow downstream is not enough

◆ Causes:

- insufficient treatment capacity of rural domestic sewage
- road crossing in the secondary protection area of drinking water source
- the reservoir does not discharge water for 100-200 days per year

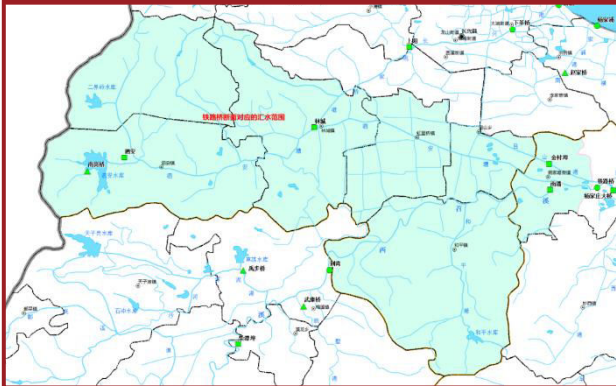
◆ Tasks:

- Improve the capacity of rural sewage treatment in tourist season
- improve the physical protection of reservoirs
- ensure ecological flow

Catchment range of Jingwan section



Catchment range of Tieluqiao section

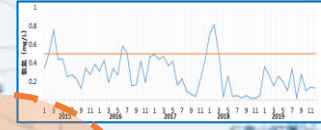
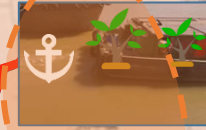
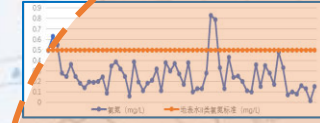


Case study

Sewage treatment of ship wharf



Construction of urban sewage pipe networks

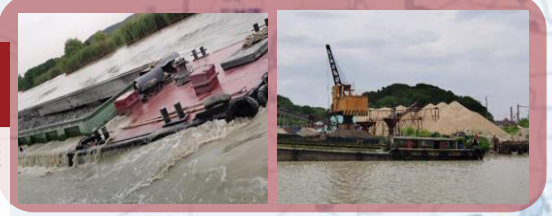


Construction of river and lake buffer zones



Regional renewable water recycle

- Construction of sewage treatment plant tail water wetland and reclaimed water reuse facilities
- Return Xitiao River and tributaries ecological water



Middle and lower reaches: to achieve the goal of clean water and green bank (increase flow and reduce pollution, ecological restoration)

- ◆ **Problems:** Section is unstable up to standard, self-purification ability decreased, Ecological base flow decreased
- ◆ **Causes:** Urban rain and pollution diversion is not complete, Dock shipping affects water quality, Coastal buffer strip encroachment, Concentration of water use
- ◆ **Tasks:** Rain and sewage diversion transformation of pipe network, Enhanced management of terminal shipping, Ecological restoration of buffer zone, Regional renewable water recycle



Thank you!

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