



Exploration on the implementation path of ecological restoration in degraded rivers -- taking Yongding River as an example

Feng Jie

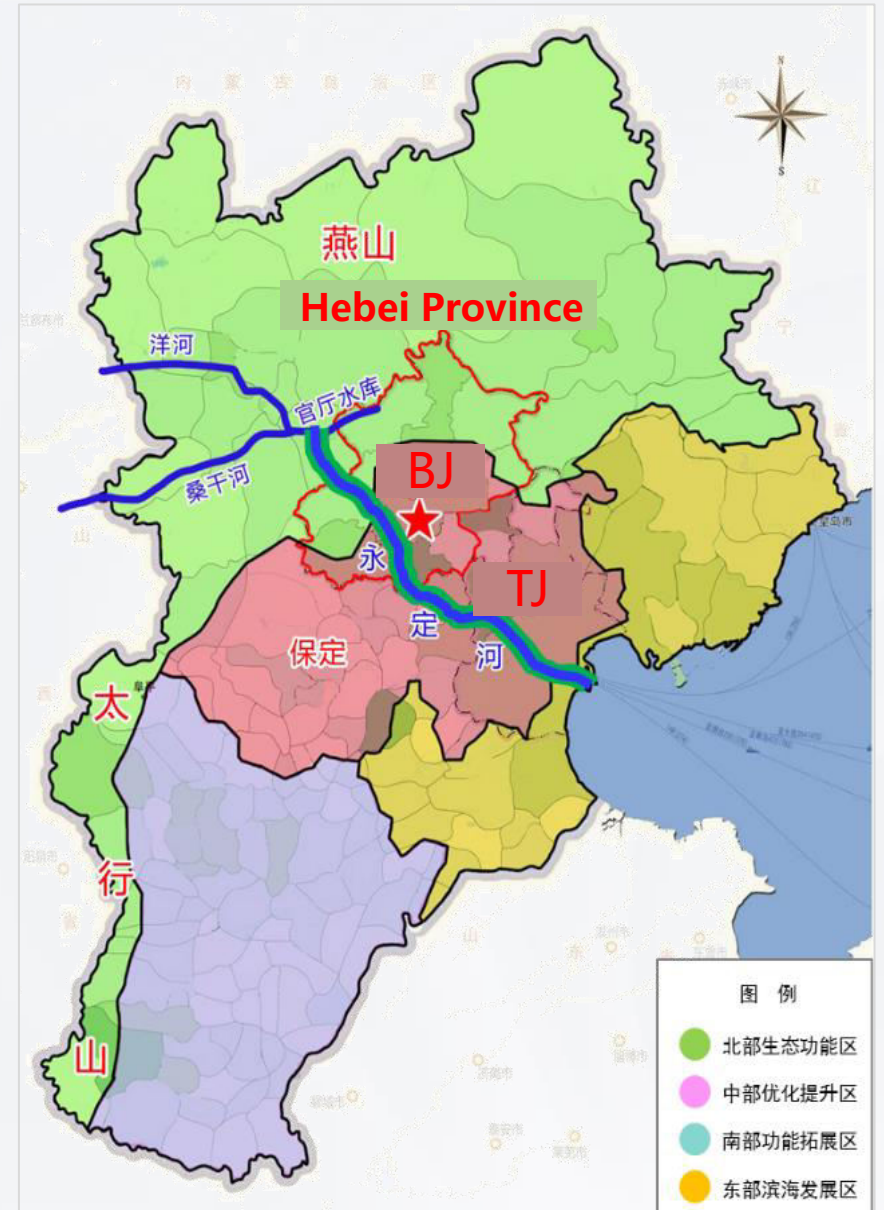
Yongding River Investment Co., LTD

Content

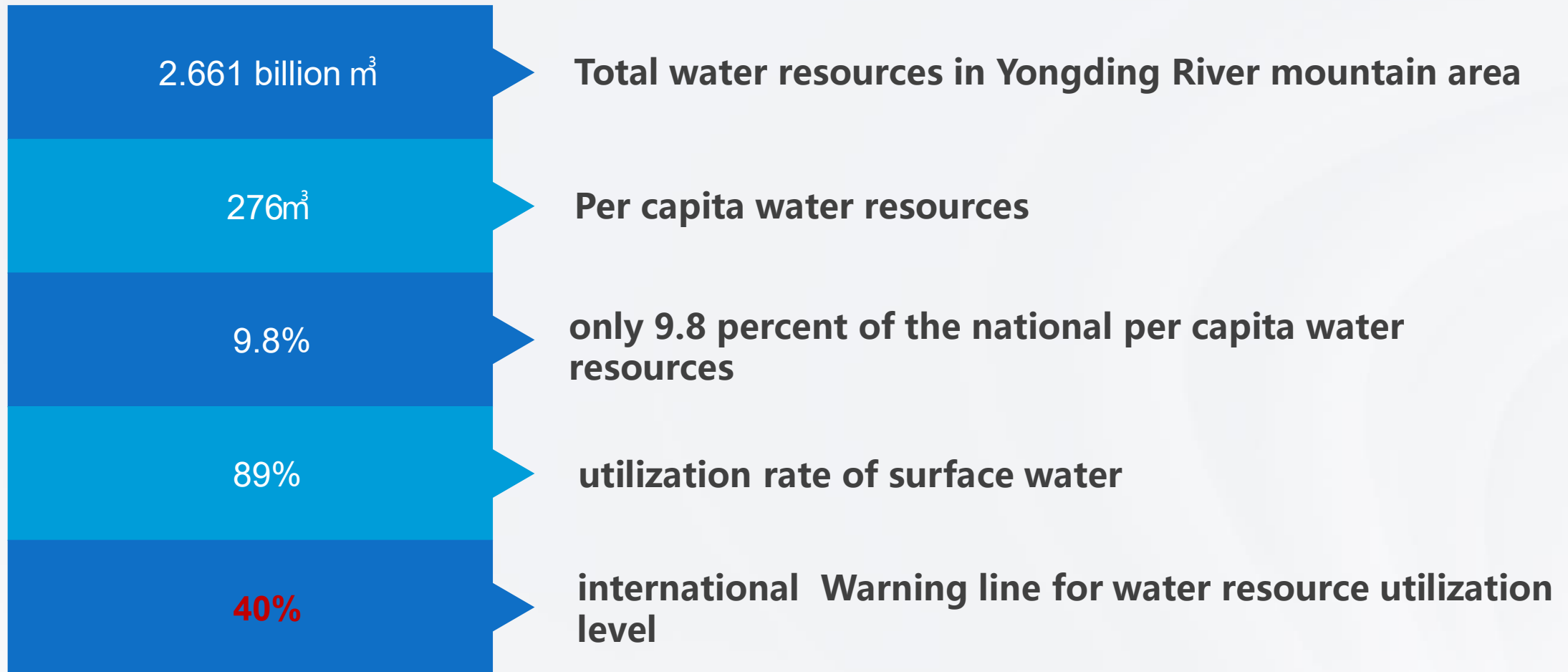
- **Overview of Yongding River Basin**
- **River ecological environment recovery measures**
- **Governance outcomes**

Overview of Yongding River Basin

- Yongding River is in an important water conservation area, which is an ecological barrier and corridor for Beijing-Tianjin-Hebei region.
- with diverse ecological environment
- with Rich cultural heritage
- the "mother river" of Beijing
- Safety barrier against flood



The upstream water inflow is reduced, and the ecological water quantity is insufficient



Overview of Yongding River Basin



- **Poor ecological quality and weak single habitat before governance**
- **Lack of systematic planning with inconsistent governance standards**
- **Typical environmental externalities**
- **Each district manages the river according to its own needs**
- **Not from a whole river basin point of view**



Overview of Yongding River Basin

In order to revive the river habitat, comprehensive governance and ecological restoration have been initiated in Yongding River ----<Overall plan for comprehensive Governance and Ecological Restoration of Yongding River>

Taking the basin as a holistic entity for implementing comprehensive system management across administrative divisions, it has successfully pioneered a pragmatic approach towards restoring the ecological environment of the degraded river.



Project lists
7个方面系统梳理了78项重点建设项目

INVESTMENT SCALE
项目总投资约370亿元

Governance Goals
“流动的河、绿色的河、清洁的河、安全的河”

Flow

Green

Clean

Safe

The <Overall Plan> for Comprehensive Governance and Ecological Restoration of Yongding River aims to promote the corporate operational model, establish the general objectives of Yongding River governance, and determine the required investment. In contrast to traditional linear time-based approaches for river basin management, the comprehensive governance of Yongding River takes into account its entire life cycle.

Unified planning and
design ordinance

A

Natural restoration
measurement

B

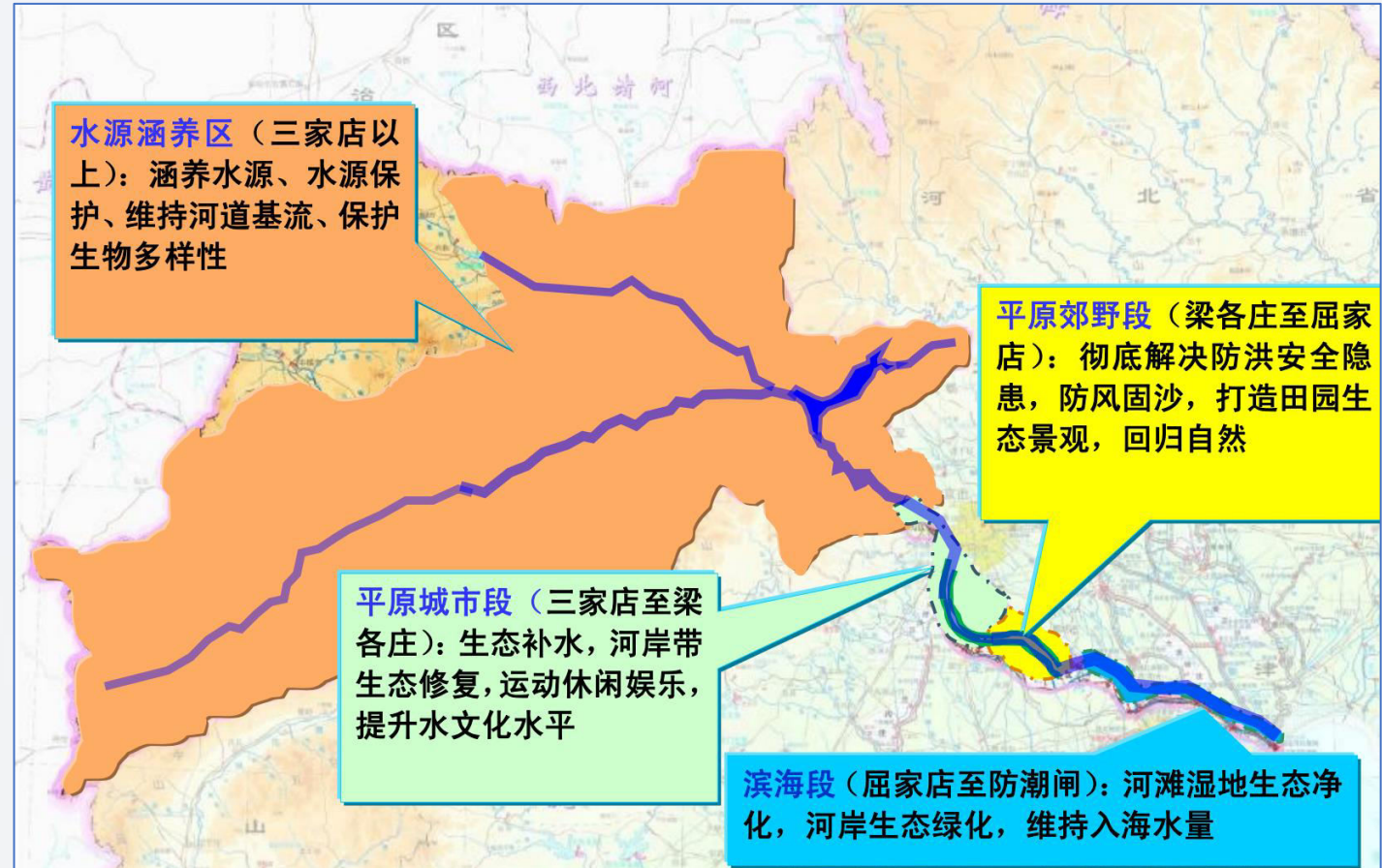
Dynamic optimization of
governance strategies

C

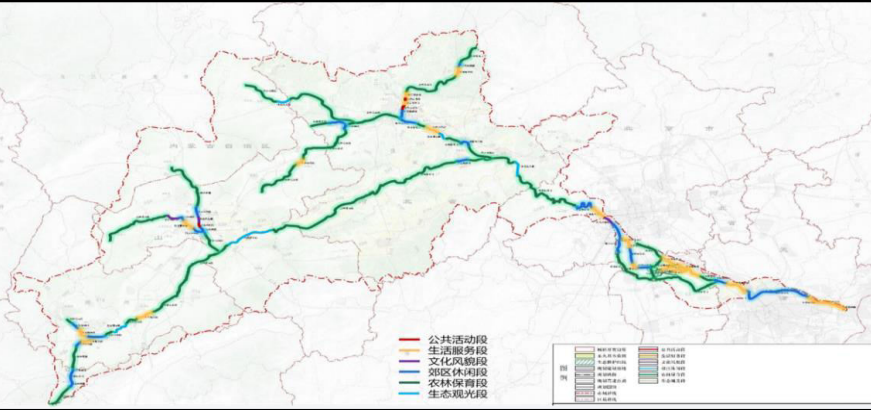
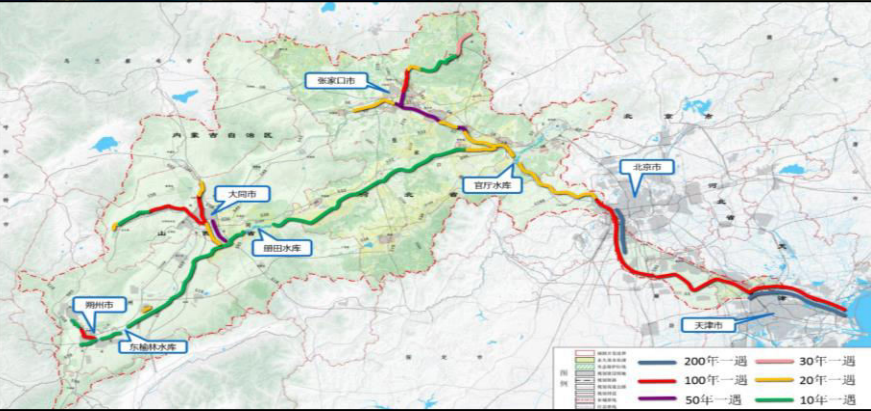
Unified planning and design ordinance

Regarding the <overall plan>, the river governance scheme is directed by the overarching planning and design ordinance to effectively steer the design of various projects and regulate the overall ecological characteristics

From Macro level--Town and nature
The river is divided into four sub-sections according to the geomorphic features: Water Conservation section、Plain Urban Section、Plain Suburban Section、Coastal Section



River ecological environment recovery strategy

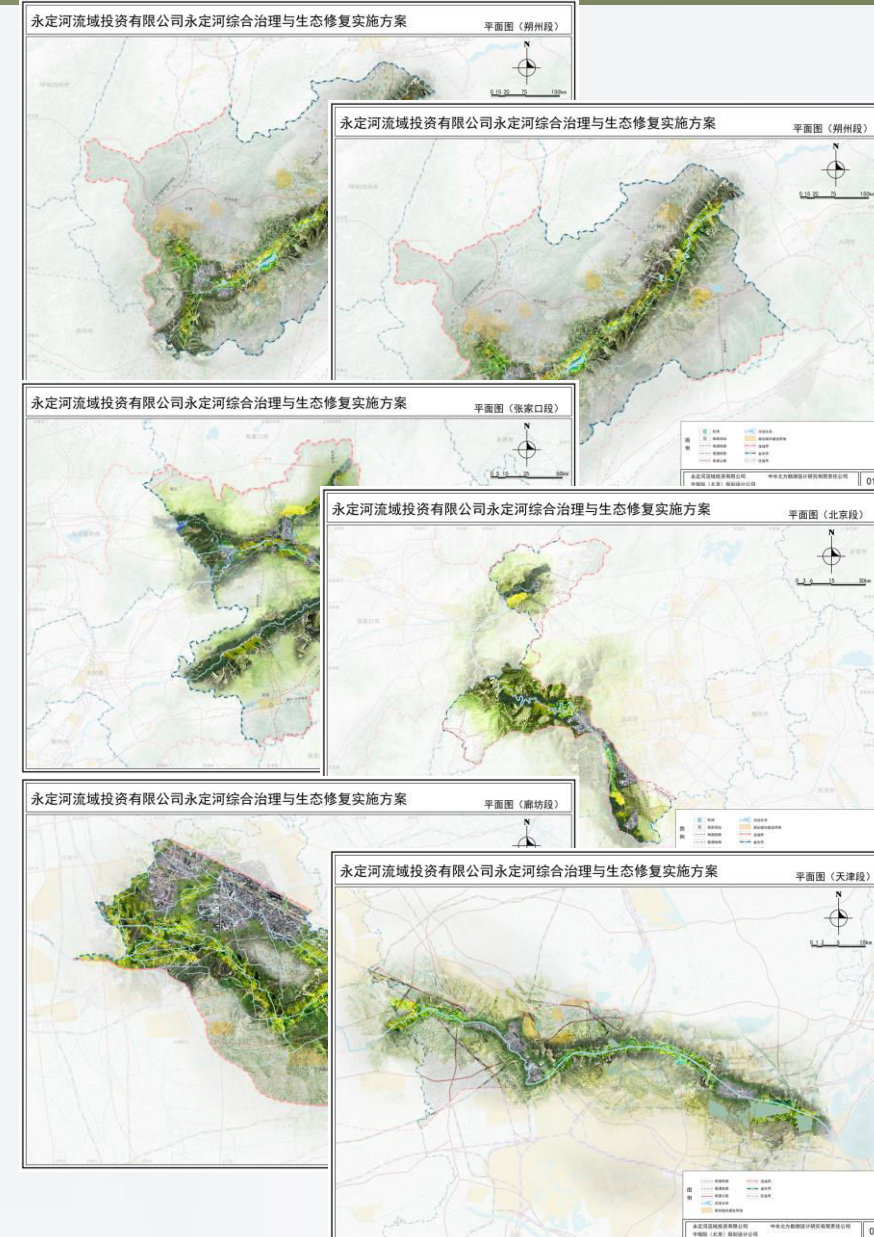


总体方案分段	二级分段	河段划分	起始位置	功能定位
滨海段	滨海段	永定新河	屈家店~入海口	防洪
平原郊野段	泛区	天津	北京、河沿	田园河道
		廊坊	梁各庄~天津界	涵养林
平原城市段	北京段	平原南段	卢沟桥~梁各庄	沙化治理
		平原北段	三家店~卢沟桥	景观观光
水源涵养区	山峡段	官厅水库~三家店	官厅水库~三家店	溪流涵养
		湿地涵养段	官厅水库~夹河村	湿地营造
	洋河	下游	花园口~夹河村	田园河道
		中游	清水河入口~下花园区	自然河道
		上游	清水河入口~东、西洋河交汇	水源涵养
		支流	清水河	生态景观
	奥干河	下游	东、西、南洋河	水源涵养
			夹河村~涿鹿县	曲折蜿蜒
		上游	溪流河入口~涿鹿县	峡谷段
			册田水库~壹流河入口	沙化治理段
			自然段	生态恢复
			榆水段	生态治理
支流	十里河、御河	生态景观		
	七里河	生态景观		
		侯河	水源涵养	
		凉水河	水源保护	

Unified planning and design ordinance

From Micro level--Channel function

The river is divided into 103 sections based on the river's location, the spatial functions of its banks, and the characteristics of its resources. Subsequently, governance guidelines are established for each section. Standardized construction criteria are implemented across the entire river.



Natural restoration measurement

- After establishing unified planning and engineering standards, the ecological restoration project that needs to be implemented is determined.
- Under the premise of ensuring safety, a simulation of restoration mode driven by natural forces is conducted. A pulse experiment with a flow rate of $500\text{m}^3/\text{s}$, suitable for the current river bed bottom and slope in the Plain area, is carried out to disrupt the existing river form and facilitate natural restoration of both landform and ecological environment.
- Utilizing pulse experiments as a strategy for restoring river ecosystems can minimize manual excavation of river channels, reduce reliance on hard bank slope protection measures, and ultimately save project investments.



Natural restoration measurement



Wet the bottom of the river

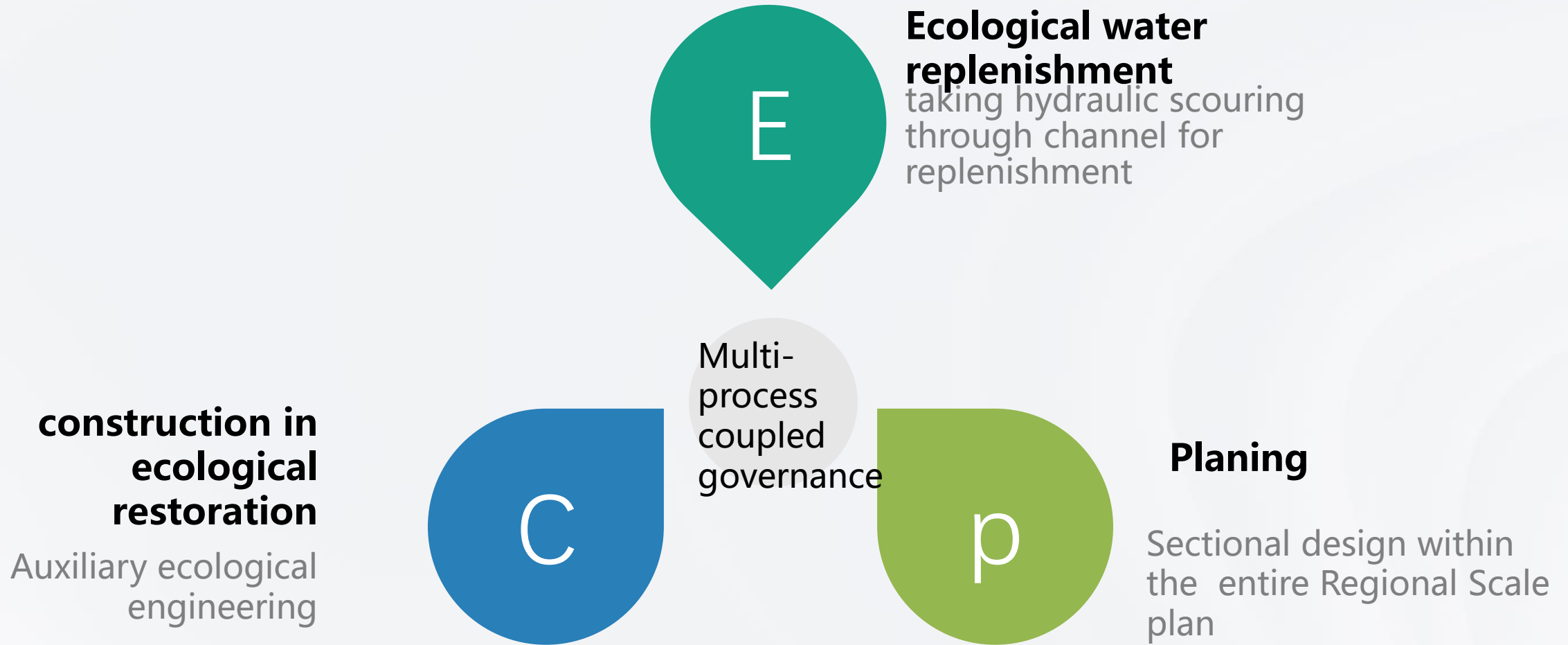
The water supply to the southern section of Beijing Plain of Yongding River is replenished through a gentle water dispatching mode, resulting in the filling of the river bottom pit and the formation of an uninterrupted waterway.

Burst out of a channel

The cascade pulse discharge test was conducted to rapidly propel the water forward, while utilizing natural hydraulic scour to create a natural channel.

Modulated channel pattern

The experimental measures, such as artificial induction and natural scouring and siltation, were refined based on the summarization of observation data and technical achievements from previous actions. These measures aim to create natural river forms while incorporating ecological water replenishment, thereby further optimizing the river form and stabilizing the mainstream channel.

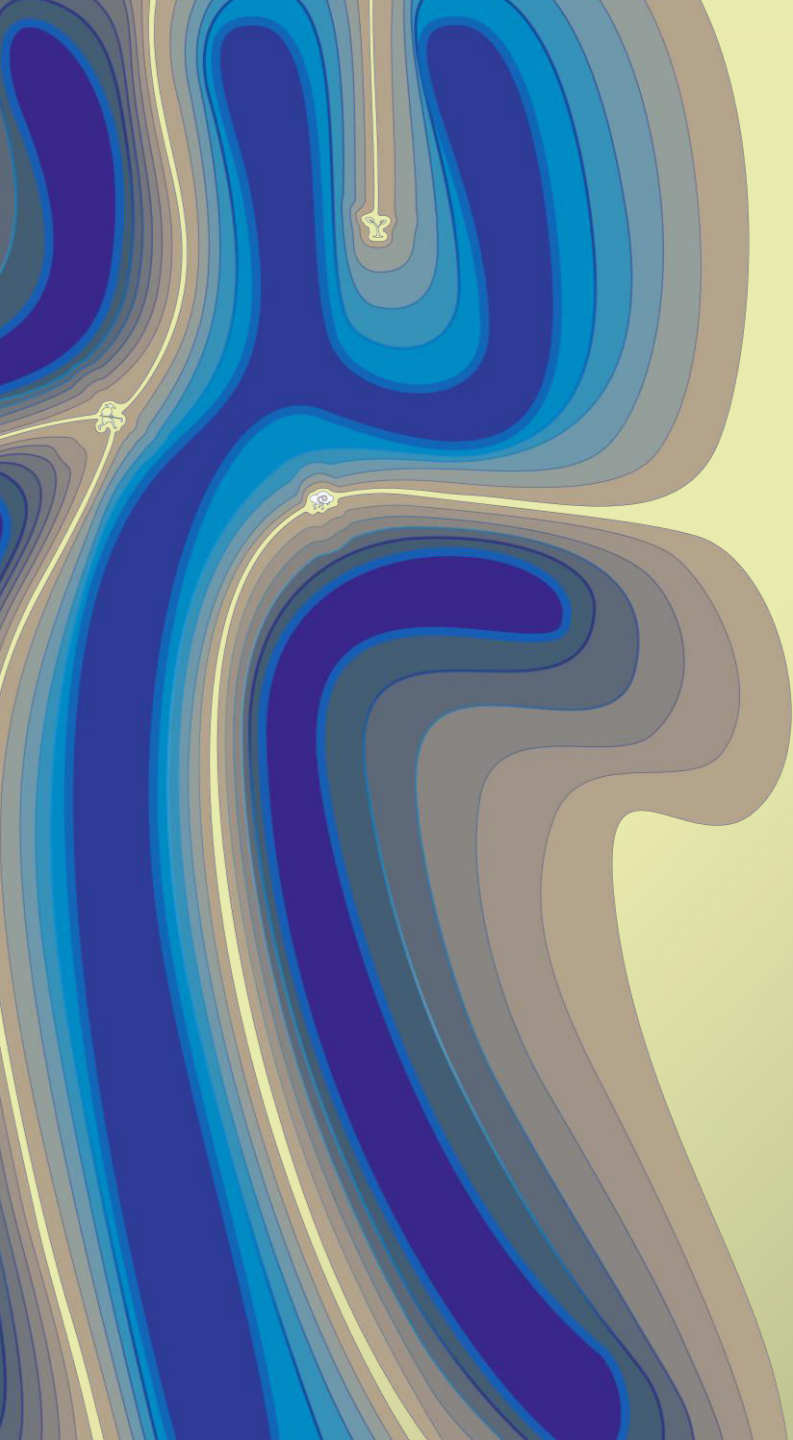


- **Coupling of ecological water replenishment and planning design:** The channel formed by ecological water replenishment is considered as the design boundary condition to ensure uninterrupted water flow in the river. The design must be adaptable to diverse ecological water replenishment requirements, ensuring the future potential for ecological restoration.
- **Coupling of Planning design and engineering construction.** In the process of engineering construction, the planning and design scheme is optimized at the watershed scale based on the construction situation. Firstly, vertically, the downstream design conditions are optimized in accordance with the upstream treatment project. Secondly, a slope and revetment optimization scheme is proposed based on the river channel management project.
- **Coupling of engineering construction and ecological water replenishment.** The ecological water refill experiment should fully utilize the scouring effect of water flow to facilitate vertical, horizontal, and three-dimensional restoration, thereby creating favorable conditions for project construction.



- The new pattern of governance and management has been effectively operated
- The 'four rivers' governance goals have been basically achieved
- The ecological resilience of the river has been significantly improved
- The construction of the Yongding River cultural Belt has been established
- The corporate top-level strategy has been steadily promoted. Through the continuous improvement of ecological quality along the river basin
- The beauty of harmonious coexistence between human and nature has reappeared along the Yongding river basin.





Thank you

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