Research Article

Analyzing the Coordinated Relationship between Logistics and Economy Using the Internet of Things in Fujian Province

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The Internet of Things (IoT) is a new method of doing things that have turned traditional lives into high technology. The improvements of IoT include smart economies, smart homes, pollution control, energy efficiency, smart transportation, and intelligence in the capacity. This technology is especially crucial in smart logistics, which is a generator of country and business efficiency and is critical to economic progress. Unfortunately, the current logistics business continues to suffer from high prices and low effectiveness. The advancement of intelligent logistics provides the potential to address these issues. In addition, IoT can generate vast amounts of data and investigate the intricate links between the transactions reflected by these data with the use of a variety of mathematical analytic methods. These characteristics are beneficial to the advancement of intelligent logistics. In this paper, we present a complete overview of IoT technologies used in smart logistics. Initially, the relevant work and IoT-based level of the growth of the logistics sector from a low-carbon viewpoint are presented. Then, we outline the technological solutions for IoT in intelligent logistics. During the experimental work, it selects a technique for estimating carbon emissions to compute the total carbon emissions of the logistics industry in eight provinces in the north and south. The carbon productivity and carbon emission characteristics of China's logistics industry are then examined. In addition, it calculates the carbon emission efficiency of Fuzhou's regional logistics industry based on the BCC model. Secondly, the coordination degree model of the composite system is used to analyze the coordination degree between the low-carbon economic system and the logistics industry level in Fujian Province. Furthermore, it selects the index of the logistics subsystem and the index of the low-carbon economic development subsystem to measure the coupling and coordination effect between logistics manufacturing and the low-carbon economy in Fujian Province.

1. Introduction

In the present era of the Internet, the importance and application of the Internet of Things (IoT) technology are rapidly increasing as it can connect all objects including nonelectronic objects. These objects can be integrated into network nodes through verifiable bar codes, and components are utilized to gather their physical position such as invested capital, operating status, the person responsible, and other information into the Internet technological design in real time. Furthermore, with the fast development of wireless communication systems, IoT is quickly acquiring ground in the situations of new wireless telecommunications

[1]. The concept of IoT is continually developing, from an initial focus on machine-to-machine connections and applications to widespread data gathering. That is, the Internet of Things has generated seas of data, and the intricate linkages between the activities recorded by this data may be studied in real time using various mathematical analytic methods. The most important application of IoT is in logistics and the economy.

The logistics economic system is a fundamental economic model that is based on the logistics business, encompassing composite materials transactions and distribution, resource usage processing firms, logistics management, distribution, and other enterprises [2]. It is essential

for economic development and a driver of country and corporate efficiency [3]. However, due to the complexity of supply networks and high labor expenses, logistical costs are still relatively high. According to the 30th Annual Status of Logistic Report from the Council of Supply Chain Management Specialists, the United States, one of the most efficient nations in terms of logistics, spent $1.65 trillion on logistics in 2018, an increase of 11.5% from the previous year and almost 8.1% of the country's $21.0 trillion GDP. In contrast, logistics expenses in the least effective nations can reach 25.2% of GDP. High shipping costs will have an impact on efficiency.

Nowadays, every country in the world pays enough attention to climate warming. China is the first developing country in the globe and a superpower in greenhouse gas emissions. Because the ecological environment in China is not ideal, to achieve the goal of sustainable growth, the domestic government has used many means [4]. The Chinese government declared in the 13th Five-Year Plan that green development should be realized by including resource conservation and environmental preservation in national policy. Furthermore, it was also declared that the circular economy is continuously encouraged by building low-carbon, harmonic, and safe energy systems and zero-carbon emission project pilot work should be implemented [5]. The low-carbon economy emerged as a result of many crises, such as rising greenhouse gas emissions and energy shortages. The British government issued The Future of Our Energy: Creating a Low-Carbon Economy in 2003, which defined a low-carbon economy [6]. Using the ideals of sustainable development, the low-carbon economy uses the least amount of energy, pollutants, and emissions to raise the economic level. Furthermore, by upgrading industrial systems, creating renewable energy, scientific and technical innovation, minimizing the consumption of energy such as oil and natural gas, and reducing gas emissions, we may achieve greater environmental and economic growth [7].

Certainly, IoT will be important in the deployment of smart logistics [8], which will fundamentally alter the way logistical operations are conducted and the structure of the economy. Unfortunately, numerous topics, such as relevant situations, present challenges, and possible trends, remain to be examined during the procedure of making IoT-based intelligent logistics a reality. This work is conducted to help those who are interested in the development and improvement of this domain. In addition, from the perspective of Fujian's low-carbon economic subsystem, the proposed synergy degree shows that it is in a moderate stage from 2015 to 2017, which is entering a high stage after 2018. Besides, from the perspective of the property development subsystem, the value of the coordination factor of the property development subsystem continues to rise after 2017 and the value of the coordination factor of the property development subsystem has reached 0.803 in 2020, indicating that the property development in this province is stable.

The innovations of this paper are as follows: (1) This paper examines the coordination linkages between logistics and the economy in Fujian Province using Internet of Things (IoT) technology, outlining the focuses and shortcomings of IoT-based smart logistics. (2) From the perspective of consumption of energy, carbon release, production of carbon, carbon emission per capita, economic efficiency index, and emission of carbon productivity of logistics manufacturing, this research work discusses the level of growth of China's logistics manufacturing. Following that, the amount of low-carbon economic development in various provinces is examined in terms of carbon emissions and economic growth efficiency. Carbon emission intensity is chosen as a proxy for the amount of low-carbon financial development on this premise. The Eviews 6.0 program is used to conduct an empirical examination of the link between logistics manufacturing expansion and low-carbon financial growth. (3) Based on the connection concept, this article establishes the coordinated development index scheme of the logistics manufacturing and low-carbon economy, uses the coupled coordinated development model to measure the coordinated development status of the logistics manufacturing and low-carbon economy in some provinces of China from 2015 to 2020, and formulates strategies to promote the low-carbon growth of the coupled system according to the results of the coupled coordinated development.

This paper consists of 6 sections, wherein Section 2 highlights the contributions of other researchers and scholars. Section 3 is based on the IoT-based development status of the logistics industry from a low-carbon perspective. Section 4 discusses our methodology for measuring carbon emission efficiency. The results obtained during the suggested methodology and their analysis is offered in Section 5. Lastly, Section 6 concludes our study effort in the last section.

2. Related Work

A new logistical and economic standard has effectively modified management concepts and creative management approaches to guarantee that the conventional logistics business can live and expand in a competitive market. The IoT, as a novel creation of the age, has given promise to the logistics business [9]. The early study of [10] discovered that IoT technology has offered unusual development chances to the logistics business and efficiently pushed the growth of the conventional logistics sector into a contemporary, popular, and forward-thinking development. The author of [11] claimed that the IoT is significant information technology in the modern generation, indicating the beginning of a new age of information. Furthermore, an early study in [12] discovered that IoT technology efficiently interconnects things with objects. The Internet is critical expertise that facilitates its successful development and delay. It spreads the sharing of knowledge to the trade of objects. The rise of IoT skills is seen as the 3rd wave in IT, as it incorporates IT into everyday life. The primary goal for NG and Wakenshaw in establishing a communications network is to maintain and regulate commodities while improving administration quality and efficiency [13]. According to the researcher in [14], to build a successful Internet of things, communications equipment, primarily infrared detectors, GPS wearable

sensors, and similar devices must be connected to the network. However, the study in [15] discovered that for the administration of commodities, the IoT system must do the following 3 phases: Firstly, discover the items and categorize them. Secondly, using smart recognition devices, the article characteristics are examined, and the information received is transformed. Thirdly, we accurately communicate the item data to the network, transmit the data to the regulator center through the Internet, and administer the goods centrally. Employing smart recognition technology, detecting, classifying, and transmitting item information, and storing the data in the information organization scheme enable items to communicate and recognize each other's requirements.

In addition to the foregoing, the low-carbon economy is governed by the philosophy of maintainable growth. It can reduce consumption of traditional high-carbon energy sources such as coal and petroleum, as well as greenhouse gas releases, by utilizing system innovation, scientific and technological research, industrial transformation, and new energy promotion to achieve a win-win economic model of social-economic development and environmental protection. Compared with a traditional economy, the low-carbon economy can promote economic level, optimize environmental quality, reduce energy consumption, and reduce emissions in the growth procedure. The emergence of a low-carbon economy is a research area and a hot topic of concern for all countries. The continuous growth of the low-carbon economy has caused China's economy to face new difficulties and opportunities, prompting China to transform into a low-carbon economy and substantially reduce greenhouse gas emissions to achieve sustainable economic growth [16, 17]. Therefore, how to decrease carbon dioxide releases and promote the growth of a low-carbon economy has become a significant issue of concern to different countries around the world. China is at a critical stage of economic improvement and environmental improvement. We need to solve the problems such as the transformation of the economic growth rate, the change of economic growth momentum, the optimization of the economic system, and the increasing energy consumption [18]. The scale of the domestic logistics market has reached more than 300 trillion yuan in 2020. The rapid growth of the service industry is the key to the domestic economic system, and the logistics industry is the focus of the national economic level [19]. Due to the continuous development of the logistics industry, the environmental pollution problems in China are becoming more and more obvious. The domestic logistics industry has brought about increased energy consumption and emission. The growth of the domestic logistics industry begins to show a clear mismatch between resources and industries. Low resource utilization, backward scientific and technological level, and a large number of pollutants discharged all cause haze or bad weather in most areas of China. In the process of reducing carbon emissions and promoting long-term economic growth, the logistics industry needs to vigorously carry out emission reduction work [20, 21]. Therefore, facing the continuous development of energy conservation and emission reduction, the logistics industry has become the key to energy preservation and release decrease in the macrobackground of low-carbon economic growth. It is essential to change the growing power of the logistics industry and promote the growth of the green economy. The process of China's growth is based on the low-carbon economy, focusing on the economic development mode of low pollution and low consumption of energy.

3. IoT-Based Development Status of the Logistics Industry from Low-Carbon Perspective

3.1. The Architecture of IoT for the Growth of the Logistics Industry.
The IoT architecture is composed of five significant layers such as perception, network, middleware, application, and business as depicted in Figure 1. Among these layers, the perception layer comprises physical components like sensors, RFID tags, barcodes, and other physical items linked to the IoT system, which resides at the lowest of IoT design. This equipment gathers information and sends it to the network layer. This layer helps as a conduit for transferring data from the perception layer to the data dispensation scheme. This data transfer may use whatever wireless or wired means, including 4G, wireless fidelity, and Bluetooth. The middleware layer is the following level layer, which has the primary accountability to process data obtained from the network layer and decide things using the outcomes of interconnected devices. This processed data can be used by the application layer for global distant access. While the business layer sits on top of the framework, it aids in the regulation of the larger IoT scheme and applications. The business layer visualizes the data and information obtained from the application layer and uses this knowledge to determine future aims and strategies. Furthermore, IoT designs may be tailored to specific requirements and application domains [22]. Besides a layered basis, the IoT scheme is made up of numerous functional blocks that allow diverse IoT processes such as sensing, identification, recognition, management, and administration [23].

There are various major functional units in charge of I/O activities, connection concerns, computing, audio/video management, and storage and retrieval. This complete functional block integrates an actual IoT arrangement, which is serious for good performance. Though numerous reference schemes have been presented with practical standards, they are still far from the basic system required for worldwide IoT. As a result, an appropriate infrastructure that can meet the global IoT demands must yet be created. Figure 2 depicts the basic functioning framework of the IoT system. This diagram depicts the Internet of Things reliance on certain application characteristics. Gateways of IoT play a significant part in IoT networks because they allow connectivity among IoT servers and devices associated with various applications [24].

3.2. Total Energy Consumption Analysis of the Logistics Industry.
The market size of China's logistics industry is 300.1 trillion yuan in 2020. In 2015, the proportion of the logistics industry in China's gross domestic product was
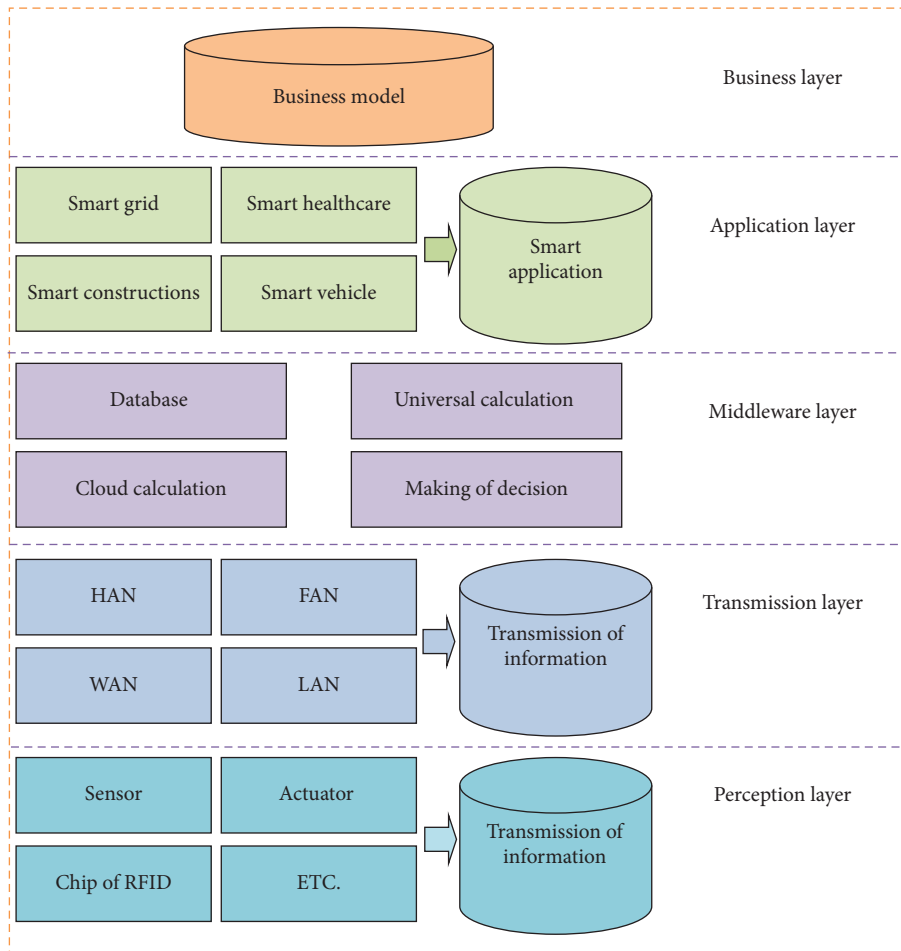
FIGURE 1: Five-layer architecture of IoT-based development of the logistics industry.
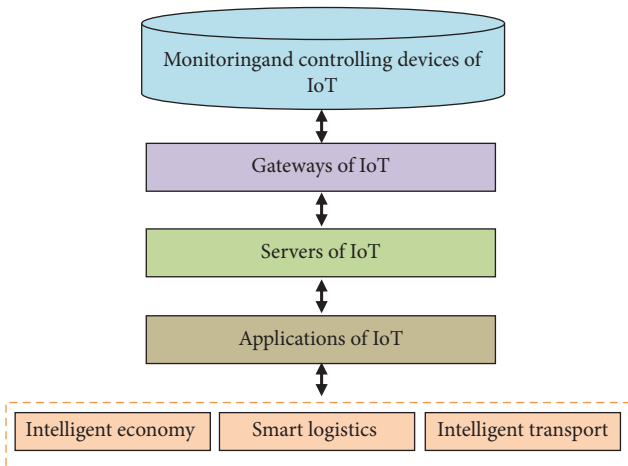

FIGURE 2: The basic functioning framework of the IoT system.

7.0%, while in 2020 it rose to 7.5%. At the same time, the logistics industry is the key industry of domestic energy consumption. Today, the logistics business is characterized by low energy usage and high emissions. With the macro-environment of lowering carbon emissions and growing economic level, it is extremely difficult for the logistics industry to minimize carbon emissions. As a result, the energy consumption faced by the domestic logistics business is investigated using the overall energy consumption and growing level of the logistics industry. Figure 3 depicts a comparison of a description of changes in overall energy consumption and the logistics industry's growth rate from 2015 to 2020.

Figure 4 shows the comparison of the description of changes in energy consumption of the logistics industry and tertiary industry from 2015 to 2020. From this figure, we can see that the energy consumption of China's logistics industry and the third industry is increasing substantially. During the period 2015–2020, the energy consumption of the logistics industry and the third industry increased slowly. After that, the energy consumption of the logistics industry and the third industry increased rapidly, increasing by 91.21 million tons and 31.57 million tons, respectively, compared with 2015.

3.3. Total Carbon Emission Analysis of the Logistics Industry. After referring to other theoretical conclusions computed in (1), this research employs the IPCC approach to finish the measurement of carbon emissions. According to this equation, we can get the carbon emissions of China's logistics industry over the years. According to the carbon
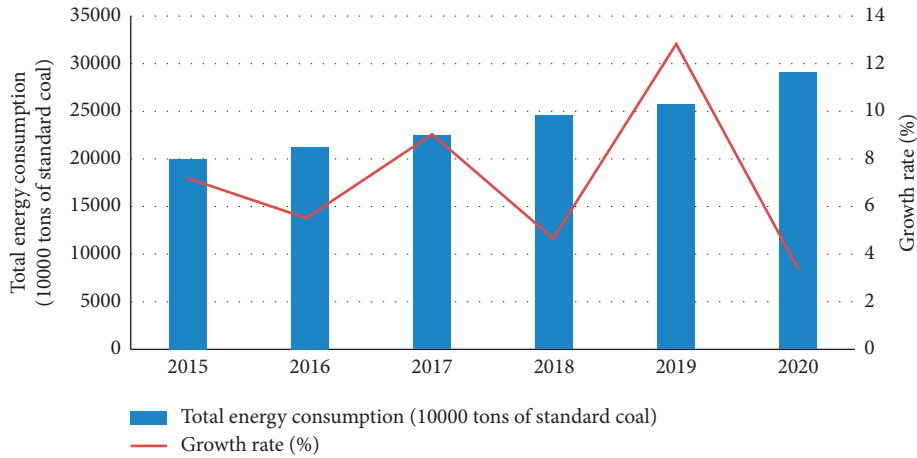
FIGURE 3: Description of changes in total energy consumption and growth rate of the logistics industry from 2015 to 2020.
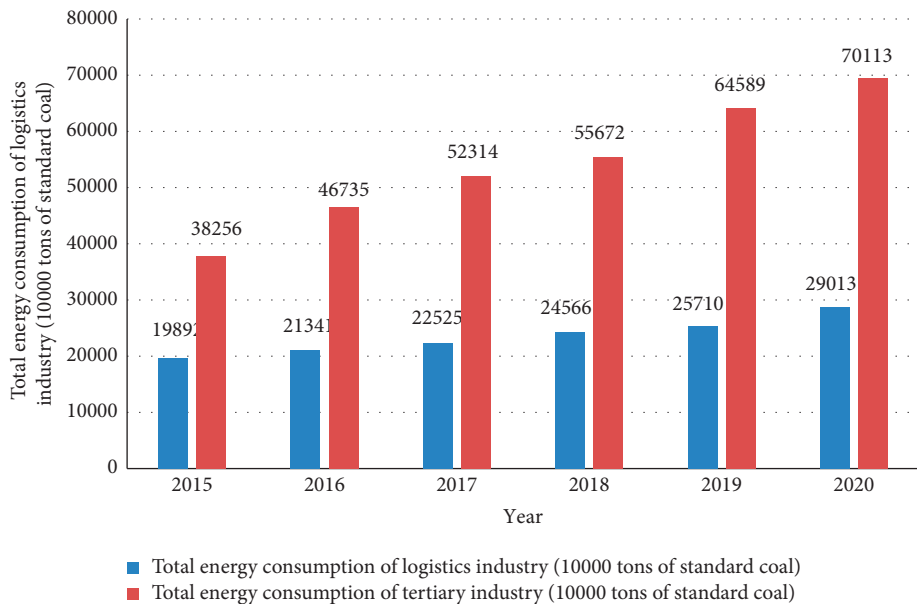

FIGURE 4: Description of changes in energy consumption of the logistics industry and tertiary industry from 2015 to 2020.

emission statistics published by the logistics industry shown in Figure 5, the total carbon emission of China's logistics industry in the previous two years ranges from 17.45 million tons to 18.113 million tons, indicating that the logistics sector's carbon emission level is not excessive. From 2015 onwards, the carbon emission of the logistics industry has shown a rapid rise to 2019, which reached 124.58 million tons in 2015 and 174.52 million tons in 2019. From 2019 to 2010, the logistics industry has shown a steady upward trend, the rising speed is lower than before, which means that the domestic logistics industry has brought a lot of carbon dioxide in the process of rising. However, in 2015, China's environmental management departments studied the air pollution problem in depth and introduced measures such as Prevention and Control of Air Pollution in Key Areas to reduce the number of carbon emissions. This makes the

domestic logistics industry develop towards the direction of low carbon.

4. Estimation Method of Carbon Emission Rate and Modeling of Coordination Degree

4.1. Carbon Emission Estimation Methods. There are no corresponding statistical methods and standards for carbon emissions in China, and only the amount of carbon emissions can be roughly estimated. Most researchers use the measured method, IPCC method, and so on in the process of measuring carbon emissions. The IPCC method calculates the carbon emissions based on the National Greenhouse Gas Inventory Guidelines. This method has the characteristics of easy data acquisition and wide application. Therefore, this research work uses the IPCC technique to complete the
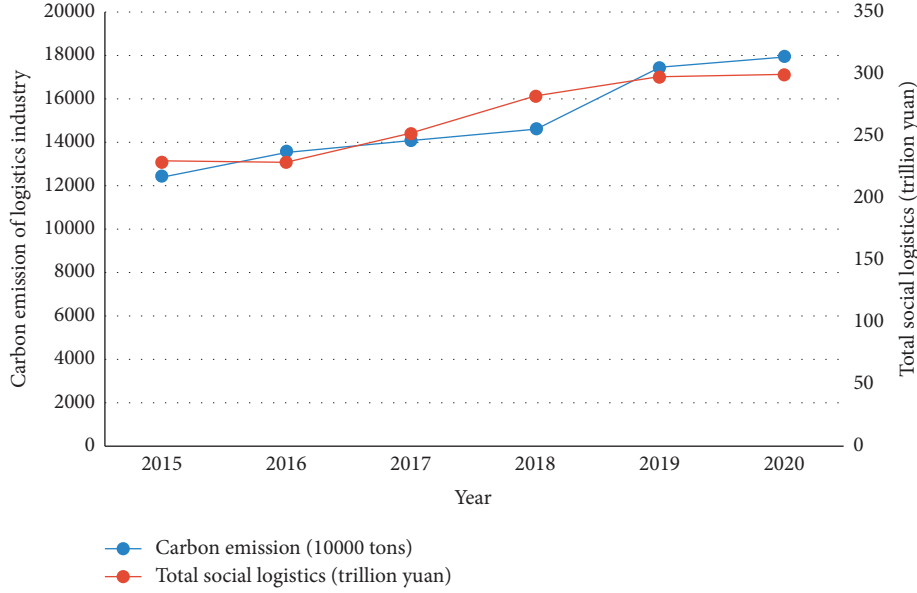
FIGURE 5: Change trend of the logistics industry value and carbon emissions from 2015 to 2020.

measurement of carbon releases [25] after referring to other theoretical results. The detailed calculation formulas are shown in

$$C^t = \sum_{i=1}^{n} E_i^t \theta_t \delta_i. \tag{1}$$

In the previous equation, C^t is the actual total carbon release of logistics in phase t area. However, E_i^t is the i in phase t, including nine types of energy consumption, such as gasoline, crude oil, coke, and raw coal. In addition, θ_i is the corresponding reference coefficient of the resource consumption transformed into standard coal. Finally, δ_i is the actual carbon emission index of the ith resource.

4.2. Carbon Productivity Measurement Method.
Kaya and coworkers developed the term carbon productivity, which refers to the average production per unit of CO_2 GDP. This metric measures the economic advantages provided by each unit of CO_2 emissions. The intensity of CO_2 emissions per unit and carbon have a negative connection. Carbon intensity decreases as carbon productivity increases, and carbon intensity decreases when carbon productivity improves [26]. The following shows the calculation formula:

$$\text{carbon productivity} = \frac{\text{output value}}{CO_2 \text{emissions}}. \tag{2}$$

4.3. Method for Measuring Carbon Emission Efficiency.
Many researchers study the actual efficiency of the logistics industry by analyzing the actual effect of carbon emission methods. The carbon emission rate refers to the highest output efficiency that can be obtained when the district obtains a fixed output value with the lowest input or maintains the input based on the existing scientific and technological capacity, which reflects the technical level. At present, the most commonly applicable DEA models are

CCR, BCC, etc., while the CCR model refers to a DEA model that takes the ratio of actual output to an input of a decision-making unit as the target, takes the actual efficiency coefficient of each decision-making unit with the target as the limiting condition, and designs a stable return and scale.

In addition, BCC model is based on the CCR model plus $\sum_{k=1}^{N} \lambda_k = 1$, and a DEA model with variable return and scale is designed. Considering the existing relevant literature, the BCC model in DEA is selected as the model to predict the effect of CO_2 emission technology.

If there are n decision-making units in total, these decision-making units have corresponding s outputs and m inputs, with Y_i representing output and X_i representing input. Then, the BCC model can be expressed in

$$\text{Min}\left[\theta_{i0} - \varepsilon\left(e^T s^+ + e^T s^-\right)\right],$$

$$s.t \begin{cases} \sum_{i=1}^{N} x_i \lambda_i + s^- = \theta_{i0} x_{i0} \\ \sum_{i=1}^{N} y_i \lambda_i - s^+ = y_{i0} \\ \sum_{i=1}^{N} \lambda_i = 1, \lambda_i \geq 0, i = 1, 2, \ldots, n \\ s^+ \geq 0, s^- \geq 0 \end{cases}. \tag{3}$$

In the previous equation, $X_i = (x_{1i}, x_{2i}, \ldots, x_{ki})^T$, $Y_i = (x_{1i}, x_{2i}, \ldots, x_{ri})^T$, x_i represents input variables, and y_i represents output variables. In addition, $y_{ri} > 0$ represents the rth output in the ith decision-making unit. In addition, $x_{ki} > 0$ represents the kth input in the ith decision-making unit. Similarly, s^+ and s^- represent relaxation variables, θ_{i0} represents the corresponding competence value of the decision-making component, e^T is the row vector of the unit, and λ is the weight vector.

4.4. Models of Coordination Degree between the Logistics Industry System and Low-Carbon Economic Development System. The common models used in the analysis of synergistic relationships, that is, coupled coordination models, can conduct quantitative analysis [27] based on space and time. However, coupled coordination models are facing the problem of difficulty in centralizing subjective and objective assignments. This paper optimizes the models, builds a composite model based on ordinal variables, further simplifies the system, and completes the measurement of system coordination degree. It also provides an efficient way to study the relationships and rules between different elements in a composite system [28]. Therefore, this model is used to study the synergistic relationship between Fuzhou's low-carbon economy and the logistics industry.

According to the results of synergy theory, sequence variables directly affect the speed of system evolution. Ordinal variables can be divided into fast and slow variables. Slow-order variables essentially affect whether the system evolves from disorder to order. Composite systems can be considered as $S = \{S_1, S_2, \ldots, S_p\}$.

This paper studies the low-carbon economic system S_2 and the regional logistics system S_1. If the corresponding order variable of the subsystem is $h_j = \{h_{j1}, h_{j2}, \ldots, h_{jn}\}$; in addition, $n \geq 1$, $\alpha_{ji} \leq h_{ji} \leq \beta_{ji}$ ($i = 1, 2, \ldots, n$), and α_{ji} and β_{ji} are the upper and lower limits of the order variable component h_{ji} to ensure the smooth operation of the system. If the subsystem can be divided into two types: if the value of $h_{j1}, h_{j2}, \ldots, h_{jk}$, $h_{ji} h_{ji}$ is higher and the degree of order in the system will be greater, and on the contrary, the degree of order in the system will be lower, so the index is positive; if $h_{jk+1}, \cdots, h_{jn}$ value is large, the degree of order in the system will be smaller, and on the contrary, it will be larger. Such indicators represent negative indicators. The corresponding order model of the subsystem evaluation index obtained in this way is presented in

$$\mu_j(h_{ji}) = \begin{cases} \dfrac{h_{ji} - \alpha_{ji}}{\beta_{ji} - \alpha_{ji}} i \in (1, k), \\ \\ \dfrac{\beta_{ji} - h_{ji}}{\beta_{ji} - \alpha_{ji}} i \in (k + 1, n). \end{cases} \quad (4)$$

By definition in the above equation, $\mu_j(h_{ji}) \in [0, 1]$; the greater the value, the higher the order degree of the order variable, and the greater the contribution of the order variable to the order degree of the system. Integration may be used to determine the geometric average approach, which is used to get the subsystem order degree in

$$\mu_j = (h_j) \sqrt[n]{\prod_{I=1}^{n} \mu_j(h_j)}, j=1,2. \quad (5)$$

In the previous equation, $\mu_j(h_{ji}) \in [0, 1]$ represents the greater the value and the greater the order degree of the subsystem.

In the process of evaluating the coordination degree of composite system, the order degree between different subsystems is analyzed again from the dynamic perspective. If the subsystem is located at t_0, the corresponding order degree value is $\mu_j^0(h_j) j = 1, 2, \cdots, k$. If the initial value of the subsystem is t_1, then its order degree is $\mu_j^1(h_j) j = 1, 2, \cdots, k$. The coordination degree of the combination of a low-carbon economy and regional logistics in this period can be determined as C.

$$C = \omega \sqrt[n]{\mu_j^1(h_j) - \mu_j^0(h_j)}. \quad (6)$$

According to the previous equation, the value range of the total coordination scheduling C of the composite system is $[-1, 1]$. The larger its value is, the higher the degree of coordinated development of regional logistics and the low-carbon economy composite system is, and vice versa.

5. Results and Analysis

5.1. Index Design and Data Source. In this paper, sustainable development is taken as the research entry point to build a composite system, in which the subsystems are divided into a low-carbon economy and regional logistics. In the process of index design, it is necessary to carry out index design according to the conclusion of the mechanism analysis. As can be seen from Figure 6, all systems are carried out from four dimensions in the process of designing indicators, and to ensure that the indicators are scientific enough, the theoretical results of previous researchers are referred to in the process of selecting indicators [29].

The four aspects of infrastructure, norms and regulations, scientific and technical innovation, and industrial scale are used as entry points in the process of picking system indicators for the regional logistics subsystem. The research theoretical achievements of [30, 31] are used as a reference in the process of selecting system indicators for the low-carbon economy subsystem and the four dimensions of energy consumption, scientific and technological power, economic composition, and the social public are taken as entry points.

5.2. Carbon Productivity Analysis. The concept of carbon production is the carbon releases caused by each unit of GDP increase. The role of this indicator is to evaluate the value and competence of carbon releases, and it can also directly reflect whether the driving force of economic development comes from high-energy consumption businesses. Therefore, in the process of analyzing the carbon emissions of the regional logistics industry, the paper takes carbon productivity as the key index, selects four provinces in the South and north of China, and calculates according to publicity (2). The results are shown in Figure 7.

It can be observed from the data in the figure that there is a certain difference in the carbon productivity of the logistics industry in the southern and northern provinces from 2015 to 2020, which fluctuates from 6700 yuan/ton of coal to 21000 yuan/ton of coal. Due to the reciprocal relationship between the emission intensity of unit CO_2 and carbon productivity, the carbon emission of Guangxi, Liaoning, Heilongjiang, and other provinces has also increased rapidly under the background of the rapid development of the logistics industry. This shows that the above provinces promote the development of the logistics industry by relying on
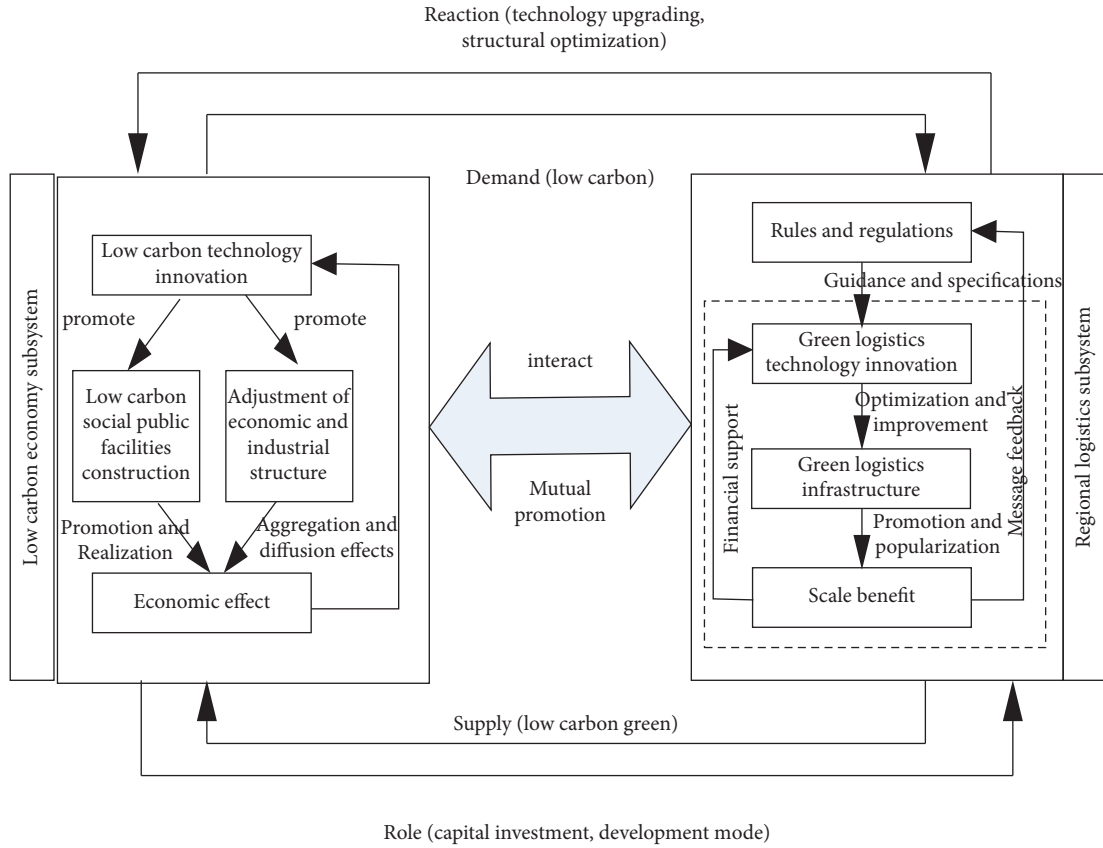
FIGURE 6: Mechanism analysis of low carbon economic system and regional logistics development system.
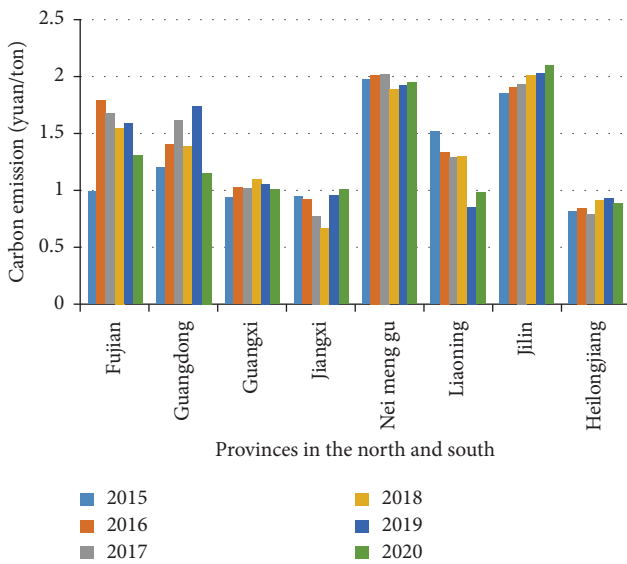

FIGURE 7: Carbon productivity of the logistics industry in four provinces in North and South China from 2015 to 2020 (unit: 10000 yuan/ton of coal).

FIGURE 8: Statistics of carbon emission competence of the logistics industry in various provinces.

energy consumption to expand economic development, which belongs to a resource-based economic growth mode. Other provinces can effectively use resources, science and technology, and other factors to adjust the logistics industry to achieve the low-carbon development of the local regional logistics industry.
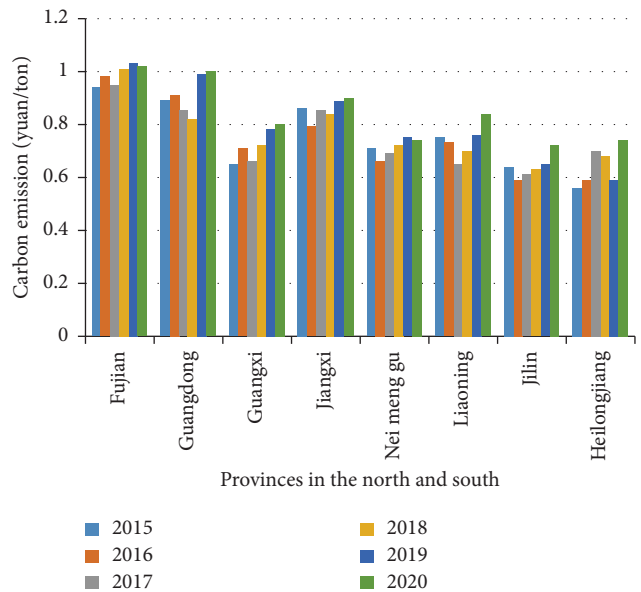
5.3. Carbon Emission Efficiency Calculation of the Logistics Industry. This paper uses deap2.1 software to solve the formula given in (3) to calculate the carbon emission efficiency of the logistics industry in four southern and four

TABLE 1: Data statistics of coordination degree of the composite system in Fujian Province.

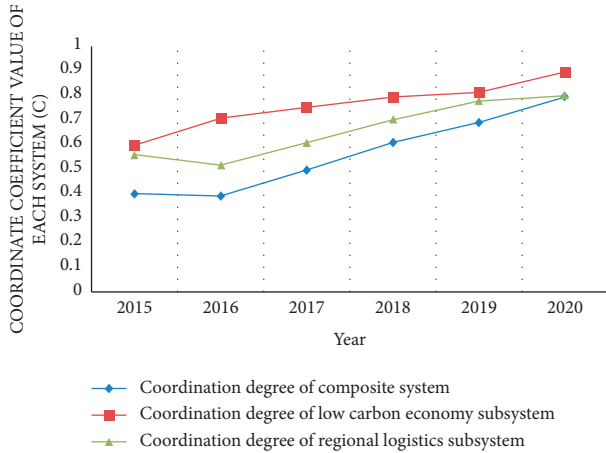| Year	Coordination degree of the composite system	Coordination degree of the low-carbon economy subsystem	Coordination degree of the regional logistics subsystem
2015	0.401	0.601	0.559
2016	0.391	0.711	0.521
2017	0.499	0.754	0.610
2018	0.614	0.798	0.704
2019	0.695	0.815	0.782
2020	0.798	0.901	0.803

FIGURE 9: Description of the change trend of system coordination degree.

northern provinces in China from 2015 to 2020. The comparison among the statistics of carbon release efficiency of the logistics manufacturing in various provinces is shown in Figure 8.

The data in the figure shows that the carbon emission efficiency of the logistics industry has changed in 2020, with the efficiency value of Fujian and Guangdong being 1, which is at the forefront of production, while the carbon release competence of the logistics industry in other provinces has also increased significantly, between 0.59 and 0.84, but it has not reached the forefront of production, indicating that there is great room for improvement in the carbon emission efficiency of the logistics industry in these provinces.

5.4. Analysis on the Coordinated Growth Structure of Regional Logistics and Low-Carbon Economy in Fujian Province. Based on the 2016 data, the data after standardization by SPSS software is entered into equation (6). Besides, the coordination degree of the low-carbon economy subsystem, regional logistics subsystem and coordination degree of the composite system of coordinated development of regional logistics and low-carbon economy is calculated. Table 1 displays the unique coordination degree data statistics of the Fujian composite system.

Figure 9 compares descriptions of the evolving trend of system coordination degree. When combined with Figure 9

and Table 1, these three coordination degrees have demonstrated a continuous increase trend from 2015 to 2020, indicating a positive association between Fujian's low-carbon economy and the logistics industry in recent years.

From the results of the figure, it is clear that in 2020, the low-carbon economy subsystem has a coordination degree of 0.901. The regional logistics subsystem has a coordination degree of 0.803. The composite system shows a coordination degree of 0.798. From the above data, we can see that there is a high coordination degree between Fujian's low-carbon economy and regional logistics. In terms of coordination level, considering the scope of coordination and the actual situation, the above three will develop from the previous junior high school-level coordination to a high degree of coordination in 2020.

6. Conclusions

Recent advances in IoT have attracted the attention of developers and researchers all around the world. IoT developers and experts are collaborating to expand the innovation on a big scale and serve society to the greatest extent feasible. Unfortunately, advancements are only achievable if we take into account the different challenges and inadequacies in the current technical techniques. This article investigates the carbon emissions from 2015 to 2020 to examine the coordination links between logistics and the economy in Fujian Province using Internet of Things (IoT) technology. From 2015 to 2020, the carbon emissions and output value of the logistics industry have been rising, which means that during this stage, the domestic logistics industry is driven by high energy consumption in the process of promoting the growth of the logistics industry. The carbon emission efficiency of favorable economic circumstances along the eastern coast ranges between 0.7 and 1. At the same time, the northern provinces with weak economic conditions have an efficiency of 0.59 to 0.87. This leads to the conclusion that the carbon emission efficiency of various locations of the logistics business in the South and North is quite diverse, and there are significant disparities. The majority of coastal locations have low-carbon emission efficiency, whereas other places have high carbon emission efficiency. The synergy of the low-carbon economy subsystem in Fujian Province is in the medium stage from 2015 to 2017 and is just entering the high stage after 2018, showing that the low-carbon economy in Fujian Province is developing steadily. In 2016, the regional logistics subsystem at Fujian Province was in the medium stage, and the coordination coefficient value was near 0.666,

which remained high after 2017. It demonstrates that the development of Fujian Province's regional logistics economy has been generally stable in the last five years, with a pattern of continuous expansion.

Data Availability

Datasets are available on reasonable request from the corresponding author.

Conflicts of Interest

The authors declare that they have no conflicts of interests.

Acknowledgments

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