Investigation and Analysis of China's Rural Water Environment Status under the Background of Rural Revitalization

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Abstract. The pollution of rural water environment has become a key bottleneck restricting China's rural revitalization strategy. Based on the strategy of rural revitalization, this paper uses literature research methods, semi-structured interviews and questionnaire survey methods to investigate and analyze the current rural water environment of four villages in Changzhou, Jiangsu Province. We found that excessive sewage discharge from industrial and agricultural production, poor living habits of villagers, gaps in government supervision and insufficient funds are the main reasons for the deterioration of the rural water environment. Therefore, we put forward relevant policy recommendations based on the main body of water environment governance.

Key words: Environmental sustainability; Water Pollution; Investigation and Analysis.

1. Introduction
In recent years, although the environmental protection department has increased its monitoring of water pollution, the rural water environment governance has been slow to start, difficult to govern situation, and hard to raise funds. Rural residents account for a large proportion of the total population in China, resulting larger domestic pollutants and industrial wastewater, and the water environment pollution is more serious than that in cities. With the transfer of industries, the number of heavy industrial enterprises in rural areas is larger and larger, leading to more serious water pollution; in addition, the rural ecological environment is fragile, and the villagers, mainly engaging in planting and breeding industries, rely on the ecological environment to a high degree. Irregular agricultural production, non-standard industrial emissions, unhealthy lifestyles of rural residents, and extensive aquaculture management are the four major causes of serious water pollution in rural areas [1]. The poor rural water environment has caused potential safety hazards in drinking water for more than 300 million people. In the context of China's vigorous promotion of the rural revitalization strategy, the sustainable development of the rural economy cannot be based on the fragile ecological environment. If the rural sewage is not treated in time, it will affect the life and production safety of farmers for a long time. As an important part of rural ecological environment governance, the governance of rural water environment is highly valued by the government: the governance of rural domestic sewage was written into the No. 1 Central Document in 2018. What are the influencing factors of rural water pollution, and where are the gaps in existing policies? It needs further research by experts and scholars. Due to China's vast territory and huge differences between
villages and villages, there is no universal water environment governance policy. The team members conduct on-site investigation and analysis of the current governance situation before they can draw conclusions and policy recommendations based on local conditions.

Jiangsu Province is located in the coastal area of central China. It has a developed economy, abundant water systems and numerous lakes. The water area accounts for 16.9% of the province's area. Because the discharge of industrial and agricultural wastewater directly affects the water environment of Jiangsu Province, Jiangsu Province attaches great importance to the governance of urban and rural water environment, and pioneered a governance and supervision system such as the river chief system.

Therefore, our team select Jiangsu Province as the research object. This article starts with the influencing factors and puts forward policy recommendations according to local conditions.

2. Literature review

2.1. Research on the causes of rural water pollution

The rural water environment and the urban water environment are different but connected. A large number of scholars discuss the impact of cities on the rural water environment based on the relationship between urban and rural areas. For example, Wang (2016) compared the environmental pollution control funds invested by the state in cities and rural areas in 2013 and found that rural areas play a secondary role in water environment governance. With established funds, cities receive most of the government funds, which makes the water environment governance differs a lot in urban and rural areas. Mao (2014) believes that while urbanization leads to urban development, urban water pollution gradually flows to the countryside, causing further deterioration of the rural water environment.

More scholars focus on the rural water environment and research the aspects of politics, law, ecology, and villagers’ environmental awareness. Gao (2015) started with the rural water environmental protection mechanism, and believed that the existing rural water environmental protection mechanism did not match the current rural water environmental governance status, and proposed to build a modern rural water environmental governance mechanism. Wei (2016) analyzed the impact of the existing water law on rural water pollution, and believed that the current rural water pollution legislation does not match the status quo in the countryside, and China lack a rural water environmental protection legal system and the welfare system for farmers affected by pollution. Zhang and Liu (2018) started with water pollution sources and concluded that the main sources of water environmental pollution are agricultural pollution, industrial pollution, domestic wastewater pollution and waste pollution, and put forward corresponding treatment countermeasures and suggestions. Huang (2014) and Ye (2019), from a people-oriented perspective, discussed the impact of villagers’ lack of environmental protection awareness and water law knowledge on the rural water environment. To improve the rural water environment, they proposed to cultivate new types of farmers by improving their Environmental awareness.

Through existing research, it can be found that scholars have a more comprehensive theoretical study on the reasons for the formation of rural water environment traditions. However, China has a vast geographic area and there are large differences in water environment governance among different rural areas in terms of economy, ecology, and government governance. To propose more targeted rural water environment governance policy recommendations, team members conducted field investigations in four villages in Changzhou, Jiangsu Province.

2.2. Research on Countermeasures for Rural Water Environment Management

Most of the existing researches start from different perspective of the main body of water environment governance and put forward policy recommendations from the three perspectives of the government, enterprises and villagers.

Regarding the improvement of legislation and supervision of government departments: Wang et al. (2014) studied the rural water environment management system and found that the unclear powers and responsibilities of the central and local governments led to the imperfect rural water environment management mechanism. Through the establishment of shared responsibility, policy guidance, district
governance, The five systems of evaluation and assessment and innovation-driven, to perfect loopholes in rural water environment supervision. Wei(2016) established a comprehensive, three-dimensional and modernized rural water system from a legal perspective. Environmental pollution protection legal system, establish a comprehensive environmental supervision and sanctions system for violations of laws.

Regarding the promotion of energy conservation and emission reduction and active participation of enterprises: Li (2016) combed the current situation and existing problems of my country's rural water environment, and proposed that government and enterprises participate in the governance of rural water environment.

Regarding enhancing the governance role of villagers: Fu(2018) believes that villagers are the main body of rural water environment governance and proposed to build a villager-centered water environment governance mechanism; Yang(2015) proposed Villagers and the government should divide the water environment governance responsibilities and bear the costs of governance separately; Xu et al. (2017) combed the game analysis among the subjects of rural water environment governance and proposed that the government and enterprises need to join forces to protect the interests of farmers to fully realize The goal of rural water environment governance.

The governance of the rural water environment requires coordinated governance in many aspects. Most of the existing studies put forward policy recommendations from the perspective of one or two parties' interests, and the recommendations are quite general; besides, there are relatively few studies carried out in the context of rural revitalization. Therefore, the team members hope that in the context of the rural revitalization strategy, comprehensively consider the governance bodies of enterprises, governments, villagers, and governance project companies to improve the existing governance mechanism.

3. Research Method

3.1. Literature research
In the early stage, the team referred to a large amount of literature and determined the method of using a specific model; and referred to the research experience of others, collected and sorted out quantitative indicator data, and finally gained an overall understanding of the rural water environment in Changzhou.

During the investigation, necessary data were obtained by consulting the "China City Statistical Yearbook", "Jiangsu Statistical Yearbook" and government reports.

3.2. Questionnaire
It’s the main method of this research. From July 21, 2020 to July 24, 2020, our team conducted a random sampling survey of selected farmers in four villages in Changzhou, Jiangsu Province, and used the following methods to ensure the accuracy of the questionnaire result.

(1) Explain the data names to the farmers first to ensure that the farmers understand the meaning of the questionnaire.

(2) Conduct one-to-one surveys, and confirm the questionnaire information immediately after the questionnaire ends, and archive the questionnaire.

(3) The number of questionnaires in this practice is directly related to sampling accuracy. In this survey, based on the minimum sample size formula and the assumption that the sampling error does not exceed 4% within the 95% confidence interval, the minimum sample size required for sampling is calculated to be 601. This time 800 questionnaires are expected to be issued, and 634 valid questionnaires are returned. The number of valid questionnaires meets the statistical requirements.

4. Research result

4.1. Causes of rural water pollution
1. Villagers: Irregular behaviors in extensive agricultural production and living
Through investigations, we found that the irregular production of farming, aquaculture, and the irregular discharge of domestic water are three main factors leading to aggravation of rural water pollution. According to the Communique of the First National Pollution Source Survey, among agricultural sources, the pollutants emitted by the planting industry accounted for 59% and 38% of the total nitrogen loss and total phosphorus loss. And the pollutants discharged by the livestock and poultry breeding industry, COD accounts for 96% of total COD, while Cu and Zn emissions account for nearly 98% of total Cu and Zn emissions. Among them, the water environment pollution caused by medium-scale farmers is the most serious, because small-scale farmers have realized a clean production system, and large-scale farmers can often get government funding to achieve clean production. Medium-scale farmers have a large amount of breeding, but lack of supervision. Random discharge of breeding wastewater and burial of livestock dead on the spot are very common, causing a large burden on the environment.

Nearly half of the villagers reported that littering of garbage in rivers and cleaning spittoons in river water are very common. Domestic wastewater is directly discharged into rivers or directly penetrated the soil without treatment. Domestic wastewater is an important reason for the deterioration of the rural water environment.

2. Enterprise: Irregular industrial production and illegal sewage discharge

With the advancement of industrialization and the transformation and upgrading of industrial structure, heavy chemical industries with high pollution and high emissions are usually transferred to rural areas, causing serious water pollution; small enterprises lacking clean production equipment directly discharge industrial wastewater into rivers, which also leads to further water environment deterioration. Irregularities in industrial production have led to a sharp decline in rural water quality. Some villagers reported to the research team that some enterprises in Changzhou still have illegal and illegal discharges. According to a questionnaire survey, 35.42% of the villagers said they did not know how to report, the proportion of those who did not dare to report and did report to the government but have no answer reached about 15%.

3. Government: lack of supervision and lack of funding personnel

The implementation at the grassroots level is not in place and supervision is absent. Rural water environment governance involves multiple departments such as the Ministry of Water Affairs, the Ministry of Agriculture, the Ministry of Environmental Protection, and the Center for Disease Control and Prevention. The supervision functions of each department cannot fully cover the actual supervision, leading to a lack of functions. For example, after the environmental protection department was renamed the ecological environment department in 2007, Changzhou's ecological environment department started as the lowest level government department to carry out effective governance of the rural water environment, but due to the limited personnel and the high level of rural pollution emission sources Dispersion, at present, the environmental protection department's supervision objects are large farms and industrial enterprises, and there is no supervision of small and medium-sized farms. The water affairs department is responsible for the overall water supply and drainage and safety guarantee of the rural areas, but cannot supervise every farmer specific conditions. As the villagers' self-government organization, the village committee is responsible for implementing the county government’s instructions, but in the process of implementation, due to the lack of corresponding rights and hindering the interpersonal relationship of the villagers, they do not treat or reflect the illegal discharge of wastewater from enterprises, farmers and growers.

In addition, the rural water environment management project (PPP project) introduced by the government lacks funds and corresponding technical personnel, and it is difficult to raise funds for maintenance and operation, and the long-term operation management and protection mechanism is not sound.

4.2. Current Status of Rural Water Environmental Treatment

In terms of sewage treatment, the rural area of Changzhou is currently in the process of connecting the sewage pipe network, rebuilding and expanding rural toilets. Comprehensive treatment is carried out by
connecting to the municipal pipe network, passing through decentralized sewage treatment facilities and small sewage treatment facilities. Over 12,000 kilometers, 13,700 septic tanks were built, and more than 7,000 small rural sewage treatment facilities (including 2,000 household water purification equipment) have finished.

In terms of governance mechanism, Changzhou, as the region that implemented the river chief system earlier, innovatively introduced the private river chief system, mobilized entrepreneurs to serve as "river chiefs", "enterprise river chiefs", "party members river chiefs", and explored water management experience. Public infrastructure construction and operating mechanisms will increase public participation in society, help small and medium-sized enterprises to significantly reduce pollution control costs, and achieve a win-win situation for protection and development. However, the private river chief system is more prone to the collusion of interests, lacks sufficient supervision rights and authoritative organizational leadership, and the participation of the people is low.

5. Policy Suggestion

The rural human settlement environment is related to the quality of the villagers’ lives. And the governance of the rural water environment, which is closely related to the villagers’ settlement environment, is particularly prominent in the overall demand for the improvement of it. Although the water environment management has been relatively complete, there are still many problems. It is mainly related to the villagers’ lack of good environmental awareness, non-standard agricultural production, non-standard production of industrial enterprises, lack of social responsibility, lack of government supervision, and difficulties in maintaining governance projects. Based on this, we give the following suggestions:

1. Strengthen water-saving publicity and raise villagers’ awareness of environmental protection. Regularly hold lectures on the theme of water-loving, water-saving and water conservation and related activities, so that the villagers have a clearer understanding of the seriousness and urgency of the current rural water pollution problems, thereby enhancing their environmental protection awareness.

2. Establish a smooth feedback channel. Through the establishment of an information platform, anonymous reporters are protected from retaliation. Increase the participation of villagers. This is a more important step to make the villagers the masters of the country and enhance the awareness of the protagonist.

3. Improve long-term operation mechanism management of rural sewage treatment. Rural sewage treatment is a rural public welfare undertaking and an important part of government work. It should be included in fiscal budget management. When preparing budgets, relevant government departments should consider expenses related to long-term healthy and effective operations, such as the employment of supervisors, water quality monitoring, and maintenance costs. Besides, various PPP models are encouraged to improve the rural living environment, regular operation and maintenance contracts are signed, and participating units are required to discover problems on time and deal with them promptly, and terminate contracts for companies that do not meet the standards.

4. Improving corporate social responsibility and legally regulating corporate illegal discharge behavior. The first is to promote relevant policies to enterprises through an extensive publicity and launch to raise their awareness of energy conservation and emission reduction; the second is to fully implement the GSP tax policy to encourage enterprises in the region to increase investment in water pollution prevention and water treatment projects; It is through fines and closure of illegal pollutant enterprises to increase the cost of illegal pollutants.

5. Attach importance to the collaboration of the government, residents, and enterprises. Municipal wastewater can be introduced into the corporate wastewater treatment system, thereby reducing the pressure on municipal wastewater treatment, and at the same time improving the efficiency of the company’s industrial wastewater treatment, for a win-win situation for both parties; by disclosing corporate water use and water discharge, and encouraging companies through the supervision of residents, etc.
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