

# The Research on the Framework of Healthy Water System Governance in Shandong Province

LIU Fang, LI Xiaomei, MIN Xianwei

School of Public Administration, Shandong Normal University, Jinan, Shandong 250014, P. R. China

liufang7698@126.com

**Abstract.** At present, the traditional water conservancy system in Shandong has created and exerted great social and economic benefits, but there are some kinds of obvious problems at the same time, for example, the water pollution is serious, the water conservancy project is not complete, the high and new technology is not widely used, the management system is not perfect, and the allocation of water resources is not reasonable, and so on. On the premise of absorbing the experience and lessons of traditional water conservancy, this paper discussed the main components of the framework of health water system in Shandong Province, and formed the four supporting systems of Shandong healthy water system. This study is not only of great practical significance to accelerate the transformation of traditional water resources to healthy water system in the whole province, provide strong support for the construction of strong economic and cultural province. At the same time, it also provides an important reference for the national healthy water system.

## 1. Introduction

The research on the framework of healthy water system governance in Shandong Province has important practical significance. The general train of thought is guided by Scientific Outlook on Development, according to the basic situation of "more people, less land and less water" in Shandong Province, focus on the overall situation of the construction of a powerful province both economically and culturally, and aimed at building a healthy water system demonstration province. The research will follow the idea of the harmony of water and human beings, and persist in overall planning of water control, using water scientifically and managing water with legislation, in accordance with the requirements of accelerating the transformation from the traditional water conservancy to the healthy water system, and ensuring the sustainable development of the economy and society, and then establish a healthy water system framework with Shandong characteristics.

## 2. The main elements of the framework of healthy water system governance in Shandong Province

### 2.1. Good waters and healthy water bodies

It mainly including rivers, lakes, ponds, wetlands and other healthy waters, this is the most basic elements of the traditional water conservancy and also the healthy water system. Among them, the river is the natural water conveyance channel to accept the surface runoff and subsurface runoff, and also the channel of the land to release sediment, salt and chemical elements into the lakes and oceans, playing the role of natural link; the lake is caused by that water accumulation in low-lying land, its



waters are wide and the exchange of water is relatively slow and it makes an important contribution to water storage, flood detention, regulating climate etc; the pond is a small artificial water storage facility, it can increase the collection and utilization of rain flood resources; the wetland is a geocomplex of aquatic biota and soil water that grow in wet or shallow water zone, it is known as the kidney of the earth, and has the functions of digestion of pollutants and improvement of water quality.

#### *2.2. Water conservancy project and connected engineering that is functionally completed*

In order to meet the needs of flood control, water supply and irrigation, human beings rely on natural waters and water systems to build a large number of water conservancy projects, and connect natural water bodies with human society, linking natural water system to artificial water network. These projects mainly include flood control and moisture-proof project(reservoir, barrage dam, dam, seawall, sea embankment, etc), water storage project(reservoir, small reservoir, sluice weir etc), water transfer project(canal, irrigation ditch, pipeline, ferry boat, etc), water lifting project(pumping station and pumped well, etc), water saving project(drip irrigation, sprinkler irrigation, pipe irrigation, etc), drainage project(flood-cutting channel, irrigation ditch, underground pipe etc), water quality restoration project(artificial wetland, oxidation pond etc).

#### *2.3. Advanced water conservancy science and technology that is widely applied*

Science and technology will play a more and more important role in the construction of healthy water system. Besides the extensive application of advanced water conservancy new materials, new technology and new equipment, the healthy water system will also apply the most advanced 3S technology, internet technology and digital technology at home and abroad to water conservancy construction and management.

#### *2.4. Perfect legal system and modern management means*

The perfect legal system and modern management is the guarantee for the smooth operation of the healthy water system. It includes all the water laws, regulations and rules, also includes water conservancy system, mechanism and institution. Especially modern management is an important symbol of the healthy water system. Shandong Province has successively formulated 4 provincial local laws and regulations, 12 provincial government regulations and 19 provincial government normative documents, and has taken the lead in promulgating and implementing "Measures for the control and management of the total amount of water", so as to form a more perfect system of laws and all kinds of water-related activities have laws to rely on.

#### *2.5. Scientific and efficient allocation system of water resources*

With the continuous development and improvement of China's socialist market economy, the healthy water system will also be integrated into it. Many behaviors need to follow the law of market economy and be regulated by the market. However, the water conservancy in China is a public welfare undertaking which is related to the national economy and the people's livelihood, and it cannot be completely allocated according to the market principle. In Shandong, the economic and social development is unbalanced, and water resources are in short supply.

### **3. Support system of healthy water system in Shandong**

After a comprehensive analysis of the components of the above health water system governance framework system. It is concluded that there are four supporting systems of the healthy water system in Shandong, including the healthy water system engineering system that is take multifunctional water network as the core, the water ecological security system that is human-water harmony, the water conservancy mechanism and institutional system that is scientific and perfect, the support system of science and education and cultural guidance system that is innovative. These systems include multiple engineering or management elements, which constitute the basic framework of the healthy water system governance framework, as shown in Table 1.

### 3.1. *The healthy water system engineering system that is take multifunctional water network as the core*

The healthy water system engineering system is an engineering complex based on the core of modern water network, considering the three major problems of water resources shortage, flood and drought threat and water environment deterioration. It has the characteristics of wide coverage, strong function, intelligence, excellent allocation and high efficiency, and also has become the basic support system of modern water conservancy project in Shandong, including the modern and intelligent water network, the flood control, drought resistant and disaster reduction project, the water resource allocation and efficient utilization project and irrigation and the drainage project of farmland.

**Table 1.** Structure of health water system governance framework

Subsystem	Elements
The healthy water engineering system focused on multifunctional water network	The modern and intelligent water network
	The flood control project, drought resistant project and disaster reduction project
	The water resource allocation and efficient utilization project
	The irrigation and drainage project of farmland
The water ecological security system with human-water harmony	The water resources protection project
	The water ecology restoration project
	The soil and water conservation project
The water conservancy mechanism and institutional system that is scientific and perfect	The water conservancy establishment and management system
	The water conservancy operation mechanism
	The water conservancy system
The support system of science and education and cultural guidance system that is innovative	The support system of science and education
	The cultural guidance system

#### 3.1.1. *The modern and intelligent water network*

A modern and intelligent water network with multiple functions, such as flood control, water supply, ecology and so on, in which the pool and pond and canal (pipe) channel are connected, and the density of water network reaches a high level. The network not only will achieve a variety of water storage and drainage network, and both wet and dry transfers, complementary surplus, but also will play an important basic role in optimizing the allocation of water resources and improving the security of healthy water system in an all-round way.

#### 3.1.2. *The flood control project, drought resistant project and disaster reduction project*

The flood control project, drought resistant project and disaster reduction project play an important part in the modern water conservancy project system. It relies on flood control and water supply projects such as reservoirs, rivers, sluices, dams, flood detention areas, wells, small rural water conservancy projects, urban emergency water supply and drainage works. It can cope with large and sudden flood and drought disasters quickly, improve the whole society's ability of flood control, drought relief and disaster reduction, and reduce the proportion of flood and drought losses to the national economy. It's an important part of the modern water conservancy system.

#### 3.1.3. *The water resource allocation and efficient utilization project*

The water resource allocation and efficient utilization project is an effective way and means to deal with the shortage of regional water resources and alleviate the contradiction between supply and demand of water resources. The water resources allocation project mainly includes water source engineering, water conveyance project, urban water distribution plant, rural drinking water project, water conveyance and water allocation project in irrigation area and so on. The project of efficient utilization of water resources mainly includes the use of unconventional water resources, agricultural water saving projects, industrial water saving projects, urban water saving projects and so on. The joint application of these projects can achieve the rational allocation of limited water resources among regions, departments and users, and continuously improve the efficiency of water resources utilization, which is an important part of modern water conservancy system.

#### *3.1.4. The irrigation and drainage project of farmland*

The irrigation and drainage project of farmland is the basic facilities for high efficiency and water saving in all kinds of irrigation areas, and also the main way to improve grain production and ensure food security, including the rebuilding and water-saving project, 'five small' water conservancy project etc. The rebuilding and water-saving is the best means to expand effective irrigation area quickly; and small cellars, small pool, small ponds, small pumping stations, small canals and other small projects is an effective complement of the main irrigation and drainage engineering, it is conducive to the formation of irrigation and drainage system that is "drought can be poured, water logging can be discharged". The modern farmland irrigation and drainage system that "engineering facilities, convenient operation, definition of property right, clear management subject" can significantly improve the conditions for agricultural production, become an integral part of the healthy water engineering system.

#### *3.2. The water ecological security system that is human-water harmony*

Water ecological condition is directly related to physical and mental health of human beings and conditions of life and work. A good ecological water means that soil erosion has been effectively controlled, agricultural non-point source pollution has been effectively controlled, and pond water and estuarine wetland has been effectively repaired, over exploitation of groundwater has been effectively controlled, the damaged mountain has been effectively controlled. It is an important symbol of the harmony of water and human beings. The water ecological security system that is human-water harmony mainly includes the water resources protection project, the water ecology restoration project and the soil and water conservation project, it has become an important supporting system for healthy water system in Shandong.

##### *3.2.1. The water resources protection project*

Water resources protection project is an important measure to ensure water quality safety and improve water environment, including sewage collection and treatment engineering, artificial wetland engineering, sewage interception engineering, sewage diversion project and agricultural pollution control project. Among them, the implementation of sewage collection and treatment in the area of water source protection area and the purification of artificial wetland water quality can improve the water quality of the water source and ensure the safety of drinking water, the water diversion project and the sewage waste water on both sides of the river can protect the water from pollution by taking measures such as removing pollution and diversion or removing pollution, in the process of agricultural production, the scientific application of pesticides and chemical fertilizers and the effective control of agricultural surface pollution can effectively reduce the risk of river and groundwater pollution. The above project is an important content of the water ecological security system.

##### *3.2.2. The water ecology restoration project*

The water ecological restoration project is an effective means to improve the ecological environment, and it is also an important guarantee for the realization of the harmony of water and human beings, including the sewage collection and treatment reuse project, the river reservoir lake and rural water environment comprehensive treatment project, the groundwater recharge supplement source and seawater intrusion prevention and control project, etc. The sewage collection and treatment reuse project can greatly reduce the emission of pollutants and promote the control of the amount of pollution in the water function area within the bearing capacity, and the health of the river and lake can be restored and maintained. The groundwater recharge supplement source and seawater intrusion prevention and control project will be beneficial to the recovery of groundwater level and the restoration and protection of the groundwater environment. The above projects constitute another important part of the water ecological security system.

### *3.2.3. The soil and water conservation project*

The soil and water conservation project is a fundamental measure for water conservation and soil fixation, including comprehensive harnessing project of mountain area basin and control of wind and sand fixation in plain area. In the hilly area, we construct forest for soil and water conservation, conservation forest, ditch project, riverside well field a riverside water source as the main body of the project. In plain area, we develop perfect windbreak forest based on field construction. The above engineering measures will significantly reduce soil erosion intensity and improve local rainwater conservation capacity, so as to effectively reduce soil and water loss caused by natural and human factors, and further improve the regional ecological environment. These projects have also become an important part of the water ecological security system.

### *3.3. The Water conservancy mechanism and institutional system that is scientific and perfect*

The Water conservancy mechanism and institutional system that is scientific and perfect is the key to the water conservancy construction and development to be standardized, unobstructed, efficient and full of vitality. It is an important part of the support system of the healthy water system, including the water conservancy establishment and management system, the water conservancy operation mechanism and the water conservancy system.

#### *3.3.1. The water conservancy establishment and management system*

The water conservancy establishment and management system determine the establishment of administrative organs, enterprises and institutions at all levels and the division of administrative authority, and it is the organizational guarantee for the development of water conservancy construction. At present, China adopts a water resource management system combined with basin and region, while some areas are progressively promoting the integrated management of water affairs. To deepen and improve the above system is the basic guarantee for the development of healthy water system.

#### *3.3.2. The water conservancy operation mechanism*

The water conservancy operation mechanism reflects the basic requirements of the operation and management of water conservancy construction, and it can determine the efficiency and effect, including engineering management and operation mechanism, water investment mechanism, water price formation mechanism, water conservancy service mechanism, water conservancy assessment mechanism, comprehensive law enforcement mechanism and so on. The mechanism of each link of water conservancy construction has been fully adjusted, improved and perfected, which is an important condition for the realization of the healthy water system.

#### *3.3.3. The water conservancy system*

At present, the water law has made clear the following systems: the water-drawing permit system, the paid use system, the system of Drinking Water Sources Conservation Areas, the river sand mining permission system, the system of combination of total water consumption control and quota

management, the water metering and charging system and the system of excess quota progressive price increase. With the promulgation and implementation of "The Measures for the Control and Management of the Total Amount of Water in Shandong Province", the most stringent water resources management system has been established and implemented. In addition, with the improvement of the socialist market economy system, the initial allocation of water rights and the market trading system will be explored and carried out. To strengthen and perfect the system, will guarantee that human behavior can meet the requirements of sustainable development and utilization of water resources, water conservancy and social and economic sustainable development in the process of producing and living in the whole society human behavior to conform to the sustainable utilization of water resources, water resources and the sustainable development of social economy, and it is also an important content of scientific and complete water conservancy system.

### *3.4. The support system of science and education and cultural guidance system that is innovative*

Technology education is an essential support for the development of healthy water system. Cultural guidance is an important measure to expand the social impact of water development, and also is one of the reasons for the development of water conservancy. The advanced scientific and technological level and rich cultural connotation are the important features of the healthy water system, and also an important part of the support system of the healthy water system.

#### *3.4.1. The support system of science and education*

Science and technology is the first productivity. Education and promotion is the key way for science and technology to serve the society. Good support for science and education is the driving force for the continuous development of water conservancy construction. It mainly includes solid water conservancy information platform, good water conservancy and technological innovation environment, strict technical supervision and standards, high-quality professional talents, perfect technology education and promotion.

#### *3.4.2. The cultural guidance system*

Culture is a general term for thought, idea, behavior, customs and habits formed in a certain period. It is the most basic and most solid values and ideology of a nation. Water culture is an important part of Chinese culture and national spirit. Therefore, it can be twice the result of half the effort to promote the development of water conservancy construction through cultural guidance. Cultural guidance is an important way to enhance the social impact of healthy water system. It is mainly to integrate water culture into traditional Chinese culture and carry out various forms of education. It includes popularizing water culture and education, guiding social behavior, improving the cultural connotation and taste of water conservancy projects, and strengthening the protection of water culture. Through subtle influence, we can guide the masses to form scientific ways of behavior and values.

## **4. Conclusion**

The above four supporting systems and their engineering elements constitute the basic framework for the healthy water system governance in Shandong Province, which is also a blueprint for Shandong's healthy water system governance. Even so, to draw such a blueprint will be implemented in a phased way. Among them, the water development goal of Shandong provincial Party committee that basically realized the modernization of water conservancy by 2020 can be considered as an important stage requirement for the development of healthy water system of Shandong. Further discussion should be carried out for specific goals and tasks at this particular stage.

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