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Perspectives on eco-water security and ecological water conservancy

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Outline



01 Eco-water security issue in China

02 An excellent case of Dujiangyan Irrigation Project

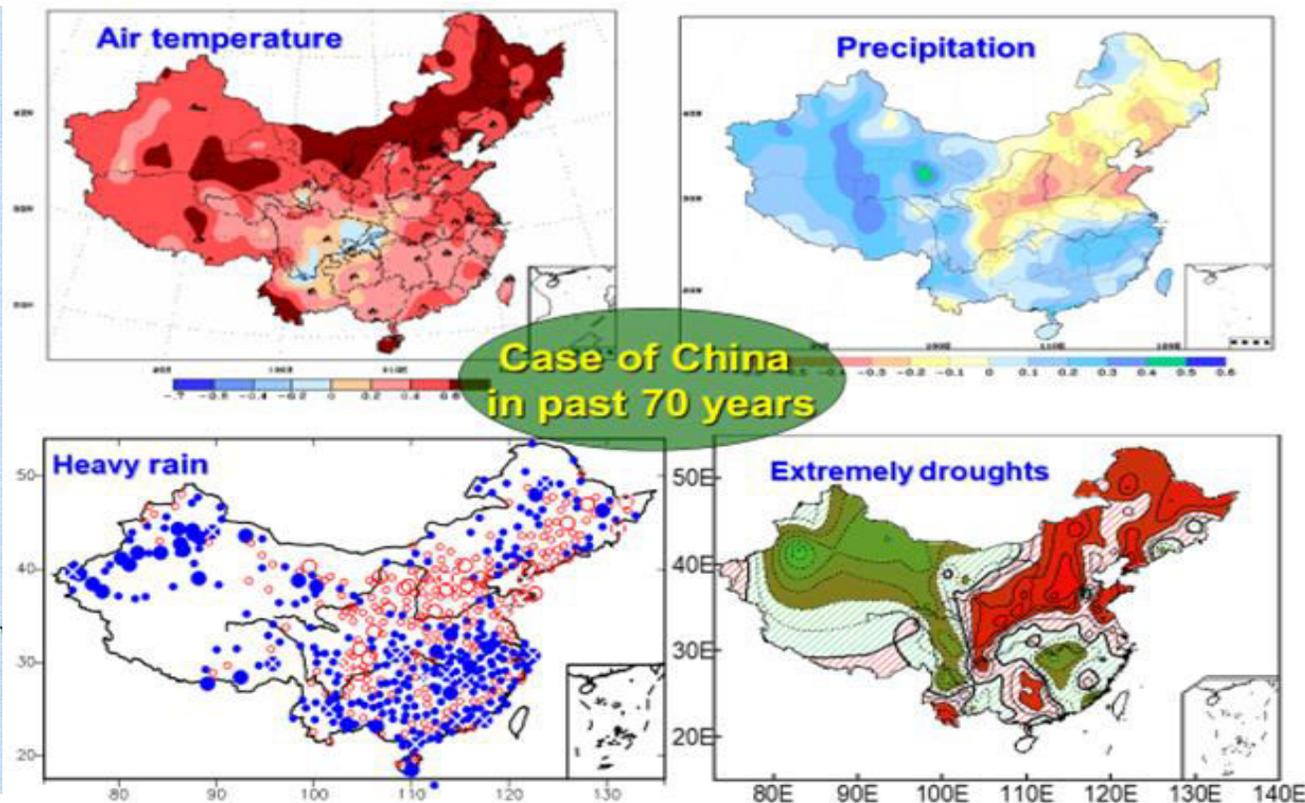
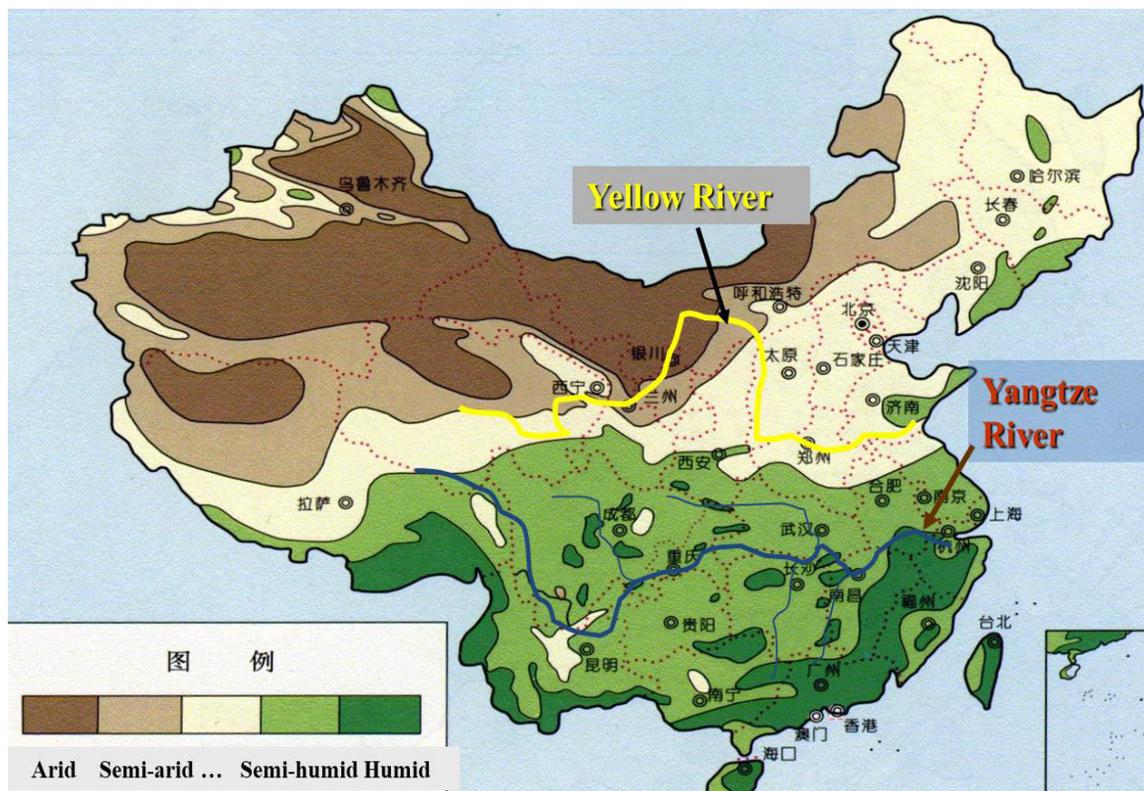
03 Perspectives on ecological water conservancy

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1. Eco-water security issue in China



1. China is the country with a big water stress from both climate impact and its population & economic development

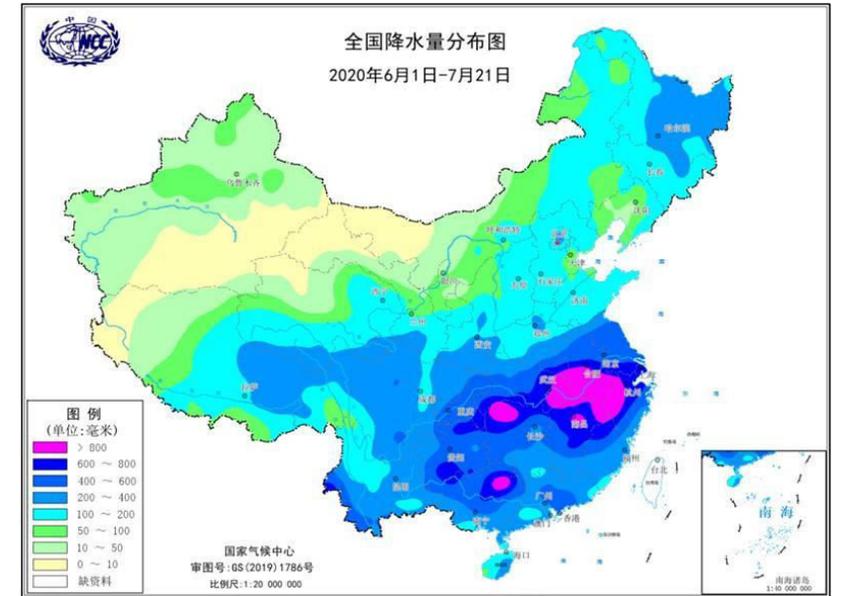


1. Eco-water security issue in China

e.g., 2020's major floods in south China

Major flooding in the Yangtze River, Huai River, Poyang Lake & Taihu Lake etc. in South China

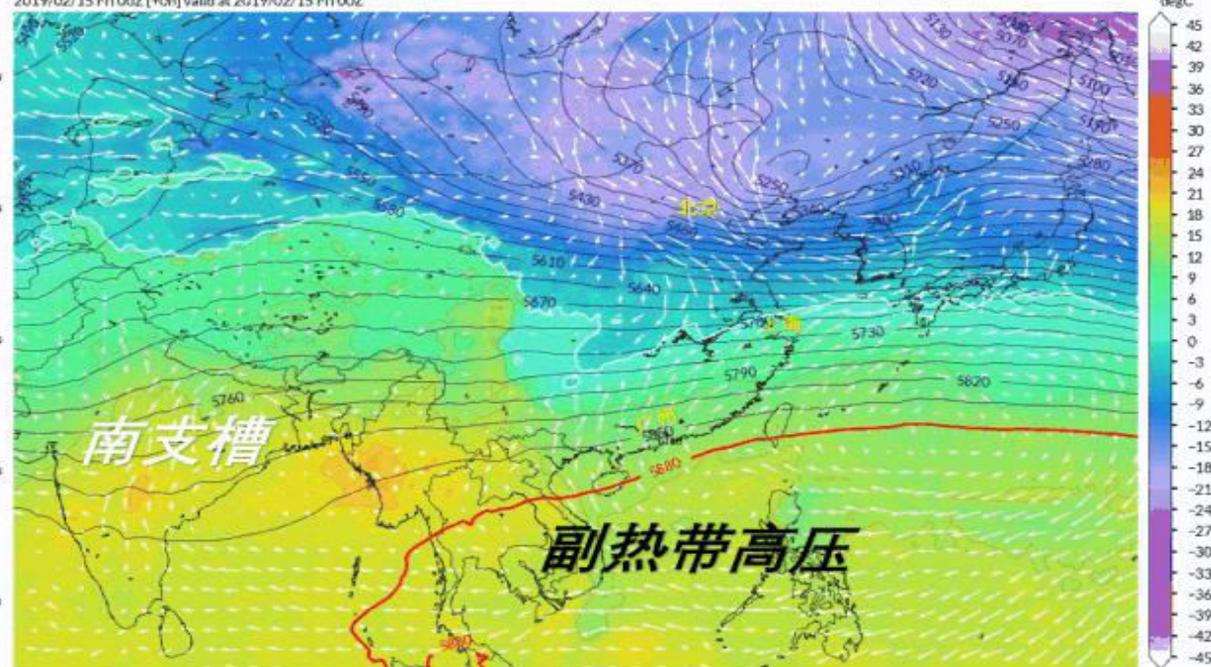
- **Meiyu period** for the Yangtze River is **23 days** much longer than usual
- **The rainfall** in the middle & lower reaches of the Yangtze reaches to **754 mm**, **68%** higher than the largest since **1961**



1. Eco-water security issue in China

Consequences!

ECMWF 850mb Temperature & 500mb Geopotential @NASDAQ
2019/02/15 Fri 00Z (+0h) valid at 2019/02/15 Fri 00Z

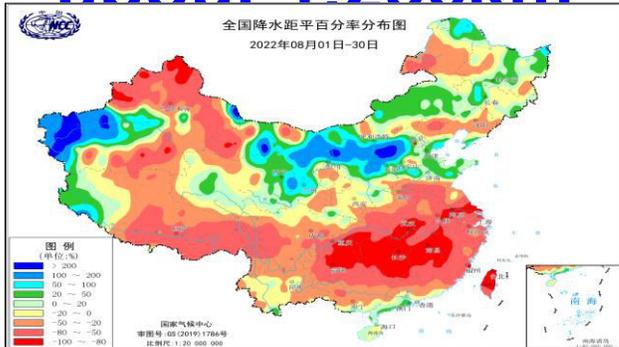
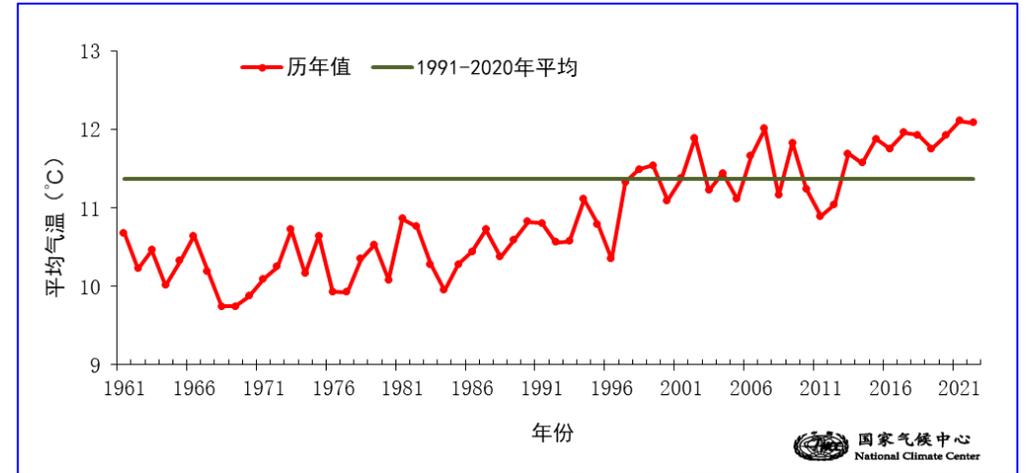


1. Eco-water security issue in China

Also, 2022's Extreme Drought in Yangtze River, arises in bigger social & economic loss and eco-system degeneration

◆ **Extreme high temperature with the strongest intensity since meteorological observation records in 1961**

◆ **It happened extreme drought and the water surface area decreased by about 1,236km² (33%) in Povana**



1. *Eco-water security issue in China*

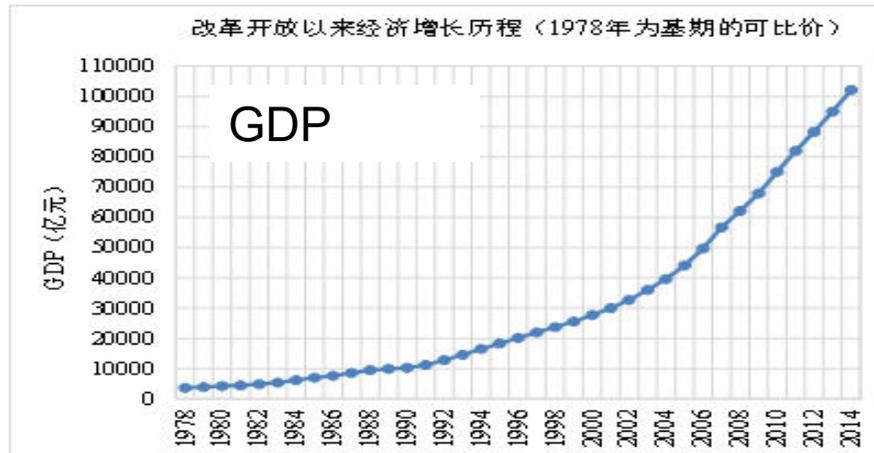
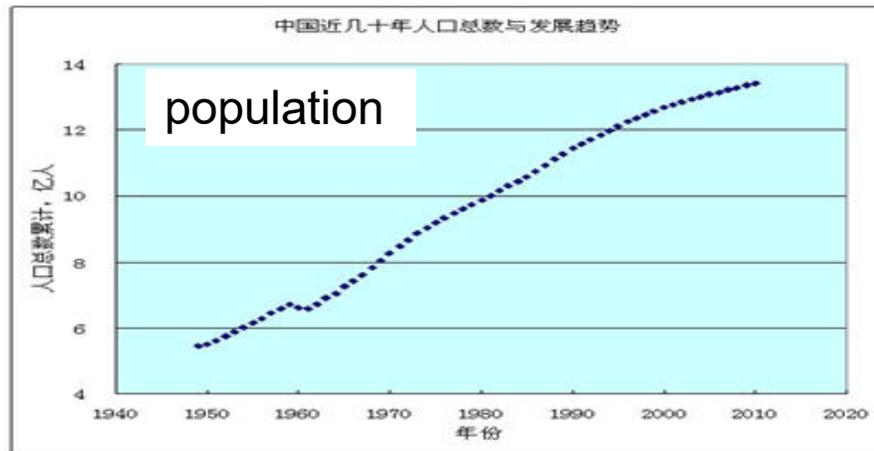
To toward the solution on water sustainable utilization in changing world, ***adaptive water management*** was implemented in China

Two aspects are **strengthened** on

- (1) Structural measures**, such water conservancy project for flood control and increasing storage capacity etc.,
- (2) Non-structural measures**, including **flood forecasting & operation of reservoirs**, insurance system, institution innovation , ... , for reducing water disaster risk.

1. Eco-water security issue in China

New vision: Along with the development of economy & society in China, **the eco-water problem** has become one of key issues for SDGs



Lake eutrophication in Dianchi (2016)



Water Blackening

Eco-water problems



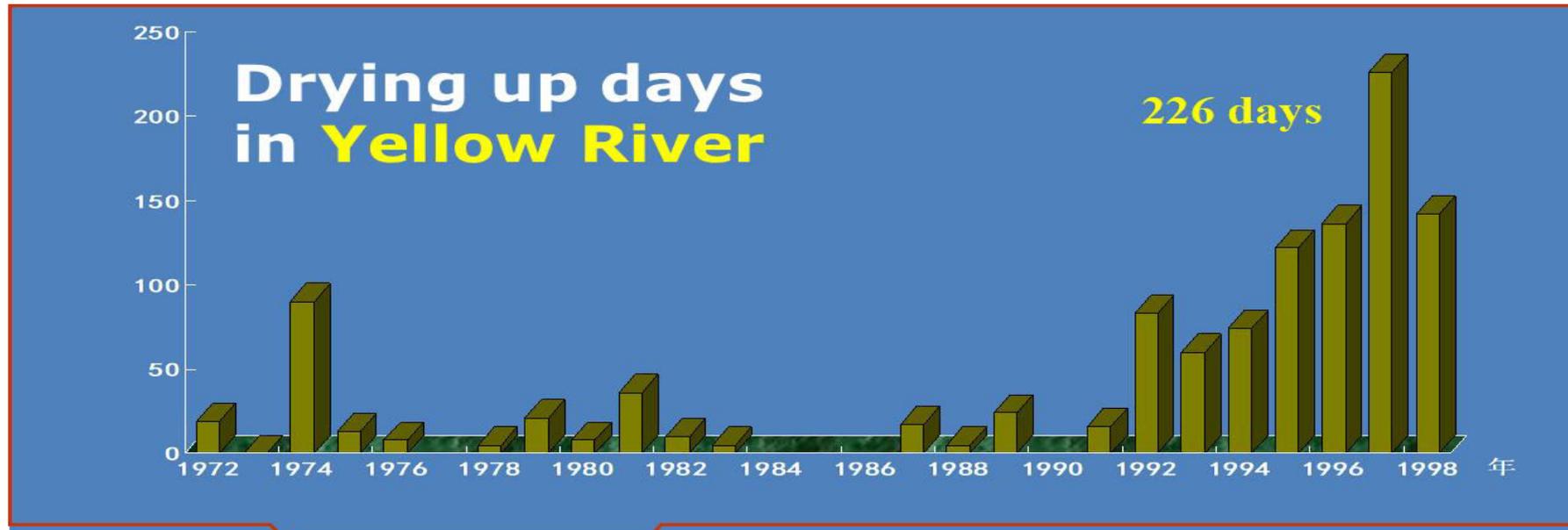
Water Logging in Changsha City (2017)



ecological degradation

1. Eco-water security issue in China

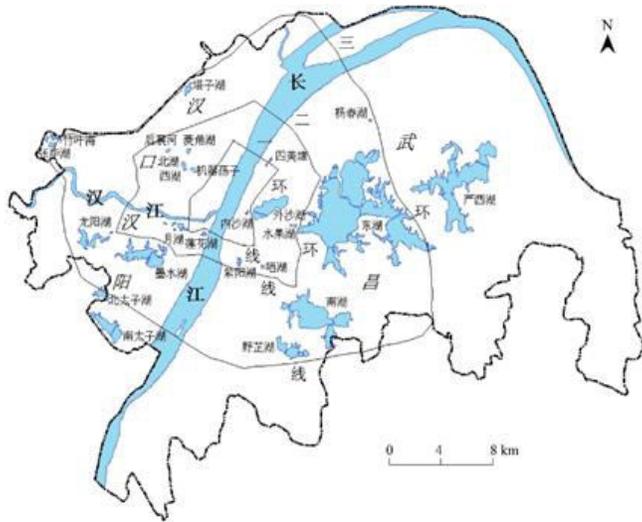
e.g., Drying up events in Yellow River during 1992-1998



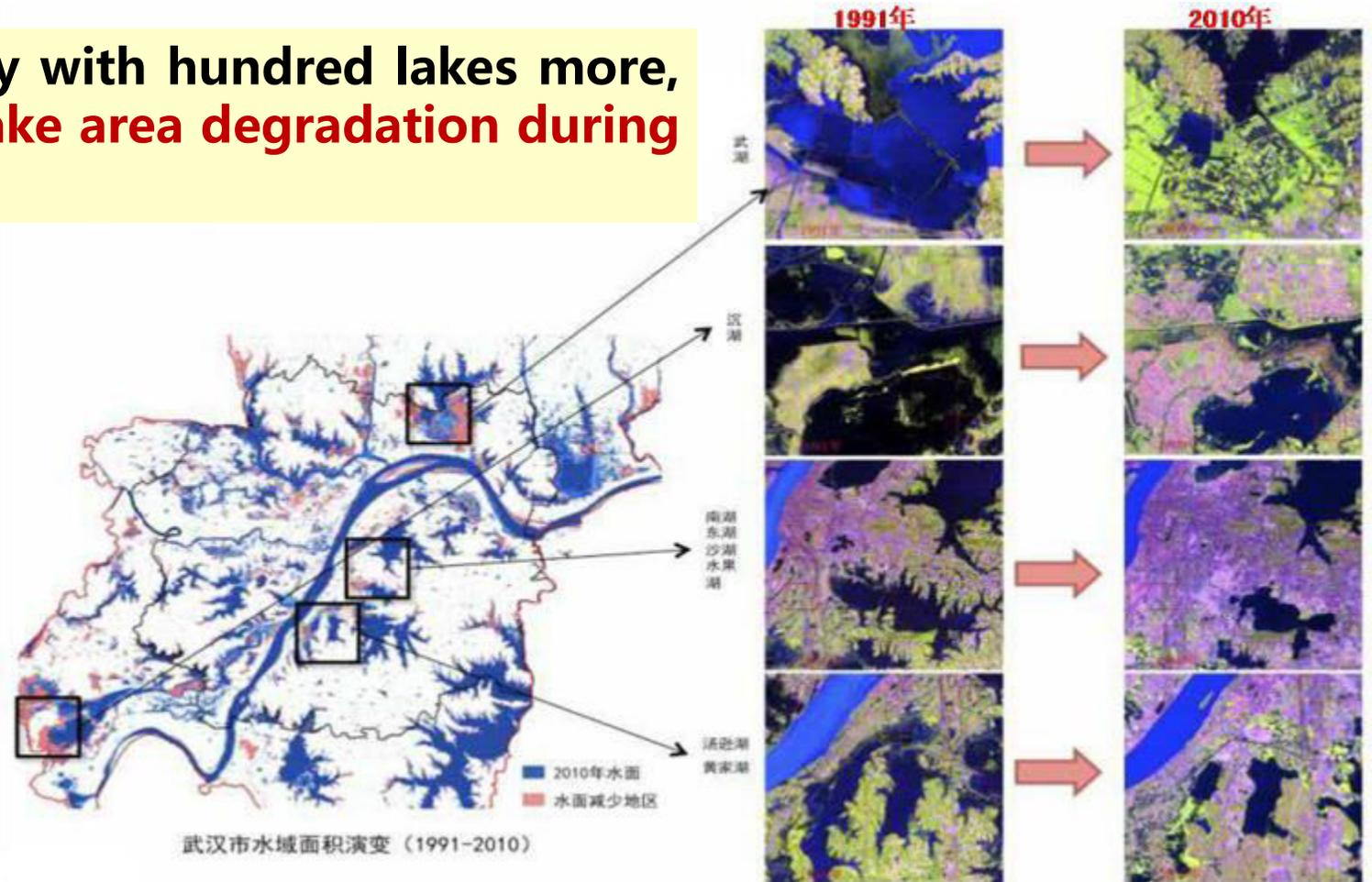
1. Eco-water security issue in China

Degradation of wetland and lakes in the cities, such as Wuhan before 2010

Wuhan city, called as the city with hundred lakes more, has experienced **228.9 km² lake area degradation during the past 30 years**



Lakes distribution in Wuhan on 2010



Water area evolution in Wuhan from 1991 to 2010



Challenges

No.1: How to **coordinate the contradiction** between **socio-economic development** and **environmental protection** ?

No.2: How to **wisely manage water** in the river basin via a **systematic way** for **eco-water security** to **maintain ecological and human development** in a sustainable way?

Eco-water security

It means that ensuring extent for ecosystem (*forest-grass cover, river & lake, wetland & coastal zone and human settlement*), **served for human survival & development demands and linked with water cycle in basin or global scale, not allow to be damaged** (Jun XIA, 2018)

- Healthy water ecosystems are stable and sustainable
- Conversely, unhealthy water ecosystems are that with incomplete or unhealthy water cycles, and ecosystem security is under threat



02

An excellent case of Dujiangyan Irrigation Project



2. An excellent case of Dujiangyan Irrigation Project

For the SDGs, **water policy in China** is being shifted to **the modern ecological water conservancy**, linked with **the ecological civilization construction**, addressed by **President Xi Jinping, PRC**, since 2012

河北塞罕坝



环球资讯



新时代推进生态文明建设
六大原则

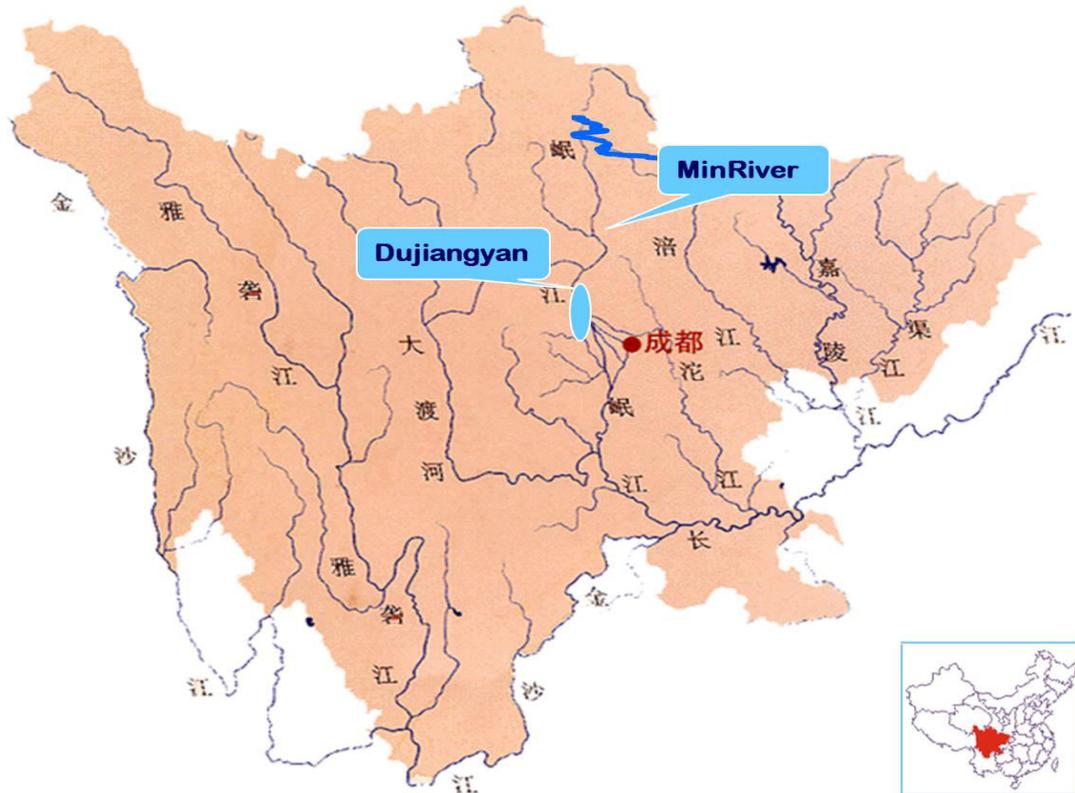
- 坚持人与自然和谐共生
- 绿水青山就是金山银山
- 良好生态环境是最普惠的民生福祉
- 山水林田湖草是生命共同体
- 用最严格制度最严密法治保护生态环境
- 共谋全球生态文明建设



2. An excellent case of Dujiangyan Irrigation Project

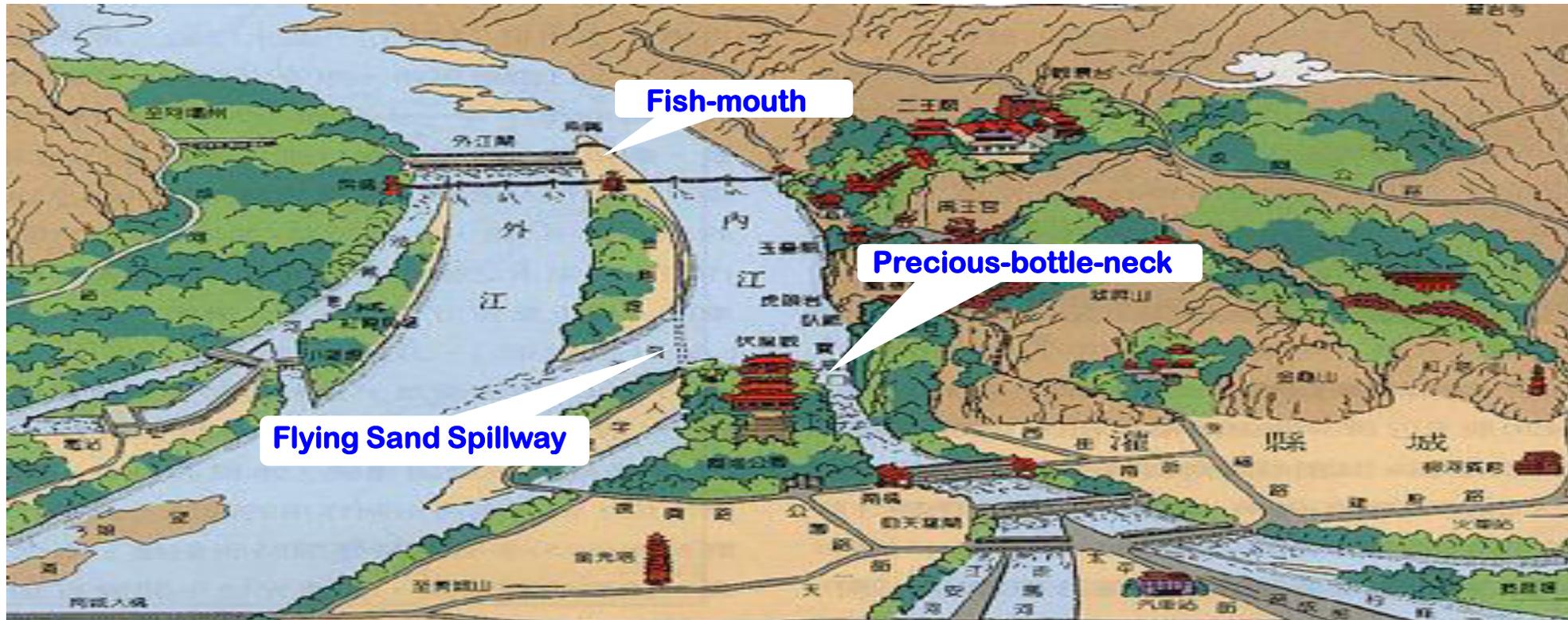
In fact, China has a longer history on the concept of eco-water conservancy and its practice

Such as **Dujiangyan Irrigation Project** in Sichuan, Yangtze River



2. An excellent case of Dujiangyan Irrigation Project

It is the world so far, has been running for **more than 2000 years**, the oldest, the only remaining, with no dam water diversion as the characteristics, still **play a huge benefit of the grand ecological water conservancy project**



2. An excellent case of Dujiangyan Irrigation Project

What we can learn from this ancient irrigation project ?

- 1) It scientifically solves the difficult on automatic diversion of river water, automatic sand discharge, and control of the inflow for irrigation**
- 2) It eliminates the flood disaster**
- 3) No dam water diversion to maintain the ecological sustainability of rivers**



So that, this project resolved the problems of irrigation, flood discharging and sands reduction effectively, breeding Chengdu plain as the Land of Abundance

03

Perspectives on ecological water conservancy



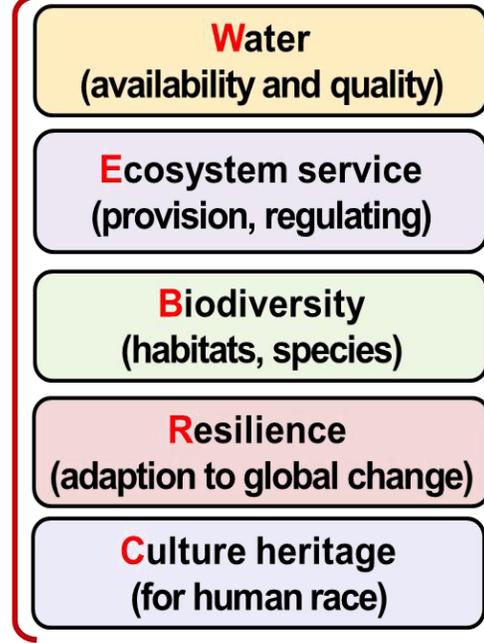
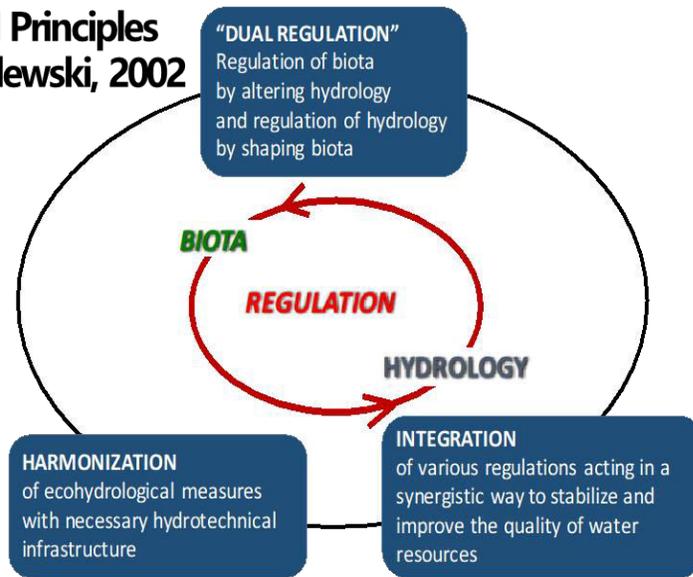
3. Perspectives on ecological water conservancy

1) The science & technology for ecological water conservancy is being strengthened, such as ecohydrology and its application

e.g.,

Ecohydrology for restoring Yangtze

EH Principles
Zalewski, 2002



EH inspired integrated watershed management and NBS solutions

3. Perspectives on ecological water conservancy



Eco-hydrology

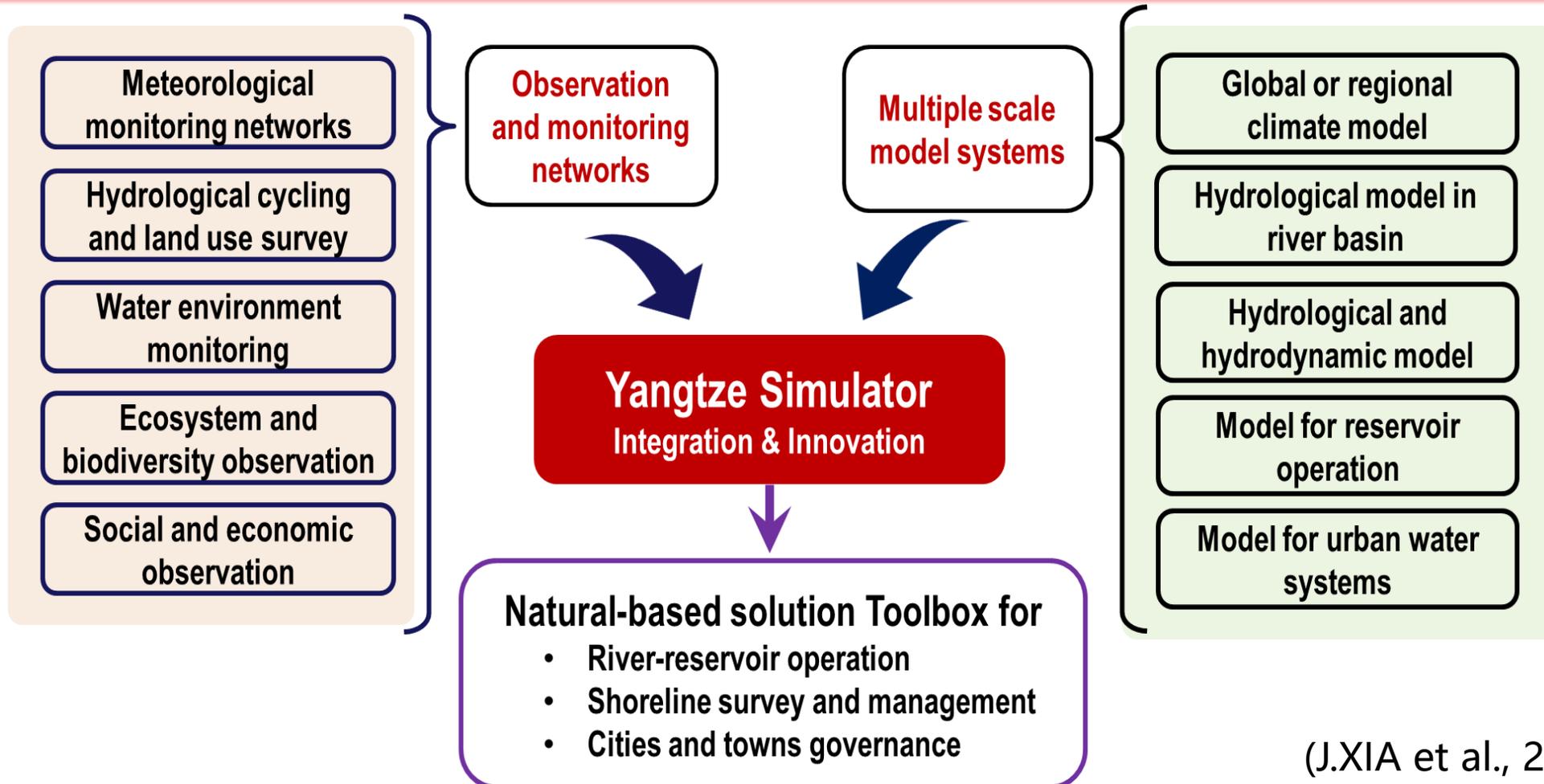


➤ **Ecohydrology** is an **integrative** science studying the **interaction** between hydrology and biota and using natural processes as management tools to **reinforce ecosystem services** on a broad range of landscapes (e.g.: coastal, urban and agricultural areas)



3. Perspectives on ecological water conservancy

e.g., **Yangtze River Simulator (YS)** was developed, providing effective tool for Monitory-Modelling and its applications on NBS



(J.XIA et al., 2018)

3. Perspectives on ecological water conservancy

For instance, **it can be applied to balance multiple use of water**

- 1. *Water Services and Uses*** Multiple use of water in irrigation areas could involve
 - ***Irrigation Service*** (Irrigated field crop production, Domestic use, Fisheries Livestock, Forest, grasses, and chena),
 - ***Domestic Service***
 - ***Environmental Uses***
- 2. *Water Accounting*** i.e., It important for an accurate assessment of all the uses and users of water, which involves a water accounting procedure that can quantify the different uses of water and gives a better understanding of the relative quantities used by different sectors. It can give an indication of the performance of sub-basin water management.

3. Perspectives on ecological water conservancy

3. Valuing the Multiple Uses of Water

This is a big also rather difficult issue. Valuing the Multiple Uses of Water involve ***the Value of Water, Valuing the Productive Uses of Water, Valuing the Nonproductive Uses of Water.***

For Valuing the water, it is good to distinguish different concepts: ***water pricing, economic value of water, and other values of water.***

4. Complementarities, Competition, and Conflicts

When water becomes scarce, there is more competition and even conflicts over water, particular on competition, complementarity, and conflict between uses. This trend will continue.

3. Perspectives on ecological water conservancy



2) Novel water governance for ecological water conservancy

e.g., The **Yangtze River Protection Law**, was passed at the 24th Standing Committee session of the **13th National People's Congress** on Dec.27, 2020, which contents 9 chapters, a total of 96 articles, i.e.,

- *General Provisions,*
- *Planning and Control*
- *Natural Resources Protection*
- *Water Pollution Control*
- *Ecological Environment Restoration,*
- *Green Development*
- *Guaranty and Supervision*
- *Legal Liability and Supplementary*

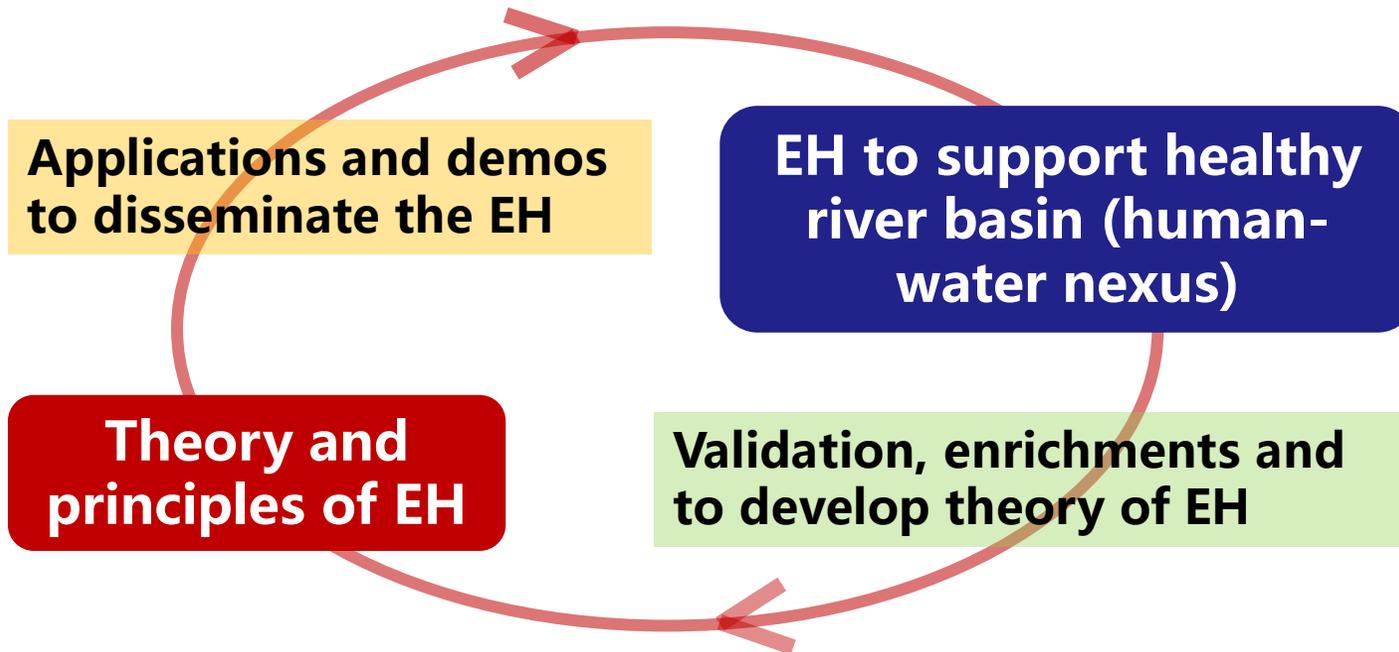


Conclusion Marks



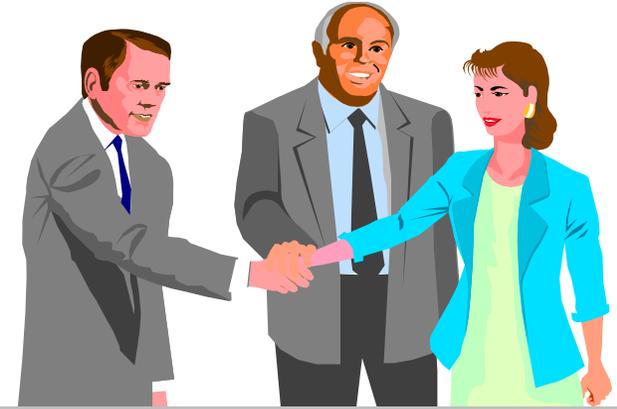
1. Eco-water security needs integrated river management

- Policy level, technical level, education & AI for innovating decision-making



2. Dujiangyan Irrigation Project is an excellent example need to be learning for construction of modern ecological water conservancy

Thank you !



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