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Risk Assessment of Water Pollution Prevention and Control Based on Entropy Weight Fuzzy Comprehensive Model

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Abstract: With the rapid development of society, the living environment is getting worse and worse, and water pollution is one of the main reasons. With the rapid development of society, water pollution has become more and more serious due to population growth or other reasons, which has caused great inconvenience to human life. Facts have proved that water plays an extremely important role in life. To formulate effective prevention and control measures, it is necessary to fully understand the water environment control situation and conduct effective analysis. Based on this, this paper first investigated the risks existing in the prevention and control of water pollution, and focused on the analysis of water pollution caused by industrial development. It was found that the relevant laws and regulations were not sound, and the low level of water pollution prevention technology was discussed. From the perspective of water pollution impact assessment and prevention risk countermeasures, this paper discussed the current situation of water pollution control and prevention risk, and put forward water pollution prevention risk countermeasures and measures. The specific prevention and control measures of water pollution were discussed. The entropy weight fuzzy comprehensive model algorithm was proposed to strengthen the water pollution risk assessment. Through comparison, it could be seen that the technical level after water pollution prevention and control increased by 17.6% compared with that before prevention and control. The degree of legal integrity increased by 14.1% compared with that before the prevention and control, and the degree of industrial pollution decreased by 13.4% compared with that before the prevention and control.

1. Introduction

As the source of everything, water plays a vital role in human development and survival. At present, the economy is developing rapidly, but it also has a negative impact. Water pollution is one of the biggest problems. At this stage, water pollution is becoming more and more serious with the speed of social development. If it continues for a long time, it would not only be harmful to social development, but also have a significant impact on people's daily life. Water pollution has seriously affected economic development and hindered the progress of social construction to a certain extent.

The entropy weight fuzzy comprehensive model has a wide range of applications in social development. Xu Lan designed a cold chain vulnerability assessment index system based on the understanding of impact, sensitivity and adaptability [1]. Yin Yuping proposed a hyperspectral image classification model based on fuzzy entropy and adaptive cosmic spectrum, and optimized the effective band grouping strategy [2]. Reddy A used the concept of Shannon entropy to evaluate the objective weight of the standard, and used the linguistic variables allocated by trapezoidal fuzzy numbers to solve the problem [3]. Biswas Animesh proposed a new technology of order preference based on the similarity of ideal solutions, which was used to solve the risk of multi-criteria group decision-making in the Pythagorean fuzzy environment. Among them, the weight information of decision makers and criteria was completely unknown [4]. Zeng Shouzhen believed that in the increasingly fierce competition and climate change, the benefits of sustainable development of enterprises were crucial to business development. He proposed a fuzzy method for sustainable supplier selection based on fuzzy information [5]. Jiskani Izhar Mithal studied and established mine safety evaluation indexes, and proposed a comprehensive model based on entropy weight and grey clustering method [6]. The above studies described the application of entropy weight fuzzy comprehensive model, but there were still some deficiencies in the use of water pollution prevention.

Many scholars have analyzed and studied the prevention and control of water pollution. Liu Yi used the improved grey correlation model and Kuznets ecological curve to quantitatively and qualitatively study the relationship between lake basin water pollution and economic growth under the planning background [7]. Wu Jianhua's purpose was to understand the relationship between different groundwater quality parameters, and track the source and influence factors of groundwater pollution through statistics and multivariate statistical technology [8]. Ma Xiaojie believed that the organometallic stent was a new type of porous mixed inorganic organic crystal, which had a very important application prospect in gas storage and separation, heterogeneous catalysis, sensor technology and other fields [9]. Rehman Shafique Ur aimed to determine the impact of environmental management control system on environmental sustainability through the intermediary of environmental strategy [10]. The above studies described the prevention and control of water pollution, but there were still some deficiencies in the entropy weight fuzzy comprehensive model.

In order to understand the specific development of water pollution prevention and control risk assessment, this paper analyzed the risks existing in the water pollution prevention and control work, and studied the water pollution impact assessment and prevention and control risk measures, so as to better deepen the reform of water pollution prevention and control measures. Compared with current water pollution prevention and control risk countermeasures, it was more accurate to use entropy weight fuzzy comprehensive model algorithm to strengthen water pollution risk assessment, which could build a more complete prevention and control system.

2. Risks in Water Pollution Prevention and Control

2.1. Industrial Development Aggravates Pollution

With the acceleration of urbanization, the urban population has increased year by year, and the discharge of urban living sewage has also increased. In recent years, industrial enterprises have particularly serious pollution, such as liquid metal waste, printing and dyeing, and food waste water, which has increased the difficulty of water pollution treatment. At this stage, the level of water pollution prevention and control technology is low, and the difficulty of water pollution prevention and control is greater [11]. In order to effectively control water pollution, advanced water pollution control technology must be adopted first. At present, it mainly depends on water pollution control technology and industrial chemical treatment. Although some progress has been made in the chemical treatment of wastewater in recent years, the technical level of water pollution control is still very low due to the increasingly complex water pollution, as shown in Figure 1.

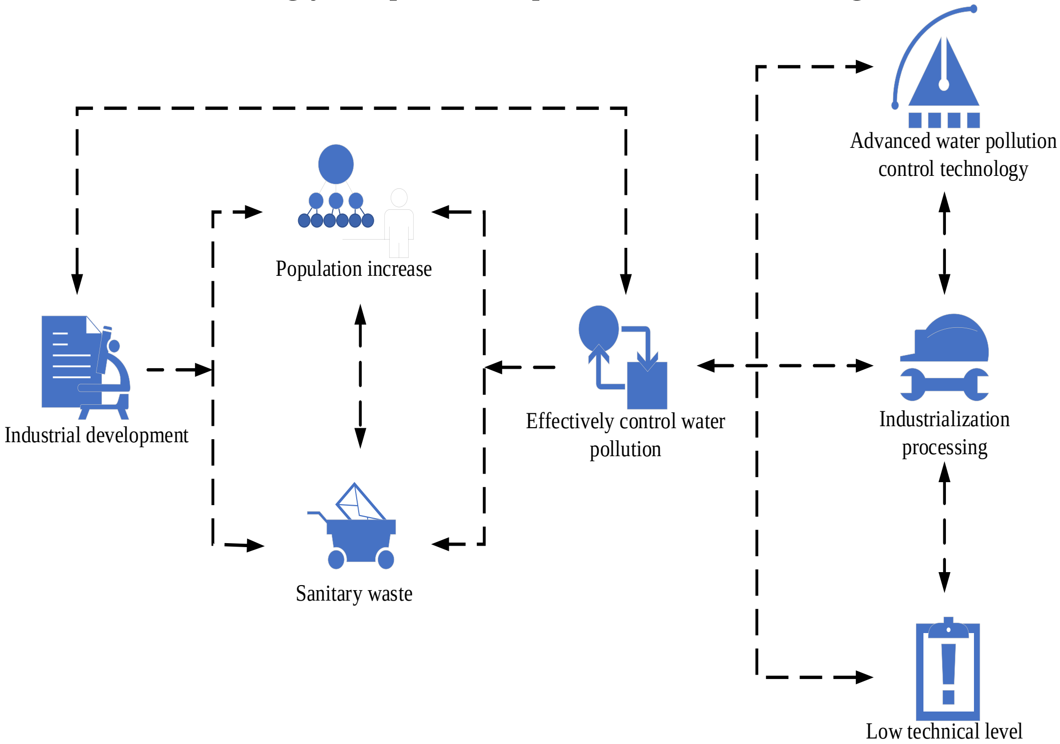


Figure 1. Industrial development aggravates pollution

2.2. Incomplete Relevant Laws and Regulations

The traditional economic development model is to develop first and then govern, but this concept makes local governments only focus on economic benefits rather than the prevention and control of water pollution. These economic benefits that damage the environment pose serious risks to future and unsustainable economic development. At present, the laws and regulations to solve the problem of water pollution are not perfect. This reflects that the regulations on the prevention and control of water pollution are not clear, and the laws and regulations on the prevention and control of water pollution are not sufficient, which hinders the implementation of water pollution control. The control measures cannot effectively achieve the expected results. The imperfection of relevant laws and regulations is one of the main risks of water pollution control, which leads to some enterprises discharging and treating wastewater at will. In addition, there is a lack of relevant laws and regulations, as well as relevant guidelines for water pollution control, thus resulting in slow water pollution control and great difficulty in water pollution control. Lack of awareness of water conservation is also a major risk to prevent and control water pollution, because lack of awareness of water resources protection would lead to excessive use and dysfunction of water resources [12].

First of all, some local governments have no actual power and responsibility to control water pollution, which is a direct obstacle to the implementation of water pollution control measures. Water pollution treatment is a long process. In this process, only with the effective support of relevant departments can the importance of water conservation be emphasized. Finally, the risk of inadequate implementation of water pollution control funds occurs from time to time. The actual monitoring work would focus on ensuring the proper use of water pollution funds. The main reason is that the relevant personnel have not formulated an effective implementation plan and allow the use of water pollution prevention measures at will, and water pollution is difficult to be carried out smoothly.

3. Water Pollution Impact Assessment and Prevention Risk Countermeasures

3.1. Current Situation of Water Pollution Control and Prevention Risks

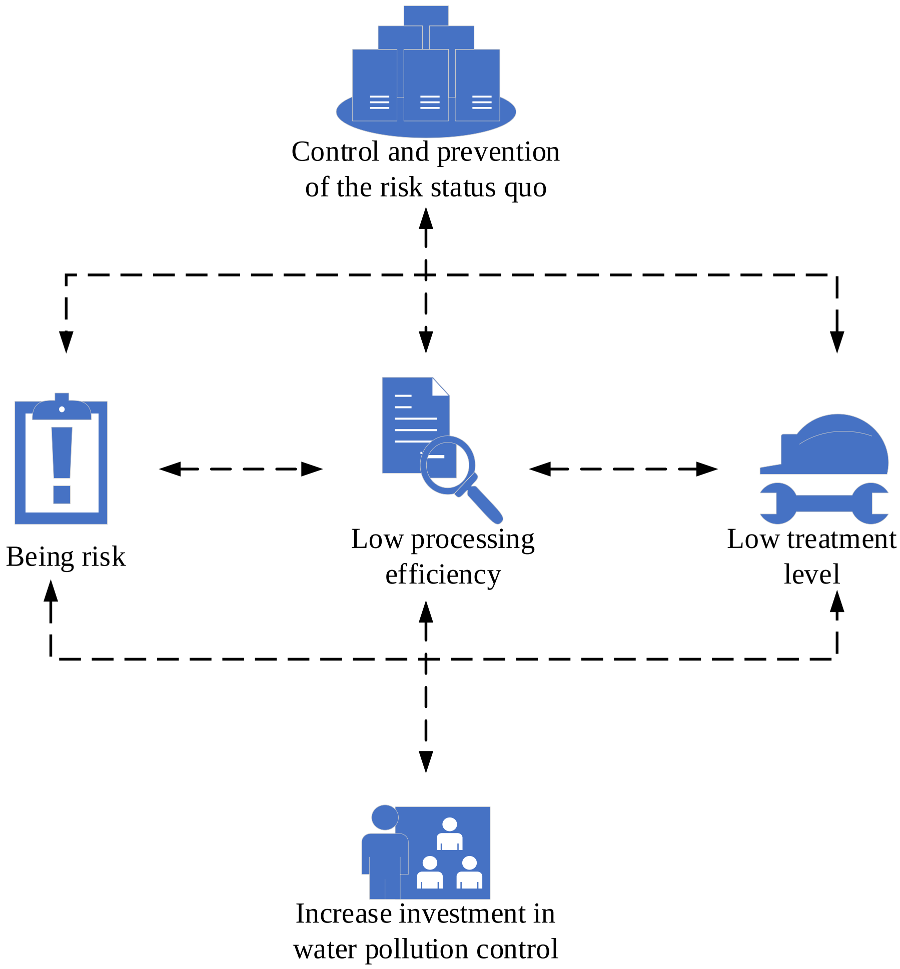


Figure 2. Current situation of water pollution control and prevention risk

At present, the treatment of water pollution is based on the following principles: There are still many risks in the wastewater treatment process in most cities, and low treatment efficiency and low treatment level are the risks of most urban wastewater. The social development is very fast, and the sewage discharge is increasing year by year. In recent years, the government has taken many risk prevention measures, but the effect is not optimistic. To fundamentally eliminate risks, the government must continuously increase investment in water pollution control. Although the current strict industrial wastewater discharge standards have been implemented, the amount of industrial wastewater discharge often exceeds the standard. In addition, some factories did not pay enough attention to this risk, and the sewage discharge increased year by year. In order to fundamentally eliminate this risk, the company's cleaner production level should be continuously improved, and the normal operation of the industrial wastewater treatment plant should be ensured [13]. The knowledge of non-point source emission reduction is not comprehensive, and proper attention should be paid to pollution control. So far, most people have not comprehensive understanding of non-point source pollution. Relevant personnel should do effective publicity work to strengthen the control of non-point source pollution, as shown in Figure 2.

3.2. Countermeasures and Measures for Water Pollution Prevention and Control Risks

People cannot live without good water in their daily life. At the same time, water resources are also necessary prerequisites for promoting social development and human survival. In recent years, the shortage of water resources has been a serious problem. In addition to the current situation of water pollution and its prevalence, it also poses a huge challenge to the development of the country. If it continues for a long time, the development would be limited to a certain extent. In order to avoid this situation, effective risk prevention measures must be taken, and one of the most urgent risks is to strengthen the protection of water resources and make the virtuous cycle of water resources and ecosystems become a reality. Scientific and effective risk prevention measures need to be taken to limit water pollution. Effective risk prevention measures can not only improve the ecological environment of rivers and lakes, but also ensure human safety to a certain extent.

The supervision and management system should be improved and the protection should be strengthened. Appropriate management regulations should be formulated, and the implementation of water pollution control measures can be improved. Management should focus on the comprehensive control of wastewater discharge, and environmental protection should be strengthened. Low-pollution projects need to be promoted, and the water environment monitoring capacity and monitoring means needed to monitor the water environment must be improved [14]. At this stage, according to the development stage, appropriate risk prevention strategies and control measures need to be taken. In addition, in terms of team building and equipment management, it must strictly follow the regulations. In order to fundamentally improve the monitoring ability, it is necessary to place the appropriate personnel in the most appropriate location for effective monitoring.

3.3. Specific Prevention and Control Measures for Water Pollution

Laws and regulations should be improved, and the water resources management system should be actively constructed. Management responsibilities should be clarified. In order to improve the efficiency of water environment management, relevant departments actively improve the water environment management system, the work content of the treatment department and the construction of the water treatment system, and clarify the work content and responsibilities of the administrative department, so as to further strengthen the management of industrial, agricultural and living wastewater.

In order to make wastewater treatment more smoothly, appropriate technical support system should be established, wastewater treatment monitoring should be strengthened, and a better environment should be created. The government should formulate and improve the technical standards for wastewater treatment according to the current level of water pollution, while implementing effective wastewater treatment technologies throughout the country. Wider application would help to increase the level of water pollution. This is mainly to strengthen the restoration and protection of river basins and water resources, as shown in Figure 3.

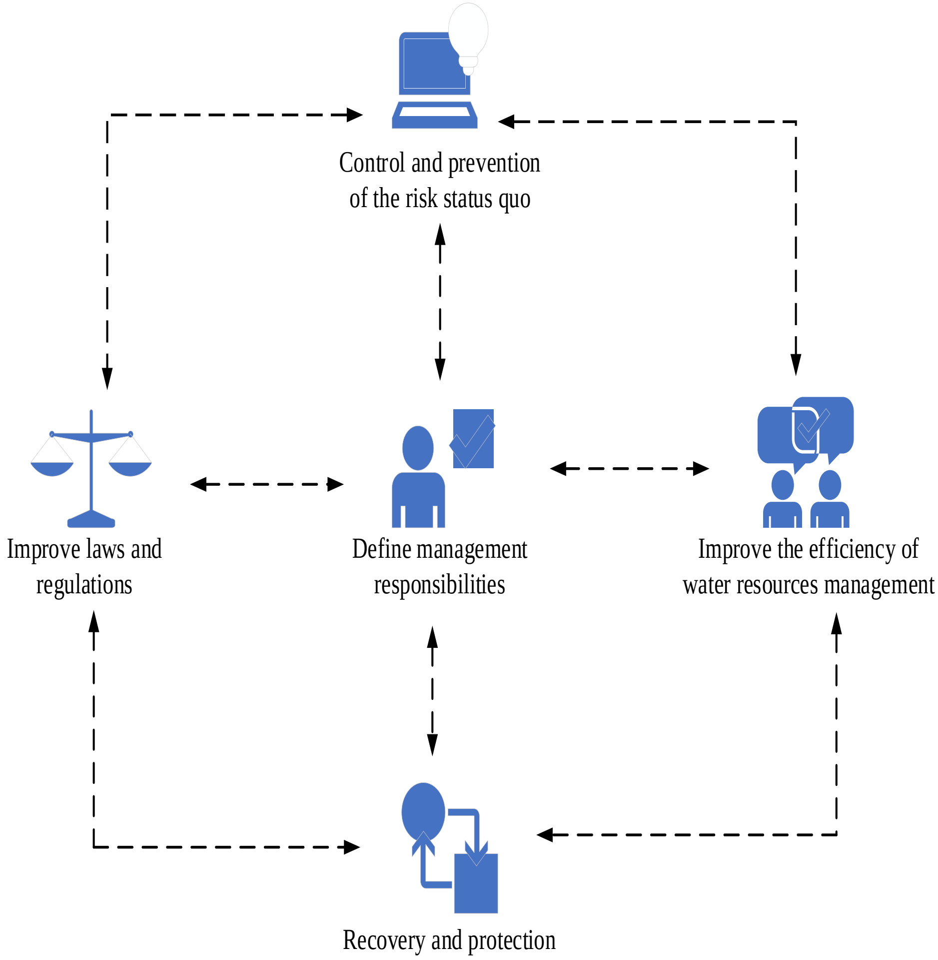


Figure 3. Specific prevention and control measures for water pollution

4. Entropy Weight Fuzzy Comprehensive Model Algorithm Strengthens Water Pollution Risk Assessment

The weight of the indicator affects the evaluation result. On the other hand, the objective reflection of the physical attribute of the indicator itself is the evaluation conclusion of the supervisor's measurement.

The characteristic value of the j th index under the i th evaluation index is calculated as follows:

$$K_{ij} = p_{ij} \backslash \sum_{j=1}^{n} p_{ij}' \tag{1}$$

The entropy of the i th evaluation index is calculated as follows:

$$h_i = -\frac{1}{mnj} \sum_{j=1}^{n} k_{ij} Ink_{ij} \tag{2}$$

The weight of the i th evaluation index is calculated as follows:

$$f_i = (1 - h_i) / \sum_{i=1}^{n} (1 - h_i) \tag{3}$$

5. Algorithm and Experimental Investigation and Evaluation of Fuzzy Comprehensive Model Based on Entropy Weight

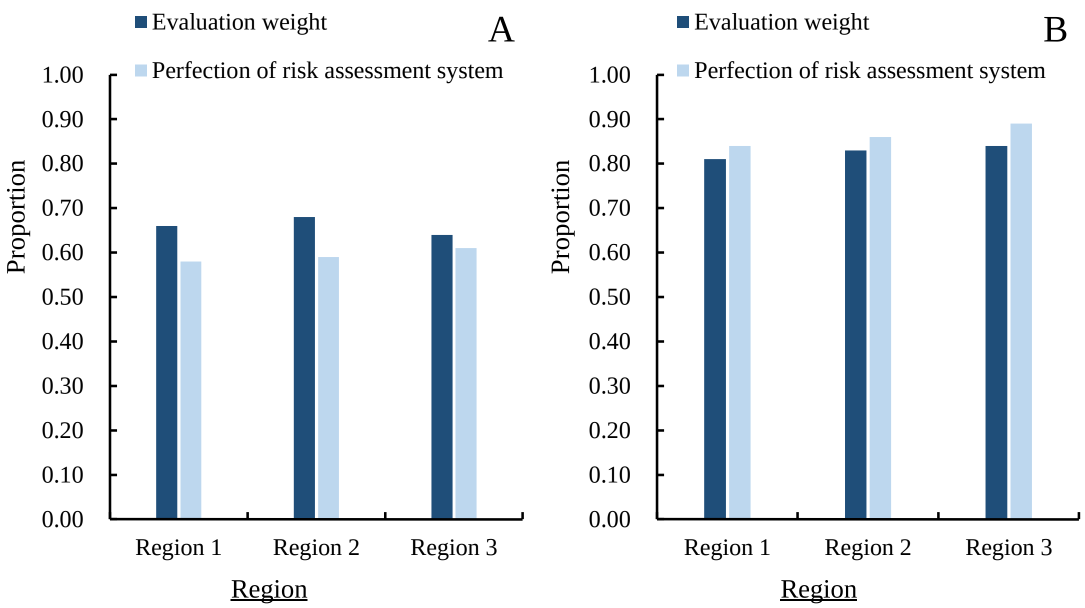
In order to study the specific evaluation effect of water pollution prevention and control risk, this paper analyzed the technical level, legal integrity and industrial pollution degree in water pollution prevention and control, and then used the entropy weight fuzzy comprehensive model algorithm to analyze the evaluation weight of water pollution prevention and control and the integrity of the risk evaluation system. First of all, this paper investigated the technical level, legal integrity and industrial pollution degree of water pollution prevention and control in three regions, and compared them with the indicators before water pollution prevention and control. The specific investigation was shown in Table 1.

Table 1. Technical level, legal integrity and industrial pollution degree in water pollution prevention and control in three regions

	Technical level		Legal soundness		Industrial pollution degree	
	Before prevention and control	After prevention and control	Before prevention and control	After prevention and control	Before prevention and control	After prevention and control
Region 1	64.3%	82.5%	70.6%	86.4%	88.4%	73.6%
Region 2	65.4%	81.4%	72.5%	85.9%	86.7%	76.1%
Region 3	62.1%	80.6%	71.6%	84.7%	89.4%	74.8%

According to the data in Table 1, before the prevention and control of water pollution, the technical level of Region 1 was 64.3%. The degree of legal integrity was 70.6%, and the degree of industrial pollution was 88.4%; the technical level of Region 2 was 65.4%, and the legal integrity was 72.5%. The industrial pollution degree was 86.7%, and the technical level of Region 3 was 62.1%. The degree of legal integrity was 71.6%, and the degree of industrial pollution was 89.4%. After the prevention and control of water pollution, the technical level of Region 1 is 82.5%. The degree of legal integrity was 86.4%, and the degree of industrial pollution was 73.6%; the technical level of Region 2 was 81.4%, and the legal integrity was 85.9%. The industrial pollution degree was 76.1%, and the technical level of Region 3 was 80.6%. The degree of legal integrity was 84.7%, and the degree of industrial pollution was 74.8%. Before the prevention and control of water pollution, the average technical level was 63.9%. The average legal integrity was 71.6%, and the average industrial pollution was 74.8%; after water pollution prevention and control, the average technical level was 81.5%. The average legal integrity was 85.7%, and the average industrial pollution was 88.2%. Through comparison, it could be seen that the technical level after water pollution prevention and control was 17.6% higher than that before. The degree of legal integrity was 14.1% higher than that before the prevention and control, and the degree of industrial pollution was 13.4% lower than that before the prevention and control.

Finally, the entropy weight fuzzy comprehensive model algorithm was used to analyze the evaluation weight of the three regions before and after the prevention and control of water pollution and the completeness of the risk evaluation system. The specific investigation results were shown in Figure 4.



a: Before water pollution prevention *b: After water pollution prevention*

Figure 4. Assessment weight and risk assessment system perfection of three regions before and after water pollution prevention

Figure 4a showed before water pollution prevention, and Figure 4b showed after water pollution prevention. It could be seen from Figure 4a that before the prevention and control of water pollution, the assessment weight of Region 1 was 0.66, and the completeness of the risk assessment system was 0.58; the evaluation weight of Region 2 was 0.68, and the completeness of risk evaluation system was 0.59; the evaluation weight of Region 3 was 0.64, and the completeness of the risk evaluation system was 0.61. It could be seen from Figure 4b that after the prevention and control of water pollution, the assessment weight of Region 1 was 0.81, and the completeness of the risk assessment system was 0.84; the evaluation weight of Region 2 was 0.83, and the completeness of risk evaluation system was 0.86; the evaluation weight of Region 3 was 0.84, and the completeness of risk evaluation system was 0.89. Through comparison, it could be seen that the evaluation weight after water pollution prevention and control was 0.17 higher than that before prevention and control, and the completeness of risk assessment system was 0.27 higher than that before prevention and control. The evaluation weight after water pollution prevention and control was 0.83, and the perfection degree of risk assessment system was 0.86; the assessment weight before water pollution prevention and control was 0.66, and the perfection degree of risk assessment system was 0.59.

6. Conclusion

Water is the source of life, which is essential for people's daily life. Water resources also play an important role in economic development. In order to prevent water pollution from affecting people's lives and impeding social and economic development, it is necessary to strengthen water pollution control, and eliminate water pollution risks, so as to protect water resources. Wastewater treatment and water environment protection are very important. The awareness of effective wastewater treatment and effective protection of water resources must be improved. Everyone must participate in this action to better achieve sustainable development of water.

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Data Availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Conflict of Interest

The author states that this article has no conflict of interest.

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