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Carbon Neutral Evaluation in the Operation of the Intelligent Exhibition Platform

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Abstract. The intelligent exhibition platform is an important trend of the green economy, and the carbon emissions in economic development can be reduced through the construction of the platform, such as vehicles, energy, transportation, etc., so the intelligent exhibition platform has the advantage of carbon neutrality. At present, the carbon neutrality evaluation of the operation of the intelligent exhibition platform should focus on the theoretical aspect, and there is a lack of research on the economic effect, carbon neutrality advantages, and environmental protection responsibilities of the exhibition platform, and there are few relevant practical cases. The results show that the reduction rate of carbon emissions has reached 20~30%, the improvement rate of economic effect is 5~8%, and the performance rate of environmental responsibility has reached more than 80%, and the intelligent exhibition platform can collect carbon neutrality data to provide feasible solutions for local economic development and strategy formulation. Therefore, the operation of the intelligent exhibition platform is conducive to the development of the green exhibition platform, and the evaluation results of carbon neutrality are more effective.

Key words. Intelligent Exhibition, Platform Operation, Carbon Neutral, Evaluation.

1. Introduction

Nowadays, countries are gradually taking the application of intelligent exhibition platforms as the focus of sustainable development of a green economy, and some scholars will use the application method, Java technology and Phyone as the core technology of the platform to improve the efficiency of the platform operation [1]. Carbon neutrality is a new type of economic accounting method proposed in international trade, which calculates the value and volume of trade through the carbon neutrality rate, so as to improve the greenness and environmental protection of the international economy. The intelligent exhibition platform can save transportation, labor and other costs, and reduce carbon emissions [2]. At present, foreign scholars have analyzed the evaluation indicators of ecological transformation and carbon neutrality of the Intelligent Society, and found that their utilization rate is related to quantitative carbon, so they will use this as an indicator for in-depth research [3]. Although some scholars have proposed the application of an evaluation framework for carbon neutrality and a preliminary implementation strategy, the operation process of the intelligent exhibition platform is complex, and the operation situation is difficult to evaluate effectively [4]. Therefore, some scholars believe that the carbon emissions should be quantified and jointly analyzed with the intelligent exhibition platform to find the relationship between the two. Therefore, this study proposes a regression analysis method to promote the development of intelligent exhibition platforms, accurately calculate carbon neutrality results, enhance the development potential of intelligent exhibition platforms, and promote the development of the local green economy. First of all, this paper collects the construction data of the intelligent exhibition platform, tracks its development process, and continuously adjusts each indicator to adapt to various complex changes [5],[6]. Secondly, consider the mutual situation between the intelligent exhibition platform and the downward industry and the economic environment, as well as the constraints of policies and public perception. Finally, in the context of the intelligent exhibition economy, especially driven by the current profits, the development of the intelligent exhibition platform, carbon neutrality, as well as the cost and environmental protection responsibility, etc., find out the factors that affect the development of the intelligent exhibition platform, as well as the accurate judgment of carbon neutrality, and provide a basis for the formulation of relevant strategies. In addition, the intelligent exhibition platform is similar to other fields, which can provide reference for solving ecological problems in the fields of computers, mathematics, and accounting. Therefore, to promote the development of intelligent exhibition platforms, it is currently possible to choose the direction of sustainable development [7].

2. Construction of Carbon Neutrality Index System in the Operation of Intelligent Exhibition Platform

A. Methods for Collecting Carbon Neutrality Data

In this study, the rational design of the exhibition hall, the cleanliness of the exhibition hall and the maximization of space should be regarded as the goals of a smart exhibition, so as to promote the sustainable development of the

exhibition platform [8],[9].The core of the discussion on the evaluation index system of carbon neutrality in the operation of intelligent exhibition platforms is to seek a standardized method to measure the "carbon neutrality, environmental responsibility fulfillment, and green economy" of exhibition facilities, resource development, use, operation and management. This study aims to remedy the principles and methods of indicator generation, such as lack of linkage, subjectivity and randomness, and the specific steps are shown in Figure 1.

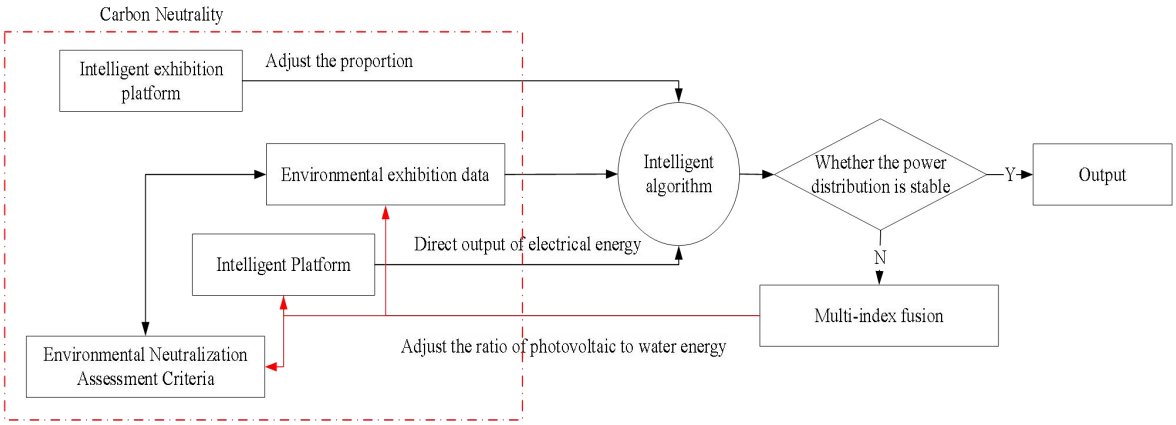

Fig. 1. Data Flow of Exhibition Platform in Renewable Energy

The index system of carbon neutrality evaluation of smart exhibitions belongs to a new category, so in the process of formulating and implementing the index system, it is necessary to clarify the significance of smart exhibitions and the goals of carbon neutrality evaluation. Based on Figure 1, the hypothesis of carbon neutrality data processing is proposed [10]. Hypothesis 1: The carbon neutrality calculation process is converted into a probability density estimation problem, and the carbon neutrality result is obtained by calculating the CO_2 density. The $set(x)=\{x_1,\cdots,x_n\}\in n$ data collection that is carbon neutral is set $set(y)=\{y_1,\cdots,y_n\}\in n$ to the data collection after the use of the smart exhibition platform. Then, carbon neutrality data x is the core of the intelligent exhibition platform and y the carbon neutrality point. There are indicators such as green economic growth rate and environmental responsibility, and $set(a,b,c)=\{abc_1,\cdots,abc_n\}\in n$ the calculation of carbon neutrality data is shown in equation (1).

$$P\left(x\cdot y_{n\times n}\right)=\sum_{n=1}^{N}(abc)_n\cdot p\left(x_n,y_n\middle|\lambda\right) \tag{1}$$

In equation (1), λ is the error constraint between the dataset, x_i is the target point set, y_i is the operation process of the intelligent exhibition platform Σ . All carbon neutrality data also involve environmental responsibility, so Hypothesis 2: The environmental responsibility of carbon neutrality is the result of qualitative analysis, which is a dichotomous calculation method, performance = 1, non-performance = 0, and the calculation is:

$$p\left(x\cdot y_m\middle|k\right)=\exp\left(\frac{\left(x_n-y_n\right)^T\rightarrow\left(x_n-y_n\right)}{n}\right) \tag{2}$$

Among them, k is a performance constraint, which is greater than 1, otherwise it is invalid. Since the carbon neutrality evaluation of the smart exhibition platform is a variable and dynamic open process, there must be representative indicators covering all relevant issues. Therefore, this study needs to clarify which issues correspond and construct a framework for carbon neutrality evaluation indicators. In view of the hierarchical relationship between the indicators, this study needs to accurately interpret the intelligent exhibition platform, and the selection scope should be environmental responsibility, green economy and carbon neutrality, and should not conflict with or intersect with other derived indices. After determining the carbon neutrality evaluation index of smart exhibitions, this study needs to create a carbon neutrality evaluation model and calculate it accordingly according to its measurable characteristics.

B. The Framework of the Evaluation Index System for Carbon Neutrality of Smart Exhibitions

From many studies and discussions, this study identified y_i is the main target dimensions, x_i is secondary target indicators and k_i is operational indicators, which were used in the carbon neutrality evaluation index system (see Table 1 for details).

Table 1. Evaluation Index System for Carbon Neutrality of Smart Exhibitions

EVALUATION OBJECTIVES FOR CARBON NEUTRALIZATION	THE FIRST LEVEL IS DIVIDED INTO THE TARGET INDEX LAYER	SECONDARY LEVEL OF TARGET INDEX LAYER	THREE LEVELS OF THE TARGET INDEX LAYER

Intelligent exhibition(y_i)	Facility and equipment(x_i)	Equipment and energy utilization	Clean energy; utilization rate of energy-saving lamps; utilization rate of energy-saving air conditioners; utilization rate of elevators
		Exhibition articles	Display objects; eyebrow board; decoration
		Venue design	Environmental protection of exhibition materials; internal structure of the venue (including exhibition hall, elevator, etc. Equipment layout); microclimate of the venue (including ventilation and lighting)
			Venue green coverage rate
	Development and utilization(x_{i+1})	Availability of venues	Space utilization (including extended and non-extended); time utilization
		Space organization of exhibition hall	Patency (including channel width and density); booth density; exhibition hall remaining space
	Management operation(x_{i+2})	pollute	Light pollution (e. g. lighting); noise pollution (e. g. excessive volume); waste gas pollution; visual pollution (including excessive marketing); solid waste (including exhibition supplies and household waste)
		Flow control	Maximum threshold (including exhibitors and visitors control); peak-peak
		Human resource utilization	Reasonable allocation rate of cleaning personnel; staff allocation rate of exhibitors; staff allocation rate of other staff

In Eq. (2) above, when the data x_i and carbon neutrality data y_i in the intelligent exhibition platform are two-dimensional, the σ impact coefficient of the two is expressed, and the following formula is used:

$$p\left(y_m \middle| n\right) = \frac{1}{2\pi\sigma^2} \exp\left(-\frac{\left\|y_m - x_n\right\|^2}{2\sigma^2}\right) \tag{3}$$

As can be seen from equation (3), it can be clearly seen in this study that the entire carbon neutrality evaluation index system is mainly composed of multiple dimensions and different levels of indicators are tested for different dimensions, so the main factor of carbon neutrality evaluation is y_i and x_i, and this study selects k_i as key factor, covering new energy, Intelligent exhibition, low-carbon environment, green economy, etc. The purpose of the above formula is to measure the efficiency of the use of the intelligent exhibition platform and the degree of carbon emission reduction and to constitute an ecological and sustainable carbon neutrality evaluation system. Based on the above analysis, it is possible to implement a multi-faceted analysis of the targeting of smart exhibitions and achieve carbon neutrality, and determine the importance of each element.

C. Carbon Neutral Evaluation Method and Calculation in the Operation of the Intelligent Exhibition Platform

In fact, the carbon neutrality evaluation of the intelligent exhibition platform is a diversified evaluation process, so simplifying the evaluation process and reducing the complexity of data are the prerequisites for the implementation of calculations. Among them, it includes the standardization of treatment indicators, the determination of indicator weights, and the constraint analysis of indicators. Given the uniqueness of all parameters, the differences between parameters need to be indexed with appropriate transformation functions so that the parameter values of the running data can be normalized without parameters. In this paper, the carbon neutrality evaluation indicators are mapped, and all the real values in the indicator system are distinguished and compared with the corresponding reference values to reveal the complex information about each indicator.

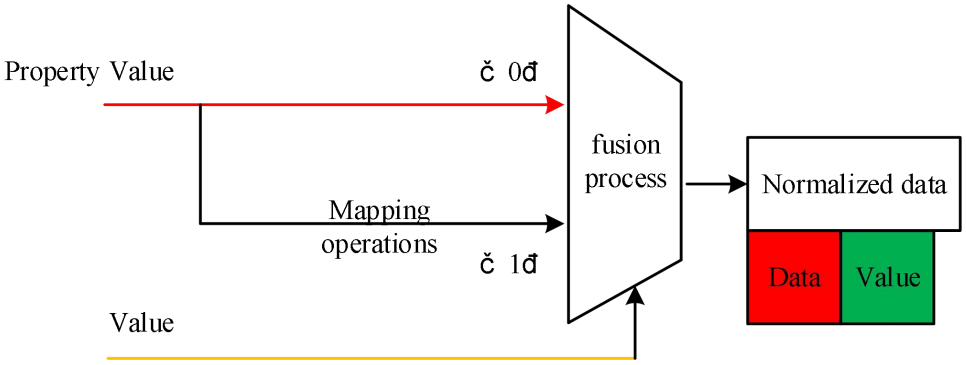

Fig. 2. Normalization of Data

For the data processing process in Figure 2, the following processing formula is obtained, as follows:
normalization of values and operating indicators: O_{iii}

$$O_{iii} = P_{iii} / S_{iii}$$ Positive indicator (i.e., the larger the indicator value, the better) (4)

The normalization of the data in equation (4) is as follows.

$$\vec{O}_{iii} = S_{iii} / P_{iii}$$ Reverse indicator (the smaller the indicator value, the better) (5)

normalization of attributes, Secondary indicators: O_{ii}

$$O_{ii} = \sum mi = lO_{iii} / m \tag{6}$$

normalization of data after fusion, Level I indicators: O_i

$$O_i = \sum ni = lO_{ii} \bullet W_{ii} \tag{7}$$

Normalize data from different dimensions. A comprehensive index of carbon neutrality and evaluation of intelligent exhibition:
Hypothesis 3: After processing different dimensions, the consistency of the data is as follows CI , and the formula is as follows.

$$CI = \sum ki\text{-}lO_i \bullet W_i \tag{8}$$

Where, lO_i is the number of indicators of one operating layer, W_i is the second level and third level of m, n and k.

After the normalization of the non-dimension is determined, the mapping values should be extracted critically, as follows.

The density of carbon neutrality turns out to is P_{iii} , the present value of the operating layer index value; The green economy has an increased rate is S_{iii} , the standard value of the operating layer index; The dichotomy of environmental liability is W_{ii} and the derivative liability is W_i , so the calculation process of different dimensions is shown in equation (9).

$$CI = \frac{\sum ki\text{-}lO_i \bullet W_i}{P_{iii}} \cdot S_{iii} \left| k_i \right. \tag{9}$$

In order to make the carbon neutral evaluation more fair and substantial, this study quantified the importance of all aspects of the carbon neutral evaluation. It adopted a linear weighted comprehensive approach to differentiate the influence of each carbon neutral evaluation, element in the whole and carbon neutral evaluation.

3. Case Study of Carbon Neutrality in the Operation of Intelligent Exhibition Platform

A. Actual Platform Introduction

The intelligent exhibition platform is written in Java and HTML languages, involves agriculture, machinery, construction and other fields, and the communication data volume of the exhibition platform reaches 10G/s, supporting 10,000 users/min. The platform is compatible with tax, economic and other related platforms to achieve cross-regional data integration. In this paper, 10~24h data is used as an example for data mapping analysis. In order to meet the needs of various large-scale international business intelligence exhibitions and large-scale business exhibitions, the data has the characteristics of comprehensiveness, comprehensiveness and high quality, the complexity of the data is high, and the data is obtained by sampling. In order to better analyze carbon neutrality, we will ρ_{co2} analyze the economic cost and environmental responsibility through the dichotomy method as the research object. Among them, the carbon emissions of the smart exhibition platform are also covered, including LED lights, air conditioners, environmentally friendly materials in the computer room, and the amount of CO_2 emitted by servers and PCs. Table 2 shows the constraints of the exhibition platform.

Table 2. Constraints on the Operation of the Intelligent Exhibition Platform

CONSTRAINTS	STANDARD	CONSTRAINTS	STANDARD
Carbon emissions	10kg/m3	Social responsibility	85%
Environmental pollution	35%	ρ_{co2}	22g/cm3
Proportion of green economy	25%	Critical values	Carbon intensity, green economy

Note: Data indicators are derived from expert surveys and questionnaire interviews

B. Carbon Neutrality Results of Smart Exhibition Platforms

The United States National Recycling Alliance accepted the "smart exhibition" strategy in Washington, and implemented it in the annual smart exhibition, smart exhibition and other related activities, advocating carbon neutrality, and proposing the utilization of petrochemical resources, such as the amount of gasoline in the transportation process, transportation cost as carbon neutrality content, personnel cost as carbon neutrality indirect indicators, so this paper takes transportation, personnel and resource consumption as carbon neutrality indicators, and conducts a 10-day test to obtain carbon neutrality theoretical results. Then, the actual carbon emissions of the intelligent exhibition platform are used as

the verification results and compared, and the specific results are shown in Table 3.

Table 3. Carbon Neutrality Results of Intelligent Exhibition Platforms

INDEX	NEUTRALIZE THE RESULTS	INDEX	NEUTRALIZE THE RESULTS
Carbon emissions	-586.19(↑)	Social responsibility	15.25 (↑)
Environmental pollution	-580.04 (↑)	ρ_{co2}	16.27 (↑)
Proportion of green economy	-251.09 (↑)	Critical values	16.38 (↑)
SAMPLE SIZE = 1G			
Likelihood ratio test $\chi 2(7)=0.525$, $p=0.03$			
McFadden $R^2=0.855$			

* p<0.05 ** p<0.01, The z-value is inside the parentheses

From the numerical results in Table 2, it can be seen that the operation of the intelligent exhibition platform can improve the carbon neutrality effect, among which is the largest carbon emission reduction, followed by environmental pollution. However, the improvement in social responsibility ρ_{co2} is small, indicating that the application scope of the intelligent exhibition platform is small and has not formed a scale effect. United States special working team of the "Intelligent Exhibition Platform Committee", which is responsible for providing guidance for the operation of the intelligent exhibition platform, and the research has found that the construction of the platform can provide support for green economic development, carbon neutrality and environmental protection. Canada's Smart Exhibition Guide, designed as a guide for the operation of smart exhibition platforms, found that the implementation of smart exhibition platforms can significantly reduce carbon emissions, consistent with the results of this study.

C. Continuous Monitoring of Carbon Neutrality

In order to conduct a more in-depth analysis, the carbon neutrality effect of the intelligent exhibition platform is analyzed by observing massive data and under the constraints of complex data, as shown in Figure 3.

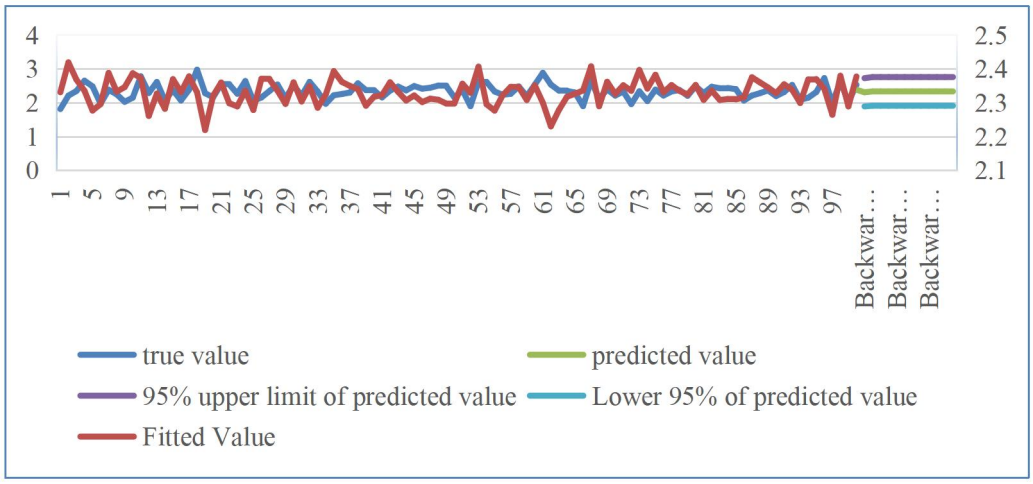

Fig. 3. Carbon Neutrality Results of the Intelligent Exhibition Platform after Operation

As can be seen from Figure 3, the concepts of carbon neutrality, environmental protection and economy are indeed integrated into the whole process of the smart exhibition, ensuring that each stage can be fully implemented. Some scholars and experts have also conducted relevant research, and the operation of the intelligent exhibition platform should meet the following three standards: The platform maximizes the use of resources, meets the needs of carbon neutrality, green economy and ecological environment, and reduces transportation volume and resource consumption. The meaning of "intelligent exhibition platform" is to establish an intelligent exhibition platform to reduce the adverse impact of resource development and economic activities on the environment, achieve energy conservation and emission reduction, thereby reducing the operating costs of social production, and achieving a balance between carbon neutrality and economic benefits in the intelligent exhibition platform. The operation and progress of the "intelligent exhibition platform" should not only meet the needs of the social economy, but also promote the fulfillment of social responsibilities. In the process of promoting economic growth, the "intelligent exhibition platform" adheres to the principle of circular economy, and integrates environmental protection and effective resource development and utilization into it, realizes the balance between the exhibition environment and the natural environment, and provides the public with intelligent exhibition materials and spiritual culture containing the excellent quality of the natural environment. In addition, we also need to think about combining the local benefits of smart exhibitions with global benefits, as well as the current and future benefits. From the perspective of the sustainability of carbon neutrality, the intelligent exhibition

platform has a very important role in promoting the carbon neutrality evaluation standard system, through the scientific construction of the evaluation system, and the implementation of diversified evaluation in the operation of the intelligent exhibition platform, strengthen the demonstration, in order to determine the effect of carbon neutrality, and on this basis, discuss the carbon neutrality situation.

D. Evaluation of the Degree of Carbon Neutrality

The carbon neutrality result cannot reflect its internal neutralization process, so it is necessary to analyze the neutralization process and find the neutralization result to confirm its carbon neutrality potential, as shown in Table 4.

Table 4. Summary of Carbon Neutrality

DEGREE OF NEUTRALIZATION	OUTCOME	ACCURACY
Match neutralization	1:1	
Neutralization method	Iterative regression	
Data extraction form	Sampling 30%	
A match is required	1G	98.2%
Fuzzy number of matches	1G	99.3%
Neutralization success rate	95%	

As can be seen from Table 4, the degree of carbon neutrality is mainly random neutralization, and no directional neutralization is carried out, so the form of carbon neutrality is natural and conforms to the normal distribution, and the results are representative.

4. Conclusion

The intelligent exhibition platform is a green environmental protection platform built through Java and other technologies, mainly to reduce transportation costs, simplify the trading environment, increase the proportion of the green economy, and promote enterprises to fulfill their social responsibilities, so it has theoretical feasibility and can improve carbon neutrality. The carbon neutrality evaluation system can be implemented reasonably. However, implementing the metrics framework still needs to be refined, and many of the associated values are difficult to collect. This study advocates a combination of questionnaires and professional consultations, combined with visitors' actual experiences and other first-hand information. At the same time, these indicators include the intensity of the smart exhibition area and the efficiency of the use of human resources. Through data regression analysis, this paper finds that the intelligent exhibition platform can simplify the complexity of data, increase carbon emissions, ρ_{co2} and show a downward trend, and improve the green economy rate, social responsibility fulfillment rate and key indicator rate, reaching more than 90%. The degree of carbon neutrality is random, which meets normal and natural distribution requirements. However, in the process of data collection for carbon neutrality, the form adopted in this paper is simple, so the representativeness of the data is slightly poor, more indicators will be added in the future, and the amount of data will be increased to improve the accuracy of the results.

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Zhejiang Province Philosophy and Social Science Planning Project (23NDJC426YBM).

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