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Evaluation of ecological governance in Hunan Province based on DPSIR model

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ABSTRACT

An important part of the construction of ecological civilization is ecological governance, which is an important way to promote the healthy and sustainable development of economy and society. Based on the DPSIR conceptual model, an evaluation index system with 30 indexes is constructed to empirically evaluate the state of ecological governance in Hunan Province from 2006 to 2015. The evaluation results show that the overall level of ecological governance in Hunan Province shows an upward trend. In each subsystem, the development trend of driving force, state, impact and response subsystems is getting better, the development trend of pressure subsystem is getting worse, and the pressure on ecological governance is gradually increasing. Based on the research results, this paper puts forward countermeasures and suggestions for ecological governance in Hunan Province from the aspects of politics, economy, culture and society.

Keywords: ecological governance. index system; DPSIR conceptual model; Hunan Province

1. Introduction

In 2015, China's urbanization rate has reached 56.1%[1], and urbanization has become the mainstream mode of social development in China at this stage. The rapid expansion of cities has brought convenience to human life in many aspects, but also brought problems such as water pollution, air pollution, traffic congestion and so on. The 18th CPC National Congress put forward the strategic layout of "five in one", which raised the construction of ecological civilization to a higher position. The construction of ecological civilization involves all aspects of social economy and culture and is an important aspect of building a well-off society in an all-round way, which also puts forward higher requirements for the practice and academic research of ecological governance in China. The 19th CPC National Congress proposed to speed up the reform of ecological civilization system and build a beautiful China, which puts forward higher requirements for the practice and academic research of ecological governance in China. To build the modernization of harmonious coexistence between man and nature, we should take conservation optimization, protection priority and natural restoration as the policy, infiltrate the concept of resource conservation and environmental protection into all aspects of social life, optimize the spatial pattern and industrial structure, and change the mode of production and lifestyle. Ecological governance is a huge and complex project, which involves all

aspects of economic and social life. It requires the active participation, coordination and cooperation of all stakeholders to maximize the effectiveness of ecological governance. Strengthening the construction of ecological civilization and green ecological governance is an important part of promoting sustainable economic and social development and promoting the healthy development of cities.

2. Literature review

In the middle and late 1990s, governance theory, as a new theoretical paradigm in the field of public management, began to enter China, which just provided a good theoretical foundation for the development of public utilities in China. Then the theory was introduced into urban governance. As the party and the state pay more and more attention to the construction of ecological civilization, the governance theory has gradually entered the field of ecological city governance. Jiang pointed out that ecological civilization is the highest moral civilization, the only way for global sustainable development and the highest criterion of human civilization[2]. Yanitsky, a former Soviet saint of love, put forward the ideal model of eco city and explained the connotation and characteristics of eco city: the integration of nature and technology, the maximum exertion of productivity and creativity, human physical and mental health and the guarantee of environmental quality[3]. In order to achieve the ideal governance effect, Jonathan can actively encourage public participation to reduce the pressure of the government and reduce the government's investment in capital and manpower[4]. Based on the subject embedding process and object development process, Hao et al. explored the innovation process of low-carbon ecological city by using the concept of good governance and process research methods[5].

As the 18th National Congress of the Communist Party of China pointed out that the construction of ecological civilization should be put in a prominent position, the construction of ecological civilization has also made some

achievements. At the same time, the academic community has continuously studied the ecological civilization, and the evaluation index system of ecological civilization construction has been put forward. For example, Sceri and James have proposed that the acceptance and participation of residents must be considered in order to realize the value of ecological city governance[6]. Qin et al. constructed an evaluation system with 35 indicators based on five levels such as system, measured and analyzed the construction level of ecological civilization in five typical cities such as Heping District of Shenyang, and put forward countermeasures and suggestions for the development of ecological civilization cities according to the current situation[7]. Luo et al. constructed the evaluation index of ecological civilization construction through the development level index model, system coordination index model and performance model, evaluated the ecological civilization construction of Kunming, and provided the basis for systematic evaluation of regional ecological civilization construction[8]. Li constructed evaluation indicators from the five aspects of land and resources spatial development, resource conservation and utilization, ecological environment protection, ecological coordination and ecological system implementation to comprehensively evaluate the construction of ecological civilization in the province[9]. Starting from the growth rate of the proportion of green GDP output value and the growth rate of urban residents' happiness index, Wang selected 16 indicators to build an ecological civilization construction evaluation index system of the ecological civilization city progress index model[10]. Starting from the "five in one", Gan and Shi summarized and analyzed the construction of ecological civilization in Xiamen, and put forward corresponding countermeasures and suggestions to promote the construction of beautiful Xiamen[11]. Yin et al. used SWOT analysis method to analyze the current situation of ecological civilization construction in Western Hunan and put forward five path choices[12].

At present, ecological governance has been paid

more and more attention by scholars at home and abroad. In recent years, the research and practice of ecological city evaluation have also achieved certain results. With the continuous development of urban governance concepts, concepts such as eco-city, beautiful China, and smart city have emerged one after another, which has also enriched the connotation and extension of eco-city. Eco-city construction is no longer simple environmental protection, green, low-carbon, recycling, etc. are gradually combined with eco-city. At present, the construction of ecological city is the construction of a richer three-dimensional ecological and livable city. Now, the research on the concept interpretation and evaluation index system of ecological governance has become the mainstream direction in the field of ecological governance. Based on the DPSIR model and based on public policy theory and sustainable development theory, this study constructs an ecological governance evaluation index system, comprehensively evaluates the ecological governance level of Hunan Province, analyzes the specific conditions of each subsystem, finds out the existing problems of ecological governance while clarifying the current situation of ecological governance in Hunan Province, and puts forward countermeasures and suggestions to promote the construction of ecological city governance in Hunan Province.

3. Construction of ecological governance evaluation index system

3.1. DPSIR model

The DPSIR conceptual model is developed and evolved on the basis of PSR and was first proposed by the European Environment Agency (EEA) in 1993 The model is composed of five aspects of "driving force pressure state impact response"[13], which is mainly used to measure and evaluate the ecological environment and sustainable development. Based on system theory, DPSIR conceptual model reveals the interaction between human and natural environment and social environment, effectively judges the causal

relationship between states and problems, and systematically describes and analyzes the relationship between environment and economic and social development based on the DPSIR model. Zhu et al. selected 28 indicators such as GDP, per capita carbon emissions and carbon productivity to build a low-carbon city evaluation index system, and analyzed the construction of low-carbon cities in Jiyuan during the Eleventh Five Year Plan[14]. Shen constructed the evaluation index system of regional green GDP Based on DPSIR model, and evaluated and analyzed the green GDP of Suzhou with 29 indexes[15]. Qiao et al. used DPSIR model and. Theil coefficient to evaluate the sustainable development capacity of Henan Province and provide decision support for regional sustainable development[16]. In the DPSIR model, as shown in **Figure 1**, the driving force is the internal cause of changes in resources and environment, mainly refers to the internal driving force and development trend in social and economic activities. Pressure refers to the impact on the surrounding resources and environment due to the needs of daily production and life. It is the direct cause of the change of ecological environment. State is the various conditions of the whole society and environment under the driving force and pressure of the ecological environment. Impact refers to the feedback results and impact degree of various state degrees of various ecosystems in the region on society, economy, resources and environment. Response refers to the positive and effective measures and countermeasures taken to realize the sustainable development of social economy.
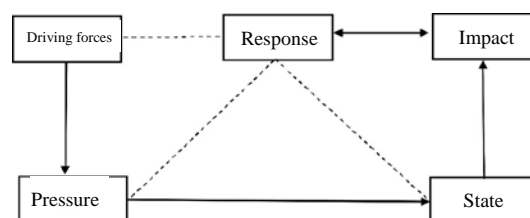

Figure 1. DPSIR conceptual model.

3.2. Evaluation index system of ecological governance

The evaluation index system of ecological governance in Hunan Province is constructed[17].

The index system is divided into target layer, criterion layer and element layer (see **Table 1**) the target layer takes the overall level of ecological governance in Hunan Province as the overall objective of the system evaluation, which is used to measure the overall construction level of ecological governance in Hunan Province. At the criterion level, the five subsystems of D-P-S-I-R are evaluated respectively to reveal the reality of ecological governance in Hunan Province. Element level, including 30 indicators including per capita GDP, population density, energy consumption per unit GDP, and "three wastes" emission.

Table 1. Evaluation index system of ecological governance in Hunan Province

Target layer	Criterion layer	Element layer	Attribute	Weight
Evaluation index system X of ecological governance in Hunan Province	Driving force Y_1	GDP per capita (yuan) Z_1	Forward	0.04187
		Disposable income of urban residents (yuan) Z_2	Forward	0.04132
		Disposable income of rural residents (yuan) Z_3	Forward	0.04297
		Engel coefficient of urban residents (%) Z_4	Negative direction	0.02848
		Engel coefficient of rural residents (%) Z_5	Negative direction	0.04586
	Pressure Y_2	Population density (person/km^2) Z_6	Negative direction	0.01599
		Energy consumption per unit GDP (ton of standard coal/10,000 yuan) Z_7	Negative direction	0.04750
		Per capita housing construction area of urban residents (m^2/person) Z_8	Negative direction	0.00816
		Per capita housing area of rural residents (m^2/person) Z_9	Negative direction	0.00979
		Private car ownership (10,000 vehicles) Z_{10}	Negative direction	0.01070
		Number of standard operating vehicles (standard set) Z_{11}	Forward	0.04415
	State Y_3	Industrial wastewater discharge (10,000 tons) Z_{12}	Negative direction	0.02346
		Domestic sewage discharge (10,000 tons) Z_{13}	Negative direction	0.01247
		Sulfur dioxide emission (10,000 tons) Z_{14}	Negative direction	0.04468
		Output of industrial solid waste (10,000 tons) Z_{15}	Negative direction	0.00498
		Forest coverage (%) Z_{16}	Forward	0.04449
		Park green space per capita (m^2) Z_{17}	Forward	0.04393
		Forest area (10,000 ha) Z_{18}	Forward	0.06450
		Water resources per capita (m^3/person) Z_{19}	Forward	0.03922
	Impact Y_4	Urban registered unemployment rate (%) Z_{20}	Negative direction	0.05069
		Proportion of tertiary industry (%) Z_{21}	Forward	0.02444
		Area of Nature Reserve (10,000 ha) Z_{22}	Forward	0.05205
		Number of beds in health institutions per 10,000 people Z_{23}	Forward	0.04442
	Response Y_5	Elasticity coefficient of energy consumption (%) Z_{24}	Negative direction	0.08500
		Greening rate of built-up area (%) Z_{25}	Forward	0.06117
		Comprehensive utilization rate of industrial solid waste (%) Z_{26}	Forward	0.01380
		Centralized treatment rate of urban sewage treatment plant (%) Z_{27}	Forward	0.03922
		Harmless treatment rate of urban domestic waste (%) Z_{28}	Forward	0.03973
		Proportion of environmental protection investment in GDP (%) Z_{29}	Forward	0.03941
		Investment in industrial pollution control (100 million yuan) Z_{30}	Forward	0.01204

4. Empirical research methods

4.1. Data collection and standardized processing

Data collection

In the process of data collection, the statistical yearbook of Hunan Province from 2007 to 2016, the China Environmental Statistical Yearbook, the statistical bulletin of Hunan Province from 2006 to 2012, the bulletin of environmental conditions of Hunan Province and other individual index data are simply calculated based on the existing relevant data. In order to ensure the authenticity and availability of all data, on the premise of not affecting the results, all indicators and measurement standards in this study are consistent with the standards of the Bureau of statistics. According to the construction principle of evaluation indicators, all indicators in this paper are divided into positive indicators and negative indicators. Positive indicator means that the value of the indicator has a good impact on the result. The larger the value, the better the result. Negative indicator means that the value of the indicator has a bad impact on the result. The larger the value of the indicator, the worse the result. The evaluation system of ecological governance in Hunan Province and the attributes and weights of specific indicators are shown in table (see **Table 1**).

Dimensionless index

Dimensionless is the standardization of data. It is a method to reduce or offset the impact of the original variable dimension on the evaluation results by mathematical means. In the multi index comprehensive evaluation, the actual value and evaluation value of each evaluation index are involved. Because the measurement unit and meaning of each index are different, there are dimensional differences between each index. This difference is the main factor affecting the overall evaluation result of things. The dimensionless treatment of indicators can solve this problem well. The common dimensionless methods mainly include

threshold method, standardization method, specific gravity method and so on. In order to avoid the lack of comprehensiveness of data due to different data properties and measurement units of each index, this study uses the extreme value method to deal with the data dimensionless, and the calculation formula is:

Standardization of positive indicators:

$$Y_{st} = \frac{X_{st} - X_{st\,\min}}{X_{t\,\max} - X_{t\,\min}}$$

(1)

Standardization of negative indicators:

$$Y_{st} = \frac{X_{st\,\max} - X_{st}}{X_{t\,\max} - X_{t\,\min}}$$

(2)

The larger the value of the positive indicator, the better the result, and the smaller the value of the negative indicator, the better the result.

4.2. Selection of evaluation methods

Weight determination

Weight refers to the relative importance of an index in the evaluation index system. At present, the academic circles have not formed a unified view on how to determine the index weight in the construction of relevant statistical indicators such as ecological governance evaluation and ecological civilization construction. At present, there are mainly two methods to determine the index weight. One is the subjective weighting method, which mainly scores and assigns the index weight according to the experience of experts in relevant fields, such as Delphi method, analytic hierarchy process and so on. However, this method is vulnerable to the influence of research field and personal cognition, which will affect the results of weight to a certain extent. Relatively speaking, the objective weighting method avoids the adverse effects of subjective factors and is more objective and scientific. It comprehensively analyzes and evaluates multiple index objects, and its results are not affected by external factors. The

objective weighting method is used to determine the weight. The main methods include principal component analysis, standard deviation coefficient method, entropy method and so on. In conclusion, this study will use entropy method to assign the weight of each index. In practice, based on the variation degree of each index, the entropy value of each index is calculated, and then the weight of each index is corrected through the entropy value, to obtain a more scientific and objective index weight.

Assuming that there are m items to be evaluated and n evaluation indexes, the original data matrix of the corresponding evaluation indexes of the items to be evaluated is formed $R = (X_{st}) m*n$.

$$R = \begin{bmatrix} X_{11} & X_{12} & \cdots & X_{1m} \\ X_{21} & X_{22} & \cdots & X_{2m} \\ \vdots & \vdots & \vdots & \vdots \\ X_{n1} & X_{n2} & \cdots & X_{nm} \end{bmatrix} m*n$$

(3)

Where X_{st} is the evaluation value of the s-th evaluation item under the t-th evaluation index.

Calculate the proportion X_{st} of the index value of the s-th evaluation project under the t-th evaluation index:

$$P_{st} = \frac{Y_{st}}{\sum\limits_{s=1}^{m} X_{st}}$$

(4)

(2) Calculate the entropy of the t-th index, e_t:

$$e_t = -K \sum_{s=1}^{m} P_{st} \ln P_{st}$$

(5)

Where $k = 1/\ln m$.

(3) Calculate the entropy weight W_t of the t-th index:

$$W_t = \frac{1 - e_t}{\sum\limits_{t=1}^{n} (1 - e_t)}$$

(6)

Calculation method of comprehensive score

Taking Hunan Province as a sample, an ecological governance index system is established based on the five aspects of DPSIR conceptual model. According to the index weight, the comprehensive index of ecological governance level and the comprehensive evaluation index of each subsystem are calculated, and the degree of ecological governance level and the development status of each subsystem are analyzed. Index mathematical synthesis method, multivariate system analysis method, fuzzy comprehensive evaluation method and grey system evaluation method are commonly used comprehensive evaluation models at present. This study adopts one of the multi index mathematical synthesis methods: linear weighted comprehensive score method, the formula is:

$$Z = Z = \sum_{i=1}^{n} W_j * Y_{ij},$$

where Z represents the comprehensive score of ecological governance level.

5. Evaluation and analysis

5.1. Evaluation conclusion

DPSIR conceptual model can reflect the internal relationship between various ecological governance indicators in Hunan Province in recent years, and can more clearly see the dynamic changes of ecological governance level in Hunan Province between years. The entropy method is used to calculate the weight, and the comprehensive index of ecological governance level in Hunan Province from 2006 to 2015 is calculated (see **Table 2**). According to the comprehensive evaluation results of ecological governance in the table, the highest year of ecological governance index is 2015, reaching 0.9704, and the lowest year is 0.2257 in 2006. From the state of various indicators, the index scores of all indicators are positive, which shows that the overall level of ecological governance in Hunan Province shows an upward trend from 2006 to 2015, and the level of ecological governance is improving year by year. From 0.2257 in 2006 to 0.9704 in 2015, Hunan Province has increased by 329.95% in this decade,

and the level of ecological governance has been significantly improved. As can be seen from **Figure 2** between 2007 and 2009, it began to decline rapidly and entered the process of slow fluctuating growth from 2012 to 2015. There are great differences in the comprehensive index of ecological governance in Hunan Province, indicating that the ecological governance in Hunan Province is not balanced.

Table 2. Comprehensive index of ecological governance in Hunan Province from 2006 to 2015

| Particular year	Driving force D	Pressure P	Status S	Impact I	Response R	Comprehensive
2006	0.0217	0.0446	0.0504	0.0153	0.0937	0.2257
2007	0.0262	0.0528	0.0507	0.0254	0.0800	0.2350
2008	0.0220	0.0582	0.0783	0.0403	0.0913	0.2902
2009	0.0400	0.0574	0.1165	0.0959	0.1202	0.4299
2010	0.0608	0.0548	0.1518	0.0771	0.1212	0.4657
2011	0.0851	0.0668	0.1251	0.0812	0.1187	0.4770
2012	0.1067	0.0709	0.1693	0.0991	0.1884	0.6344
2013	0.1436	0.0755	0.1853	0.1030	0.2157	0.7231
2014	0.1832	0.0850	0.2407	0.1537	0.2110	0.8737
2015	0.1984	0.0923	0.2566	0.1713	0.2518	0.9704
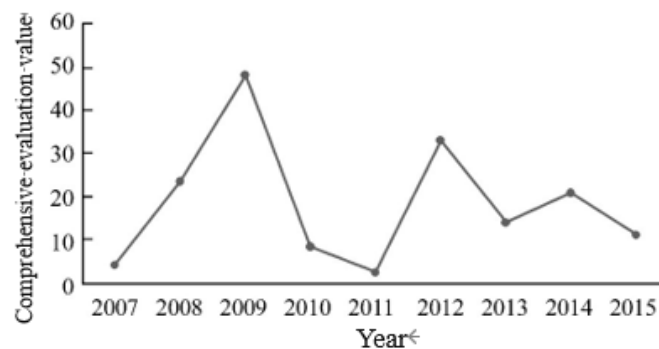
Figure 2. Growth curve of comprehensive evaluation value of ecological governance in Hunan Province from 2007 to 2015.

5.2. Conclusion analysis

Driving force subsystem

From 2006 to 2008, the evaluation value of driving force was basically in a relatively stable state. From 2009 to 2014, it was in a steady upward development momentum, and the growth rate slowed down from 2014 to 2015 per capita GDP and disposable income of urban and rural residents are increasing year by year. The Engel's coefficient of rural residents showed a downward trend year by year, and that of urban residents increased slightly in 2015, which had been decreasing year by year before. All indicators are developing towards a good trend, which shows that the driving force of ecological governance in Hunan Province performs well in all aspects, providing a strong driving force for promoting ecological governance. Overall, the driving force subsystem shows an increasing trend,

and the growth rate is large. As the backbone of the rise of central China, Hunan Province has rapid economic development and great potential. The disposable income of urban and rural residents has increased year by year, and the Engel coefficient of urban and rural residents has decreased year by year, providing a strong driving force and support for ecological governance.

Pressure subsystem

From 2006 to 2015, the overall function of ecological governance in Hunan Province showed an upward trend, which shows that the pressure faced by ecological governance in Hunan Province is gradually increasing. From 2006 to 2008, the pressure evaluation value was on the rise, showing a downward trend from 2008 to 2010. This shows that Hunan Province is under increasing pressure in the process of ecological governance, and the difficulty

of ecological governance is becoming greater and greater.

From the development of single indicators, the energy consumption per unit GDP in Hunan Province is decreasing year by year, which shows that the effect of energy conservation and emission reduction is remarkable, and the concept of the government and the people is gradually changing. At the same time, the per capita housing construction area and private car ownership of urban and rural residents are gradually increasing, which brings certain pressure to the construction of ecological city. The government should encourage people to choose public transportation as much as possible.

Status subsystem

The state of ecological governance in Hunan Province shows a fluctuating growth trend, with large fluctuations between 2010 and 2011. It remained basically unchanged from 2006 to 2007, and increased year by year from 2007 to 2010. After the great decline in 2011, the development momentum slowed down and showed a tortuous upward trend. It can be seen from this that the ecological governance in Hunan Province has achieved certain results, but the governance progress has slowed down in recent years, and the government still needs to increase the investment in ecological governance. From the perspective of single indicators, the development trend of industrial wastewater discharge and industrial solid waste production fluctuates, and 2011 is an important turning point, which shows that these two indicator values lead to the fluctuation of state value in 2011. At the same time, it also shows that the progress of "three industrial wastes" in Hunan Province is not significant and can not meet the needs of eco city construction. Hunan Province also needs to further strengthen the control of "three industrial wastes". At the same time, the changes of forest coverage, per capita park green space, forest area, water resources and other indicators tend to be good, which shows that the Hunan provincial government has made great efforts in urban greening construction.

Impact subsystem

From 2006 to 2015, the impact assessment value of Hunan Province showed an overall upward trend, with slow growth from 2006 to 2008, rapid growth from 2008 to 2009, and then a slight decline in 2010. After experiencing slow growth from 2010 to 2013, in 2014 another rapid growth followed, followed by a slower pace of growth. This shows that ecological governance in Hunan Province has had a positive impact on the economy and society, and ecological governance has achieved little effect. Judging from individual data, the registered urban unemployment rate and the area of nature reserves have not changed significantly. The tertiary industry and the number of beds in health institutions per 10,000 people are growing steadily. This shows that Hunan Province is seeking a transformation in economic development. The economic development of the tertiary industry is more in line with the needs of ecological city construction. At the same time, Hunan Province pays attention to medical security, and the medical conditions of the people have been greatly improved.

Response subsystem

From 2006 to 2015, the response evaluation value of Hunan Province showed an upward trend, but fluctuated greatly. From 2006 to 2007, from 2009 to 2011 and from 2013 to 2014, it decreased slightly, and the rest of the years showed an upward trend, especially from 2011 to 2012. In terms of single indicators, the elasticity coefficient of energy consumption has been on the rise in previous years, and showed a downward trend after reaching the peak in 2010, especially from 2011 to 2012. The concentration rate of urban domestic sewage treatment and the harmless treatment rate of domestic waste are growing steadily, showing a good trend. The investment in environmental protection and industrial pollution control shows an upward trend overall, which shows that Hunan Province has increased investment in environmental treatment, while controlling from the source to reduce the generation of pollution and minimize the damage to the environment.

6. Countermeasures and suggestions

6.1. Innovate performance evaluation and build ecological performance evaluation mechanism

Our government continues to seek reform and transformation. With the deepening of government transformation, ecology has increasingly become the focus and difficulty of government work. In the process of ecological governance, it needs the active participation of all social parties, of course, it is inseparable from the support of the government. In order to better carry out the construction of ecological civilization and promote the process of ecological governance, ecological governance evaluation has become an important aspect of government performance evaluation To this end, we must change the traditional GDP performance appraisal system, innovate the ecological performance appraisal index system, bring the achievements of ecological civilization construction and environmental governance into the scope of political performance appraisal, formulate standards for ecological governance and ecological civilization construction, enrich ecological performance appraisal measures, such as dynamic ecological performance appraisal, establish an ecological responsibility tracking system, enhance the awareness of ecological governance responsibility of public servants at all levels, and play a leading role.

6.2. Change the development mode and develop a green and sustainable economy

Building an ecological civilized city requires sustainable economic and ecological development. Adjusting and optimizing the industrial structure plays an important role in the construction of ecological cities. At present, although the proportion of tertiary industry in Hunan Province is increasing year by year, there is still a lot of waste of resources in economic and social development. The main reason for this phenomenon is that economic development depends too much on industry. In order to further improve the quality of ecological

environment and build an ecological civilized city, Hunan Province must focus on developing the tertiary industry, reduce the proportion of the secondary industry and vigorously develop technology intensive industries. continue to increase investment in the environmental protection industry and eliminate enterprises with backward production capacity. Take pollution emission and energy and resource consumption as preconditions and improve market access standards.

6.3. Reshape urban culture and strengthen citizens' sense of belonging and identity

Culture is the inner soul of a city, and it is the image of the city that is jointly shaped by urban residents. At the same time, cultural heritage is also a key factor in attracting people and enterprises. In the process of creating and enriching the urban culture of ecological governance, people and enterprises should be actively guided to develop more ecological and green behaviors. Actively publicizing the knowledge of ecological city governance can not only play the dissemination function of various old and new media, but also combine ecological governance education with the existing education system, and set up relevant education courses in schools at all levels, especially primary and secondary schools, so as to achieve "ecological environmental protection". Enhancing citizens' sense of urban identity is also crucial in the process of ecological governance. A strong sense of identity can increase the public's interest in participating in urban ecological governance, and can also enhance the public's participation in ecological urban governance. In terms of enhancing the public's sense of identity and belonging, the sense of belonging of citizens can be strengthened by continuously improving urban infrastructure and shaping the city's iconic, representative figures and events, to encourage citizens to actively participate in eco-city governance.

6.4. Improve the way of participation and broaden the channels of public participation in governance

The construction of ecological civilization involves many aspects, which is difficult to achieve unilaterally by relying on government actions, and the enthusiasm of public participation needs to be greatly improved. By learning from the experience of ecological civilization construction at home and abroad, in the process of ecological civilization construction, it is first necessary to clarify the rights and obligations of relevant subjects, perform their respective duties and work together. Based on clarifying the respective rights and obligations of the government, enterprises and the public, improve the public participation mechanism, and give full play to the strength of enterprises, universities and non-governmental organizations to participate in the construction of ecological civilization.

Conflict of interest

The authors declare no conflict of interest.

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