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SUSTAINABILITY OF FREIGHT LOGISTICS IN THE REPUBLIC OF MOLDOVA

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Abstract: The sustainability of freight logistics activity in the Republic of Moldova is a topic of great importance in the current context of climate change and global concerns related to environmental protection. The objective of this study is to analyze how freight logistics activities can be carried out in a sustainable manner in the Republic of Moldova, taking into account aspects related to energy efficiency, reducing greenhouse gas emissions and minimizing environmental impact. The international economy offers vast opportunities to stimulate economic growth through international trade. However, weaknesses in trade support services sectors in many developing countries contribute to high transaction costs and limited ability to meet the transport and logistics requirements of an increasingly complex global economy, which undermines the competitiveness of their goods and, hence the ability to seize opportunities in foreign markets. In the era of globalization of the world economy, in order to increase the competitiveness of industrial and agricultural enterprises, as well as to increase the potential of transit transport, expand the foreign trade of the Republic of Moldova, the design and development of macro logistic supply chains used in the foreign economic activity of the Republic of Moldova has become relevant.

Keywords: *sustainability, supply chain, environmental protection, trade, freight.*

Introduction

Currently, the economy is developing in a technogenic way. The expansion of transport infrastructure and the constant increase in transport volumes imply an increase in energy needs and negative effects on the environment. Responsible and environmentally conscious logistics companies are shifting to a concept of sustainable development that focuses on preserving natural ecosystems and developing efficient resource-saving solutions.

Sustainable development is the subject of the future. The term was first introduced at the UN Environment Conference in Stockholm in 1972. Sustainable development refers to a model of economic development that is achieved without depletion of natural resources. Sustainable development concerns many sectors, including transport logistics. To reduce the impact of emissions, most logistics companies use all sorts of technologies, from special programs that calculate a route with the lowest possible emissions, to electric cars and cars with appropriate environmental standards. According to statistics from the International Energy Agency, road, air, rail and waterborne transport account for an average of 28% of CO₂ emissions. Road transport is responsible for 73% of toxic emissions from all transport sources. Due to the complicated environmental situation, Europe's transport industry is implementing a series of measures aimed at controlling pollution and reducing emissions of toxic substances.

The concept of sustainable development is based on the idea of striking a reasonable balance between the environment, economic, social, cultural development and human needs. The economic component of sustainable development focuses on the efficient use of available resources, energy saving, the use of environmental protection and waste reduction technologies. The socio-cultural component involves maintaining the sustainability of cultural and social systems, equitable distribution of benefits. The environmental component is focused on maintaining the integrity of natural systems for present and future generations [4].

Theoretical aspects

After the transition to a new economic formation in the conditions of modern development of logistics in the world, the principles of logistics as one of the effective mechanisms for economic transformation are actively introduced into economic processes in Moldova. In the modern world system of economic activities and foreign trade, logistics plays an important role in organizing and managing material flows with the lowest possible financial and time costs. Logistics is a mechanism for forming an integrated logistics system and covers both fields of activity and entire countries and regions in the world.

Currently, favorable conditions exist for rational adaptation of macrologistics supply chains to take advantage of Moldova. To this end, existing international experience in the commercial and economic field and the basis of established infrastructures in industrial complexes, which include:

- capitalization of the geographical position - the length of the common border between the Republic of Moldova and Romania is about 450 km, and with Ukraine 939 km, this is the shortest land route connecting Europe with the CIS countries;

- has an adequate infrastructure - through railways and highways from north to south of the country, which have the capacity to allow the transit of goods from Ukraine to EU countries and vice versa, from EU countries to CIS countries by land.

The importance of foreign trade lies in the fact that it contributes to changing the material structure of the total Gross Product, the growth rates of the Gross Domestic Product (GDP) and its value volume. In other words, foreign trade has become one of the determining factors of economic growth and solving the social problems of each country's population. At the same time with the expansion of trade ties between countries, various theories have been developed regarding this kind of activity.

In terms of exports, the most important partners of the Republic of Moldova are: Romania, Italy, Belarus, Ukraine, Germany, Poland, Switzerland. The Republic of Moldova buys various goods from Turkey, China, Belarus, Germany, Austria, Poland, Czech Republic, France, Sweden, Hungary, Romania, Russia, etc. However, in terms of imports, the following remark is necessary, in our view. Given that many natural resources are limited and some are totally missing (gas, oil, metal, etc.), our country will need to continuously increase imports of certain goods. At the same time, we consider it unjustified when a number of important goods could be manufactured by domestic enterprises, because we have enough material and human resources. Here are just a few examples: we import vinegars, soaps, washing preparations, wool, hats, umbrellas, sticks, toys, artificial flowers, oils, etc.

The efficiency of foreign trade of the Republic of Moldova can be increased by implementing the following measures:

- reduction of production costs of goods intended for export;
- increasing the processing and quality of products exported,
- increasing the competitive capacity of the national economy;
- substantial increase of labor productivity based on modernization and refurbishment of the technical-material production base;

- reducing imports of goods by organizing their manufacture at domestic enterprises for which there are material resources and labor;

- increasing the level of specialization of production and adapting the presentation of goods for export to the requirements of the world market, etc.

In recent years, the increasingly widespread use notes logistics analysis, with the help of which the flow of goods is examined, starting from suppliers of raw materials, passing through the enterprise and ending with buyers. Logistics coordinates functional areas of the enterprise such as sourcing, production and sales and helps accelerate material and cash flows. With its help, enterprises are able to reduce costs by organizing timely supply, production and sales. Logistics becomes the main key to success, an important strategic tool for maintaining a company's competitiveness in highly competitive markets. [9]

Predictability and consistency are fundamental elements of a competitive transport and logistics system. Trade support service providers need clear, accurate, reliable and timely information

on trade-related regulatory information to plan and take the necessary decisions for the movement of goods from one country to another. In many developing countries, such information on trade legislation, procedures and documentation is not easily accessible to international shippers, shippers and carriers. This lack of information can have multiple effects:

- Poor explanation and dissemination of rules increase the likelihood of abuse by customs officials;
- Commercial operators may face significant penalties, administrative remedies or bribery due to 'mistakes' resulting from their lack of knowledge;
- Shipment delays and higher cargo immobilization costs may occur as shippers obtain adequate information and take steps to comply with unexpected documentation and procedures;
- Undisclosed changes in legal and regulatory frameworks expose operators to a high degree of liability passed on to senders, which increases transaction costs.
- Uncertainty about legal and regulatory structures can delay foreign investment in developing countries and make it more difficult to attract competitive service providers with world-class logistics know-how.

Although additional expenses caused by poor dissemination of regulatory information generally do not vary depending on the value of goods or sales volume, they can increase operating cost per unit. These costs disadvantage firms which have to bear the cost of these information gaps.

Research methodology

Reducing negative environmental impacts is a major challenge at national and international level. The solution to this challenge around the world is based on the concept of sustainable development. The Executive Director of the United Nations (UN) Global Compact, speaking at the 75-member Global Compact Leaders' Summit, noted the following [2]: "Many companies are beginning to look at the world through the prism of the Sustainable Development Goals. Entrepreneurs are looking for how their businesses, products and services relate to the realities of the planet and how they will meet current and long-term demand. [5].

The Sustainable Development Goals (SDGs) are a universal set of 17 goals and 169 targets that states have adopted to guide policy-making in the socio-economic sphere of society and environmental protection for the period up to 2030 [6,7]. The SDGs (Figure 1) are included in the global strategic programme "Transforming our world: the 2030 Agenda for Sustainable Development", which was adopted at the 70th session of the UN General Assembly. A key feature of the agenda is the indivisible and integrated nature of the SDGs, which balance all three dimensions of sustainable development: economic, social and environmental. The success of achieving the SDGs depends to a large extent on the activities of international and regional organisations promoting sustainable development and on the coherence of national, regional and international policies with regard to established priorities and the implementation of sustainable development principles [4].



Figure 1. Sustainable Development Goals

Source: (<http://cidonu.blogspot.com/p/obiectivele-global.html>)

Indicators of sustainable development of logistics activities. In the context of globalization, logistics processes and technologies for managing material and information flows are changing. The main performance indicators of modern logistics chains are provided by their productivity, optimization of implementation costs, proactive and timely response to customer needs and requests, increased transparency and speed of delivery, sustainability of operations and risk reduction. Logistics sustainability indicators are of strategic importance ahead of the adoption of the Global Agenda 2030 in 2015. The Global Agenda 2030[8], which is based on 17 key objectives. The transport and logistics sector and its prospects are linked to the achievement of objectives such as:

1. Let us eradicate poverty in all its forms, everywhere.
2. eradicate hunger, achieve food security, improve nutrition and promote sustainable agriculture.
3. Ensuring healthy lifestyles and promoting well-being for all, at all ages.
4. Ensure inclusive and equitable quality education, promoting lifelong learning opportunities for all.
5. Ensure gender equality and empower all women.
6. Ensure availability and management of water and sanitation facilities for all.
7. Ensure access to modern, reliable, sustainable and affordable energy for all.
8. Promoting sustained, inclusive and sustainable growth, full and productive employment and decent work for all.
9. Building resilient infrastructure, promoting inclusive and sustainable industrialisation and fostering innovation.
10. Reducing inequalities within and between countries.
11. Ensure inclusive, safe, resilient and sustainable cities and human settlements.
12. Ensuring sustainable consumption and production patterns.
13. Take urgent action to address climate change and its impacts.
14. 14 Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
15. Protecting, restoring and promoting sustainable use of terrestrial ecosystems, sustainably managing forests, combating desertification, halting and reversing land degradation and halting biodiversity loss.
16. Promoting peaceful and inclusive societies for sustainable development, ensuring access to justice for all and building effective, accountable and participatory institutions at all levels.
17. Strengthen the means of implementing sustainable development and revitalize the global partnership for sustainable development. [8]

Design of macro-logistics supply chains

The classical approach to designing systems and installations for various purposes involves a comprehensive analysis of the existing state of systems, installations and entities. Logistics supply chains are no exception. Therefore, before determining the principles, directions and methods of their design, it is necessary to analyze existing chains, identify the positive and negative sides of their operation, taking into account the achievements of scientific and technological progress, in particular, taking into account the developed information systems and technologies and the possibility of their application in logistics activities.

The theoretical part of the analysis of logistics activity, which should precede the analysis of the LLA, should be discussed in more detail, since the overwhelming number of publications do not pay enough attention to this issue. Western and Russian logistics researchers and experts have approached the direction and content of logistics analysis in a fragmented way, using generally accepted approaches in theory and practice. [6]

In this regard, the classification of types of analysis (systemic, organizational, economic and technological) of logistics activities carried out in the LLA currently operating at different levels of management is proposed as a theoretical statement at the pre-project stage. This classification is a

generalized and systematized version, elaborated on the basis of the general theory of logistics, presented in one form or another (extensive, fragmentary) in publications devoted to logistics. Systematized and proposed analyses of the logistics activities carried out under LLA are shown in Figure 2.

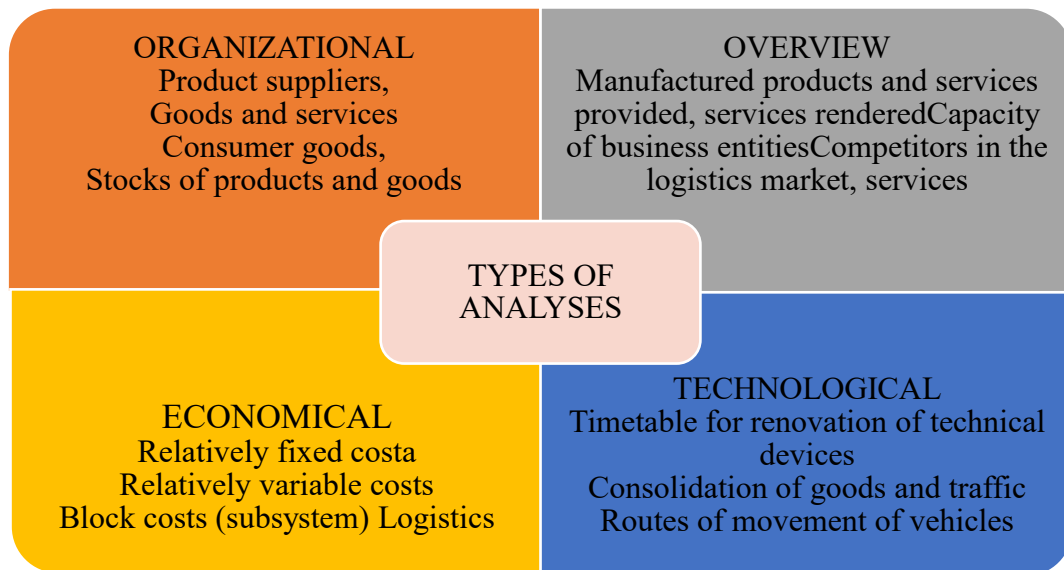


Figure 2. Types of analysis of logistics activities carried out within the LLA.

Source: elaborated by the author based on the data obtained by the author

Since the purpose of design and redesign is to create well-functioning chains, based on their rationalization (optimization) and modern technical and technological equipment, it is first necessary to classify existing macro logistics chains according to their type. This classification will make it possible to identify the type of chains that do not require redesign, the type of chains that need to be redesigned, the type of chains that need to be designed. As a result of this analysis, the type of international macro-logistics chains that do not require redesign and operate in accordance with accepted international standards, including INCOTERMS [1] were identified.

This type of chain uses a form of transit supply, a unimodal mode of transport, strictly established routes along "international transport corridors", delivering production products to foreign consumers without transshipment and transshipment.

Another theoretical and methodological aspect of logistics activities, which is one of the most important in the implementation of supply chain design (redesign) projects, must be considered according to the content logic of this study.

It is about the basic principles or assumptions of LLA design. Analysis of the results of logistics studies published in Western and Russian sources reveals that there is no special place for principles. The theoretical and methodological part of the logistics activity focuses more on the tools with which chains are built, on modeling in various emerging situations that disrupt the natural processes carried out in chains; methods that streamline and optimise logistics procedures and operations carried out in chains; on planning and forecasting the demand for logistics services.

However, when designing future LLAs and redesigning existing ones, it is necessary to initially decide on the basic provisions to be set in chains. The multidirectional nature of those provisions will not only allow each of them to be integrated into a single whole, but will also avoid any economic, organisational and technical contradictions which might arise in the future operation of the LLA. In this regard, based on the synthesis and systematization of those few publications that fragmentarily outline approaches to the content of the design principles of LLA and some of them (principles), as well as significant additions to them, a set of basic principles for the design (redesign) of logistics supply chains is proposed, which in general terms is shown in Figure 3.

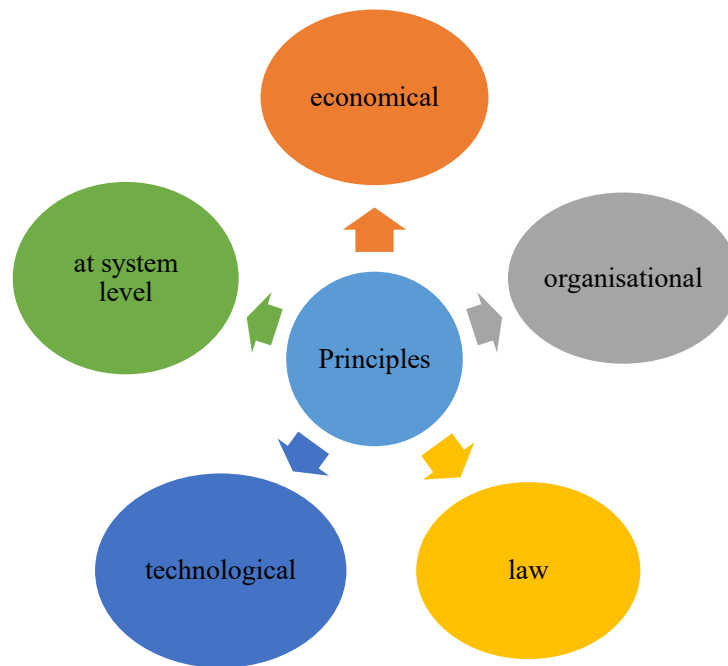


Figure 3. A set of supply chain design principles

Source: elaborated by the author based on data [1]

First of all, macro logistics chains are to be designed, which are being organized in the Republic of Moldova and will be permanently formed in the future with the involvement of private capital. This is the case for small and medium-sized enterprises, which have been promoted through a number of legislative and legal acts regulating and supporting these activities.

Due to the specificity of the economy of the Republic of Moldova, which practically does not have large production units that produce complex products and include a significant number of suppliers, producers of intermediate products and consumers of final finished products, the number of links in the chain to be designed and redesigned is limited. Therefore, on the one hand, there is no need to integrate actors in a chain. On the other hand, it is possible to effectively manage this type of chain with the help of modern information technology, and the integration process can be carried out in the interaction of chains in which different products with different purposes move.

As regards international macro-logistics chains, there is a well-established system for customs clearance of goods and related procedures, including temporary storage of products. Based on the above, supply chains operating only in Moldova – domestic macrologistics supply chains – are to be designed and redesigned. At the same time, the design of this type of chain should be based on the use of modern information technologies, maximum risk protection, integration of logistics chains with different purposes, the use of standard technical and technological processes, which will ensure high efficiency of chain operation. Let us briefly consider the stages and phases of macrologistics supply chain design.

The macrologistics supply chain design process generally consists of a series of generally accepted stages and phases: pre-project stage: stages - feasibility study, terms of reference; design stage: stages - technical design, detailed design; implementation stage: stages - commissioning, functional analysis; Stage of operation: directions - operational reliability, organization of operation, maintenance. Let's briefly comment on the macrologistics supply chain design stages.

The feasibility study at the pre-project stage is elaborated according to the results of existing and established LLA research and analysis, according to a specially designed program, which includes: determining the number of links participating in chains, identifying technical devices (number and characteristics) used in the movement of goods, determining the availability of information systems and technologies used in chains, determining the execution time of orders (cycle orders). The study and analysis are presented as a set of interrelated directions of material flow and logistics business processes carried out in the chain.

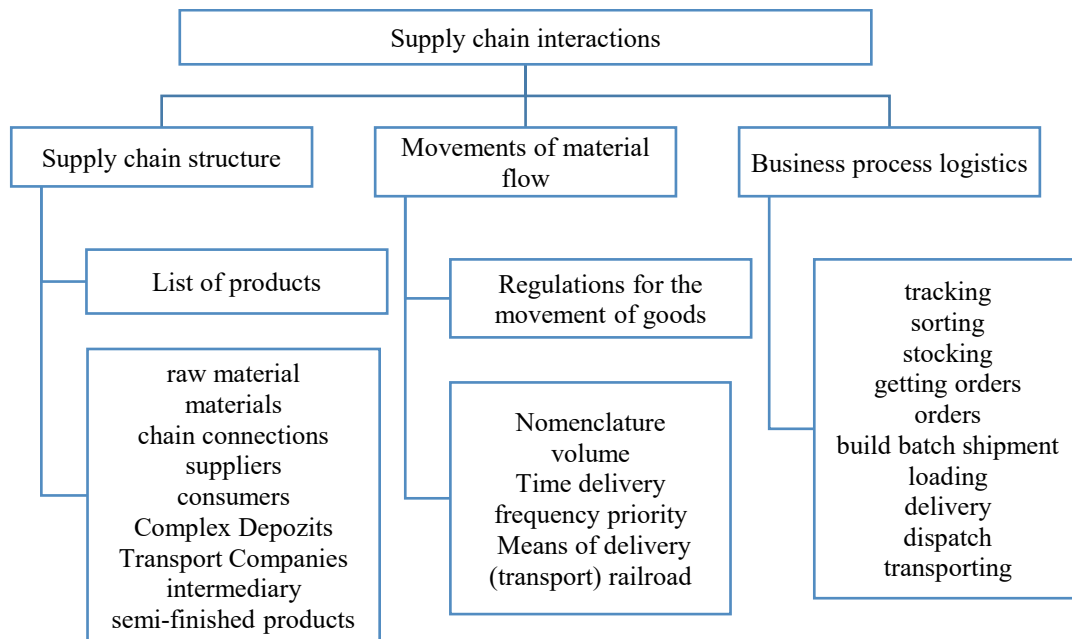


Figure 4. A set of interconnected components for the study and analysis of ALL

Source: elaborated by the author based on data [3]

The composition and content of the feasibility study are combined into four independent but interrelated sections: technical and economic characteristics of the links in the projected logistics chain; indicators of production and economic activities, organizational structure, degree of use of material and technical resources and technical devices; justification of the design objective based on the assessment of technical and economic indicators; the amount of logistics costs, proposed deadlines for delivery of products; the status of volumes for the Terms of Reference, as the final stage of the pre-project stage, includes several sections: the basis for the design - conclusions and recommendations based on the results of the study and analysis; general provisions - goals and objectives of chain design, requirements for them; tools to be used in design - methodological materials, techniques and methods; period of development and implementation - timing and summary of work to be carried out; assessment of circuit design and operation costs.

Technical design, as a stage of the design stage, consists of the characteristics of the operation of the design chain, decisions on the set of technical installations, including the choice of information systems and technologies, organisational equipment, communication and security facilities, the number and types of vehicles, types and brands of storage equipment. Detailed project development is a series of software components, processes and task descriptions.

The pilot operation shall provide for: a list of tasks and technical means covered by the pilot operation; the number of task calculation errors to be established for each task, taking into account its specific characteristics; methods and procedure for verifying tasks with regard to conformity with technical requirements; methods and procedure for verifying the technical means used to solve logistical tasks.

At the stage of operation of the logistics chain, tasks are solved that are grouped into the following main complexes: uninterrupted supply of economic entities - participants in the chain with material and technical resources in the required quantities, nomenclature and deadlines; arrangement of rational circulation of products within the chain; calculation of optimal volumes of stocks of all types of products; rational organization of the transport and storage system ensuring the movement of goods; establishing rational and optimal options of technical and technological solutions.

Information support in the form of communications and informational contacts is very important in the design of LLA; We will divide them into general information system, used by all supply chains, and corporate information system. The general system shall include information for the public, on the basis of which a databank of supply chains operating in the territory is organised. [3]

Corporate information systems are organized in each supply chain and take into account the specifics of production and business activities carried out in each chain. But at the same time, the correlation of information flows in common and corporate systems is carried out at the expense of using a uniform chain management circuit, which is based on a uniform normative and reference complex and applies uniform algorithms when performing economic calculations. Information systems are one of the original components of information technologies used in the nascent LLA. Technologies are designed to provide chain participants with information for the preparation of management decisions.

Conclusions

In a nutshell, the sustainable development of freight logistics activities in the Republic of Moldova is of great importance for the country's economy, having a significant impact on economic growth and industrial development. An integrated and coordinated approach from the public and private sectors is needed, aimed at improving infrastructure, developing human resources, using modern technology, cooperating with external partners and promoting investment in the freight logistics sector. Through these efforts, a well-developed and efficient international transport network can be ensured, which can support the sustainable economic development of the Republic of Moldova.

Designing and redesigning macro-logistics supply chains is key to improving the efficiency and effectiveness of supply chains in an ever-changing business world. This process involves constantly evaluating and reevaluating material and information flows and adjusting them to improve business processes, reduce costs and improve customer satisfaction. Redesigning macro-logistics supply chains also involves close collaboration between different parties involved in the supply process, such as suppliers, manufacturers, distributors and customers. Finally, the design and redesign of macro-logistics supply chains must also consider factors such as sustainability and environmental impact. Therefore, this process can lead to significant benefits for all parties involved and for the environment.

The legislative and economic framework for the functioning of macro-logistics and freight supply chains has a significant impact on the efficiency and effectiveness of these processes. A clear and well-defined legislative framework can help reduce uncertainty and risks in transport and supply activities, as well as ensure compliance with rules and regulations. Also, an established and predictable economic framework can help increase investment in infrastructure and technology, as well as improve logistics efficiency.

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