

INTEGRATING LOGISTICS, GREEN ECONOMICS AND SUSTAINABILITY. A PATHWAY TO A SUSTAINABLE SUPPLY CHAIN

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Date Received: 28 November 2024

Date Reviewed: 5 December 2024

Date Accepted: 11 December 2024

Date Published: 31 December 2024

DOI: <https://doi.org/10.51200/mjbe.v11i2.5811>

Keywords: Sustainable Development Theory, Ecological Modernization Theory, Resource Based Theory, Stakeholders theory, logistic, tourism, supply chain, sustainability.

ABSTRACT

*This study explores the integration of green principles in the logistics and tourism sectors, focusing on sustainable practices and their theoretical underpinnings. The qualitative study using Thematic Analysis was used. The study interviews 2 respondents, one from the logistic sector and the other from the field of tourism. Utilizing **Sustainable Development Theory, Ecological Modernization Theory, Resource-Based Theory, and Stakeholder Theory**, the research examines thematic elements such as sustainable transportation, resource efficiency, stakeholder collaboration, and eco-friendly practices. The findings reveal that adopting energy-efficient technologies, engaging stakeholders, and leveraging local resources contribute to reduced environmental impacts and enhanced operational efficiency. This framework provides a comprehensive approach for industries to achieve sustainability while balancing economic growth and environmental responsibility. The study highlights the interconnectedness of logistics and tourism in driving global green initiatives.*

INTRODUCTION

Globalization and the rise in e-commerce significantly expanded the scope of logistics, positioning it as an essential driver for a successful economic activity. Logistics promotes efficiency in supply chains, supporting global trade and economic growth.

However, operation in logistics are carbon intensive. It spans around transportation, warehousing or storage, distribution and retailing, creating significant challenges to the environment due to greenhouse gas emissions and resource depletion.

Economics of scale is the cost advantage of globalization. It plays a pivotal role in the logistic industry because logistics deals with large volumes. As the operational volume increases, the average cost per unit of good decreases. Large scale operations cover bulk transportation or centralized warehousing, reducing average cost due to increasing return to scale. This makes logistics efficient and competitive. However, achieving economics of scale often involves trade off, increased energy used, higher carbon emissions and greater environmental impact. Thus, it is critical for the logistic sector to create a balance between economics of scale and environmental sustainability.

Green economics comes into the picture in its effort for balancing the ecosystem. Green economics stresses on resource efficiencies, circulatory and carbon neutrality. It provides the framework to reconcile the challenges. Green economics can be integrated into the logistic sector by incorporating green principles into its operation. This will help to align economics of scale with sustainable practices, reducing environmental footprints while maintaining competitiveness. With green economics, the logistic sector will be transformed into a sustainable sector.

PROBLEM STATEMENT

The logistic industry is the cornerstone of global economic activity. It is driven by demand and the economics of scale. However, since the operation of logistics are highly dependent on carbon intensive, it significantly contributes to environmental degradation conflicting with the principles of sustainability. While globalization encourages economics of scale by reducing operational cost, they often

exacerbate environmental impact which is known as negative externality. These negative externalities were internalized by the firms. The internalization of the cost will reduce the consumer as well as the supplier's surplus. The internalization of the cost takes plays in the form of tax and modernization of equipment or techniques to reduce carbon emission.

The principles of green economics need to incorporated in the operation of logistics in order to rectify the misalignment between economic efficiency and environmental responsibility. Therefore, addressing these issues are essential to foster resilience, eco-friendly supply chains that align with global sustainability.

RESEARCH OBJECTIVE

The overall research objective of this study is to analyse how green economic principles can be integrated into logistic operation to achieve sustainable goals. The specific research objectives are as follows:

- a. To analyse how green economic principles can be integrated into logistic operations.
- b. To identify sustainable practices in logistics that align with environmental goals.
- c. To propose a framework for supply chain management with green principles.

LITERATURE REVIEW

Logistics and its environmental impact involves transportation, warehousing or storage, distribution and retailing. All these components in the supply chain accounts for almost 36.1 Gt in 2021 of the carbon emission (IEA, 2022). The component of logistics involve in each supply chain differs according to sectors and industries. But the key principles for green economics immaterial of which sector incorporates it is the same. It evolves with resource efficiency, optimum usage of resources, carbon neutrality, ethical and fair practices and social equity and inclusion.

Green Economic Principles.

Green economics focuses on the efficiency in limited resources. Since the resources available is minimized, the opportunity cost for the usage of these resources incurs high opportunity cost. Thus, the concept of 3R (Reduce, Reuse and Recycle) should be used extensively by companies, household and government. The life span of the products created should be increased through repurposing and refurbishing. Waste is also transformed into reusable materials, known as circular economics. In order to optimize the usage of resources, technology and innovation plays a significant role. Optimization can also take place by investing in innovative technologies and practices that drives towards sustainability known as green innovation. It encourages research and development for eco-friendly products and process where the role of the stakeholders is essential. This ensures green practices are equally accessed by all stakeholders especially the marginalised community immaterial whether they live in the urban or rural areas. This is applicable especially in energy efficient technologies that help to transfer from non-renewable to renewable energy sources like solar, wind and hydropower. With technology, resources can be used without depletion. Unfortunately, not all business can fully offset carbon emission. For those business, carbon neutrality is the solution. Carbon neutrality aims to balance carbon emissions by reducing emissions and offsetting unavoidable ones. This takes place through carbon trading system or investing in reforestation projects. Other than environment, one of the pillars that concerns the green economics is the ethical and fair practices on the local community or the staff that works in the organization. Green economics ensures that it is a social responsibility to ensure fair wages, fair working conditions and community engagement in sustainable initiatives. (Green Economy Coalition, 2012).

Underlying Theory

There are some basic underlying theories that can be integrated to establish the framework for the study. The Sustainable Development Theory is the foundation for integrating all other theories to create the framework in incorporating green principles into the logistic sector. The Sustainability Development Model is a model that looks into the mechanism on how to enhance the economic value with limited resources and at the same time sustain the environment, culture and the economic well being of the community. Thus, the focus is on the people, place and profit as mentioned by the Triple Bottom Line Theory (Slaper & Hall, 2011). Unfortunately, profit in economics looks into monetary gains or commercial value rather than economic value.

Commercial value refers to the monetary worth of a product, service or an asset in the market place. It refers to how much a buyer is willing to pay or the revenue it generated. It focuses on sales, profit and market driven. The scope is only limited to business and trade. In contrast, economic value stresses on the utility derived not only from goods and services in monetary terms but it also refers to broader economic concepts like societal well being. The societal wellbeing is measured using resource efficiency and resource optimization. Both resource efficiency and optimization aim to reduce opportunity cost and maintains long term sustainability (Levy, 2012).

Since resource is the main source that can actually derive the competitive advantage, the resource base theory is applicable in this discussion. The green principles enhances the competitive advantage from its ability to utilize valuable rate, inimitable and non-substitutable (VRIN) resources. Leveraging on the resources and the green principles, the organization can move towards sustainable practices (Olavarrieta & Ellinger, 1997)

Organization's ability to leverage on limited resources needs innovation and technology. This enables the resources which are subjected to diminishing marginal returns due to overuse or depletion can be converted to increasing marginal returns through innovation and technology. The Ecological Modernization Theory emphasizes that advance technology drives resources efficiency and reduce carbon emission. When modernization is emphasized, institutional transformation at every level by the economic decision making units must take place. The economic decision-making units are known as stakeholders (Glynn, Cadman & Maraseni, 2017; Kee-hung, Lai, Christina, W. Y. Wong & T. E. C., Cheng, 2012). Stakeholders Theory stresses on the role and responsibility of each stakeholder in enhancing the economic value of either the product, service or process through rules and regulation, monitoring system, fund, capital, management and technological know how. (Henry and Frank, 2009)

Therefore, it can be concluded that the framework of this study incorporates four essential theory, Sustainable Development Theory, Resource Based Theory, Ecological Modernization Theory and the Stakeholders Theory.

METHODOLOGY

This study adopts a qualitative research approach to explore the integration of logistics, green economics and sustainability. It focuses on tourism and logistics. Data collection was conducted through an in depth interview, semi structured with two participants from distinct industries. The first respondent works in Maersk, a Danish logistic company. Meanwhile the second respondent is an individual who works in Dong Nai Technology University, Bien Hoa, Dong Nai Province, Vietnam. The interview was designed to capture the respondents experience, organisation strategies and challenges in aligning economic efficiency with environmental sustainability. Thematic Analysis was employed to identify key patterns

and themes allowing for a comparative understanding of how green principles were applied across different sectors.

FINDINGS

1. Green Economic Principles in Maersk, a Danish Company that deals with Logistics in Vietnam.

Sustainability has become a cornerstone for modern logistics companies aiming to minimize their environmental footprint while maintaining operational efficiency. This study explores the green principles adopted by a Danish logistics company based on a respondent's account and integrates these practices with relevant theories.

a. Low Carbon Emissions in Transportation

The company prioritizes the use of Euro 4 and Euro 5 trucks, which are designed for low carbon dioxide emissions and efficient fuel usage due to advanced technology. The respondent stated:

"We use trucks with low carbon dioxide emissions, such as Euro 4 or 5. These trucks are designed to use fuel efficiently due to the advanced technology used in their production."

This aligns with **Sustainable Development Theory**, emphasizing environmental stewardship by reducing greenhouse gas emissions. Furthermore, **Resource-Based Theory** highlights the strategic advantage gained from deploying advanced, eco-friendly vehicles.

b. Efficient Transportation Planning

To minimize emissions, the company organizes road trips to maximize load per trip, reducing the total number of trips.

"By maximizing the load per trip, we reduce the number of trips and, consequently, carbon dioxide emissions."

This practice reflects **Ecological Modernization Theory**, which underscores the role of innovation and operational restructuring in achieving sustainability. The company also has installed software's to determine the routes that their trucks should take to avoid congestion as well as to reduce fuel consumption.

c. Energy-Efficient Warehousing

The respondent described how the company's warehouses use advanced software to track goods, ensuring efficient storage and quick clearance. Additionally, the warehouses are equipped with LED lights, skylights, and solar panels to minimize energy consumption.

"Our warehouses use software to detect goods entering and leaving, clearing storage efficiently. We've also installed LED lights, skylights on rooftops, and solar panels to save energy."

These efforts exemplify **Sustainable Development Theory** by balancing economic and environmental priorities and **Ecological Modernization Theory** through the integration of renewable energy and energy-efficient technologies.

d. Minimizing Paper Use with Technology

The company uses software for scanning goods and generating data, reducing the need for paper in management decisions.

"The software we use can scan goods, produce data for analysis, and support management decisions without needing much paper."

This practice aligns with **Resource-Based Theory**, leveraging technology to optimize resource usage and minimize waste.

e. Stakeholder Engagement and Leadership

Through these green initiatives, the company demonstrates its commitment to environmental responsibility, addressing the concerns of stakeholders, including customers, regulators, and the community.

"Every piece of equipment we use in the organization is energy efficient, including our forklifts."

This reflects **Stakeholder Theory**, as the company balances economic performance with environmental and social responsibilities, fostering trust and long-term partnerships.

The Danish logistics company showcases how integrating green principles, such as energy efficiency, renewable energy, and technology-driven optimization, contributes to sustainability. These practices, analysed through theoretical frameworks, highlight the potential for logistics companies to lead in environmental responsibility while maintaining operational excellence (Oksana Seroka-Stolka & Agnieszka Ociepa-Kubicka, 2019).

TABLE 1 shows the Thematic Words for Qualitative Analysis

| Theories | Response | Thematic Word |
|---------------------------------|-----------------------------------|---|
| Sustainable Development Theory | Low Carbon Emissions | Euro 4 and 5 trucks, fewer trips. |
| | Energy Efficiency | LED lights, skylights, solar panels, efficient forklifts. |
| | Waste Reduction | Clearing storage efficiently, minimal paper use. |
| Resource based theory | Technology Utilization | Advanced truck technology, warehouse software. |
| | Resource Optimization | Maximizing trip loads, efficient space usage. |
| | Renewable Energy Integration. | Solar panels. |
| Ecological Modernization Theory | Integration and Renewable Energy | Energy-efficient equipment, advanced software. |
| | Reduction on environmental impact | Fewer trips, low-emission vehicles. |
| | Environmental Responsibility | Commitment to reduce carbon emission. |
| Stakeholder Theory | Operational Efficiency | Meeting customer needs while reducing environmental impact. |
| | Sustainability Leadership | Adopting green technologies and promoting eco-friendly practices. |

Green Economic Principles in Vietnam’s Tourism Sector.

Vietnam’s tourism industry has been transitioning toward sustainable practices, integrating environmental stewardship and community participation. Based on the responses from a participant working in Dong Nai Technology University, this write-up explores the green principles implemented in Vietnam’s tourism sector, supported by relevant theories.

a. Transportation Logistics in Tourism

Tourism heavily relies on efficient and sustainable transportation systems. Using EV vans, electric bikes, and other low-carbon transportation aligns with **green logistics principles**, reducing emissions while meeting tourists’ mobility needs. (Sanhakot Vithayaporn Vilas Nitivattananon, Nophea Sasaki & Djoen San Santosa, May, 2023).

“Tourists are picked up and transported to accommodations using EV vans, and they move around cities on electric bikes.”

The transportation of tourists can be viewed as a part of the logistics network, focusing on fleet optimization, route planning, and sustainable vehicle adoption. **Ecological Modernization Theory** supports the use of innovative technologies in reducing the environmental footprint.

b. Warehousing and Local Resource Supply Chain

The tourism sector often involves supplying local produce, souvenirs, and other goods to meet tourist demands. Efficient storage and distribution processes in the tourism industry mirror logistics warehousing practices.

“Tourists consume local produce and buy them as souvenirs.”

Efficient local supply chains can be established using green logistics principles such as minimal packaging, energy-efficient warehouses, and technology for inventory management. This aligns with **Resource-Based Theory** by leveraging local resources for sustainable economic benefits.

c. Sustainable Last-Mile Delivery

In tourism, the “last mile” can refer to transporting goods and services to remote tourist destinations, such as villages or eco-tourism sites. Green logistics solutions, like bikes or EVs, can be applied here.

“Tourists staying at farms travel around by bikes, reducing the need for motorized vehicles.”

The application of sustainable last-mile delivery systems reduces environmental impacts while enhancing the tourism experience. This fits into **Sustainable Development Theory**, emphasizing low-carbon solutions.

d. Technology in Green Tourism Logistics

Tourism can adopt logistics technologies like smart systems for efficient management. For instance, inventory management for local goods can use software that tracks and analyzes data, reducing waste.

“Energy-saving equipment is installed with grid systems, and software manages storage efficiently.”

Such technologies align with **Ecological Modernization Theory**, as they modernize tourism logistics and improve resource efficiency.

e. Stakeholder Collaboration in Tourism Logistics

Both tourism and logistics sectors require collaboration among stakeholders, such as government bodies, local communities, and private companies, to achieve sustainability.

“The government trains tour guides on green tourism and emphasizes the benefits of protecting forests.”

Stakeholder collaboration ensures that logistics operations within tourism (transportation, warehousing, supply chain) meet environmental and economic goals, aligning with **Stakeholder Theory**.

Tourism can seamlessly integrate into logistics by adopting green principles such as sustainable transportation, energy-efficient warehousing, and stakeholder engagement. Theories like **Sustainable Development, Resource-Based, Ecological Modernization, and Stakeholder Theory** provide a strong foundation for understanding how tourism logistics can contribute to environmental and economic sustainability (Letunovska, Natalilia, Alesky Kwilinski, Henryk Dziwigol & Lyulyou Oleksii, 2021)

TABLE 2 shows the Thematic Word for Qualitative Analysis.
Theories Responses Thematic Word

| | | |
|---------------------------------|---------------------------|--|
| Sustainable Development theory | Low Carbon Travel | EV vans, electric bikes. |
| Resource Based Theory | Technological Integration | Energy-saving equipment, grid systems. |
| Ecological Modernization Theory | Advanced Technology Use | Electric vehicles, energy-saving infrastructure. |

Both the **logistics** and **tourism** industries have increasingly adopted **green principles** to reduce environmental impact while promoting economic sustainability. These industries intersect in areas such as transportation, resource management, and stakeholder engagement, and the application of **Sustainable Development Theory, Ecological Modernization Theory, Resource-Based Theory, and Stakeholder Theory** provides a framework for understanding how they align with sustainable practices.

Figure 1 shows the Green Principles, underlying theory and the thematic words for logistics in supply chain management for the tourism and logistic sectors.

| | | |
|--|---|---|
| <p>Euro 4 and 5 trucks, fewer trips EV Van's and electrical bikes</p> <p>lights, skylights, solar panels, efficient forklifts.</p> <p>Clearing storage efficiently, minimal paper use.</p> | <p>Sustainable Transport</p> <p>Low carbon travel</p> <p>Energy Efficiency</p> <p>Waste Reduction</p> | <p>Sustainable Development Theory</p> |
| <p>Advanced truck technology, warehouse software.</p> <p>Maximizing trip loads, efficient space usage.</p> <p>Solar panels.</p> | <p>Resource Efficiency</p> <p>Technological Utilization</p> <p>Resource Optimization</p> <p>Renewable Energy Integration</p> | <p>Resource based Theory</p> |
| <p>Energy-efficient equipment, advanced software, Energy Saving Vehicles.</p> <p>Fewer trips, low-emission vehicles.</p> | <p>Innovation and Sustainability</p> <p>Integration and Renewable Energy</p> <p>Reduction and Environmental Impact</p> | <p>Ecological Modernization Theory</p> |
| <p>Meeting customer needs while reducing environmental impact.</p> <p>Adopting green technologies and promoting eco-friendly practices</p> | <p>Environmental Responsibility</p> <p>Operational Efficiency</p> <p>Sustainability Leadership</p> | <p>Stakeholders Theory</p> |

Based on Figure 1, **Sustainable Transportation** involves the use of electric vehicles (EVs), low-emission vehicles, and fuel-efficient transport methods. It is connected to **Sustainable Development Theory**, which focuses on achieving long-term sustainability in environmental practices. Since resources are limited it involves reducing waste. It connects to **Resource-Based Theory**, which highlights using assets efficiently to gain sustainable competitive advantages. In order for the resource to be used efficiently, in both logistics and tourism, this includes the use of energy-efficient technology, inventory management systems, and green practices. This connects to **Ecological Modernization Theory**, which supports adopting advanced technologies to enhance environmental efficiency. This requires **Stakeholder Collaboration** for funding, knowledge transfer, technology transfer and regulation. Both industries engage with local communities, government bodies, and tourists to promote green tourism practices. This links to **Stakeholder Theory**, emphasizing the importance of engaging all stakeholders in sustainable decisions.

CONCLUSION

The study aims to integrate green economics with the logistics in the supply chain sustainability in Vietnam. The qualitative study aims to form a framework. The integration of green principles in logistics and tourism demonstrates a strong commitment to sustainability by addressing environmental, economic, and social dimensions. Through the application of **Sustainable Development Theory**, these industries aim for long-term environmental goals, while **Ecological Modernization Theory** highlights the role of technology in achieving efficiency and reducing emissions. **Stakeholder Theory** emphasizes the need for collaboration among communities, governments, and businesses, and **Resource-Based Theory** underlines the effective use of local resources to maintain a competitive edge. By aligning thematic

elements such as sustainable transportation, resource efficiency, stakeholder collaboration, and eco-friendly practices with these theories, logistics and tourism can serve as key drivers of global sustainability, fostering a balance between growth and ecological responsibility.

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