

Strategy of Groundwater Exploitation and Utilization based on Groundwater Functions in China

**General Institute of Hydropower and Water Resources Planning and Design,
Ministry of Water Resources (GIWP), China**

CONTENTS

- 01** Methodology of Groundwater Functions
- 02** Results of Zoning
- 03** Management and control of groundwater based on groundwater functional zones

01 Methodology of Groundwater Functions

◆ **Functions of groundwater**

◆ **Circulation and reserve**

Groundwater is involved in the terrestrial water cycle, maintains the regeneration and renewal capacity of water resources, regulates the water circulation system and enhances the stability of the system through its own enormous circulation and reserve space.

◆ **Maintenance of ecology**

Groundwater maintains the water quantity balance, water-salt balance, water-heat balance of the ecological environment, and regulates the ecological hydrology. In some places, it is a key factor to maintain surface vegetation, lakes, wetlands and other ecosystems.

01 Methodology of Groundwater Functions

◆ **Functions of groundwater**

◆ **Environment and geology**

Groundwater is an important and particularly active geological agent, and the groundwater system plays a supporting and protecting role or effect on the stability of the geological environment. Groundwater over-exploitation may cause geological and environmental disasters, such as seawater intrusion, land subsidence and land fissures

◆ **Resource supply**

Groundwater resources with certain conditions of recharge, reserve and renewal play a role in safeguarding the water supply. It can provide water supply for economic and social development.

01 Methodology of Groundwater Functions

◆ Classification of groundwater functional zones

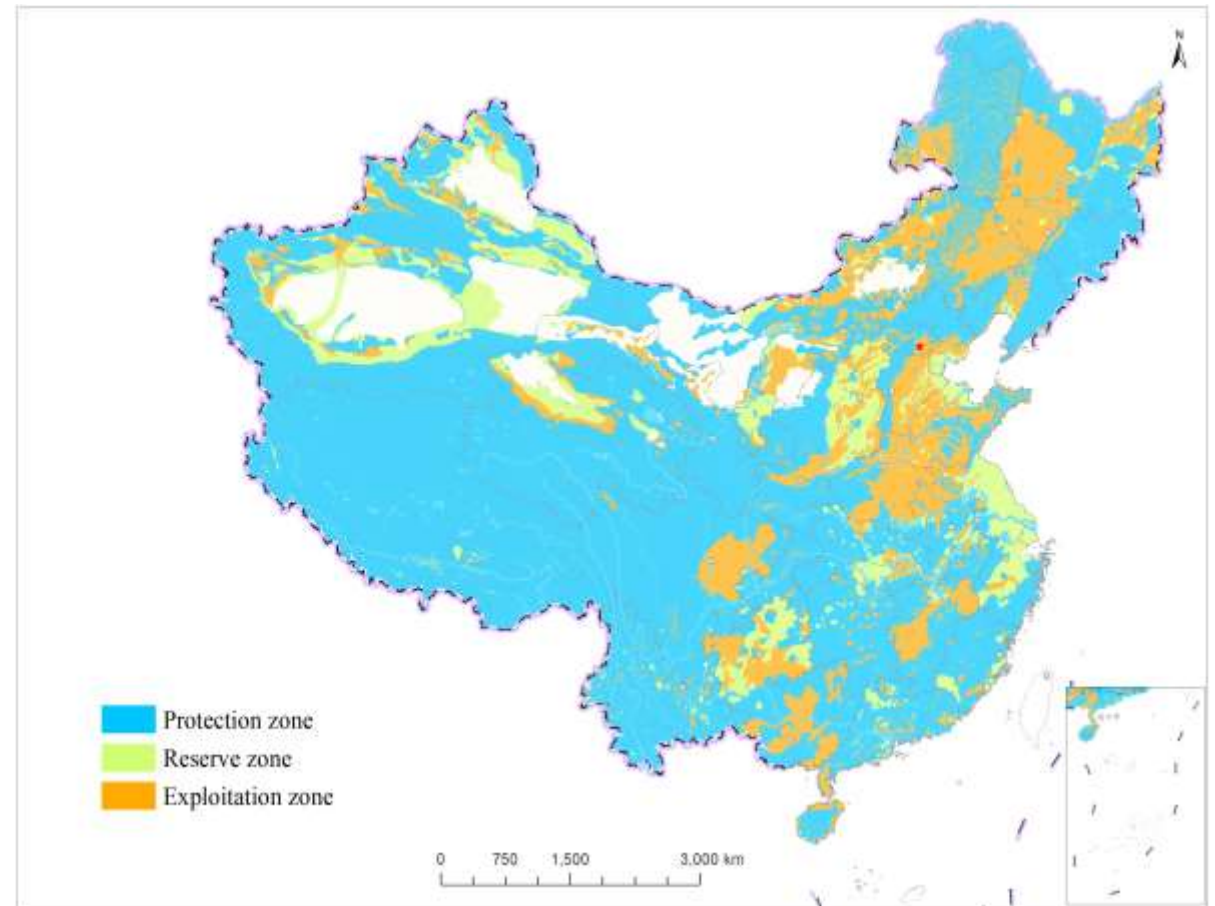
Groundwater functional zones are divided into primary and secondary levels. Within the primary level framework and based on their main functions, **3** categories are further divided into **8** secondary functional zones.

Primary	Secondary
Protection Zone	Ecological fragile zone
	Geologically and environmentally sensitive zone
	Groundwater conservation zone
Exploitation Zone	Centralized water supply zone
	Distributed exploitation zone
Reserve Zone	Emergency water supply zone
	Water reserve zone
	Unsuitable exploitation zone

02 Results of Zoning

Distribution: 67% of the land is the protection zone, **18%** is the exploitation zone and the remaining **15%** is the reserve zone.

The primary groundwater functional zones	Plain area	Hilly area
Exploitation zone	44%	7%
Protection zone	17%	89%
Reserve zone	39%	4%



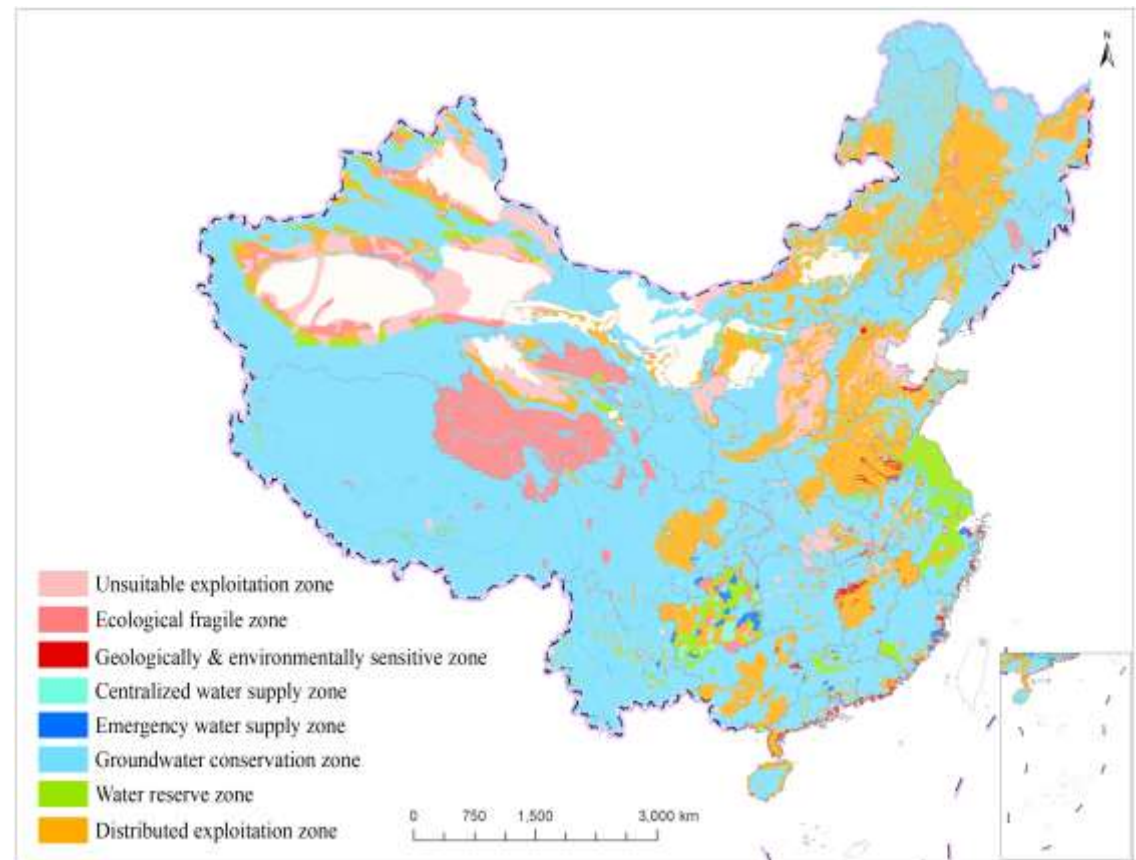
The distribution map of the primary groundwater functional zones in China

02 Results of Zoning

◆ Number of units

A total of **4,886** secondary functional zones for shallow groundwater are recognized across China, which are:

- ✓ Centralized water supply zone
- ✓ Distributed exploitation zone
- ✓ Emergency water supply zone
- ✓ Water reserve zone
- ✓ Groundwater reserve zone
- ✓ Ecological fragile zone
- ✓ Geological & environmentally sensitive zone
- ✓ Unsuitable exploitation zone



The distribution map of the secondary groundwater functional zones in China

03 The management and control of groundwater functional zones

1. Control indicators of groundwater exploitation

Principals:

- ✓ stabilizing the balance of groundwater recharge and discharge, maintaining the beneficent water cycle;
- ✓ meeting the water demand for the natural environment, retaining sufficient strategic reserves;
- ✓ making groundwater uses efficient.

03 The management and control of groundwater functional zones

1. Control indicators of groundwater exploitation

Detailed measures:

- ✓ For any groundwater functional zones that already have a problem with groundwater overexploitation, new groundwater exploitation should be **prohibited**. (*water saving, surface water replacement, reducing the farming area and even fallowing, etc.*)
- ✓ For any groundwater functional zones that are near over-exploitation, no additional new groundwater exploitation will be permitted in the future.

02 The management and control of groundwater functional zones

1. Control indicators of groundwater exploitation

Detailed measures:

- ✓ For any exploitation zone without over-exploitation problems, the groundwater exploitation can be appropriately increased according to the demand of social and economic development.
- ✓ For any protection zone without over-exploitation problems, the protection of groundwater is the priority. the groundwater exploitation and utilization should be maintained to the current status.
- ✓ For any reserve zone without overexploitation problems, massive groundwater supply for daily uses should not be increased, except for urgent need.

03 The management and control of groundwater functional zones

2. Control indicators of groundwater table

Functional Zones		Requirements of Water Table	
		Maximum Depth	Minimum Depth
Exploitation Zone		<ul style="list-style-type: none"> • No continuous decline in groundwater table • Effective groundwater supply • Maintenance of groundwater inflow per unit 	<ul style="list-style-type: none"> • Reduction in the ineffective phreatic evaporation • Maintenance of reserve space • Prevention of groundwater pollution
Protection Zone	Ecological fragile zone	<ul style="list-style-type: none"> • Maintenance of the rising height of capillary water to the depth of root system in soil • Maintenance of surface vegetation 	<ul style="list-style-type: none"> • Prevention of groundwater pollution
	Geologically and environmentally sensitive zone	<ul style="list-style-type: none"> • Prevention and control of land subsidence, seawater intrusion, land subsidence and other environmental geological disasters 	<ul style="list-style-type: none"> • Prevention of groundwater pollution • Prevention of soil salinization
	Groundwater conservation zone	<ul style="list-style-type: none"> • Maintenance of river base flow and spring discharge, etc. 	<ul style="list-style-type: none"> • Prevention of groundwater pollution
Reserve Zone		/	/



THANK YOU!