



Green Logistics: A Primer

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Abstract Logistics constitutes the heart of the operation of modern transport systems. Green logistics combines the environmental concern with logistic and transport activities. It is gaining importance throughout logistics and supply chain management. This paper provides a brief introduction to green logistics and encourages all stakeholders to consider the impact of their actions on the environment.

Keywords green logistics, modern logistics, reverse logistics, supply chain

Introduction

Modern economy depends on logistics to support the flow of goods. Logistics and transport activities are well known to have a major impact on the environment. Logistics is the integrated management of all the activities required to move products through the supply chain. The activities include the forward and reverse flows of products, information and services between the point of origin and the point of consumption. These activities are coordinated in a such as way that meets customer requirements at minimum cost. They play a critical role in enabling manufacturers, distribution channels, and retailers to work in harmony.

But traditional logistics activities consume a lot of resources and cause much pollution.

It cannot meet the requirements of modern society due to huge impact on the environment. To develop modern logistics, environment concerns should be given priority. Green logistics seems to be an inevitable choice for the development of modern logistics.

Logistics and Reverse Logistics

The primary purpose of logistics is to reduce costs, especially transport costs. Logistics is a critical factor in promoting globalization and international flows of commerce.

The reverse logistics is a key constituent of green logistics. It is an important component of a business' mission. If logistics involves the movement of material from the point of origin toward the point of consumption, reverse logistics should be the movement of material from the point of consumption toward the point of origin. Reverse logistics activities include remanufacturing, refurbishing, recycling, landfill, repackaging, returns processing, and salvage. Remanufacturing and rebuilding consume significant amount of resources. Returned products are more difficult and costly to handle than original products [1].

Like other industries, logistics companies have been dealing with the problems of energy consumption, air pollution, and resource wastefulness. Consequently, the concept of green logistics has emerged. It is a new logistics concept that was proposed by scholars in the West in 1990 [2].

Going Green

To be environmentally friendly and reduce ecological impact, a company should take the following measures:



- Eco-friendly packaging material
- Packing items more efficiently
- Choosing the eco-friendliest transportation method available
- Using recyclable items whenever possible
- Avoiding wasting water by using simple water recycling
- Being careful in the management and monitoring of hazardous materials
- Taking steps to better manage the production, collection, and disposal of waste

Concept of Green Logistics

Green logistics refers to the systematic measurement, analysis, and mitigation of the environmental impact of logistics activities. The logistical activities consist of freight transportation, storage, inventory management, materials handling, loading and unloading, packaging, distribution, and related information gathering and processing. The main objective of green logistics is to measure and minimize the ecological impact of logistics activities. Green logistics focuses on material handling, waste management, packaging, and transport. There is a strong evidence that green logistics results in increased supply chain performance.

As shown in Figure 1 [3], there are strong interactions between logistics, environment, society, and economy. A society without a stable, strong economy will not be able to focus on the environmental or social issues. Green logistics seeks to reduce costs and achieve a more sustainable balance between economic, environmental, and social objectives.



Figure 1: The three main components of green logistics [3]

The key role of green logistics in the modern economy has been recognized by all levels of government. Government can create a favorable environment for the development of green logistics and take a leading role. Approaches to reducing logistics problems include laws, regulations, taxation, finance, and fiscal subsidies. The US government pays special attention to green logistics. It has formulated several policies and regulations such as pollution source control, traffic volume limit, and traffic flow control [4].

Due to the deterioration of environment and the consumption and diminishing energy sources, green logistics is gaining more and more attention among researchers and industrial practitioners. Green logistics has become an important component of production system in today's world. Its practices are adopted in transportation, automotive industry, beverage wholesalers, and food distribution. They are also used in efficient uses of electricity, water, and heating in storage facilities.

Components of Green Logistics

Green logistics has been an integral component of sustainable development of today's economy. The key elements of green logistics include green purchasing, green production, green distribution, green transportation,



green storage, green packaging, green loading and unloading, green information gathering and management, green marketing, green consumption, green waste disposal, and green reverse logistics [5,6].

- *Green Purchasing*: This is the practice of purchasing goods and services with negative environmental effects in the least possible amounts. It requires various departments within an enterprise to consider environmental factors in the procurement by reducing the costs of material use and cutting costs of end treatment. Manufacturers should consider environmental factors when selecting raw materials.
- *Green Production*: This is the implementation of preventative environmental management strategies in a manner integrated in the production process. It involves the idea of producing goods and services with less waste.
- *Green Distribution*: This is a combination of policy measures and pollution-free distribution processing out of consideration for environmental protection.
- *Green Transportation*: This is characterized by energy saving, reductions in exhaust emissions, and reduction of air pollution. Transportation is the most visible aspect of supply chains and is one of the main sources of air pollution. Leakage during transportation should be avoided to prevent environmental pollution. Using green vehicles is also important.
- *Green Storage*: This involves creating secure storage environment and keeping products safe in the process of warehouse operations.
- *Green Packaging*: This is the ecological packaging that can economically meet the functional requirements of packaging throughout its life cycle of product packaging that can be reused or recycled. This should cost less and be environmentally friendly.
- *Green Information Gathering and Management*: This is crucial for the implementation of green logistics strategies.
- *Green Disposal*: Waste must be effectively recycled.
- *Green Reverse Logistics*: This consists of remanufacturing, reusing, and recycling. It plays in green logistics and green supply chain management. The comparison of reverse logistics and green logistics is made in Figure 2 [1].

All these elements impact the environment.



Figure 2: Comparison of reverse logistics and green logistics [1]

Benefits and Challenges

Today the logistics industry is one of the most important industries by organizing the worldwide supply chains. Green logistics gives prominence to economizing resources and reducing damage to environment. It can bring considerable social value and economic value to enterprises and make them obtain a new competitive advantage. It can also upgrade enterprises' international competitiveness [7]. Other typical benefits include lower energy consumption and cost savings caused by reduced fuel and resources, and improvement in the company's reputation.

In spite of the increasing importance of green logistics practices, it is not free from challenges. There is lack of education and training related to green logistics. Training on new technological processes introduced as part of a green logistics program needs to be implemented. Studies have shown that green logistics implementations add to the costs of investment, operations, and purchasing of eco-friendly materials.



Conclusion

Logistics is an important part of the modern economies around the world. Green logistics is an emerging cutting-edge concept that ensures that environmental, social, and financial-economic factors are taken into account in the production and distribution of products in the market. It is one of the main factors for sustainable development. It provides a useful tool for eco-logistic and sustainable enterprises. Its adoption may save costs and reduce environmental damage while improving the operating efficiency of logistics enterprises.

Green logistics is a relatively young but rapidly evolving concept. It is no longer a fantasy but a reality. It is growing in scope and importance. The interest in developing green logistics from companies, government, and the public is constantly increasing. For more information on green logistics, one should consult the books in [8,9] and two journals devoted to it: *International Journal of Logistics and International Journal of Logistics Research and Application*.

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