



# Reconsidering Water Resource Comprehensive management

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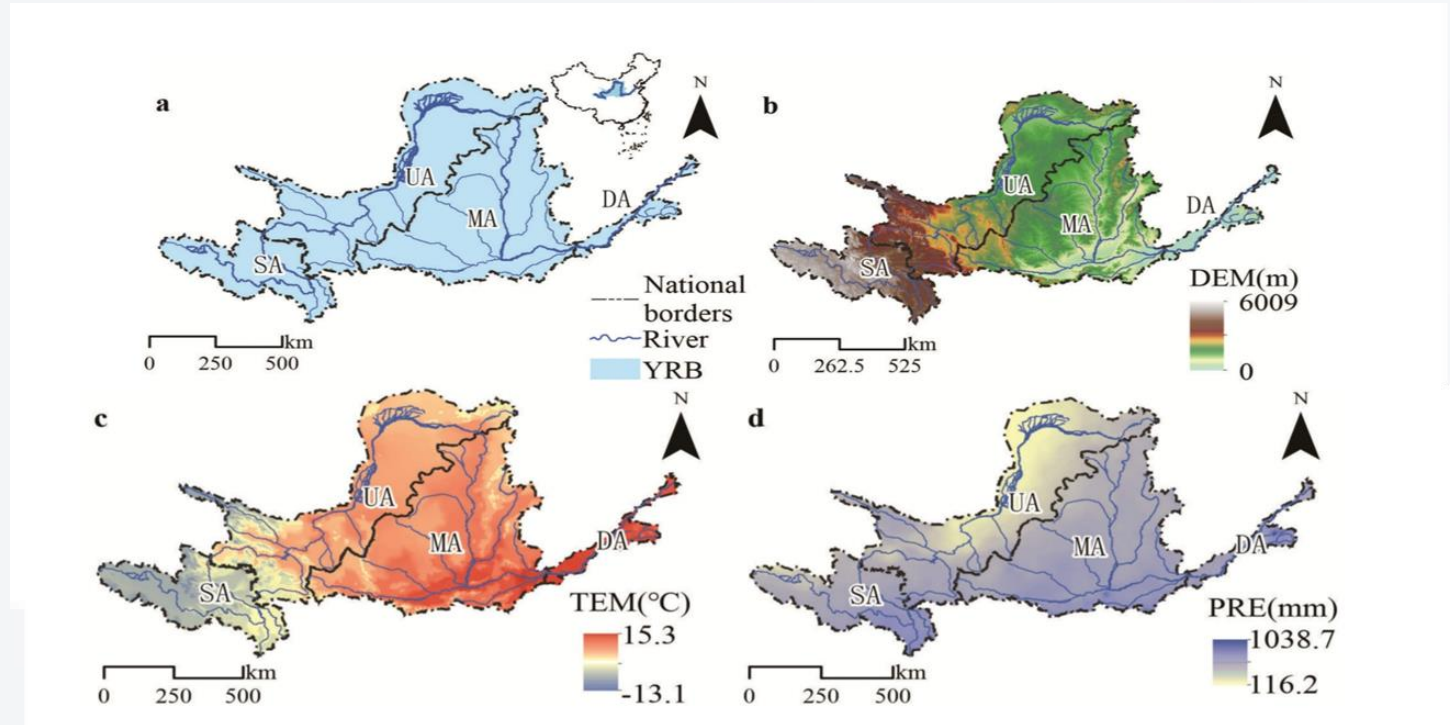
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# Content

- **Is there any changes of element of nature related to water?**
- **How do we manage water resource in an adaptable way?**

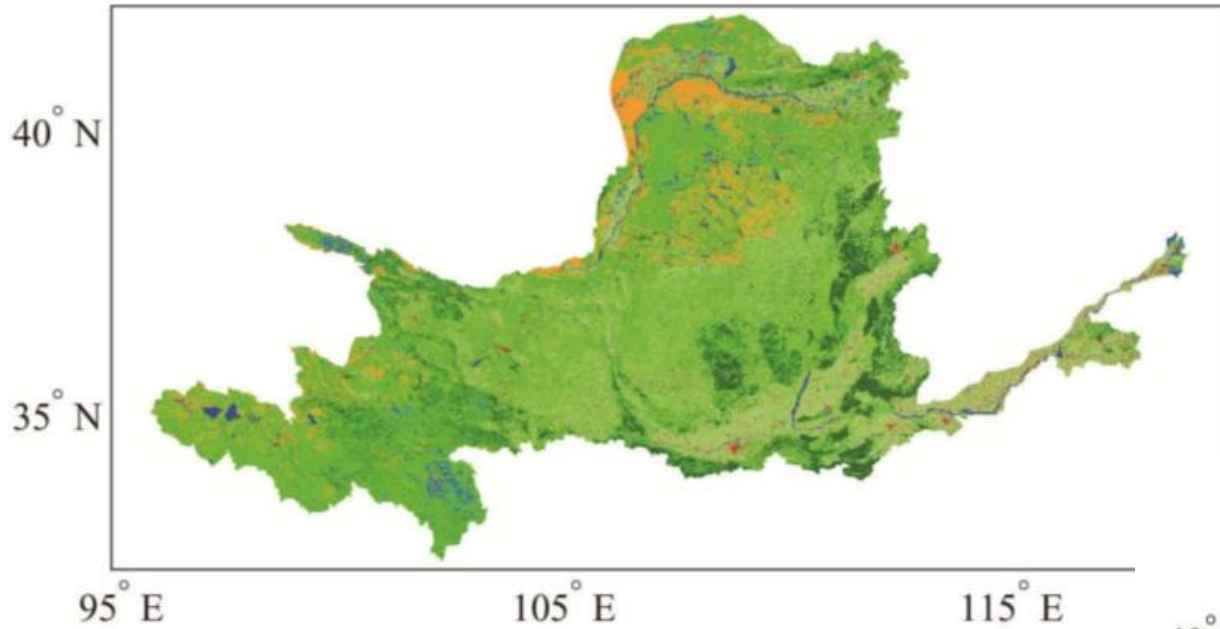
## The land use and land cover

The cumulative area of human-induced land cover change reaches 65.71 million ha from 1980 to 2015, which is close to the total area of the Yellow River Basin.

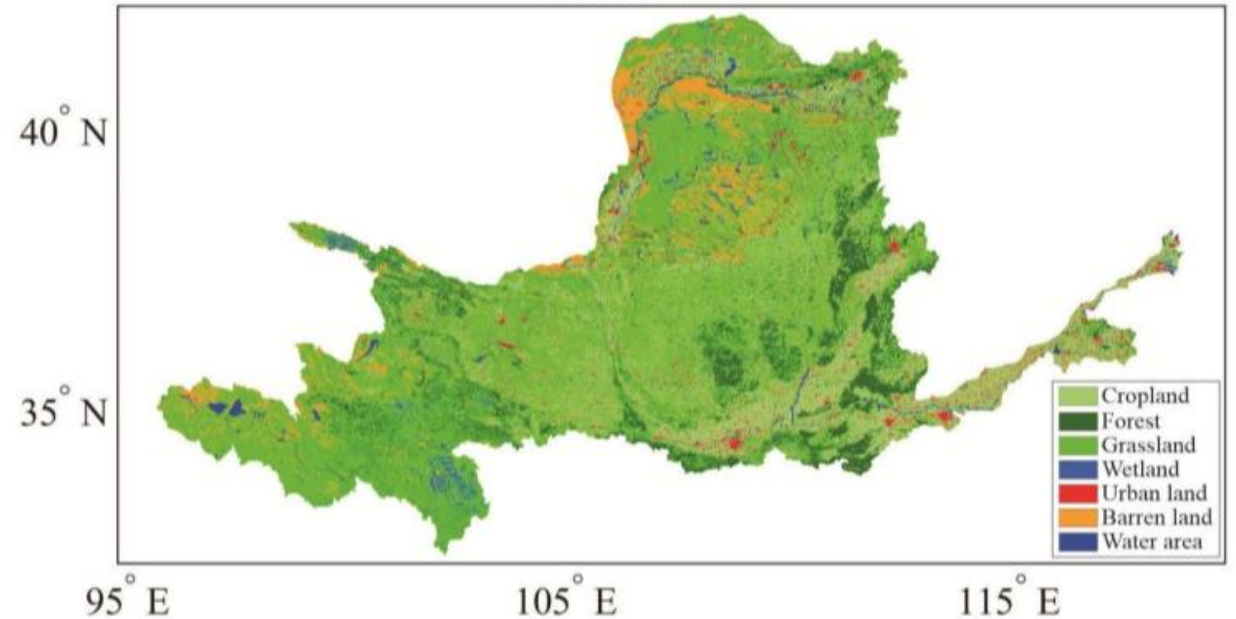


According to Liu Bo and the others study in the “Land Use and Land Cover Change in the Yellow River Basin from 1980 to 2015 and Its Impact on the Ecosystem Services “

### 1980 LULC



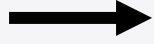
### 2015 LULC



The most change forms:

Natural area

Farmland



urban

Farmland



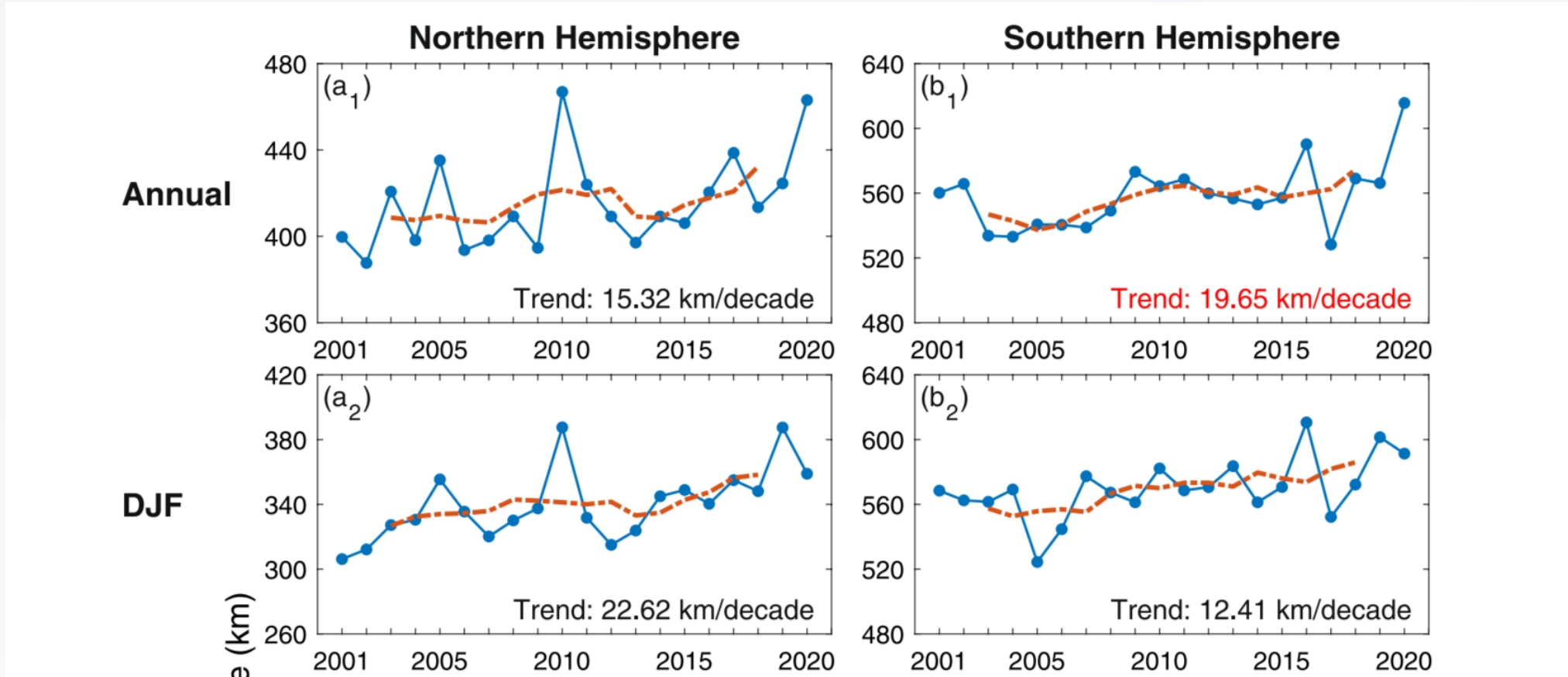
Desert/Barren

## **The land use and land cover**

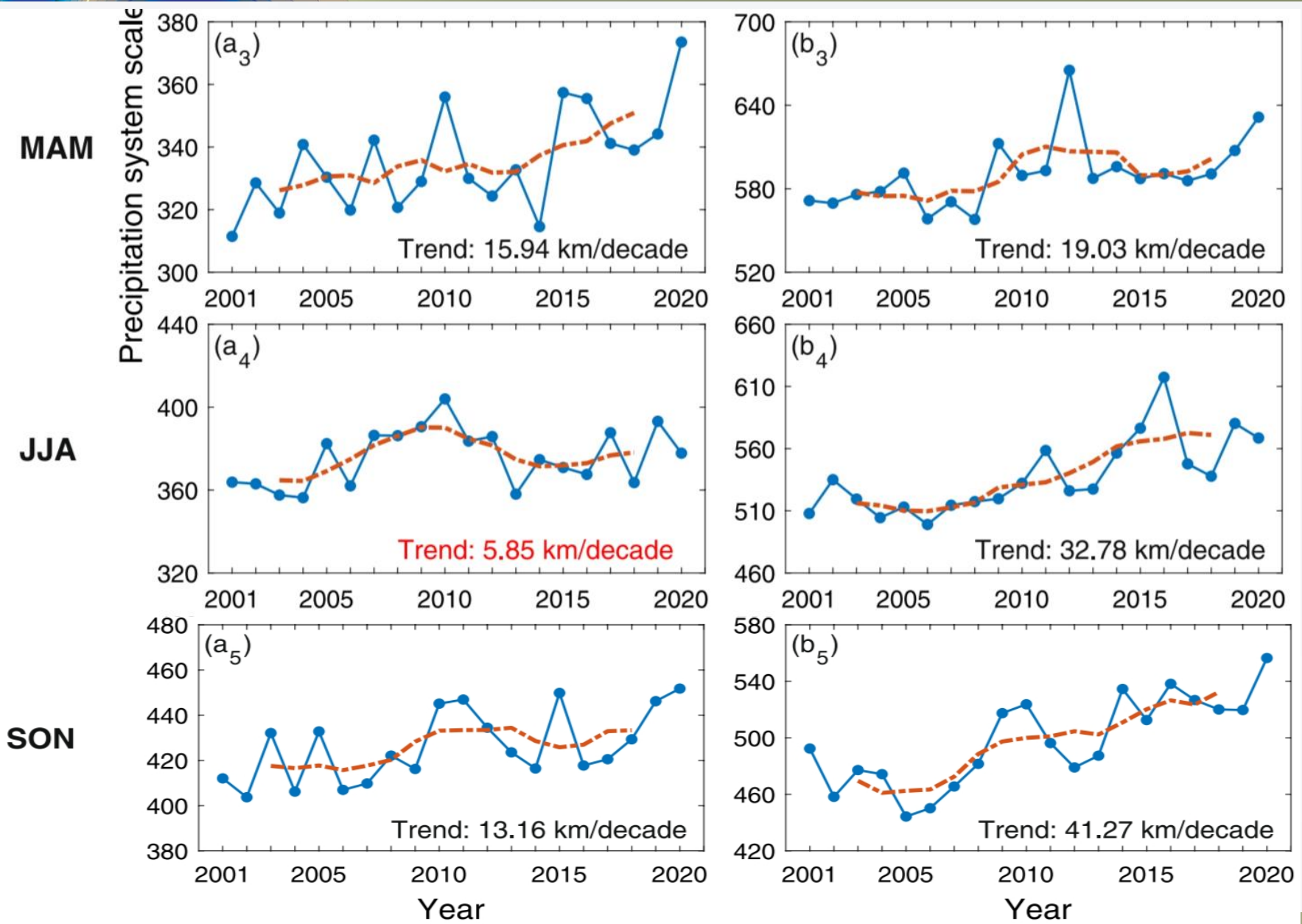
Compared with 1980, the area of urban land, water bodies, and urban lands in the YRB increased by 45.10%, 3.44%, and 2.58% in 2015, while wetland, bare land, grassland, and farmland decreased by 7.18%, 2.27%, 1.31%, and 1.29%, respectively. However, only the average annual change rate (ACR) of urban land area continued to increase.

**But we don't know how much these changes will affect precipitation, infiltration, water flow rates, and so on.**

## Climate change: The precipitation changes



# Is there any changes of element of nature related to water?



**Both hemispheres. In terms of regional differences, the system scale of nearly all precipitation systems over land regions has increased over the last two decades, and the most significant increasing trends occur over South Asia and the Maritime Continent.**

## **Climate change: The temperature changes.**

The 50 years since 1970 were the warmest 50 years in the last 2,000 years, global mean sea level rose by 0.20 meters between 1901 and 2018, rising faster than any century in the past 3,000 years, and global CO<sub>2</sub> concentrations reached 410ppm in 2019, higher than at any time in 2 million years. The effects of global warming on the entire climate system are unprecedented in the past centuries or even millennia.

Each decade over the past 40 years has been warmer than any previous decade.



# Is there any changes of element of nature related to water?

## Mining:

How much impact will annual coal mining have on groundwater resources?

Not just coal, but other mineral resources

Globe Coal production (billion kg)						
	2019		2020		2021	
	Production output	percentage	Production output	percentage	Production output	percentage
Globe	<b>81.11</b>		<b>77.32</b>		<b>81.73</b>	
China	38.50	47.5%	39.00	50.4%	41.30	50.5%
India	7.54	9.3%	7.59	9.8%	8.11	9.9%
USA	6.41	7.9%	4.86	6.3%	5.24	6.4%
Australia	5.05	6.2%	4.70	6.1%	4.79	5.9%
Indonesia	6.16	7.6%	5.63	7.3%	6.14	7.5%
Russia	4.41	5.4%	4.00	5.2%	4.34	5.3%
South Africa	2.54	3.1%	2.46	3.2%	2.35	2.9%
Germany	1.31	1.6%	1.07	1.4%	1.26	1.5%
Poland	1.12	1.4%	1.01	1.3%	1.07	1.3%
Kazakhstan	1.15	1.4%	1.13	1.5%	1.16	1.4%
Columbia	0.85	1.1%	0.52	0.7%	0.60	0.7%
Turky	0.87	1.1%	0.75	1.0%	0.86	1.0%
Canada	0.53	0.7%	0.45	0.6%	0.47	0.6%
Mongolia	0.57	0.7%	0.43	0.6%	0.32	0.4%
Vietnam	0.46	0.6%	0.48	0.6%	0.48	0.6%
Ukraine	0.26	0.3%	0.24	0.3%	0.25	0.3%



Sea level is rising, the water quality has been changed.

The water need for the development has been increasing.

Precipitation has changed, the way water moves naturally has changed, may be faster and penetrate less..... The way water exists in nature has changed more or less.



From scientific point of view, we really need to review our traditional methods, calculation formular which we use to calculate flood volume and flood speed, predict water resource quantity and many other technical regulations which we have used for many years. Are they need to be revise?



From the point of view of the object of regulation, where in the past we focused on water itself, now it's not just water, there needs to be a focus on land use and land cover or landscape, mining development, urbanization, any physical geographical changes and climate change. We need a scientific rule, or even a formula, that ties everything together in a good way, weighs and prioritizes.

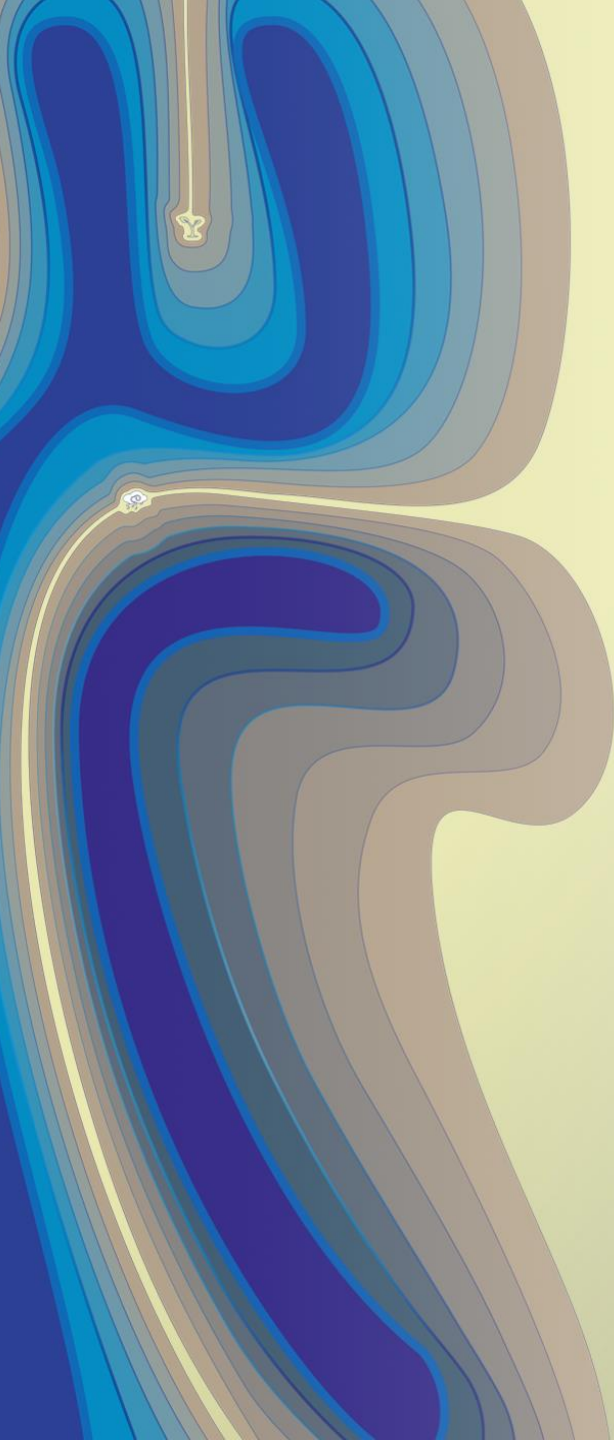
From a regulatory perspective, we need to have a coordination mechanism to determine the scale of water-based development. Water should be the most important element of all natural resources.

The water law should be the most basic and fundamental law in all natural resource management regulations.



The Yangtze River Protection Law and the Yellow River Protection Law in China have innovated the legislative approach and are no longer limited to departmental management.

Future water law formulation needs to break the boundaries of departmental management and truly make water management the top priority of the whole society.



**Thank you very much !**