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Preliminary Study on Water Resources Management in Tarim River Basin

YuFei Xiong^{1, 2, 3, 4, *}, HaiLiang Xu⁵, GuangPeng Zhang⁵

¹Key laboratory of degradation and unused land improvement engineering, ministry of natural resources., Ltd. Xi'an 710075, China;

²Institute of Land Engineering and Technology, Shaanxi Provincial Land Engineering Construction Group Co., Ltd. Xi'an 710075, China;

³Key Laboratory of Degraded and Unused Land Consolidation Engineering, the Ministry of Land and Resources of China, Xi'an 710075, China

⁴Shaanxi Provincial Land Consolidation Engineering Technology Research Center. Xi'an 710075, China

⁵University of Chinese Academy of Sciences, Beijing 100049, China

*Corresponding author e-mail: 295340477@qq.com

Abstract. It is indispensable to maintain ecological and environmental health and water resources. Uncontrolled exploitation and utilization of water resources in the Tarim River Basin has caused serious ecological problems in the mainstream. In order to ensure the stability of the ecological environment and reasonably allocate water resources, the water resources in the Tarim River Basin are Unified management, this article is based on the management of the water resources in the Tarim River and the case of foreign water resources, in-depth study of the management of water resources in the Tarim River, to provide an important basis for the rational use of water resources.

1. Research background and significance

Located in the arid region of northwest China, the Tarim River Basin is the fifth largest inland river in the world and the largest inland river basin in China. Since the 1950s, the uncontrolled development of water and soil resources has resulted in a continuous reduction in the amount of water delivered to the Tarim River. [1], causing serious ecological problems in the mainstream of the Tarim River, salinization of the upper and middle reaches, total decline of vegetation, and desertification. Problems such as the acceleration of process development are particularly prominent [2]. In particular, there has been a perennial outflow in the Daxihaizi Reservoir to the Temama Lake in the lower reaches of the Tarim River Basin. Due to the severe shortage of water resources in the lower reaches of the Tarim River, there has been a tendency to connect between the Taklimakan Desert and the Kumutage Desert [3- 4], the gradual disappearance of the “green corridor” has brought great challenges to the ecological restoration of the lower reaches of the Tarim River.



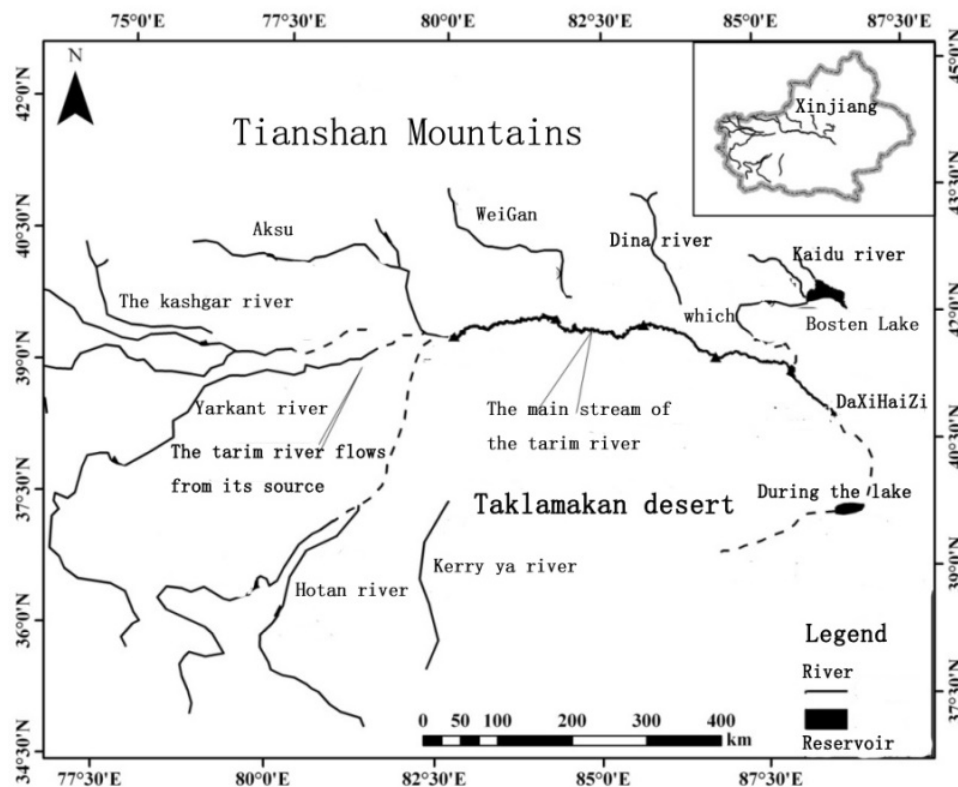


Fig. 1 The water system of Tarim River Basin

2. Research progress at home and abroad

The effective management and optimal allocation of water resources is one of the important ways to solve the water shortage or water use conflict in the basin [10]. In order to improve the level of water resources management, many scholars and water resources management departments have proposed such as “uniform management of water resources” [11], “the most stringent water resources management system” [12], “harmony of human water” [13], “water Theories and methods such as “transaction of rights” and “connected strategy of rivers and lakes”. The goal of modern water resources management should be in line with regional development and ecological environment changes, and the limited water resources should be used to maximize their economic and ecological benefits, and improve the water resources ecological security system. China is a country with a large population, and water resources contradictions are more prominent. To achieve the country's social and economic sustainable development and ecological protection, efficient use of water resources and sustainable development are the key issues to be solved.

2.1. Water Resources Management

Water resources management is to improve the utilization efficiency of water resources, protect the sustainable development of water resources, and aim at maximizing the social, environmental and economic benefits of water resources, and to specifically manage water resources allocation and water dispatch. It is also a relatively complicated water activity. Its content includes five parts: (1) strengthening social publicity and education, raising awareness of public awareness and collective participation; (2) formulating measures for rational use of water resources; and (3) formulating water resources. Management policy; (4) unified management of water resources; (5) real-time water allocation and scheduling [14]. And the water resources have the characteristics of basins. The comprehensive management system formed by combining the natural watershed nature of water resources with its multi-functional functional unity is the essence of water resources management. The

middle and lower reaches of the basin, the source and the main stream, the watershed, the water quality and water quality of the river basin, the utilization, management and protection of groundwater and surface water are unified and coordinated as a complete system, and the local interests and the overall interests are combined. Some water resources in the basin have realized the maximization of their comprehensive benefits and the optimal allocation of water resources. The overall control and comprehensive analysis have problems hindering the development of water resources management in the basin.

In recent years, water resources have become increasingly scarce, and countries around the world have gradually strengthened water resources management. In particular, the water management model with the basin as a whole unit has gradually emerged in various countries of the world. Many countries have successively established watershed management institutions to implement watershed unit management. The water body in the entire basin is treated as a complete geographical unit for unified management [15]. The purpose is to consider the water resources problem in the basin as a whole, and lay a foundation for further promoting the unified management of water resources in the basin. Developed countries have rich water resources management and utilization level and practical experience in water resources management and utilization.

Water management in the Tennessee Valley is a typical success story. As early as 1970, the United States established the Federal Environmental Protection Agency with unified water resources management authority. In 1993, it passed the Tennessee Valley Authority Act, and then established Tennessee. The Watershed Authority and relevant departments of different management content. The Authority is responsible for the organization and management of the development and protection of the Tennessee River Basin and the middle and lower reaches of the Mississippi River [16], and focuses on the interests and governance of rivers, and comprehensively develops and utilizes water resources for specific problems within the basin. The ultimate goal of not making profit is to make the overall coordination of various resources to promote the long-term development of the basin and maximize the overall benefits of the basin.

In order to control the Thames River with serious water pollution, in 1974 the UK established a special water bureau and governance committee for the basin to manage the unified watershed management and unified management of water resources. This model is conducive to solving the tough river pollution problems and protecting the ecological environment of the basin. And exercise the power to formulate corresponding laws and regulations, manage and control water pollution according to law, and improve management efficiency. Establish a regional water pollution prevention and control system in the basin, introduce market mechanisms, realize industrialization of water pollution prevention and control of stormwater discharge, and implement a salmon regression plan to restore river ecosystems. After the river basin management, the water pollution status of the river basin has been significantly improved, and the sewage is restored to the past. The benthic animals and fish communities in Hanoi are optimized with the water environment of the Thames, and the species diversity of the river ecosystem is significantly improved.

Australia's Murray-Darling River Basin has a large regional span, and the coordination between the regions and departments is difficult and difficult to manage. Due to the low level of water resources utilization, the water supply in the basin is insufficient, and the land and vegetation degradation caused by soil salinization is accompanied. Problems such as seaweed flooding and watershed capacity. After more than 100 years of hard work, the ecology of the Murray-Darling River Basin in Australia has improved significantly, and a relatively mature water resource management model has been formed. The water management model has achieved unrestricted development and utilization to comprehensive and planned coordinated management. After continuous practice, we pay attention to the management of watershed scales, and reach relevant agreements for the management departments of the river basins with large spans, and emphasize the coordination and coordination of various departments. In the work setting, policy formulation and management framework, it is necessary to carry out unified management on the scale of the river basin, and establish a water rights system and a legal guarantee system to ensure that all parts fully exert their management functions.

2.2. *Water resources management methods or measures*

Many water resources management departments in China have put forward relevant theories and methods to solve the problems arising from the development and utilization of water resources. In 2009, the Ministry of Water Resources proposed the most stringent water resources management system, clearly proposed the red line and water efficiency of water resources development and utilization. Control the red line and the water function area to limit the “three red lines” of the red line, and clarify the current stage of water resources management. In the same year, the “river-water system connectivity strategy” first proposed in the “12th Five-Year Plan” preparation work conference of national water conservancy development laid the scientific and feasible theoretical foundation and the latest ideological system for modern water resources management. In 2011, the central government issued the "Decision of the Central Committee of the Communist Party of China and the State Council on Accelerating the Reform and Development of Water Conservancy", and clearly stipulated that the most stringent water resources management system must be implemented as required to promote water resources management. This document provides comprehensive deployment and development of water resources. Social and economic development, avoiding water conflicts.

Chinese scholars have also done a lot of research on water resources management. Zuo Qiting and others believe that human society is constantly changing and developing. It is necessary to deeply understand the relationship between people and water. This is the basis for solving the contradiction between people and water, and proposes a comprehensive set. Scientific scientific water and water resources research method system. The water shortage in Dezhou City is very serious in China. Liu Xiaoyun et al. explored the sufficient conditions, index control system and water resources security measures necessary for the establishment of the most stringent water resources management system in the city, aiming at achieving efficient use of urban water resources and sustainable economic development. The connection management method of the lake system is of great significance to the national river management. Dou Ming et al. conducted an in-depth discussion on the concept and significance of the river-water system connection. The river-water system is in a constantly changing stage, and the water conservancy projects affected by natural changes and human construction. The influence of factors has led to the inevitability of changes in the connectivity of rivers and lakes. According to the main purpose, means, ways and engineering implementation methods of implementing river-water system connectivity at home and abroad, the classification of connectivity modes is laid, which lays an important foundation for further study of river-water system connectivity.

2.3. *Tarim River related research*

The Tarim River Basin is an ecologically damaged area under human disturbance. It is also a rare case and typical area for ecological restoration under human intervention in the world. It has attracted extensive attention from scholars at home and abroad and has carried out extensive research to develop and utilize water resources in the basin. Water resources dispatching, ecological environmental protection, and restoration effect evaluation provide a large number of scientific references.

Ye Mao analyzed the water resources in the Tarim River Basin. In the case of global warming, the water in the source area is significantly higher than before, but the amount of water supplied by the source to the main stream is less and less. The basin is in a state of abundant water period and has no effect on alleviating the deterioration of the main stream environment. The main reason is that the watershed is blindly uncontrolled water and soil development in the source area, causing downstream interruption and ecological deterioration. And the basin lacks an effective unified management system, resulting in low levels of water use. Although the emergency water transfer project was implemented in the Tarim River Basin in 2000, in the long run, this method only mitigates the problem of the moment and does not solve the actual problem. The destruction of ecological environment is always a serious problem facing the Tarim River Basin. The efficient management of water resources is an important guarantee for maintaining the ecological balance of the basin. The results of the research on the comprehensive management effectiveness of the Tarim River Basin show that the “three sources

flow” of the basin after the implementation of comprehensive management has basically completed the expected targets specified in the “Reform Comprehensive Management Plan Report of the Tarim River Basin” approved by the State Council in 2001.

Relevant research analyzes that the management model of the Tarim River Basin has long been unable to meet the requirements of rational allocation of water resources at present. Now the model of water resources management should closely link social economic development with the ecological environment as an important aspect, and should establish a new type suitable for social development. The management form reduces the contradiction between regional management and watershed management, and establishes a unified management system for water resources in the basin. In order to further consolidate the effects of governance and alleviate water and water conflicts in the basin, the watershed will implement a new water resources management system in 2010 (ie, implement unified management of water resources in the basin), while strengthening democratic participation, and the government and the masses will coordinate and understand each other to implement the watershed. The management policy has been effectively implemented to achieve a community of river basin interests. However, after the implementation of the unified management of water resources in the Tarim River Basin, only a small part of the study has analyzed the water resources utilization level in the basin, and there are few studies on the effectiveness of the unified management of water resources in the basin. No comprehensive systematic analysis has been made. And evaluation.

References

- [1] Song Yudong, Fan Zili, Lei Zhidong, et al. Research on water resources and ecology of Tarim River in China [M]. Urumqi: Xinjiang People's Publishing House, 2000.
- [2] Liu YB, Chen Y N. Impact of population growth and land-use change on water resources and ecosystems of the arid Tarim River Basin in Western China [J]. International Journal of Sustainable Development and World Ecology, 2006, 13 (4): 295-305.
- [3] Song Yang, Bao Anming, Huang Yue, et al. Changes of main stream environment before and after comprehensive treatment of Tarim River [J]. Arid Zone Research, 2016, 33(2): 230-238.
- [4] Gao Qianzhao, Qu Jianjun, Wang Run, et al. Effects of Ecological Water Transport on the Reversal of Desertification in the Green Corridor of the Lower Reaches of the Tarim River [J]. JOURNAL OF DESERT RESEARCH, 2007, 27(1): 52-58.
- [5] Meng L H, Chen Y N, Lin W H, et al. Fuzzy comprehensive evaluation model for water resources carrying capacity in Tarim River Basin [J]. Chinese Geographical Science, 2009, 19(1):89-95.
- [6] Zhang Q, Xu CY, Tao H, et al. Climate changes and their impacts on water resources in the arid regions: a case study of the Tarim River basin [J]. Stochastic Environmental Research and Risk Assessment, 2010, 24 (3): 349-358.
- [7] Dai Junsheng. Evaluation of ecological and economic benefits of comprehensive treatment project in Tarim River Basin [D]. Urumqi: Xinjiang Agricultural University, 2015.
- [8] Xu Hailiang, Chen Yaning, Lei Jianqiang. Influence of Ecological Water Transport on the Reversal of Desertification in the Lower Reaches of Tarim River [J]. JOURNAL OF DESERT RESEARCH, 2004, 24(2): 173-176.
- [9] Wang Changjian, Du Hongru, Zhang Xiaolei, et al. Relative resource carrying capacity of the Tarim River Basin [J]. Chinese Journal of Ecology, 2015, 35(9): 2880-2893.
- [10] Zuo Qiting, Ma Junxia, Tao Jie. The New Thought of Modern Water Resources Management and the Concept of Harmony Theory [J]. Journal of Resources Science, 2011, 33(12): 2214-2220.
- [11] Fu Xiang, Ji Changming. Main Contents and Methods of Unified Management of Water Resources [J]. China Water Resources, 2002, 10:49-52.
- [12] Chen M Z. Sustainable water resources utilization mode for river basins [J]. Advances in Science and Technology of Water Resources, 2004, 23(16): 121-128.

- [13] Zuo Qiting, Li Keren. Discussion on the theoretical system of the most stringent water resources management system [J]. South-to-North Water Transfer and Water Science and Technology, 2013, 1:34-38.
- [14] Zuo Q T, Zhang Y. Quantitative evaluation and control measures of human-water harmony for the Tarim River Basin [J]. Arid Land Geography, 2008, 39(4):440-447.
- [15] Leeuwen K V, Sjerps R. Istanbul: the challenges of integrated water resources management in Europa's megacity [J]. Environment, Development and Sustainability, 2016, 18(1):1-17.
- [16] Liu Yongqiang. Research on water resources management combined with river basin and region [D]. Xi'an: Xi'an University of Technology, 2005