Reducing the negative impact of technogenic factors in the implementation of logistics operations in the light of the concept of sustainable development

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Abstract. The article discusses the features of reducing the negative impact of technogenic factors in the implementation of logistics operations in the light of the Concept of Sustainable Development. According to the author, the logistics sector plays an important role in the economic development of the country. However, its activities can negatively affect the quality of the environment, during the implementation of logistics operations there is a significant consumption of energy of various nature, in the process of which there is a threat of environmental pollution. Efficient logistics largely contributes to the success of the business due to fast deliveries with minimal time and money. Logistics is the process of obtaining materials, products and services where and when they are needed. When considering the concept of sustainable logistics, it is important to take into account three aspects of sustainability: economic, social and environmental. Sustainable logistics is not only environmental friendliness and harmlessness to the environment, but also the impact on production processes, starting from where the raw materials are extracted, the processes involved, the use and possible processing of the product or service. When analyzing the problem of evaluating the effectiveness of logistics operations, one of the evaluation criteria will be sustainability. Sustainable development involves coordination between the environment and the economy to achieve social, economic and environmental sustainability. Keywords: technogenic factors, negative impact, logistics operations, the concept of sustainable development.

1 Introduction

The Sustainable Development Goals (SDGs) offer a consistent and fresh perspective on contemporary world issues such as hunger, gender inequality and climate change. The SDGs were created to stimulate action over the next 15 years in areas of critical importance to humanity and the environment. Environmental sciences have documented significant and serious changes in terrestrial systems, including changes in nutrient cycles, loss of

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biodiversity, reduction of natural resources and climate change [1]. Greenhouse gas emissions are a serious cause of global warming.

The International Energy Agency has recognized greenhouse gases as the main source of CO2 emissions, which are the main factor determining the state of the global socio-economic sustainable system and ecosystem. The year 2021 was a turning point in relation to climate change, which raised concerns about future sustainability. In 2021, we faced the increasing impact of severe floods, heat, drought, forest fires and hurricanes during the pandemic. Reducing CO2 emissions requires greater sustainability of emissions, which is impossible without serious social, technological and economic changes [2].

The environmental impact is also related to production and logistics activities. Logistics can be defined as the management of an organization's inventory, transportation of goods, purchases, and the flow of information through its marketing channels to increase revenue. Logistics has become the foundation and sustainability of the global economy, driven by consumption and production. Logistics plays an important role in the economic growth and development of the country and increases air pollution, including greenhouse gas emissions such as CO2 emissions. Transport accounts for 23% of global CO2 emissions in 2018. In addition, it is expected that by 2050, CO2 emissions from transport will increase significantly (by almost 60 percent), and most of these emissions will be associated with cargo transportsations, unless additional environmental protection measures are taken [3].

Both in the countries with the developing economics and in developed countries, companies strive to increase their productivity by using efficient and sustainable resources to eradicate environmental destruction, which is close to concepts such as "green" innovation, supply chain cycle, economic globalization and the use of renewable energy sources [4]. Accordingly, the problem of reducing the negative impact of technogenic factors in the implementation of logistics operations in the light of the Concept of Sustainable Development is highly relevant.

2 Materials and methods

In the process of writing the study, an analysis of literature sources covering the problems of logistics activities, taking into account the requirements for improving their environmental friendliness and safety in the light of the implementation of the SDGs, was carried out. When writing this work, comparative research methods were used.

3 Results

Efficient logistics largely contributes to the success of the business due to fast deliveries with minimal time and money. Logistics is the process of obtaining materials, products and services where and when they are needed. It works to determine the temporal and spatial positioning of raw materials, work in progress and finished stocks, where they are needed and when they are required [5]. Logistics can be divided into life logistics, operational logistics and system logistics. Livelihood logistics is concerned with meeting a person's basic needs for food, clothing and shelter in any given conditions and provides the basis for operational logistics. Operational logistics goes beyond subsistence and includes systems related to the production of luxury goods; it includes the raw materials needed by the enterprise in production. System logistics includes all the resources necessary to maintain the system in working order. These resources include personnel, testing and support equipment, spare parts for maintenance, technical publications and equipment. Thus, logistics systems consist of four main activities: procurement management, inventory management, warehousing management and transportation management [6].

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Logistics is defined as the process of planning, implementing and controlling the efficient flow and storage of goods, services and related information from the point of origin to the point of consumption in order to meet customer requirements. Efficient logistics minimizes the costs of transportation, inventory, loading and unloading and other activities related to distribution. In the light of new business trends, logistics has become very important. New trends include high production efficiency, changing inventory philosophy, high transportation costs, replication of production lines, the spread of computers and technology, rapid retail growth, globalization, and declining economic regulation. Efficient logistics systems around the world are the foundation for trade and a better economy. This allows the geographical region to use its inherent advantage by focusing its production efforts on those products in which it was an advantage, which will lead to competitive production costs, logistics costs and quality compared to other regions.

Global logistics is growing and it plays a vital role in international business. It ensures timely and efficient global distribution of goods from producers to consumers by connecting the most important components of the supply chain from the point of origin of the product to the point of consumption. It has been reported that global container trade has increased by an average of 5 percent per year over the past 20 years and at its peak in the mid-2000s was 350 million 20-foot equivalent units (TEU) per year.

Achievements in information technology and communications, transportation and processing of materials, as well as processing and transmission of large amounts of data are revolutionizing logistics management systems. The use of big data tools in logistics and supply chain management provides great advantages, as it provides better decision-making, increased efficiency, lower costs, better risk management, as well as better transparency and competition. Communication technologies make it possible to create better, faster and more reliable supply chains, communication is carried out between any firm, suppliers, customers and other participants in the chain. Global logistics plays a vital role in managing the global supply chain and contributes significantly to economic development. Logistics activities can also affect the quality of the environment. Thus, logistics efficiency and environmental quality have been the subject of intense discussions in recent years. In this regard, experts also suggested using the term Logistics Efficiency Index (LEI), which allows assessing logistics processes and assessing the impact of logistics on the quality of the environment.

Specialists conducted research in the field of assessing the relationship between LEI and carbon emissions. One group of researchers used data from 42 Asian countries to estimate the relationship between LEI and carbon emissions from 2007 to 2016.[7] The results of the GMM regression model showed that LEI and environmental quality are negatively related in the selected countries. In addition, the timeliness of logistics greatly exaggerates pollution in Asian countries. While the improvement of LEI subcategories, such as customs efficiency, infrastructure quality, service quality and competence and tracking deter pollution in Asia. Another group of authors conducted a similar study on 27 EU countries for the period from 2007 to 2014 to analyze the impact of LEI on economic indicators on a national scale (i.e., economic, energy and environmental indicators) [8]. As a result, experts came to the conclusion that international transportation increases the consumption of energy from fossil fuels in the region, while the subcategories of LEI have different effects on the quality of the environment.

Another group of specialists investigated the logistics efficiency of total carbon productivity factors at different scales and at different levels of investment, using data from China from 2008 to 2017 [9]. The empirical result of these studies shows that logistics efficiency has a beneficial effect on overall factor carbon productivity in a low-carbon economy. Logistics efficiency can reduce carbon emissions and help countries achieve economic efficiency. Another group of authors, based on the use of quantile regression methods, found that the efficiency of logistics worsens the quality of the environment. They suggested that further...
efforts around the world should be aimed at achieving sustainable logistics. In some works, it has been determined that green innovations play an essential role in achieving environmental sustainability [10]. Most of the sources focus on the impact of general technological innovations on the environment, while there are several studies that have used patents in "green" innovations. For example, some researchers used data from G7 countries to study the impact of "green" innovations on carbon emissions from consumption from 1990 to 2018 and concluded that innovations in environmental technologies significantly reduce environmental pollution in G7 countries.

Similarly, other researchers have made a similar conclusion, according to which:
– environmental innovations can play a decisive role in reducing pollution levels in OECD countries [11];
– green technologies help to reduce the environmental impact in the G7 countries [12];
– Technological innovations can help countries achieve the Sustainable Development Goals (SDGs) [13].

There is an opinion that renewable energy can restrain environmental degradation, and the use of renewable energy can limit environmental degradation in countries. It was also noted that clean energy can play a central role in curbing environmental degradation and achieving climate-related goals [14].

Studies of the relationship between economic globalization and environmental pollution are limited and demonstrate ambiguous empirical conclusions. But at the same time, almost all authors do not deny the negative impact of logistics operations on the quality of the environment. Accordingly, at the present stage it is necessary to implement technologies that enable logistics companies to take into account the principles of sustainable development in their activities.

4 Discussion

At the present stage, business relationships are becoming increasingly complex, and companies need to know and practice sustainable supply chain management in order to remain competitive. Sustainable supply chain management is linked to environmental protection, social responsibility, economic growth and profitability in the long term. Important in modern conditions is the relationship between three goals that need to be fulfilled: elimination or minimization of waste, optimization of resources and minimization of costs, sustainable development with its three aspects: economic sustainability, environmental sustainability and social sustainability, as well as sustainable logistics with its components: concepts, methods and functions of logistics. To achieve sustainable development, integration of its three dimensions is required; any defect in the three aspects of sustainable development will not lead to its achievement [15].

Logistics is involved in all aspects of business as well as people's daily lives. Sustainable logistics is related to sustainable development in general, sustainability criteria should be included in the logistics assessment in addition to other criteria such as cost and speed. Sustainable logistics is at the intersection of its concepts, methods and functions. The goal is to eliminate environmental problems in the field of logistics, which can be achieved by eliminating or minimizing the negative impact of logistics on the environment. Starting with concepts, these activities include the development of sustainable packaging and reuse, waste recycling, reduction of energy consumption and pollution caused by transport. Several logistics concepts and terms have emerged as a result of strict environmental regulations. Reverse logistics is defined as "the process of planning, implementing and controlling an efficient and cost-effective flow of raw materials, semi-finished products and finished products, together with the corresponding information flows from the point of consumption to the point of origin, to restore value or proper management" [16].
Sustainable supply chain management encompasses all activities, functions, processes, and relationships in which materials, products, services, information, and monetary transactions move between businesses. The first step in implementing sustainable supply chain management begins with product development. In addition to optimizing quality and cost, the design will allow processing products. Sustainable production is the second step that can be achieved through the use of clean production methods, the use of new technologies, reducing the amount of raw materials and resources. Sustainable marketing helps companies improve relationships with stakeholders [17].

Maintaining the biological balance, paying more attention to the environment and waste management leads to lower costs and increased competitiveness. Sustainable transport is an important element in achieving sustainable supply chain management. The use of renewable energy sources, modes of transport, infrastructure and operational management methods can be considered to achieve sustainable transport. Eco-friendly purchases lead to minimization of waste, hazardous materials and sources of pollution.

Specialists have considered concepts that provide opportunities for more productive use of resources. Lean methods include tracking the product at the factory or in the service in order to reduce energy and material losses. Unlike profit per ton, the concept of profit per hour takes into account the time aspect of the production process. This concept allows companies to make wise decisions and make choices about resources and productivity.

Advanced analytical techniques help companies navigate and sort through various variables such as equipment configuration, raw materials, and process changes. Improving resource productivity requires a comprehensive change management effort, which ensures that employees will create more value out of less. Circular thinking is a stable logic that creates new value for companies and society. This logic is based on the return of products, components and materials to the production process.

The concept of "service" was also put forward, when suppliers could focus on providing services rather than selling products as their business model. This will lead to a reduction in the use of materials as a strategic opportunity. This corresponds to the definition of "sustainable development" by the World Commission on Environment and Development. The author presented a case study of three companies; Gage Products, PPG Industries and Xerox. Three companies are using a service approach; they have adopted business models that help customers buy less of their products. Three companies have attracted new customers with their new business models. In addition, they have strengthened relationships with customers. These close relationships with customers have led to an expansion of the range of products they sell [18].

The idea of cooperation was also explored by experts, as it is necessary for the sustainability of the business. Four models of systematic sustainability using case studies were presented. The models have two things in common; stakeholder engagement and innovation in both operational processes and business outcomes. Companies can work together on issues such as climate change, resource depletion, and the ecosystem. Two types of collaboration focus on business processes and results. Firstly, it is a corporate cooperation that includes all business participants, such as manufacturers, suppliers, distributors and retailers. Secondly, expanded cooperation, which includes business and non-corporate partners, such as government, NGOs and scientists [19].

Companies can identify and share operational processes that will minimize resource consumption and waste, resulting in the protection of natural resources. In addition, companies can share certain results that minimize the impact on the environment.

The following seven practices were identified for successful cooperation in the field of sustainable development of logistics companies. So, in the process of implementing this concept, it is necessary to:

– start with a small dedicated group of employees;
– link personal interests with common interests;
– monetize system value;
– create a clear path with quick results;
– gain independent project management experience;
– create structured competition;
– to foster a culture of trust [20].

5 Conclusion

Logistics is a necessary function for all types of business. It covers a variety of actions and actions performed by companies involved in managing the flows of raw materials, semi-finished products and final products. This wide range allows the implementation and use of a variety of tools, solutions or actions, which led to the creation of the term "sustainable logistics management".

Sustainable development is positioned as the future of logistics and supply chains. It is important to understand the level of social, environmental and economic impact and viability of suppliers and customers. This is not only environmental friendliness and harmlessness to the environment, but also the impact on production processes, starting from where the raw materials are extracted, the processes involved, the use and possible processing of the product or service. When analyzing the problem of choosing a forwarder, one of the evaluation criteria will be sustainability. Choosing a logistics partner who cares about sustainability will help in the implementation of the company's strategy. Some logistics and transportation companies create reports on CO2 emissions that help achieve specific goals and strategies.

References

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