# Research on China's Green Supply Chain Development in the Last Ten Years

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## Abstract

Due to the rapid development of economy, the contradiction between human and nature is constantly deepening. As a concept that can alleviate the contradiction between human and nature and improve the competitiveness of enterprises, the green supply chain received widespread attention for society. This article use Citespace5.6.R5 to conduct a quantitative analysis of the 2028 core journals and CSSCI journals on the Internet in the past decade, and present the literature in the field of green supply chain research in China. It is found that research hotspots are concentrated in green consumption, green manufacturing, and green marketing. Furthermore, there is not much cooperation between domestic scholars and research institutions. The green supply chain is not influential in academia and the search is shallow.

## Keywords

Green supply chain; Green logistics; Development; Literature measurement.

## 1. Introduction

With the advanced China's economy, industrial pollution has followed, as a result environmental pollution become increasingly serious. On May 18, 2018, General Secretary Xi Jinping preached at the National Eco-Environmental Protection Conference: "Developing the economy is aiming to people's livelihood, and protecting the ecological environment has the same purpose." Green Supply Chain is an appropriate method to solve environmental problem and is attract academic attention in recent times. Some scholars have found that the reason why enterprises adopt green supply chain management is due to the pressure from both policies and regulations, and customers. Through government supervision, they can promote enterprises to implement supply chain management[1];

Moreno[2] believes that there is a positive correlation between the aggregation level of large-scale enterprises and small enterprises and the efficiency of regional supply chains. The promotion effect of supply chain efficiency on the aggregation of small enterprises is better than the promotion of enterprises above the scale; Based on the differential game method, Yang Tianjian and Jiang Xiuxiu[3] explained the sweatshop still exists, and found that the initial sustainable impression played and important role in improving the profit of the supply chain. Furthermore, the determination of profit sharing contracts, linear pricing and cost sharing contracts can fully coordinate the dynamic supply chain, while cost sharing contracts can only achieve Pareto improvement. Qu you, Guan Zhimin,etc[4] analyzed the impact of different risk attitudes of members on supply chain related decisions in the case of heterogeneity in consumer green preference and caused product demand uncertainty. They concluded that no matter what risk attitude performed by the members of the supply chain, the contract can achieve supply chain coordination and the most significant conclusion is that the supply chain coordination effect composed of risk aversion manufactures and risk chasing retailers.

This article analyzes the green supply chain with the help of Citespace5.6.R5 software, aiming to reveal the current research status of China's green supply chain and provide a reference for subsequent researchers

## 2. Origin and Definition of Green Supply Chain

### 2.1 Origin of Green Supply Chain

In 1994, after studying the environmental impact of some products, Webb [5] suggested that raw materials should be selected according to environmental guidelines, while paying attention to resource recycling and putting forward the concept of green procurement. In 1995, the CIPS and BIE associations established a green strategy organization to enable public and private companies to achieve environmental compatibility by improving the efficiency of supply chain management[6] In 1996, the Manufacturing Research Association of Michigan State University proposed the concept of green supply chain for the first time in a study of "Environmentally Responsible Manufacturing (ERM)".

### 2.2 Definition of Green Supply Chain

At present, there is no unified conclusion on the definition of green supply chain in academia. Zsidisin and Siferd[7] define green supply chain management as "the green supply chain management of an enterprise is the setting of the supply chain management policy, the actions taken and the various relationships formed. The relationships are in response to the environment caused by company's product, design related, material procurement, production, distribution, use, reuse, and disposal related to services.

However, Bin and Liu Fei[8] proposed that green supply chain is a modern management model that comprehensively considers environmental impact and resource efficiency in the entire supply chain. It is based on green manufacturing theory and supply chain management technology and involves suppliers and production. Factories, distributors, and users. Aiming to minimize the negative effect of production process to the environment and highest resource efficiency. The production process including material acquisition, processing packaging, warehousing, transportation, commission to end-of-life disposal.

Wang Guowen[9] defines green supply chain as integrating low-carbon, environmental protection thinking into all logistics and supply chain links, forming a complete green supply chain system from raw material procurement to industrial design, manufacturing, delivery and life cycle support .

## 3. Visual Analysis of Green Supply Chain

### 3.1 Research methods

CiteSpace is an analysis software used to identify and display new trends in scientific development in scientific literature. Since the structure, laws and distribution of scientific knowledge are presented by means of visualization, the visual graphs obtained by such methods are also called "knowledge graphs"[10]. In this study, through the visual processing of China's green supply chain literature in the past decade, identified the current problems in China's green supply chain research and provide a reference for the development of supply chain in China.

### 3.2 Data sources

The content of the green supply chain involves all links of the supply chain. The main content includes green procurement, green manufacturing, green sales, green consumption, green recycling and green logistics[11]. Therefore, on June 15th, 2020, the research was conducted on the core journals and CSSCI journals with a search term "Keywords = Green Supply Chain or Green Procurement or Green Manufacturing or Green Sales or Green Consumption or Green Recycling or Green Logistics" on core journal and CSSCI journal. The search range is from 2010 to 2020, and 2577 articles were retrieved. After manual screening, excluding irrelevant documents such as conferences, news, reports, etc., finally got 2028 documents.

## 3.3 Data analysis

### 3.3.1 Keyword analysis

Keywords can directly and accurately reflect the theme of the article. The collinear analysis of keywords through CiteSpace software can intuitively understand the research hotspots in this field[12] Latent semantic index (LSI) through SVD decomposition of the entry-document matrix can remove the features of the document that are not related to classification, thereby mining the semantic information between features, and raising the classification space from the feature space to the concept Space[13].

In this paper, Citespace is used to perform cluster analysis on keywords in the green supply chain literature through the LSI algorithm to obtain a research hotspot view (keyword co-occurrence timeline diagram, Figure 1). The small characters in the figure represent the keywords that appear more frequently in this cluster, and the names with # are the name of the cluster. A total of 10 clusters are formed in the figure, which represents that there are 10 main green supply chains in China The research topics are environmental attitude, green consumption, green manufacturing, enterprises, green logistics, green supply chain, logistics industry, product greenness, green supply chain management and consumption. From the figure, except green consumption, the remaining nine research directions all appeared in 2010. In order to explore the reasons, this article sorted out the events that occurred around 2010, and finally found that in 2010, the fifth plenary meeting of the 17th Central Committee of the Communist Party of China in Beijing adopted the The "Twelfth Five-Year Plan for Social Development", the proposal pointed out: We must insist on building a resource-saving and environment-friendly society as an important focus of accelerating the transformation of economic development. Deeply implement the basic national policy of resource conservation and environmental protection, save energy, reduce the intensity of greenhouse gas emissions, develop a circular economy, promote low-carbon technologies, actively respond to climate change, promote the coordination of economic and social development and population, resources and environment, and take the road of sustainable development.
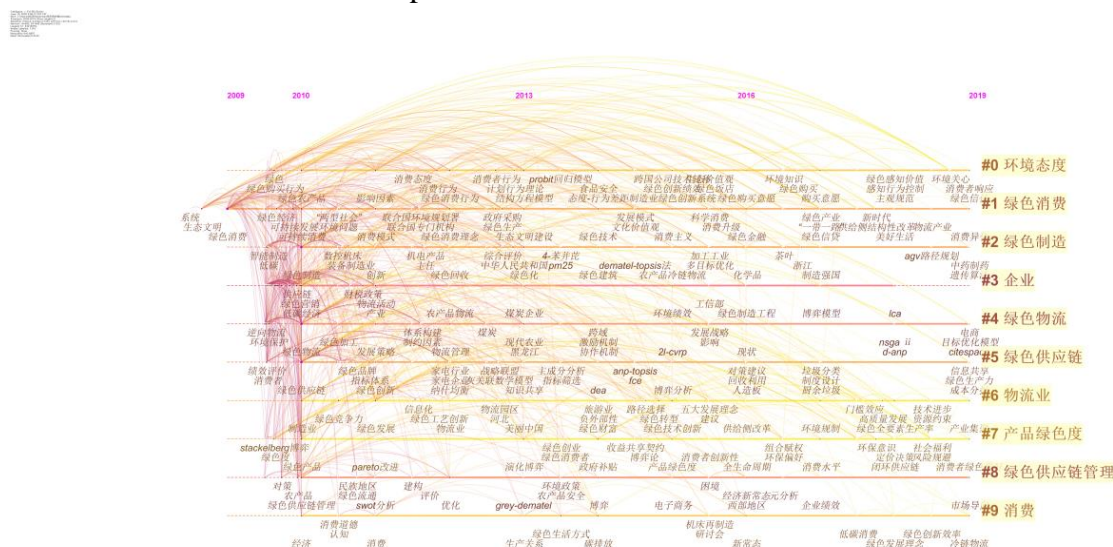


Figure 1 Research hot spots

Brust Terms refer to the vocabulary that changes frequently in a short period of time[14]. Through the analysis of sudden keywords, it is able to understand the research hotspots in a certain period of time. In this paper, the keywords of the literature are visually analyzed, and the results shown in Figure 2 are obtained. In terms of mutation intensity, green marketing has the greatest mutation intensity of 10.7661, and its mutation intensity far exceeds other keywords. This article believes that the reason for this result is that 2010 is just right in the last year of the "Eleventh Five-Year Plan". China's

economic development has achieved tremendous achievements, and people's living level have been continuously improved. Green products, and companies have begun to focus on green marketing. In terms of the duration of the mutation, the longest duration of sustainable development and greening is 4 years. Since the time of sustainable development is 2010, the reason for its mutation is also related to the "Recommendation of the Central Committee of the Communist Party of China on the Development of the Twelfth Five-Year Plan for National Economic and Social Development" mentioned above; In 2013, after sorting out, it was found that the 18th National Congress of the Communist Party of China included the construction of ecological civilization into the overall layout of China's special socialist cause.



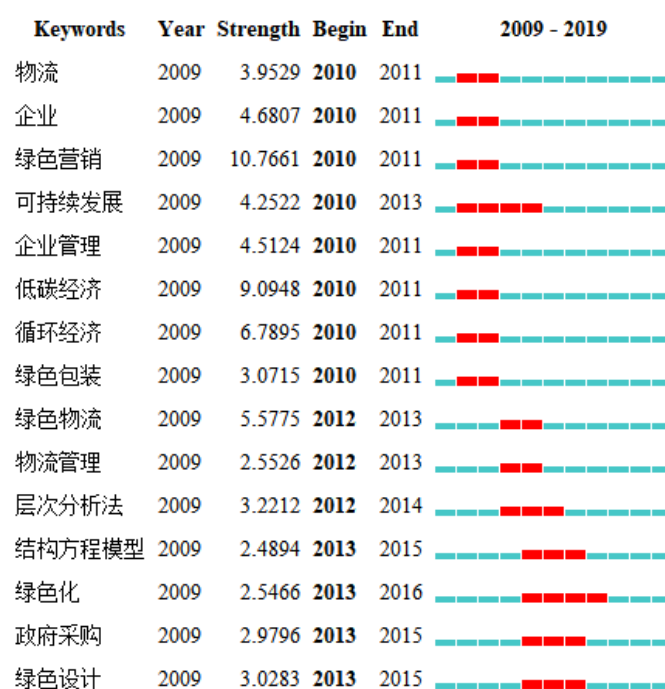**Top 15 Keywords with the Strongest Citation Bursts**

| Keywords | Year | Strength | Begin | End | 2009 – 2019 |
|---|---|---|---|---|---|
| 物流 | 2009 | 3.9529 | 2010 | 2011 | |
| 企业 | 2009 | 4.6807 | 2010 | 2011 | |
| 绿色营销 | 2009 | 10.7661 | 2010 | 2011 | |
| 可持续发展 | 2009 | 4.2522 | 2010 | 2013 | |
| 企业管理 | 2009 | 4.5124 | 2010 | 2011 | |
| 低碳经济 | 2009 | 9.0948 | 2010 | 2011 | |
| 循环经济 | 2009 | 6.7895 | 2010 | 2011 | |
| 绿色包装 | 2009 | 3.0715 | 2010 | 2011 | |
| 绿色物流 | 2009 | 5.5775 | 2012 | 2013 | |
| 物流管理 | 2009 | 2.5526 | 2012 | 2013 | |
| 层次分析法 | 2009 | 3.2212 | 2012 | 2014 | |
| 结构方程模型 | 2009 | 2.4894 | 2013 | 2015 | |
| 绿色化 | 2009 | 2.5466 | 2013 | 2016 | |
| 政府采购 | 2009 | 2.9796 | 2013 | 2015 | |
| 绿色设计 | 2009 | 3.0283 | 2013 | 2015 | |

Figure 2 Results of 15 keywords before mutation

### 3.3.2 Analysis of core authors



Figure 3 Collaboration network of authors

The author of the article is the main of scientific research, and the analysis of the structural characteristics of the author of the article and its cooperation network can reflect the core group of authors in the field and their cooperative relationship[15]. Overall, the researchers are dispersed, with

a total of 441 nodes formed, but only 260 connections. It mainly formed a cooperative network with Sheng Guanghua, Wang Youchao and Zhang Qun as the core, and there was a little cooperation between the two cooperative networks of Wang Youchao and Zhang Qun.

### 3.3.3 Analysis of research institutions

First of all, this study made statistics on the research institutes of green supply chain, and the results are shown in the table (top five in the number of articles). It can be seen from the table that the top five are Business School of Jilin University, School of Economics and Management, Beijing Forestry University, School of Economics and Management, Harbin Engineering University, Business School of Central South University, and School of Management of Harbin University of Science and Technology. 19, 17, 16 articles. Therefore, the article gap between the top five research institutions is not large, and all have in-depth research in the green supply chain. From the perspective of the region where the research institution is located, there are more research results from institutions in the northern region, which are related to the more prominent environmental problems in the region and the influence of national policies. After that, Citespace was used to perform cluster analysis on the research institutions, and the results are shown in Figure 4. In the figure, nodes represent institutions, and the size of the nodes reflects the number of documents issued by the institution. The larger the node, the greater the amount of documents sent. The connection between the nodes represents the cooperative relationship between different institutions.

Table 1 Top five research institutions

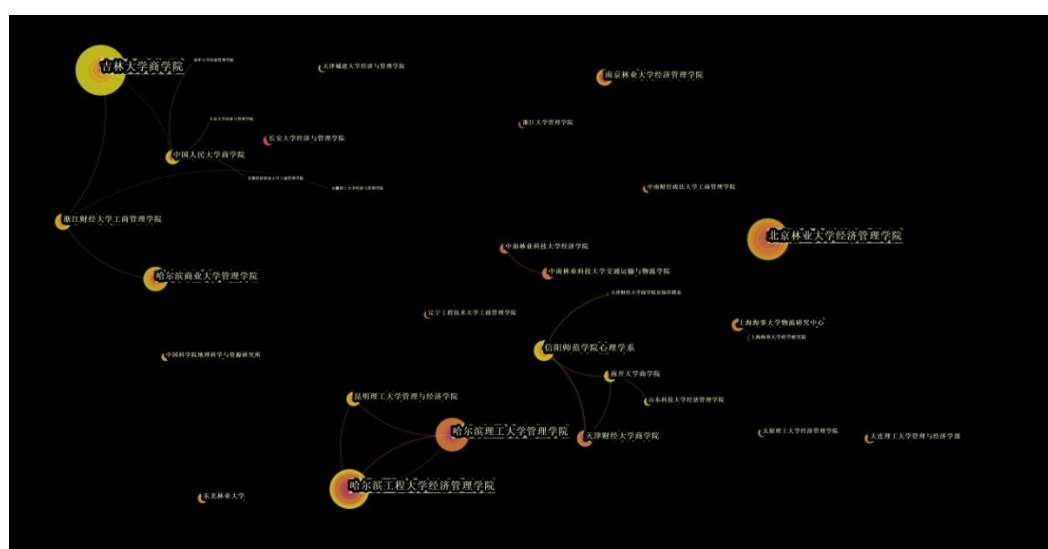| Rank | Quantity | Research Institutions |
| --- | --- | --- |
| 1 | 24 | Jilin University Business School |
| 2 | 21 | School of Economics and Management, Beijing Forestry University |
| 3 | 19 | School of Economics and Management, Harbin Engineering University |
| 4 | 17 | Business School of Central South University |
| 5 | 16 | School of Management, Harbin University of Science and Technology |



Figure 4 Clustering results of research institutions

It can be seen that most research institutions do not have a large number of articles, and in the field of green supply chain, research institutions rarely cooperate and the cooperation relationship is not strong. Only three major cooperative research circles have been formed. The first cooperation circle

is around Nankai University Business School, which contains 5 research universities including Tianjin University of Finance and Economics Business School and Shandong University of Science and Technology. The second is based on Jilin University Business School as the core, including the cooperation circle of 8 research universities including the School of Business of Renmin University of China and the School of Management of Harbin University of Commerce. The last is the cooperation circle containing the School of Economics and Management of Harbin Engineering University, the School of Management and Economics of Kunming University of Science and Technology and the School of Management of Harbin University of Science and Technology.

### 3.3.4 Journal Analysis

Table 2 Top ten journals in the green supply chain

| Sequence | Journal | Quantity | Category | Comprehensive Impact Factor (2019) |
|---|---|---|---|---|
| 1 | Logistics technology | 87 | macroeconomic management and sustainable development | 0.604 |
| 2 | China Business | 66 | trade economy | 0.37 |
| 3 | Ecological Economy | 45 | macroeconomic management and sustainable development | 1.732 |
| 4 | Business era | 44 | trade economy | 1.102 |
| 5 | Technology Management Research | 43 | management | 1.604 |
| 6 | Environmental protection | 33 | environmental science and resource utilization | 1.914 |
| 7 | Consumer economy | 32 | Economic theory and history of economic thought | 1.537 |
| 8 | Business Economic Research | 29 | trade economy | 1.102 |
| 9 | China's circulation economy | 25 | trade economy | 3.867 |
| 10 | Business economy | 24 | enterprise economics | 1.299 |

This paper analyzes the source of the journals from which the literature is exported, and obtains the top ten journals in the green supply chain (Table 2). In terms of the number of articles published, "Logistics Technology" ranked first with 87 articles. "China Business" ranks second with a difference of 21 articles, and the remaining journals have less than 60 articles, which is relatively small. The top ten journals account for 20% of the total journals. It showed that concentrated and stable journals have not been formed in the field of green supply chain. From the category of journals, there are 4 journal categories for trade economy, 2 from macroeconomic management and sustainable development, and the remaining four journals are from management, environmental science and resource utilization, enterprise economics and Economic theory and history of economic thought. It can be concluded that green supply chain mainly involves macroeconomic management and sustainable development, management and other fields, especially trade economy. In the sight of the composite impact factor, most of the top ten journals with published papers, except for China's

circulation economy, are below 2.0, and the comprehensive impact factors of the journals with the first and second published articles are both below 1.0 Thus, it can be seen that the green supply chain has not conducted in-depth research and has little influence in academia.

## 4. Conclusions and Recommendations

Based on the literature measurement method, this article combs through the Citespace software 2028 articles from 2009 to 2019 on HowNet. After research, it is found that: First, around 2010, the research hotspots of green supply chain were green consumption, green manufacturing, and green marketing. The second is that in the field of green supply chain. There is no obvious cooperation between relevant scholars and research institutions, and the research institutions are mostly in the north and southwest regions. In the future, cooperation between scholars can be strengthened by holding exchange meetings, especially for regional research institutions. Cooperation. The third is that the research of green supply chain has little influence in academia, and most of the research is not in-depth. As an important part of my country's development strategy, scholars in related fields need to strengthen research in this field, increase the influence in the field of green supply chain, and contribute to my country's economic and environmental development.

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