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Study on Performance Evaluation Index System of Rural Water Environment Management

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Abstract. Rural water pollution control has become an important part of China's water environment management. By analyzing the influencing factors of rural water environment management performance, establishing the evaluation index system, applying the structural equation model, this paper makes a comprehensive evaluation of rural water environment management through second-order confirmatory factor analysis, model path diagram drawing and data calculation. According to the effect of the strength of the factors to make effective control, the rural water environment management system will be improved.

1. Introduction

Rural water environment refers to the general name for surface water, soil water and underground water bodies such as rivers, lakes, ditches, ponds and reservoirs distributed in the vast rural areas^[1]. Since 1980s, with the transformation of agricultural production mode and the improvement of farmers' living standards, the problem of rural water pollution has become increasingly serious and gradually attracted the attention of each social stratum. Zhao Jing(2005) pointed out that there are five main sources of rural water environmental pollution in China, such as industrial wastewater pollution in township, non-point source pollution caused by excessive fertilization and pesticide use, sewage irrigation, aquaculture pollution and domestic sewage wastewater^[2]. Fan Hongpeng(2013) pointed out that the direct result of rural water environment pollution is soil erosion and drinking water safety is threatened^[3]. Song Guojun(2009) classified China's rural water environment management system, mainly including government direct administrative model, market management mode, and cooperative management mode^[4].

2. Rural water environment management performance evaluation index system

2.1. Principles for the Construction of Evaluation Index System

(1) Operational principles

First of all, the concept of selected indicators should be clear and the expression method should be concise and easy to understand. If there are potential variables that cannot be quantified theoretically, they should be replaced by observation variables. Secondly, the selected index operation method should be feasible and applicable in a long time and a wide range^[5].

(2) Principles of scientific evaluation

The evaluation indexes must scientifically reflect the characteristics of rural water environment management, and should fully follow objective laws. Considering regional differences, it should take



into account the basic status quo of rural water environment in the region, distinguish the actual gap between developed and underdeveloped regions [6].

(3) Principles of public satisfaction

The essence of government function is service, not regulation. The public's will and demand are the starting point and destination of government management. Therefore, it is necessary to take public satisfaction as an important criterion for performance evaluation of rural water environment.

2.2 Selection of performance evaluation indexes for rural water environment management

After analysis and comparison, the discussion of relevant scholars mainly focuses on management system, organizational structure, public participation and so on [2],[4]-[9],[14]-[15]. Factors affecting the performance evaluation of rural water environment management are as shown in the Table1.

Table1. Influencing factors of performance evaluation of rural water environment management

literature	Influencing factors of performance evaluation of rural water environment management
Yang Jifu, li Jiusheng	Monitoring and governance capacity, laws and regulations, top-level design, media promotion, water users association [8].
Cao Hailin	The participation of multiple actors, right to know, right to make decisions, right to participate and right to supervise, perfecting supervisory mechanism, reasonably distinguish the functions of national grassroots administrative power and rural grassroots social autonomy [9].
Zhao Jing	management intensity, propaganda and education, professional staff, control and protection measures, public participation mechanism [10]
Zhang Tieliang	perfect organization settings, establishment of a management office or commissioner, strengthen the management function of county, public participation, establishment of integrated management institutions [11]
Bai Aimin, Chen Dong	legislation idea, establishment of water pollution prevention and control system, perfecting water pollution supervision system, increase capital investment, perfecting the technical guarantee system, establishment of water pollution prevention and control system, perfecting water pollution supervision system, increase capital investment, perfecting the technical guarantee system [12]
Guo Jun song	Local governments set up environmental protection agencies in township governments, increase financial input, and individual farmers take part in environmental management on their own initiative [13]

According to the results shown in Table1 above, the factors affecting rural water environment management can be divided into four aspects: the establishment of organizational mechanism, the establishment of operational mechanism, the performance of work, and the participation of the public. The corresponding secondary indicators are shown in Table2.

Table2. Performance Evaluation Index System of Rural Water Environment Management

Exogenous latent variable	Endogenous latent variable	Observation variable
Overall evaluation (F)	Establishment of organizational mechanism (F1)	The local government has good ability to control and monitor water pollution in rural areas (X4)
		Establish a rural water pollution control team headed by the government (X1)
		Establish a professional team for water pollution control in rural areas (X3)
	Establishment of operation mechanism (F2)	Existing Third Party Institutions to Participate in the Control and Treatment of Rural Water Pollution (X2)
		Target responsibility system for rural water pollution control (X5)
		Establishment of publicity and education mechanism for water pollution control in every village (X7)
		Establishment of special funds for water pollution control in rural areas (X6)

	Formulating policies and regulations on rural water pollution control (X8)
	Measures and objectives of water pollution control in rural areas should be incorporated into the medium and long-term planning of economic development in each town (X9)
	Proper use of special funds for water pollution control in rural areas (X10)
Performance of work (F3)	Effective implementation of policies and regulations related to water pollution control in rural areas (X11)
	Effective propaganda of water pollution control in rural areas (X12)
	The rural water pollution problems petitioned by the masses has been solved and dealt with in time (X13)
	Villagers manage the water environment in accordance with regulations (X14)
Public participation (F4)	Open the situation of water environmental pollution in rural areas to the local people (X15)
	The masses have a general understanding of the situation of water pollution control in the local rural areas (X16)
	Rural water pollution control has been carried out through consultation, discussion and hearings (X17)
	Open discussion on issues related to water pollution control in rural areas (X18)

3. Preliminary Design of Theoretical Hypothesis and Model

3.1 Presentation of Theoretical Hypothesis

Based on the analysis of the influencing factors of rural water environment management performance, the following assumptions are put forward: (1) The establishment of organizational mechanism, the establishment of operation mechanism, the performance of government work and the participation of the public have a significant positive impact on the overall evaluation results, and there is little difference among the four influencing factors; (2) The degree of public participation has a more significant impact on management performance; (3) The establishment of organizational mechanism has relatively weak influence on management performance.

3.2 Preliminary Design of the Model

Based on the above theoretical assumptions, a conceptual model is constructed. As shown in the Figure1.

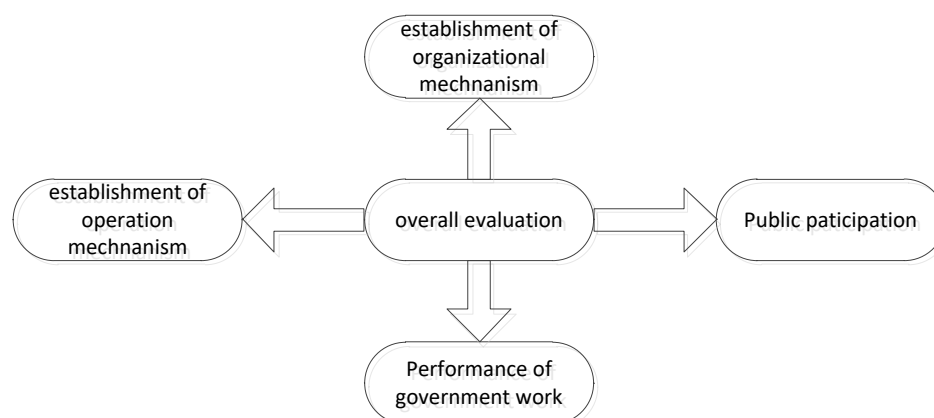


Figure 1. Conceptual model design

4. Empirical Analysis of the Evaluation Model of Rural Water Environment Management Performance Structure Equation

In order to calculate the degree of influence of different influencing factors, the author investigated the situation of rural water environment management in Changzhou City, Jiangsu Province through investigation, and used the method of quantitative analysis to conduct a questionnaire survey on the secondary indicators in the form of questionnaires. A total of 250 paper questionnaires were distributed and 220 valid questionnaires were returned. And using SPSS18.0 for data analysis, after the Z scores of the 18 influencing factors are standardized, the skewness and kurtosis values of each factor are close to 0, the mean value is close to 0, the standard deviation is close to 1, and the compliance is positive. State distribution.

4.1 Structural Equation Modeling and Model Estimation

The model was established by applying AMOS17.0, as shown in Figure 2.

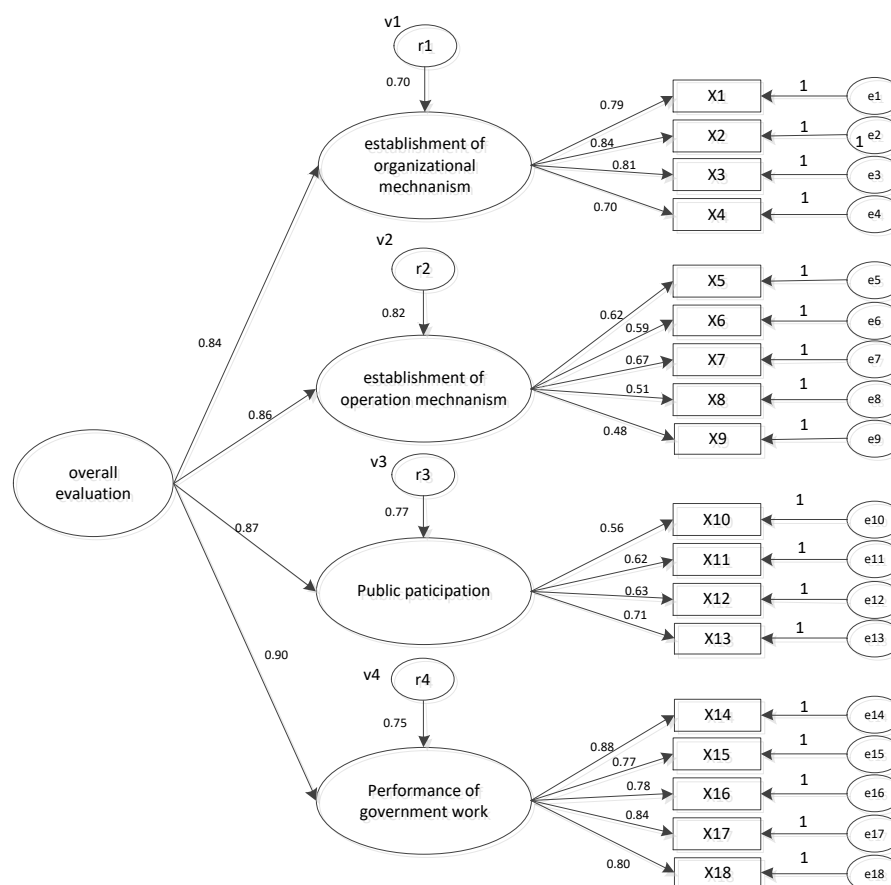


Figure 2. Performance structural equation evaluation model of rural water environment management and its standardized path coefficient

The fitting indexes are shown in Table3. GFI, NFI and IFI are close to 1, while RMR and RMSEA are close to 0, indicating that the fitting degree of the model is good.

Table3. Fitting index

Model	CMIN	p	CMIN/D F	RMR	CFI	NFI	GFI	IFI	RMSE A	AGFI
Default model	94.054	0.473	1.000	0.023	1.000	0.964	0.958	1.000	0.001	0.935

4.2 Analysis of rural water environment management factors

By analyzing the path coefficient of the influencing factors in Figure 1, it can be seen that the influencing factors of the overall evaluation of rural water environmental management performance are from strong to weak: public participation, work performance, establishment of operational mechanism, establishment of organization.

The situation is that the government has an inescapable management responsibility for the problem of rural water pollution. However, if the government department is regarded as the sole manager and supervisor of pollution emissions, it will often be subject to information occlusion, bureaucracy, technical ability and manpower. For some major environmental accidents and national policies related to the protection of the environment, the information materials are required to be publicized, and the voice of participating in the opinions is getting higher and higher. Therefore, the public participation situation has the strongest influence factors, and other factors are relatively weak.

When the public participation is a potential variable, the villagers' management of the water environment pollution problem has the strongest influence on the public participation. The government departments disclose the water environment pollution to the local people. weak. Since it is participation, the premise is that the masses should have a sense of ownership, abiding by relevant rules, responding to national policies, and restraining their own behavior while supervising the behavior of others. Therefore, the influencing factors are large.

When the performance of work is a potential variable, the rural water pollution problem of the people's petitions has been solved and dealt with in a timely manner. The most influential factors on the performance of the work, the use of special funds for rural water pollution control on the performance of work The influencing factors are the weakest. As the ultimate victims and beneficiaries of the rural water environment, the villagers can feel the water pollution more than other social classes. Through the information they have learned and the problems they reflect, the government departments and their subordinate organizations can use the least amount of manpower, financial resources, targeted control of water pollution. Therefore, the influencing factors are the biggest.

When the situation established by the operational mechanism is a potential variable for internalization, the propaganda of water pollution control is established. The educational mechanism has the strongest influence on the establishment of the operational mechanism. The measures for controlling and controlling rural water pollution are included in the medium and long term of economic development. The factors influencing the establishment of the operational mechanism are the weakest. The propaganda and education of rural water pollution control to all levels of society has made the masses feel the importance and urgency of controlling water pollution in rural areas. This greatly enhances the public's participation, thus achieving the high efficiency of rural water pollution control. Therefore, compared with other influencing factors, the establishment of propaganda and educational mechanisms has the strongest impact.

When the situation established by the organization is a potential variable, the third party's participation in the control and governance of rural water pollution has the strongest influence on the establishment of the organization. The government has good rural water pollution control, monitoring and governance capabilities. The factors affecting the establishment of the organization are weak. As a non-governmental organization, water environmental protection groups are a huge force to promote environmental management in socialist countries. It is based on the purpose of protecting the environment and is a bridge to communicate the wishes of the people and government policies. Therefore, the influencing factors are strong. At present, the government departments are also calling for the establishment of third-party organizations to participate in environmental management actions.

5. Conclusions

(1) The government encourages the establishment of non-governmentally organizations to guide the public to participate in management.

In order to promote rural water environment management more effectively, on the basis of mainly relying on the management of government departments, we should actively encourage the

establishment of non-governmental environmental protection organizations or associations in rural areas, give full play to professional organizations related to agriculture and rural areas, guide the public to actively participate in rural environmental management, and effectively protect the rural water environment.

(2) The construction of government institutions should be improved, and the management of township government should be strengthened.

Aiming at the weak rural water environment management institutions in China, the status quo of ability is not strong, in the next few years, the government should, according to the principle of balancing, establish and improve the county level of the rural water environment control management institutions, especially the important watershed or waters area counties and cities of the rural water pollution control management mechanism, improve the level of configuration instrument, strengthening the rural water environment management responsibilities; In areas where conditions permit, relevant rural water pollution control and management offices or commissioners shall be set up in towns and villages, and special personnel shall be assigned to take charge, so as to strengthen the control and management of rural water pollution.

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