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Research on the Public Behaviors to Participate in the Lake Chief System-Based on the Survey of Hengshui City, China

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Abstract

Lake chief system is an innovative measure of ecological civilization construction in lake governance and protection in China. Due to the complexity and openness of lake resources, it is difficult for the government and the market to properly handle the arduous task of lake governance, and public participation is an effective remedy for the failure of the government and the market. In order to know the public participation in the protection lakes, this paper selected 318 citizens from Hengshui city and uses the questionnaire survey to understand the public's participation attitude, approach and behavior of the lake chief system. The research results show that the public's education level, length of residence and understanding of the lake chief system have a positive impact on their participation.

Keywords

Lake Chief System, Public Participation, Participation Willingness, Length of Residence

1. Introduction

Water is the source of life, the key to production and the foundation of ecology. As an important carrier of water resources, the rivers and lakes' water ecology plays a very important role in supporting the regional development and protecting the ecological environment. With the rapid development of modern society and the frequent destruction associated with human activities, the rivers and lakes' ecology have been greatly affected and sometimes destroyed (Zuo Qiting, 2017) [1]. Some rivers and lakes have experienced shrinking lakes, increased pollution, and wetland degradation (Zhou Yunxuan *et al.*, 2016) [2]. Nowadays

China attaches great importance to the governance and protection of rivers and lakes, however the deterioration of the river and lake environment has not been reversed (Zhu Sailin, 2021) [3].

Some local governments began to actively explore the lake chief system, to improve the lake water quality standard rate, curb and improve the lake water environment pollution, and strengthen the ecological restoration function of the lake. In 2018, China's first local standard for the lake chief system was released in Shaoxing, Zhejiang province. The term "*lake chief system*" means that the lake chief, the highest level of authority, takes overall responsibility for the lake's management and protection; while other lake chiefs at lower levels also shall take direct responsibility for the lake's management and protection within their jurisdiction and shall organize and implement management and protection policies. Lake chiefs at or above the county level shall be responsible for organizing the assessment of lake chiefs at the next level of the corresponding lakes, and the assessment results shall serve as an important basis for the comprehensive assessment and evaluation of local party and government leading cadres. In this way, the joint construction relationship between the subjects of social and economic activities in the river basin can be established, and the governance and operation mechanism with everyone's responsibility and everyone participation should be formed, and gradually promoted in China.

Hengshui Lake is the second largest freshwater lake in the North China Plain and the only nature reserve in the North China Plain to maintain a complete wetland ecosystem of marshes, waters, beaches, meadows and forests, it covered an area of 75 square kilometers (Baike, 2020) [4]. With the rapid development of economy and society, the urbanization rate of permanent resident population in Hengshui Lake basin is growing rapidly, as well as yearly the water demand and wastewater discharge, affecting water quality within the Hengshui Lake basin. At the same time, due to the impact of both air pollution and water pollution, the Hengshui Lake wetland ecosystem is seriously threatened. In 2017, Hengshui city began to implement the lake chief system, and lake chiefs at all levels actively patrol the lake. However, because the public does not understand the lake chief system, communication issues arose between government and society.

To solve this conundrum, attracting public participation is key to further strengthen the management and protection of Hengshui Lake. Based on this idea, this paper focuses on the public's participation in the lake chief system and analyses at depth the problems related to the public's participation in the lake protection and management processes.

2. Literature Review

Lake chief system is an innovative measure of ecological civilization construction in lake governance and protection in China. The research of Chinese scholars mainly focuses on the theoretical basis, governance path and the effectiveness.

Fang Yueying (2022) proposed to strengthen the theoretical support of the

lake chief system [5]. Gu Shuzhong (2022) put forward the "theory of territorial management ", believing that the governance of the lake can be organized, coordinated, led and controlled by the local government based on the local actual situation, in order to achieve the management that satisfies the residents of the territory (jurisdiction) [6]. Gao Long (2020) pointed out that lake governance is a systematic project that requires systematic governance [7]. James (1997) put forward the butler theory, lake chief as a collection of water resources, water environment, water ecology and other water management subject, is the real "water assets" general butler [8].

Zhu Demi (2020) emphasized the technical support for the operation of the lake chief system, and emphasized the role of modern information technology, data technology and image technology in lake resource management [9]. Tian Ming *et al.* (2019) pointed that the construction of the lake governance system should be strengthened in terms of the organizational system, institutional system, evaluation system and guarantee system [10]. Liu Xiaoyong *et al.* (2020) stated how the hierarchical analysis method can optimize the assessment index of the lake chief system by establishing an index system [11]. Xie Jiancang *et al.* (2019) proposed that the implementation of the lake chief system should be involved in key links such as "problem-oriented", "solution", "task assignment", "command linkage", "online evaluation" and "feedback tracking", and need process services to realize process management [12].

Ma Junqi *et al.* (2022) have studied the effect of water environment treatment in Wuhan and concluded that the lake chief system has significantly improved the comprehensive water quality of the pilot lakes and reduced the total value of pollutants exceeding the quality standard [13]. Zhou Qin (2020) pointed out that since the realization of the lake chief system, the water quality of rivers and lakes and reservoirs in Guizhou province has been significantly improved and the river ecological environment has been effectively restored [14]. However, Xiao Jianzhong *et al.* (2020) pointed out how the river chief system policy did not achieve the expected effect of water resources protection in a short period of time, the responsibility of the lake chief system was not fully implemented, and the supervision mechanism was not perfect [15]. Guo Lu *et al.* (2022) believe that there were some problems in the imperfect assessment system and the lack of standardized assessment procedures in the accountability system of the Yellow River Basin [16].

From the point of existing research, its public participation in lake system research is still minor, mostly related to lake system assessment indicators and working mechanism and implementation effect, plus research on the influencing factors is scarce, and the complexity of lake resources and development needs public participation, since it can effectively alleviate the government and the market can't properly handle the difficult task. Therefore this study mainly adopts an empirical method to evaluate the status of the public participation willingness in the lake chief system, to better achieve the management of lake re-

sources, and then provide some background for later studies related to the lake chief system.

3. Variable Selection

The public plays an important role in the lake ecological environment protection and is the most basic actor in the lake environmental governance process (Garcia, 2020) [17]. However, as lake resources are public goods, the public inevitably has a "free-riding" mentality when participating in environmental protection (Langpap, 2010) [18]. Studies on the reasons for public participation in environmental governance have been analyzed from different perspectives (Shen Jinyu *et al.*, 2021) [19]. This paper analyzes the public's participation in the lake chief system from the degree of understanding and the awareness of environmental responsibility.

3.1. Explained Variable

Lake environmental governance refers to the governance of lake resources that directly or indirectly affect human life and development through various measures, so that the environment meets the development needs of human society and can adapt to the lake ecology (Gao jianyu *et al.*, 2004) [20]. Environmental protection behavior, which can centrally reflect the public's cognition and attitude towards environmental protection, is an important indicator to measure their willingness to participate in environmental governance (Shen jinyu, 2021) [19]. Therefore, this paper uses the public's lake protection behavior to describe the public's willingness and degree to participate in the lake chief system.

3.2. Explaining Variable

Public individual characteristics may influence their environmental governance engagement behavior by acting on their preferences.It has an impact on their environmental governance participation behavior (Cao heping, 2020) [21]. Therefore, this paper selected five personal trait variables, respectively individual gender, age, education level, occupational stability, residence length.

Meanwhile, the understanding of the lake chief system is also an important variable selected in this paper. Individuals face different situations will always produce different perception, and then act on their environmental behavior (Khanal, 2020) [21]. Therefore, this paper selects the public's perception of the lake chief system and the environmental pollution intensity near the lake of residence to measure the public's institutional perception of lake protection. The question consists of a set of statements, each statement has "very understand", "more understand", "understand", "," not much understand, "not understand" five answers, respectively marked as 1, 2, 3, 4, 5, each respondent's attitude is his answer to the question score, the total score can explain his understanding or his different state on this issue.

Table 1 is the description of the variable model.

Table 1. Variables of the model.

Type of variable	Variable name	Variable assignment	Mean value	Standard deviation
Willness	Are you willing to protect the lake environment	1 = Willing;0 = unwilling	0.89	0.314
Degree	Whether to prevent others from destroying the lake environment	1 = Yes; 0 = No	0.73	0.466
Personal characteristics	Gender	1 = male;2 = female	0.76	0.43
	Age	1 = 19 and under; 2 = 20 - 39; 3 = 40 - 59; 4 = 60 and over	1.89	0.751
	Education	1 = Junior high school and below;2 = High School; 3 = college; 4 = Master or above	3.46	0.915
	Whether the work is stable	1 = stable; 2 = unstable	1.410	2.216
	Residence years	1 = 10 years and less than years (including 10 years); 2 = 10 - 15 years (including 15 years) and more than 5 years; 3 = 15 years or more	3.165	1.549
System perception	Whether know the lake system	1 = very understand;2 = more understand; 3 = understand; 4 = not much understand; 5 = not understand	3.200	1.110

4. Research Methods

Data was obtained via a questionnaire designed by the Hengshui University's Lake survey team. In May 2022, a one-month survey was conducted, with unified guidance and training for the investigators before departure. During the formal survey, the questionnaire was statistically evaluated, considering the residents near Hengshui Lake as the main object. A total of 318 questionnaires were applied throughout this survey, and all of them were considered as valid, with an effective recovery rate of 100%. Table 2 shows the basic information description statistics of the sample.

According to Table 2, the gender ratio of respondents is relatively balanced; young and middle-aged respondents aged 20 and 39 account for 58.49%, more than 70% have a high school (college) or above; 70.8% have stable jobs, and the residence time is scattered, with the highest proportion for more than 15 years, accounting for 57.9%. The sample of this survey is basically in line with the current population structure and social and economic development data of Hengshui city in China, and has good reliability.

5. Results and Analysis

5.1. Analysis of the Public's Willingness and Degree to Participate in the Lake Chief System

The public's awareness of lake protection is the basis of their actual participation in lake environmental governance. Generally speaking, the higher the level of awareness, the higher the depth and breadth of their participation. Overall, 84.91% of the sample public had the willingness to participate in the lake chief

Table 2. Basic information of the samples

Feature	Category	Frequency	Ratio (%)
Gender	Male	185	58
	Female	133	42
Age	≤19	83	26.1
	20 - 39	186	58.49
	40 - 59	43	13.52
	≥60	6	1.89
Education level	Junior high school and below	98	30.8
	High School	68	21.4
	college	136	43
	Master or above	16	5
Whether the work is stable	stable	225	70.8
	Unstable	93	29.2
Length/year of residence	(0, 10]	43	13.5
	(10, 15]	91	28.6
	>15	184	57.9

system. In the sample with willingness to participate, 32% of the public prevented disruption to the lake environment. The highest percentage of stopping vandalism was illegal fishing, at 44%. When the respondents encountered people around them damaging the river and lake environment, 44.77% of the citizens chose to acquiesce. 44.94% of the citizens have not participated in river and lake management and protection activities. Although the residents of Hengshui city have the willingness to participate, they rarely dissuade others in the face of destruction. Even if others are wrong, they will choose to acquies to avoid potential contradictions and conflicts. At the same time, many citizens have not participated in the lake protection and management activities. This shows that Hengshui city citizens in participating in the river and lake protection and management awareness is not outstanding. Through interviews with some respondents, it was found out most citizens were willing to participate, but they did not know the information about lake protection activities due to information asymmetry.

5.2. The Influence of Personal Characteristics on the Participation Behavior of the Lake Chief System

The results showed that the education level had a significant impact on the public participation in the lake chief system ($P < 0.01$), since that the higher the education level, the more willing they were to participate in the lake chief system. Also, their higher the education level made them know more about the importance of the lake chief system, and therefore they were more willing to

participate in the governance. Further, for the degree of governance participation, overall, having a stable work has a significant positive impact on the degree of public participation ($P < 0.1$), indicating that the better the economic conditions of the individual, the higher the willingness to participate and the city. In addition, the residence length variable showed a significant positive effect ($P < 0.01$), and the longer the public length of residence, the more obvious the willingness to participate in the lake length system.

5.3. The Influence of the Cognitive Level of the Lake Chief System on the Participation Behavior

The estimates showed that the public perception of the lake chief system had a significant positive impact on the willingness to participate ($P < 0.01$). This may be because the more the public knows about the lake chief system, the higher the satisfaction with Hengshui Lake is, which indicates that it has understood the effect of the lake environmental governance and hopes that the lake environmental governance can be further consolidated, so it is more willing to participate in the environmental governance.

6. Conclusions

As the direct victim and beneficiary of lake environmental governance, the public's participation in the lake chief system is crucial to promoting the construction of ecological civilization and living in a beautiful city. Therefore, this paper used survey data to analyze the willingness within the Hengshui public and willingness to participate in the lake chief system and explores the internal occurrence mechanism of the public willingness to participate. The study conclusions are as follows:

Hengshui city public willingness to participate in the lake chief system is high, of which 84.91% of the public is willing to participate, but many citizens have not participated in the lake protection and management activities, the overall degree of public participation is at a low level. There are differences between the public's willingness to participate in the lake chief system and the degree of participation. Specifically, their education level and length of residence had a significant positive impact on their willingness to participate. For the public's willingness to participate in the lake chief system, the understanding of the lake chief system is what of the public willingness to participate.

7. Suggestions

Based on the above research conclusions, this paper puts forward the following suggestions to enhance the public participation in the lake chief system:

Cultivate and enhance the public participation awareness in the lake chief system and formulate incentive policies. Strengthen the publicity of the urgency of environmental governance of Hengshui Lake, enhance the public psychological perception of environmental crisis problems, reduce the public's "pick-up"

and "government dependence" psychology; formulate public protection participation, stop and report non-environmental friendly behavior, reduce the cost of public participation in lake environmental governance, stimulate the public willingness to participate, and increase the main role of the public in the environmental governance of Hengshui Lake.

Popularize the lake chief system, and strengthen the guidance of typical cases of lake environmental governance. On the one hand, government departments at all levels and social organizations at all levels can use the new media to deepen the public awareness of the ecological value of the lake environment; on the other hand, by strengthening the typical case guidance of lake environmental governance, the public can effectively feel the effectiveness of the lake chief system, emphasizing that the public participation can have a significant positive impact on water environment problems, and thus attract more public to participate its governance.

Expand the channels of public participation in the lake chief system, and improve the information exchange mechanisms of communication between the public and the government. Government can clarify and standardize the scope, channels, and procedures of public participation in water environmental governance through specific policy documents, clarify the public's responsibility and rights to lake environmental problems; also strengthen social supervision, improve the public opinion handling and feedback mechanism, and thus enhancing the government's credibility.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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