

China water S&T development pattern in the most rigorous water management framework

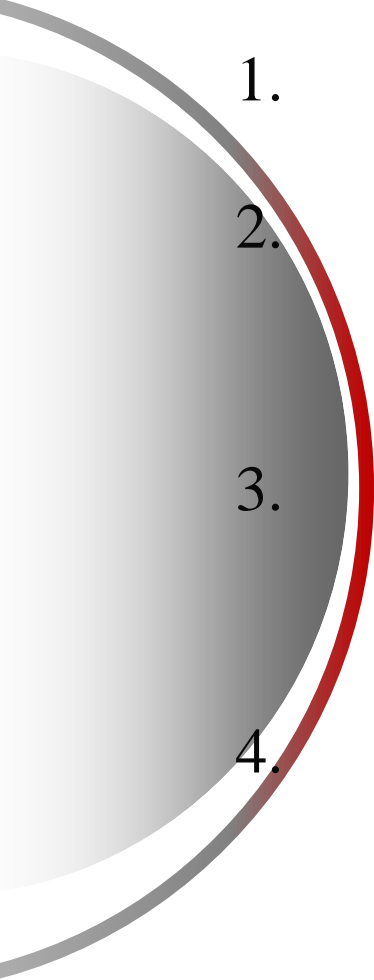
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In 2011, central No.1 document: 《on accelerating the development of water conservancy reform decisions》 : To reverse the significant lagged situation of water conservancy construction in the next 5-10 years.

学习贯彻中央一号文件 加快水利改革发展

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陈雷主持召开部务（扩大）会议 进一步...

中共中央 国务院关于加快水利改革发展的决定

水是生命之源、生产之要、生态之基。兴水利、除水害，事关人类生存、经济发展、社会进步，历来是治国安邦的大事。促进经济长期平稳较快发展和社会和谐稳定，夺取全面建设小康社会新胜利，必须下决心加快水利发展，切实增强水利支撑保障能力，实现水资源可持续利用。近年来我国频繁发生的严重水旱灾害，给人民群众生命财产造成重大损失，给国家粮食安全、生态安全、经济社会发展带来严重影响。中央决定，从2011年起，把水利作为国家基础设施建设的重点，加大投入，加快水利改革发展，力争通过5-10年努力，从根本上扭转水利建设明显滞后的局面。各地区各部门要充分认识水利对党和国家事业发展的重大战略意义，把水利作为公共基础设施建设的重点，加大投入，加快水利改革发展，力争通过5-10年努力，从根本上扭转水利建设明显滞后的局面。

[\[阅读全文\]](#)

水利部部长陈雷解析2011年中央一号文件

1月29日，《中共中央 国务院关于加快水利改革发展的决定》正式公布。这是新世纪以来的第8个中央一号文件，也是新中国成立62年来中共中央首次系统部署水利改革发展全面工作的决定。文件出台了一系列针对性强、覆盖面广、含金量高的新政策、新举措。水利部部长陈雷29日接受新华社独家专访，以权威声音解读中央一号文件。

[\[阅读全文\]](#)

Characteristics of 2011 Central No. 1 document

New positioning: economic safety、 ecologic safety、 national security

Three firsts for water conservancy:

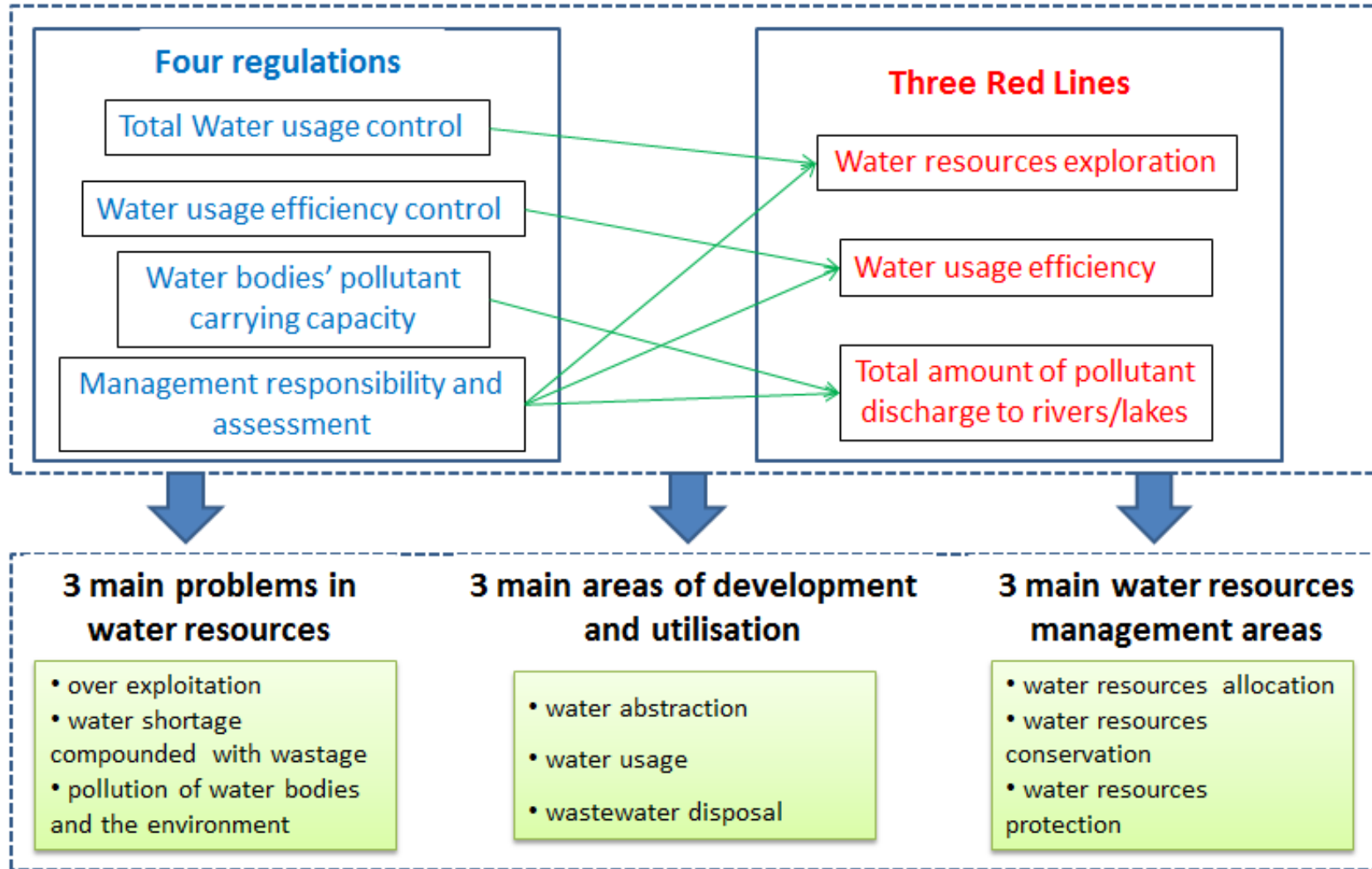
- elaboration of the important role of water conservancy in modern agricultural development, socio-economic development, and ecological environment improvement
- strong emphasis on: public, fundamental and strategic role;
- elevated to strategic level: affecting economic safety, ecologic safety, and national security

New Target: 4 main systems in 2020

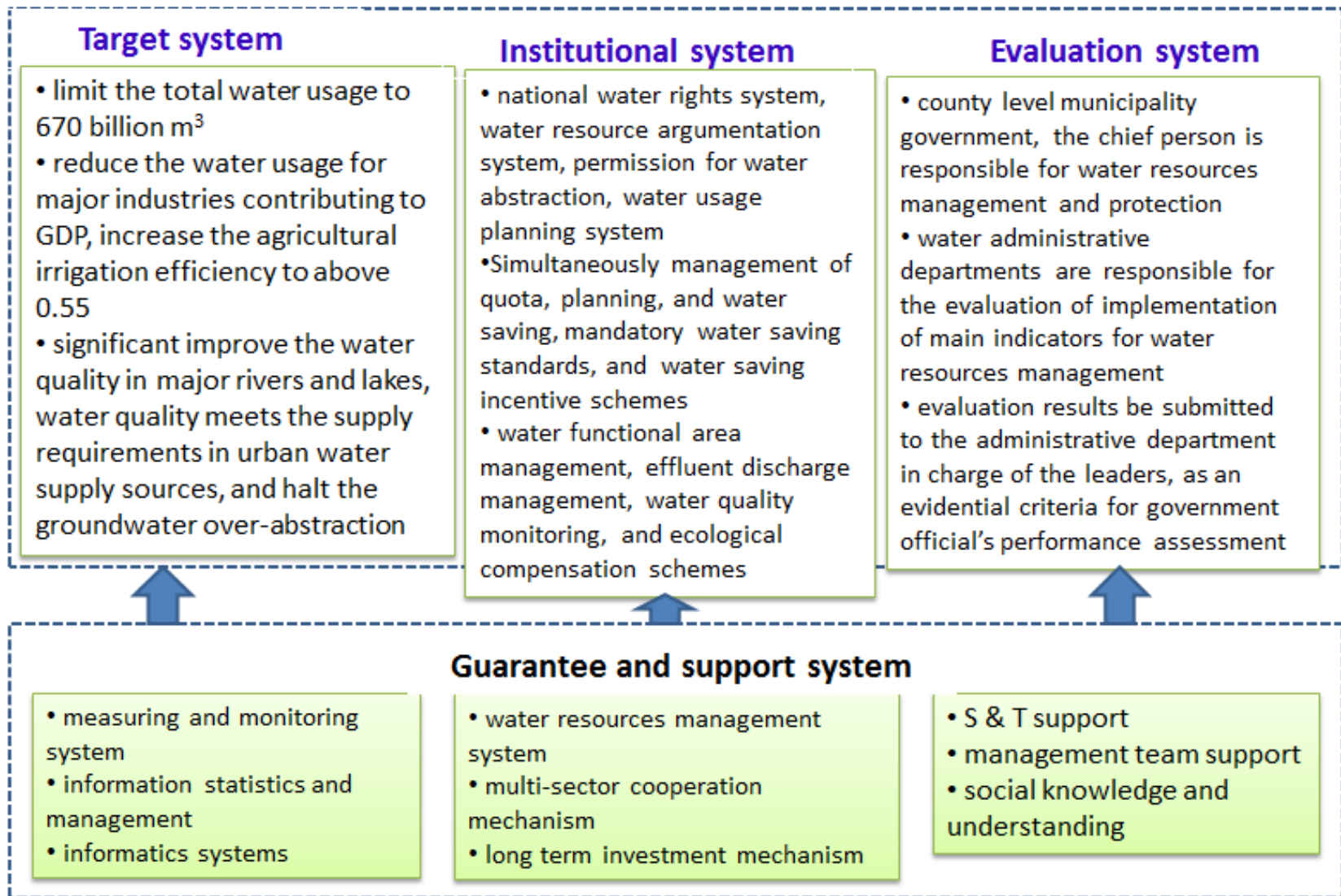
Main target set in the No.1 document: To reverse the significant lagged situation of water conservancy construction in the next 5-10 years.

- flood control and drought relief system
- rational allocation and high efficient use of water resources system
- water resources protection and river/ lake health guarantee system
- system to facilitate scientific development of water conservancy

No. 1 document specified “the most rigorous water resources management system” and positioning as “strategies to initiate and accelerate the transformation of economic development”



Architecture of the most rigorous water resources management system



2, Key issues to intensify China's water conservancy reform

The **overall objective** is to build water conservancy system to:

- ✓ enhance the support capacity of modern water conservancy;
- ✓ improve the social management level of water conservancy;
- ✓ accelerate the construction of ecological civilization.

Aim: achieve decisive outcomes in the key areas and focal points in the year 2020.

2, Key issues to intensify China's water conservancy reform

- (1) Continually enriching and improving water management ideas for sustainable development
- (2) Strengthen legislations and regulations for water conservancy and improve the legal system
- (3) Innovate the institutional mechanism for scientific development of water conservancy
- (4) Accelerate the transformation of water administrative functions, and improve the water management standard
- (5) Exert Government's leading role in social cohesion for hydraulic construction and water conservancy

2, Key issues to intensify China's water conservancy reform

(1) Continually enriching and improving water management for sustainable development ideas, and modernize water conservancy with Chinese characteristics

- management concept: accelerate the transition from water supply management to water demand management
- planning concept: transit from prioritizing development and utilization to prioritizing water conservation
- protection measures: accelerate the shift from event response to prevention of occurrence
- development method: transit from over exploitation and unregulated development to rational and orderly development
- water usage pattern: transit from extensive usage to efficient usage
- management tools: transit from administrative management to integrated management

2, Key issues to intensify China's water conservancy reform

(2) Strengthen legislations and regulations for water conservancy and improve the legal system, to form a systematic, supportive and mandatory policy regime

- Establish and improve water regulation system in accordance to China's national conditions
- Strengthening the management and binding effect of planning on water related activities
- Establish a sound mechanism of water right and water pricing
- Establish a rigorous system for rivers/ lakes management and protection

2, Key issues to intensify China's water conservancy reform

(3) Innovate the institutional mechanism for scientific development of water conservancy

- Improve the science and technology innovation system in water conservancy, strengthen basic research and technology development
- Actively absorb useful experiences and advanced technologies at home and abroad
- Accelerate the transformation of the outcomes to products, and to improve technology content and technical equipment in water conservancy
- Vigorously promote the water informatics

2, Key issues to intensify China's water conservancy reform

(4) Accelerate the transformation of water administrative functions, and improve the water management standard

- Legal administer of water conservancy should be the key measures in strengthening its public service capacity, to improve the social management level
- Promote the reform of water resources management system
- Promote water management mechanism at the basic level
- Establish and improve the water administrative enforcement system

2, Key issues to intensify China's water conservancy reform

(5) Exert Government's leading role in social cohesion for hydraulic construction and water conservancy

- To fully exert Government's leading role in water conservancy construction, management and reform
- Strengthen the coordination and cooperation at all levels within the water management and hydraulics sector, and between different government departments such as national development and reform, finance, land, environmental protection, agriculture, and construction, etc.
- Increase the publicity efforts to form a new situation of "government-led, public participate, consociate control, together we progress " --- a society-wide hydraulic construction and water conservancy campaign

3, strengthen global cooperation in water resources management

— international experience in water resources management

(1) Integrated management: from sector management to integrated watershed management, focusing on sector coordination, organization integration, and watershed management

(2) Institution building: formulate the laws, regulations and institutional framework for water resources management

(3) Market measures: with particular emphasis on combining the administrative measures and economic means

(4) Technology innovation: to adopt new technologies and other means for development and saving

(5) Public participation: Encourage the public and stakeholders to participate in water management

3, strengthen global cooperation in water resources management

Five aspects of S&T needs in China to implement the most rigorous water management system:

- S&T needs at basic level
- S&T needs in planning and design aspects
- S&T needs in the Implementation aspect
- Assessment and evaluation aspects' S&T needs
- S&T needs at the guarantee level

(1) S&T needs at basic level

Cognitive basis

- Scientific explanation of the institution
- Dynamic characteristics in different stages
- Construction of the theory system
- Relationship of the red lines
- Interaction between the most rigorous management and social economy
-

Scientific basis

- Revolution pattern of water resources
- Mechanism of ecological water need and its revolution pattern
- Economic water need forecast
- Principles of water saving and pollution reduction in different sectors
-

implementation basis

- Simulation system of water cycle and its associated process
- Evaluation method for water resources and ecological environment situations
- Scenario forecasting and inversion for the most rigorous water management
-

(2) S&T needs in planning and design aspects

System design

- System design of institutions
- Innovation in supporting system
- Regional innovation
- Medium/micro system design
- Mechanism of social regulation of water resources management
- Coordination mechanism for implementation
-

Quantitative accounting

- Design and accounting method for the total water usage control indicator system
- Design and accounting method for the efficiency control indicator system
- Design and accounting method for the pollution limit indicator system in the water function zone
-

Special issues

- Accounting of total water usage control indicators at different runoff frequencies
- Relation between water supply capacity and total water usage
- Relation between total water usage control and economic development
- Food security and agriculture water usage
- Seasonal change of assimilative capacity and its dynamic accounting
-

(3) S&T needs in the Implementation aspect

Total water usage control

- Total water abstraction control: accounting of licensed quantity, assessment of planned water abstraction and utilization
- Total water usage control: river water allocation, water transfer in sections, ground water table
- Total water usage control technology: spatial and temporal decompose of water usage index, water planned water usage
- Systematic scheduling of water resources
-

Water use efficiency control

- Hierarchical quota management technology:
- Water saving technologies and methods for different industries
- Technologies for the development of unconventional water sources
- Leakage detection and control technology during the water distribution process
- Supportive technologies for water saving society
-

Pollution limits in the function zones

- Pollution reduction and waste recycling of point source and non-point source pollution in terrestrial areas
- Monitoring and evaluation of pollutant discharged into rivers
- Water quality management at the transfer sections
- Traceability and management of pollutant discharge based on monitoring and simulation technology
- Warning and disposal technologies for pollution emergencies in the source water areas
- Restoration of damaged aqua ecosystem
-

(4) Assessment and evaluation aspects' S&T needs

Target assessment

- Statistics, collate, and identify technology for basic information
- Calculation method for achieved degree of the assessment target
- Calculation method for achieved degree of the management indicators
- Integrated assessment method for target achievement
- Trace method for those unachieved indicators
-

Process evaluation

- Evaluation method for organizational process
- Evaluation method for task completions
- Evaluation method for the implementation and effectiveness of the system
- Target-tasks related assessment
- Trace method for system defects during implementation process
-

Performance management

- Assessment method for social-economic benefits
- Assessment method for eco-environmental benefits
- Assessment method for management progress and demonstration promotion
- Assessment of comprehensive benefits
- System effectiveness assessment
-

(5) S&T needs at the guarantee level

Information support

- New technology in hydrology forecasting
- Metering and accounting technology for water abstraction
- Metering and statistic method for water usage
- Accounting method for total water consumption
- Accounting method for total pollution discharge
- Water environment and water ecology
- Management technology for water informatics
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Economy regulation

- Accounting techniques and program design for water resources fee collection
- Pricing techniques and system design for water supply in different industries
- Pricing techniques and program design for water right transfer
- Quantification and program design for ecological compensation standard
-

Institution/ mechanism

- Deepening the water management research in accordance with the law
- Clear the right and responsibility of water resources management at basin level and the regional level, work on the innovation of system reform
- Innovation in regional water management reform
- Innovation of multi-sector joint management system and public participation mechanism
-

3, strengthen global cooperation in water resources management

To effectively take the leading role of S&T and to better support national and regional public policies, to accelerate the development and implementation of the most rigorous water management system, we need to vigorously improve the technological innovation as well as the application promotion system.

- increase the S&T innovation for the implementation of the most rigorous water management system
- establish and improve the technical standardization system for the most rigorous water management system
- Strengthen the technology promotion service system for the most rigorous water management system.

4. Focal points of EU-China cooperation

To relieve the water crisis, the EU has issued “EU water framework directive” and “European water protection blueprint”. EU countries have accumulated valuable experiences in the protection of water resources security, prevention of water hazards, and construction of a harmonious environment between human and environment, which provide useful inspiration for China’s water conservancy reform and water management practice.

4. Focal points of EU-China cooperation

The China Europe Water Platform (CEWP) was established in 2012 with the objective to promote dialogue and cooperation between China and Europe within water resources management based on a principle of mutual interest, benefit and finance. The CEWP will address policies and practices within water governance, research and business development.

4. Focal points of EU-China cooperation

—future prospects for cooperation

Government organizations

Integrated river basin
management experience

Coordinated management

Water price system reform

Public participation
measures

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Research institutions

Basic theory

National macro-regulation
ways

Water-economy simulation
models

Protection and restoration
of aquatic ecosystems

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Business communities

Outcome convert into
products

Water treatment technology

Technology for the use of
unconventional water

Water saving products and
techniques

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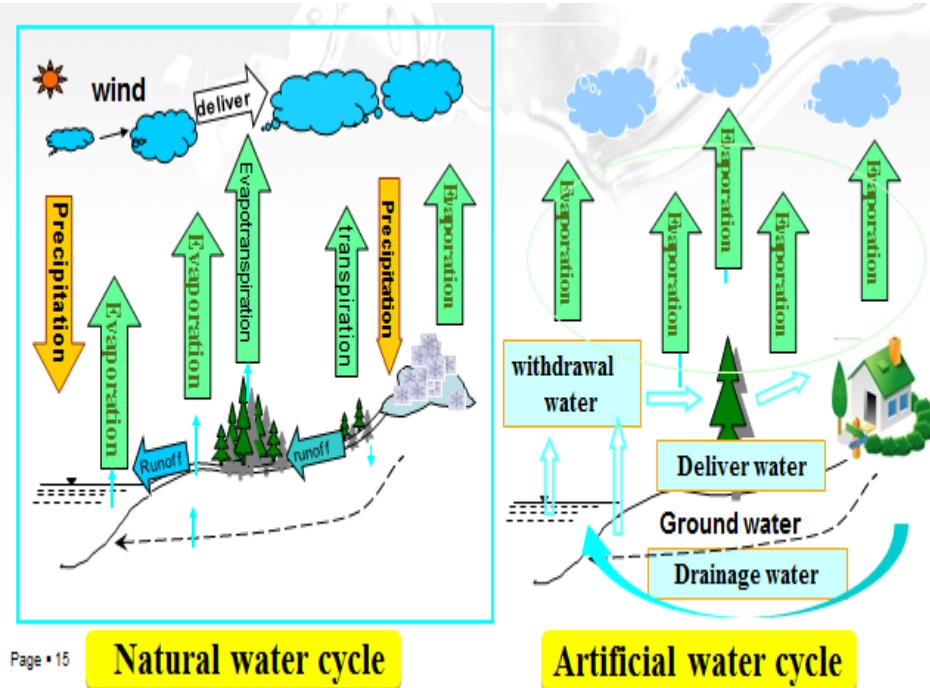
4. Partnership with the EU

Scientific cooperation fields

- ① **Basic theory:** dualistic “natural-social” water cycle
- ② **Understanding background:** water resources assessment method under changing condition;
- ③ **Reasonable allocation:** computation of ecological water requirement and water resources allocation technology
- ④ **High Efficient utilization:** modeling of social hydrological cycle and ET control technology
- ⑤ **Effective protection:** modeling of water chemistry process and its control mechanisms
- ⑥ **Ecological restoration:** techniques for aqua ecological process modeling and restoration
- ⑦ **Scientific management:** Integrated scheduling of complex water resources systems
- ⑧ **Integrated Platform:** Model system for the water cycle and its associated process

① Basic theory: dualistic “natural-social” water cycle

Since the beginning of human development and utilization of water resources, the nature water structure is broken, thus formed a “nature-social” dualistic water cycle structure. Namely, a complete water system is composed by a nature main cycle of “precipitation- slope runoff- river course- groundwater” coupling with a social side cycle of “water abstraction- water supply- water usage- water disposal”.

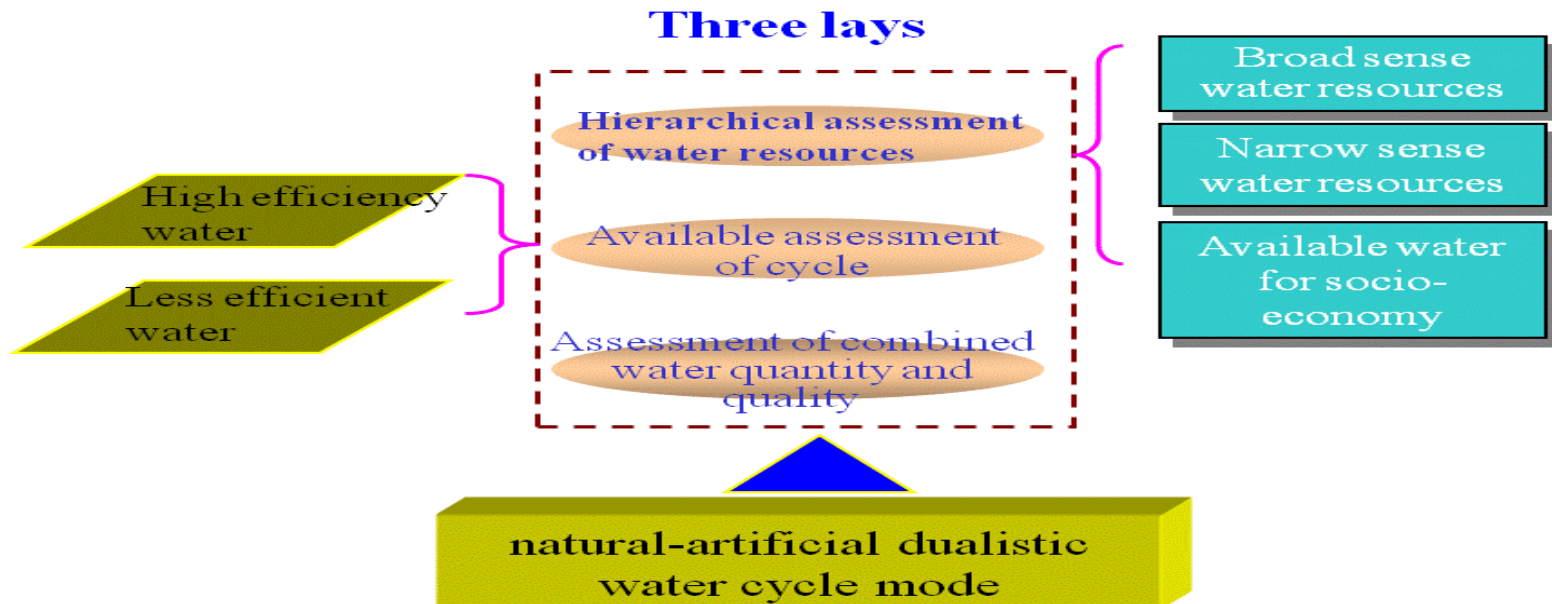


concept

In order to satisfy the water resources demand for human needs, economical and societal activities, we have incorporated the basic four hydrological steps of "water abstraction - water supply - water usage - disposal" in the process of socio-economic system

② Understanding background: water resources assessment method under changing condition

- **All components**: all components assessment of precipitation/surface water/ soil water/ groundwater
- **Hierarchy**: effectiveness→broad-sense water resources
controllable→narrow-sense water resources
renewable→minimum ecological water requirement, availability for national economic use
- **Dynamic assessment**: to evaluate the water resources under changing environment by changing the land surface parameters

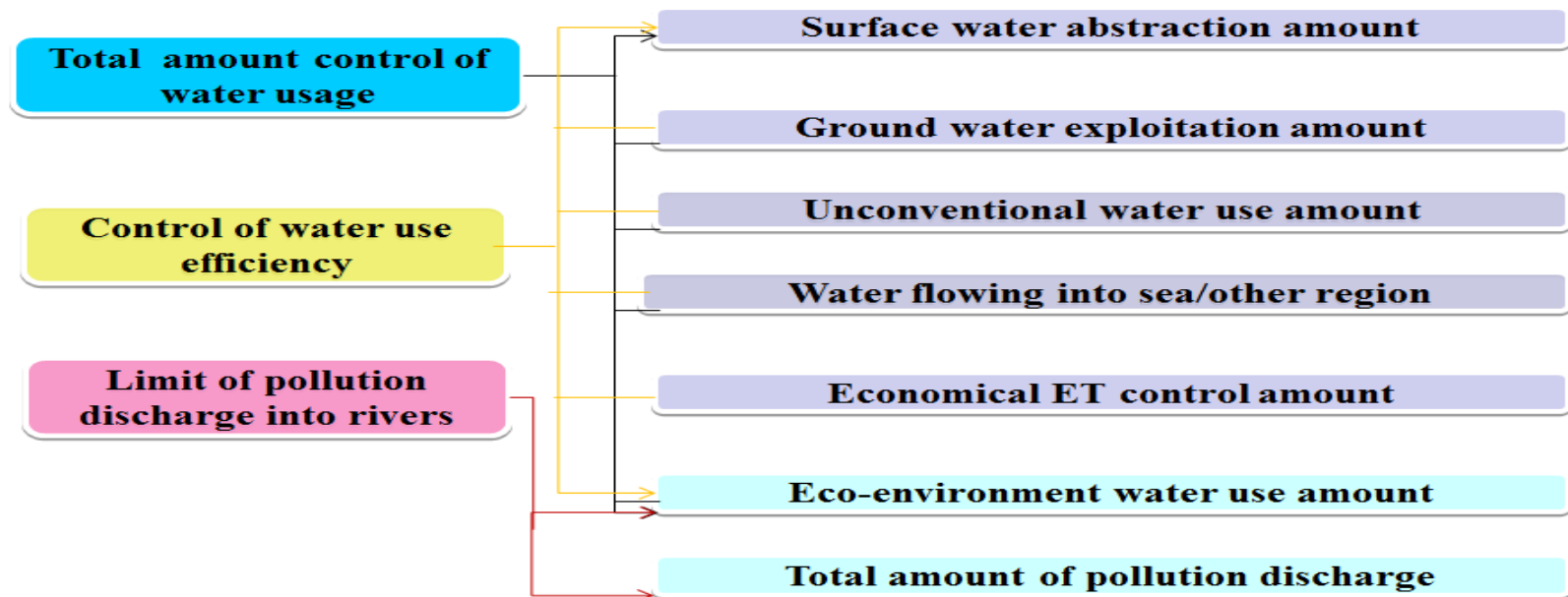


③ Reasonable allocation: computation of ecological water requirement and water resources allocation technology

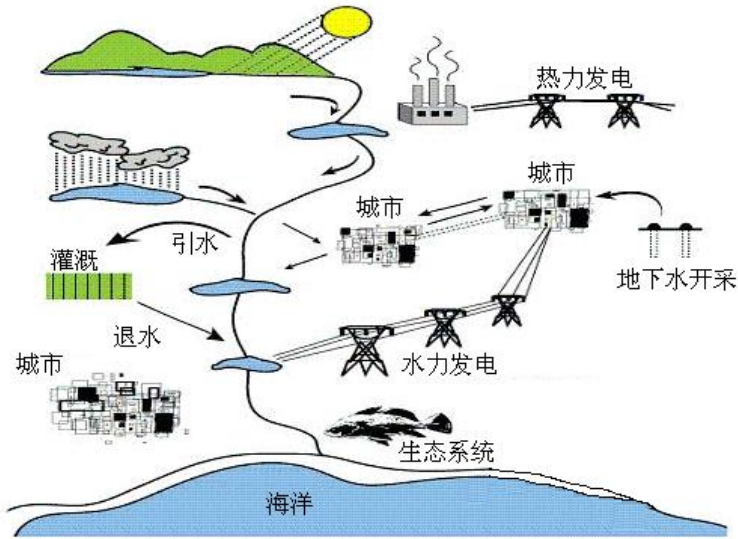
● Calculation for ecological water requirement

The amount of water required for maintaining the ecological system stability. Including the arid areas, semi-arid areas, and humid areas.

● Quantity and quality combined water allocation technology based on the seven total amount control

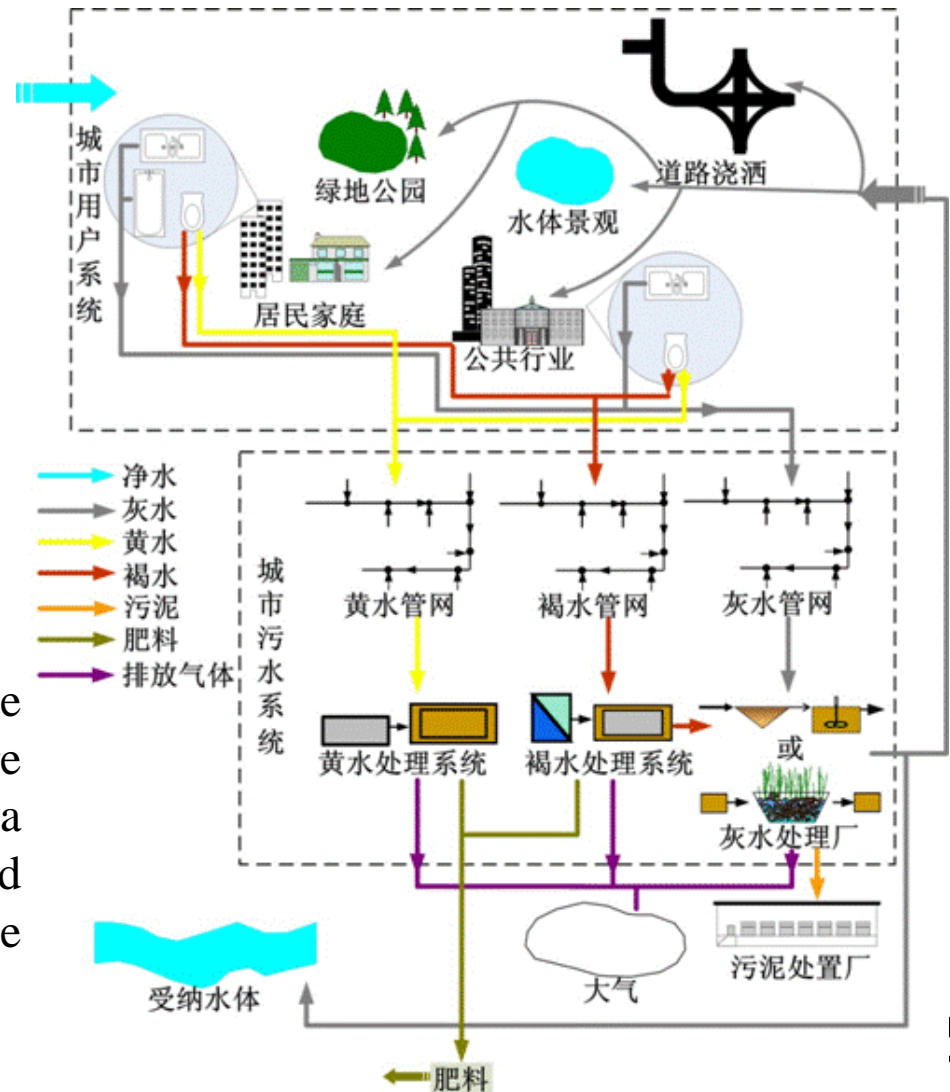


④ High Efficient utilization: modeling of social hydrological cycle and ET control technology



Social water cycle system architecture

Learn from the construction method of the distributed simulation model for the nature hydrological process, we constructed a social water cycle simulation model based on water unit identifying to describe the social water cycle process and its fluxes.



⑤ Effective protection: modeling of water chemistry process and its control mechanisms

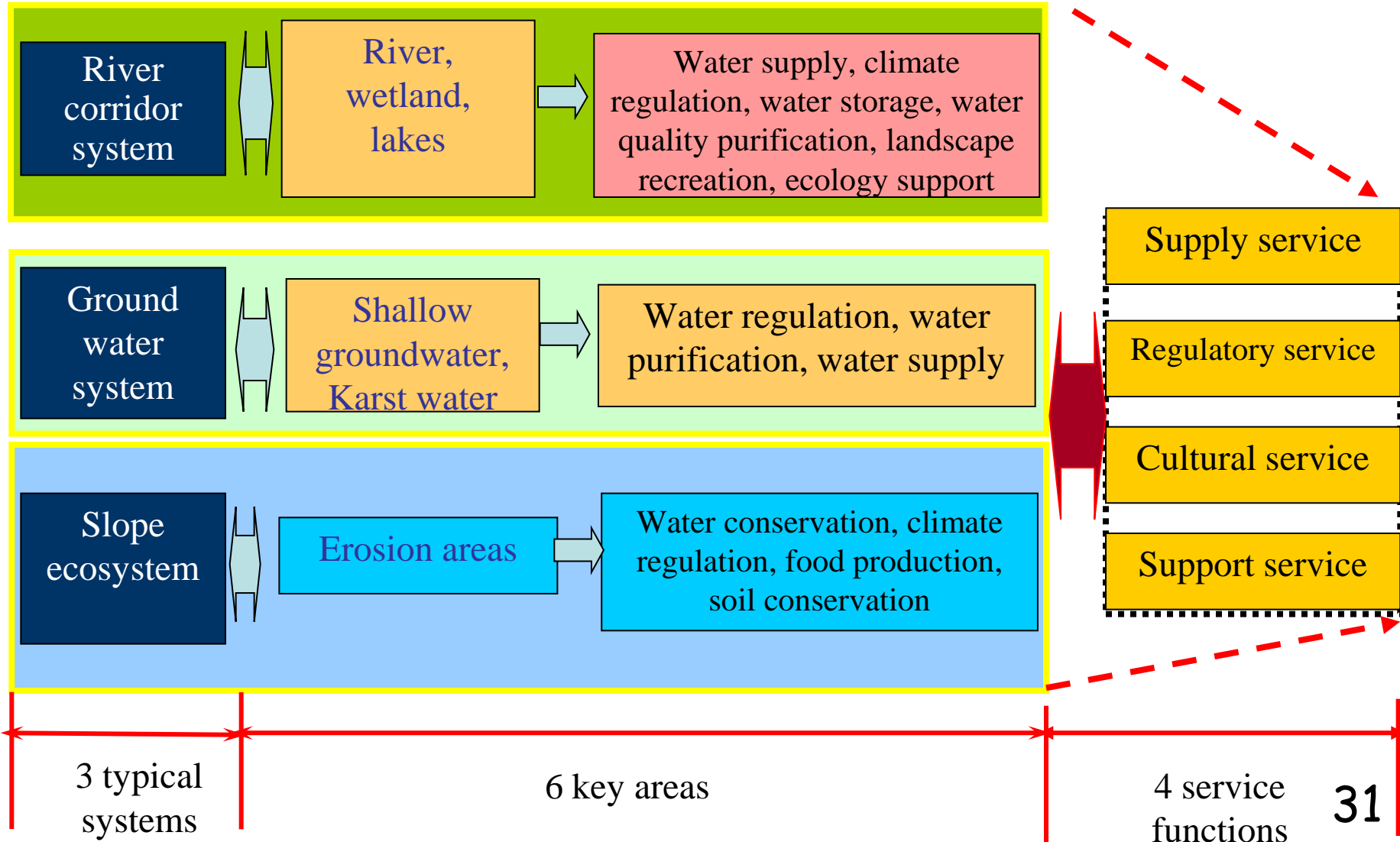
● key factors affecting the chemical process in the water body

- Geometry parameters (shape and size of current water body)
- Hydrological parameters (flow rate, flow speed, water temperature, and depth)
- Geochemical background parameters (PH value, hardness, pollutant background level)
- Physical self-purification (evaporation, dilution, diffusion, deposition, molecular adsorption, etc.)
- Physical and chemical self-purification (ionic adsorption)
- Chemical self-purification (hydrolysis, oxidation, photochemical, etc.)
- Biological degradation (hydrolysis, oxidation reduction, photosynthesis, etc.)

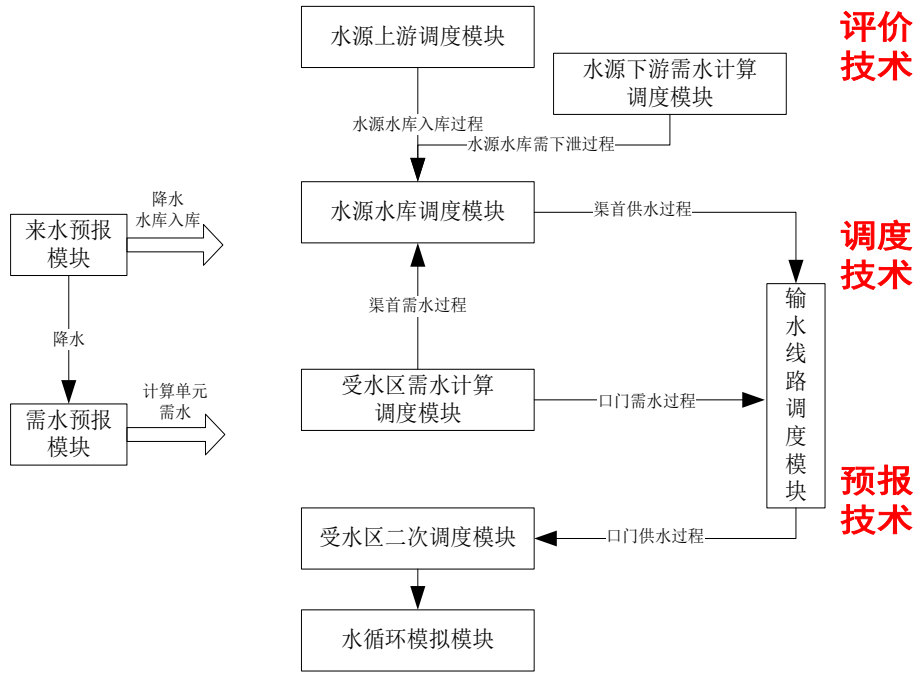
● Main measures for chemical process control:

- Block and cut measures
- Store and stop measures
- Water diversion measures
- Scheduling measures
- Integrated control measures

⑥ Ecological restoration: techniques for aqua ecological process modeling and restoration



⑦ Scientific management: Integrated scheduling of complex water resources systems



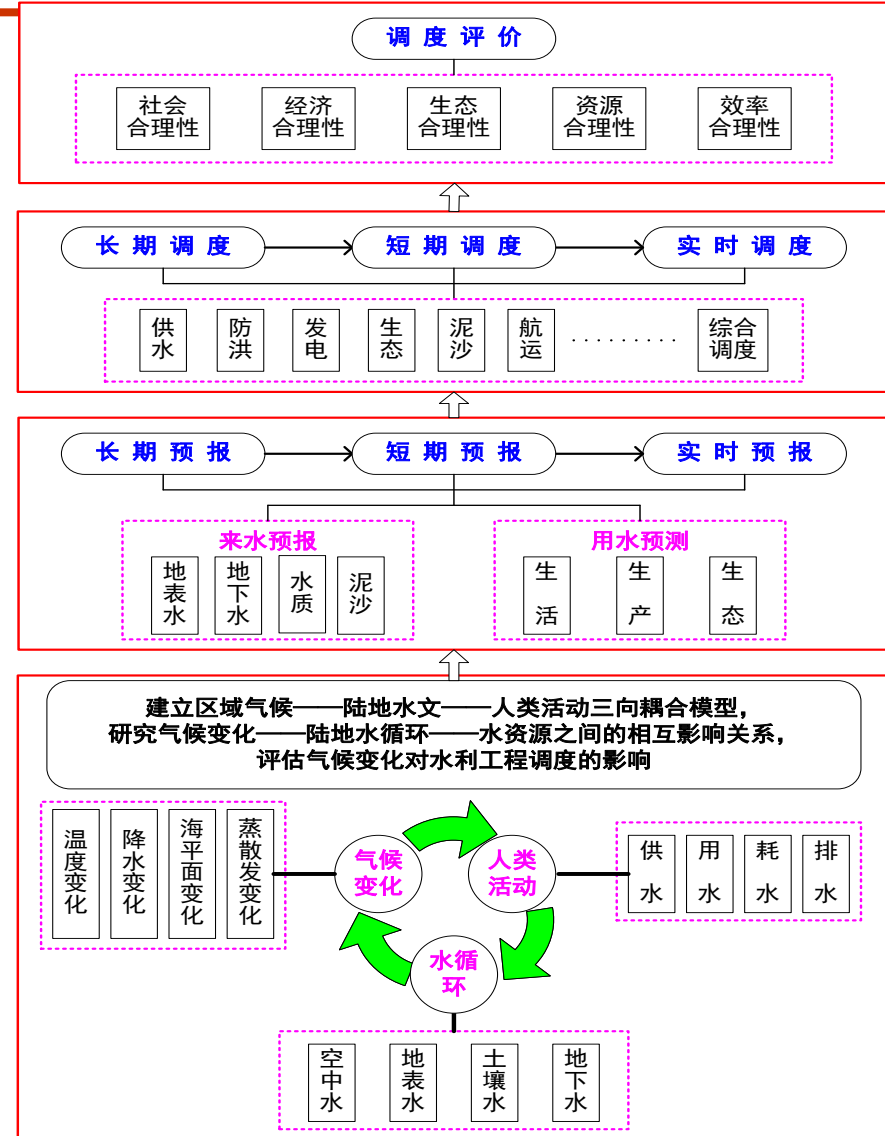
Integrated scheduling of complex water system is an important means to achieve the 3 red lines control. Through 3 processes of forecasting, scheduling, and evaluation, 5 targets of flood prevention, power generation, water supply, ecology health, and shipping and navigation can be achieved.

评价技术

调度技术

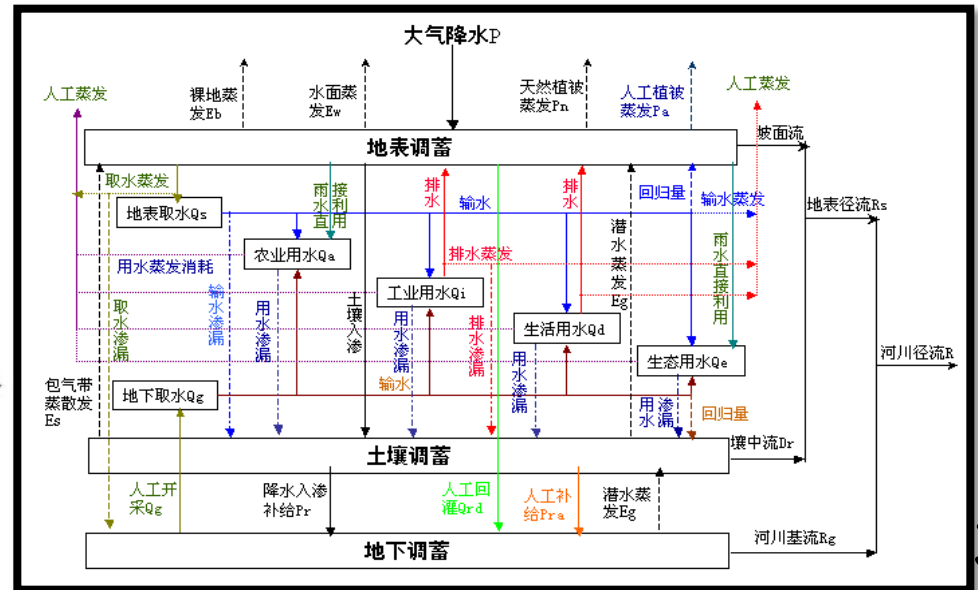
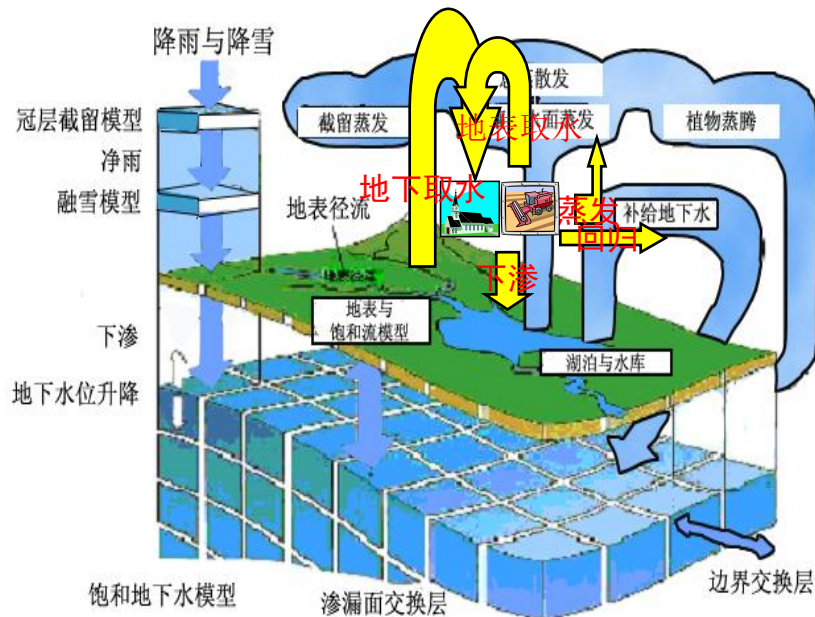
预报技术

模拟技术



⑧ Integrated Platform: Model system for the water cycle and its associated process

- Simulation of dualistic water cycle process: distributed nature water cycle simulation model- lumped (→semi-distributed→distributed) social water cycle simulation model
- Associated process simulation: river basin water chemistry simulation model, river basin aqua ecology simulation model, water and sediment model



THANKS FOR YOUR ATTENTION.

欢迎讨论交流!

