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# RESEARCH ON PUBLIC SATISFACTION OF ECOLOGICAL CIVILIZATION CONSTRUCTION IN HEILONGJIANG PROVINCE OF CHINA

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**Abstract**

Based on the theme of public satisfaction in the construction of ecological civilization in Heilongjiang Province of China, 13 cities in Heilongjiang Province of China were investigated by means of literature research, questionnaire survey and on-the-spot interview. Scientific analysis was made on the four main evaluation indexes of air quality, water quality, improvement of local living environment and the construction of ecological civilization by the government, so as to truly oppose the public to Heilongjiang Province of China The sense of achievement of ecological civilization construction in Heilongjiang Province provides support and reference for promoting ecological civilization construction and public perception in Heilongjiang Province.

**Keyword:** Heilongjiang Province of China; ecological civilization construction; public satisfaction

## 1 Introduction

The construction of ecological civilization is a long-term plan related to the well-being of the people and the future of the nation. Industrial civilization not only brings the rapid development of human beings, but also causes various environmental problems, such as ecosystem degradation, environmental pollution aggravation (Li Qing, 2019), resource constraints tightening, human beings are facing a serious situation of imbalance with nature. Only by establishing the ecological civilization concept of respecting nature, conforming to nature and protecting nature, taking the road of sustainable development, accelerating the reform of ecological civilization system and building a beautiful China(Feng Yabei et al., 2019), can people enjoy the production and living environment with beautiful mountains and rivers and low-carbon and environmental protection.

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The purpose of public satisfaction survey of ecological civilization construction is to promote the whole society to build and share ecological civilization as a subjective index (Pan Yong and Du Weidong, 2018). The public satisfaction of ecological civilization construction is a comprehensive evaluation system which can accurately and objectively reflect the public's perception of the existence and severity of the main pollution sources such as air pollution(Li Hongbao and Xu Guoquan, 2016), water pollution, noise pollution, enterprise pollution, etc. in the area, which not only reflects the public's perception of the ecological environment and the government's ecological civilization construction(Tian Tian et al.,2016), but also reflects the public's perception of the existence and severity of the main pollution sources in the area The sense of obtaining the effect of ecological civilization construction in the region is also convenient to find the existing problems and deficiencies(Sheng Mingke and Zhu Yumei, 2015), which is conducive to identifying and solving potential environmental problems, improving the pertinence and effectiveness of environmental governance, carrying out effective key ecological

environment remediation work, and providing support and reference for promoting ecological civilization construction and improving public perception(Zhang Yunfei, 2015).

**2 Details of investigation and research**

The design of the survey plan and the construction of the evaluation index system follow the principle of scientific, objective and fair. The survey content comprehensively reflects the public's satisfaction and evaluation of the ecological environment of Heilongjiang Province of China.

**2.1 Research purpose**

Public satisfaction of ecological civilization construction is an important reference index to measure the dynamic progress of regional ecological civilization construction. In this study, a sample survey was conducted among 13 residents in Heilongjiang Province of China. According to the survey data, scientific methods were used to calculate the public satisfaction of ecological environment and government ecological civilization construction in Heilongjiang Province of China, which is helpful to understand the public satisfaction of ecological culture in Heilongjiang Province of China It is of great value and significance for Heilongjiang Province to set up a correct outlook on development and political achievements.

**2.2 Research scope and methods**

The research data in this paper comes from the field survey of Heilongjiang Province of China from July 2018 to August 2019. The research object is the permanent population with legal rights and interests in 13 cities in Heilongjiang Province of China.

The research method of this paper is sampling survey. Investigators visited 13 cities in Heilongjiang Province of China, and conducted field surveys by means of field visits, in-house interviews, fixed-point interception, etc. the respondents filled in the questionnaires themselves or the investigators filled in the questionnaires according to the oral answers of the respondents. At the same time, the interviewees who are willing to cooperate with the in-depth investigation will have field exchanges and interviews.

**2.3 Questionnaire and sample structure**

Taking the residents of 13 cities in Heilongjiang Province as samples, a questionnaire about the public satisfaction of ecological civilization construction in Heilongjiang Province was designed. In the selection of public satisfaction index of ecological civilization construction, four basic principles should be followed: one is operability, the other is sustainability, the third is universality, and the fourth is subjectivity. The questionnaire is divided into three parts, as follows:

The first part is the basic information of the research object, mainly including gender, age, living time, education, occupation and other basic information, which provides basic information for the later statistical analysis.

The second part is to design three-level indicators (air quality, water quality, local living environment improvement, and government ecological civilization construction work) for the public satisfaction of ecological civilization construction in Heilongjiang Province of China, a total of 23 topics.

The third part is the case interview, which is closely related to the content of the survey to design the interview questions, so as to further ensure the authenticity, objectivity and scientificity of the survey results.

**2.4 Index system of evaluation model**

Based on the theoretical results of ecological civilization research, combined with the actual situation of Heilongjiang Province of China, the general goal (G) of public satisfaction of ecological civilization construction in Heilongjiang Province of China is established, and four secondary indicators, namely air quality (C1), water quality (C2), local living environment improvement (C3) and government ecological civilization construction (C4), are constructed. Under the four second level indicators, 23 third level indicators (a) were constructed. The hierarchical structure of the three-level indicator system is shown in Table 1.

**2.5 An empirical analysis of public satisfaction evaluation model of ecological civilization construction in heilongjiang province of china**

**2.5.1 Evaluation method**

In the study of public satisfaction of ecological

civilization construction in Heilongjiang Province of China, qualitative and quantitative analysis methods are used, mainly with Delphi method, AHP and liket's five-point scale method. On the basis of repeatedly soliciting expert opinions, the weight of each index is determined. At the same time, it quantifies the subjective, overcomes the subjective deviation to the greatest extent, and strives to get more scientific research results.

**2.5.2 Weight determination and consistency test of each index**

Using Yaahp software, according to the basic operation steps of AHP, use the 1-9 scale method proposed by T.L. Saaty to assign a value (see Table 1), determine the judgment matrix, and compare the indexes of each level one by one, calculate the characteristic vector (W), the maximum characteristic value ($\lambda_{max}$) and the index weight (Wi) of each judgment matrix, and carry out the consistency test. The consistency ratio (CR) (see Table 2) is used to measure whether the judgment matrix is consistent. When CR＜ 0.1, it is determined that the constructed judgment matrix is consistent. The calculation results show that CR

of all indicators is less than 0.1, and the consistency results of each matrix are satisfactory. The test results are shown in table 2-8.

Table 1. **Public Satisfaction Evaluation System of ecological civilization in Heilongjiang Province**

| | | |
|---|---|---|
| The general goal of public satisfaction in the construction of ecological civilization in Heilongjiang Province of China (G) | Air quality($C_1$) | Total air quality $A_{11}$ |
| | | Haze situation $A_{12}$ |
| | | Negative oxygen ion content $A_{13}$ |
| | Water quality($C_2$) | Total water quality $A_{21}$ |
| | | Water quality of rivers and lakes $A_{22}$ |
| | | Drinking water safety $A_{23}$ |
| | Improvement of local living environment($C_3$) | Food safety and quality $A_{31}$ |
| | | Waste disposal $A_{32}$ |
| | | Industrial pollution treatment $A_{33}$ |
| | | Noise treatment $A_{34}$ |
| | | Urban greening (rural greening) $A_{35}$ |
| | | City appearance (village appearance) $A_{36}$ |
| | | Improvement of overall ecological environment $A_{37}$ |
| | Government ecological civilization construction($C_4$) | Natural landscape $A_{41}$ |
| | | Places of historic figures and cultural heritage $A_{42}$ |
| | | Traffic environmental protection $A_{43}$ |
| | | Facilities for people's convenience and environmental protection $A_{44}$ |
| | | The construction concepts of government ecological Civilization $A_{45}$ |
| | | Government's ecological civilization construction Measures $A_{46}$ |
| | | Government ecological civilization construction cycle (long or short) $A_{47}$ |
| | | Effect of government ecological civilization construction $A_{48}$ |

Table 2. **Scale value of judgment matrix**

| Scale | Explain |
|---|---|
| 9 | Extremely important |
| 7 | Strong importance |
| 5 | Obviously important |
| 3 | Slightly important |
| 1 | Equally important |
| 1/3 | Less important |
| 1/5 | Unimportance |
| 1/7 | Very unimportant |
| 1/9 | Extremely unimportant |
| 8, 6, 4, 2, 1/2, 1/4, 1/6, 1/8 | Indicates the middle value of the above scale value |

*Table 3*. **Average consistency index assignment**

| n | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---|---|---|---|---|---|---|---|---|
| RI | 0 | 0 | 0.52 | 0.89 | 1.12 | 1.24 | 1.36 | 1.41 |

Table 4. **Index weight and consistency test of public satisfaction evaluation model of ecological civilization construction in Heilongjiang Province of China**

| **G** | **$C_1$** | **$C_2$** | **$C_3$** | **$C_4$** | **Wi** | **Consistency test results** |
|---|---|---|---|---|---|---|
| $C_1$ | 1 | 1 | 1/4 | 1/4 | 0.1 | |
| $C_2$ | 1 | 1 | 1/4 | 1/4 | 0.1 | CR=0.0000＜0.1 $\lambda_{max}$=4 |
| $C_3$ | 4 | 4 | 1 | 1 | 0.4 | |
| $C_4$ | 4 | 4 | 1 | 1 | 0.4 | |

*Table 5.* **Weight and consistency test of each index of air quality evaluation model**

| **C1** | **A11** | **A12** | **A13** | **Wi** | **Consistency test results** |
|---|---|---|---|---|---|
| A11 | 1 | 2 | 2 | 0.5 | |
| A12 | 1/2 | 1 | 1 | 0.25 | CR=0.000＜0.1 |
| A13 | 1/2 | 1 | 1 | 0.25 | λ max = 3 |

Table 6. **Weight and consistency test of each index of water quality evaluation model**

| $C_2$ | $A_{21}$ | $A_{22}$ | $A_{23}$ | Wi | Consistency test results |
|---|---|---|---|---|---|
| $A_{21}$ | 1 | 2 | 2 | 0.5 | |
| $A_{22}$ | 1/2 | 1 | 1 | 0.25 | CR=0.000＜0.1 $\lambda_{max}$=3 |
| $A_{23}$ | 1/2 | 1 | 1 | 0.25 | |

*Table 7.* **Weight and consistency test of indicators of local living environment improvement assessment model**

| $C_3$ | $A_{31}$ | $A_{32}$ | $A_{33}$ | $A_{34}$ | $A_{35}$ | $A_{36}$ | $A_{37}$ | Wi | Consistency test results |
|---|---|---|---|---|---|---|---|---|---|
| $A_{31}$ | 1 | 2 | 2 | 3 | 4 | 4 | 1 | 0.0557 | |
| $A_{32}$ | 1/2 | 1 | 1 | 2 | 2 | 2 | 1/2 | 0.1078 | |
| $A_{33}$ | 1/2 | 1 | 1 | 2 | 2 | 2 | 1/2 | 0.1078 | |
| $A_{34}$ | 1/3 | 1/2 | 1/2 | 1 | 1 | 1 | 1/3 | 0.1988 | |
| $A_{35}$ | 1/4 | 1/2 | 1/2 | 1 | 1 | 1 | 1/4 | 0.2371 | CR=0.0328＜0.1 $\lambda_{max}$=7.2676 |
| $A_{36}$ | 1/4 | 1/2 | 1/2 | 1 | 1 | 1 | 1/4 | 0.2371 | |
| $A_{37}$ | 1 | 2 | 2 | 3 | 4 | 4 | 1 | 0.0557 | |

*Table 8.* **Weight and consistency test of each index of evaluation model of government ecological civilization construction**

| $C_4$ | $A_{41}$ | $A_{42}$ | $4_{43}$ | $A_{44}$ | $A_{45}$ | $A_{46}$ | $A_{47}$ | $A_{48}$ | Wi | Consistency test results |
|---|---|---|---|---|---|---|---|---|---|---|
| $A_{41}$ | 1 | 1 | 1/3 | 1/3 | 1/4 | 1/5 | 1/3 | 1/5 | 0.2717 | |
| $A_{42}$ | 1 | 1 | 1/3 | 1/3 | 1/4 | 1/5 | 1/3 | 1/5 | 0.2717 | |
| $A_{43}$ | 3 | 3 | 1 | 1 | 1 | 1/2 | 1 | 1/2 | 0.0915 | CR=0.0543＜0.1 $\lambda_{max}$=8.5359 |
| $A_{44}$ | 3 | 3 | 1 | 1 | 1 | 1/2 | 1 | 1/2 | 0.0915 | |
| $A_{45}$ | 4 | 4 | 1 | 1 | 1 | 1/2 | 1 | 1/2 | 0.0858 | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| $A_{46}$ | 5 | 5 | 2 | 2 | 2 | 1 | 2 | 1 | 0.0481 |
| $A_{47}$ | 3 | 3 | 1 | 1 | 1 | 1/2 | 1 | 1/2 | 0.0915 |
| $A_{48}$ | 5 | 5 | 2 | 2 | 2 | 1 | 2 | 1 | 0.0481 |

**2.5.3 Empirical analysis of evaluation model**

In this questionnaire survey on public satisfaction of ecological civilization construction in Heilongjiang Province of China, there are 1300 samples in total and 1257 effective samples, with an effective rate of 96.69%. Using Likert's five-point scale method, the questionnaire is divided into five grades (5, 4, 3, 2, 1) from high to low ("very satisfied", "satisfied", "general", "unsatisfied", "very unsatisfied") according to the satisfaction of the respondents according to the 23 questions set by the three-level indicators. During the calculation, the five grades of the questionnaire are assigned to (100, 80, 60, 30, 0) respectively, and then the scores of each three-level indicator are calculated by multiplying the corresponding option weights. The scores of satisfactions of each three-level indicator are shown in Table 8

**3 Results**

According to the results of field investigation and comprehensive analysis, the following results are obtained for the public satisfaction of ecological civilization construction in Heilongjiang Province of China.

**3.1 The public satisfaction of ecological civilization construction in heilongjiang province is at a general level.**

In view of the above empirical analysis results, the total target index of public satisfaction for the construction of ecological civilization in Heilongjiang Province is 67.13, which is not high and in a general level.

**3.2 The public's sense of access to ecological civilization construction is not strong enough.**

In recent years, great achievements have been made in the construction of ecological civilization in Heilongjiang Province of China, which has been

recognized by the public. However, from the index value, the public's satisfaction with the improvement of local living environment and the construction of ecological civilization by the government is not high, which is between 60-70, indicating that the public has greater expectations for the living environment and the construction of ecological civilization by the government.

**3.3 The release of ecological advantages in heilongjiang province is not sufficient.**

Heilongjiang Province is a big province of ecological civilization construction, with unique geographical environment advantages. However, according to the survey results, the satisfaction of air quality and water quality is 72.33 and 62.97 respectively. The advantageous conditions and advantages of resources and environment have not been fully released.

*Table 8.* **Three level index of public satisfaction of ecological civilization construction in Heilongjiang Province of China (unit: point)**

| Names of three levels of indicators | Index |
|---|---|
| Total air quality $A_{11}$ | 77.38 |
| Haze situation $A_{12}$ | 75.98 |
| Negative oxygen ion content $A_{13}$ | 65.61 |

| | |
|---|---|
| Total water quality $A_{21}$ | 64.67 |
| Water quality of rivers and lakes $A_{22}$ | 52.94 |
| Drinking water safety $A_{23}$ | 69.60 |
| Food safety and quality $A_{31}$ | 73.55 |
| Waste disposal $A_{32}$ | 55.88 |
| Industrial pollution treatment $A_{33}$ | 67.11 |
| Noise treatment $A_{34}$ | 65.51 |
| Urban greening (rural greening) $A_{35}$ | 72.92 |
| City appearance (village appearance) $A_{36}$ | 65.15 |
| Improvement of overall ecological environment $A_{37}$ | 68.90 |
| Natural landscape $A_{41}$ | 69.36 |
| Places of historic figures and cultural heritage $A_{42}$ | 62.37 |
| Traffic environmental protection $A_{43}$ | 58.82 |
| Facilities for people's convenience and environmental protection $A_{44}$ | 54.41 |
| The construction concept of government ecological Civilization $A_{45}$ | 78.32 |
| Government's ecological civilization construction Measures $A_{46}$ | 77.35 |
| Government ecological civilization construction cycle (long or short) $A_{47}$ | 74.69 |
| Effect of government ecological a civilization construction $A_{48}$ | 76.88 |

The calculation formula of each secondary index and primary index is as follows:

$C_1=0.5A_{11}+0.25A_{12}+0.25A_{13}$

$C_2=0.5A_{21}+0.25A_{22}+0.25A_{23}$

$C_3=0.0557A_{31}+0.1078A_{32}+0.1078A_{33}+0.1988A_{34}+0.2371A_{35}+0.2371A_{36}+0.0557A_{37}$

$C_4=0.2717A_{41}+0.2717A_{42}+0.0915A_{43}+0.0915A_{44}+0.0858A_{45}+0.0481A_{46}+0.0915A_{47}+0.0481A_{48}$

$G=0.1C_1+0.1C_2+0.4C_3+0.4C_4$

Put the scores into the formula calculation, the total goal and the scores of each secondary index. As shown in Table 9:

*Table 9.* **General index and secondary index of public satisfaction of ecological civilization construction in Heilongjiang Province of China (unit: point)**

| **General objectives and names of secondary indicators** | **Index** |
|---|---|
| The general goal of public satisfaction in the construction of ecological civilization in Heilongjiang Province of China (G) | 67.13 |
| Air quality(C1) | 72.33 |
| Water quality(C2) | 62.97 |
| Improvement of local living environment(C3) | 66.95 |
| Government ecological civilization construction(C4) | 67.12 |

## 4 Discussion

### 4.1 Strengthen investment and effective governance of ecological civilization construction

The construction of ecological civilization is a long-term and complex system engineering. From the overall situation of satisfaction, according to the survey results, the satisfaction rate of waste treatment, industrial pollution and noise pollution in the three-level indicators is relatively low, the satisfaction index is 55.88, 67.11 and 65.51 respectively, and the satisfaction index of local living environment improvement in the two-level indicators is 66.95, which is the bottleneck restricting satisfaction, mainly due to the imperfect environmental protection facilities, noise treatment and environmental protection There is still a lot of room for improvement in implementation and garbage disposal. Urban residents are particularly dissatisfied with the inadequate collection facilities and garbage classification and treatment. Rural domestic garbage treatment has not formed a complete chain of cleaning, collection, transportation and treatment. Drinking water quality problems caused by industrial pollution, water quality problems of rivers and lakes, and urban noise pollution are also issuing of special concern to residents. Heilongjiang Province, China, should put the construction of ecological civilization at the top of the list, fight the key battle of ecological civilization construction, carry out effective governance, and strive to create a good living environment for the public.

### 4.2 Classification, overall planning and scientific planning for the construction of ecological civilization

Among the secondary indicators, the satisfaction of air quality is the highest, with an index of 72.33, indicating that the overall situation of air quality in Heilongjiang Province of China has been recognized by the public. According to the interview, the reason why the residents of Heilongjiang Province are satisfied with the air is that Heilongjiang Province has carried out targeted measures and measures to solve the problem of air pollution, increased the investigation and supervision of the enterprises involved in air pollution, increased the supervision of coal-fired facilities and coal stacking, strictly controlled the use of bulk coal, especially the use of poor coal, strictly controlled the burning of straw in the field, and seriously polluted coal Chemical enterprises take measures to limit production or stop production, such as staggered peak production. In winter, the haze days show a decreasing trend, the air quality has been significantly improved, and the public satisfaction of air quality is also good. However, according to the survey results, the satisfaction degree to the water quality of rivers and lakes is 52.94, which is the lowest of the three-level index, and the satisfaction degree to the water quality is 62.97, which is the lowest of the two-level index. The main reason for the low satisfaction of water quality is that there are great differences in economic development level and resource endowment among cities in Heilongjiang Province, which directly affects the public satisfaction of ecological civilization construction. According to the field visit, Heihe City, Daxinganling region and Yichun City have unique natural resources and geographical location, high forest coverage and less water pollution. The reason for the low satisfaction of water quality is that some resource-based cities have not solved the water pollution effectively. For example, the residents of Daqing, Jixi and Qitaihe have relatively low satisfaction of water resources. The index of water quality satisfaction is affected. Therefore, Heilongjiang Province of China should plan scientifically, arrange as a whole and carry out the construction of ecological civilization with pertinence and crucial significance according to the actual situation.

### 4.3 Improve the public's right to know about the construction of ecological civilization

According to the survey results, among the three indicators, the satisfaction index of the government's ecological civilization construction concept, the government's ecological civilization construction measures, the government's ecological civilization construction cycle (long or short), and the government's ecological civilization construction effect are 78.32, 77.35, 74.69 and 76.88 respectively. It shows that the residents of Heilongjiang Province are satisfied with the local government's ecological civilization construction, and most of them are positive about the local

government's ecological civilization construction concept and measures. But at the same time, it is also hoped that the local government can increase the investment in the construction of ecological civilization and improve the public's right to know about the construction of ecological civilization. During the investigation and visit, many residents expressed that they were not familiar with and understand the ecological civilization construction work of the local government. Although in the data display, the satisfaction index of the government's ecological civilization construction is 67.12, and the public expressed that they felt the importance of various departments of the government to the ecological civilization construction work, but how to deploy and what specific measures are not fully understood and mastered by the public. Therefore, we should improve the open platform of government affairs for the construction of ecological civilization, so that the public can understand the relevant policies, laws and regulations and government affairs information of the construction of ecological civilization at the first time, continuously improve the information openness of the construction of ecological civilization of the government, and maximize the convenience and benefit of the construction information of ecological civilization of the government.

### 4.4 Release the advantages and characteristics of regional ecological resources in heilongjiang province

Heilongjiang Province is a large ecological province, an important ecological barrier in northern China, with strategic advantages of promoting sustainable development. The total area of forest land in Heilongjiang Province is over 23.24 million hectares, and the forest coverage rate is 47.7%. There are many lakes such as Jingbo Lake and Wudalianchi Lake, with a natural wetland area of 5.56 million hectares and 48 national nature reserves. There are abundant biological species, excellent natural climate and significant ecological resources advantages. At the same time, Heilongjiang is an important commodity grain base of the country. Since the founding of the People's Republic of China, Heilongjiang has provided one seventh of the country's commodity grain, which is known as the "great granary of China". Heilongjiang Province should make full use of the advantages of its own ecological resources, actively explore the effective path to promote development relying on ecological resources to ensure national food security and release development potential, scientifically develop and utilize under the premise of strict protection, concentrate on the development of special industries such as green agriculture, eco-tourism, health care for the aged, and cultivate growth space and competitive advantages Potential economic growth point. Promote better and faster economic and social development, improve the living environment and quality of life of Heilongjiang people, live a happier and better life, and make people feel more satisfied and satisfied.

## 5 CONCLUSIONS

Through the investigation and Research on the public satisfaction of ecological civilization construction in Heilongjiang Province (Zheng Chundong et al., 2014), we can know that Heilongjiang Province has attached great importance to the construction of ecological civilization for a long time, but there is still something to be improved (Niki Frantzeskaki, 2019). The construction of ecological civilization is a systematic project. The construction of ecological civilization in Heilongjiang Province should start from a strategic and overall level(Rita Lopes and Nuno Videira, 2018),The construction of ecological civilization will be included in the overall plan of economic and social development, the relationship between ecological environment protection and economic development will be correctly grasped, and the path of promoting ecological priority and green development will be explored in coordination, so that the construction of ecological civilization in Heilongjiang Province will achieve greater achievements and the satisfaction of people's construction of ecological civilization will be greatly improved(Raffaele Lafortezza et al., 2018).

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**Data availability**

No data, models, or code were generated or used during the study.

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