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Introducing Artificial/Computational Intelligence-Derived Non-Parametric Transfer Functions for the Implementation of Dynamic Circular Economy Decision-Making Systems

Minghua Yu [1,2,*] and Junjun Zheng [1]

1 School of Economics and Management, Wuhan University, Wuhan 430000, China
2 State Grid Electric Power Research Institute, Wuhan Nanrui Co., Ltd., Wuhan 430000, China
* Correspondence: 2018101050061@whu.edu.cn

Abstract: With the development of science and technology, resource consumption has increasingly become a social problem. The circular economy is an economic form of a comprehensive utilization of resources. At present, China's circular economy industry has begun to develop towards intensification, scale and specialization. With the deepening of research on the value of a comprehensive utilization of resources, the traditional economic field has undergone tremendous changes. According to the current situation of circular economy industry, an intelligent decision-making system is designed using artificial intelligence technology. Empirically, using the circular economy model and combining the sequence parameters to determine the sequence parameter indicators of the scientific and technological innovation subsystem and the energy saving and emission reduction subsystem, the correlation analysis of each indicator is carried out, and the order degree of the two subsystems is obtained respectively, so as to obtain for the enterprise the degree of synergy of the evolution system of the circular economy synergy of industries and industrial clusters. After repeated exploratory tests, it is found that the calculation has achieved over 98% of the precision of an astute direction, and has specific use and value because of the enormous number of preparing modes and trial dependability. Making a specific commitment to the circular economy is a trusted and logical solution.

Keywords: circular economy; open dynamics; input-output; intelligent decision-making; sequential parameter method and intelligent decision-making method; deep learning

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1. Introduction

With the development of science and technology and the change of life style, human society has had great problems in terms of resources and environment. A large number of examples in developed countries illustrate the seriousness of this problem. The circular economy is best articulated as the circular asset economy. It is a financial progress model portrayed by asset preservation, conservation, and recycling and climate-friendly. The accent is put on sorting out monetary exercises into a criticism interaction of "assets items sustainable assets". It is characterised as low double-dealing, high use and low impact. All materials and energy can be sensibly and forever used in this continuous financial cycle to diminish the effect of monetary impacts on the natural environment to the smallest possible degree. The accumulation of a large mount of waste has caused serious damage to the earth's environment and its population. The circular economy is mainly composed of four systems: recycling, information transmission, infrastructure construction, and waste management. Among them, the recycling system is the core of the circular economy industry. In the circular economy, material and energy production efficiency is low. Its main feature is that there are many waste resources (such as metals, ores, waste plastics, building materials, garbage, etc.) in the production process of products. However, because these resources are renewable materials, they will not cause environmental pollution, so they do not need to be treated via industrial processing (such as incineration or chemical treatment). In the regeneration process, if there is no sufficiently high intensity treatment measures or no good management mechanism, the product will be lost or replaced by other substances. The fact that such resources are not recycled has caused huge damage and impact on the environment, and has also become a long-standing contradiction between sustainable development and environmental protection. China's economy has developed rapidly since the reform and opening up, but the lack of awareness of resource protection has led to the sustained and rapid development of China's economy although resources are not effectively used or even wasted. Therefore, the circular economy has been gradually popularized and applied on a large scale in China. How to reduce the impact of waste on the environment, make effective use of resources, and realize the coordinated development of economic environment and ecological environment are urgent problems to be solved in the current circular economy.

In ongoing research on the circular economy, Wen Subin believes that natural resources and the environment are essential for high-quality economic growth. The rapid development of traditional industrial economic models has greatly affected the sustainability of resources and the environment and the sustainable development of the economy. Therefore, in a circular economy, investment must be made, and projects are indispensable. Traditional project decision-making methods do not consider resource and environmental constraints. This does not help implement sustainable development strategies and make project decisions and requirements based on the requirements of circular economy to provide a reference for similar decisions. However, pursuing the protection of natural resources and the environment will inevitably delay economic development. He did not explain how to balance the relationship between these two [1]. Yu Erdong accepts that as indicated by the circular economy model, natural variables are utilized as a significant reason for overseeing organization esteem and deciding the successful execution of the circular economy esteem chain. According to the point of view of the circular economy esteem chain, he utilizes the information yield technique and the movement-based estimation strategy to gauge the natural expense of the organization according to the two viewpoints of the inside esteem chain and the outside esteem chain. For instance, numerous plants are profiting from it. For the situation study, he assesses the estimation strategies and models and reports the estimation and control of the assembling organization's ecological expenses [2]. Zhi Lei believes that the depletion of agricultural resources in Jiangxi Province has problems such as high emissions and serious environmental damage, which will not help the sustainable development of resource-based villages in the new era. He analyzed the development status of resource-based villages in Jiangxi Province and found that Jiangxi is restricting Jiangxi. The construction of resource-saving villages has an adverse impact on the sustainable development of existing resources. A large number of talents have been introduced into the countryside, with the goal of effectively ensuring the sustainable development of resource-based villages in Jiangxi. However, the development of rural areas is still slow, and the solution needs to be further studied [3].

In light of the financial matters and biological speculations connected with the circular economy, as well as related research at home and abroad, this exploration examines the turn of events, firstly, the model of the circular economy, and dissects the progressions of the macroeconomic business chain under the circular economy model. He stringently characterizes the important ideas in the circular economy, and on this premise characterizes the extent of this article, or at least, the recycling system of assets in the circular economy is the key object of examination. Secondly, it discusses the classification of resources in the circular economy, puts forward the classification of resources in the circular process, and uses a large number of circular economy practice cases to verify the resource circular path proposed in this study. He uses this as the basis and foundation for the construction of a circular economy input-output model. Thirdly, on the basis of analyzing the advantages and feasibility of the input-output technology research of the circular economy, the input-output table and model of circular economy are constructed [4]. The construction of relevant evaluation indicators has been theoretically discussed. To a certain extent, this research has opened up many new ideas and specific methods for theoretical analysis, and applied quantitative research to circular economy [5,6].

2. Intelligent Decision-Making Methods for Circular Economy

2.1. Theoretical Research on Foreign Circular Economy

The main characteristics of foreign circular economy research include three points: First, the extensive skills of research participants. In every country, there are companies participating in the circular economy. The major motivation behind the circular economy is to diminish the contribution of assets however much as could reasonably be expected in the monetary cycle, and to avoid and lessen squander deliberately. The reusing of waste just lessens the last treatment limit of waste. The significance of the standards of "decrease, reuse and reusing" and "3R" in the circular economy is not compared, yet they are in a logical request. Decrease has a place with the information end and expects to reduce the number of materials entering the creation and utilization process; Reuse is an interaction aimed at drawing out the period of items and administrations; Reusing has a place with the result end, targeting reusing waste to diminish the last treatment limit. The need for waste treatment is: keep away from creation by reusing the last removal. This means that we, first of all, ought to give full thought to saving our assets, further developing the pace of use of assets for unit items, and forestalling and lessening the age of waste at the wellspring of creation input; In addition, the poisons that cannot be eliminated and the bundling of waste and second-hand products utilized by purchasers are reused to make them return to the monetary cycle. Just when the aversion and reusing cannot be acknowledged can the last waste be treated in an ecologically coherent manner. The most significant standard of the coordination among climate and economic progress is to accomplish a subjective jump from end treatment to source control, from squander usage to squander decrease, and to generally diminish the utilization of normal assets, in this manner lessening the contamination of the natural burden. They keep on further developing item creation processes according to ecological insurance prerequisites, endeavor to accomplish cleaner creation and natural security plans, and accomplish a progression of reuse, reusing and decrease in materials inside and between organizations. Commonsense experience, and a few legislatures have prepared and worked on the political framework for executing a circular economy through regulation, organization, effort, and management [7,8], through the assessment of product life cycle and thermodynamic methods, input and output, and environmentally friendly accounting and environmental systems. Kuz et al. have carried out various theoretical analysis methods, such as network curves, decoupling assessment models, and ecological footprints, Third, the completeness of the research level. That is to say, for small-scale research (based on the internal material recycling method of a single company), the average recovery rate (based on the economic method of material recycling between companies working together), and large-scale recycling (based on economic methods) must also pay close attention to recycling and utilization of the entire society. Table 1 shows the comparison between the circular economy and the traditional economy [9,10].

Table 1. Comparison between traditional economy and circular economy.

Serial Number	Circular Economy	Traditional Economy
1	Resources-Production-Circulation-Consumption-Renewable Resources	Resources-Production-Circulation-Consumption-Waste Discharge
2	Closed-loop feedback process	One-way linear economy
3	High proportion of resource reuse	Economic growth depends on high-intensity development and resource consumption
4	Less damage to the ecological environment	Destroy the ecological environment with high intensity
5	Low mining, low consumption, low emission, high utilization	High mining, high consumption, high emission, low utilization

In the economic growth model, the integration of material circulation as an endogenous variable changes the economic behavior of economic units and lays the foundation for the circular economy. In order to develop the circular economy, it is also necessary to study the relationship between different production sectors in the circular economy and the production balance. Exchange and distribution between consumer sectors is the law of operation of material flow and energy flow. How does the value-added economy in the macroeconomic system affect economic growth? Many Western scientists try to incorporate the recycling of materials into the macrodynamics research framework. Some raw materials and recycled materials that have not yet entered the state of capital accumulation are accumulated in the form of waste after consumption. Wastes are recyclable raw materials. Together with the raw materials, they become input sources and jointly generate intermediate inputs. The model shows that if the waste is deemed useful, the waste inventory will be one of the sources of profit, and the company will seek to reuse and recycle the waste. Waste inventory tends to decrease over time, and recyclable waste gradually becomes a scarce resource [11,12]. Even if there are no relevant environmental regulations, it is not economically feasible to include it in the waste list without recycling. Economists will choose to recycle waste to maintain long-term economic growth.

2.2. Insufficiency of Existing Research

Based on the research situation at home and abroad, current domestic research on the circular economy is mainly manifested in the following four points:

(1) Although most of the research involves the definition of the related concepts of circular economy and the discussion of development principles and methods, the real systematic analysis of the development model of circular economy is not in-depth and comprehensive. The circular economy changes the macroeconomic industry chain. It is also the basic element and starting point of the circular economy from the macroeconomic analysis. However, the existing research has almost no analysis from this angle, which makes the relevant research lack the necessary theoretical basis and reasonable analysis angle [13]. Therefore, it is difficult to have a more systematic and complete description of the theory of circular economy.

(2) The quantitative research of the domestic circular economy started late. So far, most of the quantitative research of circular economy is mainly related to the evaluation of circular economy, but it still stays as a conceptual description, and the relevant evaluation index system refined by it is also mostly indicators. The qualitative description is mainly. For more in-depth research on circular economy theory, there is no unified and recognized entry point and breakthrough point. We have discovered and confirmed some valuable conclusions from empirical studies abroad. The processing methods of by-products and co-products also provide a reference method for the processing of recycling resources in the circular economy. However, whether it is an environmental protection input-output model or a waste input-output model, as well as table-based by-products and co-products processing methods, there is a fatal shortcoming when analyzing circular economy problems, that is, the existing methods and models are all theoretical Only a one-way description of the material flow process can be done, but the description of the material flow cyclic flow process cannot be done, and this is the most critical content of the circular economy model. For example, the two processes of recycling and recycling of waste in the circular economy model are the key links that lead to the circulation of material flow, but even if it is a theoretical analysis or model, there is almost nothing that can be involved in existing research [14,15]. In fact, the material circulation process in the circular economy is very clear and obvious, and it can also be described and refined.

(3) Current research on the circular economy is essentially carried out on three levels, namely the micro-enterprise level, the meso-regional level, and the macro-national and social level. Existing studies have analyzed the specific implementation conditions and priorities of the corporate circular economy; a large number of empirical

studies have been conducted on waste management and resource recycling at the regional level, especially in Japan, with detailed statistics and empirical research on resource recycling [16,17]. However, domestic and foreign research on the macro-level circular economy research is very limited. Theoretical research is limited to the discussion of development models, the concept and principle of circular economy; empirical research is also limited to the calculation of a certain sustainable development indicator in individual developed countries. In addition, due to statistical data, the comprehensive calculation of circular economy or sustainable development at the national level cannot so far be carried out.

(4) The circular economy is considered to be an important way to achieve sustainable development, but the discussion on the feasibility of the circular economy to achieve sustainable development is rarely involved [18]. Compared with the theory of sustainable development, the theoretical research of the circular economy is very inadequate. More importantly, the existing theoretical research of circular economy has seldom been analyzed from the perspective of achieving sustainable development. Therefore, this has caused the theoretical natureof circular economy and sustainable development research. There is a certain degree of disconnection in development-related theories.

3. Input-Output Intelligent Decision-Making Correlation Experiment

3.1. Random Forest Algorithm

In random forest, each classification and regression tree has a set of independent TS samples. These samples are composed of alternative samples S, which correspond to the number of samples received by the bagging algorithm from the total sample S. The algorithm uses each TS to train and learn the sorting and regression tree to build each classifier, each internal node the branch of is realized by randomly selecting many attribute values according to the theory of random subspace and finally forming classification or regression rules to form a function [19,20]. This paper selects a county of a city in China. The Gini coefficient can be used to sort the tree, and the least square deviation can be used in the regression tree [21,22]. The specific calculation is as follows:

$$Gini(t) = 1 - \sum_{j} p^2(j/t) \tag{1}$$

In the formula: t is the branch attribute of the current node; p represents the proportion of the target category j appearing in the node t. The *Gini* standard definition of node t divided by attribute value s is [23,24]:

$$Gini(s,t) = p_l Gini(t) + P_r Gini(t) \tag{2}$$

The division standard is to make *Gini* the smallest. Least squares deviations are mostly used to measure regression trees, and the fitting error formula for node t is:

$$Err(t) = \frac{1}{n} \sum_{d} (y-k)^2 \tag{3}$$

where n is the number of instances in node t; k is the average value of the target value of instances in each node:

$$k_t = \frac{1}{n} \sum_{d_i} y_i \tag{4}$$

The least square deviation standard of node t divided by attribute value s is defined as [25,26]:

$$Err(s,t) = \frac{n}{n_t} Err(t) + \frac{n}{n_r} Err(r) \tag{5}$$

In order to simplify the calculation process in the computer and avoid traversing the attribute value multiple times, the Formula (5) is simplified to obtain:

$$Err(s,t) = \frac{S^2}{n_l} + \frac{S_r}{n_r} \tag{6}$$

In the formula, the S division standard is to maximize the Formula (6) [27].

3.2. Input and Output of Physical Circular Economy

In the production and consumption process, natural resources require a certain amount of input, and the consumption process requires product input in the production process. A large amount of waste is processed in production and consumption. In addition to the production and consumption process, the process of waste recycling, waste regeneration and waste reuse also generates and disposes of waste eventually. The above process is represented by a solid line in the figure, which represents a circular economy. The process of resource utilization in the development model is consistent with the process of traditional economic development, that is, the one-way resource utilization process, as shown in Figure 1.

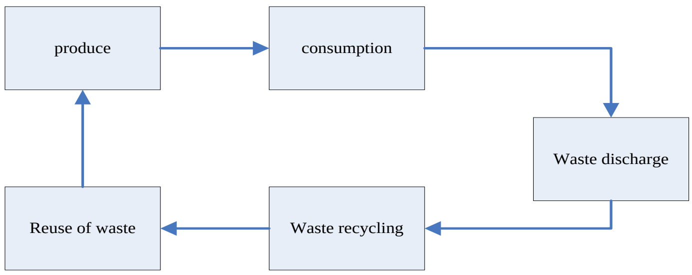


Figure 1. Schematic diagram of the development model of circular economy.

It includes products, labor, waste, recycled resources, and garbage from traditional production processes. Because the units of various material resources are inconsistent, it can only be aggregated for the row-wise output of the circular economy input-output table [28]. Based on this, this study lists the row balance relationship of each department in the circular economy input-output table, and lists the corresponding row balance equation based on the row balance relationship of each department. The line balance relationship of the production department is shown in Formula (7).

$$\sum_{j=1}^{n} x^p + \sum_{j=1}^{n} x_i{}^c = x_i^p \tag{7}$$

That is, the total output of the production process, the products produced by the production department, the products of the department consumed by the resident's consumption process, the products produced by the production department, and the line balance relationship of the consumption department, as shown in Formula (8).

$$\sum_{j=1}^{n} x_j^p + x^c = X^v \tag{8}$$

The total output of the consumer sector is the sum of valuable labor provided by humans, which mainly includes labor provided for each production process and services provided for the consumption process. Therefore, the total output of the consumption process, the labor and services consumed in the production process of the production sector, reuse the line balance relationship of the sector, as shown in Formula (9).

$$\sum_{j=1}^{n} x_i^u + Y_i^u = X_i^t \tag{9}$$

The line balance relationship of the reusable waste recycling department is shown in Formula (10).

$$\sum_{j=1}^{k} x_{ij}^r + Y_i^r + x^r = X_j^r \tag{10}$$

The consumption of reusable waste by the final demand department is mainly the direct transfer of the directly reusable waste through import and export without going through the recycling department. The line balance relationship of the recycling department of recyclable waste is shown in Formula (11).

$$\sum_{j=1}^{l} x_{ij}^{rt} = Y_i^{ri} - X^{ri} \tag{11}$$

The direct consumption coefficient refers to the direct consumption of products of related departments when a certain department produces a unit product. The general definition of direct consumption coefficient represents the direct consumption of the products of the first department by the production unit of the first department, which is called the direct consumption coefficient of the products of the first department by the first department.

$$a_{ij} = x_{ij} / X_j \tag{12}$$

In the circular economy input-output table, by dividing the production department, waste discharge department, waste recycling department, waste recycling department, and waste recycling department, the entire process of resource recycling can be included in the input through the calculation of the model. In the output and model, we can clearly understand the consumption of various products and resources in the production or consumption process of each department. One can also learn more about the types and quantities of recycled resources (reuse resources and renewable resources). In traditional input and output, only the total consumption of all resources can be estimated, which mixes the recycled resources used in the total consumption of all resources without distinction.

By using deep learning, we can train the data and then get the model. Deep learning can achieve different goals through different learning methods. We divide the data into three parts, namely the data body part, the model part and the model training part. The main part of the data constitute the source of the model training data, and the model training data are effectively controlled in the model data; The model will influence and predict the model according to the hidden variables in the data of the model.

4. Open Dynamic System Based on Circular Economy

4.1. Comparative Analysis of the Evolution of Input and Output of the Circular Economy

Foreign practical experience has shown that in the early stage of the development of the circular economy, financial support methods were basically promoted by the government. The government adopted legislation, fiscal and taxation methods, and comprehensively used various regulatory methods, plus the environmental protection of the public. Knowledge propaganda and education will gradually promote the concept of circular development and green development throughout society. Gradually embarking on a benign development track, the circular economy policies of four important countries in the world are shown in Table 2.

Table 2. The development of the four countries' financial support for circular economy.

Country	Circular Economy Development	Financial Support Measures for the Development of the Circular Economy
United States	The circular economy model has penetrated into the United States' economic development concepts and economic development methods, and it involves a wide range of industries.	Support the development of circular economy through two ways, including financial support and market financing.
Germany	The garbage classification system is widely implemented throughout the country, and a complete garbage disposal industry system has been established.	In supporting the development of circular economy, it mainly relies on government Project funds and bank's preferential credit policy support.
Japan	Established a circular economy legal system earlier in the world	Through the establishment of special funds, policy-based financial institutions are used to provide medium and long-term loan concessions for circular economy enterprises.
Denmark	Facilitate financial subsidies and loan policies for the wind energy industry	Promote the widespread use of renewable energy in the market through fiscal subsidies and price incentive policies.

When carrying out cleaner production, the company introduced the concept of circular economy, realized the reuse of energy, water and waste through the introduction of high-tech technology, and achieved the goal of phased energy saving and emission reduction. The good progress in energy conservation and emission reduction has also provided a solid foundation for the sound development of the circular economy.

From Figure 2, we can see that through the summary and comparative analysis of the above three models in different regions, we can easily find that under the constraints, guidance and support of current policies, enterprises follow the training and introduction of circular economy enterprises. The chain of talents to technological transformation and upgrading, the optimization of the industrial chain, and the creation of profits have gradually entered the track of benign development, and ultimately changed the regional economic structure and ecological environment.

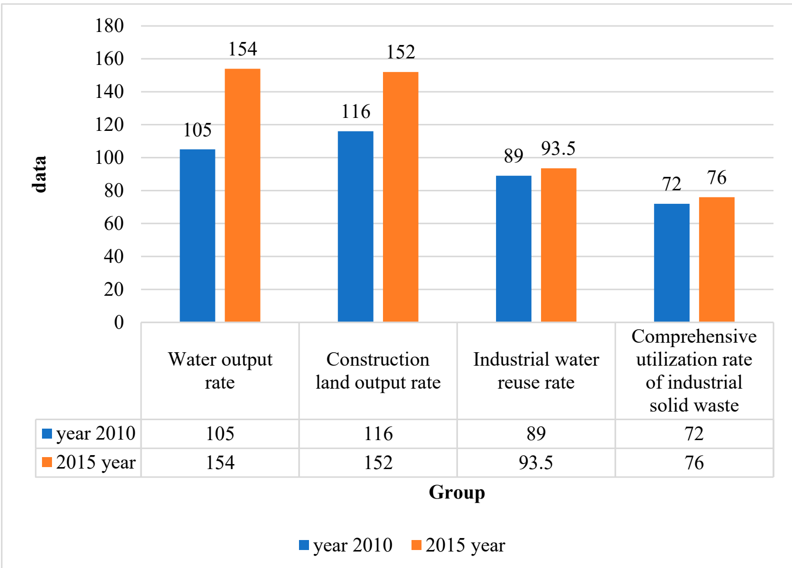


Figure 2. Urban circular economy development indicators in 2010 and 2015.

The order of the subsystems of the six high-energy-consuming industries' circular economy synergy evolution model is shown in Figure 3: The four high-energy-consuming industries have differences in technical processes, production processes and many other aspects, resulting in their production processes. The focus of the new energy is different, the application of new energy is different, and the amount of solid waste produced by different products and the type and amount of pollutant emissions are also very different.

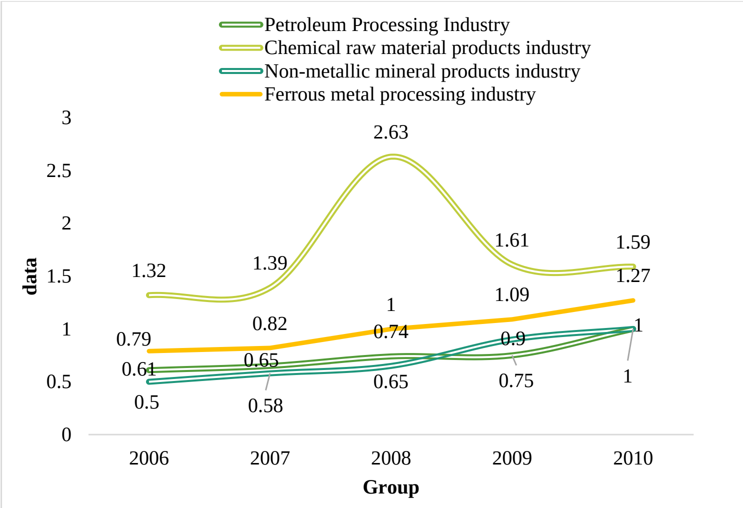
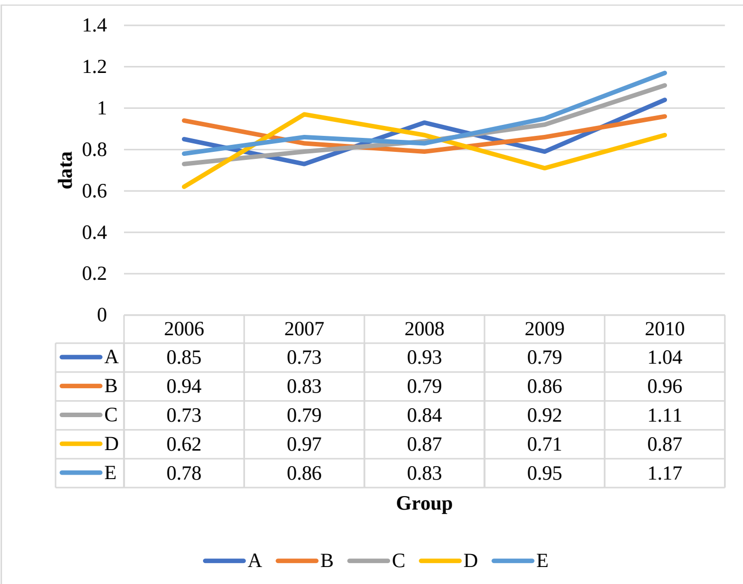


Figure 3. Urban circular economy in 2006 and 2010.

As shown in Figure 4, the order of the energy-saving and emission-reduction subsystems of the non-metallic mineral products industry and the power, thermal production and supply industries has been significantly improved, because all indicators are developing in the direction of optimization; ferrous metal smelting and rolling. The orderliness of the energy-saving and emission-reduction subsystems of the processing industry and non-ferrous metal smelting and rolling processing industries have increased slightly, but not significantly; the petroleum processing, coking and nuclear fuel processing industries, and the chemical raw materials and chemical products industries have declined due to the fact that the overall energy consumption of 100 million yuan of operating income has declined significantly and is now unstable. Although pollutant emissions were in decline, they have subsequently increased.



	2006	2007	2008	2009	2010
A	0.85	0.73	0.93	0.79	1.04
B	0.94	0.83	0.79	0.86	0.96
C	0.73	0.79	0.84	0.92	1.11
D	0.62	0.97	0.87	0.71	0.87
E	0.78	0.86	0.83	0.95	1.17

Figure 4. The synergy of the evolution of the circular economy synergy among the five high-energy-consuming industries.

4.2. Synergy Effect of Circular Economy in High-Energy-Consuming Industrial Clusters

Through this indicator, we can get the influence of a single industry on the circular economy synergy of high-energy-consuming industrial clusters. This paper studies the evolution of the synergistic effect of circular economy in high-energy-consuming industrial clusters, selects industrial wastes with a large amount of processing and patent applications, and simulates and tests technological innovation subsystems and energy-saving emission reduction subsystems. The cyclic evolution of the system model obtains a systematic co-evolution simulation value. The obtained correlation is relatively high, indicating that the correlation is suitable for the system dynamics model of the coordinated development of circular economy in high-energy industrial parks. First, the calculated inspection results of the scientific and technological innovation subsystem are shown in Table 3:

Table 3. Inspection results of the number of patent applications.

Years	Actual Value	Simulation Value	Relative Error
2006	286,625	284,239	0.83
2007	341,590	330,441	3.23
2008	357,242	376,643	−5.43
2009	384,514	422,853	−9.97

The orderliness of the technological innovation subsystem increased by 0.6025 times during the "Eleventh Five-Year Plan" period and 0.6559 times during the "Twelfth Five-Year Plan" period. The orderliness of the energy-saving and emission-reduction subsystems increased by 0.6572 times during the "Eleventh Five-Year Plan" period and 0.1672 times during the "Twelfth Five-Year Plan" period. The main factor in the decline in the growth rate of the energy-saving emission reduction subsystem is the increase in emissions of various pollutants in 2014, as shown in Figure 5.

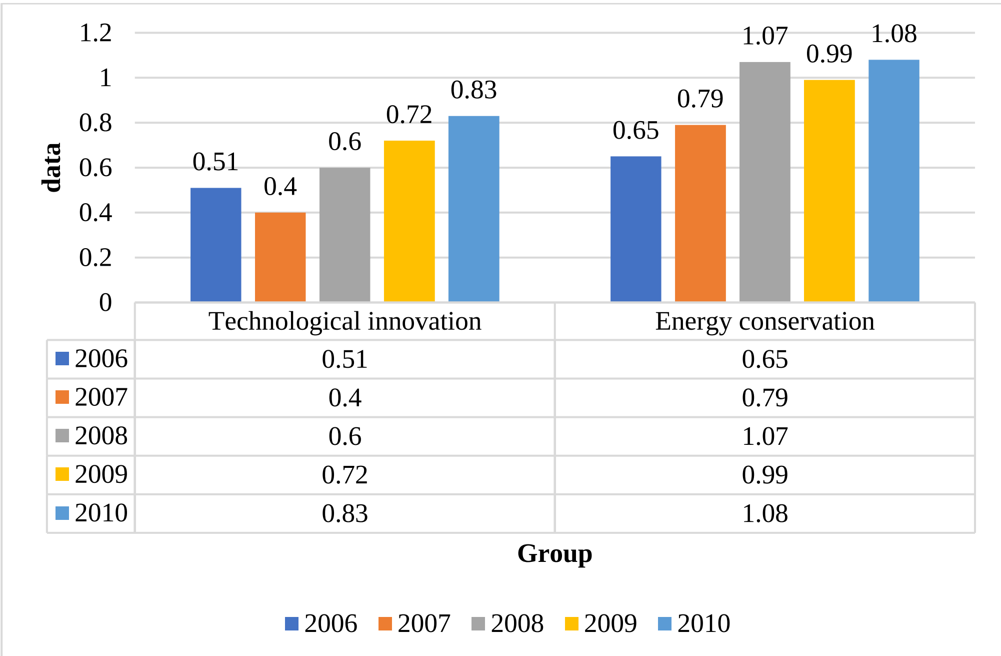


Figure 5. The order of technological innovation in high-energy-consuming industry clusters.

Due to the decline in the overall solid waste utilization rate, the types of subsystems used for technological innovation in the co-evolutionary system dynamics model of circular economy in high-energy-consuming industrial clusters decreased in 2007. In the five energy-intensive industries, the total utilization rate of chemical raw materials and solid waste in the chemical production process is unstable, and the total utilization rate of solid waste in the non-ferrous smelting and rolling industries is relatively low. During the period 2006–2010, the percentage of waste recycling was 46.4719%.

As shown in Figure 6, the circular economy synergy of high-energy-consuming industrial clusters reached a basically good state in 2006, but in 2007, due to the decline in the orderliness of the technological innovation system, the overall synergy declined in 2007, showing a state of basically non-coordination. It is necessary to predict and analyze the evolution of the synergy of circular economy in high-energy-consuming industrial clusters.

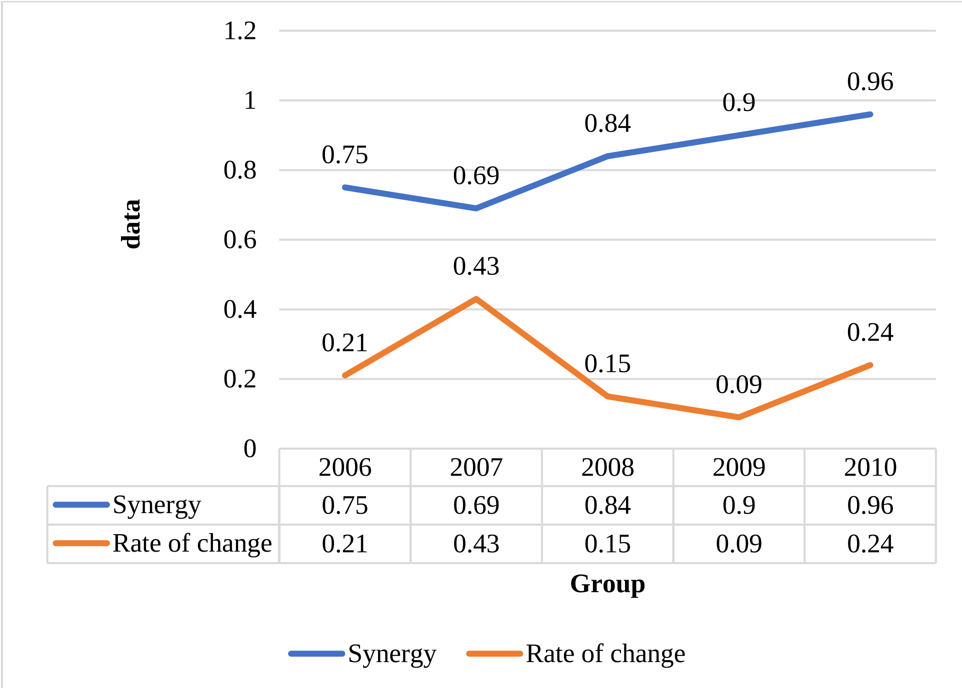


Figure 6. The evolution trend chart of the synergy effect of the circular economy in a high energy-consuming industry.

ETL (Data Warehouse Technology) is used to describe the process of extracting, transforming, and loading data from the source to the destination. From Figure 7 we can see that in the data warehouse EDW system architecture, there are several parts of the ETL process: the ETL process from the source system in the ODS data area of the data warehouse, and the ODS data warehouse data in the personal data area, the ETL process in the area, the ETL in the summary, and the ETL application in the personal data from the area. The data area of the summary data area is from the source system to the data area of the ODS data area of the data warehouse, and then to the ETL of a single data area, Complete the source cleanup and complete the data, and finally form a unified data set in the entire company's EDW data storage system; the ETL process from the atomic data area to the summary data area and the application data area is mainly based on different business subject areas and business applications need to extract data from the atomic data area, transform, summarize, and process to generate a specific data set. The ETL process has a relatively large workload and is very cumbersome, which requires complex data conversion and intermediate cleaning processes. ETL must ensure data consistency, reliability and accuracy, and the data quality control unit needs to be integrated with the data acquisition unit. To verify that the quality control operations have been completed in the correct order during the entire conversion process from the source data environment to the target environment to ensure that the data is input to the data environment and this results in reliable data.

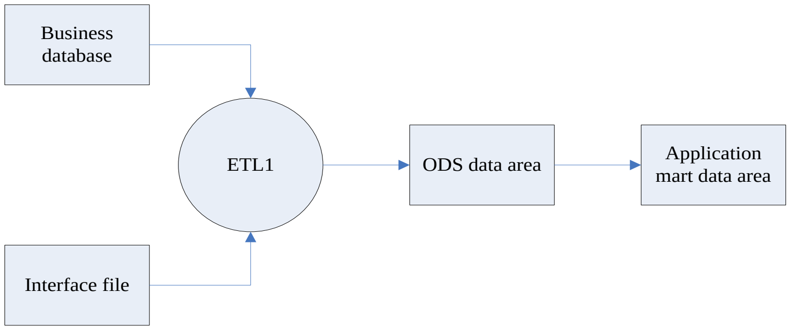


Figure 7. ETL process steps.

5. Conclusions

Profound learning can recreate the change laws of different boundaries in the asset recovery process under various states, so the framework can get the laws of the unavoidable connection between different creation connections and factors in every item handling and creation process through model estimation. Different monetary models, for example, the mix of low-carbon economy and circular economy are continually being attempted in the financial turn of events. This paper divides the system dynamics model of the evolution of the circular economy synergy of high-energy-consuming industry clusters into two subsystems: technological innovation; and energy saving and emission reduction, based on the theory of order parameters, combined with the synergetic viewpoint, constructing the high-energy-consuming industries, industrial clusters and enterprises. The essence of the economic system based on the circular economy model is an open complex giant system. For this, a design method of an open dynamic input-output intelligent decision-making system is proposed. This method takes the established dynamic input-output feedback control model as the core, and establishes the nonlinear multi-objective dynamic optimization model of the whole system and each decision-making unit respectively. Then, the satisfactory solution set is determined by the multi-level hierarchical intelligent coordinator, so that the decision-making result is or approximates the global optimization, and meets the requirements of openness and stability. Finally, after continuous experimental testing, it is found that the algorithm has reached an accuracy rate of more than 98% in intelligent decision-making, and has certain practical value due to many training modes and reliable experiments, in the hope of making a certain contribution to the circular economy. However, due to the limitations of time and technology, the research on the evolution of the synergistic effect of circular economy in high energy-consuming industrial clusters is still insufficient. In this regard, we will carry out further research and discussion in the follow-up.

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