Water Management in China: Challenges and Countermeasures

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I. Water status in China

II. Achievements and Main Challenges

III. Countermeasures for Water Resources Management

IV. Major Tasks of Water Reform and Development
I. Water status

Great span from the North to the South, highland in the West, lowland in the East, monsoon climate in most regions, plus large population. Thus water status has special features.
1. Water status

1. Low per capita availability, imbalanced distribution in time and space

Per capita availability  2100\,m^3
28\% of world average
Availability per farmland 1400\,m^3
50\% of world average
Absolute water shortage in northern part
I. Water status

1. Low per capita availability, imbalanced distribution in time and space

**Time**

60-80% rainfall and runoff during flood season

Jan… May… Aug… Oct… Nov…

**Space**

Water resources only 19% in northern part

- Surface runoff variation is generally 2-6 times between years, 10 times at maximum.

[Bar chart showing land, population, farmland, and water resources distribution between South and North, with percentages of 64%, 60%, 46%, and 19% respectively.]
I. Water status

2 Complex water and river system, great difference between north and south

Multiple rivers, complex water systems >100km², 22909 rivers
Dense water network in the South, high water abundance
Less water resources in the North, mostly seasonal stream with high sediment
I. Water status

3 Frequent flood disaster with wide impact

Frequent heavy rainstorm in short time duration, sometimes wide-range watershed rainfall in long time duration.

The mid and low stream of the 7 river systems are affected severely by flood and typhoon – 1/2 population, 1/3 farmland and 3/4 industry and agriculture gross output.

Loss from flood disaster accounts for 50% of that from natural disaster.
I. Water status

4 Severe water loss and soil erosion, vulnerable water ecology

Severe water loss and soil erosion, soil erosion over 2.95 million km²
Distribution – mainly in western part
Source: hill slope and erosion gully
Over 1/3 are arid or semi-arid region, especially northwest region
II. Achievements and Main challenges

30 years after the Reform and Opening-up, China achieves 10% annual economic growth with only 1% annual water consumption increase.

In 2013, water consumption was 94 m³/10,000 RMB industry added value. Down by 74% in 1997.

In 2014, effective utilization coefficient of farmland irrigation is 0.523.
II. Achievements and Main challenges

- In water resource utilization, China promotes energy conservation and consumption reduction and green development.

- China’s installed hydro units is world No. 1, with annual power generation of 662.6 billion KWh. This effectively improves energy mix, promotes economic and social development, and contributes to improving ecology and mitigating global climate change.
II. Achievements and Main challenges

- In water and food security, China protects farmland and water resources, and develops a complete farmland irrigation system.

- For 30 consecutive years, irrigation water maintains zero increase, while food production increases by 78.5%. In particular, China enjoys 11 years of consecutive increase since 2004. Total food production 607 million tons in 2014.

- China ensures food security for 21% of world population with only 6% of world fresh water resources and 9% of world farmland.
II. Achievements and Main challenges

China is undergoing industrialization, urbanization and rural modernization, with intertwining old and new problems, such as the increasing impact of global climate change, water shortage, severe water contamination, and worsening water ecology.
II. Achievements and Main challenges

1. Water shortage – prominent conflict between supply and demand

Average shortage over 50 billion m³ for years
II. Achievements and Main challenges

Over-utilization of water resources is protruding
II. Achievements and Main challenges

2 Waste of water resources is a big problem

GDP output per cubic meter is only 1/3 of world average
Water consumption per 10,000 RMB industry added value is 3-5 times of advanced industry water consumption
II. Achievements and Main challenges

2 Waste of water resources is a big problem

Extensive water consumption in agriculture. Effective utilization coefficient of farmland irrigation is 0.523, far low than world advanced level (0.7-0.8)
II. Achievements and Main challenges

3 Heavy water contamination

Total water and contaminated water discharge was 77.5 billion tons in 2013. Compliance at water zones is only 63% of all monitored zones. Category-IV river-length contamination and sever contamination accounts for 31.4% of all assessed river-length.

Compliance rate of water function zones
II. Achievements and Main challenges

4 Deteriorating water ecology

River course dry-up, lake shrink, reduced eco-function in river course and lake, urbanization occupying lake and river course and leading to flood, ill-organized hydro construction leading to less bio-diversity, over-exploitation of underground water leading to ground subsidence…
II. Achievements and Main challenges

5. Water conservancy capacity is insufficient

• Enlarging grain production without water consumption increase
• Water conservation in agriculture is a demanding task

Grain production

Unit: 10,000 tons
II. Achievements and Main challenges

Water conservancy is incapable of assurance

Per capita water supply is only 2/3 of world average. Urban water security is under great pressure with accelerating urbanization.
II. Achievements and Main challenges

Water conservancy is incapable of assurance

Flood defense is big concern

Medium and small city locates around small rivers, with imbalanced rainfall in time and space
Rivers are incapable of regulating flow rate by themselves
III. Countermeasures for water management

After 30 years of rapid growth, China’s economy has entered into a new phase featuring constrained resource and environment, urgent demand on eco-product, more interconnected infrastructure and critical institution and regime innovation.

Dealing with insufficient supply of water conservancy and eco-product, and enhancing water security is a big issue for China.
III. Countermeasures for water management

- Stick to the new concept of “water conservation as priority, balance among regions, systematic approach and dual control”

Water security shall be dealt with in a comprehensive approach to promote harmony between the people and water and sustainable development.
1. Promoting all-round water-conservative society

- Conservation throughout production and life by subjecting urban development, land use, population growth and production to water resources.
- Improving water conservation policies and standards, R&D promotion and other incentives.
- Promoting all-round water conservation in industry, agriculture, service sector and urban development. Accelerating application of water-conservative technology and upgrade of water-conservative product.
- Enhancing planned water use and rated management. Strengthening water metering and monitoring capacity building. Setting up water resources monitoring platform and information management system at central, watershed and local levels.
2. Further improving modern water conservancy facility

Accelerating 172 major engineering projects that are critical to economic and social development and have strong rippling effect. In particular, a number of key water diversion projects, large water dams and water-conservation and irrigation channels and networks shall be started in mid-west regions to effectively deal with regional water shortage.
3. Making water conservancy bring benefit to livelihood

- Continuing to accelerate safe drinking water projects in countryside to deal with rural water security
- Focusing on weak links by enhancing key anti-flood projects and managing medium and small rivers, eliminating risk, reinforcing ill-maintained dams and water-gate, and administering urban anti-flood and drainage system.
- Accelerating nationwide anti-draught plan and enhancing anti-draught and disaster mitigation capacity.
4. Reinforcing water conservancy for food security

- Implementing region-wide water conservation and irrigation initiative to promote centralized and effective use of water resources.
- Focusing on matching and water-conservative upgrade for medium and large irrigation areas to enhance the comprehensive productivity in agriculture.
- Accelerating the construction of end channel system and matching field projects to develop modern farmland irrigation system.
5. Promoting water eco-civilization

(1). Implementing the strictest water resource management to ensure its sustainable use

- Implementing the strictest water resources management regulations released in 2012
- Enhancing social self-governance, balancing water supply and demand, maintaining harmony between human and water

Core

Implementing “three red lines”: control

- Red line for quantity control
- Red line for efficiency control
- Red line for pollution hold
5. Promoting water eco-civilization

(1). Implementing the strictest water resource management to ensure its sustainable use

Red line for controlling water resource use

Strictly control excessive growth of water consumption
Prevent and over exploitation of water resources

![Total water consumption graph]

Total water consumption

- 2010: 6022 m³
- 2015: 6350 m³
- 2020: 6700 m³
- 2030: 7000 m³
5. Promoting water eco-civilization

(1). Implementing the strictest water resource management to ensure its sustainable use

Water consumption quota in all sectors shall reach world advanced level

Setting water consumption quota to ensure no increase in total quantity

Coefficient for effective use of farmland irrigation water

Water consumption per 10,000 RMB industry added value (m³)
5. Promoting water eco-civilization

(1). Implementing the strictest water resource management to ensure its sustainable use

- Implementing the strictest water resource management to ensure its sustainable use
- Compliance rate of water quality
  - 2010: 46%
  - 2015: 60%
  - 2020: 80%
  - 2030: 95%

Enhancing water pollution control and water resource protection
Controlling pollutant discharge within the bearing capacity of rivers and lakes
5. Promoting water eco-civilization

(1) Implementing the strictest water resource management to ensure its sustainable use

- Local government head be responsible for water resources management
- Developing assessment system for tiered evaluation and supervision
IV. Major Tasks of Water Reform and Development

1. Strengthening water-saving society construction

- Striving for agricultural water saving. Modern high-efficient irrigation system
- Speeding up innovation of industrial water conservation. Water recycling
- Water conservation in service and urban domestic water use. Water grid upgrading; use of water-efficient equipments and facilities
- Non-conventional water source use. Wastewater treatment facilities; desalination
IV. Major Tasks of Water Reform and Development

2. Flooding defense and drought relief

- Improve disaster resilience capacity
- Urban counter-logging measures
- Emergency management for drought relief
- Regulation and commanding for flood defense and drought relief
3. Speeding up infrastructure construction

- Key water structures.
  - Agricultural,
  - diversion, water source,
  - river channeling, etc

- Rural infrastructures.
  - Rural water quality improvement
  - small on-farm facilities
  - green small hydropower
  - ponds, etc
IV. Major Tasks of Water Reform and Development

4. Water ecological processes

- **Water resources protection.** Reducing total discharged pollutants, protecting key water source area, rehabilitate eco-fragile river and lake, carry out ecological regulation

- **Treatment of groundwater over-exploited area.** Reducing over abstraction scale

- **Water and soil conservation**

- **Water system linkage.** Connecting rivers, reservoirs and lakes into a water grid or system

- **Environmental friendly structure.** Combining construction with environment protection
Strictly controlling increased water use, gradually exiting from the occupied water ecology. Implementing eco-space management for rivers and lakes, enhancing status evaluation and promoting rehabilitation of rivers and lakes. Accelerating interconnection of watershed and regional rivers and lakes, developing modern ecological water network, optimizing water resource distribution, enhancing the bearing capacity of water resources and water environment.
Tackling over-exploitation of underground water

Implementing cross-watershed diversion project, optimizing water resources distribution, accelerating industry restructure and water conservation, tackling over-exploitation of underground water at North and Northwest China to achieve balance of exploitation and replenishment.
IV. Major Tasks of Water Reform and Development

Controlling water loss and soil erosion

IV. Major Tasks of Water Reform and Development

Highlighting the impact on eco environment

Paying attention to protecting eco-environment in plan compilation, project demonstration, construction, commission and operation. Reducing people relocation and farmland occupation in dam construction. Promoting treatment of water loss and soil erosion at key watershed, accelerating treatment of hill slope and small eco-watershed development.
IV. Major Tasks of Water Reform and Development

5. Modernized water management

- Implement the strictest water management system. Total water usage, water use efficiency, pollutant discharge control in water functioning zone monitoring.
- Water body management and protection.
- Modernization of water structure management system.
6. Deepening reform in key water areas

- Water rights system.
  - Water permits
  - Water rights trading
  - Creating water market

- Water price reform.
  - Rural water price reform; Urban water tiered price

- Diversified Investment mechanism
  - public revenue; social capital
IV. Major Tasks of Water Reform and Development

7. Rule of Law

- Water legislation
- Enactment and penalty
- Administration in line with law
  - power list
  - defining jurisdiction between central and local governments
  - information publicity
8. Capacity Building

- Science innovation and International Cooperation
  - climate change, high efficient water saving technology, water environment protection and treatment, water disaster prevention and preparedness, risk management, etc.

- Staff training and education

- Capacity building in grass level

- Hydrological information and network
Thank you!