Sustainable Development and Management of Water Resources in the Yangtze River Basin

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Abstract. Water resources are the basic resources on which people depend for survival. They play an indispensable role in the procedure of modern economic society and also important links in the construction of ecological civilization. With the continuous acceleration of the industrialization process, the problem of rapid population increased cannot be furthermore underestimated. The healthy water resources have increasingly become a prerequisite for sustainable economic and social development, and it is imperative to strengthen the sustainable development and management of water resources. Therefore, including the existing problems in the management of water resources, and propose further development strategies, which provides feasible references for promoting the rational use of environmental resources and protecting China’s river basins.

Keywords. Water resources; Yangtze River Basin; sustainable development; water resources management.

1. Introduction
“Together grasp great protection and not engage in major development” is the overall goal of ecological civilization construction in the Yangtze River Basin in the new era, and water resources are the key core elements. However, in the early industrialization and urbanization process, due to improper protection and management of the Yangtze River Basin, problems such as the shrinking of the Yangtze River waters, the deterioration of water quality, the sharp reduction of resources, and the degradation of ecological functions were prominent. In recent years, relevant state departments and local people’s governments in the river basin have advanced construction and protection of ecological environment resources [1], and invested a lot of money to improve the ecological environment protection of the Yangtze River Basin, with certain results. However, due to the combined effects of human economic activities and climate change, the significant lakes have shrunk, and the quality of water resources declined remains prominent. Such as the Dongting Lake and Poyang Lake, which are called the “double kidneys” of the Yangtze River, have repeatedly experienced droughts. The ecological and ecological damage in the basin, frequent flood and drought disasters, serious pollution of the water environment, increasing shortage of water resources, and serious soil erosion are still new and old problems. Intertwined, local health conditions are worrying, far beyond its resources and environmental carrying capacity, making the Yangtze River water ecological environment is facing unprecedented challenges. Therefore, to implement a new concept of water control in the new era, not
only promote the sustainable development of the Yangtze River Basin, but long-term strategic tasks are required.

2. Overview of Water Resources in the Yangtze River Valley
The biggest river and mother river and life river of the Chinese nation is the Yangtze valley. It has a total length of more than 6,300 km and a watershed area of 1.8 million km², accounting for 18.8% of the country’s land area. It is carrying 32% of country’s population and 34% of the total economic volume. It is a strategic water source for China’s water resources allocation, an important clean energy strategic base, and a “gold” traversing the east and west. "Waterway", a natural treasure trove of rare aquatic organisms and an important support for improving the ecology and environment in the north, is one of the most dynamic and potential areas for economic development in China [2].

It is obvious that coordinating the relationship among water environment and water ecological carrying capacity of the Yangtze valley and strengthening the long-term development and management of the watershed are both the primary content of the construction of the river economic development index and the sustainable development of the Yangtze valley’s economy and society provides important support.

3. The Main Problems Facing Water Resources in the Yangtze River Valley
Comprehensively promoting construction of ecological civilization in drainage areas of the Yangtze River is a new requirement in the new era, and it is also an important part of implementing the new development concept of “innovation, coordination, green, openness and sharing”. Protection is placed in a prominent position in the China’s future ecological construction, moreover gradually strengthen protection of ecological development and utilization of the Yangtze River valley. Since the founding of New China, the CPC Central Committee and the State Council have attached great importance to the development and protection of the Yangtze River. They have always adhered to the planning preparation as the guide, the wading management as the means, the project construction as the basis, and the scientific and technological innovation as the support to carry out the Yangtze River management and development in all aspects. Work with protection. Through the unremitting efforts of several generations, tremendous achievements that have attracted worldwide attention have been achieved. The protection system and water ecology has been gradually established, and the comprehensive management system for river basins has been continuously improved [3]. However, due to the constraints of natural environment changes and human social production and living activities, combined with unreasonable use and management, some areas of the Yangtze River Basin gradually began to show polluted water, shorter water, and soil erosion is increased year by year. This result leads to make the water ecological carrying capacity and economic and social development needs to be out of balance, which has become the most important factor restricting the sustainable development of the entire society. Its outstanding performance is in the following four aspects.

3.1. Water Pollution is Serious, and Water Ecological Security Faces Severe Challenges
Overall, the Yangtze valley are relatively great, while quality of the water environment in some regions is still not optimistic. Specifically, the tributaries of Jialing River, Minjiang River, Tuojiang River, and other tributaries along the middle and lower reaches of the Yangtze River have prominent water pollution problems, concentrated industrial zone layouts, and concentrated discharge. The pollution problems are particularly prominent. The water quality in Class III and Class II tributaries is even inferior to Class V, making some tributaries and lakes and reservoirs eutrophic. The improper treatment of urban industrial waste water, low sewage collection rate, direct sewage discharge, and backward sewage pipeline infrastructure directly affect the environmental carrying capacity and environmental renewable capacity of the Yangtze valley [4]. The consequences of this are: first, it directly affects the social water use of urban residents along the river, which increases the safety risk of drinking water; second, the rapid growth of the urban population is also one of the causes of insufficient water supply, leading to water supply security risks. Third, the destruction of water
environment, unreasonable exploitation, overfishing and other factors have led to a sharp decline in aquatic biodiversity, cherishing species on the verge of extinction, and the threat of aquatic ecological security. This shows that water pollution presents serious problems, and the tasks of water pollution stock control and incremental control are still very arduous [5]. These potential risks have led to severe tests and challenges for water ecological security.

3.2. The Extensive Utilization of Watershed Shorelines Highlights the Contradiction between Management and Protection

With the rapid economic and social development of the Yangtze River Basin, the provinces and cities along the Yangtze River have paid more and more attention to the "gold value" of the Yangtze River coast. The economic development of the mainstream of the lower reaches of the Yangtze River and some cities have relatively scarce coastline resources. The problem of the extensive utilization of online resources is very prominent [6]. According to the relevant data of China Industrial Economic Information Network, the 158-km coastline of the Hunan section of the Yangtze River trunk line has more than 70 terminals of various sizes; the 152-km coastline of the Yangtze River in Jiujiang, Jiangxi, and more than 150 ports; Anqing in Anhui and Chizhou in 167 Utilizing the shoreline, there are 260 berths of various terminals. There is a pier less than one kilometer on average. The further downstream, the denser the ports and terminals, and the tighter the shoreline resources, there is basically no new shoreline available in Jiangsu Province. However, the problem with this is that the utilization efficiency of shoreline resources is not very high, and some construction projects generally have unreasonable phenomena such as unused, more occupied and less used, deep water and shallow use, and lack of shorelines for public terminal construction. Take advantage of extensive development and low efficiency. It is precise because of this extensive shoreline development and utilization that the contradiction between the water ecological environment protection area that should be an important wetland, water resources protection area and residents' drinking water source area is increasingly prominent.

In addition, the development and utilization of shoreline resources involve multiple departments such as maritime affairs, port and shipping, transportation, water conservancy, land, waterways, and environmental protection. The functions of these departments are cross-cut and lack of unified planning. The conflicts between the counties and cities along the Yangtze River and even between the provinces and cities are difficult to coordinate, which has led to the intensification of the conflict between the management and protection of the Yangtze River Basin.

3.3. Imperfect Institutional Mechanisms and Insufficient Comprehensive Management Capabilities

Through these practical explorations, the Yangtze River Basin has initially formed a comprehensive management system. First, in the management regulations concerning water resources laws and regulations, such as the “Water Pollution Prevention Law”, “Water and Soil Conservation Law”, “Nature Protection Zone Regulations”, “Water Pollution Prevention Law Implementation Rules” all Regulations have been made for management, and the laws and regulations system has been gradually improved. However, with the rapid development of the regional economy, the contradiction in the development and utilization of water resources has gradually emerged. The local legislation and departmental legislation lack specificity and pertinence to the problems in the standardized management of the watershed, which gives reasonable development, and Continuous use and effective protection bring challenges. First, due to the large number of regional provinces flowing through the Yangtze River Basin, each local government will be driven by economic interests and local protection considerations, and will not formulate policies for the interests of the entire river basin. This also affects the Yangtze River Basin. An important factor for sustainable use. The second is that the management of the Yangtze River Basin involves multiple departments, the responsibilities of different departments are cross-cut, the responsibilities are not clearly defined [7], the information exchange is inaccurate and timely, the information sharing is insufficient and opaque, the coordination
ability needs to be strengthened, and the comprehensive management ability needs to be improved. This will directly restrict the sustainable development of the economy and society.

3.4. Lack of In-Depth Public Participation Mechanism, No Information Sharing Mechanism Platform Established

For many years, the Yangtze River Basin has been based on government administration as the main mode of communication and coordination management. It is led by the government alone, with little public participation, and there are problems with the democratic management of water resources. Local governments and relevant departments at all levels use top-down internal management methods to exchange information, but few representatives of the people in the water source area participate in water management and decision-making, and public supervision is not strong enough. Up to now, the cooperation and coordination between many local governments, water conservancy departments, and non-governmental organizations have lagged behind, making the resources of the Yangtze River Basin unable to fully reflect public opinions and the interests of the water users. In the long run, public participation is seriously inadequate, and public enthusiasm and initiative are greatly reduced. Due to the unavoidable overlapping of functions and powers of various departments, there is no unified platform for establishing an information-sharing mechanism, which has weakened the chance of division of labor and cooperation; Reflecting the demands, this is also one of the issues that need to be resolved to maintain the sustainable use and development of the Yangtze River Basin.

4. Effective Strategies for Sustainable Development and Management of Water Resources in the Yangtze River Basin

4.1. Enhance the Sustainable Use of Water Resources in the Yangtze River Basin

Increasing the utilization rate of water resources enables the Yangtze River water resources to develop in a reasonable and sustainable direction, and supports the sustainable development of the economy and society with the sustainable development of river basin water resources.

4.1.1. Improve the Efficiency of Sustainable Recycling of Water Resources. The most effective way to save water resources is to enhance the recycling of water resources. The development of the Yangtze River Economic Belt in recent years has also driven the economic and social development of the surrounding cities [8]. On one hand, the internal water recycling and reuse of industry companies can be used to alleviate the crisis of water resources shortage in the Yangtze River Basin and reduce the amount of water drawn from urban natural water bodies. On the other hand, vigorously promote the reuse of urban sewage for industry, agricultural irrigation, public facilities, residential flushing toilets, irrigation of green space, landscape water, and roads, etc., which also saves the water intake of the Yangtze River Basin at the source. Both resource conservation and economic development are correct.

4.1.2. Deepen the Awareness of Water Resources Protection. It is literally impossible for resident that protect water resources cannot rely on single government management, and more people need to participate to jointly protect water resources and improve the efficiency of water resources utilization. To expand the propaganda and protection of the Yangtze valley's water resources and raise publicity of water hazards [9]. First of all, through the new information era propaganda media such as TV, radio, and the Internet, we can carry out centralized propaganda at the annual “World Water Day” and “China Water Week” opportunities. It calls on people to pay more attention to the Yangtze River valley, in addition to change the habit of severely overusing and wasting water resources. Secondly, local administrative departments at all levels adopted laws and regulations to popularize the relevant knowledge of the “Water Law” among the people, widely implement the concept of automatic water-saving formed by urban residents around the river, clarify the awareness of water rights, and strengthen the utilization efficiency of the Yangtze valley’s water resources. Action by the whole people to reach a consensus and lay a solid foundation in the future.
4.2. Strengthen Water Resources Management in the Yangtze River Valley

Strengthen innovative management method, balance the ecosystem, provide a strong guarantee for the sustainable development of water resources, maintain production capacity for the sustainable development of the economy and society, and ensure the long-term stability and sustainable development of human society.

4.2.1. Strict Legislation and Implementation of National Pollution Control Laws and Regulations.

So as to realize the comprehensive management, laws and regulations are essential [10]. First, further improve the existing laws and regulations in the Yangtze River valley, and use legal coercive measures to promote water conservation and make the laws more operable. Second, speed up the establishment of special laws and regulations on the Yangtze River Basin and adapt to the characteristics of the Yangtze River Basin, such as the “Regulations on the Protection of Water Resources in the Yangtze River Basin”, “The Yangtze River into the River”. Specifically refine the watershed management and the scope of specific responsibilities, focusing on the promotion of drainage areas of the Yangtze River Basin, joint scheduling of reservoirs in the midstream, utilization of resources on the coast, and middle and lower reaches of river channels. The formulation of relevant supporting laws and regulations such as beach governance, further improving the water laws and regulations system, and providing legal protection for the construction of the Yangtze River Economic Belt; third, strengthening law enforcement capacity building, strengthening law enforcement teams, coordinating the promotion of comprehensive law enforcement and joint law enforcement in the Yangtze River Basin, and enhancing supervision and law enforcement The level will ultimately provide a basis for the management of the Yangtze River Basin and strict enforcement.

4.2.2. Optimize Water Resources Management and Speed up the Improvement of Institutional Mechanisms.

In the management of the Yangtze River valley, it is necessary to continuously optimize and innovate water resources management systems so that relevant local administrative departments and water conservancy departments along the Yangtze River can realize that the rational usage can promote the healthy development of society. First, according to specific conditions, a special management department should be established to manage the Yangtze valley’s water resources, in addition, improve the water resources management system, and achieve effective protection of the Yangtze River’s water resources. The second is to rationally adjust the industrial structure, promote the upgrading of surrounding enterprises along the river, optimize the industrial structure [11], improve the available structure of water resources, and strengthen the purification of the Yangtze River waste water and sewage. For urban and rural domestic water, we must improve and upgrade its water supply system in a timely manner. The third is to intensify the supervision of the management of the Yangtze River Basin, establish a daily supervision and inspection system, effectively implement law enforcement, and implement the main responsibilities of law enforcement supervisors. We will resolutely implement comprehensive clean-up and rectification of illegal sewage discharge, barrier setting, fishing, breeding, sand mining, mining, reclamation, and encroachment on waterfronts in the river, and further improve governance capabilities.

4.2.3. Establish an Information-Sharing Platform and Expand Public Participation.

With the rapid development of science and technology networks and the continuous improvement of social governance, the participation of the public in the management of water resources has gradually become more convenient. One is to actively promote the sharing of resource information among the administrative regions of the Yangtze River valley and conservative departments, promote communication and consultation, and use information technology to effectively carry out exchanges and cooperation; the second is to involve the public in the social governance of the Yangtze River Basin water, so that representatives directly participate in water-related decision-making in the Yangtze River Basin, enhancing the public participation and democratic consultation mechanism in the Yangtze River Basin, and improving the efficiency and effectiveness of the water resources management in the Yangtze River Basin.
management information system. This method of universal participation not only enhances the sustainable management of the Yangtze River Basin, but also promotes the spontaneous enthusiasm of the public.

4.2.4. Strengthen Shoreline Management of Waters and Create a Good Ecological Environment. Planning constraints on the development of the Yangtze River coast. First, strictly follow the planned protection zones, reservation zones, controlled utilization zones, development and utilization zones and other functional zoning and management requirements to carry out coastal zone division management and use control to promote shoreline resources. Save sustainable use and improve water resources utilization efficiency; Second, actively promote the registration of property rights of the shoreline of the rivers and lakes in the Yangtze River Basin, clarify the water property rights trading system, establish paid use of the shorelines of the waters in the Yangtze River valley, pay attention to strive to build a scientific orderly and efficient Ecological shoreline development and utilization pattern; third, to approve and supervise the coastline of the Yangtze River waters, improve the supervision system for the construction and development of waters, create a good ecological environment, and build a water-clear green corridor.

4.2.5. Promote Ecological Protection Technology Research and Improve Technological Security. Realize the efficient use of ecological civilization, promote ecological protection, and strengthen the research on ecological issues such as water resources protection, water pollution prevention, shoreline utilization protection, unified water resources scheduling, and water administrative management to solve technological problems. First, do a top-level design of scientific research projects, improve scientific research support capabilities, and actively declare scientific and technological achievements in governance. Reasonable and efficient use of scientific and technological platforms and scientific resources; second, strengthen the construction of scientific and technological talents, adopt a variety of forms to widely cultivate scientific and technological talents, strengthen inter-academic exchanges, and strive to build a professional river management talent team with strong business capabilities; Third, strengthen cooperation with scientific research units and production units, combine production and research, promote scientific and technological achievements, and realize the gradual transformation of scientific and technological achievements into the application of river management practices, and combine scientific and technological support and practical development to jointly promote work on protecting the Yangtze River valley.

References
[1] Ma J H 2018 Thoughts on Strengthening Sand Mining Management in the Yangtze River (People’s Yangtze River News) 5th ed.
[2] The Yangtze River Water Resources Commission 2016 Strengthen the Protection of the Yangtze River and Promote the Construction of Green Ecological Corridors People’s Yangtze River 42 2-5.
[3] Lu C 2019 Reflections on the key issues of several major issues of “grasping the big protection” Journal of Hohai University (Natural Science Edition) 4 284-295.
[4] Chen Q 2016 Strengthening the protection of water resources in the Yangtze River to ensure water safety in the river basin People’s Yangtze River 9 4-7.
[5] Wang J H 2019 Thinking of comprehensive management of water resources in the Yangtze River basin under the background of ecological protection People’s Yangtze River 10 2-6.
[6] Ma J H 2018 Comprehensively promote the construction of aquatic ecological civilization in the Yangtze River Basin under the guidance of Xi Jinping’s ecological civilization People’s Yangtze River 12 2-6.
[7] Xu J J and Wu Z G 2020 Discussion on the thinking and countermeasures of water resources development and protection of the Yangtze River in the new era People’s Yangtze River 1 125-128.
[8] Zhang J B 2020 Strengthen water resources management and utilization strategies Science and Technology Innovation and Application 5 184-185.

[9] Wei S Y 2019 Research on water resources management and protection methods Heilongjiang Science 20 134-135.

[10] Gong L Q 2019 Research on sustainable utilization of water resources and water resources management Heilongjiang Water Conservancy Science and Technology 3 38-39.

[11] Yang R J, Sun M Y, Fu B J, Zhang L Z, Hao W W and Zhang Y Y 2020 Sustainable management strategy of the Yangtze River Basin Environmental Science Research 5 1092-1099.