Big Data Evaluation on Blue Carbon Economic Development Level in Daguang Bay, Jiangmen City

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Abstract: In order to promote the development of blue carbon economy in Daguang Bay of Jiangmen City, realize the blue rise and promote the high-quality development of Marine economy, this paper constructs the evaluation index system of blue carbon economy development in Daguang Bay based on the relevant Marine data of Jiangmen City from 2010 to 2019. The entropy method is adopted to calculate the weight of the index and analyze the development situation of blue carbon economy in Daguang Bay of Jiangmen City from the perspective of time. The results show that the development level of blue carbon economy in Daguang Bay of Jiangmen City, including Xinhui District and Enping City, is on the rise, while that in Taishan City is on the decline. However, the development level of blue carbon economy in Xinhui District and Taishan City is better than that in Enping City. It is found that in order to achieve high-quality development of Marine economy in Jiangmen, there are still problems such as poor quality of Marine environment, insufficient driving force of Marine innovation and unbalanced regional development. Therefore, it is proposed to strengthen Marine environmental protection, promote Marine science and technology innovation, and focus on increasing the development of blue carbon economy in Taishan City and Enping City.

Keywords: Daguang Bay, Blue Carbon Economy, Entropy Method.

1 INTRODUCTION

The rich resources contained in the ocean are an important support for social and economic development. The United Nations once pointed out in 2001 that "the 21st century is the century of the ocean", and countries all over the world have listed the development of the Marine economy, the protection of the Marine environment and the protection of their own maritime rights and interests as important development strategies [1]. As a maritime power, the report of the 19th National Congress of the Communist Party of China clearly requires that we adhere to land and sea coordination and accelerate the construction of a maritime power, which once again sounded the clarion call for building a maritime power. At the same time, as a major carbon dioxide emitter, China will actively participate in global environmental governance and fulfill its emission reduction commitments. "Strive to reach the peak of carbon dioxide emissions by 2030, and strive to achieve carbon neutrality by 2060" is a major strategic decision made by the Party Central Committee and an important task for governments at all levels to implement new development concepts and promote high-quality development.

BDEDM 2023, January 06-08, Changsha, People's Republic of China

DOI 10.4108/eai.6-1-2023.2330371

As early as 2015, the Central Committee of the Communist Party of China and the State Council issued the "Overall Plan for the Reform of the Ecological Civilization System" and pointed out that "it is necessary to establish an effective mechanism for ocean carbon sink and accelerate the expansion of the blue economic space." Blue carbon sink (abbreviated as "blue carbon"), that is, ocean carbon sink, is the process, activity and mechanism of using marine organisms to absorb carbon dioxide in the atmosphere and fix it in the ocean [6]. As a new idea of low-carbon economic development, blue carbon sink has been studied by many scholars. Hu Jianbo and Zhang Qiang [3] defined the connotation of blue carbon sink, and put forward corresponding countermeasures and suggestions for promoting the development of Blue carbon sink in China to better promote the realization of emission reduction targets based on its development status and problems. Wang Chengrong [9] used the 21st Century Maritime Silk Road as the background to analyze the importance of the development of blue carbon in Guangdong Province to control greenhouse gas emissions, marine ecological environmental degradation, and the implementation of the blue carbon "Belt and Road", and explore its development path. MacreadiePI et al [4]. summarized 10 important issues about blue carbon to improve blue carbon science and its related applications in mitigating climate change. Moritsch Monica M et al. [5] explored the maximum benefits of blue carbon sequestration under four management scenarios: management retreat, management retreat plus dam removal, erosion in high-risk areas, and erosion in moderate-to-high-risk areas, and compared their economic values.

As a major marine city in Guangdong Province, Jiangmen City closely follows the national and provincial strategic deployment, vigorously promotes the construction of a "strong marine economy", fully promotes the comprehensive development of the marine economy, and plans a "blue rise". For Jiangmen to realize the blue rise and promote the high-quality development of the marine economy, the scientific development of Daguang Bay is the only way [8]. The development of blue carbon economy can effectively promote the marine ecological balance of Daguang Bay and help to promote the establishment of carbon financial market, and it is also of great significance to promote the development of new marine business in Daguang Bay. Therefore, the development of marine carbon sinks is the material basis for Daguang Bay to implement the concept of green development, build a marine ecological civilization, and achieve high-quality development of the marine economy.

2 CONSTRUCTION AND RESEARCH METHODS OF BIG DATA EVALUATION INDEX SYSTEM FOR BLUE CARBON ECONOMIC DEVELOPMENT IN DAGUANG BAY, JIANGMEN CITY

2.1 Construction of Big Data Evaluation Index System for Blue Carbon Economic Development in Daguang Bay, Jiangmen City

In 2013, the Guangdong Provincial Government approved the scope of the Daguang Bay Comprehensive Development Economic Zone [2]. Based on the availability of data, this article takes Xinhui District, Taishan City and Enping City as the research objects to explore the blueprint of the three.

In order to objectively and scientifically evaluate the development level of the blue carbon economy in Daguang Bay of Jiangmen City, it is necessary to establish a set of evaluation index system, and to integrate previous researches and establish an index system on the basis of literature analysis, as shown in Table 1. The original indicator data comes from the "Jiangmen Statistical Yearbook" (2010-2019).

Table 1: Construction of Big Data evaluation index system for blue carbon economic development in Daguang Bay, Jiangmen City

Target layer	Criterion layer	Element layer	Dimension	Indicator attributes
The development level of the blue carbon economy of Daguang Bay	Carbon sink indicators（A1）	Main energy consumption（B1）	Tons of standard media	Inverse
		Forest cover rate（B2）	%	Positive
		Green area rate of built-up area（B3）	%	Positive
		Green coverage area（B4）	Hectares	Positive
		Forest stock（B5）	Ten thousand cubic meters	Positive
	Marine economic development indicators（A2）	GDP per capita（B6）	yuan	Positive
		Added value of tertiary industry（B7）	Ten thousand yuan	Positive
		Freshwater aquaculture area（B8）	mu	Positive
		Aquatic product output（B9）	Ton	Positive

2.2 Research Methods

Entropy is a measure of uncertainty. Entropy method is a mathematical method used to judge the degree of dispersion of a certain index. The greater the degree of dispersion, the greater the impact of this indicator on the evaluation. The calculation process of the entropy method evaluation model is as follows:

- Construct the original index data matrix. Suppose the original index evaluation matrix for the high-quality development of marine economy in Guangdong Province is:

$$X_{ij} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1j} \\ x_{21} & x_{22} & \cdots & x_{2j} \\ \vdots & \vdots & \vdots & \vdots \\ x_{i1} & x_{i2} & \cdots & x_{ij} \end{bmatrix} \quad (1)$$

Formula (1): represents the original evaluation index matrix, and represents the index data of the th index in the th year.

- Dimensionless processing of data. Since most of the measurement units and orders of magnitude of X_{ij} are different, it is necessary to standardize each indicator to eliminate the impact of different dimensions on the results.

$$X'_{ij} = \frac{x_{ij} - min\{x_j\}}{max\{x_j\} - min\{x_j\}} \tag{2}$$

$$X'_{ij} = \frac{max\{x_j\} - x_{ij}}{max\{x_j\} - min\{x_j\}} \tag{3}$$

Among them, the positive index adopts formula (2), and the negative index adopts formula (3). X'_{ij} is a standardized value, and $\min\{x_j\}$ and $\max\{x_j\}$ are the minimum and maximum values of a certain index respectively. Formula (4) is the standardized evaluation matrix:

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} \\ a_{21} & a_{22} & \cdots & a_{2j} \\ \vdots & \vdots & \vdots & \vdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} \end{bmatrix} \tag{4}$$

A is the standardized evaluation matrix, and a_{ij} is the standardized index value.

- Calculate the contribution degree Y_{ij} of the evaluation index. After the data is dimensionlessly processed, the contribution of the j-th indicator in the i-th year is calculated. The formula is shown in (5):

$$Y_{ij} = \frac{x'_{ij}}{\sum_{i=1}^{m} x'_{ij}} \tag{5}$$

- Calculate the index information entropy e_j. Used to reflect the amount of information of the j-th index. $k = 1/\ln(m)$, m is the evaluation year. In the evaluation system for the high-quality development of marine economy in Guangdong Province constructed in this paper, m is 9. The calculation formula is shown in (6):

$$e_j = -k \sum_{i=1}^{m} \left(Y_{ij} \times lnY_{ij}\right) \tag{6}$$

- Calculate the information utility value. Its value directly affects the size of the weight. The greater the information utility value, the greater the importance of the evaluation and the greater the weight. As shown in formula (7):

$$d_j = 1 - e_j \tag{7}$$

- Determine the weight of the evaluation index. The greater the weight, the greater the contribution to the evaluation result. As shown in formula (8):

$$W_j = \frac{d_j}{\sum_{j=1}^{n} d_j} \tag{8}$$

- Calculate the comprehensive evaluation value of the sample. Use the product of the j-th index weight W_j and the standardized matrix A as the evaluation value F_{ij}, that is, $F_{ij}=W_j*A$.

3 BIG DATA EVALUATION OF BLUE CARBON ECONOMIC DEVELOPMENT IN DAGUANG BAY, JIANGMEN CITY

3.1 Analysis on the Weights of Blue Carbon Economic Development Indexes in Daguang Bay, Jiangmen City

According to the results in Table 2, on the whole, carbon sink sink has a greater impact on blue carbon economic development (A1) than Marine economic development (A2) in Daguang Bay, Jiangmen City. Specifically, in 2010, the gre-en coverage area (B4) and forest stock volume (B5) have a higher weight (0.174 and 0.152, respectively), indicating that the green coverage area has a significant impact on carbon during the development of carbon sink in Daguang Bay, Jiangmen City. The achievement of the emission reduction target has the greatest impact, followed by the forest stock volume, and the forest coverage rate (B2) has the lowest weight of 0.076. For indicators related to marine economic development, the added value of the tertiary industry (B7) has the highest weight and has the most profound impact, followed by per capita GDP (B6), and freshwater aquaculture area (B8) has the lowest weight. In 2019, the biggest impact on the development of Daguang Bay's carbon sinks is still the green coverage area (B4), with a weight of 0.201, and the biggest impact on the development of Daguang Bay's marine economy is still the added value of the tertiary industry (B7).

On the whole, the development of the blue carbon economy of Daguang Bay in Jiangmen City has the same presentation at different development stages. The green coverage area and the added value of the tertiary industry are the main fac-tors affecting the development of the blue carbon economy in Daguang Bay, Jiangmen. Highlight the important status of both. In the future, while developing the marine economy, we can increase the area of green coverage, optimize the structure of the tertiary industry, expand the added value, and promote the high-quality development of the marine economy of Daguang Bay.

Table 2:2010-2019 Daguang Bay Blue Carbon Economic Development Index Weight in Jiangmen City

	year / index	2010	2011	2012	2013	2014
A1	B1	0.078	0.076	0.075	0.072	0.074
	B2	0.076	0.075	0.076	0.071	0.073
	B3	0.082	0.077	0.089	0.103	0.090
	B4	0.174	0.172	0.173	0.163	0.167

	B5	0.152	0.163	0.158	0.173	0.194
A2	B6	0.125	0.116	0.120	0.123	0.125
	B7	0.140	0.150	0.140	0.128	0.115
	B8	0.076	0.075	0.075	0.071	0.073
	B9	0.096	0.095	0.093	0.097	0.090
	year / index	2015	2016	2017	2018	2019
A1	B1	0.073	0.077	0.081	0.084	0.092
	B2	0.072	0.075	0.081	0.087	0.087
	B3	0.089	0.081	0.131	0.101	0.097
	B4	0.185	0.193	0.202	0.203	0.201
	B5	0.184	0.170	0.086	0.085	0.085
A2	B6	0.128	0.129	0.133	0.139	0.133
	B7	0.108	0.106	0.107	0.117	0.117
	B8	0.072	0.075	0.079	0.082	0.083
	B9	0.089	0.093	0.099	0.103	0.104

3.2 An Analysis of the Time Series Evolution of the Blue Carbon Economic Development in Daguang Bay, Jiangmen City

According to the blue carbon economic evaluation system of Daguang Bay in Jiangmen City constructed in this paper, the comprehensive score is calculated from the perspective of time series. The results are shown in Table 3. At the same time, in order to more intuitively show the development and changes of the blue carbon economy in the Daguang Bay of Jiangmen City The trend is described by a line chart, as shown in Figure 1.

Table 3:2010-2019 Comprehensive scores of blue carbon economic development indicators in Daguang Bay, Jiangmen City

City/District	2010	2011	2012	2013	2014
Xinhui District	0.691	0.682	0.685	0.669	0.657
Taishan City	0.500	0.513	0.486	0.482	0.516
Enping City	0.169	0.154	0.144	0.141	0.138
City/District	2015	2016	2017	2018	2019
Xinhui District	0.658	0.659	0.735	0.730	0.718
Taishan City	0.461	0.464	0.378	0.379	0.379
Enping City	0.172	0.197	0.235	0.274	0.288

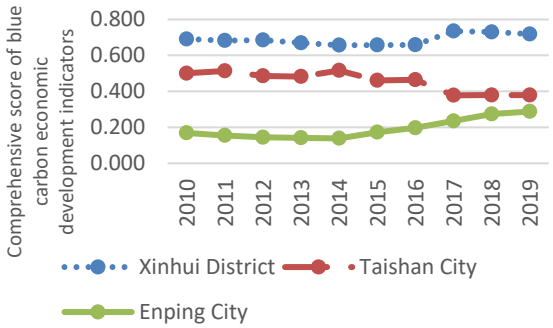

Figure 1: The development and changes of the blue carbon economy in Daguang Bay, Jiangmen City

On the whole, the blue carbon economic development level of Xinhui District and Enping City, including Daguang Bay, Jiangmen City, from 2010 to 2019, showed an upward trend, while Taishan City as a whole was at a declining level, but Xinhui District and Taishan City The level of development of the blue carbon economy is generally better than that of Enping City. Before 2014, the development level of the blue carbon economy in Enping City was declining, and increased attention to it in 2014, after which the development level began to rise slowly. 2015 is a critical year for Xinhui District's industrial transformation and reform. The provinces and cities proposed an important deployment for building an advanced equipment manufacturing industry belt on the west bank of the Pearl River. The development of the Daguang Bay Economic Zone has been upgraded to a provincial strategy, and its development level has gradually risen in the past two years. The level of development has declined, and the development between regions is in a state of imbalance.

Therefore, intensifying the development of blue carbon economy in Taishan City and Enping City and achieving the balance of regional blue carbon economic development is of great significance for promoting the high-quality development of the marine economy of Daguang Bay.

4 CONCLUSIONS AND INSPIRATION

This paper analyzes the development situation from 2010 to 2019 by establishing a big data evaluation index system for the blue carbon economy of Jiangmen Daguang Bay, combined with the entropy method. The research conclusions are as follows:

- The impact of carbon sink on the development of the blue carbon economy of Daguang Bay in Jiangmen City is greater than that of the marine economy. The green coverage area and the added value of the tertiary industry are the main factors affecting the development of the blue carbon economy in Daguang Bay, Jiangmen City.

- From 2010 to 2019, the blue carbon economic development level of Daguang Bay of Jiangmen City, including Xinhui District and Enping City, showed an upward trend, while Taishan City was at a declining level, but the level of blue carbon economic development of

Xinhui District and Taishan City Overall, it is better than Enping City, and there is a phenomenon of uneven development between regions.

Through the above conclusions, in order to vigorously develop the blue carbon economy and realize the high-quality development of the marine economy of Daguang Bay. Get the following inspiration:

- Strengthen marine environmental protection. Strict environmental access mechanisms, keep the red line of ecological protection, strengthen the bottom line of environmental quality, and increase marine carbon sinks based on the scientific use of marine resources to effectively help achieve the goal of carbon neutrality.

- We will promote innovation in Marine science and technology. Innovation drives industrial development, and Marine scientific and technological innovation is an important strategic support for the high-quality development of China's Marine economy [7]. Combined with the current situation and potential of blue carbon development in Daguang Bay, support for blue carbon technology and industrial development research in the field of Marine related scientific research should be increased. At the same time, it will create a talent cultivation place for Daguang Bay, strengthen communication and cooperation with Wuyi University, Guangdong, Hong Kong and Macao higher education institutions, and plan to build higher education institutions and comprehensive colleges in Guanghai Bay to provide talent support for the economic development of the Daguang Bay Industrial Belt.

- Strengthen the blue carbon economic development of Taishan city and Enping City, narrow the gap with the new hui District, realize regional coordinated development, and jointly promote the high-quality development of daguang Bay Marine economy.

Acknowledgements

This research was supported by the Guangdong Philosophy and Social Science Planning Project (Research on the trading mechanism of coastline resources in Guangdong - Hong Kong - Macao Greater Bay Area from the perspective of marine ecological civilization construction, Project No. GD20XGL14)

This research was supported by the Humanities and Social Sciences Research Planning Fund of the Ministry of Education (Research on dynamic pricing and trading mechanism of coastline resources in Guangdong-Hong Kong-Macao Greater Bay Area under the background of marine ecological civilization construction, Project No. 21YJA630097)

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