Acta Tecnología - International Scientific Journal about Technologies
Volume: 11 2025 Issue: 3 Pages: 147-152 ISSN 2453-675X

Impact of green logistics and its significant importance in SCM operations-overall glance
Panneerselvam Sivasankaran, Gopal Ramesh

https://doi.org/10.22306/atec.v11i3.296 *Received: 15 June 2025; Revised: 29 July 2025; Accepted: 15 Sep. 2025*

Impact of green logistics and its significant importance in SCM operations-overall glance

Panneerselvam Sivasankaran
Department of Mechanical Engineering, Mohamed Sathak AJ College of Engineering, 34, Rajiv Gandhi Salai (OMR) Inside SIPCOT IT Park, Siruseri, Egattur, Chennai, Tamil Nadu 603103, India,
mech.sivasankaran@msajce-edu.in (corresponding author)
Gopal Ramesh
Department of Mechanical Engineering, Mohamed Sathak AJ College of Engineering, 34, Rajiv Gandhi Salai (OMR) Inside SIPCOT IT Park, Siruseri, Egattur, Chennai, Tamil Nadu 603103, India, mech.ramesh@msajce-edu.in

Keywords: green logistics, enhancing efficiency, carbon emissions, sustainable logistics.
Abstract: Green logistics is a term that is important in the context of logistics management operations that have an influence on the environment. Green logistics focusses on systematically measuring, analyzing, and reducing the environmental effect of logistics. This covers every action related to the forward and backward flow of information, products, and services from the point of origin to the point of consumption. Green inventory management, green facility placement, the operational effects of environmental restrictions, ethical purchasing, green technology selection, and eco-design principles are all related to it. It seeks to use a balance between environmental and economic efficiency to build a sustainable firm value. For a sustainable global future, green logistics must be implemented. An attempt has been made in this article to survey the significance of green logistics in the current technological landscape. In order to gather data regarding the application of green logistics in organizations, the survey form has been created to include respondents of all ages.

1 Introduction

A key component of supply chain management in 2025 is "green logistics," which seeks to lessen the adverse environmental effects of logistics activities. It is important because it lowers carbon emissions, enhances brand image, and complies with regulations. Along with cost savings, companies can increase operational efficiency by implementing green practices.

1.1 Important green logistics aspects

Diminished Carbon Footprint: Green logistics aims to cut greenhouse gas emissions from storage, goods and other logistics-related activities. Numerous tactics, such as utilizing electric cars, planning routes more efficiently, and implementing renewable energy sources, can help achieve this.

Increased Operational Efficiency: Green logistics encourages the use of technology that can simplify processes, cut down on inefficiencies, and boost overall productivity, such as data analytics and route planning software.

Possible Cost Savings: Green logistics can result in real cost savings by maximizing fuel consumption, cutting waste, and enhancing operational effectiveness, in addition to benefits for the environment and branding.

Better Image of the Brand: Companies that put sustainability and green logistics first draw in eco-aware clients and investors, which boosts the reputation of their brands.

Regulatory Compliance: Green logistics techniques assist companies in remaining in compliance and avoiding fines as a result of numerous governments enforcing more stringent environmental laws.

1.2 Instances of green logistics at work

Vehicles that run on hydrogen and other alternative fuels: Converting to these vehicles greatly lowers air pollution and carbon emissions.

Route optimization: Delivery routes can be made more efficient by using technology to cut down on trip time and fuel usage.

Eco-friendly packaging: Reusable or biodegradable packaging materials minimize waste as well as their detrimental impacts on the environment. Green logistics is not only a trend but also essential for companies looking to prosper in 2025 due to rising consumer demand for sustainable goods and services and increased environmental consciousness. Businesses may boost their financial line, improve their brand image, and help create a more sustainable future by adopting green practices.

1.3 What is the term "green logistics" and what does it include?

The Association of Supply Chain Management (ASCM) Dictionary defines green logistics as a supply chain that takes into account how its operations affect the environment, takes steps to comply with environmental safety regulations, and informs partners and customers of these actions. This includes green reverse logistics, where

the provider is in charge of getting rid of packing materials and materials that are harmful to the environment, like heavy metals.

1.4 What makes green logistics critical?

While putting green logistics into practice benefits our environment greatly, it also helps businesses save more money and boost production efficiency. Additionally, consider the perspective of the consumer: if you had the option, wouldn't you feel more comfortable selecting a business that was contributing to environmental awareness? Based on their own assessment of which brands are dedicated to sustainability, 68% of consumers want to base their future purchases, according to Forbes.

Thus, green logistics has become a crucial component of supply chain management because it will not only save your business time and money, but it will also improve the perception of your brand.

1.5 Green logistics started when?

In the 1970s, as people's awareness of the mounting problems posed by climate change increased, the idea of, or demand for, green logistics first emerged. Growing regulatory demands and technology developments brought about by this awareness aided in the development and diffusion of green logistics in the business sector. Companies started to evaluate the environmental impact of their operations and implement changes to include eco-friendly logistics systems and more sustainable supply chain administration in order to mitigate the environmental harm caused by consumer demand for more environmentally friendly brands and products.

1.6 The development of environmentally friendly transportation

1970s: Concerns about the oil crisis and environmental consciousness lead to the first Earth Day.

Environmental restrictions began to take shape in the 1980s, notably the Brundtland Report and the modifications to the Clean Air Act.

In the 2000s, supply chain management as a whole began to incorporate green logistics and corporate social responsibility (CSR) more heavily.

2010: To increase productivity and cut emissions, businesses start implementing cutting-edge technologies like telematics, GPS tracking, and route optimization software on a large scale.

2012: The Paris Agreement places more emphasis on the necessity of reducing carbon emissions in all areas, including logistics, the construction of green warehouses and distribution centres, and the use of energy-efficient architecture and renewable energy sources.

2020s: Businesses pledge to lower greenhouse gas emissions while expanding the use of hybrid and electric vehicles in logistics fleets. The circular economy, which emphasizes recycling and reuse in supply chains to reduce waste, gains popularity.

As new technologies and environmental concerns increase, green logistics keeps changing. The next stage of green logistics development is probably going to be driven by additional advancements in automation, circular economy principles, and sustainable materials in the future.

2 Literature review

2.1 Review on green logistics

Mary Catherine Osman et al. [2023], in order to comply with emerging market trends and public demands for environmentally friendly freight transportation, logistics networks must implement a number of Green Logistics Practices (GLPs). Investigating the potential effects of using fossil fuels as a GLP on system design and corporate strategy is the aim of this study. A review of the literature indicates that there is a dearth of research on the utilisation of fossil fuels [1]. The findings of a literature review indicate that there is a dearth of knowledge about the use of fossil fuels.

Dharmendra Hariyani et al. [2024], green supply chain management (GSCM) must be used by organizations because of restrictions and increased environmental consciousness. Despite extensive research on the topic, little is known about how exactly GSCM concepts relate to sustainable sourcing and distribution. The study intends to elucidate the fundamental ideas of GSCM, distinguish between sustainable sourcing and distribution concepts, assess theoretical frameworks that direct GSCM practices, look into new developments, and pinpoint obstacles and difficulties in GSCM. This review uses the Scopus database to examine GSCM with an emphasis on sustainable sourcing and distribution [2].

Jamal Fortes [2009], providing a concise summary of the literature on green supply chain management (GrSCM) during the last two decades is the aim of this paper. Waste management, green manufacturing, green operations, green design, and reverse logistics are the primary themes that arose from the literature. The establishment of social and environmental sustainability in operations management and the supply chain has advanced significantly thanks to sustainable development. In the late 1980s, manufacturers implemented a greener approach in their operations systems, going beyond what was mandated by the law [3].

Zhuoyan Qin [2019], the public suggested that enterprises be held to higher standards for green management and environmental preservation. The introduction of green supply chain management has given businesses additional possibilities. This page compiles the relevant research on green supply chain management, the relationship between green supply chain management and business performance, and possible future research trends and problems [4].

Yi wang et al. [2023], nowadays, social and economic progress is characterized by greening and digitization. Digital technology is widely recognized by the business and academic communities as a key enabler of green

supply chain management. The new field of technology is constantly changing due to the quick development of digital technology and the start of the Industry 4.0 era. As a result, academic research in this area is expanding but has not yet reached saturation. In addition, the study explores how these technologies might lower energy and resource inputs as well as pollution emissions, thus increasing the green supply chain's operational efficiency and yielding social, economic, and environmental advantages [5].

Abhijna Neramballi et al. [2017], in a market with intense competition, businesses extend their supply chain globally. Laws, environmental groups, stakeholders, and consumers are all putting pressure on businesses to focus more on the environmental impacts of their supply chains. Due to this development, supply networks are increasingly more concerned with sustainability, which has caused Green Supply Chain Management (GSCM) to flourish. This project intends to create a conceptual model that will arrange the vast amount of literature in the field of GSCM in order to enhance supply chain performance generally and the environment in particular [6].

Roya Anvari et al. [2023], reviewing and categorizing the literature in three different but somewhat related supply chain domains—Reverse Supply Chain (RSC), Closed Loop Supply Chain (CLSC), and Green Supply Chain (GSC)—is the first attempt at this task. Therefore, each of these three topics has been divided into several criteria, each of which is an assessment of several connected conditions. Through a review of previous research and a summary of the key findings, this study attempts to achieve the stated goals. The first section will go over what has been done, and the second half will go over what has been discovered [7].

Mutua Mutie Daniel et al. [2022], activities related to distribution and transportation play a significant role in an organization's resource usage and environmental damage. Air emissions from automobiles and associated organizational activities can have an adverse effect on the environment, leading to localized smoke, acid rain in the area, and climate change [8].

Jasneet Kaur et al. [2018], in order to gain a competitive edge, boost customer satisfaction, improve brand image, and, of course, have fewer negative environmental effects, companies are increasingly talking about green supply chain management. Performing a literature review on the obstacles to the green supply chain and suggesting a categorization system to rank the most significant ones is the main goal of this study [9].

Nekmahmud Md et al. [2020], using Green Supply Chain Management (GSCM), industry in developed countries is creating answers to the global sustainability challenge. Similarly, the companies of poor countries are trying to apply GSCM for sustainable development. This study aims to conduct a thorough evaluation of the literature on GSCM practices and investigates the present status of the practice in Bangladesh [10].

Christian Ayemoma Apolaagoa et al. [2023], the concept of Green Supply Chain Management (GSCM) and its impacts are examined in this research using bibliometric analysis and a relational approach to the corpus of recent literature. Its primary source of data is the Scopus database. Refined search parameters were used to retrieve 652 documents by 1959 writers in order to discover relevant papers in the topic of study. The publications studied were those released from 2017 to 2022 [11].

M.K.Dhillon et al. [2023], in order to inform future research, this study aims to synthesize the diverse body of existing knowledge on flexible and green supply chain management (FGSCM) in emerging economies and identify research gaps . Through the triangulation of network analysis, text mining, and systematic literature review, we built a novel structured systematic literature review. The outcomes of the review were analysed using institutional theory and contingency theory [12].

Sudhanshu Gupta [2017], in the area of sustainable development, significant strides have been made in enhancing the ecological and social sustainability of operations management and the inventory network. In the late 1980s, several producers and manufacturers went above and beyond the call of duty to establish more environmentally friendly and sustainable business structures. This study aims to give a concise summary of the many studies and publications that have been written over the past 25 years regarding green supply chain management (GrSCM) [13].

Dasanayake et al. [2022], environmental contamination is one of the main issues of the decade that continues to worsen due to the careless actions of corporations worldwide. Most industries are concentrating on implementing green supply chain techniques in order to achieve sustainability in the Triple Bottom Line (TBL) and overcome the challenges posed by pollution. The study's objectives are to determine how multinational firms are using Green Supply Chain Practices (GSCP) to improve their organizational contribution to environmental sustainability and to conduct a comprehensive analysis of green practices and how the logistics and supply chain sector can use the "sustainability" concept to reduce adverse environmental effects [14].

Jeya Rani et al. [2025], the only emphasis of the current research study is how it helps Sabaari Logistics Pvt. Ltd., a developing Indian logistics company, improve its logistics performance. As green sustainability gains more attention globally, logistics companies have been reorienting from conventional approaches to more sustainable and environmentally friendly methods. Transportation, warehousing, packaging, and waste treatment are just a few of the supply chain operations that are subject to green supply chain management, or GSCM. Energy-efficient warehouse systems, ecologically acceptable packing materials, optimized routes, and the use of fuel-efficient vehicles are all examples of these at Sabaari Logistics [15].

Fuyume Sai [2019], recently, the logistics service industry has been increasingly concerned about environmental sustainability. Although there are an increasing number of studies on sustainable initiatives among logistics service providers (LSPs) in the body of current literature, limited study has been done between LSPs and shippers. Japan (2006–2017). Unlike the questionnaire- and interview-based studies found in the literature, we use a text mining technique to analyse the co-occurring links of data, i.e., connections of the practices, and present the collaborative sustainability actions carried out through the provision and demand for logistics services [16].

G L F Benachio et al. [2019], the construction industry is one of the largest producers of waste worldwide. To address this issue, the idea of environmental sustainability in the industry can be applied in a number of ways, such as waste reduction, carbon emission reduction, improved material selection, and more. Building sustainability can be improved by implementing Green Supply Chain Management (GSCM), as these areas include multiple stakeholders throughout the project life cycle [17].

Zhenjing Gu et al. [2022], logistics are essential to the economic development of any country or region. Urbanization and international trade affect logistical performance. The efficiency of logistics is significantly impacted by urbanization. However, logistics has disadvantages as a significant energy user. As logistics performance increases, urbanization and greater mobility result in higher carbon emissions. The efficiency of logistics has a favorable impact on trade openness, which lowers carbon emissions. Consequently, it is essential to comprehend the role of logistics from an economic and environmental perspective [18].

3 Case study of green logistics

In this section attempt has been made to collect survey information from respondents working in various organization like Industries, College etc. In this case study number of responses obtained were 2 both were from technical educational institutions in India.

The following survey questionnaire framed while collecting data from the respondents

Q1. "To what extent are you aware of the concept of green logistics?"

Q2. "Have you implemented any green logistics practices in your organization?"

Q3. "How important is green logistics in your organization's strategic goals?"

Q4. "What are your long-term goals for green logistics?"

Q5."What are the main areas of focus for research and development in green logistics?"

These are the above metrics set in the questions as mentioned here.

3.1 Results and discussion

The Figure 1, it is illustrated that 100 % of the respondents have given their preferences to use of electric vehicles by reducing carbon emissions. Thus, it controls the environment pollution by increasing the efficiency of logistics. Overall, it improves the sustainability of operations by safely transferrin the items as well planned by organization.

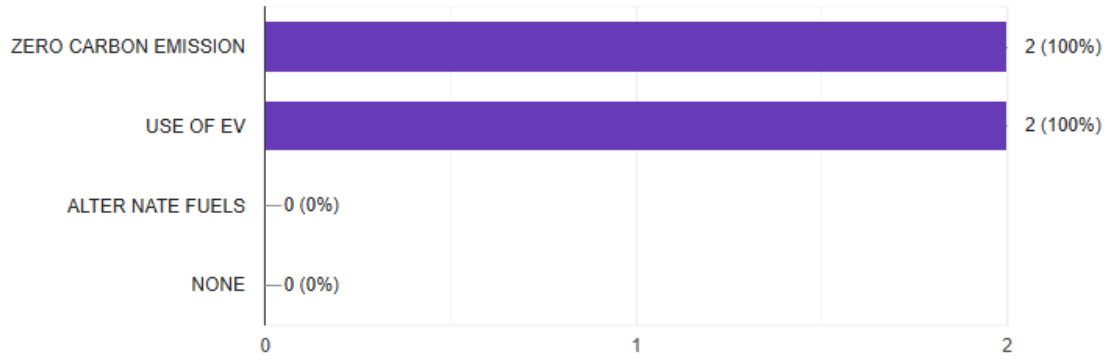

Figure 1 Green logistics metrics

4 Conclusion

Green logistics, which has both financial and environmental advantages, is an essential component of sustainable business practices. Employing eco-friendly supply chain practices can help companies lower their carbon footprint, increase productivity, and improve the perception of their brands. A smart step that sets companies up for long-term success in a market that is changing quickly is the adoption of green logistics.

A closer look at green logistics' conclusion is provided here:

Advantages of Green Logistics.

Effects on the Environment:

Decreased Carbon Footprint: Green logistics reduces greenhouse gas emissions, which makes the environment cleaner.

Conservation of Resources: Ecological methods such as recycling and waste minimization aid in the preservation of natural resources.

Decreased Pollution: Businesses can lessen air and noise pollution by employing eco-friendly transportation and route optimization.

Problems and Things to Think About:

Costs associated with implementation: Although the long-term advantages of green logistics exceed the initial outlay, companies may still need to cover the upfront expenses of new procedures and technologies.

The limitations of the infrastructure.

Some places might not have the infrastructure required to facilitate green logistics, such electric vehicle charging stations.

Supply Chain Intricacy:

Green supply chain integration can be difficult and necessitates cooperation and communication

References

[1] OSMAN, M.C., HUGE-BRODIN, M., AMMENBERG, J., KARLSSON, J.: Exploring green logistics practices in freight transport and logistics: a study of biomethane use in Sweden, *International Journal of Logistics Research and Application*, Vol. 26, No. 5, pp. 548-567, 2023. https://doi.org/10.1080/13675567.2022.2100332

[2] HARIYANI, D., HARIYANI, P., MISHRA, S., SHARMA, M.K.: A literature review on green supply chain management for sustainable sourcing and distribution, *Waste Management Bulletin*, Vol. 2, No. 4, pp. 231-248, 2024. https://doi.org/10.1016/j.wmb.2024.11.009

[3] FORTES, J.: Green Supply Chain Management: A Literature Review, *Otago Management Graduate Review*, Vol. 7, pp. 51-62, 2009.

[4] QIN, Z.: *A Literature Review of the Impact of Green Supply Chain Management on Firm Performance*, *Journal of Service Science and Management*, Vol. 12, No. 7, pp. 872-879, 2019. https://doi.org/10.4236/jssm.2019.127059

[5] WANG, Y., YANG, Y., QIN, Z., YANG, Y., LI, J.: A Literature Review on the Application of Digital Technology in Achieving Green Supply Chain Management, *Sustainability*, Vol. 15, No. 11, 8564, 2023. https://doi.org/10.3390/su15118564

[6] NERAMBALLI, A., SEQUEIRA, M., RYDELL, M., VESTIN, A., IBARRA, M.: *A Comprehensive Literature Review of Green Supply Chain Management*, Proceedings of the 2nd World Congress on Civil, Structural, and Environmental Engineering (CSEE'17) Barcelona, Spain, April 2-4, pp. 1-8, 2017. https://doi.org/10.11159/icesdp17.17

[7] ANVARI, R.: Green, Closed Loop and Reverse Supply Chain: A literature review, *Journal of Business & Management*, Vol. 1, No. 1, pp. 33-57, 2023. https://doi.org/10.47747/jbm.v1i1.956

[8] MUTUA MUTIE, D., ODOCK, S., LITONDO, K.: Green Logistics Practices and Performance: A Review of Literature, *African Journal of Business and Management*, Vol. 7, No. 2, pp. 233-350, 2022.

[9] KAUR, J., AWASTHI, A.: A systematic literature review on barriers in green supply chain management, *International Journal of Logistics Systems and Management (IJLSM)*, Vol. 30, No. 3, pp. 330-348, 2018. http://dx.doi.org/10.1504/IJLSM.2018.092613

[10] NEKMAHMUD, M., RAHMAN, S., SOBHANI, F.A., OLEJNICZAK-SZUSTER, K., FEKETE-FARKAS, M.: A Systematic Literature Review on Development of Green Supply Chain Management, *Polish Journal of Management studies*, Vol. 22, No. 1, pp. 351-370, 2020. https://doi.org/10.17512/pjms.2020.22.1.23

[11] APOLAAGOA, C.A., MUHAMMED, A.-R., ZUZIE, R.S., OWUSU, A.: A Bibliometric Literature Review of Green Supply Chain Management and Its Impacts Using VOSviewer and R (Bibliometrix), *Journal of Service Science and Management*, Vol. 16, No. 3, pp. 369-390, 2023. https://doi.org/10.4236/jssm.2023.163021

[12] DHILLON, M.K., RAFI-UL-SAHAN, P.M., AMAR, H., SHER, F., AHMED, S.: Flexible Green Supply Chain Management in Emerging Economies: A Systematic Literature Review, *Global Journal of Flexible Systems Management*, Vol. 24, No. 1, pp. 1-28, 2023. https://doi.org/10.1007/s40171-022-00321-0

[13] GUPTA, S.: The Curious Case of Green Supply Chain Management: A Literature Review, *International Journal of Research in IT and Management (IJRIM)*, Vol. 7, No. 1, pp. 8-19, 2017.

[14] DASANAYAKE, W.M.D.A., GAMAARACHCHI, B.G.T.N, RANATHUNGE, K.K.G.I.S., KARUNARATHNA, K.N.P.: *How Green Supply Chain Practices Support Environmental Sustainability: A Literature Review*, 13th International Conference on Business & Information ICBI, University of Kelaniya, Sri Lanka, pp. 231-241, 2023. https://dx.doi.org/10.2139/ssrn.4454020

[15] RANI, J., VINOTHKUMAR, A.: A Study on Green Supply Chain Management in Logistics, *International Journal of Research Publication and Reviews*, Vol. 6, No. 4, pp. 12526-12529, 2025.

[16] FUYUME, S.: Survey of Sustainable Logistics Services via Text Mining, *Journal of Mechanics Engineering and Automation*, Vol. 9, pp. 100-110, 2019. https://doi.org/10.17265/2159-5275/2019.03.004

[17] BENACHIO, G.L.F., FREITAS, M.C.D., TAVARES, S.F.: Green Supply Chain Management in the Construction Industry: A literature review, *IOP Conference Series: Earth and Environmental Science*, Vol. 225, pp. 1-8, 2019. https://doi.org/10.1088/1755-1315/225/1/012011

[18] GU, Z., MALIK, H.A., CHUPRADIT, S., ALBASHER, G., BORISOV, V., MURTAZA, N.: Green Supply Chain Management with Sustainable Economic Growth by CS-ARDL Technique: Perspective to Blockchain Technology, *Frontiers in Public Health*, Vol. 9, pp. 1-13, 2022. https://doi.org/10.3389/fpubh.2021.818614

Review process
Single-blind peer review process.