Research Article
The Low-Carbon Effect Measurement of the Structural Adjustment of the Ice and Snow Industry Based on Artificial Intelligence

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Ice and snow economy is an economy characterized by ice and snow, and its foundation is ice and snow resources. The ice and snow economy covers the tertiary industry of ice and snow activities, and its core power comes from ice and snow tourism, which promotes the common development of manufacturing, transportation, catering, retail, and other industries. This paper studies the low-carbon effect measurement analysis of the structural adjustment of the ice and snow industry based on artificial intelligence, which proves that the economic benefits and carbon emissions of the structural adjustment of the ice and snow industry will be greatly improved after the addition of artificial intelligence technology. For this research, a series of investigation experiments are conducted, and the ice and snow industry in Heilongjiang Province is selected for analysis. First, the important position of artificial intelligence technology in today’s information society and its practicality are fully analyzed, and then its feasibility in combination with the structural adjustment of the ice and snow industry is analyzed. Second, it analyzes the characteristics of the structural adjustment of the ice and snow industry while taking into account its requirements for measuring low-carbon effects. The mathematical model of industrial structure optimization based on low-carbon constraints is adopted in the application model of artificial intelligence technology in the adjustment of the ice and snow industry structure, and the effects of carbon emissions before and after structural adjustments in the ice and snow industry are calculated to achieve a better industrial structure adjustment plan. Experimental data shows that with the help of artificial intelligence in the process of structural adjustment of the ice and snow industry, the average income of residents has increased by nearly 7%, and the transformation of the ice and snow industry’s contribution to the reduction of carbon emissions has rapidly increased to 12.24%.

1. Introduction

The ice and snow industry is a new industry, and the development of this industry is inseparable from its unique resource endowment, which has a great relationship with location and climate, but at the same time, it does not completely rely on these. Some areas with relatively scarce ice and snow resources are also tapping the industry value of the ice and snow industry, forming a strong competition for the traditional ice and snow industry regions. The development of the ice and snow industry often requires the government and relevant managers to make good plans for it in order to achieve better results. Heilongjiang Province has unique advantages in developing ice and snow economy: first, Heilongjiang Province is the northernmost province in China, with the most annual snowfall and freezing periods. It is the province with the most ice and snow resources in China. From a global perspective, Harbin is the largest and most populous city among the regions rich in ice and snow resources in the world. Second, Heilongjiang Province also has a long-standing ice and snow cultural background and has the cultural foundation to give full play to the ice and snow economy. The development prospect of the ice and snow industry in Heilongjiang is very good. The Harbin Ice
and Snow Festival held every year since 1985 has become a unique and nationally renowned grand festival. Third, Qiqihar Heilong Sports Equipment Factory is the only domestic enterprise that produces a variety of ice sports equipment, providing a sufficient equipment manufacturing basis for the development of the ice and snow economy in Heilongjiang Province. Fourth, because Heilongjiang Province is a large agricultural province, a large number of idle populations will be produced during the winter slack period. The ice-snow economy can bring northern farmers who are slack in winter agriculture into the economic industry, turning the half-year slack of the agricultural population into effective production throughout the year, and has sufficient labor advantages. During the “14th Five-Year Plan” period, statistics show that the more countries hosting the Winter Olympics, the more skiers, the stronger the attraction of ice and snow tourism. In the post-Winter Olympics era, China will enter a golden development period for the ice and snow industry, and the ice and snow economy will explode. The preparation of the plan during this period is precise to seize the window period before the Beijing Winter Olympics, to seize the trend of the global ice and snow industry’s further eastward shift, and it is aimed at the golden opportunity for the leap-forward development of the ice and snow economy in the post-Winter Olympic era. It complies with the consumption upgrade trend of residents, promotes cooperation in the ice and snow economy on a larger scale, and forms a broad market space for “300 million people participating in ice and snow sports.” This also means that a large number of labs will join in to promote the development of the ice and snow industry.

From a practical point of view, optimizing the development of ice and snow industry resources and enhancing the intrinsic value of ice and snow industry resources provide a theoretical basis for the construction of ice and snow tourist attractions, the construction of ice and snow manufacturing, and the integration and optimization of the ice and snow resource system. It promotes the industrial upgrading and industrial structure optimization of the ice and snow industry in Heilongjiang Province and then promotes the development of the regional economy in Heilongjiang Province, which has extremely important practical significance. In general, its significance has three points, all of which play an important role in Heilongjiang’s economic development and exchange protection. First, the research focus of this article is the optimal utilization of ice and snow resources. Ice and snow resources are both green and recyclable resources as well as advantageous resources in Heilongjiang Province. This research is conducive to enhancing the virtuous circle and sustainable development of Heilongjiang Province’s economy; second, it clarifies the interaction between the ice and snow economy of Heilongjiang Province and the overall economy of Heilongjiang Province through quantitative analysis methods and provides a theoretical basis for the economic status of ice and snow tourism in Heilongjiang Province; and third, by extracting the key factors that affect the ice and snow tourism economy in Heilongjiang Province, it provides a decision-making basis for improving the operating environment of the ice and snow economy in Heilongjiang Province. From a theoretical point of view, the theoretical research on the intrinsic value of special resources such as ice and snow has been realized. First, it broadens the research scope of the ice and snow economic industry resources, comprehensively evaluates the value of the ice and snow industry resources, and explores the process of its formation and realization with innovative research content; second, it deepens the research on the resource value of the ice and snow industry, starting from the analysis of surface problems, digging and exploring the internal laws of the value itself, so as to reach a certain theoretical depth in the research on the inner value of the ice and snow industry resources. These have important theoretical significance for further in-depth exploration of the realization of the resources of the ice and snow industry. During the “Twelfth Five-Year Plan” period, it is necessary to consolidate and expand the results of revitalization, deepen reform and open up, accelerate transformation and development, and promote the sustainable development of resource-based cities. According to the national environment and the characteristics of the Northeast region, the development and utilization of resource-based cities require vigorous development of alternative industries, especially in the northeast region that has sustainable development and certain advantages characteristic industries. The ice and snow sports industry is one of the unique industries in the northeast. At the same time, as the “sunrise industry” in the northeast, it has received attention from many places. Most provinces and cities have vigorously developed the ice and snow sports industry based on their own historical advantages, making the ice and snow sports industry a rapid development and a huge market. Therefore, economic benefits should be taken into account when the industry is adjusted, and efforts should be made to achieve sustainable development while increasing income, without sacrificing the environment. This not only creates a lot of economic benefits but also provides more jobs, which plays an important role in improving people’s livelihood. Therefore, in order to boost the economy and attract foreign investment, various provinces and cities have listed the ice and snow sports industry as one of the important measures for future development. Only by vigorously developing distinctive industries like ice and snow sports can the economic development of the northeast be accelerated, and the relatively backward economic situation can be solved.

At present, many researchers are analyzing and researching the measurement and analysis of the low-carbon effect of industrial structure adjustment, and many scholars have their own methods to achieve it. Based on China’s commitment to emission reduction targets in the Paris Climate Agreement in 2015, Zhang et al. proposed a dynamic factorization model to decompose and compare the impact of industrial structure on carbon emission reduction during the “Fifth Five-Year Plan” period from 2006 to 2030 in the dimensions of industries and sectors. However, the method he proposed did not have a significant positive impact on carbon emission reduction in China’s industrial structure adjustment [1]. Shen et al. pointed out that computers and information technology are considered to be
one of the most powerful engines of modern growth, but more empirical evidence is needed to quantify their impact. He observed the structural changes in the manufacturing industry of the People’s Republic of China by using large-scale enterprise-level data sets, studied the role of computers and information technology in the adjustment of industrial structure, and found that computers and information technology have greatly promoted changes in the industrial structure. At the same time, faster and higher-quality growth of enterprises has been identified as a potential channel through which computer use can improve the industrial structure. Companies that use computers grow faster, spend more on research and development, and enjoy higher productivity. It is just that it depends on the manager’s work experience [2]. Ma et al. said that the adjustment of regional industrial structure has become one of the major projects to transform the mode of economic development. Based on the evaluation and analysis of China’s regional industrial structure, a panel data econometric model is established to explore the impact of taxation arrangements on the regional industrial structure, but the quality of the problem-solving method proposed by him is not high [3]. Yang said that computers and information technology are considered to be one of the most powerful engines of modern growth, but more empirical evidence is needed to quantify their impact. He used large-scale enterprise-level data sets to observe the structural changes in the manufacturing industry of the People’s Republic of China, studied the role of computers and information technology in industrial restructuring, and found that computers and information technology have greatly promoted changes in the industrial structure. But for the entire complex industrial adjustment process, this research is not enough to meet the requirements [4]. Nedeljkovic-Knezevic et al. said that national culture can influence entrepreneurship by creating a specific cultural framework that defines the possibility of identifying opportunities for entrepreneurial activities and their social needs. By measuring the nine GLOBE cultural dimensions of “Kolubara” employees and residents of Lazarevac, the GLOBE (Global Leadership and Organizational Behavior Effectiveness) method is used to investigate the relationship between this organizational culture and national culture. This result is discussed and analyzed in the context of the ongoing economic transformation of many post-socialist economies, but experiments prove that it is not effective [5]. Chernyav’sKa said that the scientific works of well-known scientists at home and abroad fully confirmed the scientific regulations on the management and coordination of structural changes and the reform and reorganization of domestic industrial enterprises. In addition to providing a transformation model aimed at adjusting the sequence of specific reorganization steps of an enterprise, in management theory and practice, many restructuring methods aimed at enterprise development have been developed in recent years. However, there is a certain gap in the theoretical basis for the need to adjust the industrial structure, especially in the metallurgical industry. Scientific research shows that one of the main factors for the development of industrial enterprises is the reduction of resistance to change in industrial enterprises and the implementation of structural adjustment mechanisms. Therefore, there are many ways to implement transformational changes, including the use of tools and methods to organize activities to ensure the optimization of economic activities. The methodological method of implementing industrial enterprise development modeling on the basis of the reorganization provided by the research will improve the competitiveness of steel enterprises, but the data samples he collected are not enough [6]. Geng and Wang said that the industrial structure directly affects the overall allocation of resources and the types and quantities of pollutants and is closely related to the quality of the production and living environment. In order to analyze the quantitative relationship between the industrial structure and the main emissions of environmental pollution, the current situation of environmental pollution in Hubei Province, China, is analyzed, and the comprehensive correlation coefficient between the industrial structure and the environmental pollution emissions is calculated by the gray comprehensive method. However, the results show that his aspect is not effective in practical applications [7].

As an emerging industry, the development of the ice and snow industry should follow the development laws of general industries, and market-oriented operation is the ultimate choice. Through the allocation of ice and snow resources in the market to achieve industrial development, government intervention and participation should be kept to a minimum. However, as an emerging industry, if it wants to speed up development, avoid detours, prevent market regulation from failing, and avoid vicious competition and other inevitable contradictions and problems in the initial stage of industrial development, it must give full play to the government’s macrocontrol functions. In the process of promoting the development of Harbin’s ice and snow industry, the government should pay more attention to macromanagement, implement guidance and planning for the ice and snow sports industry, follow the development model and laws of the market, and, in accordance with laws and regulations, combine economic levers and administrative systems to truly realize functional transformation.

2. Overview of Artificial Intelligence and Ice and Snow Industry and Model Construction

2.1. Artificial Intelligence. Artificial intelligence is an extremely challenging science, and those who do it must understand computer literacy, psychology, and philosophy. Artificial intelligence is a very broad science, which consists of different fields such as machine learning, computer vision, and so on. Judging from the 2019 artificial intelligence industry structure adjustment catalog, promoting the application of artificial intelligence technology and realizing artificial intelligence product manufacturing in various fields are the main trends in the development of China’s artificial intelligence industry in the future [8, 9]. Among the encouraged items directly related to artificial intelligence, there are 10 industrial applications related to artificial intelligence, including smart manufacturing factories, smart voice interaction systems, wearable devices, smart robots, smart
education, smart environmental protection, smart cities, and other application fields. In more than 100 encouraging entries in 23 fields that indirectly mention artificial intelligence technology and products, there are many mentions of intelligent products and technology applications in various industries [10, 11]. With the help of artificial intelligence technology, the ice and snow industry can give tourists a better experience and better manage the ice and snow industry. With the continuous application of artificial intelligence technology in various industries and the continuous landing of intelligent equipment, the overall efficiency of various industries will be greatly improved, and the cost will also decrease, but with that, practitioners will face the dilemma of unemployment [12, 13]. Many aspects of the ice and snow industry can be integrated with artificial intelligence. For example, its ice and snow game project management uses artificial intelligence for supervision and management. The artificial intelligence framework is shown in Figure 1.

2.2. Ice and Snow Industry. The term "industry" is currently a popular vocabulary frequently used in economics circles. The people’s demand for ice and snow sports has increased; the national policy on the development of the ice and snow industry has not changed; and the trend of sustainable and healthy development of the ice and snow industry has not changed. The potential of the Chinese ice and snow industry is still huge and the space is still broad. The industry has its own conceptual expression in different theories: the Physiocratic School is the first school to put forward the term “industry” and specifically refers to agriculture in its theory [14, 15]. The industry has also been interpreted by the Marxist political economy as an industry for the production of material products. This definition is generally accepted by most people and is considered the only definition. In the second half of the twentieth century, more and more nonproductive services and products were produced outside the manufacturing industry, and the definition of the industry was changed. The single definition of material product production no longer applies, so a new definition came into being [16, 17], as shown in Figure 2.

Based on the above definition, this article believes that the ice and snow industry is an industry produced through the development of ice and snow resources and emerges from the discovery of the intrinsic value of ice and snow resources [18, 19]. The ice and snow industry develops the local characteristic economy, which is a new path to optimize the industrial structure of cold cities and a new breakthrough point for reform and innovation in the new century. In a narrow sense, the ice and snow industry is a collection of enterprises that process and integrate ice and snow resources and provide products and services, and it is also a collection or system of enterprises that obtain profits or generate income from ice and snow resources. All in all, the ice and snow industry is a collection of enterprises with ice and snow as the medium [17, 20]. In a broad sense, it is also possible to include a collection of companies that produce products or provide services for the purpose of market consumption related to ice and snow. In short, the ice and snow industry is a collection of enterprises integrating science, culture, practicability, and economy. The ice and snow industry covers not only material production behaviors but also service sports behaviors. Its operation is not only dependent on manual labor but also dependent on complex mental labor. From the perspective of the labor situation, it is the product of the continuous evolution of the industrial model, representing a new type of industrial model, with the characteristics of intersectionality, systematization, and integration [21, 22]. The ice and snow industry is an industry with regional characteristics formed around the development of ice and snow resources, and it is a new entry point for the economic development and innovation of ice and snow cities. Therefore, the research on the ice and snow industry should be a combination of natural science and social science, as shown in Figure 3.

2.3. Industry Chain. The industrial chain is a concept involving a wide range of fields. At present, the academic circle does not have a strict and unified understanding of the concept and meaning of the industrial chain. The reason is the different perspectives on the understanding of the industrial chain [23, 24]. This article believes that the industry chain should be explained from the perspective of core competitiveness, that is, the industry chain is a competitive industry that can take a certain region with a good market prospect, high technology content, and strong industrial relevance as the core. Through the provision of resources, technical support, and social connections, these core industries are formed into a chain industrial organization system based on their upstream and downstream, demand structure, and overall layout relationships [25, 26].

The industrial chain has the following four characteristics. The structure of the industrial chain, which is fully described by these four characteristics, has a complementary role: first, the industrial chain expresses the division of upstream and downstream among industries; second, what the industrial chain expresses is the interdependence between various industries; third, the industrial chain can indicate the technological level of the industry; and fourth, the industrial chain can indicate the degree of social demand for the industry [27, 28]. The main body of the industrial chain is each production unit or enterprise, which establishes the linkages between industries through division of labor and cooperation. The industrial chain connects closely related companies that produce different types of products by controlling information exchange, product exchange, and capital exchange. The industrial chain has changed the single operation mode of enterprises and is the extension and expansion of the globalization of the information economy in the field of production [29]. It is a process that results from value creation and reaches customer needs directly, as shown in Figure 4.

2.4. Reasonable Planning of the Areas Involved in the Development of the Ice and Snow Industry. Industrial layout refers to the economic phenomenon of the spatial distribution and
A combination of industries within a country or region. The upgrading of the industrial layout is to focus on the factors that affect the industrial layout, from the perspectives of resources, market, manpower, industrial linkage, external economic scale, government intervention, and so on, so as to achieve the optimal layout of this type of industry. After decades of development, the Harbin ice and snow cultural industry has already possessed a certain scale and influence. However, with the changes in the international economic environment and the rapid development of the domestic economy and society, the potential of the ice and snow industry needs to be further tapped. The current industrial...
layout can no longer meet the development needs of the new period, and the government urgently needs to upgrade the industrial layout in an all-round way to form a new industrial layout suitable for regional economic development. Through the optimization of the layout of the ice and snow industry, an ice and snow cultural industry park with concentrated industries and unified operation shall be formed, and it shall strive to become a national-level cultural industry demonstration park by the Ministry of Culture. The ice and snow industry involves many types, and the equipment required is also different, as shown in Figure 5.

2.5. Industrial Chain of the Ice and Snow Industry in Heilongjiang Province. The ice and snow economic industry is an economic complex, with ice and snow tourism as the core, and other related industries closely surrounding the ice and snow tourism industry, forming a large-scale industrial chain. The content of the ice and snow economy industry includes ice and snow tourism, ice and snow equipment manufacturing, ice and snow sports, ice and snow entertainment, and other industries. The terminal of the ice and snow economic industry chain is in ice and snow tourism products and services, through which to meet the needs of different consumers of various types and levels so that the ice and snow industry can obtain economic profits. The ice and snow economy industry integrates its related departments into a dynamic link through the division of labor between different departments in the industry. Therefore, the particularity of the ice and snow industry makes the ice and snow industry chain more complicated than the traditional industry chain, as shown in Figure 6.

2.6. Model Construction. The optimization of the industrial structure based on low-carbon constraints is to achieve the purpose of economic growth under certain specific conditions. This method is often used when calculating industrial economy in the process of industrial structure adjustment. Therefore, the objective function is economic growth, and carbon emissions are regarded as constraints. At the same time, combined with the actual situation, the total economic growth, full employment, and industry added value are also used as constraints to construct a linear programming model. The construction of the linear programming model should follow the principle of seeking truth from facts, and the constraints should be considered in the calculation.

2.6.1. Decision Variables. The decision variable $x_i$ ($i = 1, 2, \ldots, 26$) is the industry added value of the 26 subsectors under the manufacturing industry in Zhejiang Province.

2.6.2. Objective Function. In order to achieve economic growth, the objective function is set as follows:
where \( x_i \) represents the industry value added during the forecast period of the \( i \) industry.

### 2.6.3. Restrictions

**Total carbon emissions constraints:**

\[
\sum_{i=1}^{26} x_{it} \leq C_t, \tag{2}
\]

where \( C_t \) represents the total carbon emission limit; \( c_i \) represents the carbon emission intensity of each industry, which has been calculated from the above calculation; and \( x_{it} \) represents the industry added value during the forecast period of the \( i \) industry.

**Constraints on total economic growth of the manufacturing industry:**

\[
\text{Max} \sum_{i=1}^{26} x_{it}, \tag{1}
\]

\[
W_l \leq \sum_{i=1}^{26} x_{it} \leq W_h, \tag{3}
\]

where \( W_l \) represents the lowest value of economic growth expectations, \( W_h \) represents the highest value of economic growth expectations, and \( x_i \) represents the industry added value during the forecast period of the \( i \) industry.

**Constraints on total employment:**

\[
L_l \leq \sum_{i=1}^{26} l_i x_{it}, \tag{4}
\]

where \( L_l \) represents the expected minimum value of the number of employed population, \( l_i \) represents the number of employees with the added value of each industry unit, and \( x_i \) represents the industry added value of the \( i \) industry during the forecast period.
2.7. Industry Size Constraints

\[ xl \leq xi \leq xh, \]  

(5)

where \( xl \) represents the expected minimum value of the added value of each industry, and the minimum value is greater than or equal to 0; \( xh \) represents the expected maximum value of the added value of each industry; and \( x_0 \) represents the industry added value of the \( i \) industry during the forecast period. The model takes 2012 as the base period for the study and takes 2016, the year of the carbon emission reduction target committed by the Chinese government at the Copenhagen World Climate Conference, as the forecast period.

Calculate the direct carbon emission factor \( R \) as follows:

\[ R = \sum_{j} e_j, \]

(6)

where \( e \) is the production capacity value of the industry, \( E \) is the energy loss value of the industry, \( X \) means the capital input value, and \( f \) is the carbon emission coefficient value of the industry.

\[ f_j = \sum_{k=1}^{m} \theta_k a_{kj}, \]

(7)

where \( \theta_k \) represents the carbon emission coefficient of the energy variety and \( a \) represents the proportion of the \( k \)-th energy consumption in the total energy consumption of the \( j \) industry.

Calculate the direct consumption coefficient \( a \) as follows:

\[ a_{kj} = \frac{x_{ij}}{x_j} \quad (i, j = 1, 2, \ldots, n), \]

(8)

where \( a \) represents the total input of the \( j \)-th product or industry sector and \( x \) represents the value of the goods or services of the \( i \)-th product sector directly consumed in the production and operation of the product or industrial sector. Input-output analysis is a common method used to calculate implied carbon emissions in recent years. Input-output tables are compiled through economic statistics, and corresponding mathematical models are established by mathematical methods such as linear algebra to reflect the relationship between various departments in the economic system.

Calculate the complete consumption factor \( b \). \( b \) represents the sum of the direct consumption and indirect consumption of the goods or services of the \( i \)-th product sector when the \( j \)th product department provides a unit for final use.

The matrices \( A \) and \( B \) satisfy the following relationship:

\[ B = (I - A)^{-1} - I. \]

(9)

Calculate the department’s complete carbon dioxide emission coefficient \( T \) as follows:

\[ T = R_j + F_j, \]

(10)

where \( R \) represents the carbon dioxide emission factor for direct energy consumption of the sector.

\[ F_j = \sum_{i=1}^{n} R_i b. \]

(11)

When deriving the complete carbon emission coefficient \( T \) of each department, the carbon emissions generated during the export or import process can be calculated according to the import and export volume of Heilongjiang Province. The results at this time are easily affected by the choice of the carbon emission factor and may deviate from the actual value.

\[ M = T \ast Y, \]

(12)

where \( Y \) represents the amount of exports or imports and \( M \) represents the amount of embodied carbon emissions generated during exports or imports.

The advantage of the entropy method is that even if there are many pollution indicators, they can be combined into one undesired output indicator through this method. The specific calculation method is as follows:

Index standardization:

\[ y = x_{ij} \sum_{i=1}^{m} x_{ij}, \]

(13)

where \( y \) is a standardized index.

Calculate the entropy value of the \( j \)-th pollution index as follows:

\[ f_j = -(1/mn) \sum_{i=1}^{m} x_{ij} \ln y. \]

(14)

Calculate the difference coefficient of the \( j \)-th pollution index as follows:

\[ g_j = 1 - f_j. \]

(15)

Calculate the weight of the \( j \)-th pollution index as follows:

\[ w_j = \sum_{j=1}^{m} g_j. \]

(16)

Get the value of the environmental pollution index for the \( i \)-th year as follows:

\[ L_i = \sum_{j=1}^{m} y_{ij} w_j. \]

(17)

The quality of industrial structure adjustment can be understood as: the transfer of resource elements from low-efficiency industries to high-efficiency industries, which promotes an increase in the proportion of high-efficiency industries and ultimately increases the productivity of each industrial sector. It is represented by the symbol \( \text{StrH} \), and its calculation formula is

\[ \text{StrH}_{it} = \sum_{j=1}^{l} (S_{ij} \cdot F_{ij}), \]

(18)

\[ S_{ij} \cdot F_{ij} = \sum_{j=1}^{n} W_{iyj} y_j + \beta x_{ij}, \]
where $i$, $j$, and $t$ represent province, city, industry, and time, respectively; $J$ is the total number of industries; $S$ is the proportion of the added value of the $j$ industry in province $i$ to the total value added of all industries at time $t$; and $F$ is the labor productivity of industry $j$ in province $i$. Calculate the proportion of industries with high labor productivity in the total industry. The greater the proportion, the greater the $StrH$.

3. The Structure Adjustment Experiment and Result of the Ice and Snow Industry

3.1. Methods. Literature analysis method: collect comprehensive literature data and information analysis data on the basis of existing research to process and sort and analyze the problems existing in the ice and snow tourism economy in Heilongjiang Province. System analysis method: the ice and snow tourism economy in Heilongjiang Province is a complex system involving the economy, society, culture, and environment. This study applies the system analysis method to grasp the context of the ice and snow economy in Heilongjiang Province as a whole. The method of combining quantitative analysis and qualitative analysis: qualitative analysis is carried out based on the theory of industrial relevance to provide a theoretical basis for quantitative analysis, calculate the correlation coefficient of the ice and snow economy-related industries, and analyze the driving effect of the ice and snow economy through the input-output method, which is a quantitative analysis.

3.2. Experimental Results. According to the transformation coefficient of the ice and snow industry structure, the larger the transformation coefficient of the ice and snow industry structure, the greater the degree of the transformation of the ice and snow industry structure. The structural transformation of the ice and snow industry in Heilongjiang Province was the largest from 2000 to 2005. The analysis of the evolutionary trajectory of the ice and snow industry structure in Henan Province shows that during the Eighth Five-Year Plan period, the three-industry structure of Heilongjiang Province has undergone major changes. The transformation of the industrial structure from 2015 to 2020 has the highest contribution to economic growth at 15.8%, which is nearly two percentage points higher than that during the Tenth Five-Year Plan period. The greater the contribution of industrial structure transformation to economic growth, the greater the role of industrial structure transformation in economic growth, and the adjustment of the industrial structure during the Eleventh Five-Year Plan period will play the greatest role in promoting economic growth. From 1996 to 2020, the contribution of industrial structure transformation to economic growth shows a wave-shaped growth trend. As shown in Table 1.

And by comparing the change trajectory of the industrial structure transformation coefficient and GDP growth rate in Heilongjiang Province, it is found that the direction of the two changes is basically the same. When the industrial structure transformation coefficient increases, the GDP growth rate also increases. Since the contribution of the transformation of the industrial structure to economic growth in each time interval is positive, it shows that the deforestation of industrial structure adjustment in Heilongjiang Province has played a role in promoting economic growth, as shown in Figure 7.

Select the total energy consumption of Heilongjiang Province from 1996 to 2020 and the actual GDP value of Heilongjiang Province converted from the base period of 1988 and calculate the amount of 10,000 tons of standard coal consumed per 100 million total social output value, which is called Heilongjiang Province’s energy consumption intensity. Calculate the reduction rate of energy consumption intensity in Heilongjiang Province in the five time intervals of 1997–2000, 2000–2005, 2005–2010, 2010–2015, and 2015–2020, respectively, by calculating the reduction rate of energy consumption intensity in Heilongjiang Province and the industrial structure transformation coefficient. The ratio of $a$ is the contribution of each degree of industrial structure transformation to energy saving and consumption reduction in the interval, as shown in Table 2.

From 1996 to 2020, the energy consumption intensity of Heilongjiang Province has gradually declined, indicating that the energy utilization efficiency of Heilongjiang Province has gradually improved. However, from the perspective of total energy consumption and energy consumption intensity, Heilongjiang Province is in the upper-middle level of the country. From the perspective of the contribution of the transformation of the ice and snow industry in Heilongjiang Province to energy conservation and consumption reduction, the impact of each degree of industrial structure adjustment on energy conservation and consumption reduction has shown a wave-like unstable state and even has a negative value during the Tenth Five-Year Plan. The increase in energy volume offsets the influence of the transformation of industrial structure on energy saving and consumption reduction, making it negative. Energy conservation and consumption reduction in Heilongjiang Province mainly rely on technological progress, and the structural effect has not been fully exerted, as shown in Table 3.

The emission coefficients of wastewater, waste gas, and solid waste in Heilongjiang Province have generally shown a downward trend year by year. It shows that with the development of the economy, the waste that needs to be discharged into the environment to obtain unit industrial production value is gradually reduced, and the reduction range is very large. The contribution of each degree of structural change to the control of wastewater discharge decreased after the Eighth Five-Year Plan period and then increased year by year, indicating that the transformation of the industrial structure had a relatively large impact on the reduction of wastewater discharge. The contribution of each degree of structural change to the control of exhaust emissions increased from a negative value year by year, then suddenly dropped to 0.08 during the Tenth Five-Year Plan, and then rose to 3.48 during the Eleventh Five-Year Plan. It shows that the influence of industrial structure adjustment on the reduction of exhaust gas emissions is unstable, but the
change from negative to positive value also shows that the adjustment of industrial structure has gradually had a beneficial effect on reducing exhaust gas emissions. The contribution of each degree of structural change to the reduction of waste residue emissions has decreased year by year, which also reflects the continuous high growth of the ice and snow industry in the three industries in Heilongjiang Province. The transformation of the industrial structure is not strong enough, and the impact of the transformation of the industrial structure on the reduction of waste residue emissions is getting lower and lower. During the Eleventh Five-Year Plan period, the contribution of each degree of structural change to the reduction of waste slag emissions increased rapidly to 12.24%, which is closely related to the country’s proposed series of energy-saving and emission-reduction measures and the delineation of rigid indicators for each province. In response to the national call, Heilongjiang Province has adopted more effective measures to speed up the closure and elimination of a number of enterprises with backward technology, high energy consumption, and large pollution. The environmental protection situation has been significantly improved, as shown in Table 4.

The consumption power of the residents in the ice and snow sports industry in the province has increased from September to November 2014. Among the per capita disposable incomes of all parts of China, except for Beijing, Shanghai, Zhejiang, Guangdong, Tianjin and other developed areas, the per capita income level is relatively high. The disposable income of other cities and regions is about
600–700 yuan, and there are enough consumer groups in all regions, and if the development is reasonable, it should be able to meet the consumption needs. The per capita consumption expenditure of urban residents was 11,679.04 yuan, an increase of 7.0%, and the average monthly disposable income was 1,286.7 yuan. Therefore, it can be seen that the living standards of residents in Heilongjiang Province have been continuously improved, so how to allow residents to transfer their consumption to the ice and snow sports industry is particularly important, as shown in Figure 8.

The ice and snow industry has fully explored ice and snow resources, and Heilongjiang Province has gradually increased its popularity by using its own resource advantages. This has enabled the ice and snow industry in Heilongjiang Province to obtain a large number of external investment and financial support, and the ice and snow industry has been greatly developed. At the same time, the ice and snow industry has also brought huge economic profits to Heilongjiang Province. Every year, the number of people directly involved in the ice and snow tourism industry in Heilongjiang Province is as high as 50,000. In terms of the number of tourists, the total number of tourists in Heilongjiang Province in 2020 was 300 million, and the number of ice and snow tourists accounted for more than 50% of the total, as shown in Figure 9.

In terms of the total amount, from 2015 to 2019, the total carbon emissions increased from 96.0435 million tons to 13.0923 million tons. The total carbon emissions increased by 116.72%, with an average annual growth rate of 8.35%. The increase in 2005 was larger, reaching 25.16% in 2015. After the year, the growth rate of total carbon emissions has decreased year by year, and by 2020, there will be negative growth, as shown in Figure 10.

### 4. Discussion

From the experimental data results, as artificial intelligence has joined the structural adjustment of the ice and snow industry, the economic benefits of the entire ice and snow industry have been greatly improved, and environmental issues such as carbon emissions have also been greatly improved. Take the 2020 Heilongjiang International Ski Festival as an example. In the first month of its opening, the number of tourists received by various snow places in the province increased by nearly 30% year on year, and the ski tourism revenue alone exceeded 4 billion yuan during this period. Taking the situation of the Spring Festival Golden Week as an example, it shows that the tourism market in Heilongjiang Province is developing well. The economic development of Heilongjiang Province also pays more and more attention to environmental protection. At the same time, among many energy sources, the combustion and use of raw coal have the largest contribution to carbon emissions, and its fluctuating trend is basically the same as the total carbon emissions, followed by crude oil, and the other energy sources have the same contribution to carbon emissions. To reduce the total amount of carbon dioxide emissions in Heilongjiang Province, the most effective way is
to reduce the amount of raw coal used in production and daily life and make good use of artificial intelligence technology to control and manage carbon emissions.

5. Conclusions

In the process of structural transformation of the ice and snow industry, energy is an essential element for industrial development. To solve the contradiction between energy supply and demand, on the one hand, clean energy can be used to replace disposable energy, and on the other hand, the problem between industrial development and energy can be solved by improving energy utilization efficiency. In order to improve the efficiency of industrial energy utilization, Heilongjiang Province can rely on high-tech development zones to increase investment in scientific research,
vigorously cultivate a group of professional talents, improve independent innovation capabilities, use advanced technology to rectify industries with high energy consumption and low energy utilization, increase energy utilization efficiency, and promote carbon dioxide emissions reduction. The adjustment of industrial structure has an important impact on economic growth, population employment, energy conservation and consumption reduction, and environmental protection, which in turn affects the sustainable development of economic subsystems, social subsystems, energy subsystems, and environmental subsystems. The experimental data results show that the impact of industrial structure adjustment on reducing exhaust emissions is unstable, but the change from negative to positive also shows that the adjustment of industrial structure has gradually had a beneficial effect on reducing exhaust emissions. The contribution to the reduction of waste residue emissions has been decreasing year by year, and the impact of the transformation of industrial structure on the reduction of waste residue emissions is getting lower and lower. Therefore, artificial intelligence-based structural adjustment of the ice and snow industry can better effectively control carbon emissions.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Authors’ Contributions

Weibo Sun and Hongbo Du contributed equally to this work.

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