Groundwater Management in China

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Outline

1. General Condition
2. Issues
3. Main measures

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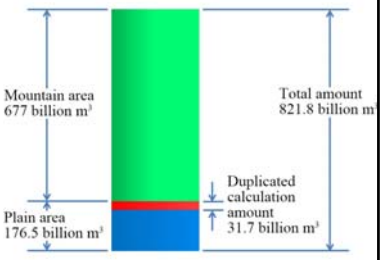
1. General Condition

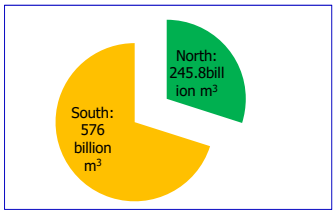
Total Amount:

821.8 billion m^3, is about 30% of total national water resources.



mountain areas:

82% of groundwater resources distribute in mountain areas, which totally overlaps with the river flow.



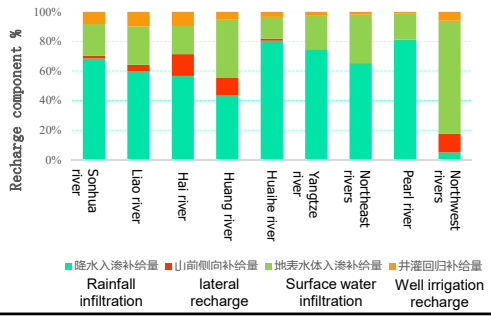
GW Resources Distribution

1.General Condition

- Plain areas:
  - Amount:176.5 billion m^3
  - 78% is in the north.
  - Multiple recharges
  - vary significantly from place to place.

- Recharge features

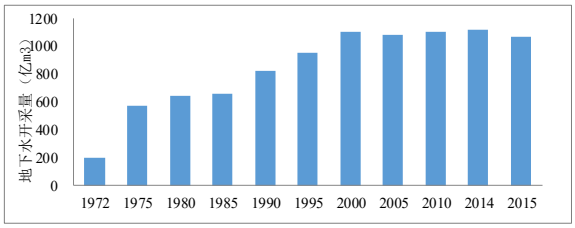
Rainfall infiltration	Surface water infiltration	lateral recharge	Well irrigation recharge
50%	36%	8%	6%



1.General Condition

Evolution of Utilization

- Before 1970s， mainly developed by small scale and distributed way.
- After 1970s, started to intensively develop and groundwater use amount increased dramatically.
- Since 2000, the groundwater use amount have been stable.

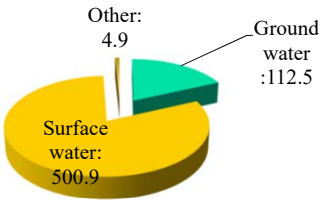


Change of groundwater utilization since 1972

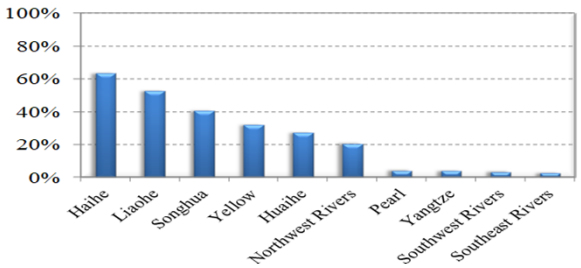
1. General Condition

Current Utilization

- Current GW supply is about 110 billion m^3 (88% from the North), accounts for 18% of national total water supply.



- In Haihe River basin, GW supply accounts for 64% of total water supply.

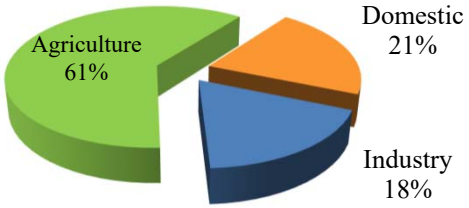


Ratio of GW Supply to total water supply in 10 Major Basins

1. General Condition

Current Utilization

- **GW use for different sectors**



- ✓ More than 400 cities (out of more than 600 cities) take GW as their main source of water supply.
- ✓ The well irrigation area accounts for over 15% of the total irrigated farmland area in China.

Outline

1. General Condition
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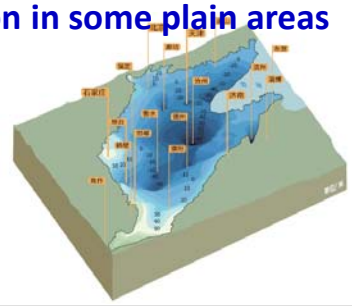
2. Issues

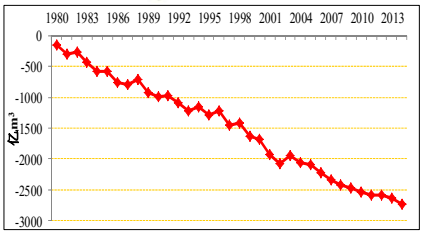
- GW over-exploitation
- GW quality deterioration
- GW monitoring and management

2. Issues

Severe GW over-exploitation in some plain areas

- The total over-exploitation area reaches about 300,000 km^2 and accounts for 11% of the total plain area (except desert). (data of 2015)
- Annual over-exploitation amount is up to 16 billion m^3, which accounts for 19% of the total extraction amount in plain area, 99% occurs in the North.
- It is estimated that until 2014 groundwater storage in the northern plain areas has been depleted by 270 billion m^3 compared to 1980.





Groundwater storage depletion from 1980 to 2014 in the northern plain areas

2. Issues

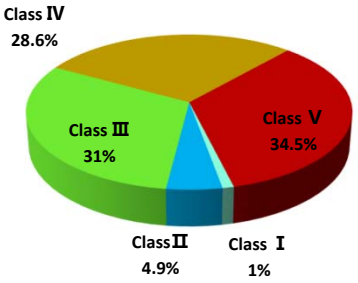
Severe GW over-exploitation in some plain areas

- **Environmental and geological problems caused by GW over-exploitation：land subsidence, Seawater intrusion, Vegetation deterioration and desertification**

2. Issues

Groundwater pollution

- Assessment of shallow groundwater quality in 1.97 million km^2 of plain areas indicate that 63% of them belongs to class Ⅳ and Ⅴ, 26% of which is caused by human activities.
- GW pollution has currently presented a trend from single point to whole region, and from cities to rural areas.



Ratios of different classes of GW in assessed areas

2.Issues

GW monitoring and management still needs to be enhanced

- GW regulation system still need to be improved, lacking regulations for further operation and matching local legislations.
- Sound economic regulatory mechanism should be established for GW management.
- Current GW monitoring and metering system still couldn't satisfy the increasing need of GW management.

Outline

1. General Condition
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3. Main Measures

3.1 Implement "double control" of abstract amount and water table for groundwater management: total amount and exploitation intensity

3.2 Take comprehensive measures to rehabilitate groundwater balance

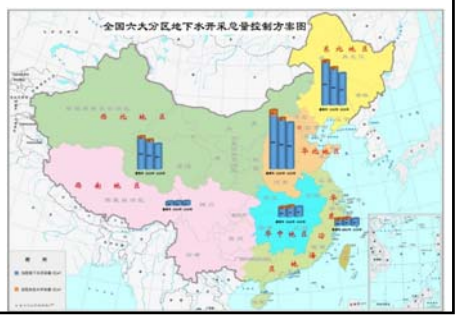
3.3 Enhance management supporting work

3. 1 Implement “double control” for groundwate management

- The National Plan determine the control amount of GW abstraction of each province and each river basin.
- Provinces breakdown the provincial amount to each city and each county.
- Trying to establish groundwater table control system.

National planning of groundwater utilization and protection

Total amount control targets of different regions in China



3. 2 Take comprehensive measures to rehabilitat GW balance

- Water-saving: raise water resource utilization efficiency, promote water saving in well irrigation area.
- Use more surface water: replace groundwater use with more surface water from water diversion and local hydraulic engineering projects.
- Enhance recharge: put some diversion water in the rivers.
- Planting structure adjustment: cultivate drought resisting varieties, reduce irrigation. area.

3.3 Enhance management supporting work

- Improve groundwater management law and regulation system
- Optimize groundwater management economic regulation mechanism
- Improve metering, monitoring and publication system

3.3 Enhance management supporting work

- Improve groundwater management law and regulation system
  - Release "Groundwater Management Regulation", establish a sound groundwater management mechanism, including: total amount and water level control, groundwater pollution prevention and treatment, management in different layers and categories, strategic reserve and emergency management, investigation, evaluation and planning, as well as monitoring & measurement.
  - Intensify the local groundwater management legislation


地下水管理条例
（讨论稿）
目 录

3.3 Enhance management supporting work

- Optimize groundwater management economic regulation mechanism
  - Allocate water rights to users, charge more for excess use of GW
  - Adjust groundwater resource fee and promote water saving
  - Establish financial incentive mechanism, encourage water source replacement
  - Establish compensation mechanism, promote planting structure adjustment in over-exploitation area.

3.3 Enhance management supporting work

- Enhance management supporting work
  - Enhance groundwater metering and monitoring rates.
  - Establish groundwater management information systems.

National groundwater monitoring project initiated in 2014: national groundwater monitoring project started in 2015 and will accomplish in 2019. As the implementation of the projects, the monitoring density will reach 5.8 per thousand square kilometers, the monitoring data of national stations will be delivered to the center in an hour.


谢谢！
Thank you!