

## **7. GREEN LOGISTICS - DEVELOPMENT AND IMPLEMENTATION\***

*Environmental problems, material depletion, and high dependency on fossil fuels are core problems of logistics in the EU as well as globally. Therefore, numerous countries, in particular Member States of the EU, have ambitious goals for the increased use of renewables, increased energy efficiency, the reduction of greenhouse gas emissions, transition to sustainable transportation and similar changes. EU companies are, therefore, strongly committed to reducing their environmental impact, reducing the use of fossil fuels and becoming more sustainable. Logistics companies are no exception due to the impact of logistics processes, such as transportation and distribution that impact human health, ecosystem and air quality, climate changes (with noise, vibrations, fossil fuel related harmful emissions etc.), warehousing (especially with energy used for heating and cooling) and packaging (especially with the use of material). Therefore, the implementation of green logistics is necessary for the sustainable future of our planet. This chapter identifies how the idea of green logistics was developed and has evolved, analyses key problems for its implementation, and presents the current status of green logistics, including the best practices of green logistics implementation in selected organizations.*

### **7.1 Introduction in green logistics**

#### **7.1.1 Why pursue green logistics?**

The main objective of logistics is to coordinate logistical activities and to meet customer requirements at minimum cost. In the past, the cost of achieving the logistic objectives were expressed only in financial or economic terms, but today, due to the external effects of logistics, such as pollution, noise, accidents, and other factors, companies are seeking a balance between economic, environmental and social objectives (Knez, 2011).

Over the previous decade, companies have been under strong pressure because of governmental environmental legislation and increasing public environmental awareness. In particular, attention is being paid to the distribution of goods (which is strongly related to logistics), which causes lower local air quality, noise and vibrations, traffic accidents, and contributes to global warming. It is estimated that freight accounts for approximately 8% of energy-related CO<sub>2</sub> emissions in the

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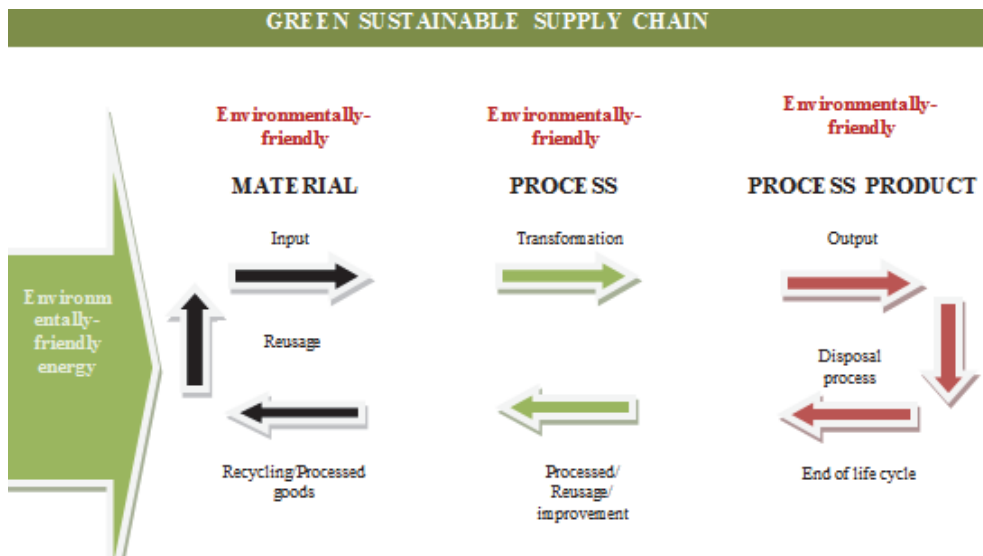
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world. If the storage and handling of materials are included, an additional 2% to 3% can be added. The World Economic Forum estimates that logistics activities represent approximately 5.5% of total global emissions, two thirds of which is caused by freight transport, and approximately 9–10% is related to logistics-related facilities. The energy used for transporting goods has been increasing rapidly in comparison with the energy consumed by cars and buses. Shipping represents 15–30% of the total CO<sub>2</sub> that is released into the atmosphere annually, so it is not surprising that governments and intergovernmental organizations have been developing policies to reduce greenhouse gas (GHG) emissions in the atmosphere (McKinnon, 2012).

### 7.1.2 The idea of green logistics

The idea of green logistics is based on protecting the environment and reducing the environmental and other costs of logistic processes; it covers all the stages of the product lifecycle, including its recycling and embodied energy that should (ideally) mainly be produced from renewables. It requires an upgrade of traditional (classic) logistics (i.e. the right goods in the right place at the right time in the right quantity and right condition in the right packaging at the lowest cost) through the concept of meeting all the requirements of users and customers including the lowest rate of environmental pollution.

Figure 7.1. Green supply chain (Knez, 2011)



Green logistics or the concept of the green supply chain, presented in Figure 7.1, therefore, aims to achieve a sustainable balance between economic, environmental, and social objectives (Knez, 2011). Green logistics and related topics have recently become highly current and relevant and are frequently one of the most important factors that set new trends and impact national or organizational policy and development strategy. That 'green' topics are extremely current and relevant can also be seen in the Horizon 2020 calls, because the highest amount of the EU-related grants and financing is provided for sustainable and green research projects.

### **7.1.3 History of the development of green logistics and its beginnings**

The pioneering research in the field of green logistics is almost impossible to determine. The starting point could be the first article written on this subject that was published in a logistics journal, but this would discard all previous research related to the environmental impacts of logistics. Although the concern about the harmful effects of transport had been expressed as early as in the 1950s, the beginning of most of the research related to green logistics can be found only after 1960. However, it is noted that the research articles and books that deal with environmental problems are very rare throughout the period from 1960 to 2000 and are becoming more common only in the previous decade (McKinnon, 2012).

In the previous 40 years, logistics developed as an academic discipline; consequently, green logistics also did so. New environmentally related trends can be identified in green logistics research, such as the growth of environmental awareness, the dissemination of environmental regulations, the development of national and international standards on the environment, and others. As a result of these trends, the volume of 'green-related' information available to the logistics provider has also dramatically increased and enables better implementation of green logistics in its processes. Various and extensive specialized studies on green logistics have become a daily reality.

The motives for the majority of earlier studies that examined the impact of logistics on the environment has been an increase in freight traffic and especially the increased number of road cargo trucks that were very loud and very polluting. A large number of studies were carried out, particularly in Great Britain, with the goal of measuring the impact of transport on the environment. This led to the formation of the representatives of the truckers and the Committee on the Environment in the organization, which published a series of reports on how to streamline the movement of cargo by road between 1974 and 1979. Advances in vehicle technology and tighter regulations regarding emissions led to a significant contribution to the simultaneous reductions of harmful emissions and cost of transportation (McKinnon, 2012).

The first identified major study of the distribution of goods in urban regions was carried out from 1970 to 1980. Larger cities, such as London and Chicago, started to study city transportation, and academic institutions started to explore specific aspects of the urban freight system. In the 1980s and 1990s, research in this area was severely limited as they (supposedly) exhausted all sources of financing in the previous period. Many environmental problems associated with urban freight transportation remained unresolved. That is why this topic became highly relevant again between 1990 and 2000 when a large amount of new research supported by international research initiatives in Europe was initiated (McKinnon, 2012).

Individual branches of the economy are now also dealing with the question of how to bring a product from production to the distributor and beyond, most efficiently and at a minimum cost (including for the environment). Greater emphasis is placed on urban freight transport, and new branches of urban freight research include the diversity and scale of facilities that are associated with last mile logistics.

## **7.2 Methodology**

In this chapter, we have reviewed scientific and professional literature to review data on the historical development of green logistics, to discuss its starting point and development along with a review of different studies evaluating importance of green logistics in practice. Since greening is becoming an important global trend, we identified how well green logistics is implemented in practice. Our focus was on the Slovenian economy. A review of special databases was also carried out to gather relevant data about important factors, presenting the development and the level of implementation of green logistics. We have made a comparative analysis of green logistics and the importance of environmental issues and their inclusion in companies' objectives in Slovenian and American companies.

Additionally, we have identified crucial problems in the implementation process of integrating 'green' into business processes. These problems were carefully reviewed and cross-compared. Different studies have identified different implementation problems, and we have studied whether these problems are also relevant for the transition to green processes in Slovenian companies. Key findings were synthesized and discussed.

## 7.3 Green logistics in practice

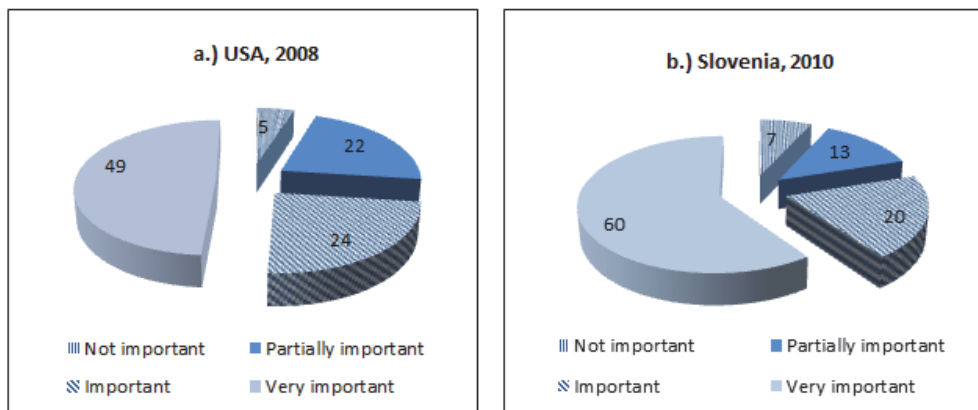
### 7.3.1 The importance of green issues and integration of 'green' in business strategy – a cross-comparison of the USA and Slovenia

Many recent studies have shown that green logistics strategies have gained importance in supply chain management and that the transport and distribution activities have a significant weight in the formulation of these strategies.

Recent research (Insight Research) conducted among 600 supply chain experts across the EU, the USA and Japan in 2008 revealed that, on average, 35% of their companies had a written 'green' strategy for supply chains, while this proportion increased to 54% among enterprises whose annual turnover exceeds 1 billion USD. The various activities carried out by this strategy include logistics, which was identified as environmentally problematic and was, therefore, changed in 81% of these enterprises. This study has shown that logistics and supply chain management (economic) goals are closely related to environmental objectives.

Another study performed by McKinsey consulting (Supply Chain Digest, 2008) in 2008 revealed that talking about green solutions and having a green strategy or sustainable policy is far ahead of real actions and implementations of these strategies in practice. Including over 2000 American companies, the study showed that 73% of them were convinced that climate change is an important or even very important issue (Figure 7.2) but that only 23% of them had included environmental issues, i.e. climate change, in the companies' objectives (Figure 7.3).

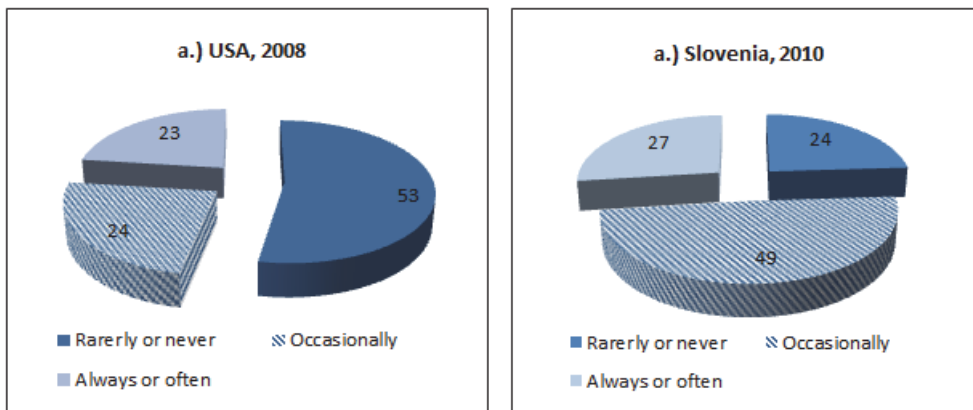
Figure 7.2. Importance of climate changes in USA and Slovenia



Source: a.) Supply Chain Digest, 2008 and b.) Knez, 2010.

A similar study was carried out at the Faculty of Logistics at the University of Maribor in 2010, which included 120 Slovenian companies. Figure 7.2 and Figure 7.3 also present a comparison between American and Slovenian companies, revealing that in Slovenia the percentage of companies that considered climate change to be an important or very important topic is 80% (Figure 2) but again only 27% had already included climate change issues in the companies' objectives (Figure 7.3). Research in the USA has also shown that there are relatively few companies that actually set their emissions targets while, conversely, more than 60% of enterprises believed that they manage and implement environmental improvements without defining environmental goals and having objectives such as reducing their greenhouse gas emissions; 15% of them were not even aware whether they had set them or not. The results are similar in Slovenia, although environmental issues are slightly more important in Slovenia, and more companies have already included them in their objectives. Furthermore, slightly more companies believed that they manage and implement environmental improvements without defining environmental goals.

Figure 7.3. Including awareness about climate changes in company objectives

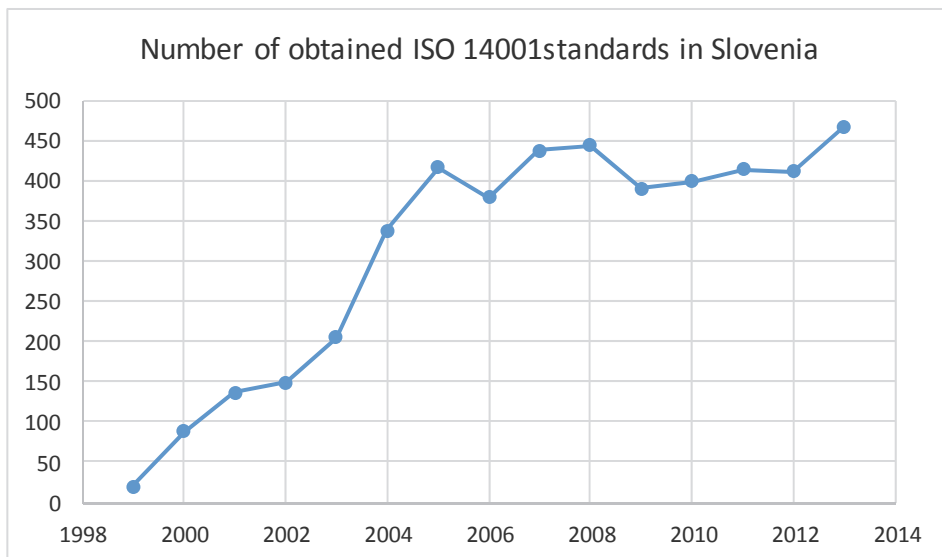


Source: a.) Supply Chain Digest, 2008 and b.) Knez, 2010.

Therefore, the implementation of logistics activities in accordance with the principles of green logistics can be raised to a higher level through a variety of strategies. One such solution is the 'top-down' approach that is less popular with companies: the government sets goals and dictate actions and changes. In the other, more user-friendly 'bottom-up' approach, companies themselves based on their own interests and beliefs (or because they identify new business opportunity) and create and implement green policies. The environmentally friendly business activities of companies can be disclosed with the acquisition of voluntary environmental

standards, such as the ISO 14000 series. The number of ISO 14001 certificates has been increasing since 1998; however, since 2008 the number of acquired certificates has fallen slightly, presumably due to the global economic crisis. The situation has been improving in recent years. The number of obtained ISO 14001 standards in Slovenia is presented in Figure 7.4.

Figure 7.4. Number of ISO 14001 environmental management standards in Slovenia



Source: ISO, 2015.

### 7.3.2 Key problems and factors of implementing green logistics

Different extensive surveys conducted among companies in recent decades have revealed that many organizations around the world promote their environmental awareness and environmentally friendly actions. It would be a great thing if these were their primary objectives as well. However, in most cases it appears that the companies are mainly focused on marketing campaigns that influence the public opinion regarding their environmental suitability and acquiring customers rather than genuine environmentally friendly actions. Key factors for becoming greener were therefore studied and discussed. In Table 1, the key findings of three different studies are presented revealing factors that are important for logistic companies to become environmentally friendlier.

Table 7.1. Key factors for greening of business processes in enterprises

<i>Eye for Transport (2007)</i>	<i>Aberdeen group (2008)</i>	<i>Insight (2008)</i>
Improving public relations	Company existence	Optimize supply chain
Improving customer relations	Increasing energy and fuel costs	Improve company image
Part of the plan for being socially responsible company	Competitive advantage, differentiation	Lower the costs of logistic
Finances and profitability of investments	Compliance with current and future legal regulation	Compliance with legal regulation
Compliance with legal regulation	Increasing transport costs	Customer demands
Decreasing fuel costs		Differentiation from competitors
Increasing supply chain efficiency		Developing alternative logistic networks
Decreasing risks		
Improving investors relations		

It is encouraging that enterprises react to these studies and that they have also identified the greening of their processes as a new business opportunity as well.

In this perspective, Slovenia is no different from other countries. However, there are also some additional proposals for the greater promotion of green logistics that should be applied, such as the preparation of comprehensive sustainability guidelines for Slovenia, which could bring together all stakeholders' interests, including the field of green logistics. Europe has set ambitious environmental targets but crucial problems are many times identified in developing countries who all want to achieve the standards of the developed and rich countries but without the implementation of green processes in accordance with the principles of green logistics, which are still extremely rare or almost non-existent.

### 7.3.3 Best practices of green logistics

Each company must first understand the impact of the emissions associated with purchasing materials or semi-finished products and their production processes. Then, a company has to systematically analyse the possibilities of reducing their environmental impact with existing measures and new opportunities as well as analysing potential costs, both for themselves for other partners in the supply chain.



Today, many companies still believe that CO<sub>2</sub> emissions in supply chains are mainly originating from partners whose operations and actions cannot be controlled.

For example, the American retail chain Wal-Mart also transfers their green policy to their partners and in some cases this is a condition for their cooperation. In recent years, they have announced numerous initiatives and actions that seek to motivate their suppliers regarding environmentally friendly actions. If Wal-Mart can truly find a way to double its fleet (trucks) energy efficiency in the next ten years, it will not only reduce their carbon emissions but will also save millions of dollars due to lower transport and fuel costs.

Another case of best practice is Iceland, which is probably the only country in the world with a coherent strategy for sustainable development that does not include the use of fossil fuels, including oil. Iceland heats over 85% of all buildings with geothermal energy and produces over 80% of total electrical energy in hydropower plants. A part of the electricity produced in the period of low electricity demand is used for the electrolysis of water and hydrogen production. Hydrogen is then used to power Reykjavik's fuel cell bus fleet.

Even in Slovenia, there are increasing numbers of cases of best green practices. The best of them are nominated for the Green Logistics company award.

#### **7.3.4 Reverse logistics is crucial for being green**

Jonathan Weeks, a former chairman of the British Institute of Logistics, defined logistics as the flow of materials from the earth through the production, distribution and consumption back to earth. Returning product and packaging waste for reuse, recycling, and disposal are activities that are now considered to be a key part of green logistics (McKinnon, 2012).

Interest in research of green logistics and reverse logistics evolved in the 1990s when governments and companies began to reform their waste management, started to reduce the proportion of waste material in municipal landfills or incinerators, and started to increase the proportion of recycling and reuse. This has radically transformed the logistics of waste management and has encouraged research in reverse logistics, especially in the return flow of goods throughout the whole supply chain.

Increasing interest in logistical activities associated with the return of broken, unsold or returned consumer products back into the supply chain by the consolidation, handling and disposal of waste products represent a huge opportunity to reduce costs, to make new revenues (e.g. by selling waste), to create new green jobs, and to increase efficiency in the logistics sector as well as to reduce global material use.

## 7.4 Conclusion

Green logistics is not only manifested through the use of commercial vehicles that meet the latest EURO 5 and EURO 6 standards, the use of vehicles running on biodiesel, natural gas, electric propulsion and vehicles using hybrid technology but also in the optimization of loading trucks, optimizing travel routes, the integration of renewable energy into logistics processes, the reuse and recycling of waste packaging, teaching drivers about fuel-efficient driving, in multi-modality, in the redirection of traffic from road to rail and maritime transport, and many other activities. The realization of a green logistics policy in a company is certainly not a condition that determines the long-term existence in the market but it can be argued that its implementation adds value to the company over the long term, which may be reflected in a better social reputation and gaining new customers (Knez and Plut, 2010). This is not (yet) a condition for the success of the company. However, those companies that are proactive and are already investing in the implementation of greener processes can more easily and more flexibly achieve their competitive advantage, successfully apply for European green funding, follow environmental legislation and so on. Over the next decade, the development of logistics will continue, which will also be focused on the still interesting rationalization of business processes.

Current trends of global transport will further continue, and the volatility of fuel prices will continue to shape trends on the global market. Therefore, it will be crucial to finding the right, green, and renewable energy resources that will allow logistics providers to be competitive in the global market. Today, the question of whether logistics will have to show a 'green face' is no longer relevant. The pressure in this direction increases in all sectors of the economy, policy, and society; therefore, the real question is when we will transit to 'green' in order to maximize our contribution to preserving the environment.

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