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5th Yellow River Forum, Sept. 2012

基于骨干枢纽 重构新的平衡
Rebuilding balance based on
the key hydrop-projects

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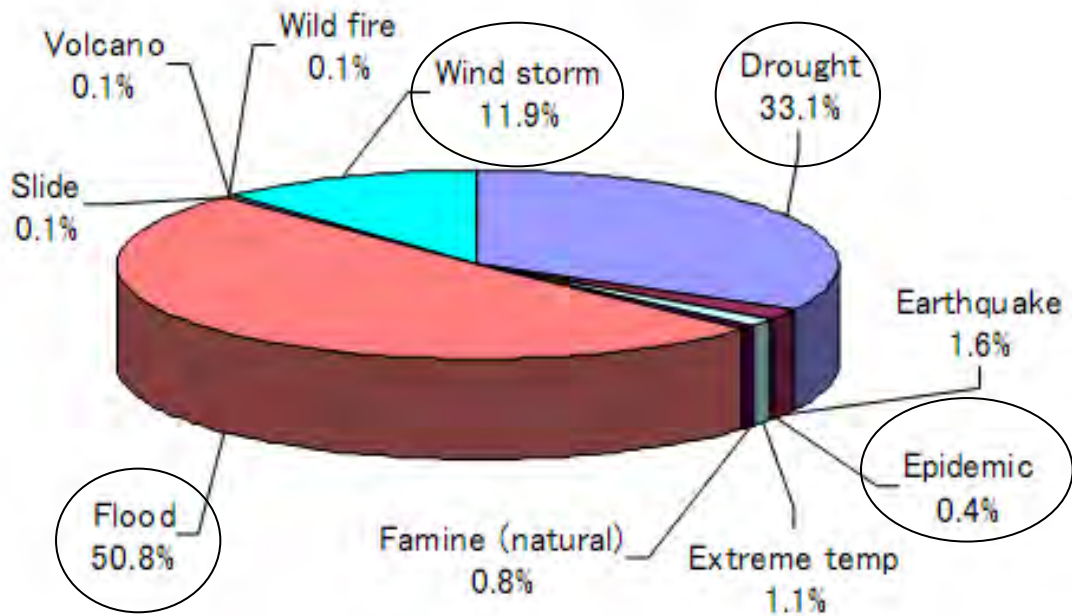
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1. Introduction

- China is a big country suffered by sever floods in its long history.

Number of Total Affected People
(World/ Disaster Type) (1975-2005)



Source: CRED-EMDAT, Université Catholique de Louvain, Brussels, Belgium, 2005

“善为国者必先除五害。水一害也，旱一害也，风雾雹霜一害也，疠（瘟疫）一害也，火一害也，此谓五害。五害之属水为大”

——《管子·度地篇》

A man who is adept at running a state should eliminate Five Hazards ahead. One is flood; one is drought; one is harmful weather including wind storm, fog, hail and frost; one is epidemic, and one is pest. These are called the Five Hazards. Flood is the severest one among the Five Hazards.

From Guanzi
(475-221 BC)

Basic Features

中国水系图

长江	6300	珠江	4800
黄河	5464	淮河	4300
黑龙江	5420	京杭	1797

Floods occurred in major rivers of China in 20th Century

River basin	>20 year flood	10-20 year flood	5-10 year flood	Sum to
Yangtze	6	19	33	58
Yellow	4	4	15	23
Huaihe	4	9	14	27
Haihe	3	5	10	18
Songhua	3	4	16	23
Liaohu	3	6	17	26
Zhujiang	5	5	16	26
Zhe-Min area	3	3	6	12
Total	31	55	127	213

图

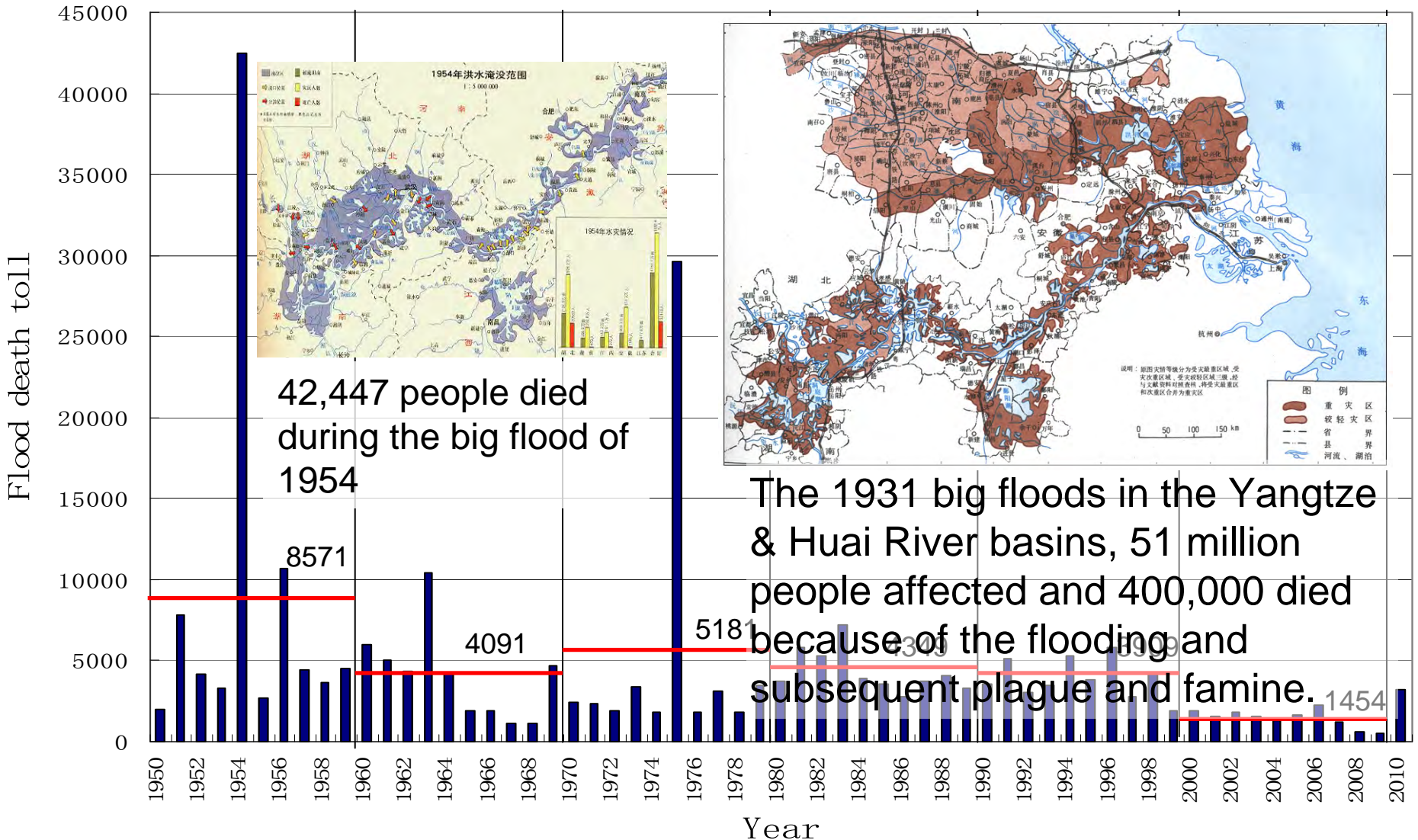
内外流区域界

比例尺

0 350 700 (km)

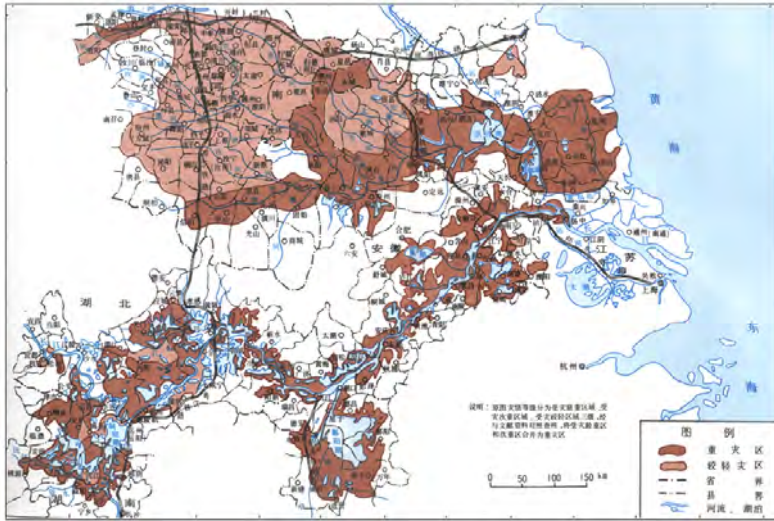
南海诸岛

Flooding death toll in China (1950-2010)



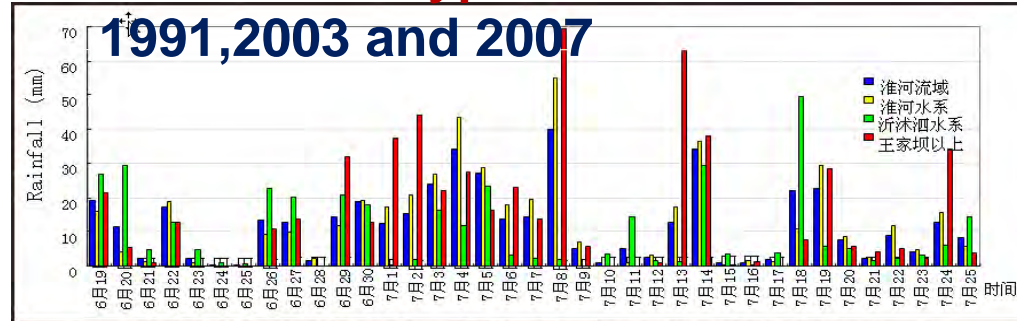
Historical events of big floods

The first type: the Yangtze and Huaihe Flooding in 1931

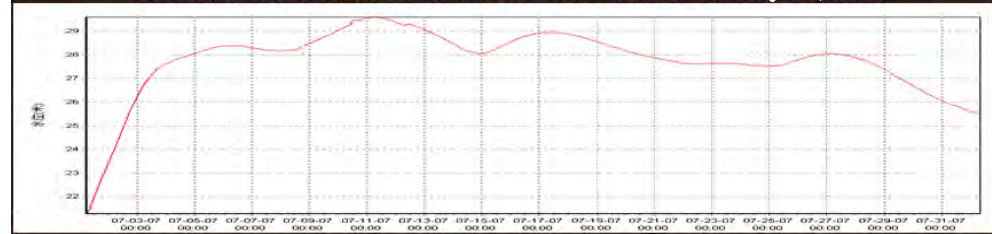


The second type: floods in

1991, 2003 and 2007



Rainfall in the Huai River basin from June 19 to July 25, 2007



Hydrograph at the Wangjiaba station during July 2007

The third type:
flood in 1975
Max. rainfall:
830mm in 6hr
and 1,060mm in
24hr in storm
center.

Collapsed Banqiao Dam

Collapsed Shimantan Dam

北江大堤保护区历史洪水风险图（1915年）

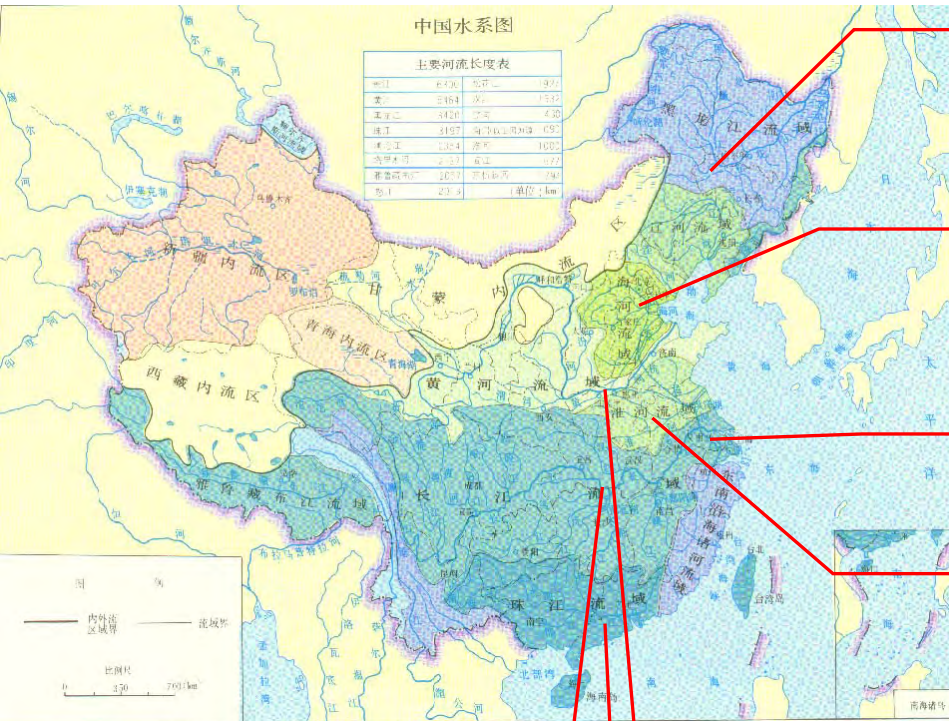


The 1915 flood



- In July 1915, big floods occurred in the North and the West rivers simultaneously with return period of 200-year. Guangzhou was flooded in 7 days. In the delta region of the Pearl River, 432 000ha farmland and 3.78 million residents were affected with casualties more than 100 thousand.

Seven River Basin Water Resources Commissions, MWR



Song-Liao River Water Resources Commission, 1982

Haihe River Water Resources Commission, 1979

Taihu Basin Authority, 1984

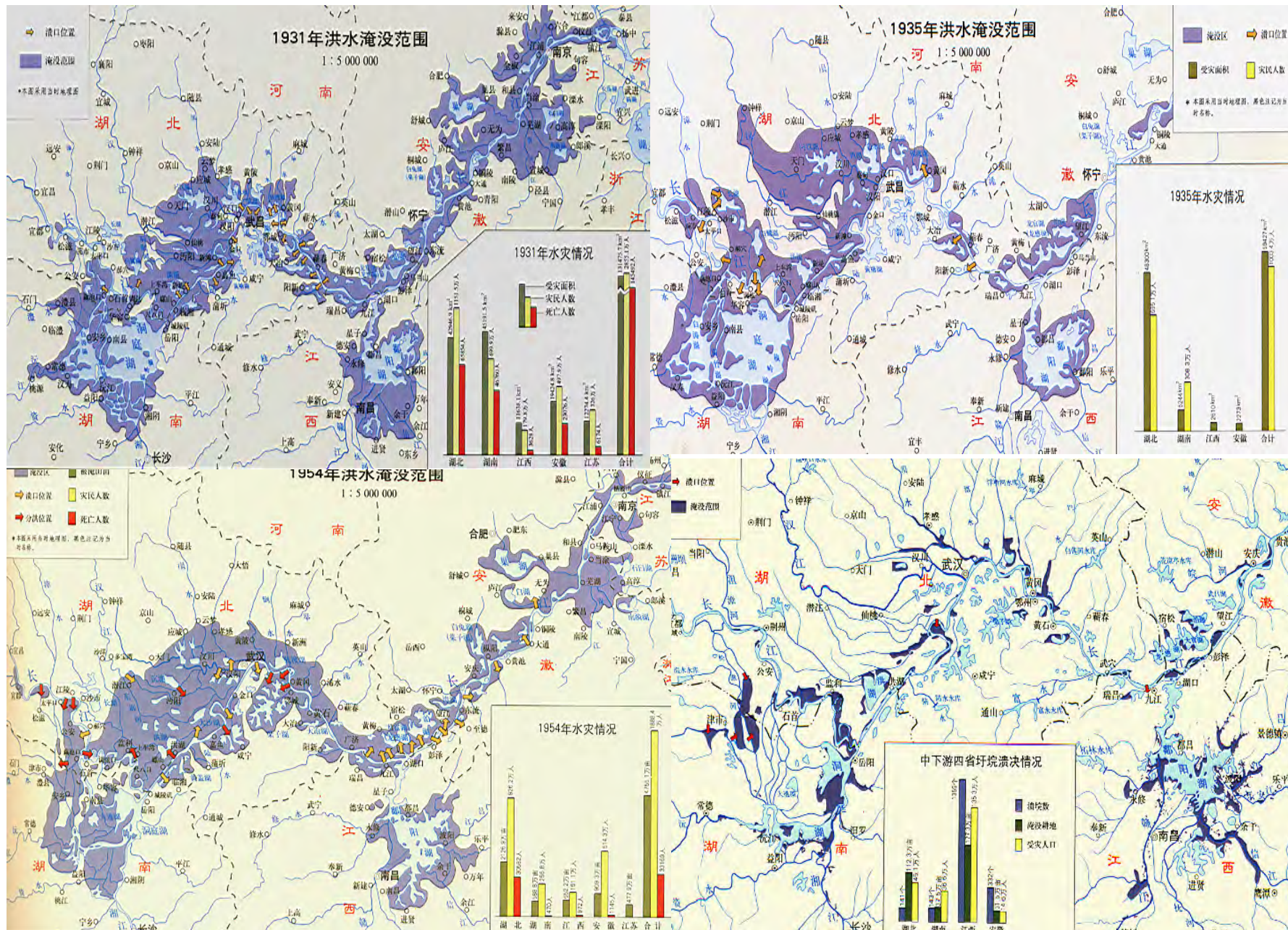
Huaihe River Water Resources Commission, 1950

Chang Jiang Water Resources Commission, established in 1950

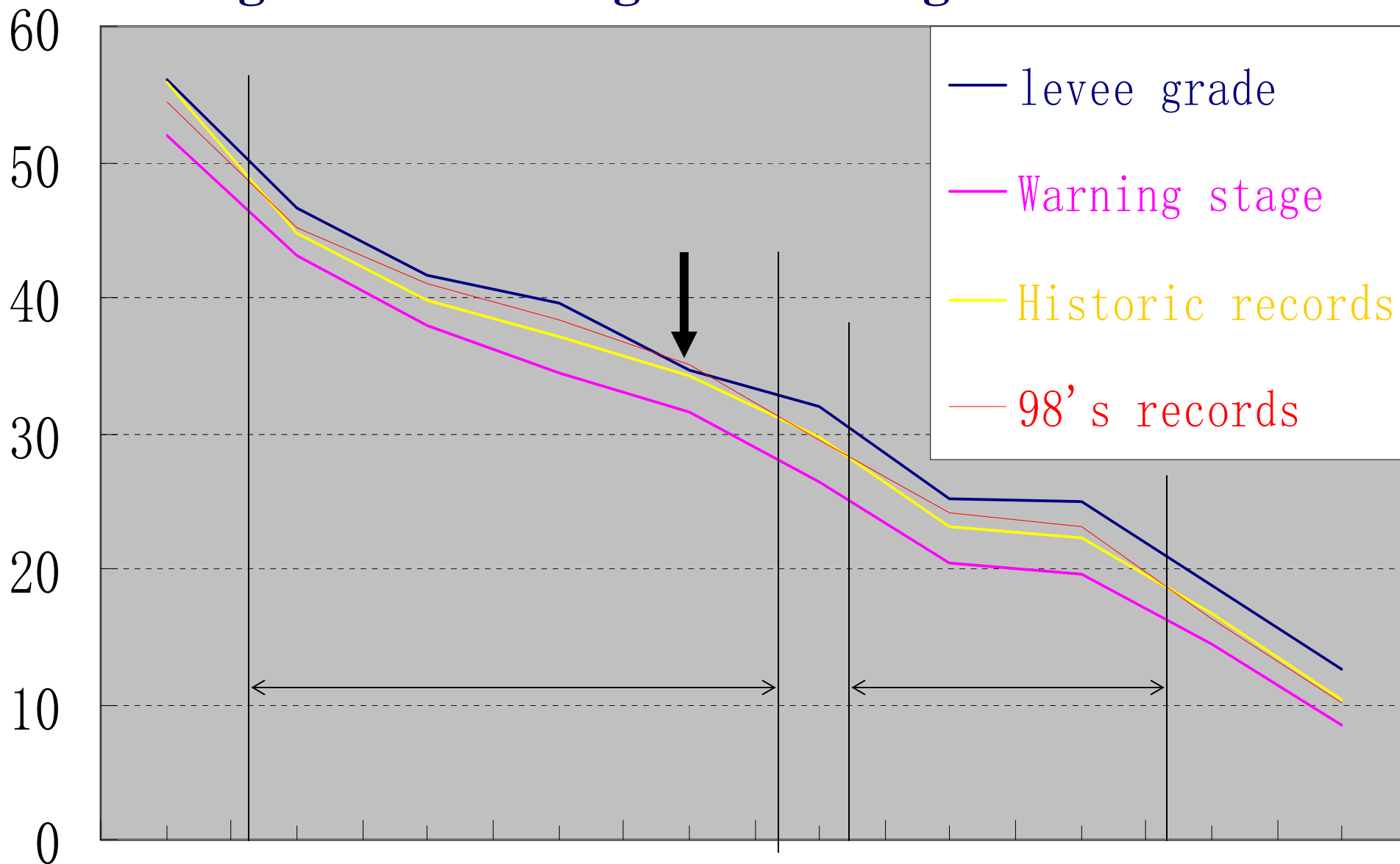
Yellow River Conservancy Commission, 1950

Pearl River Water Resources Commission, 1979

Impact of the flood control systems



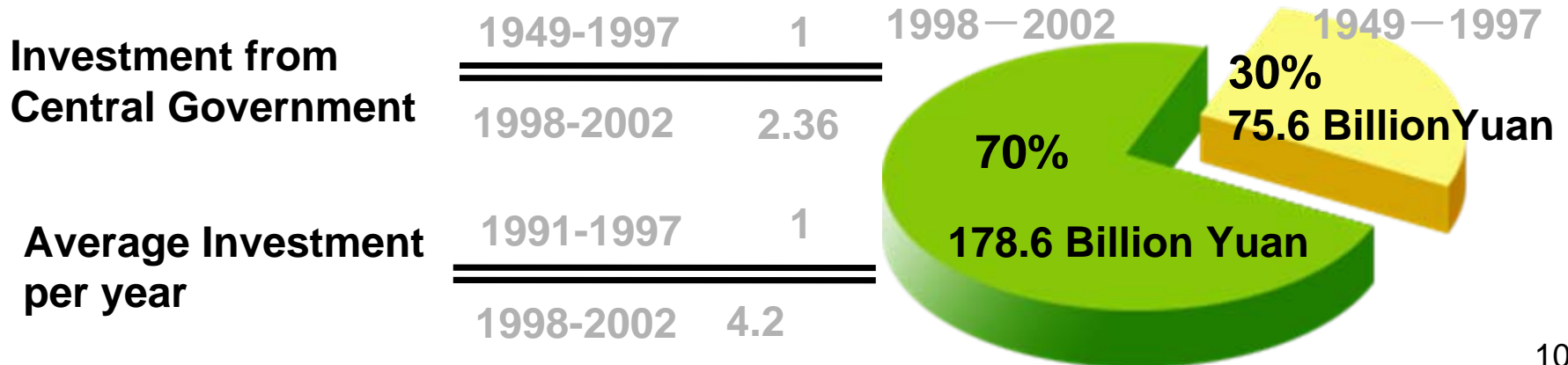
The Highest Water Stage of the Yangtze River in 1998



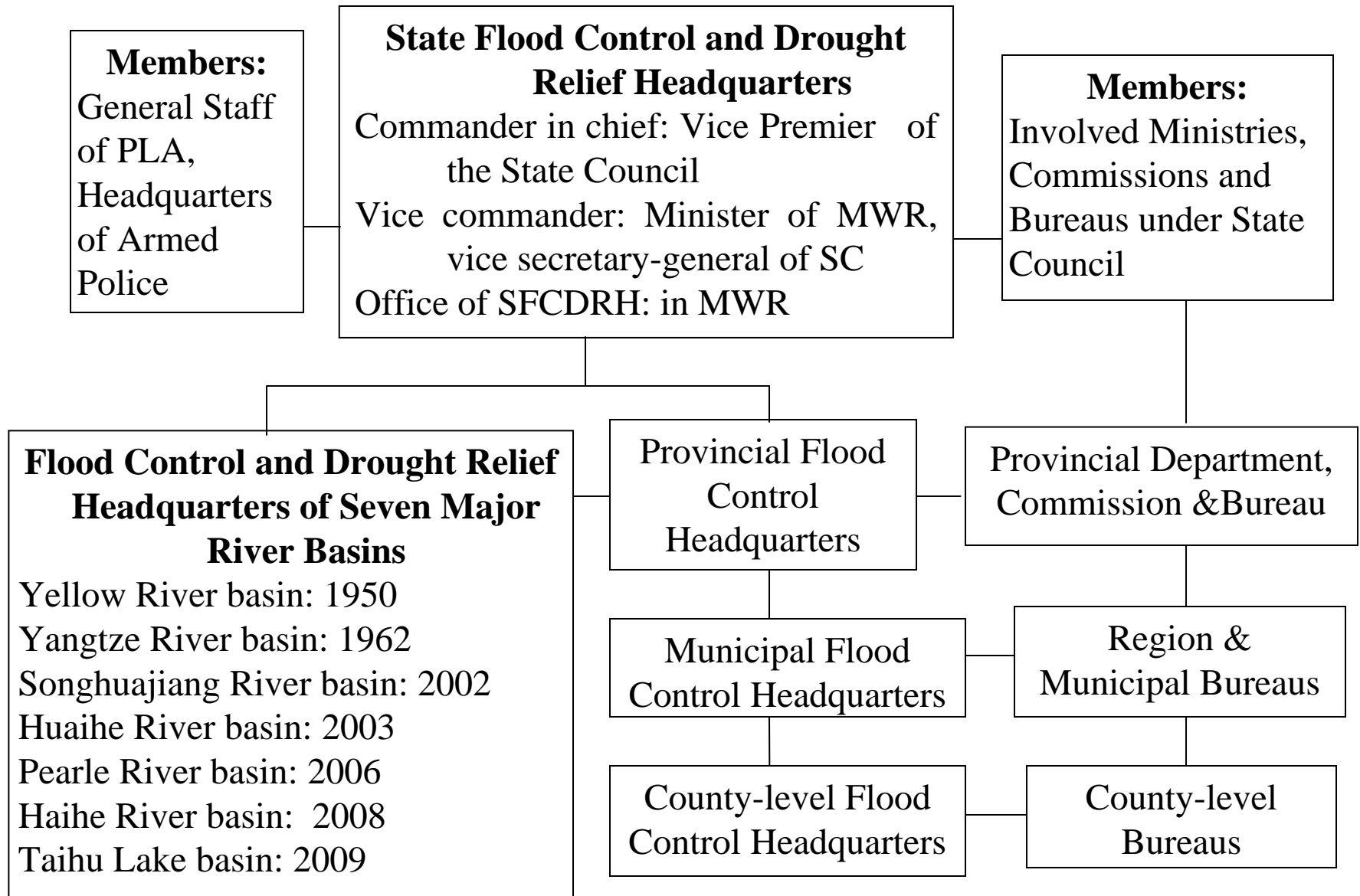
宜昌 沙市 石首 监利 螺山 汉口 武穴 九江 大通 南京

Flood fighting in 1998 : a great turning point in accelerating the process of flood management in China

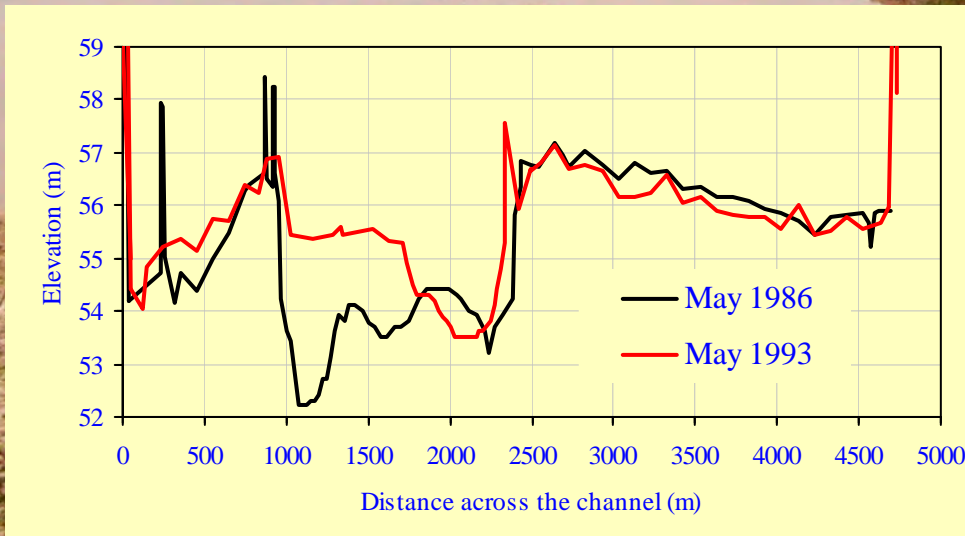
- After the 1998 flood, the investment in enhancing flood control system has been increased several fold, and people commenced to explore the flood prevention and mitigation issues in a wider field of vision on society, economy, environment, ecosystem, population, resources and public security, etc, which formed a new thinking of water governance to promote a harmonious relationship between man and nature for the sustainable development.



Emergency management system and response mechanism

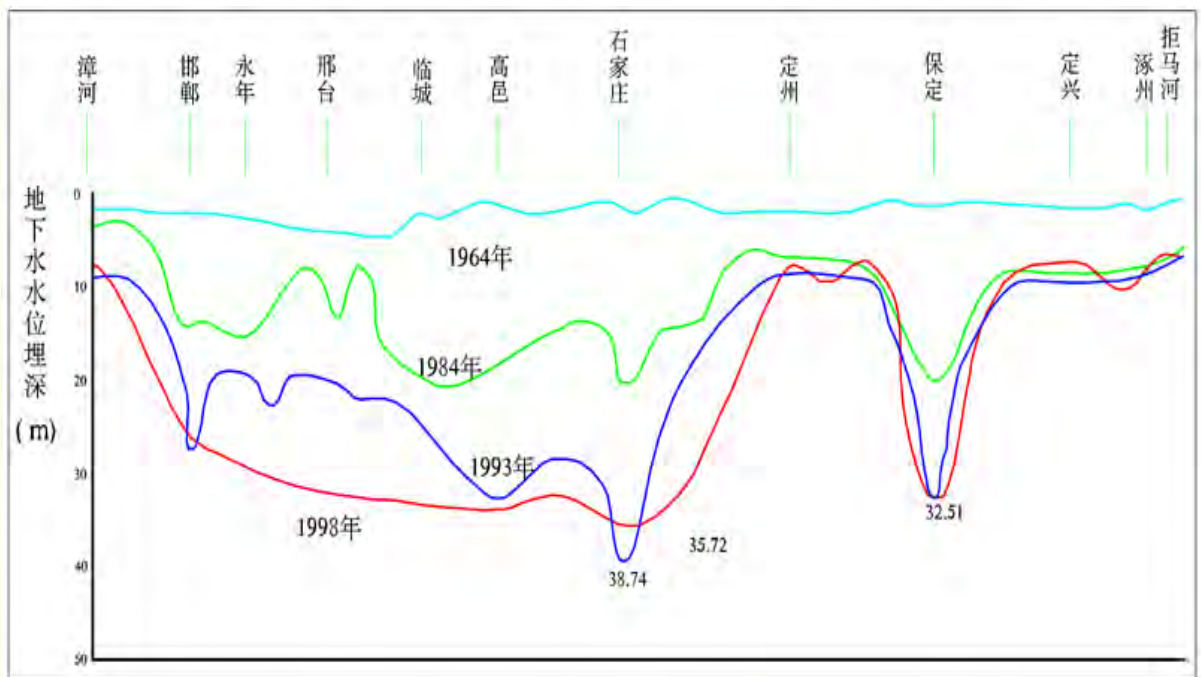
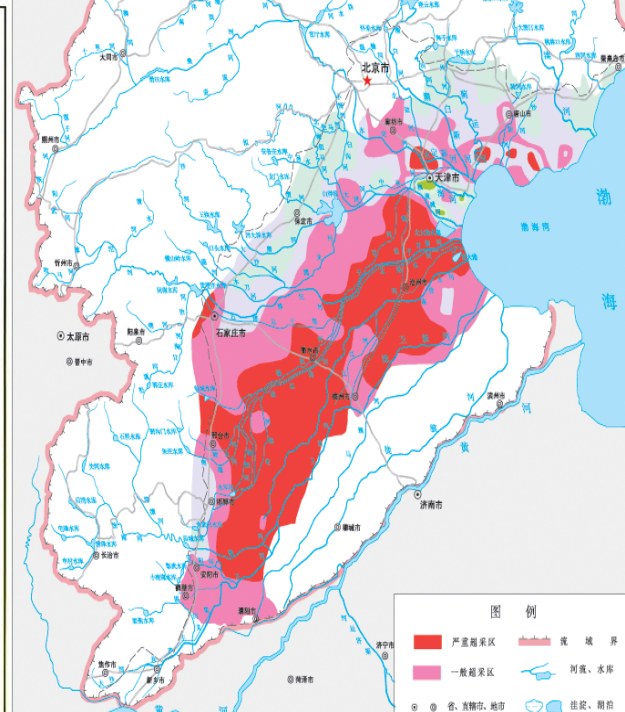
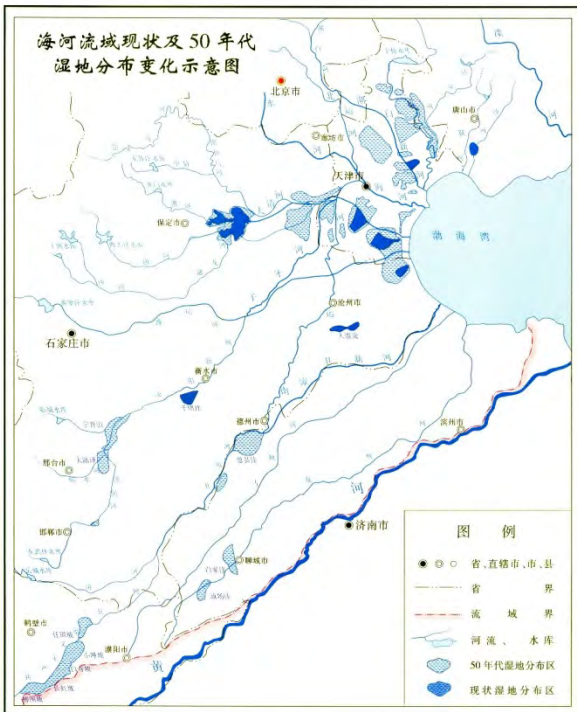
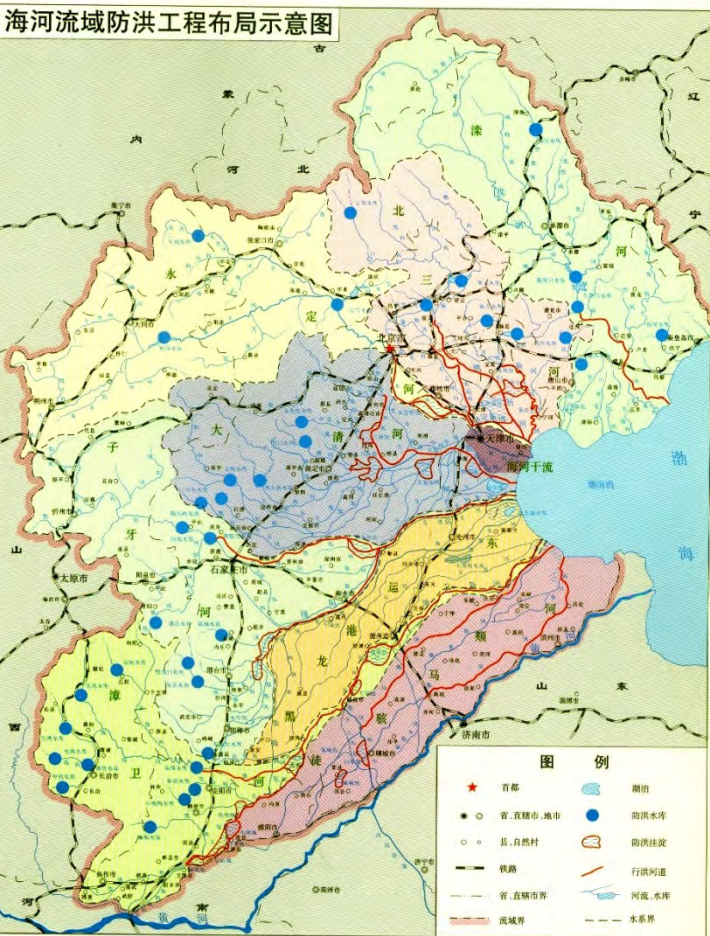


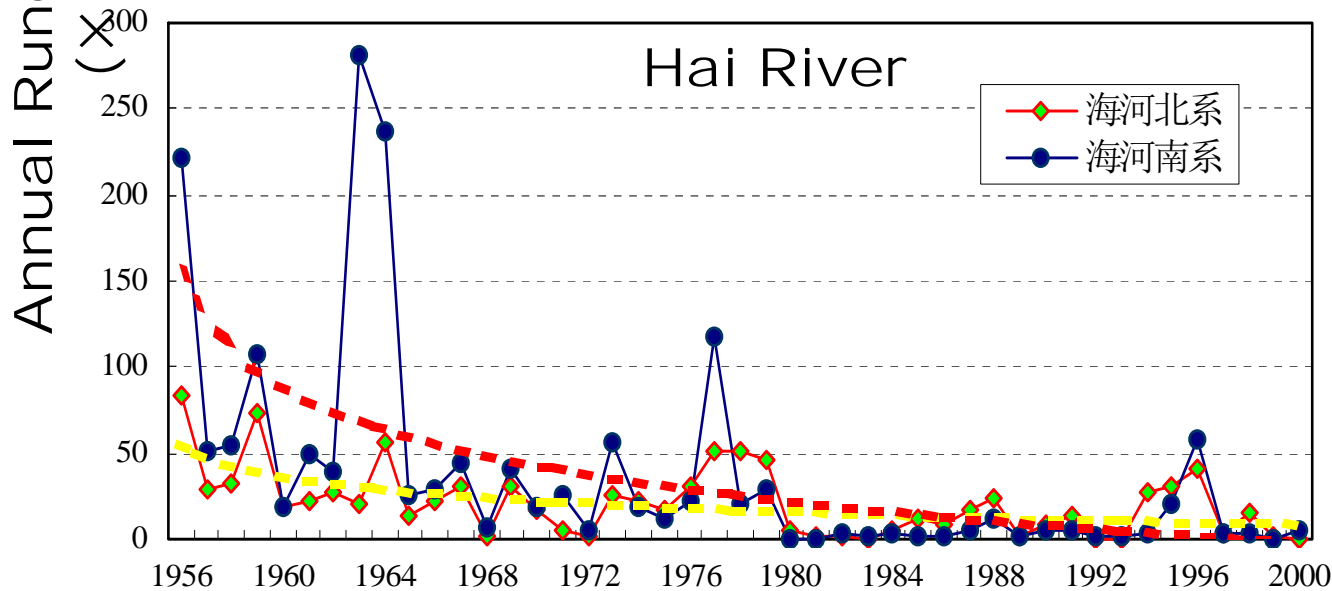
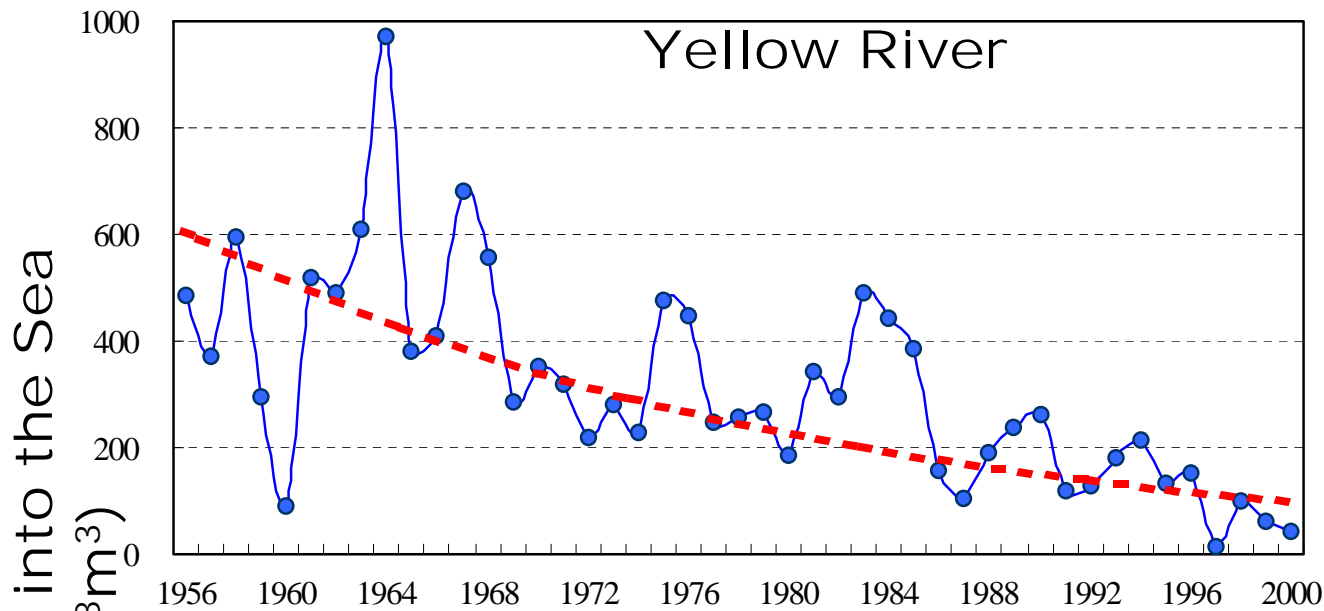
Changes of flood control situations of the lower Yellow River



Changes of flood control situations in the Haihe River basin

海河流域防洪工程布局示意图



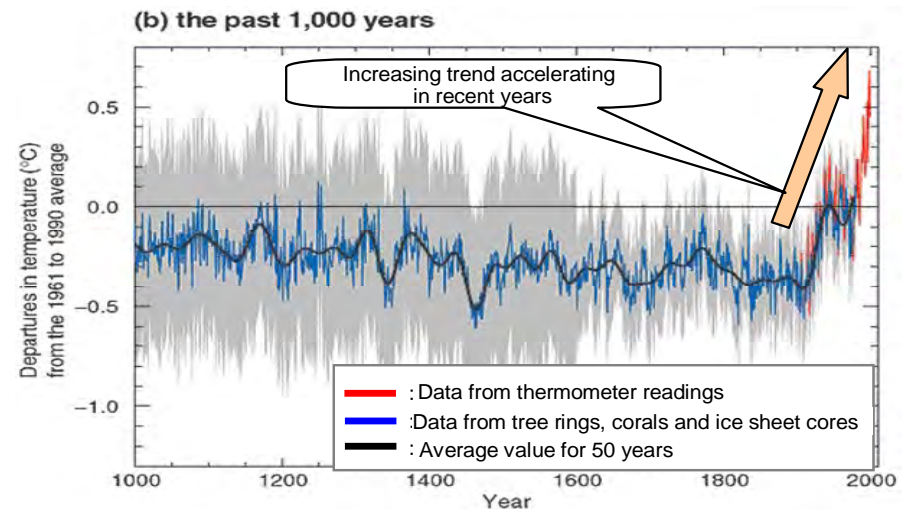
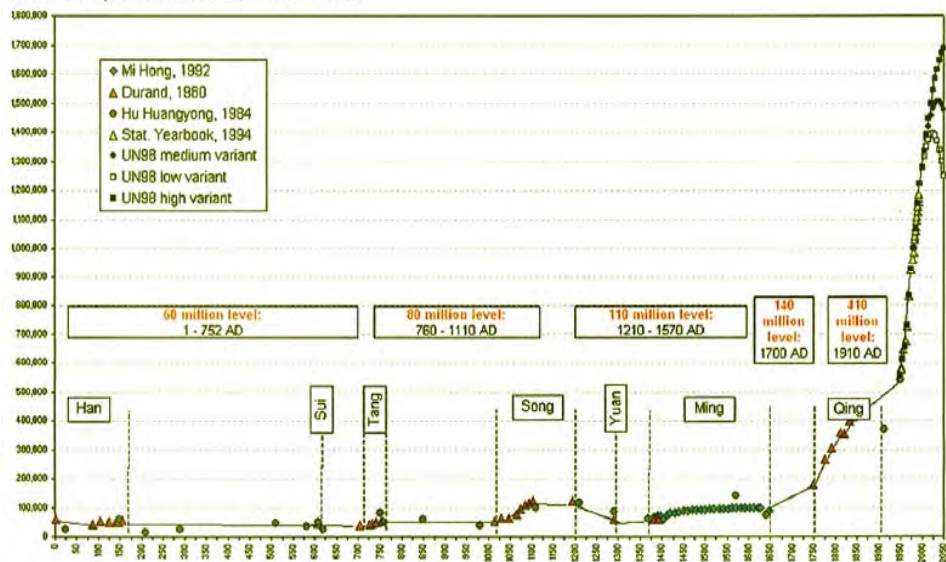


From 1950s to 1990s, the annual runoffs into the sea have been decreased by 77% from the Hai River, 70% from the Yellow River, 26% from the Huai River.

2. Rebuild a new balance based on the key flood control projects

- For a stable and good life, people always hope to construct an orderly but not chaotic society; hope to live in a relatively steady but not unadaptable surroundings.
- However, such kind of order and relative stability may be disrupted by the changes of some specific elements from the surroundings, and may be broken down by the development of human itself or their major actions.

China's Population Growth, A.D. 0 - 2050



Excerpts from "Climatic Change 2001", a Report of the First Working Group in the Third Evaluation Report of the IPCC

How the challenges can be addressed

- Rapid process of urbanization
- Weak flood control and drainage system
- The gap between rich and poor
- Increasing uncertainties in global warming
-

How to meet the basic needs of survival?

Lower demands in security

Flood control system developed in a whacky circle

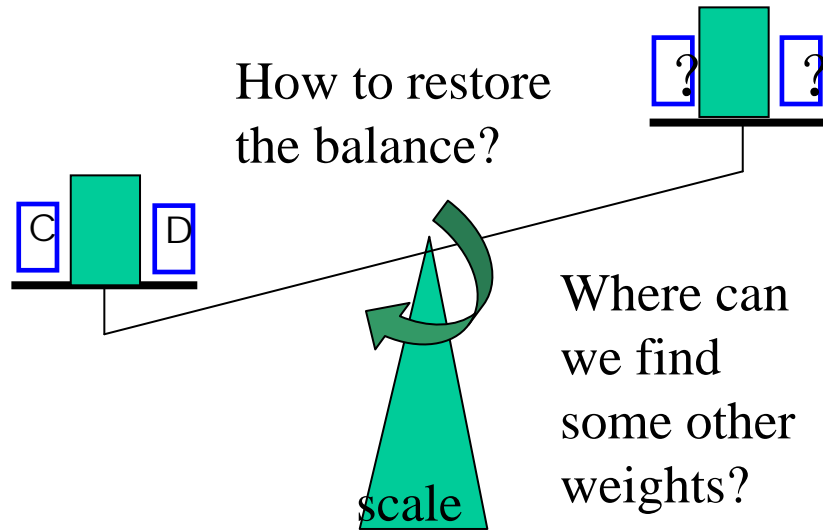
Lower technical ability

Low level of urbanization

Undeveloped stage

How to enhance or create new balance step by step to meet the demands of rapid and smooth development?

Developing stage



How to keep or rehabilitate the existed balance?

How to cope with the challenges coming in the future?

High level of management, with strong economic and technical capacities

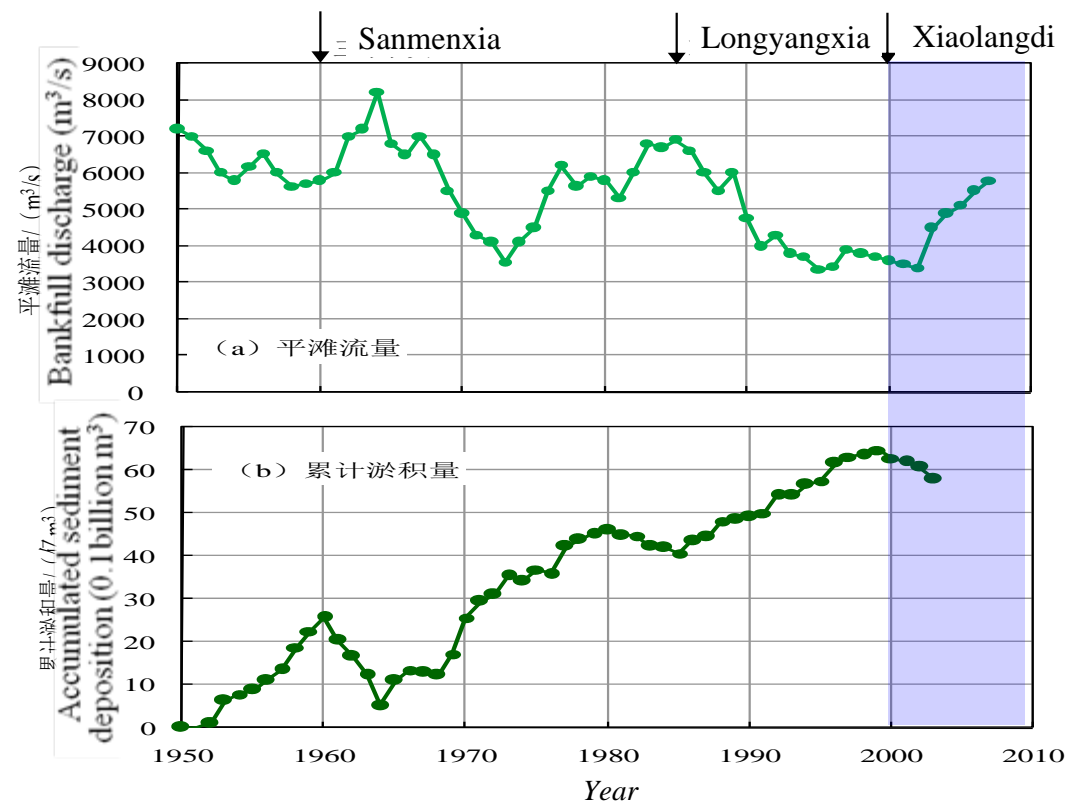
Sustainable development stage

Some key hydro-projects in China



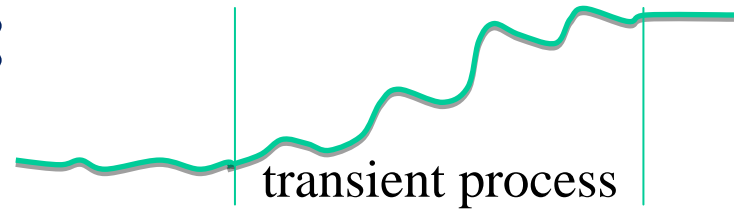


Along with the rapid increase of population and urbanization, demands of water supply, food supply, and power supply growth rapidly, as well as flood prevention.



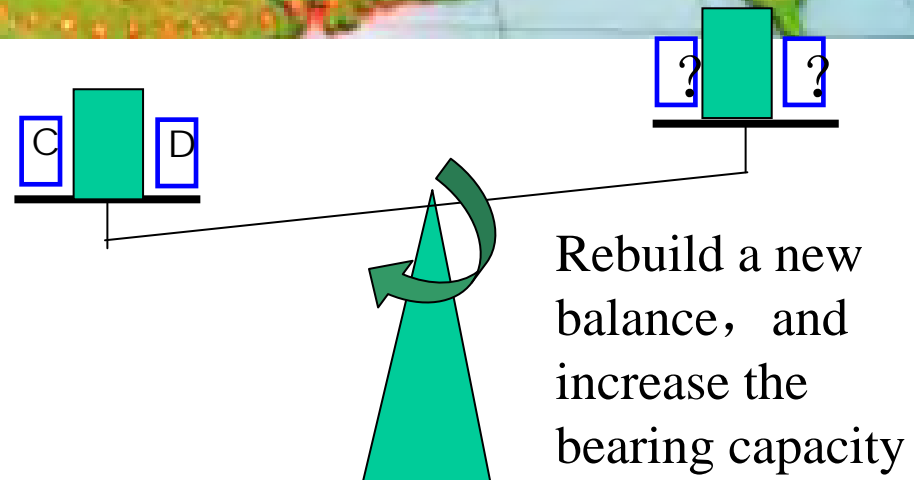
Dam construction is to satisfy the growing fundamental demands for human development, and to rebuild a new balance that the nature itself has not been able to provide.

Rebuild a new balance: Opportunities and risks



The water level fluctuate considerably in the reservoir will cause the geological disasters. Sediment deposited in the reservoir and clean water release, inevitably lead to the river erosion deposition. Water level fluctuation and water temperature changes in the lower reaches and hard to avoid the impact on fish reproduction.....

Such a composite system may be rebuilt to a new balance through a transient process under the forces of both man and natures.




Evolution of the ecological environment of the middle and lower Yangtze River has long been clear

Flood storage volume of lakes decreased from $102.3 \times 10^9 \text{ m}^3$ (1954) to $10 \times 10^9 \text{ m}^3$ (1998).

The water rate of the Jiangnan Plain decreased from 25% (1940) to less than 10% (2000).



There were more than 100 lakes with area larger than 10 km^2 around the middle and lower Yangtze River and linked each other. However, apart from the lakes Dongting and Poyang, the passages between these lakes and the Yangtze had been cut off since 19th century.

 Dongting Lake decreased from 6000km² in early 19th Century to 4350 km² in 1949, and further to 2625 km² in 1995 due to sedimentation and polder reclamation





River –linked lakes declined sharply and lake areas decreased have brought a series of problems



The baiji had almost disappeared in 1990s

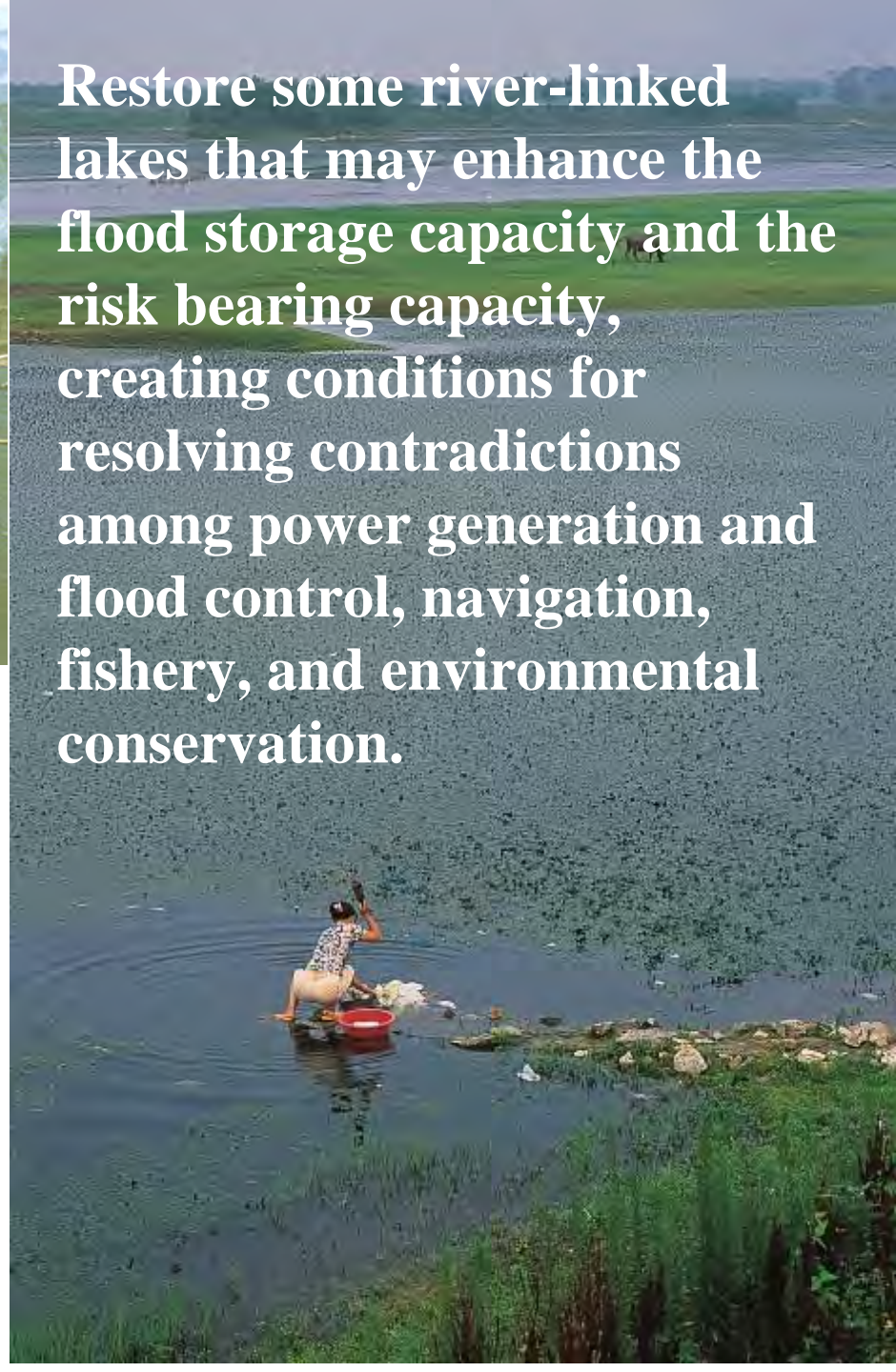


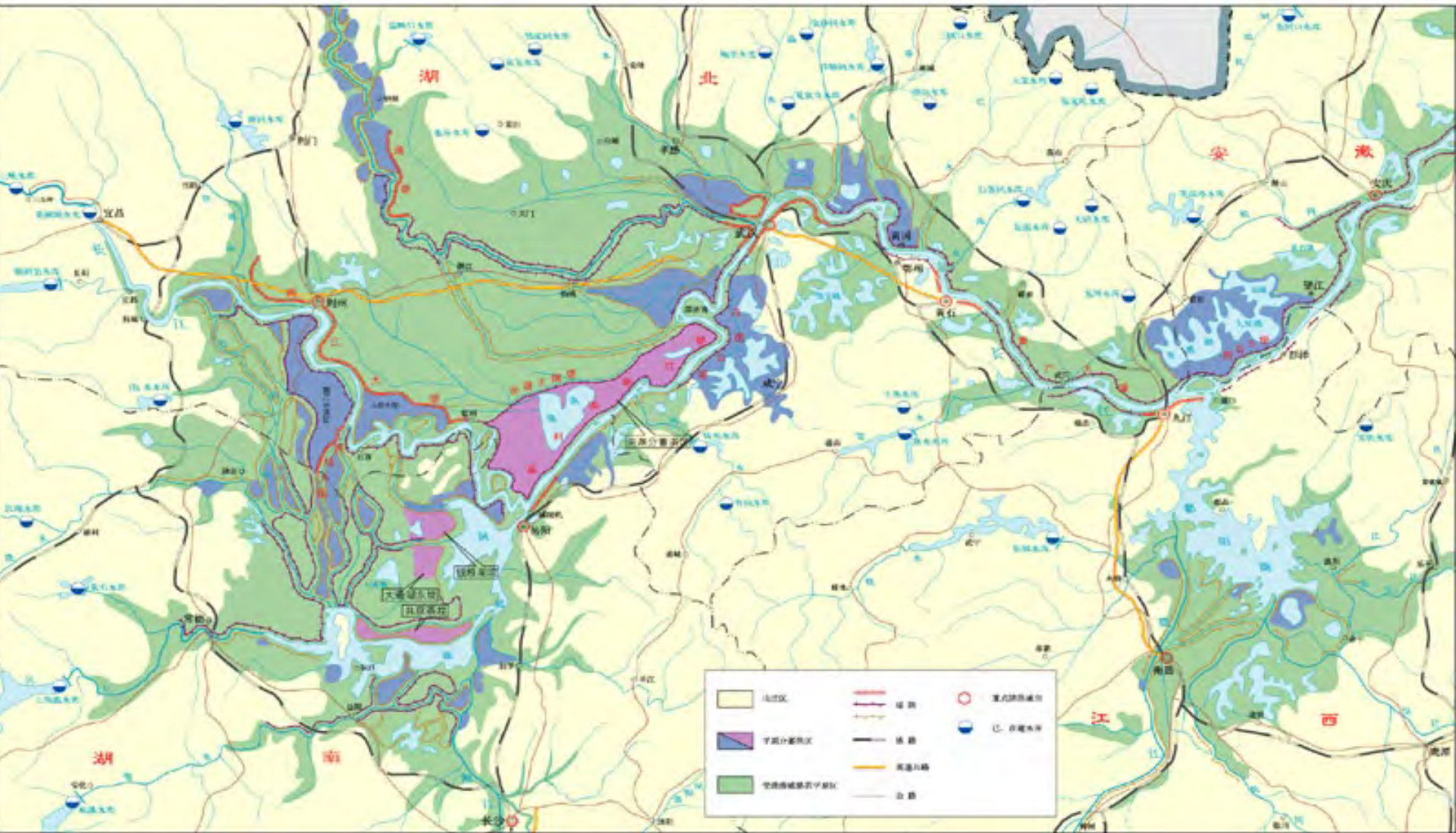
Migratory fishes and semi-migratory fishes decreased in the Yangtze River and the diversity of fish reduced significantly in the lakes.



Restore some river-linked lakes that may enhance the flood storage capacity and the risk bearing capacity, creating conditions for resolving contradictions among power generation and flood control, navigation, fishery, and environmental conservation.

Three Gorges Project creates a possibility for the restoration of eco-environment along the middle and lower Yangtze River





Safety construction of flood detention areas offers an opportunity for the restoration of eco-system

Conclusions

- Fluvial flooding is a major type of floods in China, and flood control is the main function of the key hydro-projects in large rivers.
- China, as a large developing country, is facing more pressure in water securities, which is also a big challenge for many countries over the world to realize the millennium development goals.
- How to rebuild balance based on the key hydro-project on large rivers is a challenge for us.
- We are willing to learn from all around the world, and contribute our experiences to solve such a worldwide problem.



**Thank you for
your attention!**

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