Strategic Study of Integral Water Resource and Environment Management of Haihe River Basin

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Abstract
There are many problems about integral water resource and environment management, so it is necessary to frame integral water resource and environment management strategic action plan to solve them. The paper discussed the task, the target and the general idea of the action plan, and expatiated on the directions in which we should take actions aiming to the idiographic circs and advices about framing each action plan.

Key words
Haihe River Basin, water resource, water environment, integral management, SAP

1. Task of basin level SAP

As an important part of Global Environment Fund item Integral Water Resource and Environment Management Programming (IWEMP for short), the integral management of water resource and environment of Haihe River Basin (‘SAP of Haihe River Basin’, for short) aims to ‘framing SAP of Zhangweinan sub-basin with the key point of water pollution control and long term governmental investment of Zhangweinan sub-basin and a SAP of Haihe River Basin with the key point of ability construction and integral management. Each SAP should have specific plans to reduce water consumption and pollution, improve the departmental coordinative relations and set up water management mechanism of local governments’.

The main tasks of SAP of Haihe River Basin are to generalize IWEMP of various provinces (or municipalities or autonomous regions) and key counties (or cities or districts). SAP of Zhangweinan sub-basin, main achievements of strategic studies and demonstration projects, make up SAPs, solve problems of mechanisms, policies, management, monitor and treatment, and provide directions of water
resource and environment management of Haihe River Basin.

2. Target of basin level SAP

2.1 General target
The general target is to promote the IWEM of Haihe River Basin, realize reasonable allocation of water resource, use water efficiently, restore ecological environment, relieve the shortage of water resource efficiently, reduce the pollution of Bohai Sea from the land, improve water environment quality of Haihe River Basin and Bohai Sea and promote the sustainable development of society and economy in Haihe River Basin.

2.2 Action targets
◆ Strengthen the ability of integral water resource and environment management
◆ Realize gross control of water resource
◆ Implement ET management and real water saving
◆ Achieve the effect of pollution treatment
◆ Ecological restoration
◆ Ecology and environment improvement of Bohai Sea
◆ Protect drinking water safely

2.3 Periodical target
Taking 2004 as the standard year, 2010 as the short-term year, 2020 as the mid-term year, 2030 as the long-term year, periodical targets, which should be achieved in recent years including ET gross control, partition control of surface water, over utilization control of ground water, water pollution control, water ecology restoration, reproducing utilization of sewage and construction of integral management ability, will be made up.

3. General idea of basin level SAP
General idea: follow one concept, surround one core, establish four systems and carry out seven tasks.

3.1 Follow one concept
ET Management, water consumption management and gross control is a typical concept ‘development depended on water’ and it should be followed by the work about water resource and environment management of Haihe River Basin.

3.2 Surround one core
Water resource and environment management is the core of IWEMSAP of Haihe River Basin. We should surround it during the following action plans and measures.

3.3 Establish four systems
The four systems include legal policy system, supportive system of supervision ability, construction of projects system, and guarantee system.

3.4 Carry out seven tasks
ET management, distribution and control of surface water, over exploitation control of ground water, reduce the pollution and achieve the standard of water function areas, ecology restoration, construction of management ability and guarantee of safe drinking water.

4. Action plans of Haihe River Basin
**Action one:** Enhance the construction of ability to realize integrated management

- **Policies**
  - Establish ‘water right system of Haihe River Basin based on ET management’
  - Establish ‘management system of groundwater exploitation in Haihe River Basin’
  - Establish ‘permit system for wastewater disposal in Haihe River Basin’
  - Constitute ‘examination methods of water quantity and quality for provincial boundary section in Haihe River Basin’
  - Constitute ‘management methods of public participating of Integral Water Resource and Environment Management in Haihe River Basin’

- **Regulations**
  - Advise State Council to propose ‘implement suggestion of integral water resource and environment management in Haihe River Basin’
  - Advise Ministry of Water Resources to propose ‘ET monitoring and distribution management regulations in Haihe River Basin’
  - Advise Ministry of Water Resources and Ministry of Environmental Protection to propose ‘water quantity and quality management regulations of provincial boundary section in Haihe River Basin’

- **Management system**
  - Reform target
    - The reform target is to establish integral water resource and environment management system which should match with the natural water resource rule, the development of society and economy, and water environmental protection of Bohai Sea.
  - Reform proposal
    - Basin level: establish Integral Management Committee of Haihe River Basin.
      Integral Management Committee of Haihe River Basin will consists of representatives from the governments of the related provinces (or autonomous regions or municipalities), Ministry of Water Resources, Ministry of Environmental Protection, other related ministries and the important water users, etc.
      Under the guidance of Ministry of Water Resources, Ministry of Environmental Protection, based on Management Bureau of Zhangweinan Canal, Integral Water Resource and Environment Management Committee of Zhangweinan Canal Basin, which consists of water users, water and environmental departments of provinces, cities and countries, should be established.

- **Construction of monitoring ability**
  - ET center, monitoring system of surface water quantity and quality, construction of dynamic monitoring system of groundwater, share of water resource and environmental protection information.

- **Construction of management systems**
  - Water resource and environment information system, decision-making support system, etc.

- **Team construction**
  - The basin management institution should establish integral water resource and environment management center, which is charge of the daily operation and management of ET center, annual monitoring-evaluation of GEF projects. Each local department about water resource and environment should also establish the necessary institutions. It is also necessary to build a team for integral water resource and environment management and to enhance their technical ability.

**Action two:** Implement surface water district control to make regional water balanced

- **Partition of regions to control**
  - According to the concept that it should be consistent with traditional water regions and the administrative regions, there are available monitoring-stations, mainly contraposes the important rivers and bigger reservoirs, the whole basin could be divided into 35 regions to control.

- **Study out the water quantity and quality index of the regions**
  - Take the water quantity into Bohai Sea and the exploitation quantity of groundwater to control in
different planning level years as the prerequisites, based on the target ET by SS4 and the achievement by SS7, we should study out the region index to control by using the basin model.

- **Project measures of regions to control**
  The project measures includes construction of canals, channel connection and water conservancies, studying new attempering manners for large reservoirs to meet the primary functions and the requirement of water for ecology of riverways.

- **Management measures**
  It includes perfecting management system, checking the existing surface water permit system, bringing ecology water using into management system, carrying out annunciation system, verifying the responsible body, establishing and perfecting the monitoring system.

**Action three: Implement ET control and save water really**

- **Analysis on current ET distribution**
  Based on the remote sensing data, we can analysis the distribution of ET and take it as the basis of adopting the measures controlled.

- **Ascertain and distribute the target ET**
  Based on water balance, we should establish the consumptive ET and distribute it into each region by the core model under the condition that it can not influence the grain production, farmers’ income, environmental quality and it should promote all the regions to use water effectively.

- **Actions adopted for target ET**
  Agricultural measures, biological measures, project measures and management measures should be adopted to ensure the achievement of target ET.

- **Feasibility analysis of action schemes**
  Technical and economic feasibility of action plans, capacity of users, social and environmental impact, technology-support and management basis.

- **Guarantee mechanism**
  Change of water resource management concept, establishment of ET management institution, establishment of democratic management system, staff training and technical support, establishment of water resource monitoring system and monitoring evaluation index system based on ET, financial support.

**Action four: Enhance pollution control to meet water quality standards in water function areas**

- **Integrate water function regions and water environmental function areas, establish the water quality targets**
  Integrate water function regions belonging to water resource department and water environmental function regions belonging to environmental department, establish water quality targets for all the function regions.

- **Gross control for wastewater disposal and achievement of water function regions standard**
  Analysis the receiving capacity of Haihe River Basin for COD and NH₃-N in 2010, 2020 and 2030, indicate the reduction targets for every province, make sure that the water function regions achieve the standard.

- **Pollution reduction measures**
  Change the industrial structure and the mode of economy development, save water, reduce pollution, give attention to both land and water, perform strict local standards.

- **Guarantee measures**
  Enhance guidance, put responsibility into effect, perfect the harmony mechanism of regional environment protection, environment control artifice, manifold financing, carry out programming projects, encourage the public to participate in it, protect environment rights and interests, strengthen the scientific research ability, establish and perfect monitoring network and information system.

**Action five: Improve the aqueous habitat**

- **Restoration targets**
  With water resources allocation, protection, management and pollution control, restoration targets, such as raising carrying capacity of water resources and environment, realizing efficient protection for aquatic ecosystem and environmental system, remediating aquatic ecosystem and environmental system
damages, reducing damages caused by natural disaster; promoting good aquatic ecosystem and environmental system, realizing safety of aquatic ecosystem and environmental system, economic and social sustainable development in Haihe River Basin, should be achieved. Through implementing measures, the recovery target of the aquatic ecosystem and environmental system will be realized step by step. The final aim expected will be the 1970s’ status of the Haihe River Basin aquatic ecosystem and environmental system by 2030.

◆ General layout
General idea should focus on protecting urban water sources, restoring riverways, wetlands and groundwater, improving the water body function, strengthening water resources allocation and water function regions management. Based on existing water project structures, the general layout follows as that urban water sources conservation on the upriver, wetland and groundwater restoration on mid-river and coastal wetland and estuarine eco-area restoration on the downriver, achieve the target that rivers and lakes ‘connection, green bank, clean water, flowing river’, then form aquatic ecosystem protection and guarantee system.

◆ Action plans

➢ River and lake environment restoration
River surface area restoration project: combining construction of flood control project, some actions will be implemented such as rebuild floodgates, widen and dredge up river ways, heighten dike and allocate water for ecology.
Wetlands restoration projects: Restore 16 wetlands such as Dalangdian, Hengshui Lake and Beidagang, etc.
Groundwater restoration projects: Implement ‘Scheme of reducing exploited groundwater quantity in using water regions of South-to-North Water Transfer Project’, restored water level in groundwater funneled area step by step.
Restored aquatic ecosystem and environmental system of rivers and lakes in cities. Implement restored projects of aquatic ecosystem and environmental system of rivers and lakes in 26 cities such as Beijing, Tianjin and Shijiazhuang, etc.

➢ Water and soil conservancy
Water and soil conservancy projects will take Yanshan Mountain, Yongdinghe River, Taihang Mountain and Lubei Plain regions as the key point, implement lumbering-forbidden measure in the remote mountainous areas where few people live and good-vegetation stockbreeding areas and adopt high standard centralized treatment to avoid the continuous deteriorating trend of water and soil eco-environment in the dense population mountainous areas.

➢ Water sources allocation for ecosystem
Plan water demand of ecosystem, carry out water sources, construct allocation and connection projects.

Action six: Carry out groundwater exploitation control to keep a balance between exploitation and recharge of groundwater

◆ The rule for sustainable exploitation of groundwater
In the foreseeable period and under the condition of using groundwater with well from some containing water layer, some problems, such as continuous decline of water level, ground surface subside, ground surface crack, seawater intrusion, salt groundwater intrusion, soil deserting and natural vegetation atrophy, will not happen.

◆ Target and scheme of reducing groundwater quantity exploited

Target:

➢ Deep confined groundwater overdraft area: forbidden exploitation
➢ Target of low groundwater overdraft area:

The low groundwater overdraft area less than 20 km apart from the coast: forbidden exploitation
The low groundwater overdraft area less 10 km around the salty water area: forbidden exploitation

Besides the two types above, the target of reduced groundwater exploitation is balance between exploited and filled groundwater during several years.

◆ Scheme of exploitation control:

➢ Scheme of deep confined groundwater overdraft area:
By year 2010: the exploited quantity drop to 80 percent of that of the standard year (year 2004).
By year 2020: the exploited quantity drop to 30 percent of that of the standard year (year 2004).
By year 2030: forbid exploitation roundly.
➢ The low groundwater overdraft areas located in brittle ecology and environment areas:
   forbid exploitation roundly from year 2010 on.
➢ The low groundwater overdraft areas in good ecology and environment areas:
   By 2010: the exploited quantity drop to 90 percent of the overdraft quantity of the standard year, by
   2020: the exploited quantity drop to 50 percent of the overdraft quantity of the standard year, by 2030:
   achieve the balance between exploited and filled groundwater quantity.
◆ Guarantee measures
Reduce water demand: reduce non-benefit water consumption step by step, stop wasting water, reduce
the water quantity consumed per unit GDP, adjust industrial and agricultural structure for reducing the
depending on groundwater exploitation.
Increase water supply: make the best of water sources outside basin, such as South to North water
transfer project, Yellow River water transfer project, enhance wastewater treatment and recycling,
increase reclamation water, flood water and seawater available.
**Action seven:** Make wastewater recycled to increase water resource and reduce pollution
◆ Zoning concerning the recycling of wastewater and sewage of the basin
Through the inevitability, economic and feasibility of wastewater recycling, establish uniform
assessment index system and divide reclamation water utilization regions, direct the reclamation water
utilization planning in cities.
◆ Formulating plans for the utilization of recycling wastewater for key cities
Based on summarizing strategic 6 experience, formulate plans for the utilization of recycling wastewater
for key cities.
◆ Bring water reclamation into water resources allocation system
From the angle of view of the whole basin and water right theory based on ET, reclamation water
utilization should be known newly and brought into water resources allocation system to realize that
different users use water of different quality and avoid the effect on water users in downstream.
◆ Strengthen wastewater treatment in small cities and towns
Based on the research results of SS6, ecological pond system, ground infiltration system and manual
wetland system are commended for treating wastewater in small cities and towns, and wastewater
treatment should be put into together with wastewater recycling.
◆ Spread wastewater management experience in coast area of Tianjin
The coast area of Tianjin has accumulated much wastewater management experience, and we can spread
it to other areas of Haihe River Basin.

**References**

   water resources, 2008
   of rivers, 2008
   of water resources, 2008
   (2006-2010)
[5] Strategic study of GEF projects in Haihe River Basin (Study 1 to 8)