



# Impacts of Globalization on Green Logistics Centers in Lithuania

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This paper is a theoretical analysis, opening with the introduction where the problem of the research, the object of the research, the purpose of the research and the research methods are described. The analysis has revealed that the market situation, logistics service providers face today, differs a lot from the situation years ago. Globalization as a process is lightening supply lines, thereby increasing the freight transport intensity of the world economy. Lithuania is geographically good situated, therefore there are great possibilities to integrate into the European trade community, the efficient system of logistics centers is necessary. Climate change is likely to become a major business driver over the next few decades as companies come under intense pressure to decrease the pollution to nature. The main object of this article is the impacts of globalization on green logistics centers in Lithuania. The principal purpose of the article is systemization and thorough description of the knowledge and information (found in a large number of sources) about the economic globalization concept, green logistics, logistics centers and to present a coherent overview on such aspects of logistics as: the importance of green logistics, supply chain management and collaborative logistics.

Key words: *Green logistics, globalization, supply chain management.*

## 1. Introduction

Globalization is a process that has during the recent 30 years the most tremendous impact on the world's business, as we see it today. As borders become more transparent and market access is facilitated, both government and business have been forced to augment their competitiveness, creating the infrastructure and strategies needed to benefit from the accelerated growth of international commerce. Mostly all economic processes happening in countries' market are affected by the phenomenon of globalization, logistics is not an exception. The logistics process has become a rapidly growing area and many organizations began to realize its impact on supply chain profitability.

Logistics are called one of the main accelerators of spreading globalization process around the world. Logistics are at the heart of modern 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 code-word for a range of

environmental concerns, and is usually considered positively. It is employed to suggest compatibility with the environment, and thus, like 'logistics' is something that is beneficial. When put together the two words suggest an environmentally-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 paradoxes and inconsistencies arise, which suggest that its application may be more difficult than what might have been expected on a first encounter.

In this article we consider how the term has been developed and applied to the transportation industry. Although there has been much debate about the effect of globalization to green logistics centers development over the last ten years. Lithuania is not an exception. When the broader interpretations are attempted, it will be shown that there are basic inconsistencies between the goals and objectives of 'logistics' and 'greenness'. We conclude this article by exploring how these paradoxes might be resolved.

The principal aim of the article is to highlight the impacts of globalization on green logistics centers in Lithuania. Tasks: to analyze the impacts of globalization, to emphasize the changes of green logistics centers in Lithuania. Object of the article: Green logistics centers in Lithuania.

## 2. Globalization and logistics

People around the world became more connected to each other than ever before. Information, finance, etc. move around the world faster than ever. Products produced in a most remote corner of the globe are now available to the rest of the world. It is much easier for people to travel, communicate, exchange information and do business worldwide. This whole phenomenon is called globalization. Spurred on in the past by merchants, explorers, colonialists and internationalists, globalization has, in more recent times, been increasing rapidly due to explosive evolution in communications, information and transport technologies. It has also been affected by trade liberalization, logistics internationalization

and financial market deregulation (Čepinskis, Masteika 2009).

The globalization process has been recognized as one of the main underlying forces impacting global logistics service providers (Lemoine 2005). The last few decades have seen a steady growth of international trade and international transport. The main driving forces behind this growth are worldwide growth of the global economy and relaxation of trade barriers. Of course this growth is not evenly spread around the globe and sometimes disruptions can be observed caused by incidental factors such as local economic crises, weather conditions, and political incidents. It is important to understand the mechanism behind this development and, furthermore, to seek to assess the consequences of these mechanisms on global transportation systems, global economies, and their level of environmental sustainability. As a result of globalization input to global logistics system, M. Pesut (2009) notices that: global logistics as a process are very flexible and easy variable, because it could be influenced by several of economical, social and political aspects (see Figure 1):

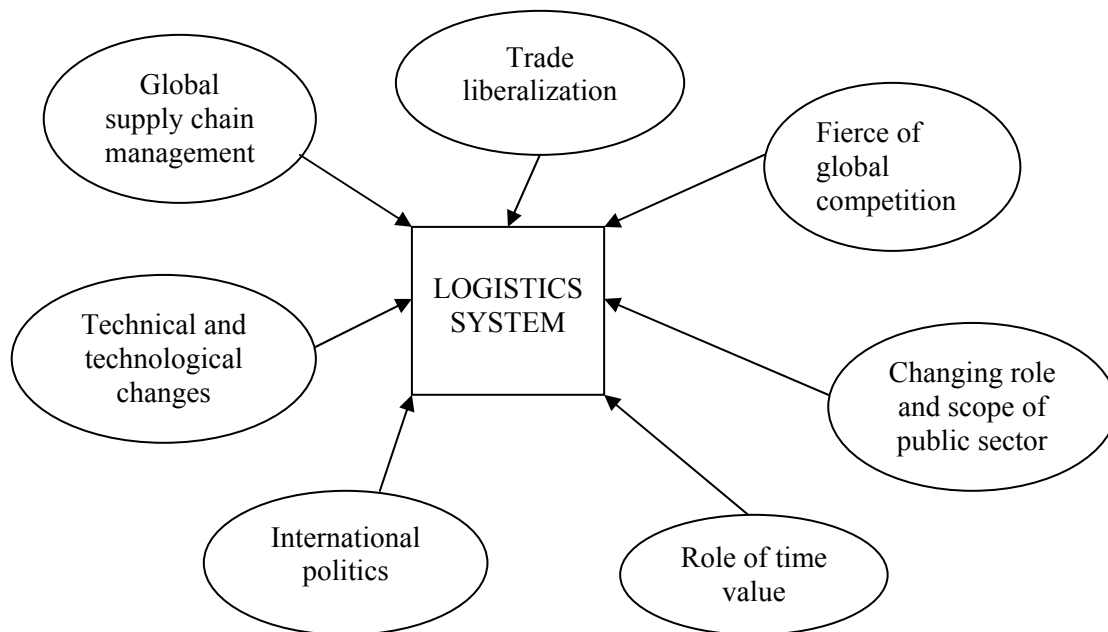


Fig. 1. Logistics influenced by several aspects

In recent years there has been a growing recognition that the processes, whereby we satisfy customer demands, are of critical importance to any organization. These processes are the means whereby products are developed, manufactured and delivered to customers (Christopher 2003). The logistics concept (see Figure 2) is the thread that connects these crucial processes and provides the basis for the design of systems that will cost-effectively deliver value to customers.

The same concept of logistics can be adjusted for international trade and called global logistics concept. The main difference is that the same system

operates worldwide and involves international barriers such as: foreign policy, customs fee, global competitiveness, etc. (Čepinskis, Masteika 2010).

Global Logistics play a very important role in economics of every country. Bowersox J. (2002) states that strong logistics and transportation services can enhance the competitiveness of an economy – inefficient supply chains through high transport and logistics costs could impede export and import flows, may increase costs for firms, especially those competing in the export market. According to Roberts P.O. (2007) global logistics costs are (see fig. 3).

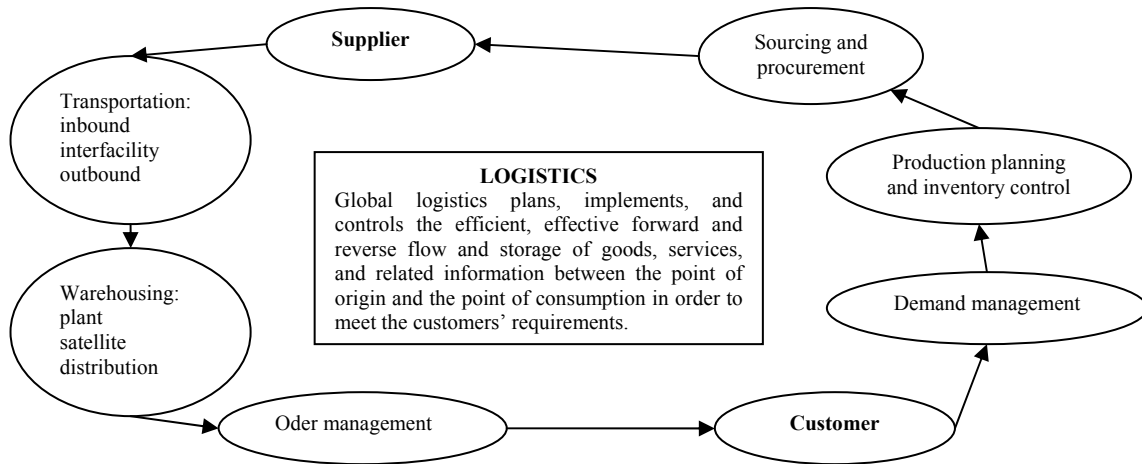


Fig. 2. Logistics concept (Source: made by authors according to Pesut (2009))

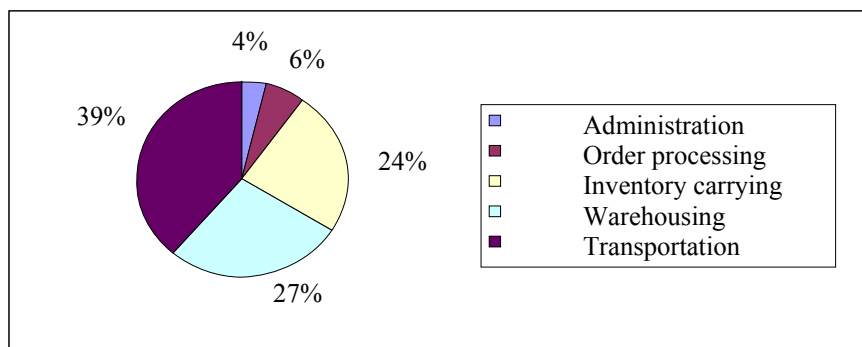


Fig. 3. Worldwide logistics costs 2010 year (Source: Roberts (2007))

Taylor C. (2006) states that logistics have such an enormous impact on supply chain management that global logistics information is now essential for supporting enterprise decision making, including forecasting and demand planning. To make good decisions, a line of business managers and executives need to understand optimized logistics costs – by both origin and destination. They also need predictable delivery dates, clear visibility into import and exports logistics events and automated alerts when planning changes or a shipment is off schedule. Collecting and processing information about load traffics, calculating, forecasting and planning of logistics costs help managing the growth of exports and imports. (Čepinskis, Masteika 2010)

### 3. Green logistics centers in Lithuania

The process of globalization has made a huge impact on every country's economic situation. Lithuania is not an exception. From a historical perspective 20 years ago Lithuania was a member of the Soviet Union where planned economy was a dominant type of economics. As a result, demand and supply of production was controlled by government, the economy of the country was not affected by competition. All that system of planned economics was not effective. After Lithuania regained the independence in 1991 the whole economic situation in

the country dramatically changed. Lithuania got a possibility to enter foreign markets, received investments from foreign countries and encountered market competition. In 2004 Lithuania entered the European Union and as a result the country consolidated its positions in the world's economic community. One of the main advantages of that event was that Lithuania was integrated into the European trade community, no country borders have been left. Exports grew at very high rates. In the situation where an increase in trade and freight transport volumes in Lithuania is expected (Lithuania faces a major economic restructuring) that requires to achieve more integrated and sustainable transport and communication system in the country. First target is to set out the strategic logistic centers in the country. At present, suppliers in Lithuania have changed their supply chains strategy. Supply chain management is outsourced, given to third party logistics (further 3PL) providers. The main reasons are lower costs and more qualified and efficient management in a supply chain. Outsourcing is a reliable business strategy because turning non-core functions over to external suppliers enables companies to leverage their resources, spread risks and concentrate on the issues critical to survival and future growth. Many Lithuanian companies have selected logistics outsourcing as a way to restructure their distribution networks and get competitive advantages. Logistics outsourcing, as a 3PL provider for all or part of the company's logistics operations,

has grown at a high rate over the recent years. Logistics outsourcing in Lithuania has increasingly become an effective solution to reduce costs and spread risks for traditional, vertically integrated companies. As research shows approximately 55 percent of selected 500 companies in Lithuania have at least one contacted with a 3PL provider. These objective reasons prove that logistics centers in

Lithuania play a big role in the country's economy and the sites for logistics centers should be chosen according to the road network in the country, geographical situation and foreign trade policy. The authors of the article present such a model of logistics centers in Lithuania according to the factors mentioned above in Figure 4.

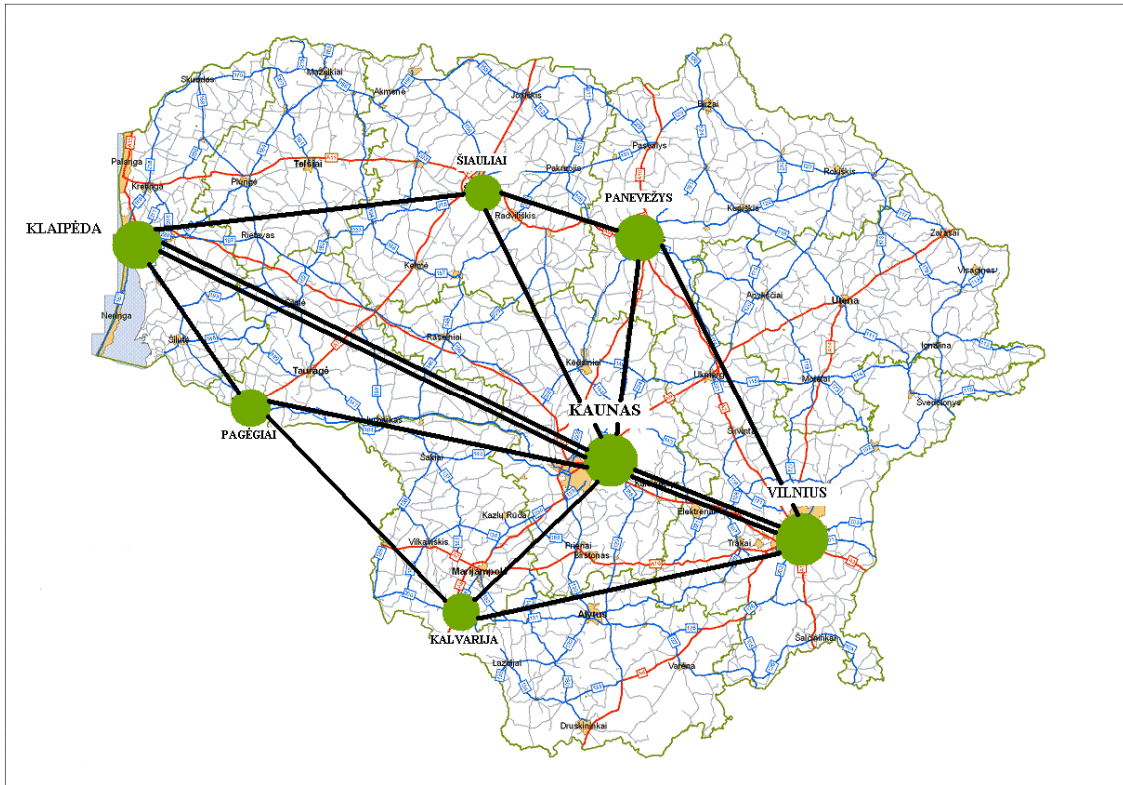


Fig. 4. The network of logistics centers in Lithuania

The authors are of the opinion that the structure of logistics centers presented in Figure 4 will be sustainable and effective. In Kaunas city there should be the main strategic logistics center of Lithuania. The main reason is that Kaunas is in a geographical center of Lithuania. Second, Kaunas has the best communication (by roads, railways, air, water) with other cities. Third, Kaunas is chosen as a strategic logistic center of Lithuania by the government of Lithuania. When Lithuania joined the EU lots of investments were made in roads infrastructure, railways included. At the moment there are few strategic projects being developed: "VIA Baltica" and "RAIL Baltica". The main purpose of these projects is to connect Estonia, Latvia, Lithuania and Poland with high quality road and railway that follow the EU requirements. It will be the gateway to Western Europe. The road and railway go through Kaunas, it is another reason for placing the main strategic logistics center in Kaunas city.

Klaipeda is the only seaport in Lithuania. The logistics center in this city will help for suppliers distribute the goods which will be shipped from the Far East, North America or Western Europe. Klaipeda has good connection with other cities of Lithuania by roads (highway Klaipeda, Kaunas, Vilnius) and by

railway. Not far from Klaipeda (25 km) there is situated the airport of Palanga, which is important for distributing the goods.

Vilnius is the capital of Lithuania, all the strategic solutions and investments are made there. The strategic mission of logistics center in Vilnius will be to supply Byelorussia market with goods. Vilnius has the largest and main airport of the country therefore all other cities will be served with goods via logistics center of Vilnius.

Šiauliai and Panevėžys are situated in the northern part of Lithuania. The main purpose of logistics centers in Šiauliai and Panevėžys will be to serve northern states (Latvia, Estonia and Scandinavian countries) with goods.

The logistics center of Pagėgiai is in a very good geographical situation for supplying the Russian market with goods. Kalvarija logistics center will serve Western Europe with goods and it will be the strategic gateway to Western Europe through Poland.

According to Lithuanian Minister of Transport Communication Eligijus Masiulis the strategic goal of Lithuania is to become a transit country and to build a bridge connecting Western Europe with Russia and other Middle East countries. Lithuania has great opportunities to achieve these goals because it has

favorable geographical position and logistics system which should be generally improved.

The process of globalization accelerates the trade capacities which spread the logistics network (supply chain) around the world. The larger trade capacity – the larger the amount of loads should be delivered, the more loads – the more transport operations should be done. Logistics are responsible for a variety of externalities, including air pollution (CO<sub>2</sub> emission), noise, accidents, vibration, land-take and visual intrusion. Various attempts have been made to assess the relative environmental impacts of freight modes, and a relatively consistent picture emerges from these different studies despite some difference in absolute values. Figure 5 presents the findings from a thorough assessment of the CO<sub>2</sub> emissions per tonne-km for a range of transport modes (McKinnon 2007). In general, rail and waterborne modes of transport are less damaging to the environment than road haulage, with typical

emissions from waterborne freight being four or five times less per tonne-km than for road, and in the case of rail it is seven times lower than road haulage. At either extreme, air has significantly higher CO<sub>2</sub> emissions at around 1600 grams per tonne-km, while pipeline has the lowest emissions rate. The role of these two modes in the freight transport system is particularly specialized. A shift to the more pipeline traffic would be desirable for environmental reasons, but practicalities of achieving this are limited. By contrast, it is clearly undesirable from a sustainability perspective to encourage greater use of air freight (Woodburn, Whiteing 2010).

As freight transport typically accounts for 80-90% of logistics-related carbon emissions, it is hardly surprising that it is the main focus of carbon-mitigation efforts. These efforts can be targeted on five key parameters in Table 1 (McKinnon et al. 2010).

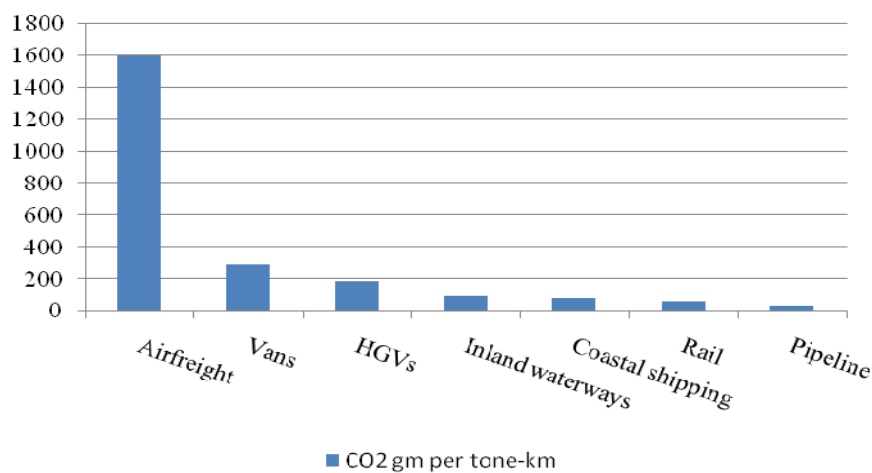


Fig. 5. Estimated average CO<sub>2</sub> intensity values for freight transport modes. (Source: Woodburn, Whiteing (2010))

Climate change is likely to become a major business driver over the next few decades as companies come under intense pressure to decarbonize their activities. There is general acknowledgement in government circles that the increase in global temperatures (above pre-industrial levels) must be limited to 2° C by 2100. This will entail a global reduction in CO<sub>2</sub> emissions of 50% by 2050 (against 1990 levels), with some developed countries already committed to an 80% reduction over this period (Committee on Climate Change 2008). To our knowledge no country has, as yet, disaggregated these national-level carbon reductions into a series of sectoral targets. In theory these targets should be related to the marginal cost of carbon abatement (MCCA) in different sectors. It is not known how the MCCA of logistical activities is likely to compare to that of other business activities. In absolute terms, however, the carbon footprint of logistics is likely to

be much smaller in 2050 than it is today (McKinnon 2008).

Over the past 10-15 years, against a background of increasing public and government concern for the environment, companies have come under mounting pressure to reduce the environmental impact of their logistics operations. This impact is diverse, in terms of the range of externalities and the distances over which their adverse effects are experienced. The distribution of goods impairs local air quality, generates noise and vibration, causes accidents and makes a significant contribution to global warming. The impact of logistics on climate change has attracted increasing attention in recent years, partly because tightening controls on pollution and road safety improvements have alleviated the other environmental problems, but also because new scientific research has revealed that global warming presents a much greater and more immediate threat than previously thought. (McKinnon 2010). Figure 6 presents the main principles of logistics going green.

Table 1. Parameters of carbon reduction

PARAMETER	EXPLANATION
Freight transport intensity	this is the ratio of freight movement (usually expressed as tonne-kms) to economic output.
Freight modal split	this indicates the proportion of freight carried by different transport modes and can be expressed as the ratio of tonne-kms carried by more carbon-intensive modes such as road and air to tonne-kms carried by greener modes like rail, barge, ship and pipeline.
Vehicle utilization	this can be measured by the ratio of vehicle-kms to tonne-kms, in other words how much vehicle traffic is required to handle a given amount of freight movement. If the vehicles are well-loaded on outbound and return journeys this ratio is minimized.
Energy efficiency	defined as the ratio of energy consumed to vehicle-kms travelled. It is a function mainly of vehicle characteristics, driving behavior and traffic conditions.
Carbon intensity of the energy source	the amount of CO <sub>2</sub> emitted per unit of energy consumed either directly by the vehicle or indirectly at the primary energy source for electrically-powered freight transport operations.

It is estimated that freight transport accounts for roughly 8 per cent of energy related CO<sub>2</sub> emissions worldwide. The inclusion of warehousing and goods handling is likely to add around 2-3 per cent to this total. In the road sector, the amount of energy consumed by cars and buses, and, in the EU, may overtake it by the early 2020s. It is hardly surprising therefore that governments and inter-governmental organizations are developing carbon abatement policies for the freight transport sector.

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. Furthermore, sustainability does not only have an environmental dimension. Sustainable development was originally portrayed as the reconciliation of environmental, economic and social objectives.



DISTRIBUTION	INCREASE CO <sub>2</sub> EFFICIENCY (10% by 2012, 30% by 2020)	MANUFACTURING	EXTRACTION OF RAW MATERIALS / SOURCING	PRODUCT RECOVERY
<ul style="list-style-type: none"> <li>• Combined transport</li> <li>• Alternative modes of transport (rail, waterway, ocean...)</li> <li>• Reverse logistics</li> </ul>	<ul style="list-style-type: none"> <li>• Develop, pilot and implement abatement levels</li> <li>• Integrate CO<sub>2</sub> into subcontractor management</li> </ul>	<ul style="list-style-type: none"> <li>• Reducing energy consumption</li> <li>• Use of clean technologies</li> <li>• Reducing production waste</li> </ul>	<ul style="list-style-type: none"> <li>• Sustainable purchase</li> <li>• Use of less polluting materials</li> </ul>	<ul style="list-style-type: none"> <li>• Recycling</li> <li>• Reusing used products</li> </ul>

Fig. 6. Logistics going green

4. Paradoxes of green logistics in transport systems

If the basic characteristics of logistical systems are analyzed, several inconsistencies with regards to environmental compatibility become evident. Five basic paradoxes are discussed in Table 2.

Although there is a clear trend for governments, at least in their policy guidelines, to make the users

pay the full costs of using the infrastructures, logistical activities have largely escaped these initiatives. The focus of much environmental policy is on private cars (e.g. emission controls, gas mixtures and pricing). While there are increasingly strict regulations being applied to air transport (noise and emissions), the degree of control over trucking, rail and maritime modes is less. For example, diesel fuel is significantly cheaper than gasoline in many

jurisdictions, despite the negative environmental implications of the diesel engine. Yet trucks contribute on average 7 times more per vehicle-km to nitrogen oxides emissions than cars and 17 times

more for particulate matter. The trucking industry is likely to avoid the bulk of environmental externalities it creates. (Rodrigue et al. 2009).

Table 2. Paradoxes of green logistics (Source: Rodrigue et al., 2009)

DIMENSIONS	OUTCOME	PARADOX
COSTS	Reduction in costs through improvement in packaging and reduction in wastes. Benefits are derived by the distributors.	Environmental costs are often externalized.
TIME / FLEXIBILITY	Integrated supply chains. Just-in-time and door-to-door provide flexible and efficient physical distribution systems.	Extended production, distribution and retailing structures consuming more space, more energy and producing more emissions (CO <sub>2</sub> , etc.).
NETWORK	Increasing system-wide efficiency of the distribution system through network changes.	Concentration of environmental impacts next to major hubs and along corridors. Pressure on local communities.
RELIABILITY	Reliable and on-time distribution of freight and passengers.	Modes used, trucking and air transportation, are the least environmentally efficient.
WAREHOUSING	Reducing the needs for private warehousing facilities.	Inventory shifted in part to public roads (or in containers), contributing to congestion and space consumption.
E-COMMERCE	Increased business opportunities and diversification of the supply chains.	Changes in physical distribution systems towards higher levels of energy consumption.

The hub structures supporting many logistical systems result in a land take that is exceptional. Airports, seaports and rail terminals are among the largest consumers of land in urban areas. For many airports and seaports the costs of development are so large that they require subsidies from local, regional and national governments. The dredging of channels in ports, the provision of sites, and operating expenses are rarely completely reflected in user costs. In Europe, national and regional government subsidies are used to assist infrastructure and superstructure provision. The trend in logistics towards hub formation is clearly not green. (Rodrigue et al. 2009)

The actors involved in logistical operations have a strong bias to perceive green logistics as a means to internalize cost savings, while avoiding the issue of external costs. The top environmental priority is commonly reducing packaging and waste. These observations support the paradoxical relationship between logistics and the environment that reducing costs does not necessarily reduce environmental impacts. (Brewer et al. 2001)

## 5. Conclusion

1. Global logistics connect widely dispersed producers and customers by organizing them through gateways and corridors located in global areas. Global logistics start the communication with other foreign countries and widespread the opportunities of trading. International commerce consolidates the cooperation and partnership among the world's nations and this appearance

2. makes global economy grow at a very fast pace. Developing global logistics system makes all worlds' trade operations more simple and rapid.
3. Logistics centers in Lithuania play a big role in the state economy and the places for logistics centers should be chosen according to road network in the country, geographical situation and foreign trade policy.
4. Logistics are responsible for variety of externalities, including air pollution (CO<sub>2</sub> emission), noise accidents, vibration, land-take and visual intrusion. Various attempts have been made to assess the relative environmental impacts of freight modes, and a relatively consistent picture emerges from these different studies despite some difference in absolute values.
5. The impact of logistics on climate change has attracted increasing attention in recent years, partly because tightening controls on pollution and road safety improvements have alleviated the other environmental problems, but also because new scientific research has revealed that global warming presents a much greater and more immediate threat than previously thought.

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## Globalizacijos įtaka žaliųjų logistikos centrų plėtrai Lietuvoje

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Per pastaruosius dešimt metų globalioji logistika tapo daugelio įvairių sričių mokslininkų tyrimų objektu. Iki šiol vyksta moksliniai ginčai dėl globaliosios logistikos raiškos formų, turinio, lygmenų priežasčių, ekonominių, socialinių ir kt. pasekmių, ateities vizijų ir kitų aspektų.

Globaliosios logistikos ekonomikoje, kaip ir kitur, svarbiausia kategorija yra efektyvumas bei logistikos sąnaudų mažinimas. Bendrąja prasme efektyvumas – tai rezultato ir išlaidų užsibrėžtam rezultatui pasiekti santykis. Jei įmonė ar šalis veikia patirdama visų veiksmų minimalias sąnaudas, tai sakoma, kad logistinės sistemos grandinė veikia efektyviai. Kitaip tariant, kuo mažesnė išlaidų suma ir kuo tomis lėšomis sukuriama daugiau produkto, tuo didesnis efektyvumas.

Praktinė verslo įmonių patirtis parodė, kad įmonės vis dažniau vertina logistiką kaip konkurencijos priemonę, nes logistika padeda pasiekti gerų daugialypės įmonių veiklos rezultatų. Įmonės struktūrose organizuojami ir tobulinami įmonės medžiagų ir gaminių vidiniai ir išoriniai srautai sąnaudų aprūpinimo paslaugų požiūriu. Todėl iškyla būtinybė įtraukti į logistiką strateginį įmonės planavimą. Strateginė įmonės koncepcija apima ir pagrindinę logistinę poziciją. Todėl labai dažnai įmonės ekonominėje politikoje logistiniai projektai dominuoja.

Ekonomikai plėtoti reikalingi nauji būdai, kaip pagreitinti ekonomines reformas. Vienas iš būdų – sukurti logistines sistemas tiek vidaus, tiek ir makroekonomikos srityje. Kaip žinoma, logistinės sistemos leidžia pasiekti efektyvių sprendimų, pavyzdžiui, sumažinti gamybos ir produkcijos apyvartos sąnaudas, kai nustatytas vartotojų aptarnavimo kokybės lygis, minimizuoti žalą aplinkai, sumažinti taršos lygį šalyje ir taip išvengti papildomų mokesčių.

Ši tema yra aktuali kiekvienai sparčiai besivystančiai šaliai. Optimaliai ir efektyviai veikiant logistikos sistemai (kai teisingai išdėlioti logistikos centrai), sukuriama šalies pridėtinė vertė, taip pat suteikiamas konkurencinis pranašumas kitų šalių atžvilgiu. Be to, tokiu būdu mažinamas taršos lygis šalyje, atsisakant nereikalingų, netikslingų, neefektyvių krovinio pervežimo operacijų.

Straipsnio pirmojoje dalyje apibrėžiama *globalizacijos* sąvoka, pateikiama globalizacijos veiksnių logistikai analizė. Antroje dalyje pateikiamas logistikos centrų išsidėstymo modelis Lietuvoje, apibrėžiama *žaliųjų logistikos centrų* sąvoka, nurodoma jų svarba šios dienos ekonomikai ir visuomenei. Trečiojoje dalyje pateikta žaliosios logistikos paradoksų lentelė, kurioje atsispindi paradoksalios žaliosios logistikos nauda šalies gamtinei aplinkai.

Straipsnio objektas – žalieji logistikos centrai Lietuvoje.

Straipsnio tikslas – įvertinti globalizacijos įtaką žaliųjų logistikos centrų plėtrai Lietuvoje.