Construction of Environmental Governance Evaluation Index System in Liaoning Province under the Background of Double-carbon

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Abstract: In order to achieve carbon neutral goal, solve the increasingly complex environmental problems, strengthen the construction of ecological civilization, this article uses entropy method, select 2015-2019 Liaoning province environmental governance related data, from environmental governance process, environmental governance results, environmental governance conditions to establish Liaoning province environmental governance evaluation index system, through the comprehensive score and dynamic change trend analyze the problems existing in environmental governance work in Liaoning province. The study found that the main problems in the environmental governance model in Liaoning Province include low social participation in environmental governance, carbon emission reduction and other indicators that need to be improved, and a low digital level of environmental governance. Based on the above problems, this paper puts forward corresponding countermeasures for environmental governance in Liaoning Province to promote the environmental governance capacity of Liaoning Province.

1 INTRODUCTION

On September 22,2020, General Secretary Xi Jinping, for the first time at the General debate of the 75th UN General Assembly, Xi Jinping first proposed to accelerate the formation of a green development mode and way of life and build an ecological civilization and a beautiful earth. China will increase the country's independent contribution, take more powerful policies and measures, strive to peak its carbon dioxide emissions by 2030, and strive to achieve carbon neutrality by 2060.To solve increasingly complex environmental problems and achieve carbon neutral goals, we must establish a more sound and efficient environmental governance model. Under the background of double carbon, the establishment of Liaoning province new thinking, by the construction of environmental governance evaluation index system, from the environmental governance process and environmental governance ability, and analyze the problems existing in Liaoning province, provide countermeasures to improve the environmental governance ability of Liaoning province. The research on environmental governance is mainly in the aspect of environmental governance subjects, the measurement of environmental governance efficiency and the evaluation of urban environmental governance ability, and the research on environmental governance under carbon emissions and other related backgrounds, which mainly focuses on the relationship between environmental governance policies and environmental governance performance.

Overall analysis, many scholars for environmental governance ability evaluation has not formed a complete system, and in the background of double carbon for specific areas of environmental governance problems discussed less, this paper believes that the environmental particularity of different regions should be considered, through the indicators of the environmental governance ability, and analyze the existing problems, formulate the environmental governance mode in line with the regional development.

2 CONSTRUCTION OF ENVIRONMENTAL GOVERNANCE EVALUATION INDEX SYSTEM UNDER THE BACKGROUND OF DOUBLE-CARBONMANUSCRIPT PREPARATION

The basic definition of environmental governance is that a variety of public or private individuals and institutions govern eco-environmental public affairs. This paper builds a process-oriented environmental governance evaluation index system from three aspects: environmental governance process, environmental governance results and environmental governance conditions.

2.1 Index Selection

According to the above contents, three levels of environmental governance process, environmental gover

nance results and environmental governance conditions Standard, seven secondary indicators, environmental governance behavior, environmental governance intensity, annual carbon index improvement degree, annual pollution control improvement proportion, annual ecological and environmental improvement degree, talent and technical conditions and social participation, and 22 three-level indicators drawn therefrom (see Table 1).

2.2 Evaluation Method and Data Sources

2.2.1 Determine the Entropy Weight

Due to the discrete and unit inconsistency of various indicators, the paper first unified the scale by extremal standardization method. Entropy method can avoid the inaccuracy of subjective assignment and data overlap problem, objectively assign various indicators, and determine the weight of each index through the uncertainty of the information provided by each index, and then obtain the information entropy of each index. For a single indicator, the greater the entropy of the information entropy, the greater the degree of disorder, the greater the effect on the comprehensive evaluation. Therefore, this paper uses information entropy to calculate the weight of each index, to provide a basis for the

comprehensive evaluation of environmental governance index system in Liaoning Province.

2.2.2 Data Sources

Select the relevant data from 2015 to 2019 to establish an evaluation index system. The relevant data comes from 2015-2019, Liaoning Statistical Yearbook, Liaoning Science and Technology Statistical Yearbook and Liaoning Department of Ecology and Environment in 2019. Some of the real indicators are supplemented according to the difference method.

Table 1: Environmental governance evaluation index system.

Primary index	Secondary index	Tertiary indicators	Unit
Environmental governance process	Environmental governance behavior	Cultivated land occupation tax	Hundred million yuan
		Resource tax	Hundred million yuan
		Investment in urban environmental infrastructure	Hundred million yuan
		Forestry investment	Hundred million yuan
	Environmental governance intensity	Investment in environmental pollution control /GDP	%
		Environmental protection expenditure /GDP	%
Environmental governance achievements	Improvement degree of annual carbon index	Annual carbon emission reduction ratio	%
		Reduction ratio of energy consumption per unit GDP	%
		Proportion of annual carbon productivity increase	%
	Increase proportion of annual pollution control	Increase proportion of annual domestic waste removal and transportation volume	%
		Increase proportion of annual domestic wastewater treatment capacity	%
		Increase proportion of annual industrial wastewater treatment capacity	%
		Increase proportion of comprehensive treatment capacity	%

		of industrial solid waste in	
	Annual improvement degree of ecological environment	Reduction ratio of annual air pollution days	%
		Optimization of surface water quality	%
		Increase proportion of annual greening coverage	%
Environmental governance conditions	Talent technical conditions	Number of R & D personnel (ecological protection and environmental treatment)	Person
		Investment of scientific research funds (environmental protection, ecological construction, pollution control and other activities)	Thousand yuan
		Construction of digital environmental governance platform	Score
	Degree of social participation	Number of citizen opinions solicited on government websites	Piece
		Influence of government media platform	Score
		Number of environmental governance documents issued	Piece

3 ANALYSIS OF ENVIRONMENTAL GOVERNANCE EVALUATION RESULTS IN-LIAONING PROVINCEEUNDER THEBACKGROUND OF DOUBLE-CARBON

The comprehensive score and ranking of the environmental governance indicators in Liaoning Province from 2015-2019 were calculated according to the entropy method (see Table 2).

Overall analysis of environmental governance evaluation results According to the first-level index score in the environmental governance evaluation of Liaoning Province from 2015 to 2019, it can be seen that the level of environmental governance work in

Liaoning Province is showing a rising trend in the recent five years, and the environmental governance achievements are remarkable, and its upward trend is obvious. Although the environmental governance process has fluctuated in the past five years, it is still on the rise. Environmental governance conditions have basically changed horizontally.

Through the analysis of the scores of various indicators, it is found that Liaoning Province should not only pay attention to the indicators of the environmental governance achievements, but also strengthen the attention to the environmental governance process and strengthen the control of theenvironmental governance process. In addition, Liaoning province should also pay attention to the improvement of environmental governance conditions (see Figure 1).
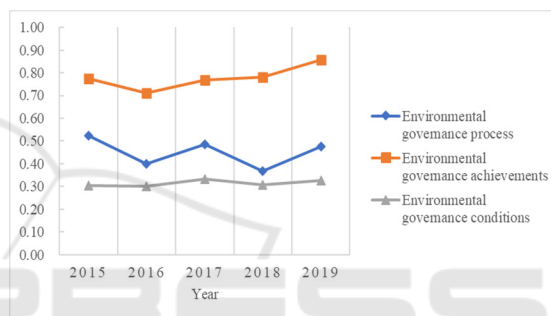

Figure 1: Comprehensive score chart of each level index.

According to the second-level index score in the environmental governance evaluation of Liaoning Province from 2015 to 2019, it can be seen that the environmental governance behavior and environmental governance intensity change synchronously with the degree of annual ecological environment improvement, which shows that the environmental governance behavior and environmental governance intensity have a strong correlation with the annual ecological environment improvement.

Table 2: Environmental governance evaluation index system.

Primary index	Secondary index	Tertiary indicators	System composite score	Rank
Environmental governance process	Environmental governance behavior	Cultivated land occupation tax	0.6220	2
		Resource tax	0.5723	4
		Investment in urban environmental infrastructure	0.3231	11
		Forestry investment	0.1242	22

	Environmental governance intensity	Investment in environmental pollution control / GDP	0.3578	9
		Environmental protection expenditure /GDP	0.2508	16
	Improvement degree of annual carbon index	Annual carbon emission reduction ratio	0.3884	8
		Reduction ratio of energy consumption per unit GDP	0.3148	12
		Proportion of annual carbon productivity increase	0.3544	10
Environmental governance achievements	Increase proportion of annual pollution control	Increase proportion of annual domestic waste removal and transportation volume	0.6560	1
		Increase proportion of annual domestic wastewater treatment capacity	0.5961	3
		Increase proportion of annual industrial wastewater treatment capacity	0.2442	17
		Increase proportion of comprehensive treatment capacity of industrial solid waste in	0.1693	19
	Annual improvement degree of ecological environment	Reduction ratio of annual air pollution days	0.4949	6
		Optimization of surface water quality	0.1453	20
		Increase proportion of annual greening coverage	0.5271	5

The average score of annual pollution control proportion is the highest, but the degree of fluctuation

is large. Therefore, there is a very low value in 2017. Therefore, effective measures are still formulated to strengthen the annual pollutant controlin the future environmental governance, so as to ensure the steady increase of the increasing proportion of annual pollutant control. The degree of improvement of annual carbon indicators and social participation are steadily increasing, but both scores are low.

Table 3: Environmental governance evaluation index system (connect up).

Primary index	Secondary index	Tertiary indicators	System composite score	Rank
Environmental governance conditions	Talent technical conditions	Number of R&D personnel (ecological protection and environmental treatment)	0.4112	7
		Investment of scientific research funds (environmental protection, ecological construction, pollution control and other activities)	0.1386	21
		Construction of digital environmental governance platform	0.2678	15
	Degree of social participation	Number of citizen opinions solicited on government websites	0.2016	18
		Influence of government media platform	0.2843	13
		Number of environmental governance documents issued	0.2691	14

Therefore, Liaoning Province still needs to take further measures to strengthen the control of carbon indicators, in order to achieve carbon neutrality; environmental governance work still needs to strengthen social participation, and build an environmental governance model involving the government, enterprises and citizens. The technical condition score of talent is also low and shows a downward trend. This paper believes that this trend is compared with talents in Liaoning Province. The serious flow and the low level of scientific and

technological development are related. The further improvement of the environmental governance level in Liaoning Province needs to be based on high-quality talents and supported by advanced scientific and technological conditions (see Figure 2).
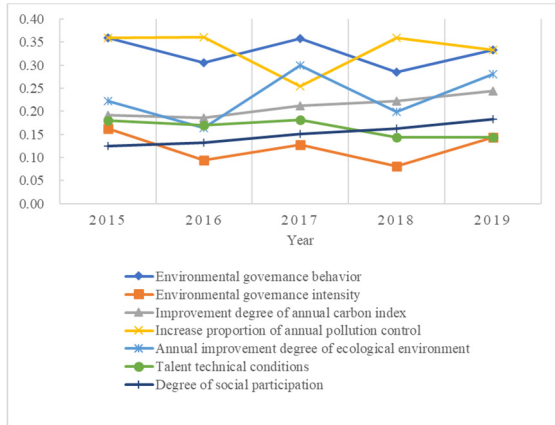

Figure 2: Comprehensive score chart of each level index.

4 CONCLUSIONS AND SUGGESTIONS

Based on the index analysis of Liaoning Province environmental governance evaluation system, this paper puts forward the following conclusions and suggestions for the future environmental governance work in Liaoning Province:

4.1 Strengthen the Disclosure of Government Information, Environmental Protection Departments Solicit Citizens 'Opinions on Environmental Governance and Ecological Protection Issues to Improve Citizens' Participation

The environmental protection department should improve the policies and laws on environmental protection and environmental assessment, improve the reward system for environmental problems, establish and improve a sound environmental protection system, enhance the influence of government media platforms related to environmental governance, use media platforms to strengthen the publicity and education in environmental protection, guide citizens to enhance environmental awareness and mobilize the enthusiasm of environmental participation.

4.2 Combine Environmental Governance with Internet Technology

Increase investment in the introduction of scientific and technological talents and scientific research funds, develop environmental governance-related technologies, and integrate Internet technology with environmental governance technology, to improve the innovation and convenience of environmental governance. At the same time, the combination of environmental governance and Internet technology can better establish a model of coordinated governance between the government, citizens and enterprises, and promote social subjects to more effectively participate in environmental governance activities.

4.3 Establish a Platform for Carbon Emission Monitoring and Control

In order to balance carbon emission reduction and economic benefits. Through digital twin technology data modeling, environmental governance related environmental data and economic activities for real-time monitoring, through big data technology for carbon emissions and carbon peak, carbon neutralization process prediction, finally through digital twin technology for carbon reduction path and policy planning scenario simulation simulation, found problems and optimization, combined with artificial intelligence technology to adjust the implementation of planning.

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