Evaluation of the Implementation Effect of the River Chief System in Huzhou City

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Abstract. Based on the objectives and tasks of the implementation of the river chief system, an evaluation system for the implementation of the river chief system in Huzhou city was established, which consists of four parts: water pollution prevention and control, water environment treatment, water resources protection and water function improvement. Based on the relevant data of Huzhou city from 2010 to 2018, the implementation effect of river chief system was analyzed. It is found that the implementation effect of the river chief system in Huzhou city shows a well upward trend, but there are still some fluctuations and deficiencies. In view of the future development of river chief system, relevant suggestions for developing a linkage and cooperation mechanism, strengthening the assessment and accountability mechanism and increasing publicity.

Keywords: River chief system, Effectiveness evaluation system, Water ecological civilization construction, Huzhou

1. Introduction

With the rapid development of economic society, the contradiction between man and water is becoming more and more prominent, which causes a series of ecological security problems. Increased attention has been paid to river management in the wake of a severe water shortage caused by an outbreak of cyanobacteria in Taihu. In 2016, General Office of the CPC Central Committee and General Office of the State Council issued the Opinions on Comprehensive Implementing the River Chief System, indicating the necessity and urgency of establishing the river chief system. In July of the following year, the 43rd meeting of the Standing Committee of the 12th Zhejiang Provincial People's Congress deliberated and adopted the provisions on the River Chief System of Zhejiang Province. The implementation of river chief system has also attracted extensive attention of scholars. As a policy innovation in China's current water environment governance dilemma, the river chief system has aroused the enthusiasm of local governments for water control, and it has quickly formed a diffusion effect in the whole country driven by its advantages of being effective, practical, simple and easy to operate [1-2]. Some scholars also pointed out that the river chief system still has many difficulties, such as the rule of law and the lack of policy innovation [3], the integration of functions faces many
constraints [4], the coordination mechanism fails [5] and other problems. In the exploration of how to really realize "river governance" by river chief system, it is necessary to clearly recognize that river chief system has an emergency transitional nature and insist on its perfect development [6], Guo-hui zhan [7] et all believe that we should also pay attention to the dimension of the rule of law, improve the relevant laws and regulations; Xin-fu cao [8] and so on suggests the market mechanism should be introduced into the river chief system to promote the improvement of the basin governance system.

On the basis of existing literature, based on the tasks and requirements in relevant documents issued by the state and Zhejiang Province, this study builds an index evaluation system, evaluates the effectiveness of various indicators in Huzhou from 2010 to 2018, and provides some references for the development of the river chief system in Huzhou.

2. Construction of the evaluation system for the effectiveness of the River chief system in Huzhou city

2.1. Data sources and index selection

According to the documents issued by the central and local governments, it is concluded that the river chief system is mainly composed of four parts: water pollution control, water environment management, water resources protection and water function improvement, the concrete index system as shown in table 1. The original data are all from The Statistical Yearbook of Huzhou from 2011 to 2019.

| Indicators Categories | Indicators category | Index selection | Attribute |
|-----------------------|--------------------|-----------------|-----------|
| Water pollution control | Discharge of wastewater | Total waste water discharge / 10,000 t | negative |
|                       |                     | Urban domestic sewage discharge / 10,000 t | negative |
|                       | Pollutants in wastewater Discharge conditions | Cod emissions/t | negative |
|                       |                     | Ammonia nitrogen emissions/t | negative |
| Water environment management | Sewage treatment capacity | Sewage treatment rate of central city (%) | positive |
|                       | Regional drainage Capacity | Daily sewage treatment capacity of central city / 10,000 t | positive |
|                       |                     | Length of drainage pipe /km | positive |
| Water resources protection | Water use efficiency | Total domestic water consumption per capita /L | negative |
|                       |                     | Ten thousand yuan GDP water consumption/(m · ten thousand yuan⁻¹) | negative |
|                       | Regional water supply capacity | Total water supply / 10 million m | positive |
|                       |                     | Comprehensive production capacity of tap water/(million m ·d) | positive |
| Water function improvement | Economic function | Water freight volume / 10,000 t | positive |
|                       |                     | Total fishery output value /ten thousand yuan | positive |
|                       | Ecological function | Green Coverage rate in built-up areas (%) | positive |
|                       |                     | Per capita green park area / m² | positive |
2.2. Data processing and weight assignment

In order to eliminate the influence of different order of magnitude and dimension, it is necessary to standardize the data. If the larger the index value is, the better the positive index standardization formula (1) will be adopted. The smaller the index value, the better the negative index standardization formula (2) is adopted.

\[
x'_{ij} = \frac{x_{ij} - \min x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (1)
\]

\[
x'_{ij} = \frac{\max x_{ij} - x_{ij}}{\max x_{ij} - \min x_{ij}} \quad (2)
\]

In the formula, \(x_{ij}\) and \(x'_{ij}\) represent the value of the j evaluation index in year i before and after standardization respectively.

In this study, the coefficient of variation method was used to weight the effectiveness evaluation index of Huzhou river chief system. The coefficient of variation method is an objective weighting method, which directly uses the information contained in each index to calculate the weight of the index. If the difference of index value is larger, the weight is larger; The smaller the index difference, the smaller the weight.

\[
v_j = \frac{\bar{x}}{\sqrt{\sum_{i}(x_i - \bar{x})}} \quad (3)
\]

Where, \(x\) is the evaluation index of J from 2010 to 2018, \(\bar{x}\) is the arithmetic mean of, \(m\) is a year, denoted as 1, \(v\) in 2010, is the coefficient of variation of the JTH evaluation index.

The weight of each evaluation index is calculated by the coefficient of variation, \(w_j\) is the weight of each index, \(a_{ij}\) is the specific score of the implementation of the river chief system in Huzhou, as shown in Formula (4) and Formula (5).

\[
w_j = \frac{v_j}{\sum v_j} \quad (4)
\]

\[
a_{ij} = \sum w_j \times x'_{ij} \quad (5)
\]

3. Analysis of the effect of the river chief system in Huzhou city

3.1. A subsection

The specific evaluation value and growth rate of the implementation effect of the river chief system in Huzhou city from 2010 to 2019 can be calculated by using the specific values of indicators in Table 1 and according to formula (5), as shown in Table 2.

| Year | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 |
|------|------|------|------|------|------|------|------|------|------|
| Score | 0.31 | 0.35 | 0.42 | 0.41 | 0.45 | 0.47 | 0.63 | 0.67 | 0.72 |
| Growth % | - | 13.63 | 20.94 | 1.64 | 7.98 | 5.68 | 33.83 | 6.92 | 7.32 |
As can be seen from Table 2, the implementation of the river chief system in Huzhou city achieved remarkable results from 2010 to 2018. Before the official implementation of the river chief system, the growth rate was the fastest from 2010 to 2012, and the construction level of water ecological civilization showed a significant upward trend, but the growth rate was negative from 2012 to 2013. In August 2013, Huzhou city officially issued the Implementation Plan of Huzhou City to establish the river chief system, and the water ecological civilization construction level gradually rose, and the implementation effect of the river chief system was obvious.

3.2. Analysis of reasons for the fluctuation of the implementation effect of the river chief system
Caused by a large bloom of blue-green algae in Taihu lake region around the problems of water environment deterioration, Wuxi City drives the river chief system establishment and development of surrounding areas, and Huzhou city is located in the south of Taihu lake, affected by the Taihu lake water ecological security, and as the birthplace of river chief system, river’s management consciousness is strong, the government to give attaches great importance to the quality management, fast action, so water ecological civilization construction (2010-2012) to quickly highlight effect. In 2013, Huzhou city officially established the "river chief system" management system within the whole city, which promoted the solution of the difficult problem of river and lake management and protection, and the level of water ecological civilization construction continued to rise. In the initial stage of the full implementation of the river chief system from 2013 to 2015, there was a certain gap in the goals and cognition of the river chiefs at all levels in Huzhou City, the high-level coordination and promotion efforts were insufficient, the legal framework system and the administrative system still need to be improved, and the implementation effect of the river chief system has a small increase, in a steady growth stage. Moreover, after more than ten years of the river chief system, the work enthusiasm of the responsible personnel declined and entered the fatigue period of management, which caused fluctuations in the growth rate of the implementation of the river chief system. The promotion of the river chief system was initiated at the central level. And at the local level, Zhejiang’s “five-water co-governance” has gradually shown results. The level of water ecological civilization construction in Huzhou has been significantly improved, with a growth rate of 33.83%. The growth rate of the implementation effect of the river chief system tended to be flat, which may be related to the fact that the long-term water governance mechanism and responsibility system in Huzhou has been relatively complete, the water source management measures and technologies are more advanced, and the engineering measures of the river chief system have become saturated.

4. Conclusions and Suggestions

4.1. Conclusions
According to the implementation objectives of the river chief system, an evaluation system for the implementation effectiveness of the river chief system was constructed, consisting of water pollution prevention and control, water environment treatment, water resource protection and water function improvement. The weight was given by the coefficient of variation method, and the specific value of the implementation effectiveness evaluation of the river chief system in Huzhou city from 2010 to 2018 was obtained. The results showed that: the implementation effect of the river chief system in Huzhou city from 2010 to 2018 is divided into three stages, namely the rapid development period of water ecological civilization construction from 2010 to 2012, the steady growth period from 2013 to 2015, and the new development period from 2016 to 2018, which are closely related to the governance system and promotion efforts of the river chief system in Huzhou city.

4.2. Suggestions
According to the above research conclusions, combined with the requirements of ecological civilization construction and sustainable development road, the following suggestions are put forward for the further implementation and promotion of river chief system in Huzhou city: (1) Carry out the
linkage and cooperation mechanism in depth. Promote the exchange between river chiefs of different rivers and lakes, carry out the upper and lower linkage of the river basin, and carry out cooperative management mode, so as to improve the effect of river course management. (2) Strengthen the assessment and accountability mechanism. According to the specific problems of different lakes, we should evaluate and access the differentiated long effectiveness of river chiefs. The evaluation system should be a comprehensive prevention and control of water pollution, water management, protection of water resources and water environment function promote four aspects, and the ecological environment of the damage to the presidency is a lifelong liability system, in order to improve the comprehensive ability, realize river chief system. (3) Intensify publicity efforts. The river chief system is a regulatory means to supervise and assess the government's responsibility for water control. In a certain extent, it ignores the role of social mechanism, and grassroots people lack a comprehensive and in-depth understanding. In addition to the river chiefs appointed by the government, nongovernmental forces and capital will be used to promote the implementation of the river chief system, so as to enhance the public's understanding and support for the construction of water ecological civilization and create a situation of wide participation and joint supervision by the whole society.

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