

Green Logistics –Development and Paradoxes

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Abstract: Logistics are an important role of modern transport systems. Contemporary technological and spatial developments have improved the cost, efficiency and reliability of freight and passenger transport systems. At the same time, the negative environmental impacts of transportation have gained wide recognition and are at the core of issues of sustainability, especially in urban areas. Since the applications of logistics are generally positive for the efficiency of transport systems, it has been suggested that logistics are environmentally friendly, thus the concept of “green logistics”. This paper presents about the green logistics developments, applications, drivers, adoption, and some issues that should be dealt with from the perspective of a government and company’s logistics systems and paradoxes.

Introduction

‘Logistics’ are at the heart of recent transport systems. As has been demonstrated earlier, the term implies a degree organization and control over freight movements that only modern technology could have brought into being. It has become one of the most important developments in the transportation industry. ‘Greenness’ has become a buzz word for a range of environmental concerns, and is usually considered positively. It is employed to recommend compatibility with the environment, and thus, like ‘logistics’ is something that is beneficial. When put together the two words suggest an eco-friendly and efficient transport and distribution system. The term has wide appeal, and is seen by many as eminently desirable. However, as we explore the concept and its applications in greater detail, a great many absurdities and discrepancies arise, which suggest that its application may be more difficult than what might have been expected.

Objectives of the study

1. To know about the developments, applications, drivers and adoption of green logistics.
2. To present the issues that should be dealt with from the perspective of a government and company’s logistics systems
3. To understand the paradoxes of green logistics

Data collection

Present paper is based on only secondary data. The data is drawn from different journals, magazines, and Internet.

Why green?

Reasons why companies choose to “go green” is such as it is a market for their business being green. It gives the company a competitive benefit. Since the customers are demanding now a days that the businesses will be green. And as Shrivastava (1996, 56) concludes that customer are demanding green products and packaging more friendly to the environment. He then continues that some consumers are willing to pay higher prices for environmentally sound products, and they are seeking more information about contents, use disposal and recyclability. But it is not the only reason why businesses are going green and adapting green logistics. And as Thiell, Zuluga, Montanez and Hoof (2011, 335) concludes that transportation of the logistics operation has a significant impact on the environment. This is when one considers how much CO₂ that vehicles, aircrafts and vessels generate. It is often considered one of the main causes of the global warming effect that is threatening the world today. Also according to Wu Haw-Jan and Steven C (International Journal of physical distribution

&logistics management 1995) another reason why being green and using green logistics is of an importance is because of the serious environmental problems that have arisen from the economic growth. Reasons like depletion of the ozone layer, rapid disappearance of rain forests, pollution of air and water and scarcity of landfills pose threats to the global quality of life. They also state that there has been an increasing demand for green products in the marketplace, more stringent pollution regulations set forth by government and more environmentally responsible business management. Another factor that is mentioned in the article is that to be “able to achieve the business goals and objectives, a company must respond to increasing consumer demand for green products, comply with ever tightening environmental regulations, and implement environmentally responsible plans as a good corporate citizen.” A factor that also needs to be considered is the governmental reasons. The roles of government in preserving the environment are as a regulator, facilitator and buyer. The government sets standards such as vehicle emission standards, recycling requirements in federal, state and local levels; they also set standards in noise control. In Europe and Canada there has also been set stringent standards on source reduction, material reuse and waste recycling. A benefit from the government is that they support research and provides investment and regulatory incentives for business to develop new environmental technologies. When it comes to logistics they support the development of transport infrastructure and regulations, which includes high-speed rail and alternative fuels. And there is also a benefit from handling the environmental issues in a proper manner. This is to avoid legal and financial consequences of environmental mismanagement, coupled with bad publicity.

What is Green Logistics?

The last decade has seen a tremendous increase in the public and government concern for the environment. As a result there has been an excessive amount of pressure on major firms to reduce the environmental impact of their logistics operations. This has risen to a varied impact, in terms of the choice of externalities and the distances over which their undesirable effects are felt. Transportation of goods has a negative impact on the local air quality, generates noise pollution, leads to accidents and, in totality, makes a noteworthy input to global warming. The impact of logistics on weather change has called for increasing attention in recent years, partially because increasing controls on pollution and road safety improvements have alleviated the other environmental problems. Also, new scientific research has exposed that global warming presents a much greater and more instantaneous threat than earlier thought. It is expected that goods transportation accounts for around 8% of energy-related Carbon Dioxide emissions worldwide. The inclusions of warehousing and freight management are likely to add another 3% to this total. Making logistics sustainable in the longer term will involve more than cutting carbon emissions. Despite recent improvements, the potential still exists to cut the other environmental costs of logistics by a significant margin.

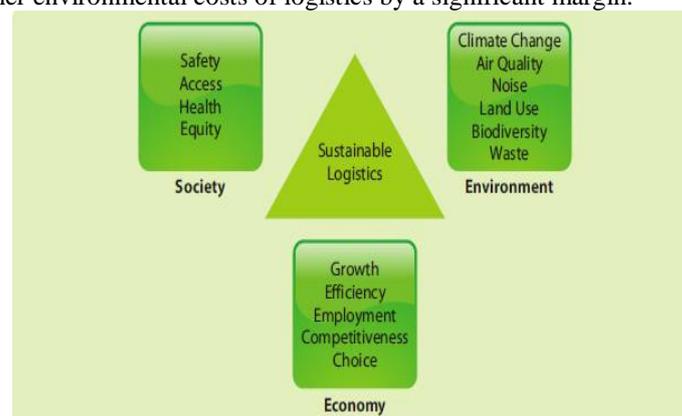


Figure 1: Impact of Sustainable Green Logistics on Everyday Living

Green logistics is becoming very important in the corporate world, since the demands on companies are getting stricter and the green logistics have to be considered throughout the process in the business. In the late 1980s and in the early 1990s greenness became a catchword in the transportation industry. Since the world commission on Environment and Development set an establishment of environmental sustainability as a mission for international action, it gave the green issue a remarkable push in the economic and political fields. Logistics that was then a developing subject was seen by many as an opportunity to adopt a more green and environmental face. (Dr. Jean Paul Rodrigue, Dr. Brian Slack & Dr. Claude Comtois, 2009)

The main objective of logistics is to co-ordinate these activities in a way that it meets customer requirements at minimum cost. In the past this cost has been defined in purely monetary terms. As concern for

the environment rises, companies must take more account of the external costs of logistics associated mainly with climate change, air pollution, noise, vibration and accidents. This research project examines ways to reduce these externalities and achieves a more sustainable balance between economic, environmental and social objectives.

From logistics to green logistics

Logistics is one of the crucial competitive factors in developed countries. Thus, the modern logistics is oriented to more and more pretentious users and final goods consumers. Consequently, logistics is under constant pressure to seek new ways of optimization and customer satisfaction. Reverse logistics is one of the results of increased demands and needs from different levels of society. Environmental pressure became very strong two decades ago, as the environmental degradation became evident through CFCs, acid rains and global warming.

In the early 1990s reverse logistics became a society obligation in the developed countries. Logistics experts produced a lot of different studies, reports and opinions at that time. Namely Tanja and Murphy exposed how the environment issues could be incorporated in the logistics sector. This new logistics basis was placed as logistics entered in the sector of collecting waste and recycling.

Fundamental actions in the late nineties incorporated reverse logistics as an equal element of the entire logistics. Moreover, it was a starting point of development of green logistics, which is even a wider concept than reverse logistics. Reverse logistics includes processes of movements and transportation of waste from the users to recycling plants. The overall reverse logistics activities can be divided into four main groups:

1. Collection,
2. Inspection, selection and sorting processes,
3. Reprocessing, and finally
4. Redistribution

Green logistics deals also with environmental questions, such as pollution and environmental degradation caused by improper logistics processes and utilisation of old and environmentally unfriendly transport technology.

Drivers for Green Logistics

This section describes the various drivers for Green Logistics.

Mounting energy costs

Increasing power and fuel costs, together with the cost of related raw materials used in infrastructure building and functioning has led to chances for looking into green alternatives that can significantly lead to a reduction in the price. Reducing the power consumed by IT apparatus, energy efficient lighting and cooling, substitutive energy sources, recycling and tele-presence can help develop the bottom line in business financial sheets.

Worldwide alarms among corporate over GHG (Green House Gases) emissions

Many corporate policies now consist of targets for decreasing their impact on the surroundings. With IT equipment, infrastructure and people having a significant footprint in any business today, identifying and lowering its impact is becoming very important. Green IT is thus as important to an industrial manufacturer as it is to a telecom or an IT services organization.

Climate change

Global Warming impacts weather, ice-caps and glacier. On an average, mountain glaciers and snow cover have reduced in both the northern and southern hemispheres. This widespread lowering in glaciers and ice caps has contributed to observed sea level rise.

Regulations such as EPA (Environmental Protection Agency), RoHS (Restriction of Hazardous Substances) and so on

The environmental policies in diverse geographies can be largely classified as regulatory (bans, permits and standards), financial (gains for adherence and reduction) and educational (environmental reporting, audits, product labeling and so on). Green IT knowledge and concerns are leading to the development of legislations along all these areas. Assortments of IT hardware in an organization need to follow certain specifications to obtain Energy Star Ratings. This has been effective in the US since 2007. Controlling the carbon trace of IT is also becoming significant for getting environmental certifications. Penalization by policing agencies to implement carbon credit obedience is another inspiring factor for Green IT initiatives. Many inducements are

being provided by the governments (tax incentives) and service companies to embark on projects such as cooling system retrofits, apparatus consolidation and self-generation through interchangeable sources to make up for some of the savings costs for commissioning these transformations.

Improved community awareness of environmental issues

Widespread consciousness is likely to lead to privileged choices in vendor selection based on Green IT practices. A flourishing Green IT tactic is largely reliant on an end-to-end obedience across supply chains, along-with sharing the best procedures in companies across the supply chain.

Development and Application of Green Logistics

In common with many other areas of human endeavour, 'greenness' became a catchword in the transportation industry in the late 1980s and early 1990s. It grew out of the growing awareness of environmental problems, and in particular with well-publicised issues such as acid rain, CFCs and global warming. The World Commission on Environment and Development Report (1987), with its establishment of environmental sustainability as a goal for international action, gave green issues a significant boost in political and economic arenas. The transportation industry is a major contributor to environmental degradation through its modes, infrastructures and traffics (Banister and Button 1993; Whitelegg 1993). The developing field of logistics was seen by many as an opportunity for the transportation industry to present a more environmentally-friendly face. During the early 1990s there was an outpouring of studies, reports and opinion pieces suggesting how the environment could be incorporated in the logistics industry (Muller 1991; Murphy et al. 1994; Tanja 1991). It was reported that the 1990s would be 'the decade of the environment' (Kirkpatrick 1990).

As we look back on the decade we can observe that interest in the environment by the logistics industry manifested itself most clearly in terms of exploiting new market opportunities. While traditional logistics seeks to organise forward distribution, that is the transport, warehousing, packaging and inventory management from the producer to the consumer, environmental considerations opened up markets for recycling and disposal, and led to an entire new sub-sector: reverse logistics. This reverse distribution involves the transport of waste and the movement of used materials. While the term 'reverse logistics' is widely used, other names have been applied, such as 'reverse distribution', 'reverse-flow logistics', and 'green logistics' (Byrne and Deeb 1993).

Inserting logistics into recycling and the disposal of waste materials of all kinds, including toxic and hazardous goods, has become a major new market. There are several variants. An important segment is customer-driven, where domestic waste is set aside by home-dwellers for recycling. This has achieved wide popularity in many communities, notably because the public became involved in the process. A second type is where non-recyclable waste, including hazardous materials, is transported for disposal to designated sites. As land fills close to urban areas become scarce, waste has to be transported greater distances to disposal centres. A different approach is where reverse distribution is a continuous embedded process in which the organisation (manufacturer or distributor) takes responsibility for the delivery of new products as well as their take-back. This would mean environmental considerations through the whole life-cycle of a product (production, distribution, consumption and disposal). For example, BMW is designing a vehicle whose parts will be entirely recyclable (Giuntini and Andel 1995).

How the logistics industry has responded to the environmental imperatives is not unexpected, given its commercial and economic imperatives, but by virtually overlooking significant issues, such as pollution, congestion, resource depletion, means that the logistics industry is still not very 'green'. This conclusion is borne out by published surveys. Murphy et al (1994) asked members of the Council for Logistics Management what were the most important environmental issues relating to logistics operations. The two leading issues selected were hazardous waste disposal and solid waste disposal. Two thirds of respondents identified these as being of 'great' or 'maximum' importance. The least important issues identified were congestion and land use, two elements usually considered of central importance by environmentalists. When asked to identify the future impact of environmental issues on logistical functions, again waste disposal and packaging were chosen as leading factors. Customer services, inventory control, production scheduling – logistical elements – were seen to have negligible environmental implications.

Adapting Green logistics

The reason why companies usually adapt a green transport system is in order to reduce traffic congestion, reduce pollution, and promote social harmony and to save transportation costs. But since there is a huge competition between transportation systems it increases the waste of transport resources. So when a system of green logistics infrastructure is established it sets the basis system for the entire green logistics system.

In order to achieve a integrated green transport system and integrated transport hub should be established, since it is a connection of road network and an inter-city transport corridor. And it has a direct

impact on the overall efficiency of transport systems. But modern management is needed in order to achieve this, since sea, land and air and other various means of transportation will be found in a transportation hub.

With transportation should the company also consider the form of transportation that is being used for the goods? The company should take advantage of water as a transport option. Since a large amount of volume can be transported, it leaves a small footprint; it has low energy consumption and also a small pollution.

A part of having a successful green logistics model is to have a platform for the information system. If there is an existing information system it can provide information and precisely monitor every process of logistics activities. In this information system the members of the logistics team can monitor the product packaging, storage, transportation; distribution processing, loading and handling etc. When they are monitoring these activities they can then comply with the requirements of environmental development and can implement easier the environmental logistics decision-making. The system includes eight models which is show in this figure:

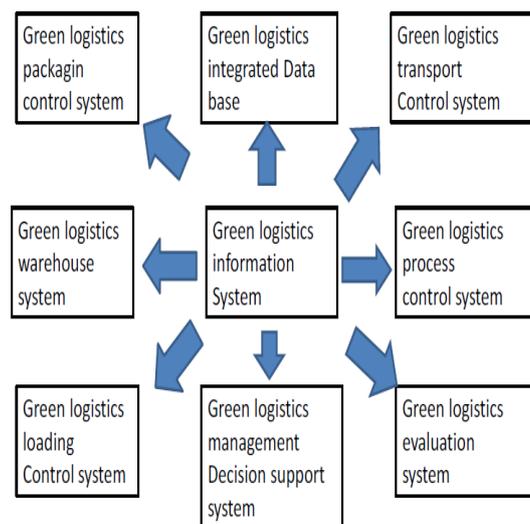


Figure 2: Green logistics information system structure
Source: Zhan Yingjung & Liu Juanjuan

Now these different parts of green logistics will be explained a little bit further.

We start with the green packaging control system. In this part the company should promote production departments to use as simple as possible and biodegradable material when producing the package. And to be able to monitor and control the enterprise's product packaging other green system evaluation indicators should be adapted. Then after this we focus on the green transport control system. Here it should be evaluated the activities that are causing goods damaged during the transport and also consider the environmental pollution. In the green warehouse control system it is one of a series of system to monitor any non-green in warehouse sub-factors. The following is the green process control system; this is a system to monitor productions from product places to the final consumption places. Also issues such as packaging, segmentation, measurement, assembly, commodity inspection etc. can go under the process control system. The following is the green load and unload control system. In this part activities such as transportation, storage, packaging or carrying of goods are controlled and monitored. The sixth is the green logistics evaluation system. Here there are mainly four aspects that should be considered; the environmental performance logistics system, resource performance logistics system, economic performance logistics system and the technical performance of logistics systems. The last one is the green logistics management decision support system. Here in this system the main goal is to create and establish many models of green logistics so that members involved in logistics can optimize the decision-making and choices.

Green logistics is not only an issue for companies but also an issue for governments.

Some issues that should be dealt with from the perspective of a government and company's logistics systems are:

1. Management of pollution sources:

Regulations of emission of waste should be considered according to the air pollution control act. It refers to the amount of NO₂ emission that comes from motor vehicles so there can be a restriction the types of

vehicles that are on the road. The purpose is to promote the usage of eligible vehicles, and also the promoting of control of vehicle noise.

2. A guidance of different options of transportation:

Governments should rationalize and guide the usage of optional transport means. They should also encourage enterprises to select appropriate modes of transport. This can be done through taxes or administrative policies so that the companies logistics and pollution will be efficient.

3. To be able to control the traffic flow:

Governments are mainly responsible for the construction of roads. And also making a whole plan of roads and railway development, they should also modernize traffic control systems, develop rules to control road parking activities and so on.

Paradoxes of green logistics

When adapting green logistics there might be some inconsistencies that might arise. The issue is that green logistics is supposed to be environmental friendly, but logistics in itself is not very green. This is because of pollution and waste that is created. So when adapting green logistics there are some paradoxes that arises. Companies wants to get the cheapest way to do things but at the same time they should choose options that are green, which sometimes are more costly to the company. The logistics industry has reacted to the environmental imperatives should not be unexpectedly, this is given by its commercial and economical imperatives. But here there are significant issues that are being overlooked. These are issues such as pollution congestion, resource depletion which are issues that are not very green.

Dimension	Outcome	Paradox
Costs	Reduction in costs by improving packaging and reduction of waste. The distributors gain the benefit.	Externalized environmental costs.
Time/flexibility	Integrated supply chains, DTD and JIT provides a adjustable and competent physical distribution systems	Extended production, distribution and retailing models that are consuming more space, energy and generates more missions (CO2, particulates,NOx, etc.)
Network	(Hub-and-spoke structure) Through network changes there is a increasing system-wide well organized distribution system.	Environmental impacts on major hubs and along corridors are being considered and the pressure on local communities.
Reliability	That freight and passengers can rely on time distribution and its reliability	Transportation methods that are used, truck and air that are the least environmental efficient.
Warehousing	The need for private warehousing operations are reducing	Inventories are partly on roads or containers that are adding more congestion and are taking more space.
E-commerce	Diversification of supply chains and better business possibilities	Physical distribution systems changes that requires more energy consumptions.

Conclusion

There are several definitions of green logistics. One of them are “green logistics is concerned with producing and distributing goods in a sustainable way, taking account of environmental and social factors.” Reasons why companies are going green are that it gives a competitive advantage and is required by governments and laws. Being green is also a way for the company to be responsible in their operations. Since logistics are considered to be one of the main causes of the global warming, with the emission of CO2 that generates from vehicles, aircrafts and vessels. Companies adapt green logistics systems because they want to reduce congestion, pollution and to save transportation costs.

But there are issues that companies need to deal with in green logistics. There are issues like time or cost. What is more important? Materials, a vendor with lower cost but not as environmental friendly as a vendor with higher costs. The more environmental friendly vendor might also be further away than the low cost vendor, which then can add longer shipping distances. Transportation, freight delays and longer lead times that can come from consolidation of shipments. Companies deal with a lot of issues concerning green logistics. But the benefits can also be good. Such as a competitive advantage, saving in costs and a better reputation.

References:

- [1]. Banister, D. and Button, K. (eds) (1993) *Transport, the Environment, and Sustainable Development*. London: E & F N Spon.
- [2]. Dr. Jean Paul Rodrigue, Dr Brian Slack & Dr Claude Comtois, 2009, *The Geography of transport systems*, Routledge, The chartered institute of Logistics and transport, 2008
- [3]. de Brito, M. P., Dekker, R.: *A framework for reverse logistics, Reverse logistics – Quantitative Models for Closed-Loop Supply Chains*, Springer, Berlin, 2004, pp. 3-29
- [4]. Blumberg, D. F.: *Reverse logistics and closed loop supply chain processes*, Taylor & Francis, New York, 2004
- [5]. Giuntini R. and Andel T.J. (1995) "Advance with reverse logistics". *Transportation and Distribution* Feb. 73-6.
- [6]. Jean-Paul Rodrigue, Brian Slack, Claude Comtois *Green Logistics (The Paradoxes of)*, *Published in A.M. Brewer, K.J. Button and D.A. Hensher (eds) (2001) "The Handbook of Logistics and Supply-Chain Management", Handbooks in Transport #2, London: Pergamon/Elsevier*
- [7]. Kirkpatrick D. (1990) "Environmentalism: The New Crusade". *Fortune*, February 12, 44-51.
- [8]. Byrne P. and Deeb A. (1993) "Logistics must meet the 'green' challenge", *Transportation and Distribution*. Feb. 33-35.
- [9]. Murphy, P., Poist, R. F., Braunschweig, C. D.: *Management of Environmental Issues in Logistics: current status and future potential*. *Transportation Journal*, 1994, pp. 48-56
- [10]. Muller E.W. (1990) "The Greening of Logistics" *Distribution*, January, 27-34.
- [11]. Murphy, P., Poist, R.F. and Braunschweig C.D. (1994) "Management of Environmental Issues in Logistics: current status and future potential". *Transportation Journal*, 48-56.
- [12]. Shrivastava P, 1996, *Greening Business, profiting the corporation and the environment*, Thomson Executive Press, Cincinnati Ohio
- [13]. Sabina Nylund, *Reverse logistics and green logistics*, 2012
- [14]. Tanja P.T. (1991) "A decrease in energy use by logistics: a realistic opportunity?" in *European Conference of Ministers of Transport: Freight Transport and the Environment* Brussels, 151-165.
- [15]. Whitelegg, J. (1993) *Transport for a sustainable future: the case for Europe*. London: Bellhaven.