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LETTER TO THE EDITOR

Modeling Analysis of the Impact of Ecological Compensation Legal Mechanism on Water Source Pollution Improvement

Jisu Meng*
Society and Law School, Shandong Women's University, Jinan 250300, China
*Email: mengjisu123@163.com

At present, China's water pollution control areas are promoting the use of ecological compensation methods to influence and motivate residents' ecological protection actions. To this end, the effect of the ecological compensation mechanism implemented by the drinking water source protection zone in Kunming City, Yunnan Province was objectively evaluated. The Qingshuihai Reservoir (with compensation) and the Niulan River (without compensation) in the two water source basins in the Xundian County area of Kunming City A total of 532 valid questionnaires from 6 villages were used as samples. The structural equation model was used to study the impact of ecological compensation legal mechanism on local water pollution improvement. From the analysis of residents' protection behavior awareness, the results show that: with or without ecological compensation, behavioral attitudes, subjective norms and perceived behavior control, the three psychological factors have a positive impact on the local residents' ecological protection willingness and behavior; It is good to encourage villagers to implement ecological protection. However, the current incentive effect of ecological compensation is still very limited, and the effect on the internal psychological factors of the basin residents is less effective. Aiming at the problems existing in the ecological compensation mechanism of Kunming, this paper puts forward some suggestions for exploring and popularizing the PPP model as a market-based ecological compensation mechanism.

Ecological compensation; legal mechanism; water pollution; ecological protection.

1 INTRODUCTION

The purpose of the ecological compensation mechanism is to protect the ecological environment and promote the harmonious development of man and nature. It can comprehensively utilize administrative means and market means. It coordinates the interests of ecological environment protection and ecological environment construction according to factors such as ecosystem services, ecological protection costs and ecological development opportunities. For example, the market economy is used to balance the interests between upstream and downstream river basins, inside and outside the nature reserve. Therefore, the construction of ecological civilization and the implementation of environmental protection work in the new era require the establishment of an ecological compensation mechanism. The ecological compensation legal mechanism can correct residents' perceptions of ecological protection and change their behaviors, which is conducive to environmental protection and improvement. The research in this paper is to take the drinking water protection zone in Kunming, Yunnan Province as an example, to improve the behavior of local residents from the ecological compensation legal

mechanism, to study the impact of ecological compensation legal mechanism on water pollution, and to carry out modeling analysis (Ebrahimi et al. 2017, Gao et al. 2017, Sarkar et al. 2017).

Fengping Wu, Min Zhu, Shang Luo et al. published an article entitled "Ecological Water Price Adjustment Model Based on Contamination Bearing Capacity of Ecological Water Resources" in journal Ekoloji's 2019 Issue 107. In this paper, the ecological water price adjustment model based on the ecological water resources pollution carrying capacity is studied. The AHP analytic method is used to evaluate the polluted ecological water resources index system, and the index comparison judgment matrix is constructed to achieve the consistency test. Calculate and shape the weight of the polluted ecological water resources indicator. On the basis of analyzing residential water and industrial water, the ecological water resources adjustment model is constructed by using the ecological water resources carrying capacity model to calculate the ecological water resources adjustment model, and the ecological industrial ecology is rationally adjusted. The price of water depends on the actual situation. The results show that the ecological water price adjusted by the model is within the acceptable range of residents' living, the urban domestic water consumption growth trend is slow, and the industrial water reuse rate is increased by 6.3%. It is a scientific and reliable ecological water price adjustment model. The modeling method is good in this paper, which can be used to model and analyze the impact of ecological compensation legal mechanism on water source pollution improvement.

Yin stated in the article; the ecological environment is the basis of human survival. Ecological compensation is one of the effective measures to control water pollution (Yin XD 2018). Establishing and improving the legal system of water resources ecological compensation in the whole basin is an important measure for the country to promote the construction of ecological civilization, and is also a major factor in building an ecological civilization. decision making. The ecological environment is the basis of human survival. Ecological compensation is one of the effective measures to control water pollution. Establishing and improving the legal system of water resources ecological compensation in the whole basin is an important measure for the country to promote the construction of ecological civilization, and is also a major factor in building an ecological civilization. decision making. There are two key elements of ecological compensation for water pollution, one is damage compensation, and the other is gain compensation. Based on the analysis of China's water environment ecological compensation system, the paper puts forward four principles of water environment ecological compensation and four legal and regulatory system construction suggestions. Tong et al selected the Jiuquan area of Gansu Province, and analyzed the factors affecting agricultural water-saving ecological compensation from the five perspectives of driving force, pressure, state, influence and response, and established the evaluation of agricultural water-saving ecological compensation (Tong CF et al.2017). The system, the application of Analytic Hierarchy Process (AHP) principle analysis and the weight of each index in the evaluation index system. The results show that the factors of agricultural water-saving ecological compensation involve social and economic factors, national policies and their environmental impacts, which are restricting agricultural water conservation. The most important factors for the development of ecological compensation provide theoretical support for China's agro-ecological compensation laws and regulations and the formulation of national policies, which can enhance the pertinence and practicality of agricultural water-saving ecological compensation, and promote agricultural water saving with wider impact and importance. The practical significance.

All the above-mentioned literatures have carried out in-depth analysis and research on the legal mechanism of ecological compensation, but there are still some areas to be supplemented in terms of pertinence. To this end, this paper is proposed and hoped to be supplemented.

2 IDEA DESCRIPTION

The comprehensive promotion and implementation of ecological compensation is the basic national policy of China at present. The "Opinions of the General Office of the State Council on Improving the Compensation Mechanism for Ecological Protection" and the "Implementation Opinions on the Compensation Mechanism for Sound Ecological Protection" of Yunnan Province have been implemented in 2016 and 2017.The spirit of the Party's 19th National Congress on promoting the market-based ecological compensation mechanism has put forward new requirements and development directions for the formulation of ecological compensation mechanisms and policies. China's ecological compensation mechanism has been researched and practiced in many fields.

The quantitative analysis and research are more: The research on the satisfaction degree of grassland herdsmen's ecological compensation policy and its influencing factors, the satisfaction degree of farmland protection farmers' ecological compensation policy and its influencing factors Research, research on the impact of residents' ecological protection willingness and behavior in nature reserves, research on satisfaction evaluation of watershed residents or forest farmers' ecological compensation policies, and research on community and farmer participation mechanisms in watershed management. However, as the ecological compensation work is still in the pilot and gradual promotion stage, the construction of ecological compensation mechanisms in various fields and their influencing factors are not the same. As far as the water source protection area is concerned, at present, China has comprehensively carried out and implemented ecological protection compensation work in lakes with important ecological functions or drinking water sources, and applied ecological compensation to influence and encourage residents' ecological protection behavior. Kunming City implemented the ecological compensation mechanism in Songhuaba and Qingshui Haiyunlong Reservoir, the three main drinking water source protection areas in the main urban area, to objectively evaluate the effect of the ecological compensation mechanism and the satisfaction of residents. In the two water source basins in the Xundian County area of Kunming City, namely, the Qingshuihai Reservoir (with compensation) and the Niulan River Basin (without compensation), six villages with different conditions were selected as research objects, and 532 effective surveys were collected. Questionnaire, using the TPA theory and structural equation model, studied the impact of ecological compensation policies on the ecological protection willingness and behavior of local residents. The research results can provide a reference and decision-making basis for the comprehensive implementation of the ecological compensation mechanism in the future development of the watersheds in Kunming and Yunnan provinces.

2.1 Method design

Qingshuihai Reservoir is located in Xundian County, Kunming City. It is one of the three major drinking water sources in Kunming's main urban area and is one of the first water source protection areas in Kunming to implement ecological compensation mechanism. Niulanjiang is a water diversion pond project put into use in Yunnan Province in recent years. It is used as a backup drinking water source in the main urban area of Kunming to carry out watershed ecological protection. It has a large flow area in Xundian County and has a wide impact area, but it has not yet carried out ecological compensation. jobs. This paper selects six natural villages with different economic levels as research areas for the following reasons: First, the two regions belong to the same county. No matter whether it is policies or regulations, or the customs and habits of the villagers, there is no big difference. Therefore, the impact of some objective factors can be reduced when doing comparative research. Second, considering that economic conditions will affect the villagers' willingness to protect and behave, thus affecting the improvement of water pollution, the three villages with different economic conditions are selected from the Qingshui Seawater Source Protection Area and the Niulan River Basin Ecological Protection Area.

Research object.

From February to August 2017, due to the needs of the research, the research team selected three villages (Haitou Village, Xintian Village, Haiwei Village) with different ecological conditions and different economic conditions in the Qingshui Sea Basin with ecological compensation policies. In the three villages (Shengli, Shuanglong, Baishiyan) with different economic development status in the Niulan River Basin, the compensation survey was carried out, and questionnaires were sent to the village. A total of 600 questionnaires were distributed, 600 were collected, and 532 valid questionnaires were obtained. Among them, there were 307 valid questionnaires in the Qingshui Basin and 225 valid questionnaires in the Niujiang River Basin.

2.2 Building the model

Planned Behavior Theory (TPA) is one of the important theories about the generation of individual behavior in social psychology. The theory holds that the three elements of attitude, subjective norm and perceptual behavior control determine the will, and the will directly affects the action. Guided by this theory, an analytical model for constructing ecological protection willing, ecological protection behavior and ecological compensation mechanism is shown in Figure 1.In Figure 1, behavioral attitude refers to the tendency of residents in the watershed to ecological protection (positive acceptance, negative resistance); Subjective norms refer to the consensus of the surrounding people in the basin protection area on ecological protection; perceptual behavior refers to the willingness and ability of residents to restrict behavior based on the good wishes of ecological protection. The ecological compensation mechanism is an external adjustment variable, which affects the ecological protection behavior by interacting with the residents' ecological protection willingness.

2.3 Research hypothesis

Based on the research results in Figure 1 and related literature, the following three assumptions are given. Hypothesis 1: Behavioral attitudes, subjective norms, and perceptual behavioral control positively influence the willingness to protect. Hypothesis 2: The willingness to protect positively affects the act of protection. Hypothesis 3: The ecological compensation mechanism has a significant impact on ecological protection behavior.

2.4 Questionnaire design

The basic information for the resident's survey includes gender, education, ethnicity, age, identity, and annual income. Among the 532 households surveyed, they were divided into the following six areas:

(1) Gender aspect: It is noted that the previous relevant research households were mostly male-oriented, and this time they have been improved and balanced in a targeted manner. Among them, there were 279 males, accounting for 52.4% of the total sample; 253 females, accounting for 47.6% of the total sample.

(2) In terms of education level: Due to the rural areas surveyed, the level of education is generally low. 193 students in primary school education accounted for 36.3% of the total sample; 47 students with high school education or above had only 47 The total sample size was 8.8%.

(3) Ethnic aspects: The Han nationality is dominated by 519 households, accounting for 97.6% of the total sample.

(4) Age: Mainly for adults, from 20 to 65 years old.

(5) In terms of identity: The respondents were mainly masses, with a total of 521 households, accounting for 97.9% of the total sample, and the rest were cadres.

(6) Income: There are 269 households whose income is mainly based on agriculture, accounting for 50.6% of the total sample. The rest are migrant workers or businessmen. In terms of income, the annual income is mostly 20,000-30,000 yuan. 274 households, accounting for 51.5% of the total sample.

2.5 Structural model

According to the principle of Figure 1, there is a structural equation model as follows:

$$X_4 = \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \mu_1$$
$$Y = \alpha_4 X_4 + \mu_2 \quad \text{..... (1)}$$

Where α1, α2, α3, and α4 represent the path coefficients between the potential variables, respectively; μ1 and μ2 represent the residuals of the two equations, respectively.

Structural equation model of Niulan River watershed and clear water seawater basin.

3 RESULTS

For the reliability analysis of the questionnaire, the Cronbach s α reliability coefficient was used to reflect the reliability of the questionnaire. It is generally believed that the value of Cronbach s α is between 0.7 and 0.8, which is a high confidence value, and if it is <0. The reliability coefficients are all greater than 0.7, indicating that the data obtained from this survey has good reliability.

Validity is used to test the accuracy of the measurement results, including combination reliability (C. R.) and mean variance extraction (AVE). C. R., AVE value is acceptable between 0. 36 ~ 0. 5, greater than 0. 5 means higher validity. The validity analysis using AMOS software is shown in Table 3. It can be seen that the C. R. and AVE values are both greater than 0.5. The structural equation fit analysis results are shown in table 1.

Table 1 Structural equation fit analysis table

Indicators	CMN/DF	GFI	CFI	RMSEA	IFI	NFI	TLI
Numerical value	1.982	0.934	0.977	0.057	0.978	0.956	0.971
Standard	<3	>0.9	>0.9	<0.08	>0.9	>0.9	>0.9

4 DISCUSSION

Through the analysis of the protection path of the Niulan River watershed and the clear water seawater basin, it is found that the standardized path coefficient between the behavioral attitude and the willingness to protect in the Niulan River waters is 0. 158, P = 0. 026 < 0. 05, indicating that the behavioral attitude is significant Influencing the willingness to protect. The standardized path coefficient between behavioral attitudes and willingness to protect in clear waters is 0. 181, P = 0. 016 < 0.05, indicating that behavioral attitudes significantly positively affect the willingness to protect. It can be seen that the ecological compensation legal mechanism can positively influence people's willingness to ecological protection, thereby improving water pollution.

5 CONCLUSIONS

Guided by the theoretical model of social behavioral psychology, this paper uses the structural equation method to pass 532 questionnaires to the ecological protection willingness and behavior of residents in two water conservation areas with different characteristics in Xundian County, Kunming. The differences and the impact of the ecological compensation mechanism were statistically analyzed and compared. It is hoped that the residents' willingness to ecological protection will reflect the impact of water pollution improvement.

The results are as follows:

First, the three psychological factors of residents' behavioral attitude, subjective norms, and perceived

behavioral control positively affect the willingness to protect the ecological protection, and the ecological protection willingly affects the ecological protection behavior.

Second, in the Qingshui Seawater Source Protection Area where the ecological compensation mechanism is implemented, the path of ecological protection willingness and ecological protection behavior of the basin residents has been strengthened to some extent.

Thirdly, there is no significant difference in the psychological factors of the residents in the basin without ecological compensation, namely, behavioral attitude, subjective norms, and perceived behavioral control, resulting in no significant difference in ecological protection willingness, but there is a certain degree in ecological protection behavior. The difference, but the difference is not big.

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