

# **Strengthen the Construction of Water Resources Monitoring Ability, Support the Strictest System of Water Resources management**

JIANG Yun-zhong, WAN Yi

(1 China Institute of Water Resources and Hydropower Research, Beijing 100038, China; 2 Water Resources Management Center of MWR, Beijing 100053, China)

**Abstract:** At present, the overall water resources monitoring ability in China is weak since there is an absence of a sound monitoring system and comprehensive monitoring information. In addition to the problem of weak management ability in monitoring, measurement and information, it can hardly meet the need of implementing the strictest management system of water resource and also restricts the practice of the system to some extent. The production states the necessity of further development of water resources monitoring ability and points out the concept of “One Country, One Account” for constructing water resources information. There is an analysis on the demand on further development of water resources monitoring ability and profound discussion about the strategies for supporting “three red-line” management.

**Key Words:** water resources, monitoring ability, the strictest management system

## **Introduction**

The Chinese Government has attached great importance to the water resources management. The No.1 Policy Document on Decision on Speeding Up the Reform and Development in Water Sector (Central Gov.[2011]#1, hereinafter to be referred as “Decision”) stresses the strictest water resources management system which points out that the water resources management is a strategic measure on accelerating transformation of the mode of economic development. The “Regulation for Strictest Water Resources Management”(State[2012]#3, hereinafter to be referred as “Regulation”) was issued by the State Council in 2012, which formulates comprehensive layout and elaborate arrangement of implementing this management system.

The Strictest Water Resources Management System is a strategic decision which will have a long-term proceed and requests hard work of governments and relevant sectors, particularly water authorities. It is hardly to meet the demand of the Strictest Water Resources Management System from respect of regulation, institution, mechanism and management ability as a result of less investment on water resources management in China and shortage of metering and monitoring facilities. It is necessary to comprehend the significance of implementing the Strictest Water Resources Management System and to strengthen the supporting measures on management, regulation, institution, mechanism, fund, capacity and technology on the overall situation of social and economic development. According to the Decision, it formulates to “enhance capacity building of monitoring water quantity and quality and better monitoring assessment to provide technical support” and to “accelerate development of command system of flood and drought control and water resources management system for improving informatization of water resources monitoring, water management and project operation”. The Regulation identifies “improving water resources monitoring system” as the key support measure of implementing the Strictest Water Resources Management System and points out “strengthening the construction on facilities of testing and monitoring water intakes, drainages, and sewage outlets to rivers; accelerating development of water resources management system to build up water resources monitoring and

management platforms at central, river basin and local levels; completing the capacity building of emergency and mobility monitoring and improving overall monitoring, forecasting and management ability”.

### **I Further development of water resources monitoring ability is the key measure on implementing the strictest water resources management system**

The key point of implementing the strictest water resources management system is to formulate and carry out the “three red-line” of water resources management; enforce laws and supervision and bridge the weak links in water resources management which have been embodied in less water infrastructures, insufficient monitoring skills and weak dispatching methods that can hardly meet the demand of implementing the strictest water resources management system. It must promote the comprehensive informatization of water resources and enhance water resources management ability and levels by means of further development of monitoring water resources in China.

#### **1 Further development of water resources monitoring is the urgent demand of carrying out management of “three red-line”**

Since the water resources control is a complex issue that involves the interests of stakeholders and their relationship, including the up and down streams; left and right banks; all related regions and sectors. This issue, therefore, has a high demand on the accuracy, scientificity and elaboration of the first-hand information. The current water resources and its development can hardly meet the demand of the strictest water resources management system as a consequence that it mainly relies on statistics without first-hand information. In addition, there is less equipments for online monitoring water quantity and quality of sections on boundary lines that fails to manage the total water consumption of the local region or hardly achieves the aim of saving energy and reducing emissions. The absence of real time monitoring of water users leads to the failure in assessment of water efficiency. The weak ability of monitoring sewage outlets to rivers and water functioning zones can neither control the total pollutants to rivers nor carry out the supervision and management of water function. It is necessary to strengthen the informatization development of water resources; carry out real time monitoring of key water users, sewage outlets to rivers and river crossing sections on the boundary lines; evaluate the water resources development in effective and instant manner; achieve the target of total control, quota management, water rights allocation and energy saving and emission reduction.

#### **2 Further development of water resources monitoring is the key backup of establishing the method of “one country one account” for water resources**

The water resources information is the important foundation of further development of water resources management. At present, there is a lack of water resources information on the one hand. And on the other hand, the existing information, even though, has been spread out in each authority of every sector at central, river basin or local level. As a result of much different data sources, the information can barely meet the demand of accurate and real water resources data or of the integrated water resources management considering different statistics, technologies, measuring ways, sharing conditions and interest of various stakeholders. For the purpose of further supervision and macro control of water resources of the country, sticking to the “three red-line” and establishing the method of “one country one account” for water resources, it urgently needs to enhance the water resources monitoring ability of the country to collect water information

in instant, accurate and comprehensive manner in order to ensure the updating, authenticity and authority of the water resources data that can lay a backup to the strictest water resources supervision and assessment system.

### **3 Further development of water resources monitoring is the key tool of urban and rural water security**

The water quality security is a current concern owing to the pollution in the water source areas in China. In Chinese cities and towns, the risk of water quality security in drinking water sources involves a large population. Under double stresses of global climate change and large-scale human activity, there is trend of more frequent incidents of water supply security due to droughts and pollutions. The blue alga bloom in Taihu Lake caused emergent water supply risk and negative impact on production and living of residents and social and economic development. The drought in the Northwestern region of China in recent years was rarely seen in history considering its long duration and wide coverage. The tools of further development of water resources monitoring ability, online monitoring of water quantity and quality of drinking water source areas and solution of urban and rural water supply based upon the water source management are necessary for water supply security in rural and urban areas and current urgency of water proceed.

### **4 Further development of water resources monitoring ability is the preliminary step of improving decision-making level**

The water resources management refers to a management of the overall process from water supply to consumption and then to discharge and it also stands for an important window of social management of water and public service. However, the current informationization of water resources has been so far lagging behind that can barely meet the demand of social and economic development which requests a precise, dynamic, scientific and quantitative management of water resources. Comparing with the informationization of other counterparts, like tax affairs, public security, land and resources, environment, meteorology and electronic power, the development in water sector is obviously slow. The informationization development in water sector regarding flood control and drought relief, water and soil conservation and irrigation is also a late comer which can hardly match the key role of water resources in the national strategic priorities. The problem of lacking water monitoring methods and water resources information platform restricts the development of water abstraction permit, water use plan and saving, water allocation, integrated management of multiple sources, water rights identification and transfer. Therefore, it is difficult to transform the water resources management from being extensive to being precise; from static to dynamic; from experience-oriented to scientific-oriented and from qualitative to quantitative.

## **II. The analysis on function framework and demand of the capacity building of water resources monitoring**

The implementation of the strictest water resources management system needs a quantitative, rational and elaborate management of water resources. The key basis of practicing the strictest water resources management system is a better monitoring system with overall monitoring information. It is necessary to set up evaluation system of water resources for improving data collection, monitoring methods and monitoring ability in order to complete the quantitative assessment of four control objectives, including the total water consumption, industrial 10000

yuan increase in the value of water consumption, irrigation efficiency rate and water quality rate of water functioning zones reaching standard. Thus, it can enable the management of “three red-line” to meet urgent demand of being operable, examinable and evaluation-friendly.

The requirement of “three red-line” on the monitoring ability of water resources can be identified as four parts at two levels, including the part of visible red-line, examinable current situation, management with measure and decision making with support at the level of information service and decision making management.

The “Visible red-line” refers to can make the “three red-line” defined by the Strictest System of Water Resources management into a visible way that is easy for public and water managers perceived. The visible red-line is necessary to include the macro-regional level as well as specific object level of water resources development and utilization. The “three red-line” can be decomposed into four evaluation index, including total water consumption, industrial 10000 yuan increase in the value of water consumption, irrigation efficiency rate and water quality rate of water functioning zones reaching standard. Four index includes the level of national total quantity, but also includes index decomposed by river basin and administrative region, while river basin is subdivided into region of first grade, region of second grade, region of third grade, region of fourth grade and region of fifth grade, and administrative region is subdivided into provincial administrative region, municipal administrative region and county administrative region, all these index include different level years of year 2030, 2020 and 2015. In the level of specific object, including water intake users, sewage outlets to rivers, water functioning zones, boundary lines of provinces. These information of “red-line” requests to display in the most visible, notably and accurate way.

The “Examinable current situation” refers to monitoring and display the dynamic relationship between current situation of water resources development and utilization and “red-line” accurately through further development of water resources monitoring capability. Because of the complex of water resources monitoring, it is still cannot monitor every drop of water online automatically, monitoring of status quo including direct monitoring and statistical monitoring. Direct monitoring refers to water quantity monitoring mainly based on on-line monitoring and water quality monitoring mainly based on survey to the specific objects such as water intakes users, sewage outlets to rivers, important water functioning zones, boundary sections of big river and administrative region. Statistical monitoring refers to use the method of combing statistical model with mathematical model to evaluate and monitoring in regional situation of macro-level dynamically on the basis of scientific statistic system. The distance between current situation and “red-line” information is displaying in the way similar to “red-yellow-blue” partition to warning.

The “Management with measure” refers to provide support for red-line management of water resources development and utilization, red-line management of water efficiency control and red-line management of water functioning zones with pollutants, on the basis of “examinable current situation”. Red-line management of water resources development and utilization includes planning management, water resources assessment, water intakes total control management of river basin and region, water abstraction permit management, water resources paid use management, groundwater management and protection, water resources integrated dispatch management, etc. Red-line management of water efficiency control includes water saving management, water quota management, and water-saving technology transformation management,

etc. Red-line management of water functioning zones with pollutants includes water functioning zones supervision management, source of drinking water protection management, protection and recovery of water ecosystem management, etc.

The “Decision making with support” refers to provide decision-making support for managers in the respects of water resources planning allocation, water resources planning dispatch, water resources on-time dispatch and water resources emergency management.

### **III The capacity building of water resources monitoring support for “three red-line” management implement strategic**

The “three red-line” of water resources management is a extremely complex process from index design, decomposition, confirm to the final implementation and evaluation, which is need to formulate reasonable strategy, to provide technical support for “three red-line” management through the capability building of water resources monitoring.

#### **1 Support for the implement strategic of “red-line management of water resources development and utilization control”**

In the aspect of indicator decomposition, takes monitoring to natural water cycle as the foundation, takes water resources available quantity calculated by water resources grading regions as the boundary, takes water resources allocation scheme defined by water resources planning and related water quantity allocation scheme as basis, to formulate control index of regional user water quantity. In the implementation, on one hand management department of river basin to coordinate total index decomposition in each administrative region in the watershed by mean of monitoring platform, on the other hand administrative region to summary index decomposition result in different watershed, after water balance to determine regional water red-line control index in different evaluation stage comprehensively. In the aspect of supervision and evaluation, takes monitoring to social water cycle as the foundation, use water monitoring divides into surface water and groundwater in the evaluation stage. Comprehensively statistic and analysis on monitoring data of surface water and groundwater according to the local use water structure and development trend. At last, combine planning with actual situation, to conduct the red-line examination according to index definition and index management scheme of development and utilization control red-line. The result of evaluation will collect, report and then at public through information system.

#### **2 Support for the implement strategic of “red-line management of water efficiency control”**

In the aspect of index composition, takes water resources planning data and monitoring data as the basis, makes clear current water efficiency index, according to the requirement of regional economical and social development and improve regional water eco-environment, to determine the water intakes reduction rate of 10000 yuan GDP , water intakes reduction rate of industrial 10000 yuan increase in the value of water consumption, and increase rate of water-saving irrigation in the regional national economic and social development planning period. In the implementation, relying on the monitoring to the water intakes quantity of user terminal and statistical measures, the monitoring divides into agriculture water use, industrial water user, and domestic water use. The agricultural water intake mainly through information collection and

transformation system and information service system, get data from related agricultural and irrigation system. The industrial water use monitoring includes on-line monitoring on industrial water intake, self-contained water source, water from public network and unconventional water sources, and make efficiency accounting through analysis of different output of different industry. The monitoring objects of domestic water use includes rural living water, urban living water and tertiary industry in the city, make efficiency accounting comprehensively according to population and structure, through related data from information service system. In the aspect of red-line definition, through the analysis of historical data and the situation of regional economic and social development, according to national targets of energy-saving and emission reduction, aided by water resources planning management and assessment management, make the red-line control target of regional water resources efficiency. The result of evaluation will collect, report and then at public through information system.

### **3 Support for the implement strategic of “red-line management of water function zone limited pollutants”**

In the aspect of index composition, takes “integrated water resources planning” and “water function zones” approved by the central and provincial people’s government as the basis, combines with the target of water quality protection in the water function zones, determine control index of water function zone with pollutants, on the basis of sewage outlets into river of each water function zones. The monitoring to pollutants in the water function zones includes section monitoring of upstream and downstream and water body monitoring in the water function zones. Through the collection and analysis of the on-time water quantity, water quality data and scientific verification data from lab in the section monitoring, to give the monitoring assessment result in the evaluation period of water function zones. The result of evaluation will collect, report and then at public through information system.

For the purpose of further development of national water resources monitoring capability, “Project Implementation Scheme of National Water Resources Monitoring Capability Building (from 2012 to 2014)” is compiled by the Ministry of Water Resources in year 2011. Plan to use about three years to carry out the project of national water resources monitoring capability building, basically establish three monitoring systems, preliminary form national water resources monitoring capability suitable to the short-term target of implementation the strictest system of water resources management, lay a foundation to support for quantitative evaluation of water resources management.

After the implementation of the project, can realize 70 percent of water intake quantity on-line monitoring, 80 percent of water quality monitoring in important water function zones, the full converge rate of water quality monitoring increase from 14 percent to 55 percent, achieve core information interoperability in the central, river basin and provincial water resources management, and main water resources management on-line processing, provides technical support for implementation the strictest system of water resources management and provincial evaluation.

## **Conclusion**

Further development of water resources monitoring ability is a extremely complex and difficult system project and major task, which will has a long-term proceed and involving a wide range and strong comprehensiveness. For the purpose of formulating national integrated water

resources management system, and building water resources information as “one country, one count”, it is necessary to strengthen supporting measures as follows, first should integrated planning, steadily promotion, and adhere to the principle of combing the short-term with long-term; second should overall planning, grading construction, and adhere to the principle of combing central with local, third should demand-oriented, application-oriented, and adhere to the principle of combining advanced with applicable, forth should platforms shared, resources shared, and adhere to the principle of combing the professional with foundation, solid put forward.

## Reference

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