

Sustainable Development Strategy for the Water Resource Economy in Qinba Mountain Area

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Abstract: The security and sustainable development of water resources have been determined to be crucial for the green and circular development of the Qinba Mountain Area. Thus, it is important to seek the paths for its implementation. In this paper, we summarize the current status of water-conserving society construction, drinking water security in rural areas, water resource fee-to-tax reform, and pilot water-right construction in the Qinba Mountain Area. Moreover, we consider these problems in terms of water source use, water use awareness, pollution control, and resource reforms. Based on national government plans, a general development strategy has been proposed, which focuses on saving water resources, improving the policies on water resource economics, and science and technology support. The corresponding strategic countermeasures for the sustainable development of water resource economy are as follows: implementing the policies for water conservation and increasing the utilization of unconventional water sources, improving the construction of sewage treatment facilities and strengthening the security of drinking water in rural areas, comprehensively promoting the water fee system reform and expediting the construction of water rights system, and establishing novel development models for the water resource economy based on the resource advantages. The sustainable development of the water resource economy in the Qinba Mountain Area will be supported by a coordinated management of water resources, water environment, water ecology, water industry, and water culture.

Keywords: Qinba Mountain Area; water resource economy; sustainable development; institutional development; technological support

1 Introduction

As per the 13th Five-Year Plan, it has been emphasized that water resources determine production cycles and the development of cities. Thus, water security is considered as one of the national strategies. As a basic natural and strategic economic resource, water is not only the control factor of the ecological environment but also the important component of sustainable social and economic development. Qinba Mountain Area, which has a vast territory and abundant water resources, is underdeveloped and thus requires special support from the government. Taking advantage of its water resources and developing a water resource economy are important strategies to realize the win-win scenario of regional ecological environment protection and poverty alleviation in Qinba Mountain Area and to achieve regional green circular development.

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Water resource economy involves several aspects such as water resource supply and demand, water resource efficiency, water rights and water prices, water resource management, water environment protection, and water resource security [1]. With the support of the CAE Advisory Project “Research on the Strategy of Green Circular Development in Qinba Mountain Area,” the comprehensive research on the water resource protection and utilization in Qinba Mountain Area has been carried out [2]. With the continuous support of “Research on the Strategy of Green Circular Development in Qinba Mountain Area (Phase II),” the project team focused on the regional water resource economy and explored the sustainable development paths of water resources in Qinba Mountain Area from multiple perspectives. Thus, in this paper, we analyzed the current situation of the water resource economy in Qinba Mountain Area, summarized the problems, and proposed the overall development ideas and countermeasures combined with the relevant national planning.

2 Current status

2.1 Water-conserving society construction

From October 2016 to January 2017, related government ministries and commissions have issued a number of water-conserving policies and documents to carry out the water-conserving society construction at the county level. The Qinba Mountain Area authorities have timely issued supporting plans and related policies according to the regional characteristics and have actively promoted the water-conserving society construction.

In January 2017, Henan provincial government issued *Implementation of Double Control of Water Resource Consumption Total Amount and Intensity in the Thirteenth Five-Year Plan*. The plan has proposed that by 2020, water consumption per 10 000 yuan of GDP and value additions by industry would drop by 25 % compared to the ones in 2015. The efficient utilization coefficient of irrigation water would be improved to 0.61. In March 2017, Gansu Province issued the *Implementation Rules for Planned Water Management (Trial)* to control the total water consumption, implement the system of water planned utilization, improve the efficiency of water utilization, and strengthen the management of water demand and processing. Meanwhile, in September 2018, Chongqing municipal government issued the *Water Conserving Management Measures (Trial)*, which specified the principles and mechanisms of water conservation, water conservation management, water-conserving measures, unconventional water source utilization, etc. In 2018, Shaanxi Province carried out the county assessment work of water-conserving society standard construction at the provincial level. Lantian, Zhouzhi, Mei, Huayin, Danfeng, Nanzheng, and Shiquan in Qinba Mountain Area have reached the standard of water-conserving society at the provincial level. In March 2019, the Ministry of Water Resources (MWR) announced the list of the first batch of counties (districts) that have met the water-saving society construction standards, including Eyi, Lueyang, Hanbin, and Shanyang in the Shaanxi area of Qinba Mountain Area.

2.2 Drinking water security in rural areas

Drinking water safety not only serves as an important symbol of the rural living standards improvement, but it is also a measurement of the local’s social and economic development. In recent years, the authorities of Qinba Mountain Area have actively promoted the implementation of the rural drinking water safety consolidation and improvement project, established the shortage of water conservancy, and gradually improved the centralized water supply rate in rural areas.

For example, in the past four years, Fangxian, Shiyan, Hubei Province has invested 289 million yuan in the construction of 308 rural centralized and 870 decentralized drinking water projects. It was estimated that 146 400 poor people were able to have provided access to safe drinking water (100 % coverage). In March 2019, Chongqing municipal government printed and issued the *Implementation Plan for Consolidation and Improvement of Rural Drinking Water Safety*, which selected 12 pilot counties including Yunyang, Fengjie, Wuxi, and Chengkou in Qinba Mountain Area, to explore the long-term mechanisms of rural drinking water project operation and management and to make up for the shortcomings of imperfect rural drinking water facilities, investment and financing mechanisms, irregular operation, and management.

2.3 Water resource fee-to-tax reform

Water resource fee-to-tax reform has been considered an important embodiment of “the compensation systems for the use of water resources.” Shaanxi, Henan, and Sichuan in Qinba Mountain Area are listed as the national pilot provinces for water resource fee-to-tax reform. With the implementation of the translation of taxes and fees,

the burden of domestic water for residents and urban public water supply enterprises did not increase.

The three provinces have issued the implementation measures for pilot provincial water resource tax reform and refined the relevant requirements according to the actual local situation. They then issued and distributed the relevant measures for the information transfer of water resource taxpayers and promoted the work convergence and information sharing of water conservation and tax departments. In addition, Henan Province issued the *Emergency Plan for Water Resource Tax Collection and Management* in order to establish and improve the emergency working mechanisms for water resource fee-to-tax reform. Sichuan Province has also issued a number of special management measures, including *Notice on Matters Related to Water Resources Tax Collection of Centralized Drinking Water Projects Mainly for Rural People's Living Water* and *Notice on the Scope of Water Resources Tax Payment Locations* [3].

2.4 Pilot water-right construction

After the completion of the South-to-North Water Diversion Project, the shortage of water resources in Henan Province has been alleviated. However, due to the unbalanced economic development of the receiving areas, there still remains a mismatch between the allocation of water use indicators and water demand in a certain period after the operation of the middle route of the South-to-North Water Diversion Project. In June 2014, MWR issued the notice on carrying out the pilot work of water rights, selected Henan Province in Qinba Mountain Area as one of the seven pilot areas to conduct water rights trading between cities and counties along the middle route of the South-to-North Water Diversion Project (Table 1), and explored the establishment of water rights trading information system, trading rules, risk prevention, and control mechanisms. In December 2017, the pilot work of water rights in Henan Province had been checked by the MWR. By promoting the South-to-North Water Transfer trade, the regional disbalance between water supply and demand was effectively alleviated. The balanced development of the economy and society in different regions was promoted. At the same time, the pressure on local businesses to pay the basic water fee for the South-to-North water transfer was eased. Further, the water consumption index for the South-to-North water transfer has been noted to have accelerated.

Table 1. The trading situation of the South-to-North Water Diversion Project in Henan [4].

Two parties	Annual trading volume ($\times 10^4 \text{ m}^3$)	Trading time (year)		Trading value ($\text{yuan}\cdot\text{m}^{-3}$)	
		Agreement	Intention	Trading value	Trading profit
Pingdingshan–Xinmi	2200	3	20	0.87	0.13
Nanyang–Xinzheng	8000	3	10	0.74	0.13
Nanyang–Dengfeng	2000	3	10	0.84	0.23

2.5 Water ecological civilization construction

In 2013, MWR selected a number of cities with good foundations, strong representation, and typicality to carry out the pilot work of water ecological civilization construction. Several cities in Qinba Mountain Area were then selected. In August 2017, Xi'an has been included in the first batch of the national water ecological civilization construction pilot. From November to December 2018, Xiangyang, Luoyang, and Nanyang have been included in the second batch. For example, in Nanyang, Henan, the protection of the river water ecological environment was strengthened, and the long-term management mechanisms for the construction of water ecological civilization city were developed and implemented. The construction project of World Water Expo Park in Xichuan has been included in the 13th Five-Year Plan of Nanyang. Nanyang Baihe National Wetland Park was then identified as a National Wetland Park.

3 Problems

3.1 Low utilization of unconventional water sources

According to the statistics for the water resources consumption bulletin in 2017, the surface water supply in Qinba Mountain Area was about 76 %, the groundwater supply was about 22 %, while the water supply from other sources was deemed very low. Longnan (13.20 %), Dingxi (11.43%), and Xi'an (7.46 %) were the top three cities that have high water supply rates from unconventional sources. Though the groundwater supply rate in Shaanxi and Henan was high, the contribution of their unconventional sources was less than 5 %. The common sewer networks with a mixed flow of rainwater and sewage water were mostly used in these regions. The diversion of

rainwater and sewage water lagged behind, which aggravated the water pollution and resulted in a significant waste of rainwater resources. However, the insufficient treatment capacities of domestic and industrial sewage have limited the contribution of renewable water supply.

Based on water usage indicators, low water utilization rates were identified in several areas. It potentially opened new horizons for water conservation in households, farmland irrigation, and industrial systems. For instance, the per capita water consumption in Hanzhong, Shaanxi, from 2015 to 2017 was about 480 m³, the average water consumption per 1000 m² for farmland irrigation was more than 1200 m³, and the water consumption per 10 000 yuan of GDP was more than 120 m³, far exceeding the national average. In addition, the leakage rate of the water supply network in most areas of the region was more than 10 %. Moreover, in Shiyang and Xiangyang in Hubei, it was more than 25 % [5]. The construction loopholes of pipe network facilities aggravated the waste of water resources.

3.2 Awareness of ecological water needs

According to the statistics of the water resources bulletin in 2017 (Table 2), the eco-friendly water consumption in Qinba Mountain Area was 6.195×10^8 m³, accounting for only 3.09% of the total water consumption. The eco-friendly water consumption in Luoyang and Xi'an was determined to be highest (more than 10 % of total consumption). The latter was due to the shortage of surface water resources, serious groundwater exploitation, and the great demand for ecological water supply. The surface water sources in Hubei were deemed sufficient, leading to the low demand for ecological water supply. The improvement of the awareness of ecological water in several areas is still required.

Table 2. The status of ecological water supply in Qinba Mountain Area.

Province	City/county	Ecological water content ($\times 10^8$ m ³)	Total water content ($\times 10^8$ m ³)	Proportion (%)
Henan	Luoyang	1.530	14.750	10.370
Chongqing	Chengkou	0.004	0.413	0.940
	Yunyang	0.014	1.600	0.880
	Fengjie	0.015	1.100	1.360
	Wushan	0.008	0.609	1.260
	Wuxi	0.008	0.585	1.280
	Kaixian	0.030	2.910	1.030
Sichuan	Mianyang	0.690	18.920	3.650
	Guangyuan	0.120	6.400	1.890
	Nanchong	0.100	13.610	0.730
	Dazhou	0.360	12.090	2.980
	Bazhong	0.050	5.240	0.950
Shaanxi	Xi'an	2.230	19.030	11.720
	Baoji	0.180	8.240	2.180
	Hanzhong	0.110	16.640	0.660
	Weinan	0.230	14.530	1.580
	Ankang	0.080	7.390	1.080
	Shangluo	0.100	3.010	3.320
Gansu	Longnan	0.004	1.970	0.200
	Tianshui	0.060	3.860	1.550
	Dingxi	0.030	3.850	0.780
	Gannan	0.003	0.830	0.360
Hubei	Shiyang	0.080	9.000	0.890
	Xiangyang	0.160	33.980	0.470
	Shennongjia	0.000	0.160	0.000

3.3 The effect of water pollution control in rural areas

The lack of standards has been identified as the biggest problem for the sewage discharge and treatment in rural areas. At present, only Chongqing, Shaanxi, and Sichuan have officially issued relevant local standards in Qinba Mountain Area, whereas Gansu and Henan have issued drafts for comments. The incentive policies for rural sewage recycling and waste recycling and the improvement of the complementarity between rural domestic waste,

pesticide and fertilizer, livestock manure, aquaculture standards, and local land policies or sewage treatment standards are required.

There are multiple rural domestic pollution control technologies and facilities. However, in some areas, the treatment technologies simply copied those for urban pollution control. Moreover, in several areas, local treatment technologies and modes are not deemed suitable for the local conditions, water quantity, and quality. For instance, some areas pursue high-end devices and demonstrate low investment efficiency and uneven treatment. The problems of sewage scattering and direct discharge remain serious. It can be attributed to the relatively backward infrastructure construction, the poor sewage collection capacity, and the low construction coverage of treatment facilities limited by the sewage pipe network. The operation of rural water conservation and environmental infrastructures has been deemed professional but unintelligent. It is difficult to realize the information management for optimal operation and maintenance, which leads to the low effective utilization rate of related facilities.

3.4 Disbalance between water price reform and water right transaction

The average water price in Qinba Mountain Area is relatively low. The progress of water price reform and development is uneven. The scope and standards of water price collection in the region are related to the level of economic development and water resource conditions. Overall, this level is low. In some areas, there is little difference between the price of water for production and operation and that for households. Water resource management systems did not succeed in restricting industrial water consumption. The policy aiming to restrict water consumption for particular industries is not prominent. In terms of domestic water usage, as of the end of 2017, there were still some areas that have not implemented the stepped water price system for residential water usage. The collection standards of sewage treatment fees in some areas have not met the relevant national requirements. In multiple areas, authorities were unable to collect fees, or the collection standard was too low to make up for the cost of water supply and the scarcity of water resources.

The water rights system is also not perfect. For instance, the water rights transaction is still in the exploratory stage. The current water right trading is mostly carried out in the provincial administrative regions or a single basin due to the lack of national legislation. Thus, trading between different regions and basins is quite difficult to implement. For the existing water right trading, developing a unified implementation standard has been difficult due to the different conditions in the pilot provinces. Moreover, the artificial isolation of the water rights trading market due to institutional reasons is not conducive. In particular, it hinders the formation of a comprehensive, standardized, and unified water rights market, including the Qinba Mountain Area. In addition, the economic value of water resources is focused too much in the current water right trading while the ecological value of water resources is ignored, which restricts the comprehensive benefits of water right trading.

4 General development ideas

4.1 High priority of saving water resources

The people of Qinba Mountain Area should obey the principle of saving water resources, comprehensively promote the water-conserving society construction, and strictly control the total amount and intensity of water resource consumption. They also should promote wastewater recycling and rainwater resource utilization, improve water resource utilization efficiency, form water-saving production and lifestyle, and promote regional economic growth, transformation, and upgrading by comprehensively improving water resource utilization efficiency.

4.2 Improvement of policies for a water resource economy

The people of Qinba Mountain Area should obey the decisive role of the market in water resource allocation, implement the combination of government guidance and market regulation, improve the system of paid use of water resources, and stimulate the internal productivity of sustainable development of water resource economy. They also should establish a regional water rights system in Qinba Mountain Area. On the basis of summarizing and evaluating the experience of pilot water right trading and water flow property right confirmation in the region, they should establish the initial water right allocation system, cultivate and develop the water market, and explore various forms of water right trading.

4.3 Focus on science and technology support

The people of Qinba Mountain Area should strengthen the role of science and technology support and promote

the application of novel information technologies, including big data, Internet of Things, and artificial intelligence. These technologies can be used for regional water resource monitoring and management, wastewater treatment, water-saving equipment, etc. Thus, the focus should be on the collaborative research of advanced technologies and applicable equipment such as accurate water intake measurements, online real-time monitoring, accurate water-saving irrigation control, efficient recycling of water resources, reclaimed water reuse and rainwater utilization, and intelligent leakage monitoring of pipe network. They should also strengthen the demonstration and application of advanced and practical technologies, accelerate the transformation of technological achievements, and expand water-saving and green industries.

5 Strategies and suggestions

5.1 Implementation of the National Water Saving Action plan

The *National Water Saving Action Plan* should be implemented in Qinba Mountain Area to achieve agricultural water saving and production increase, industrial water saving and emission reduction, urban water saving and loss reduction; further, the use of unconventional water sources. (1) In the process of promoting the comprehensive reform of agricultural water price, advanced and applicable agricultural water-saving irrigation technologies, including channel anti-seepage, pipeline water delivery, sprinkler irrigation, walking irrigation, drip irrigation, and low-pressure pipe irrigation, should be promoted. (2) The rapid development of the water-saving irrigation equipment manufacturing industry should be promoted, together with the application of intelligent technologies in water-saving irrigation and industrial water-saving transformation. Enterprises that carry out water-saving technology upgrades and recycled water reuse should be guided. (3) The water supply and consumption measurement system and online monitoring system should be further advanced. Water-saving management and upgrade of high water consumption enterprises in an effort to strengthen advanced wastewater treatment and standard reuse should be encouraged. A scientific water supply network transformation technical scheme should be adopted. The old pipe network replacement should be gradually promoted. The water supply network design and scaling mechanisms should be extensively studied. Network management should be carried out finely to build the digital pipe network. (4) The application of reclaimed water should be taken as the guidance for the wastewater treatment standard. Moreover, landscape, municipal greening, agricultural irrigation, and industrial utilization should be prioritized. We should thus implement the low impact development mode by building rainwater collection and utilization facilities featuring infiltration, detention, storage, purification, utilization, and drainage according to local conditions. The latter will promote the sponge city construction in Qinba Mountain Area.

5.2 Improvement of construction of rural sewage treatment facilities

Combined with the process of rural domestic waste treatment, toilet revolution, reconstruction of dilapidated buildings, and rural road construction in Qinba Mountain Area, the water supply facilities, drainage facilities in rural residential buildings, and lay sewage collection pipelines should be improved. Pollution control and resource utilization should be implemented under the combination of engineering solutions and ecological measures.

The combination and optimization research of rural sewage treatment processes should be strengthened. A technical support system with short processing times, less equipment, and easy management should be developed. The green and efficient drinking water treatment technology should be adopted, with stable standards and health protection. It should become the core goal and include new water purification processes with low energy consumption, fewer chemicals usage, and short processing times. The latter can be based on physical separation and imitation of natural technologies, safe disinfection processes with broad-spectrum sterilization, low by-products production, and continuous disinfection.

Centralized or decentralized treatments and corresponding sewage treatment technologies are selected according to the rural sewage discharge intensity, regional differences in water quality/composition, rural water standards, and other factors. We suggest establishing a local government to spearhead rural sewage operation mechanisms, clarify the main responsibility, and improve the supervision system. We also believe that it would be useful to develop a long-term and stable funding mechanism for rural sewage treatment, increase government financial support, and encourage private capital to participate. Finally, we suggest forming a market-oriented service system of third-party professional institutions in order to ensure the long-term and stable operation of sewage treatment facilities.

5.3 Following market trends and promotion of the water price system reform

We suggested establishing and improving the ladder price system of water for urban residents. In areas where this system is yet to be implemented, the specific implementation scheme should be formulated as soon as possible. The step water quantity, step water price, and pricing cycle should be reasonably determined in combination with the local conditions. Cities and towns that have implemented stepped water price for residents should carry out further adjustment and improvement in accordance with relevant national requirements and plans. In this process, it is important to speed up the automatic water meter installation in order to lay the foundation for the full implementation of the step price system of residential water.

The charging standard of sewage treatment should be reasonably increased. Considering the regional water pollution control situation, economic and social affordability, and other factors, the operation cost of sewage treatment and sludge disposal facilities should be compensated. Reasonable profits should be allowed. The standard of sewage treatment fee should be moderately increased. The collection of sewage treatment fee should also be optimized.

We suggest to reasonably raise the standard of water resources fee collection and steadily promote the water resource fee-to-tax reform. In areas where the water resource fee-to-tax reform has not been carried out, it is suggested to reasonably raise it for groundwater, especially for certain industries, refine the user or industry classification of water resource fee collection standard, and explore the collection standard of combining single water resources fee with progressive one. We also believe that it would be beneficial to summarize and evaluate the effectiveness and experience in the pilot areas and optimize the water resource fee-to-tax reform program. Finally, we suggest to improve the water intake permit system, strengthen the registration of users' water intake permit, improve the popularization rate of water intake metering facilities, capitalize on the advantages of big data in monitoring the information of enterprises' water users, and realize automatic supervision.

5.4 Optimization of water right system construction and standardized water right transaction

The improvement of the initial water right confirmation and distribution mechanisms has been determined as vital in the entire water right system construction [6,7]. It is suggested to establish a water rights trading market in Qinba Mountain Area, break the disadvantages of market dispersion and regional limitations, gradually expand the scope of industries and trading subjects, and promote the orderly establishment and operation of the large-scale market.

We also suggest standardizing the price formation mechanism and strengthen the decisive role of the market in the price formation process of water right transaction. We believe that it would be useful to explore the price formation bidding mechanisms in advance to ensure that they truly reflect the price of water rights to the willingness of the transferor and the transferee to pay and ensure that the transferor of a water right can obtain the reasonable income.

5.5 Innovative water economy development model based on the resource superiority

Based on the characteristics of water resources, such as ecology, culture, and tourism, and following the principle of "green, innovation, integration, and sustainability," the comprehensive development of water-related industries in Qinba Mountain Area should be promoted. Cultivating and expanding the natural water industry based on quality water is an important way to promote the green circular development of the water resource economy. It is suggested to build a unified, independent brand of drinking water and develop an online commercial water market relying on the e-commerce platform. With a large amount of tourist resources, it is suggested to combine the regional cultural resources to create a unique hydrological landscape and vigorously develop tourism. Based on the regional advantages of good air and water resources, it is suggested to build a healthy environment, integrate healthy lifestyle concepts, and vigorously develop the healthcare industry. It is suggested to capitalize on the advantages of traditional Chinese medicine, strengthen green production and upgrade superior products, and vigorously develop the modern Chinese medicine industry.

6 Conclusion

Abundant and high-quality water resources endow the Qinba Mountain Area with good potential for sustainable development of the water resource economy. However, due to historical development specifics and geographical factors, the current condition of water resource economy in Qinba Mountain Area is not optimal. High-quality

water resource conditions have not yet been transformed into economic advantages. According to the characteristics of Qinba Mountain Area, it is suggested to implement the *National Water Saving Action Plan*, improve the construction of rural sewage treatment facilities, promote the reform of the water price system, standardize water rights trading, and innovate the development mode of water economy. The sustainable development of the water resource economy in the Qinba Mountain Area should be put into practice by coordinated management of water resources, water environment, water ecology, water, industry, and water culture (Fig. 1).

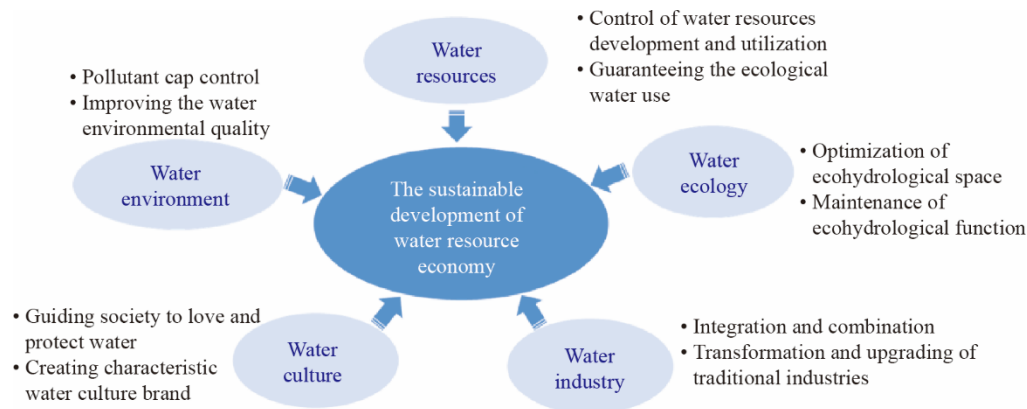


Fig. 1. Development strategy for the water resource economy in Qinba Mountain Area.

References

- [1] Shen M H, Chen Q N. Water resource economics [M]. Beijing: China Environmental Science Press, 2008. Chinese.
- [2] Hou L A, Yang Z F, He Q, et al. Development strategy for the utilization and protection of water resources in the Qinba Mountain Area [J]. Strategic Study of CAE, 2016, 18(5): 31–38. Chinese.
- [3] Dai X Q, Zhou F, Liao S H. Analysis of the progress of expanding water resources tax reform pilots [J]. Water Resources Development Research, 2019, 19(3): 3–4, 40. Chinese.
- [4] China Urban Water Association. Yearbook of urban water supply statistics 2018 [M]. Beijing: China Urban Water Association, 2018. Chinese.
- [5] Guo H, Chen X D, Liu G. Study on the practices of water rights trading in South-to-North Water Diversion middle route project [J]. South-to-North Water Transfers and Water Science & Technology, 2018, 16(3): 175–182. Chinese.
- [6] Tian G L, Ding Y M. Research on water rights registration system under the water rights administration reform [J]. China Population Resources and Environment, 2016, 26(11): 90–97. Chinese.
- [7] Tian G L. Comparison of the experiences of water rights reform in pilot provinces and its countermeasures [J]. Environmental Protection, 2018, 46(13): 28–35. Chinese.