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QUALIFICATION PAPER

(EXPLANATORY NOTES)

OF GRADUATE OF ACADEMIC DEGREE

«BACHELOR»

THEME: «Fuel and lubricant international transportation management»

Speciality 073 «Management»

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*I certify that in this qualification paper
there are no borrowings from the works of other authors
without appropriate references*

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ТЕМА: «Управління перевезенням паливно-мастильних матеріалів в міжнародному сполученні»

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Київ 2024

NATIONAL AVIATION UNIVERSITY
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Academic Degree Bachelor

Speciality 073 «Management»

Educational Professional Program « Logistics »

APPROVED

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«13» May 2024

TASK

FOR COMPLETION THE QUALIFICATION PAPER OF GRADUATE

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1. Theme of the qualification paper: «Fuel and lubricant international transportation management» was approved by the Rector Directive №624/сг. of April 24, 2024.

2. Term performance of the paper: from May 13, 2024 to June 16, 2024.

3. Date of submission paper to graduation department: June 01, 2024.

4. Initial data required for writing the paper: general and statistical information about fuel and lubricant market in Ukraine and Europe, information of the company «CD-Trans» LLC, production and financial indicators of the company, literary sources on logistics and supply chain management and internal transportation, Internet source.

5. Content of the explanatory notes: introduction; specifics of logistics management of transportation of fuel and lubricants in Ukraine and Europe; the essence of strategic management of supply chains of fuel and lubricants, analysis of activity of «CD-Trans» LLC; general description and analysis of the production and financial indicators of «CD-Trans» LLC, identification of deficiencies in the existing schemes for the supply of fuel and lubricant materials in international traffic; conceptual model of management of transportation of fuel and lubricants «CD-Trans» LLC., evaluation of efficiency of technological schemes of transportation of fuel and lubricants in international traffic; conclusions and recommendations.

6. List of obligatory graphic matters: tables, charts, graphs, diagrams illustrating the current state of problems and methods of their solution.

7. Calendar schedule:

№	Assignment	Deadline for completion	Mark on completion
1	2	3	4
1.	Study and analysis of scientific articles, literary sources, normative legal documents, preparation of the first version of the introduction and the theoretical chapter	13.05.24-16.05.24	Done
2.	Collection of statistical data, timing, detection of weaknesses, preparation of the first version of the analytical chapter	17.05.24-20.05.24	Done
3.	Development of project proposals and their organizational and economic substantiation, preparation of the first version of the project chapter and conclusions	21.05.24-26.05.24	Done
4.	Editing the first versions and preparing the final version of the qualification paper, checking by standards inspector	27.05.24-29.05.24	Done
5.	Approval for a work with supervisor, getting of the report of the supervisor, getting internal and external reviews, transcript of academic record	30.05.24-31.05.24	Done
6.	Submission paper to Logistics Department	01.06.24	Done

Graduate _____
(signature)

Supervisor of the qualification paper _____
(signature)

8. Consultants of difference chapters of paper:

Chapter	Consultant (position, surname and name)	Date, signature	
		The task was given	The task was accepted
Chapter 1	Senior Lecturer, Semeriahina M.	13.05.24	13.05.24
Chapter 2	Senior Lecturer, Semeriahina M.	17.05.24	17.05.24
Chapter 3	Senior Lecturer, Semeriahina M.	21.05.24	21.05.24

9. Given date of the task May 13, 2024.

Supervisor of the qualification paper: _____ Myroslava SEMERIAHINA
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Task accepted for completion: _____ Kateryna Ziablova
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ABSTRACT

The explanatory notes to the qualification paper «Fuel and lubricant international transportation management» comprises of 92 pages, 30 figures, 14 tables, 80 references and 3 appendixes.

KEY WORDS: CONTRAILER TRANSPORTATION, FUELS AND LUBRICANTS, INTERNATIONAL TRANSPORT, SUPPLY CHAIN MANAGEMENT, TANKERS

The basic principles of fuel and lubricant international transportation management are considered in the qualification paper.

The theoretical part considered logistics management of fuel and lubricants transportation in Ukraine and Europe and strategic management of fuel and lubricants supply chains. The analytical part is devoted to the analysis of financial and economic activity of «CD Trans» and to identify the bottlenecks in business processes of supply of fuel and lubricants. The project and recommendation part dedicated to development of conceptual model of management of transportation of fuel and lubricants «CD-Trans» LLC and evaluation of efficiency of technological schemes of international transportation of fuel and lubricants.

The subject of the qualification paper is a set of theoretical and practical aspects of fuel and lubricant international transportation management.

The object of the qualification paper is the process of fuel and lubricant international transportation by «CD-Trans» LLC.

Methods of research are analysis, synthesis, induction, deduction, modeling, generalization.

Materials of qualification paper are recommended to be used during scientific research, in the educational process and in the practice of specialists of logistics departments.

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NOTATION

AM	– Agile management;
ASMAP	– Association of International Freight Forwarders of Ukraine;
ICC-A	– Cargo insurance Institute Cargo Clause A;
ICC-B	– Cargo insurance Institute Cargo Clause B;
ICC-C	– Cargo insurance Institute Cargo Clause C;
CMR	– Convention on the contract for the international carriage of goods by road;
EU	– European Union;
LLC	– Limited liability company;
LM	– Lean management;
SCM	– Supply chain management.

INTRODUCTION

The relevance of the research lies in modern market conditions, because the market of petroleum products plays a significant role in the development of the national economy of Ukraine and significantly determines the state of the energy industry, because energy carriers constitute a significant share of added value in the final price of consumer goods. In fact, the market of petroleum products is the guarantee of the energy state security sector and affects the interests of every citizen of Ukraine. Therefore, the question of researching the state and trends in the development of the fuel and lubricants market in Ukraine, the specifics of the activities of its participants and the management of transportation in international traffic are extremely relevant.

It should be noted that the market of oil and oil products can be considered as a place for buying and selling oil and oil products and therefore it can be considered through the prism of internal and external commodity flows, that is, domestic production and distribution of products, as well as the import of goods. On the other hand, the market of oil and oil products as an economic category can be considered through the prism of economic relations between subjects (oil producers, oil carriers, oil refiners, oil traders and consumers) of economic activity aimed at realizing their economic interests. Accordingly, the spheres of such a market are spheres of processing, transportation, storage and use of motor gasoline, diesel fuel and their substitutes.

The purpose of qualification paper is research and analysis of processes, strategies and methods of fuel and lubricants supply management in the international context at example of the «CD-Trans» LLC.

The main tasks, the solution of which is necessary to achieve the purpose of the qualification paper are:

- to describe approach to logistics management of fuel and lubricants transportation in Ukraine and Europe;
- to explain the role of strategic management of fuel and lubricants in supply

chains;

- to provide a general characterisation of the «CD-Trans» LLC»;

- to analyse the company profile of the «CD-Trans» LLC and the main types of activities;

- to describe the competitive environment of the functioning of the «CD-Trans» LLC on the market of importers of fuel and lubricants;

- to analyse the management structure, organizational structure of the company;

- to conduct an analysis of the main production and financial indicators of «CD-Trans» LLC during the years 2021 - 2023;

- to provide practical recommendations on determining the main directions and prospects for solving the problem of management of the transportation of fuel and lubricants in international traffic.

The subject of the qualification paper is a set of theoretical and practical aspects of fuel and lubricant international transportation management.

The object of the qualification paper is the process of fuel and lubricant international transportation by «CD-Trans» LLC.

The issues of research devoted to fuel and lubricant international transportation management and supply chain management were considered in their scientific works by such Ukrainian scientists as: Bolkvadze LI, Migal OF (2022) [5], Volynets L. (2021) [7], Duna N., Matvienko A. (2022) [9], Koba O. (2020) [13], Kunda NT, Solomka A.O. (2021) [15], Lebed M., Luzhanska N.O., Lebed I.G. (2023) [16], Slavych V.P., Yelnyk V.V. (2023) [19], Smerichevska S.V., Matsyshina O.V. (2022) [21], Shuldiner Y.V., Primachenko G.O., Pashchenko G.S. (2023) [27], Korobkova O., Pavlovska L., Shpak N. (2023) [47].

At the same time, this topic has been investigated by international authors in their publications, such as: Ajanovic A., Haas R. (2021) [29], Al-Enazi A., Okonkwo E.C., Bicer Y., Al-Ansari T. (2021) [31], Batarlienė N., Šakalys R. (2021) [32], Dai B., Nu Y., Xie X., Li J. (2021) [37], Hu Q., Gu W., Wang S. (2022) [43], Pan M., Pan C., Li C., Zhao J. (2021) [58], Rana R.S., Kumar D., Prasad K. (2023) [65], Ricci S., Abdelbary A., Elgazzar S., Bayoumi E. (2021) [66], Safronova A., Reshetko N.,

Majerčák J., Kurenkov P. (2021) [67], Van der Westhuizen S., Collard F.X., Görgens J. (2022) [75] and others.

In turn, the issue of international supply of fuels and lubricants to Ukraine during military situation in the country is still poorly researched.

The theoretical and scientific-methodological basis of the qualification paper is the fundamental provisions of management, logistics and supply chain management. In the process of research, the following methods and approaches were used as: analysis and synthesis, generalization, grouping, tabular and graphical methods, statistical analysis, comparative analysis, methods of marketing research, economic analysis, SWOT analysis methods, methods of optimizing logistics system parameters and implementation of project solutions, graphic - visualization of the results of identification of the main technological trends of the postal operator.

CHAPTER 1

THEORETICAL BASES OF FUEL AND LUBRICANTS INTERNATIONAL TRANSPORTATION MANAGEMENT

1.1 Logistics management of fuel and lubricants transportation in Ukraine and Europe

Logistics in the organization of international transportation represents a complex mesosystem of socio-economic relations between economic entities that have a certain logic of construction, operation and development, as well as various regulatory mechanisms. The rapid development of logistics is due to a number of factors of changes in the concepts of production and consumption at the micro-, meso-, macro- and mega-levels.

Analysis of logistics processes in the organization of the system of providing the enterprise with all types of material resources, in the construction of a system of interaction with resource suppliers, before the organization of the production process, the sale of finished products, and their international transportation are complex and important tasks.

Due to the war, the economy of Ukraine is in a state of crisis. The transport industry was significantly affected by military operations, which in turn led to a decrease in the ability to transport goods by all available modes of transport. The study of the market of road freight transportation and the search for opportunities for its further development in the post-war period requires special attention and a thorough approach to the study of this issue.

It is known that cargo transportation is a powerful factor in the development of society and the country's productive forces. Ukraine's integration into the European Union requires the use of modern organizational forms and advanced technologies in the transportation process. Currently, the development of national and international

cargo transportation networks is impossible without documentation and information coverage. At each stage of cargo transportation and transshipment, there is a constant exchange of information between the parties of the transport process, putting forward certain requirements for the clarity and speed of transmission of the necessary information, which, as a rule, depends not only on the accuracy and continuity of the process, but also on the fulfilment of all the terms of the contract. It is possible to ensure the fulfilment of such requirements by introducing into the production process automated information management systems [12, 15], which implement orderly storage, prompt transmission of information on the control of cargo and transport units. Common systems make it possible to unite all agents in all countries, provide operational access to all the necessary information, allow to significantly simplify the procedures for issuing and checking the necessary documents, and the possibility of electronic exchange of information with partners and clients reduces the likelihood of errors and delays associated with human factor.

International road freight transport plays an important role in the country's economy and significantly affects the development of market relations. They have many advantages compared to other modes of transport, such as speed of delivery, relatively lower financial costs compared to other modes of transport, safety, delivery on time and point [15]. But the organization of international road transportation is one of the most difficult issues both for the carrier and for the country as a whole. The main problems in the organization of international transportation of goods by road transport are - imperfect state regulation, high transportation costs, delays when crossing the customs border with long queues, insufficient number of universal and transit permits. Increasing the efficiency of the provision of transport services due to the use of information technologies allows to increase the profitability of transport enterprises and makes it possible to reduce the cost of both transportation and the final product [24].

Ukrainian scientists Lebid E.M, Luzhanska N.O., Lebyd I.H. (2023) in their work «Development of projects of alternative methods of delivery of foreign trade goods during wartime with the participation of logistics intermediaries» note that with

the beginning of the war in Ukraine, enterprises that carry out foreign trade operations or provide related services suffered significant losses and were forced to restore economic activities under martial law. The resulting limitations concern both the lack of access to individual infrastructure facilities and their resources, and the safety of enterprise personnel and their activities during a full-scale invasion. However, the growing need for both export of goods and import to Ukraine became the impetus for the development and implementation of projects of alternative ways of delivery [16, P. 155].

The relevance of these implementations to this day is significant for manufacturers of goods, trade, transport, logistics and customs brokerage enterprises. Because the result of their entrepreneurial activity, as taxpayers, will ensure the filling of the budget of Ukraine. Therefore, for the restoration of foreign trade operations, strategic planning is necessary, containing multi-level, complex activities and a large number of management decisions.

In turn, Shuldiner Y.V., Primachenko G.O., Pashchenko G.S. (2023) considered alternative options for cargo delivery during the period of military operations in Ukraine. Also, in their article, the authors emphasize container transportation and the interaction of road and rail transport [27, P. 132-140].

Kunda N.T., Solomka A.O. (2021) in the scientific work «Features of preparation and organization of mixed transportation of cars in international traffic» highlighted the role of mixed transportation of goods in the world transport industry. Scientists defined intermodal transportation according to international rules. The methods of loading the car were also presented and the conditions of their application were analysed. The use of truck carriers and containers for the transportation of vehicles was described. Schemes of the arrangement of cars on semi-trailers were presented. In general, the authors set out the basic rules for preparing cars for transportation, which ensure the preservation of the commercial type of cargo and successful delivery [15, P. 235 - 231].

A number of authors devoted their works to the transportation of fuel and lubricants. Thus, Slavych V.P., Yelnyk V.V. (2023) in the work «Optimization of the

process of cargo delivery of a gas supply company» developed models for optimizing the process of transporting liquefied gas by road transport of a gas supply company due to the creation of a more efficient route for the movement of cargo vehicles [19, P. 85].

Bolkvadze L.I., Myhal O.F. (2022) note that transportation serves the needs of people and businesses around the world. Thanks to the effective functioning of the transport system, global supply chains are formed, and the development of economic relations in countries is also ensured. An increase or decrease in the volume of cargo transportation indicates the growth or decline of the economy, both of a single country and of the world as a whole. Today, during the difficult challenges facing Ukraine, the importance of researching the transport system and finding future ways of developing the domestic road freight transport market is extremely relevant [5].

In foreign trade, the international transportation of goods is the movement of goods from one country to another, which is also the most important logistics activity among all types of activities, since it takes a third of the total costs of the organization [7]. As a result, it affects the final cost of the product. Therefore, the development of transport infrastructure is considered critical precisely because of the growing dependence of society on transport networks [27].

As a result of globalization, digitalization and the development of both international and national trade, the demand for transport services has increased significantly. Over the last decade, it has shifted mainly to road transport due to its advantages such as easy accessibility, flexibility of operations and reliability. Thus, automobile logistics is considered one of the most influential factors of the country's economic development [21].

Motor transport is most effectively used for transporting small loads over short distances. In addition, it is an important mode of transport at the beginning and at the end of the multimodal transport chain. Unlike domestic road transportation, international cargo transportation has longer delivery times and requires additional preparation of documents before starting the transportation of goods.

In the case of international road transport, the most common means of transport for the movement of goods is a truck. International shipments, like any other freight

forwarding services, are based on a series of steps that must be followed to guarantee loading and delivery times. In general, it is possible to distinguish several main stages of international transportation carried out by road transport with the help of a logistics company (fig. 1.1).

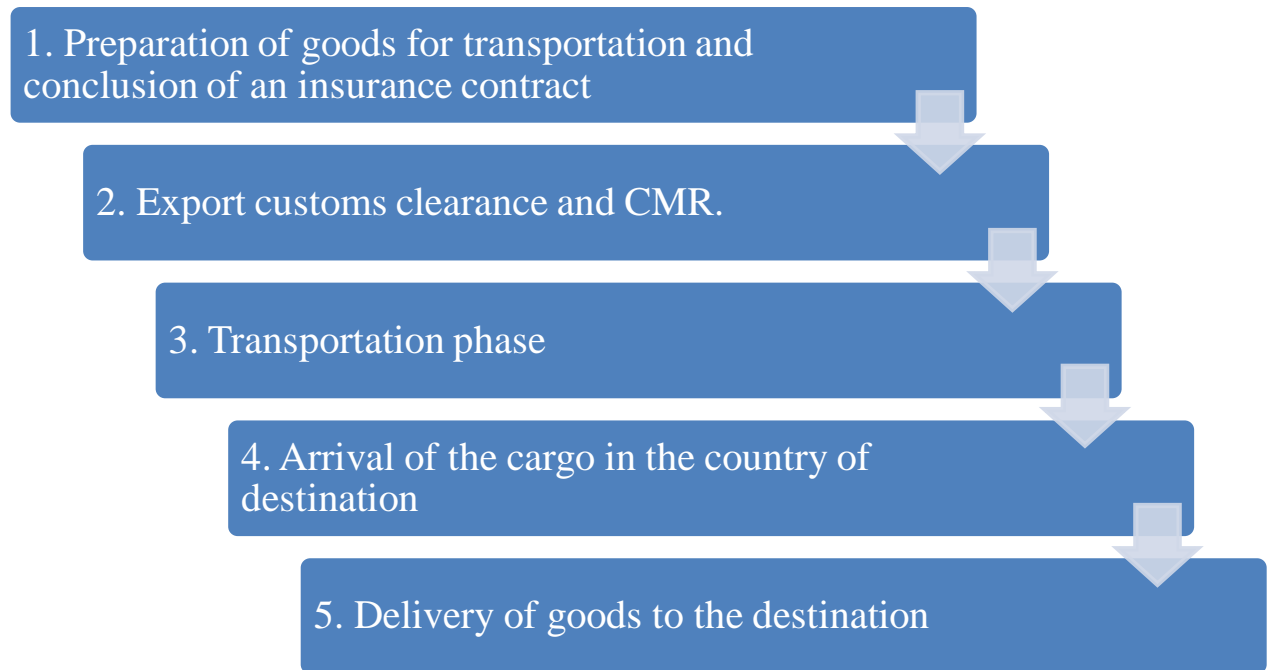


Figure 1.1 - The main stages of international transportation

Source: [5, P. 3]

Preparation of goods for transportation and conclusion of an insurance contract. After receiving the cargo at the client's territory, the carrier prepares the cargo for its proper transportation. This process consists in choosing the appropriate packaging according to the type of product and its correct placement. This allows you to minimize possible damage during transportation. Depending on the risks covered, the insurance market distinguishes three main types of cargo insurance: ICC-A, ICC-B, and ICC-C (category of cargo insurance) [16].

Export customs clearance and CMR (Convention on the Contract for the International Carriage of Goods by Road). The goods must be placed for customs clearance before leaving the country, both to check the cargo and the necessary documents to obtain permission to leave.

Transportation phase. After product preparation and export clearance, the product is transported directly. To avoid cargo checks at the borders of intermediate countries between the countries of departure and destination, it is necessary to issue a TIR Carnet (TIR Carnet), which minimizes paperwork at the borders and shortens delivery time.

Arrival of the cargo in the country of destination. After crossing the border of the country of destination, the goods must be placed at customs for import clearance to check documentation and, if necessary, physical inspection of the goods. It is also important to consider the rules of each country or economic zone in order not to violate their laws. If the necessary documentation of the transported goods is not available for registration, the goods will be held at customs. After completion of import cleaning, the goods are transported to the place of destination.

Delivery of goods to the destination. After the cargo arrives at the agreed place, the carrier delivers the goods to the importer or the company that will be responsible for its unloading [17].

Today, during the war, the importance of road transport has increased, as it makes it possible to carry out both import and export operations. «Agreement on the liberalization of freight transportation», or the so-called «transport visa-free», is one of the key results of the support of the state from the EU in the field of transport and provision of export logistics, which means the economy. Thanks to the Agreement, the export of goods by trucks in the direction of the EU countries in 2023 increased by 30% this year, if compared with 2021, when the permit system of transportation was in effect. In addition, the Agreement is the main element of the «Solidarity Paths» to support grain exports in the absence of stable alternative routes and maritime blockade" [17].

Key results of the Agreement signed on June 29, 2022:

- export of Ukrainian goods by road to the EU increased by 40% in 2022 compared to the previous year, and by 30% in 2023 compared to 2021;
- import of goods to Ukraine from the EU increased by 11% in 2022 and by 25% in 2023, compared to 2021 - before the signing of the Agreement;

- 48% more goods were exported to EU countries by road during the one and a half years of the Agreement than during the same period before its signing. Imports increased by 44% during this period.

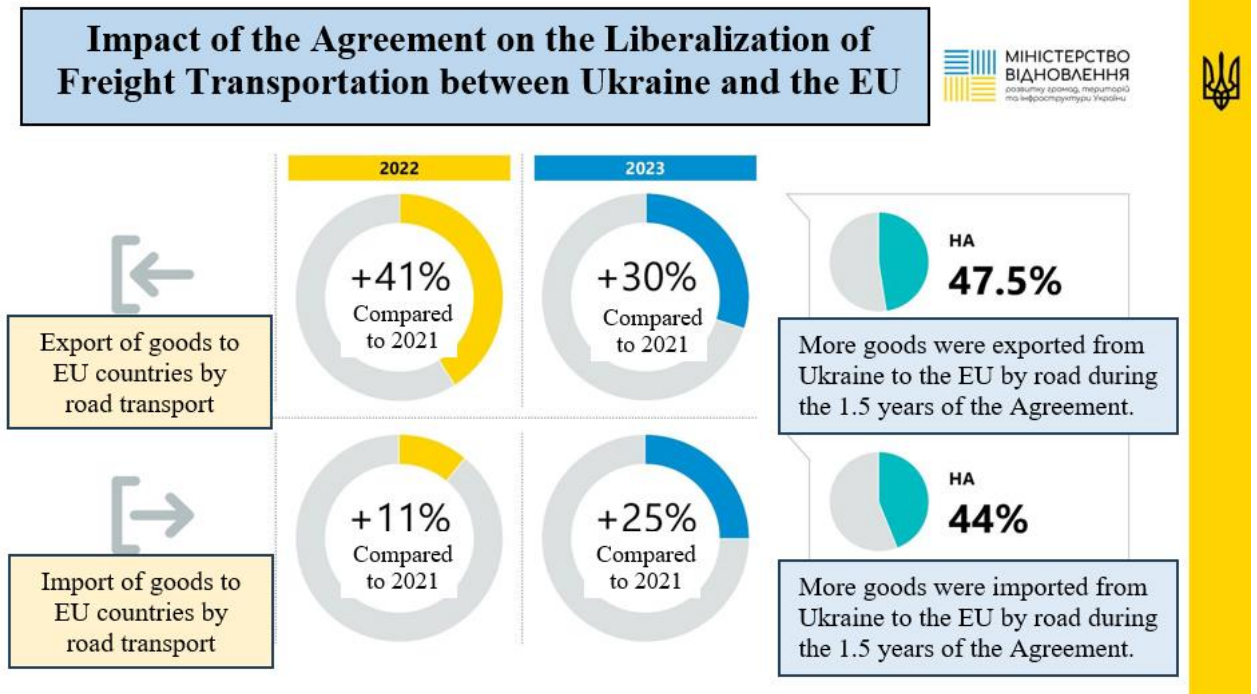


Figure 1.2 – Impact of the Agreement on the Liberalization of Freight Transportation between Ukraine and the EU (2021 – 2023)

Source: [17]

The agreement on the liberalization of cargo transport between Ukraine and the EU was signed on June 29, 2022 for a period of one year. In 2023, it was extended for another year - until June 30, 2024. The key content of the Agreement is the ability of Ukrainian carriers to carry out transportation to EU countries without permits, as was required before signing. For their part, carriers from EU countries have the same opportunity when importing goods to Ukraine [17].

In general, it can be said that the share of road freight transport on the market will continue to grow in the coming years. In connection with the war, the possibility of sea and railway routes to provide the necessary volume of imports and exports in Ukraine decreased.

It is worth noting that the organization of international road transportation belongs to a complex functional system that is studied mainly through two criteria: effectiveness, which reflects the effectiveness of the research to its intended purpose [5], and resource efficiency, which reflects the result of the activity to the resources spent on it.

For choosing criteria for the efficiency of road transport, it is necessary to adhere to the following norms:

- interdependence between the selected criteria;
- efficiency of use of all resources;
- the relationship between the effectiveness of the selected criteria and the management decisions made.

Evaluation of the effectiveness of the organization of international transportation by road transport is determined by the effectiveness of functioning and compliance with the set goal (table 1.1).

Table 1.1 – Description of the methodological levels of the study of the effectiveness of the organization of international road transport

Level	Elements	Resource	Evaluation indicators
Consumers of transport products	Transport service (delivery conditions, possibility of additional services)	Motor transport enterprises, forwarding companies	Transportation tariff, delivery time
The process of planning the organization and management of cargo delivery in international traffic	Forecasting demand for transportation, the process of managing vehicles on the route	Orders for transportation, ways of communication	Costs for planning organization and management
Technological process of cargo delivery in international communication	Transportation routing, organization of loading and unloading operations, cargo transportation	Rolling stock, loading and unloading mechanisms, capacity of crossing points, road and transport infrastructure	Technological and economic indicators

Source: [5]

Based on the analysis of service and resource parameters for the lower methodical level, established efficiency criteria, we will present a logical model of the connection of integral (interlevel) efficiency of the research object, which we will present in fig. 1.3.

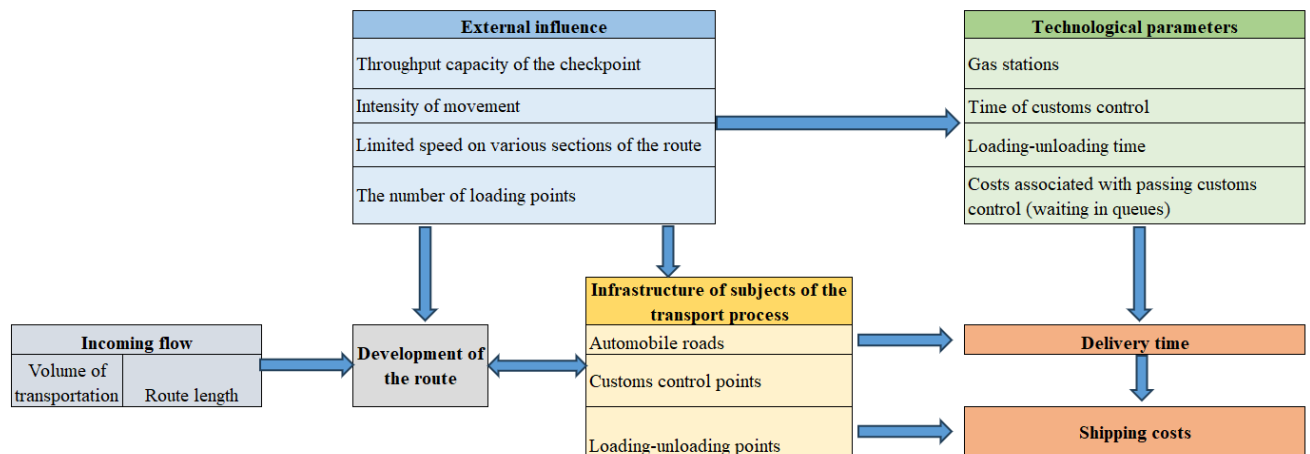


Figure 1.3 – Target links of the process of organization of international road transport

Source: developed by the author

According to fig. 1.3, for the technological process of cargo delivery in international communication, it is possible to distinguish four streams of influence on the output parameters: input stream, external influence, technological parameters and the environment of the subjects of the transport process.

For designing the route, the main component of the delivery time is the transportation time, which is affected by the transportation distance, although a shorter transportation route requires less costs and reduces the delivery time, but there is a possibility that the poor condition of the highways will reduce the delivery speed, the insufficient number of gas stations on the route will increase the delivery time due to the need to deviate from the route in search of gas stations, long queues at checkpoints will lead to unproductive downtime that can increase the time and costs of cargo delivery in international traffic. Such external influencing factors as the capacity of the checkpoint, traffic intensity, limited traffic speed on different sections of the route, the

number of loading points are uncontrollable for the researcher, but we can analyse them and identify patterns of their influence, because they have a direct impact on the route development process of cargo transportation in international traffic.

The main management decision within the technological process is the use of information technologies and software products to develop a route taking into account the above factors, which in turn leads to a decrease in technological indicators, such as the time of customs control, loading-unloading time, costs associated with passing customs control (idling in queues), which affect the initial parameters. With the use of information technologies, we have information about the location of the car, with the help of sensors placed in the body, we can monitor the temperature and humidity of the cargo. Thanks to electronic customs, it becomes possible to reduce the time of customs clearance due to the rapid arrival of electronic documents in the database and, accordingly, the cost of cargo delivery, which significantly speeds up the time of cargo delivery. Therefore, an important element of cargo delivery management in international traffic is the use of information technologies.

1.2 Strategic management of fuel and lubricants supply chains

All types of transport use fuel and lubricants for transportation. For mass transportation over long distances, fuel and lubricants are transported by water, road or rail [13].

Water transportation of fuel and lubricants successfully competes with pipeline transportation in terms of its economic indicators. The following types of bulk vessels are distinguished: sea and river tankers; sea (lighters) and river barges. Each oil tanker is characterized by the following main indicators:

- 1) displacement - weight of water displaced by a loaded vessel; the tonnage of the vessel at full subsidence is equal to the own weight of the vessel and the full cargo in it;

- 2) deadweight – the total weight of the cargo being lifted (which is also transported for personal use);
- 3) carrying capacity – weight of transport cargo;
- 4) sediment at full load;
- 5) travel speed at full load.

Of all the types of vessels, the tanker is the most widespread - a self-propelled vessel, the hull of which is divided into compartments by a system of longitudinal and transverse partitions.

Sea, river and lake tankers are distinguished by their technical indicators and sailing conditions. Sea tankers, which have become especially widespread for the transportation of oil, have the highest specific gravity. Currently, a trend towards a sharp increase in cargo capacity has emerged in world shipbuilding. Currently, there are supertankers with a deadweight from 2×10^4 to 5×10^4 Mn.

River tankers, unlike sea tankers, have a relatively small draft and, therefore, a limited carrying capacity.

Oil barges are used in river transportation. The introduction of the method of pushing a caravan of barges instead of towing helped increase the efficiency of river transportation. With this method, the pushing barges are rigidly connected, which provides better use of the passing flow and better manoeuvrability. This progressive way of transporting non-self-propelled barges allowed a sharp increase in speed.

Railway transportation of fuel and lubricants is carried in tanks with different purposes. For the transportation of light petroleum products (gasoline, kerosene, diesel fuel), four-axle tanks with a volume of 60 m³ with universal draining devices are mainly used: special purpose tanks; tanks with external steam heating; thermos tanks.

Special purpose tanks are mainly intended for transportation of highly viscous and paraffinic oils and petroleum products. Tanks with external steam heating differ from ordinary ones in that the lower half of the compartment of this tank is equipped with a steam jacket with a heating area of 40 m². Steam for heating oil products before draining is supplied through the fitting of the steam jacket of the universal draining device. The introduction of such tanks greatly facilitates the draining of highly viscous

oil products, reduces downtime, as well as energy and labour costs. One of the significant disadvantages of these tanks is some increase in the weight of the container. Thermos tanks are intended for hot transportation of highly viscous petroleum products. A stationary tubular heater with a heating surface of 34 m² is located inside the tank.

For the unloading and loading of railway tanks, the pouring-filling overpasses located on the straight section of the railway dead-end are used.

Car transportation of fuel and lubricants has become the most widespread in Ukraine. Road transport is used to transport petroleum products over a limited distance. In fig. 1.4 presents the classification of road tankers for transportation of fuel and lubricants.



Figure 1.4 – Classification of road tankers for transportation of fuel and lubricants

Source: [11]

The delivery of oil products and liquefied gases over short distances (up to 100 km) is carried out centrally by motor transport enterprises using specialized road

transport (car tanks, semi-trailers and tank trailers, tank containers, on-board cars and trailers with mobile metal rubber-fabric tanks, containers, barrels and water bottles).

The main feature of modern constructions of automobile tanks is the use of load-bearing tanks (frameless tanks). Tanks in relation to the base chassis can be located horizontally and obliquely. The horizontal location of the tank is used mainly in the construction of automobile tanks intended for the transportation of fuel, oil and special liquids. Inclined and horizontal storage tanks are used for transporting liquefied gases. In the cross-section, horizontal and inclined tanks have round, rectangular and elliptical shapes. The last two forms are used in order to lower the center of gravity of the car tank and give it greater stability when moving.

The shape of the cross-section of the tank, as a rule, is determined by the requirements of operation, mechanical strength and stability of automobile tanks during movement. For the basic chassis, cars and car trailers of the necessary load capacity, possibility and manoeuvrability are used. The carrying capacity is selected in accordance with the requirements of a one-time delivery of petroleum products or liquefied gas in the accepted delivery scheme. Possibility and manoeuvrability is determined by the purpose of the tank and the area of its use.

For regions with moderate road and climatic conditions, chassis of cars with a wheel formula of 6×4 and 6×2 are used, and for regions with difficult conditions, chassis of multi-purpose vehicles of type 6×6 and 4×4, as well as chassis of crawler tractors are used.

Medium and large-capacity tank trucks, which include a car tank with a tank trailer, are widely used in automobile companies. The use of such road trains allows you to reduce their own weight and significantly increase the carrying capacity.

Strategic decisions in the supply chain [13]:

- identification of key competencies and choice of supply chain strategy,
- adaptation of the entire chain to the nature of demand and characteristics of supply,
- development of the general concept of the chain — a combination of functions and processes, determination of the range and degree of outsourcing,

- choosing of suppliers and intermediaries in distribution,
- design of the system of movement of raw materials, materials, etc., as well as finished products,
- choosing the concept of stock management,
- decisions regarding the information system, including the transfer of information,
- choosing of the principles or model of risk management in the supply chain,
- decisions regarding relations between chain participants,
- choosing of cost management method,
- choosing the location of logistics facilities and their equipment,
- choosing of mode of transport and transportation routing, etc.

During analysing fuel and lubricant supply chains, it is important to consider two phenomena:

1) general price pressure, which forces supply chain leaders to continuously focus on price reduction, even when the competitive strategy is primarily focused on quality or delivery time;

2) the concentration of profit in one link of the value chain, which is observed in many types of activities, for example, in the field of personal computers it is associated with microprocessors and software, in the chemical industry - with production, not distribution, on the other hand, in the case of general goods consumption appears in distribution, not in production.

In the general case, the model of influencing factors on the choice of fuel and lubricant supply chain strategy can be presented schematically in fig. 1.5.

Effective supply chains are characterized not only by high speed of delivery, but also by low costs, but also respond flexibly to changes in supply and demand, easily adapt to difficult changes in the market structure, and take into account the interests of all participants who are part of the supply chain.

Modern concepts of SCM include:

1) Lean management (hereinafter LM) - focuses on the elimination of any waste. It is closely related to the strategy of the price leader and indicates ways to reduce the

costs of production and distribution of goods, and therefore, the possibility of selling finished products at a lower price than competitors.

2) Agile management (hereinafter AM) in supply chains is a quick response to changes in demand, and a key element of the chain strategy is perfect service to the end customer.

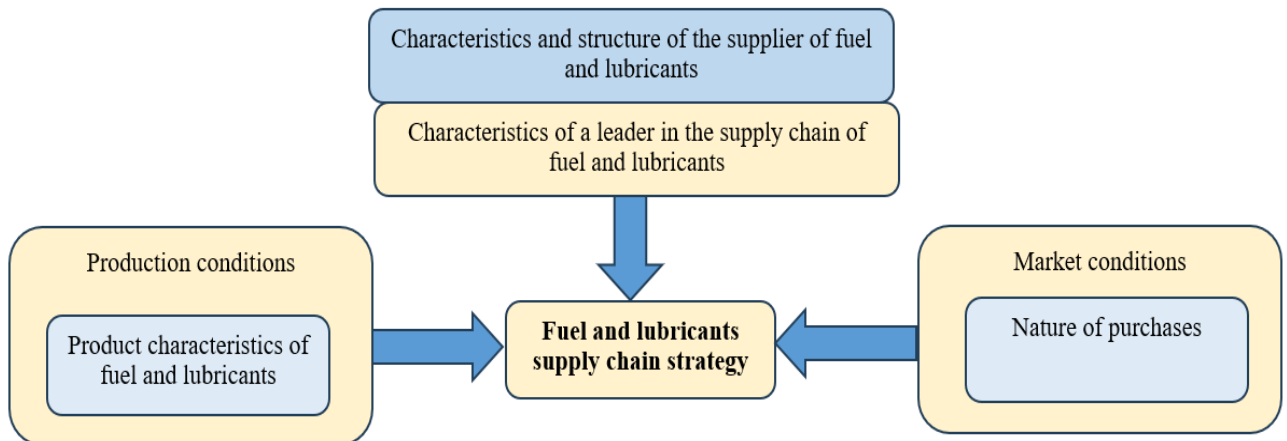


Figure 1.5 – A model of influencing factors on the choice of fuel and lubricant supply chain strategy

Source: developed by the author

External conditions and attributes of the supply chain influence the strategy, but are not decisive, of course, for its choice and influence the choice of a method of gaining a competitive advantage within the LM and AM supply chain strategies (table 1.2).

Strategic transactions in the supply chain management system for fuel and lubricants entering international markets include:

- creation of joint ventures, licensing,
- acquisition of ownership of infrastructure objects,
- import / export,
- counter trade and duty refund.

The main elements of global logistics transactions are schematically summarized in fig. 1.6.

Table 1.2 – Ways of gaining a competitive advantage within LM and AM supply chain strategies

Fuel and lubricants supply chain strategy	Market success factors	The most important element of competitive advantage
Agile management	Flexibility Quality Costs Cumulative delivery time	Product availability
Lean management	Quality Cumulative delivery time Accessibility	Low costs

Source: [13]

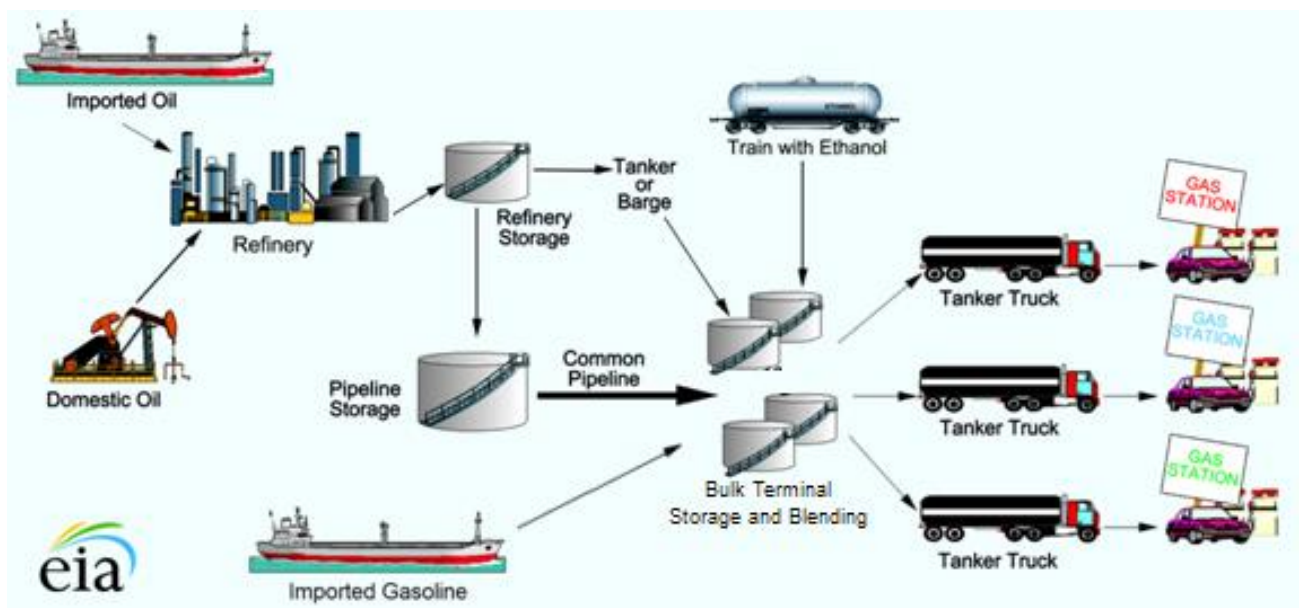


Figure 1.6 – Fuel and lubricant supply chain

Source: [44]

The methods of organizing logistics supply chains for fuel and lubricants are:

- Creation of organization levels. Coordination is at the global level, and final production and distribution operations are at the local level. Thus, despite the fact that the company carries out global activities, its products are connected to the conjuncture of local sales markets with the help of local logistics operations. For example, in the automotive industry, the main manufacturers of complete equipment structure the networks of their manufacturing companies at the global level, while forcing suppliers to build their facilities in close proximity to the equipment manufacturing plants.

- The growing role of individual links of the logistics chain. For example, the development of a traditional warehouse into a production unit, which performs the functions of final finishing of finished products as additional services, which contributes to the creation of a flexible enterprise capable of responding to the conditions of local markets.

Supply chain management of fuels and lubricants includes management of all stages of supply, from initial production to final delivery to customers. The main elements of fuel and lubricant supply chain management are presented in fig. 1.7.

Planning and forecasting:

- An important step in supply chain management is the development of a strategic plan, including forecasting of demand for fuel and lubricants. Understanding demand will help you avoid stockouts or overstocks and meet customer needs.

Purchasing and supply:

- Supply management includes selecting suppliers, negotiating terms of supply, concluding contracts and placing orders for fuel and lubricants. It is important to ensure quality, reliability and timely delivery of materials.

Warehouse management:

- Effective warehouse management helps ensure proper storage of fuel and lubricants. This includes optimizing inventory, controlling expiration dates, organizing warehouse space, and using automated inventory management systems.

Transportation and logistics:

- Managing the transportation of fuels and lubricants includes planning routes, selecting vehicles, monitoring deliveries, and resolving potential problems such as delays or loss of cargo. Efficient logistics help reduce costs and ensure fast and smooth delivery.

Shared information system:

- Using a shared information system, such as ERP (Enterprise Resource Planning), allows coordination between all stages of the supply chain. This helps to reduce errors, improve communication and interaction between different actors in the supply chain.

Monitoring and analysis:

- An important aspect of fuel and lubricant supply chain management is monitoring and analysis. This includes tracking sales, inventory, transportation and other parameters, which allows you to identify problematic situations and take appropriate corrective measures to optimize the supply chain.

Figure 1.7. – The main elements of fuel and lubricant supply chain management

Source: developed by the author

Chain reconfiguration processes (deferral). Postponement is the transfer of operations in the logistics chain to a later date until the moment of receiving the order from the client. It can be deferred production (performance of final operations of assembling products and ordering them to order at the local level); postponement of packaging at the local level warehouse, which will ensure individualization of products.

Creation of physical infrastructure from among selected providers of logistics services. For example, companies engaged in business in the field of fashion and sportswear, when creating a global logistics network, entrust distributors with the performance of all secondary activities (management of warehouse processing processes, work of distribution centres).

Chapter 1 summary

In the theoretical part of the qualification work, the basics of transportation management of fuel and lubricants in international traffic were considered, which made it possible to draw the following conclusions.

The conducted analysis showed that the economy of Ukraine is in a state of crisis due to the war. The transport industry was significantly affected by military operations, which in turn led to a decrease in the ability to transport goods by all available modes of transport. The study of the market of road freight transportation and the search for opportunities for its further development in the post-war period requires special attention and a thorough approach to the study of this issue.

Today, during the war, the importance of road transport has increased, as it makes it possible to carry out both import and export operations. «Agreement on the liberalization of freight transportation», or the so-called «transport visa-free», is one of the key results of the support of the state from the EU in the field of transport and provision of export logistics, which means the economy. Thanks to the Agreement, the

export of goods by trucks in the direction of the EU countries in 2023 increased by 30% this year, if compared with 2021, when the permit system of transportation was in effect. In addition, the Agreement is the main element of the «Solidarity Paths» to support grain exports in the absence of stable alternative routes and maritime blockade.

In the work, a scheme of result-target relations of the process of organization of international road transportation is built. According to the scheme, when designing the route, the main component of the delivery time is the transportation time, which is affected by the transportation distance, although a shorter transportation route requires less costs and reduces the delivery time, but there is a possibility that the poor condition of the highways will reduce the delivery speed, the insufficient number of gas stations on the route will increase the delivery time due to the need to deviate from the route in search of gas stations, long queues at checkpoints will lead to unproductive downtime that can increase the time and costs of cargo delivery in international traffic.

The research also describes in detail the management of fuel and lubricant supply chains, which is a complex process that requires attention to detail, coordination between various participants and the use of modern technologies. Effective management helps to ensure proper quality and proper supply of fuel and lubricants, reduce costs and increase customer satisfaction.

CHAPTER 2

GENERAL ANALYSIS OF PRODUCTION AND FINANCIAL INDICATORS OF «CD TRANS» LLC ON THE MARKET OF FUEL AND LUBRICANTS IN UKRAINE

2.1 Analysis of the results of commercial activity of «CD Trans» LLC on the fuel and lubricant market

The Ukrainian fuel and lubricant supply company «CD Trans» LLC positions itself as a leading importer of high-quality petroleum products produced by European refineries. «CD Trans» LLC was registered on November 1, 2012 and has been successfully operating on the Ukrainian market since that time.

The company's main areas of activity are:

- import and sale of petroleum products (optimization and expansion of the geography of supplies of petroleum products of European production);
- provision of a full range of transport and forwarding services for the transportation of fuel and lubricants by road transport.

«CD Trans» LLC was created with the aim of organizing wholesale trade in petroleum products on the Ukrainian market, establishing close trade contacts with the largest companies and main independent operators in the field of petroleum products trade in Ukraine.

Today, «CD Trans» LLC sells oil products to Ukrainian companies that are owners of small and large networks of gas stations (hereinafter - gas stations), owners of oil depots, as well as other large and small consumers in Ukraine.

In addition, «CD-Trans» LLC is a member of the Oil and Gas Association of Ukraine and a member of the European Business Association (EBA). The company is interested in expanding cooperation in various regions of Ukraine with networks of gas

stations and oil depots, with the aim of increasing sales and bringing European petroleum products as close as possible to the end consumer market.

«CD-Trans» LLC is a modern organization that works on the principle of providing high-quality cargo transportation services, maximum attention to customers and striving to improve its service. During its existence, the company supplied the Ukrainian market with a wide range of oil products of European manufacturers.

Since February 2013, «CD-Trans» LLC has been an active member of the Association of International Freight Forwarders of Ukraine (ASMAP). The company's specialists are highly qualified and are always ready to provide a full range of transport and forwarding services for the transportation of fuel and lubricants, which includes:

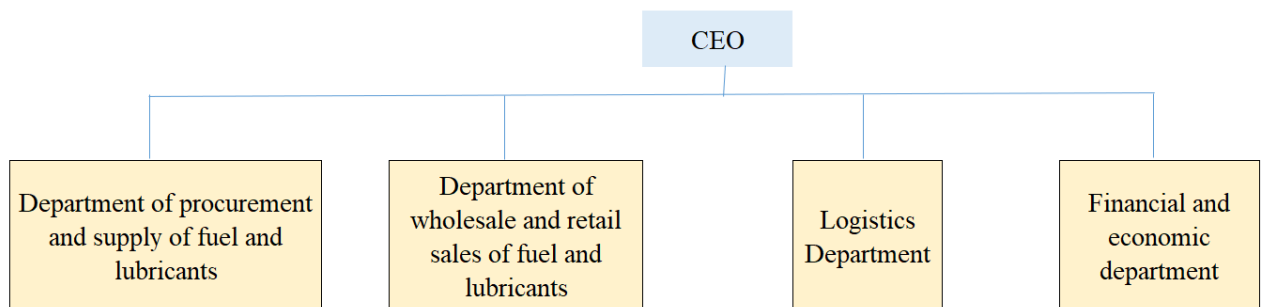
- drawing up the optimal cargo transportation route, consulting on cost reduction and increasing the efficiency of transportation;
- calculation of tariffs for domestic, international (import), transit transportation, works and services related to them;
- conclusion of contracts with other forwarders and participants in the transportation process;
- tracking the cargo and informing about its location, issuing operational information about the location of tank trucks, the date and time of border crossing and receipt by the client;
- interaction with insurance companies regarding cargo insurance;
- interaction with security companies on issues of cargo escort during transportation;
- work on certification and registration of serial and batch certificates of conformity according to current standards in Ukraine;
- performance of duties of a customs broker at all large border, hub stations during transportation of export-import goods;
- organization of cargo forwarding on the way;
- obtaining permits and processing documents for the transportation of dangerous goods;

- advising consignors, consignees and cargo owners on drafting contracts and transport documents in accordance with legal requirements;
- coordination of the interaction of all participants in the cargo delivery process;
- information support during the entire time of cargo transportation.

In general, external forces capable of limiting the flexibility of «CD-Trans» LLC's strategy include the following:

- industry competition;
- regional differences in market potential;
- changes in the technologies of energy extraction and production of other material resources and products, which belong to the list of items of the company's transport and forwarding services complex;
- changing the structure/geography of the redistribution channels of the company's transport and forwarding processing items;
- prospects (change of priorities) of the socio-economic development of the state,
- the intensity of changes in the development trends of the service sector,
- conditions/rules of state regulation, etc.

The organisational chart of «CD-Trans» LLC is shown in fig. 2.1.



Full-time staff: 34 people

Drivers: 64 people

Figure 2.1 – Organisational chart of «CD-Trans» LLC

Source: developed by the author according to input data of the company

It is worth noting that the company constantly participates in tender purchases and auctions, constantly competes with leading suppliers, not compromising on the

price and quality of the supplied fuel. The Ukrainian fuel market has completely changed over the past 2 years. Let's consider in more detail the supply countries for transportation of fuel and lubricants of «CD-Trans» LLC. It should be noted that in the spring of 2022, an extremely tense situation with the supply of fuel has developed in Ukraine. Very quickly, the Russian occupying forces incinerated the only Kremenchug oil refinery, where it was produced, and all oil storage facilities were actually destroyed. There was a critical shortage of fuel, and its prices were sky-high. But then the government managed to stabilize the situation.

In 2023, «CD-Trans» LLC imported fuel from the Baltic countries, Poland, Greece, Romania, Moldova, and Slovakia. Distribution by share of supply is shown in fig. 2.2. Note that 35-36% of the fuel enters Ukraine through the Polish border. Therefore, the blockade, which was organized by carriers or farmers, was really intended to interrupt the supply of fuel to Ukraine.

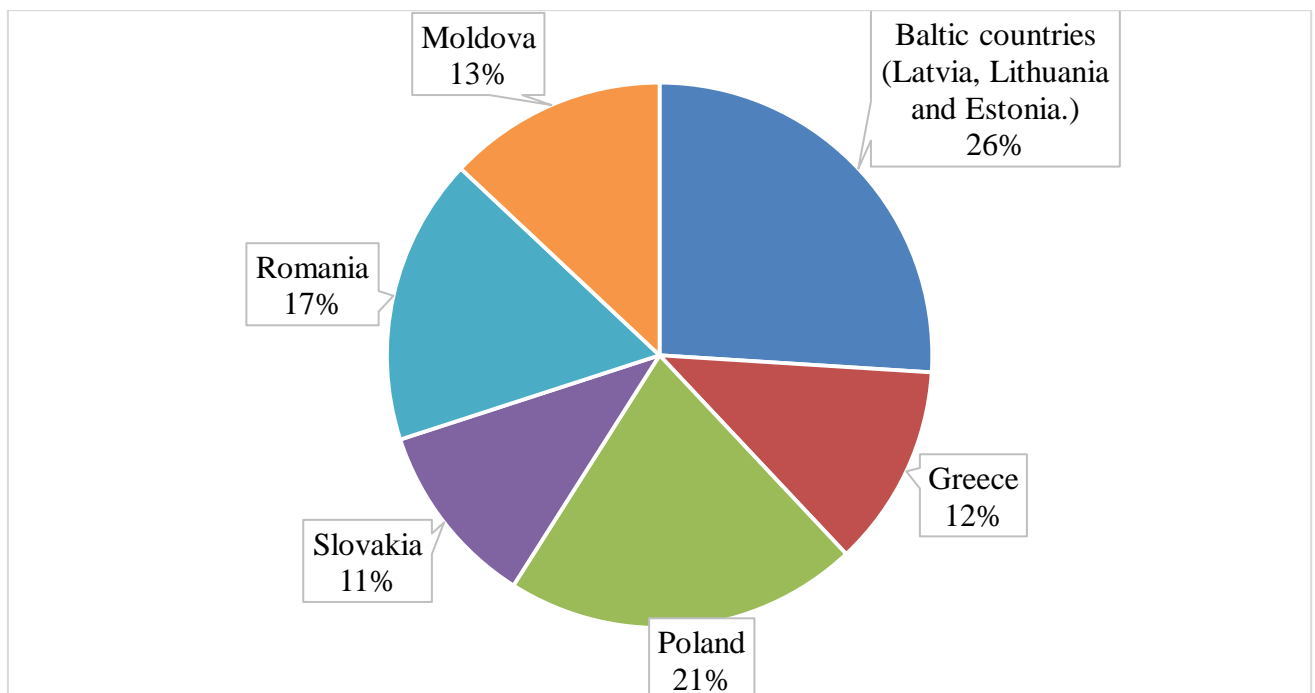


Figure 2.2 – Geography of fuel and lubricant imports by «CD-Trans» LLC in Ukraine in 2023

Source: developed by the author according to input data of the company

The main importers of fuel and lubricants in Ukraine in 2023 were UPG, Cantarell Trading LTD, Alliance energy, UNTK, OKKO, Avantage7, Parallel, Prime, Patriot, Start Global Trade and others. Its share of imports is presented in fig. 2.3.

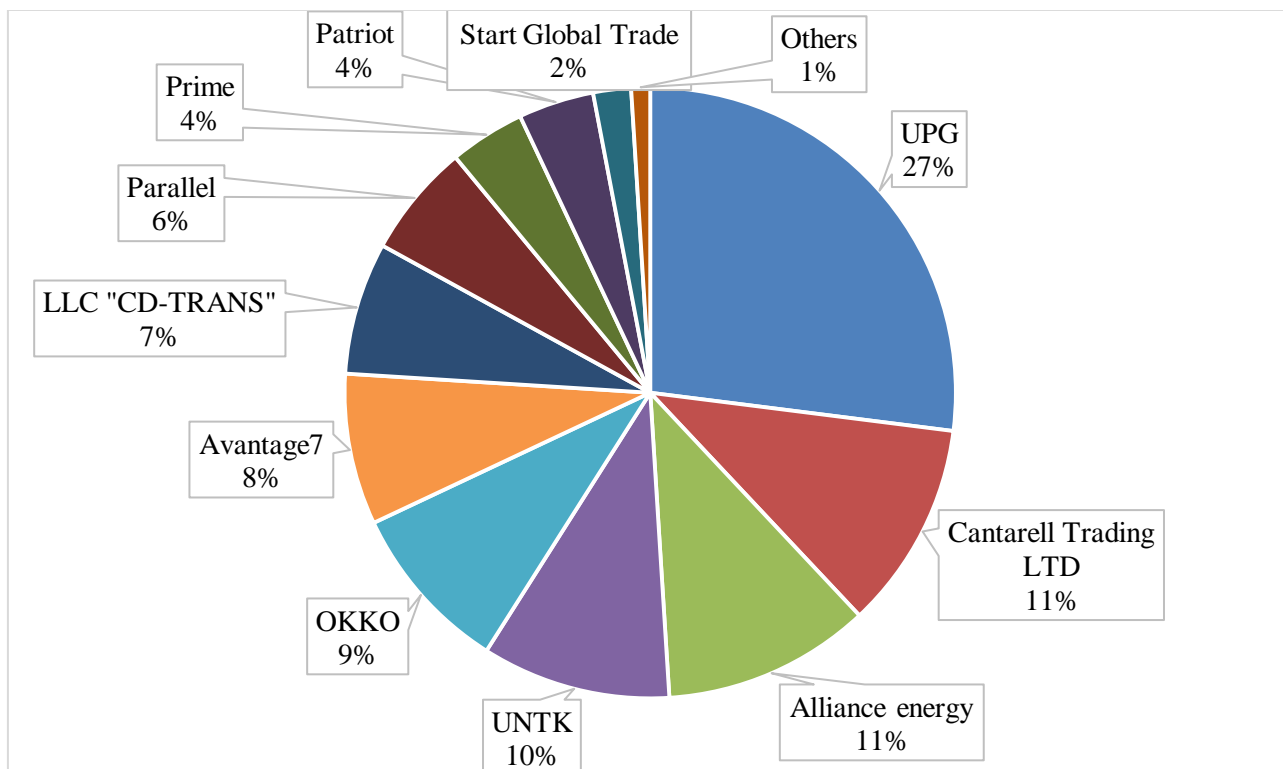


Figure 2.3 – The main importers of fuel and lubricants in Ukraine in 2023 [5]

Source: developed by the author according to input data of the company

«CD-Trans» LLC offers for sale: gasoline

- automobile A-92-K5-Euro;
- automobile gasoline A-95-K5-Euro;
- automobile gasoline A-98-K5-Euro;
- diesel fuel DT-L-K5, Grade C;
- diesel fuel DT-Z-K5, Grade F;
- diesel fuel DT-Z-K5, class 0, class 1, class 2, class 4;
- fuel for RT brand jet engines;
- fuel oil 100;
- road bitumen.

Therefore, «CD-Trans» LLC has a considerable number of European suppliers of light petroleum products, which creates competitive advantages in terms of customer service in terms of price and speed of product delivery.

Let us now consider the consumers of «CD-Trans» LLC products. As already mentioned, the company carries out wholesale and small-wholesale deliveries of fuel and lubricants to various enterprises in various sectors of the economy.

The shares of the main wholesale consumers of fuel in Ukraine in 2023 are presented in fig. 2.4.

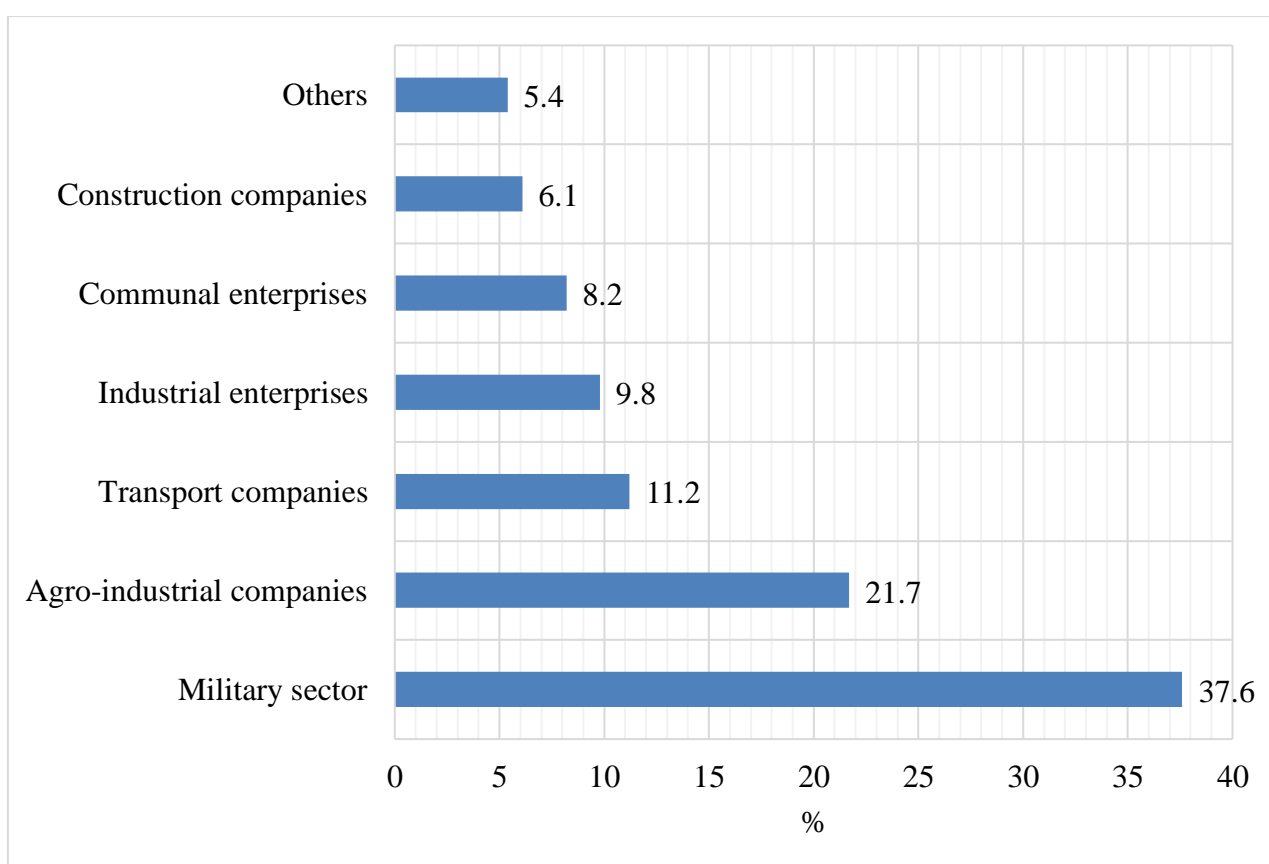


Figure 2.4 – Shares of the main wholesale consumers of fuel in Ukraine by «CD-Trans» LLC in 2023

Source: developed by the author according to input data of the company

Since the end of February 2022, the market of petroleum products in Ukraine has experienced additional force majeure impacts associated with the start of a full-scale war:

- termination of fuel supplies from Russia and Belarus;
- stoppage of domestic production of oil products market in Ukraine in connection with the shelling of the Kremenchug Refinery;
- Russian blocking of Ukrainian ports;
- occupation of part of the territory;
- increasing demand for petroleum products in the defence sector;
- Russian attacks on oil depots and warehouses of fuel and lubricants;
- use of gasoline and diesel fuel in autonomous power generators during power outages.

After the start of active hostilities at the end of February 2022, the military sector became the main consumer of the market of oil products in Ukraine - its share according to the results of 2023 was 37.6%. Last year, farmers used 21.7% of fuel from the total volume of the market, and transporters - 11.3%. The shortage in the market of oil products in Ukraine, which arose in the late spring - early summer of 2022, was overcome by reorienting supply logistics to the western direction. In this way, the customer-oriented activity of «CD-Trans» LLC allows to constantly increase sales volumes and attract new customers.

Note that the range of products offered by the company to its customers is not large. In the table 2.1 presents the nomenclature and volume of sales of light petroleum products during 2020-2023.

Table 2.1 – Volumes of sales of light petroleum products by types of products of «CD-Trans» LLC during 2020-2023, (tons)

№	Types of products	2020	2021	2022	2023
1.	A-92	196,3	245,1	273,4	293,1
2.	A93/95	403,5	505,3	547,9	642,6
3.	A-98	7,1	8,7	9,3	11,8
4.	Diesel fuel	621,5	771,7	885,7	934,4
5.	In total	1228,3	1530,9	1716,4	1881,9
6.	Growth rate	-	1,25	1,12	0,73

Source: developed by the author according to input data of the company

So, in a fairly short period of time, «CD-Trans» LLC managed to increase the volume of sales of light petroleum products in 2021 by 25% in relation to 2020, respectively, in 2022 by 12% in relation to 2021. And even in 2023, the company managed to maintain sales volumes higher than in previous years.

In fig. 2.5 shows the dynamics of sales volumes of gasoline and diesel fuel, and fig. 2.6 shows the structure of sales by assortment.

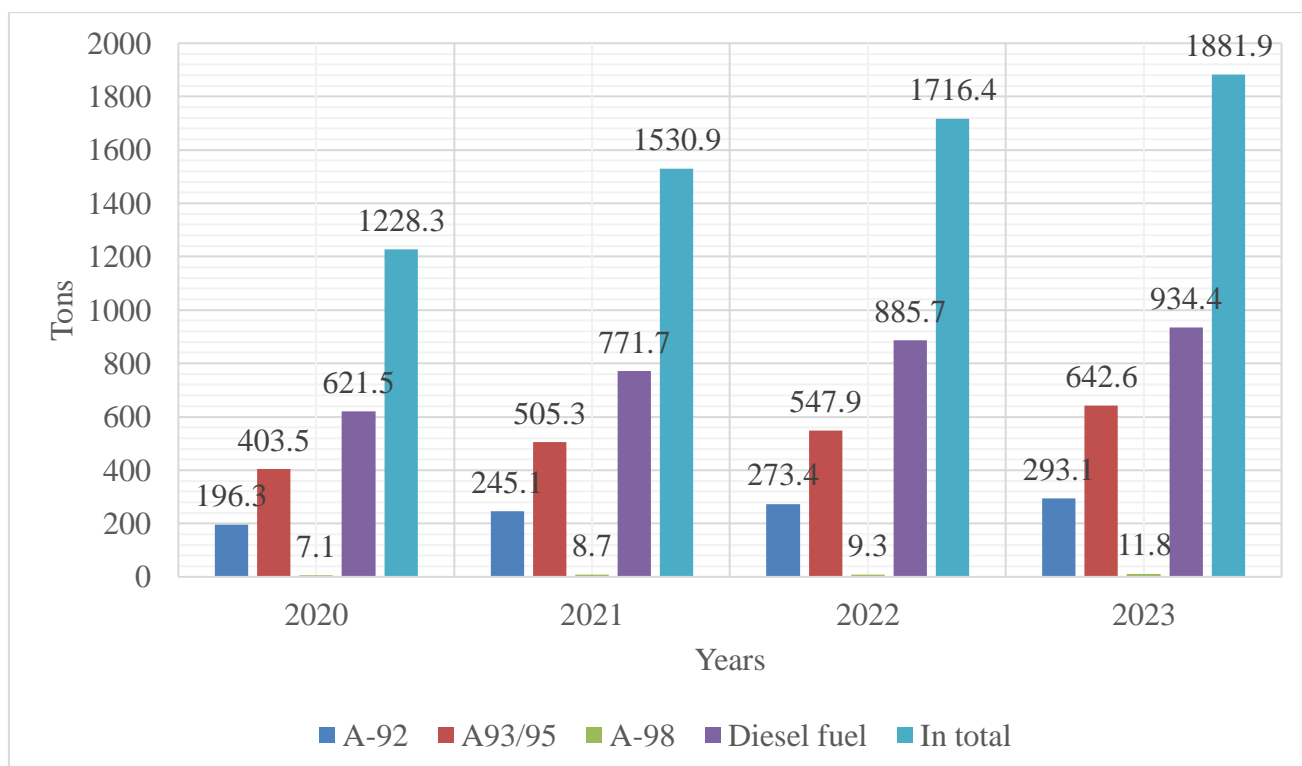


Figure 2.5 – Dynamics of sales of light petroleum products of «CD-Trans» LLC during 2020-2023

Source: developed by the author according to input data of the company

It can be seen from the figure that diesel fuel is the main source of income for «CD-Trans» LLC and is in constant demand.

From the data presented in the table 2.1 and diagrams show that the share of diesel fuel sales increased from 52% in 2022 to 59% in 2023. Therefore, a type of product that brings stable income and is in constant demand is important for the company. A-98 gasolines are in the least demand, but the presence of this type in the assortment is of great importance, since it is part of the assortment portfolio.

It should be noted that the sale of fuel and lubricants is characterized by seasonality, which is shown in fig. 2.7.

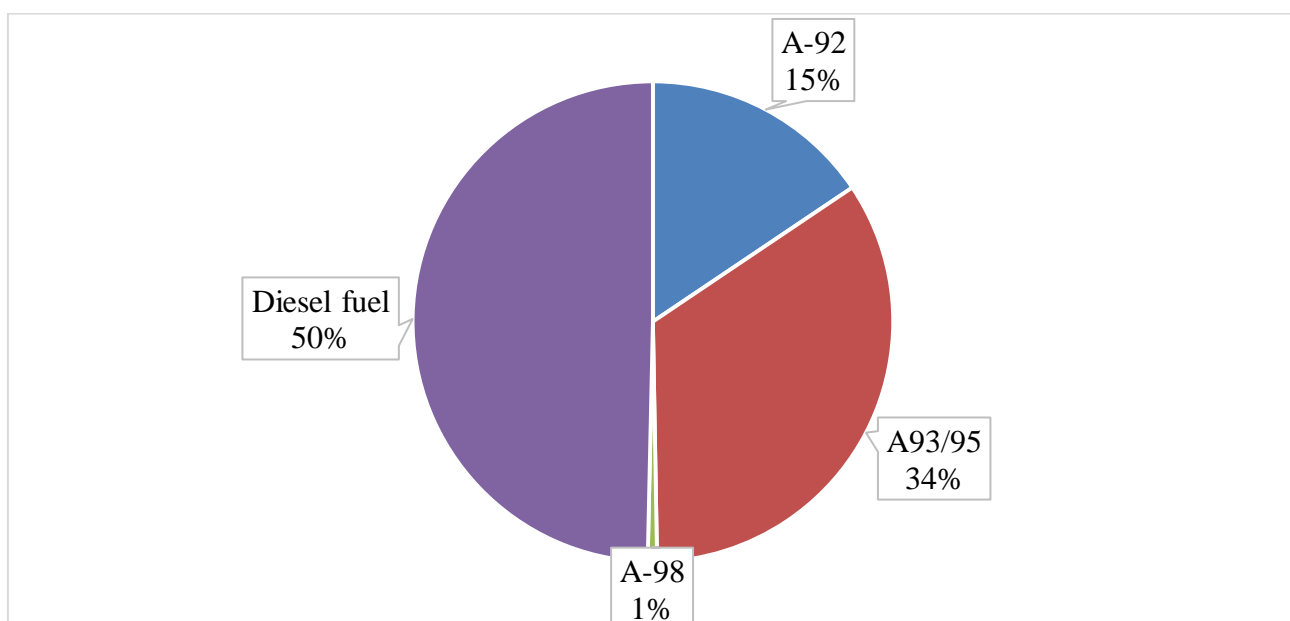


Figure 2.6 – Structure of sales of light petroleum products of «CD-Trans» LLC by types of product in 2023

Source: developed by the author according to input data of the company



Figure 2.7 – Dynamics of sales volumes of fuel and lubricants of «CD-Trans» LLC in 2023

Source: developed by the author according to input data of the company

As shown in the figure, the sale of fuel and lubricants at «CD-Trans» LLC has a pronounced seasonality: in the winter months from December to February, the sales volume is minimal, and in September and October, the maximum values are reached. This applies to both gasoline and diesel fuel, which is explained by the growth in demand from the company's customers, in particular, in agro-industrial enterprises.

Summing up, it can be noted that the main type of economic activity of «CD-Trans» LLC at the present time is the import of light petroleum products into Ukraine, in particular and not exclusively Diesel fuel, gasoline and liquefied gas, as well as their wholesale and retail sale on the territory of Ukraine. Analysis of the performance of «CD-Trans» LLC on the fuel and lubricants market shows that the company has regular customers, due to which it increases sales volumes.

2.2 Analysis of the financial results of the «CD Trans» LLC activity

The effectiveness of production and commercial activities of «CD-Trans» LLC and its ability to adapt to market conditions are evidenced by financial indicators, which include

- turnover of the enterprise,
- income by type of activity;
- expenses by type of activity;
- profit (loss) from operating activities;
- net profit (loss) of the wholesale company.

Let's consider the essence and methodology of determining individual financial indicators.

The volume financial indicator of the main operating activity is the gross sales volume (revenue from the sale of goods). The gross volume of sales is defined as the total amount of revenue from the sale of goods at selling prices. If the sales volumes of light petroleum products depend on the ability of the trading company to establish

product sales, then it cannot influence the prices. Pricing is influenced by various economic and political factors, which leads to constant price fluctuations. The change in the dollar exchange rate also has a significant impact, as most deliveries come from imported manufacturers.

«CD-Trans» LLC sells light petroleum products (gasoline and diesel fuel), and also provides additional services related to customer service. In the table 2.2 present data on the total income from the sale of fuel and lubricants for 3 years, and in fig. 2.8 graphically shows the structure of revenue by types of products.

Table 2.2 – Data on the volume of revenue from the sale of fuel and lubricants of «CD-Trans» LLC during 2021-2023, (thousand UAH)

№	Types of products	2021	2022	2023
1	A-92	5904	8763,6	9327,2
2	A-95/97	12757,8	18918,8	19702,6
3	DIESEL FUEL	17583,5	26969,7	30755
4	Total turnover	36245,3	54652,1	59784,8

Source: developed by the author according to input data of the company

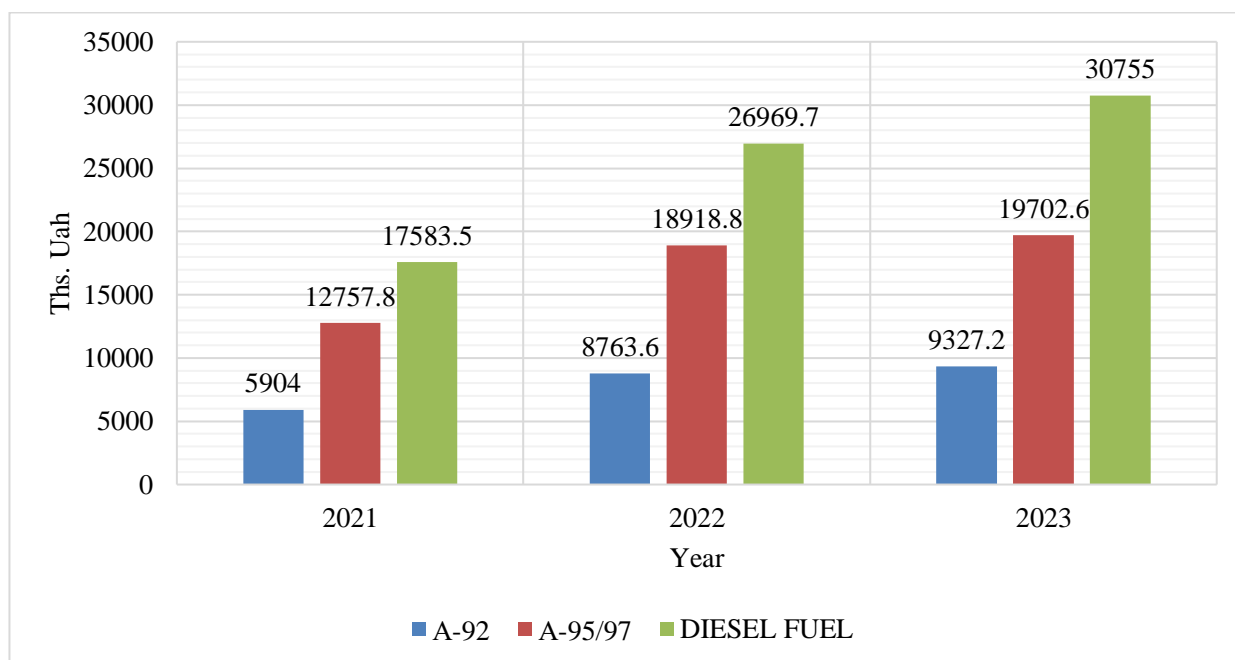


Figure 2.8 – Dynamics of revenue from the sale of fuel and lubricants of «CD-Trans» LLC during 2021-2023

Source: developed by the author according to input data of the company

Therefore, the sale of diesel fuel provides the company with the largest amount of sales revenue of 51% in 2023 and, accordingly, 33% of A-95/97 and 16% of A-92 (fig. 2.9).

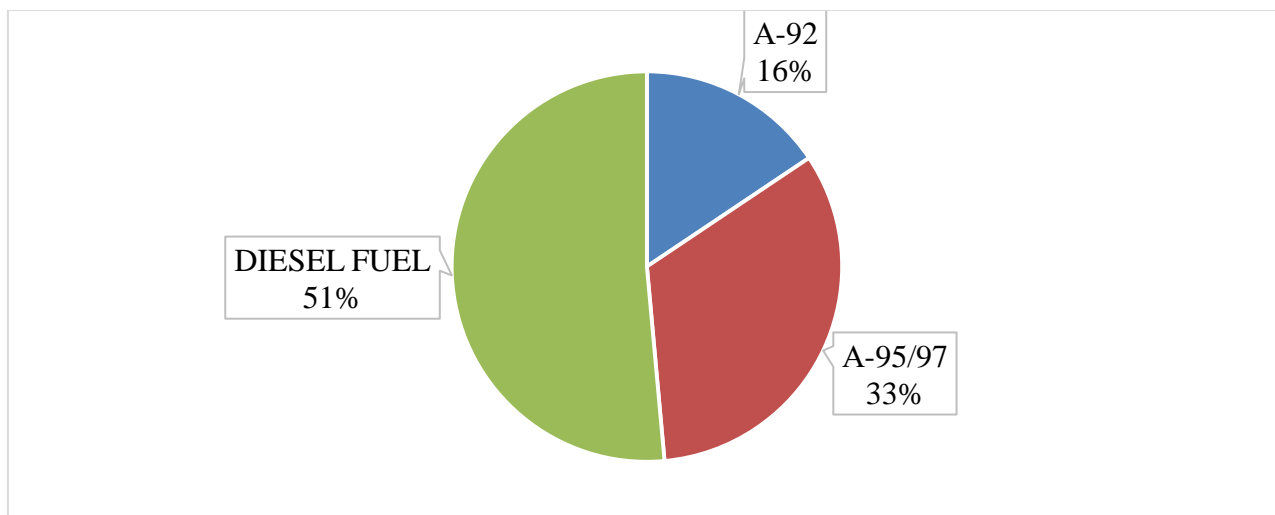


Figure 2.9 – The structure of revenue from the sale of products of «CD-Trans» LLC during 2023

Source: developed by the author according to input data of the company

Now let's analyse the costs of the enterprise. According to national accounting standards, expenses are a decrease in economic benefits in the form of the disposal of assets or an increase in liabilities that lead to a decrease in equity (with the exception of a decrease in capital due to its withdrawal or distribution by owners).

At the enterprise, importers of fuel and lubricant materials «CD-Trans» LLC distinguish such costs as: for the purchase of goods, capital investments in the extended reproduction of fixed assets and current costs for the organization of economic activities (transportation, storage, finishing, sub-sorting, advertising, packaging and sales of goods).

Purchase funds are constantly in circulation, they are invested in inventories at the expense of own working capital and bank loans, loans from other enterprises. As a result, all of them are reimbursed at the expense of the income received because of the economic activity of «CD-Trans» LLC. The costs of carrying out economic activities

are mostly included in the costs of circulation and represent the operating costs of a trading company.

In the table 2.3 presents data on the structure and amount of operating costs of the «CD-Trans» LLC during 2021-2023.

Table 2.3 – The structure and amount of operating costs of «CD-Trans» LLC in 2021-2023, thousand UAH

№	Cost items	2021	2022	2023
1.	Procurement and supply chain costs	1087,4	1639,6	1793,5
2.	Logistics costs	1812,3	2732,6	2989,2
3.	Sales costs	724,9	1093	1195,7
4.	Salary for personnel	1152	1224	1368
5.	Other costs	362,5	546,5	597,8
6.	Total costs	7156	9253,7	9963,3

Source: developed by the author according to input data of the company

Fig. 2.10 graphically shows the structure of costs during 2023.

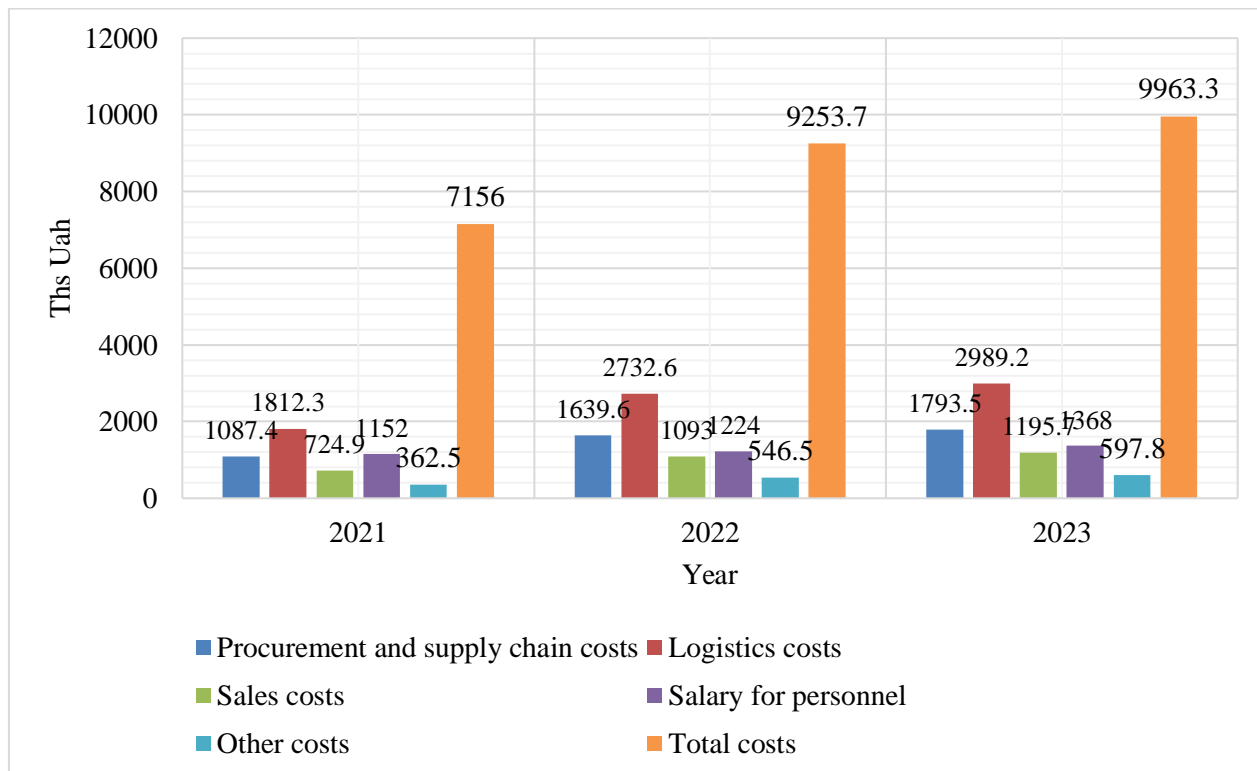


Figure 2.10 – The structure of operating costs of «CD-Trans» LLC during 2023

Source: developed by the author according to input data of the company

The largest item of the company's expenses is logistics expenses, which make up 38%, fig. 2.11. This is due to the increase in the cost of transportation and storage of fuel and lubricants. Costs for the organization of procurement and supply of petroleum products are 23%, for sales - 15%. The share of personnel costs is 17%. The given data allow us to conclude that the efficiency of a wholesale trade company depends significantly on how the processes of buying and selling goods are organized.

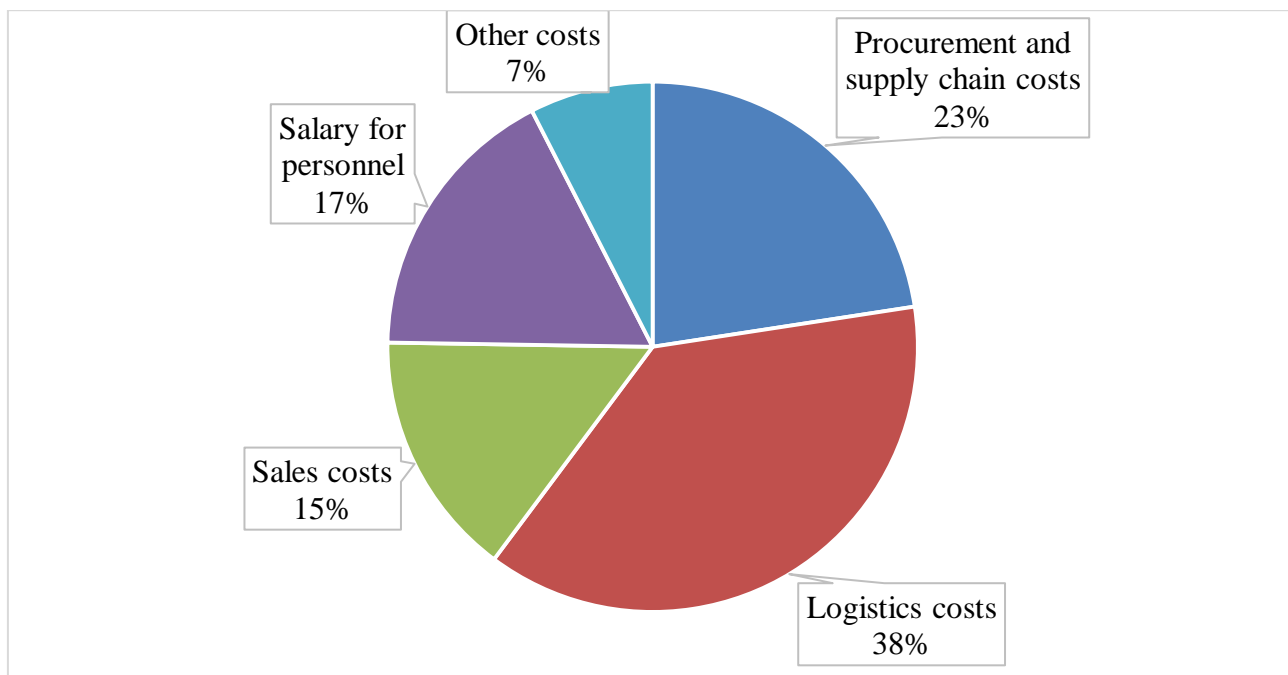


Figure 2.11 – Share of operating costs of «CD-Trans» LLC in 2023

Source: developed by the author according to input data of the company

Gross profit from the sale of petroleum products is formed as the difference between the net income from sale and the cost price of sold products (goods). Net income is calculated by deducting taxes, i.e. excise duty and value added tax, from the total income. The dynamics of net income, total expenses and profit before taxation are presented in fig. 2.12.

Therefore, the financial performance indicators of the «CD-Trans» LLC enterprise indicate its profitability. It should be noted that the absolute amount of profit is not the main indicator of the level of efficiency of economic activity. It is necessary to correlate it with incurred costs and assets that provide entrepreneurial activity, in

order to be able to draw a conclusion about the level of economic efficiency. In a broad sense, profitability means profitability. The enterprise is profitable, the results from the sale of products (works, services) cover production costs and allow normal business activities on the market.

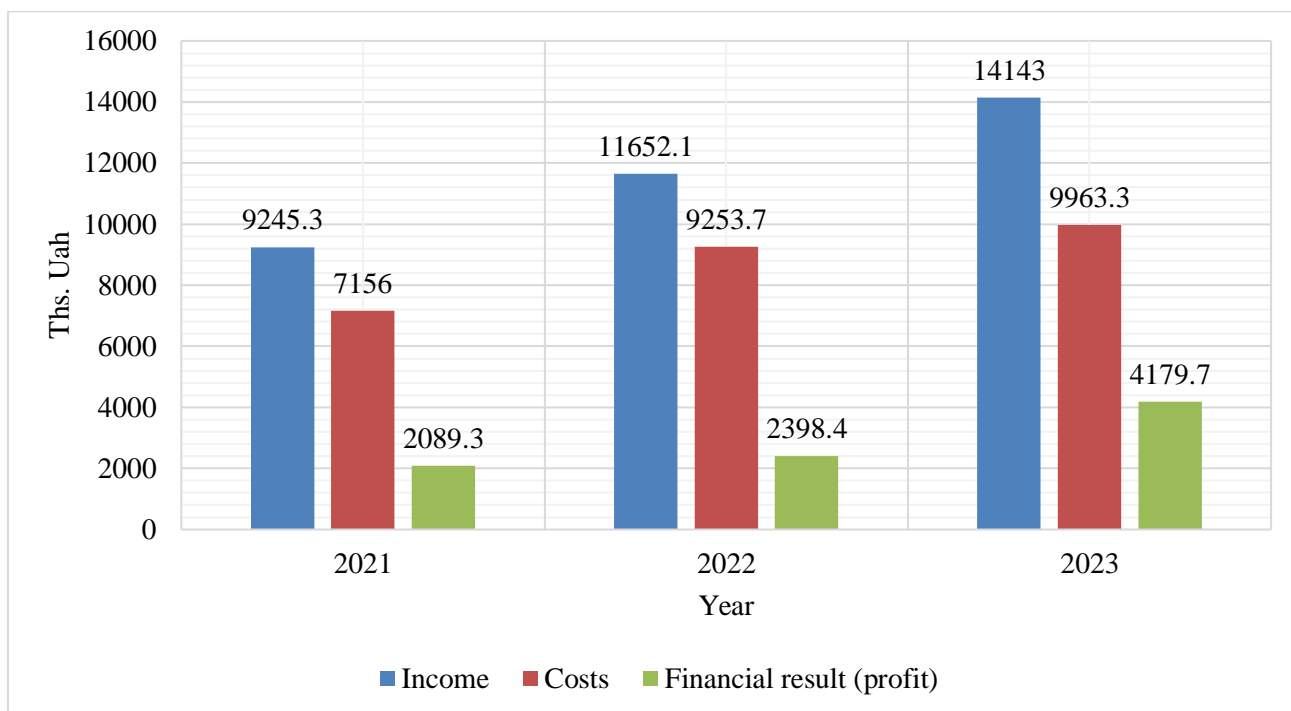


Figure 2.12 – Dynamics of net income, costs and profit of «CD-Trans» LLC during 2021-2023, (thousand UAH)

Source: developed by the author according to input data of the company

In order for the net profit to grow steadily, it is necessary to constantly monitor the level of profitability indicators, that is, the ratio of results (profit) to the company's expenses, which we will present in the table 2.4 and fig. 2.13.

Table 2.4 – Initial data for calculating the profitability of the operating activities of «CD-Trans» LLC, ths. Uah

Indicators	2021	2022	2023
Income	9245,3	11652,1	14143
Costs	7156	9253,7	9963,3
Financial result (profit)	2089,3	2398,4	4179,7

Source: developed by the author according to input data of the company

Fig. 2.13 graphically depicts the dynamics of profitability indicators of the wholesale trade in fuels and lubricants. The profitability of revenue means that the company received UAH 0.42 of profit per UAH 1 of sales in 2023. On the one hand, this is a small profit, but it indicates the low marginality of the wholesale trade business. Experts believe that the added value of wholesale intermediaries is 8% of the final price. Operating profitability indicates that net income fully covers the company's expenses. In 2021, the cost-effectiveness ratio was 29%, and in 2023 it was 42%, which shows a positive trend of improving the efficiency of commercial and production activities. The high level of profitability in 2023 is explained by the seasonality of sales and the increase in profitability during the peak period.

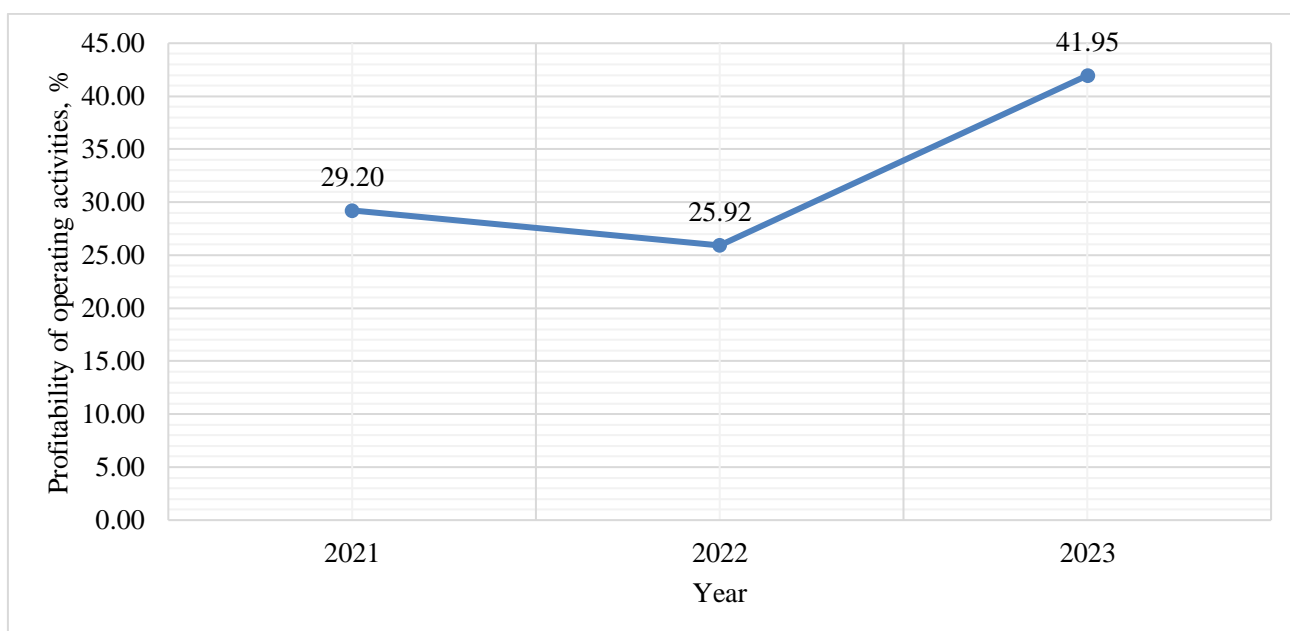


Figure 2.13 – Dynamics of indicators of profitability of wholesale trade in fuels and lubricants of «CD-Trans» LLC

Source: developed by the author according to input data of the company

Therefore, the analysis of the financial condition of «CD-Trans» LLC allowed us to draw the following conclusions:

- the dynamics of income for the period from 2021 to 2023 is positive, despite the nationwide problems of a military, political and economic nature.

- there is a positive trend in the growth of indicators of profitability (profitability) of operational activities, which indicates the stability of the company «CD-Trans» LLC and the provision of operational activities, the value of the company's services and good management.

In general, the analysis of the financial results indicates the relative stability of the stability of the financial condition of «CD-Trans» LLC.

2.3 Analysis of business processes of supply of fuel and lubricants and identification of bottlenecks

«CD-Trans» LLC is a trade intermediary between importers of European oil products and their direct consumers, that is, it turns large wholesale into small and retail. Commercial mediation involves the implementation of the processes of promotion of goods on the market and its transfer from the manufacturer to the buyer in accordance with the purchase and sale agreement (fig. 2.14).

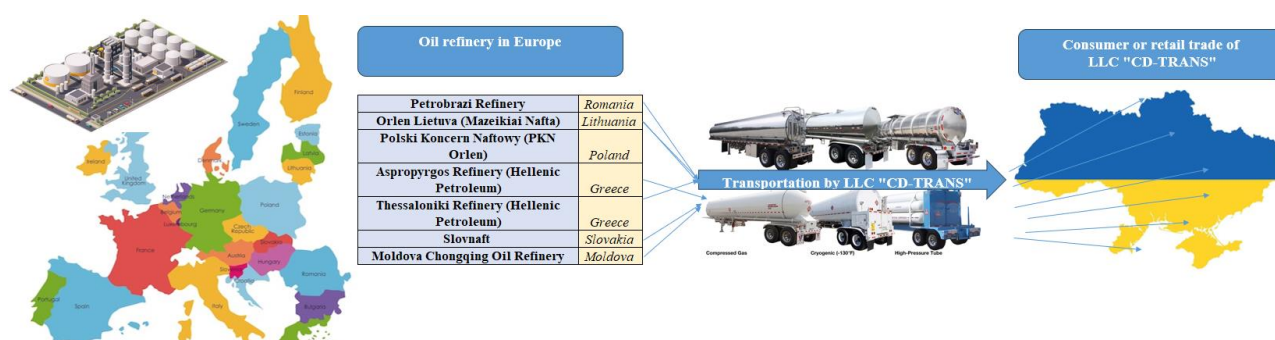


Figure 2.14 – Schematic of the supply chain of fuel and lubricants from manufacturers to end users of «CD-Trans» LLC

Source: developed by the author according to input data of the company

The task of «CD-Trans» LLC as an intermediary in the presented in fig. 2.14 of the scheme - to transform the flow of the producer's goods (diesel fuel) into an input flow convenient for the consumer and retail trade. However, in this case we are talking

about two intermediaries - a large wholesaler, which is most often an importing company, which directly buys fuel and lubricants from manufacturers located in the Baltic States, Poland, Greece, Romania, Moldova, Slovakia. «CD-Trans» LLC, as already mentioned, buys diesel fuel from the following importers, which is presented in the table 2.5. Then he sells this fuel to his client in small wholesale or retail.

In our opinion, there is an increase in the share of small wholesale trade in petroleum products on the Ukrainian market. The main reason for this phenomenon is delivery by car lots, the share of which reaches 50% in the total volume of sales. According to the estimates of market participants, the share of the small-wholesale segment is currently more than 3 million tons per year of diesel fuel and gasoline, while the overall market balance for both products is about 8 million tons in 2023. Moreover, the growth of small-wholesale sales of petroleum products increased by 25-30 % in 2023 in relation to 2022, and by 31% in 2021 in relation to the previous one.

Table 2.5 – Importers of fuels and lubricants and general characteristics of production capacities [5]

Company name	Country	City	Production, tonn/year	Characteristics
1	2	3	4	5
Petrobrazi Refinery	Romania	Ploiesti	4,5 mln.	A wide range of valuable petroleum products: from gasoline, diesel fuel, and liquefied petroleum gas to jet fuel and other petroleum products. The facility is connected by pipeline to oil fields in the Oltenia region and to the port of Constanta
Orlen Lietuva (Mazeikiai Nafta) subsidiary company PKN Orlen	Lithuania	Mazeikiai	12 mln.	Currently, crude oil is shipped from the Butinge Oil Terminal. Polish PKN owns the only oil refinery in the Baltics - the Mazeikiai Oil Refinery. The Orlen Lietuva group includes an oil complex consisting of the Mazeikiai Oil Refinery, the Butinge Terminal, and the Birzhai oil pipeline, as well as the Ventus Nafta company, the trading house Mazeikiai Nafta, Paslaugos tau, Emas, Naftel. Orlen Lietuva is 100% owned by the Polish company PKN Orlen.

Continuation of table 2.5

1	2	3	4	5
Polski Koncern Naftowy (PKN Orlen)	Poland	Plock	ORLEN2020 ≈36 Mln. ORLEN2030 ≈45 Mln.	A diversified energy concern operating in Central Europe and Canada. We provide energy and fuel to more than 100 million Europeans, and our advanced products are available in almost 90 countries on 6 continents.
Grupa Lotos S.A.	Poland	Gdansk	around 11 mln.	The share of diesel fuel in the production structure is 59%. The refinery activity of the Gdańsk refinery is carried out at six main production plants: a distillation plant, a fuel plant, a hydrocracking plant, an oil plant, hydrogen, and sulfur plant owned by Grupa LOTOS, and an EFRA plant owned by LOTOS. Asphalt. Storage and formulation of products is the subject of activity of Zakład Komponowania I Ekspedycji Product is carried out by Zakład Nalewu Cystem.
Aspropyrgos Refinery (Hellenic Petroleum)	Greece	Aspropyrgos	7,5 mln.	The refinery is of complex type and is one of the most modern in Europe. Processes crude oil mainly from Saudi Arabia, Iran, Libya. Manufactured products: Gasoline, Diesel, Jet fuel, Fuel oil
Thessaloniki Refinery (Hellenic Petroleum)	Greece	Thessaloniki	4,6 mln.	The Thessaloniki Refinery is a hydro degreasing (atmospheric distillation) refinery that works in conjunction with the Aspropyrgos and Elefsina refineries as a single entity. The pipeline network between the Thessaloniki refinery and the OKTA refinery facilitates the supply of crude oil to the latter.
Slovnaft	Slovakia	Bratislava	6 mln.	Slovnaft refines 5.5 to 6 million tonnes of crude oil per annum and produces a broad range of motor fuels, fuel oils and petrochemical products.
Moldova Chongqing Oil Refinery	Moldova	Chongqing	4 mln	An oil refinery is an industrial enterprise whose main function is the processing of oil into gasoline, aviation kerosene, fuel oil, diesel fuel, lubricating oils, lubricants, bitumen, petroleum coke, and raw materials for petrochemicals.

Source: developed by the author according to input data of the company

The largest points of sale of petroleum products in small wholesale are Kyiv, Korosten (Zhytomyr region), Novograd-Volynskyi (Zhytomyr region), Kharkiv, Lviv

and Odesa. This distribution was due to higher fuel consumption in these regions, as well as due to the peculiarities of the supply of petroleum products to the Ukrainian market. In particular, there is a terminal in Novohrad-Volynskyi, through which diesel fuel is delivered, and Korosten is a major railway junction where petroleum products produced by the Lithuanian Oil Refinery are delivered.

The main advantages of retail trade are relatively low costs, a higher sales margin and convenience for customers. When selling in large wholesale, quite a lot of costs fall on railway tanks, you also need to pay for cleaning, serving, cleaning, etc. However, in this case, small traders need to control a larger number of processes and categories of personnel - drivers of gasoline trucks, forwarders, employees of oil depots, etc., since the vast majority of customers buy fuel in small wholesale with delivery to the specified place.

Traders also note that in the small-wholesale segment, the margin level is higher than when selling fuel in large wholesale. Thus, the margin for the sale of petroleum products with delivery by motor vehicle varies between 0.10-0.40 UAH/l, while in large wholesale this indicator is 0.05-0.20 UAH/l, depending on the market situation.

Based on the structure of the supply chain of fuel and lubricants, the following barriers can be identified that complicate the management of business processes:

- the distance of movement from the producer to the consumer,
- the time required to accumulate stocks, taking into account the unevenness of production and consumption processes,
- unevenness of flows between participants of the supply chain (different sizes of batches and delivery terms);
- currency and financial barrier due to the need for mutual settlements in different currencies and prepayment, as a rule, at the expense of a loan;
- an information barrier associated with the lack of available and reliable information.

The company-trading intermediary "reconciles" the opposing interests of manufacturers of fuel and lubricants and consumer enterprises. The first tries to sell large batches of goods, using the possibilities of mass production. Fuel consumers are,

as a rule, small enterprises that buy fuel and lubricants in small batches to meet current needs. In this case, «CD-Trans» LLC actually synchronizes the production and consumption of goods. Wholesalers purchase fuel at their own expense, often by providing a prepayment or a product credit, and thereby finance the process of moving goods from the manufacturer to the retailer.

«CD-Trans» LLC as a wholesale agent provides the following services:

a) provide information and consulting services to customers who purchase fuel and lubricants, namely, assess the need, regroup goods, store stocks, deliver fuel to the place of consumption;

b) importers who supply goods in bulk, namely: facilitating the sale of fuel, storage of stocks, financing of the production process, reduction of credit risk, providing market information, etc.

Presented before allows to schematically present the main business processes of wholesale trade activity in accordance with its understanding as the activity of providing services to suppliers and buyers of commodity resources, which is presented in fig. 2.15.

The presented business processes and operations characterize the commercial activity of the enterprise, which includes wholesale purchase, conclusion of contracts and sale of diesel fuel, understanding them in a narrow sense as processes related to the change of ownership. The production business processes of the trading company «CD-Trans» LLC are related to the physical movement of fuel: it is transportation, storage, assembly, packaging, packaging, that is, related to the logistics activities of the enterprise.

Establishing relations with suppliers of diesel fuel, «CD-Trans» LLC complies with standard requirements and ensures the stability of purchases, ensures the removal of products from the supplier and their storage at its own facilities. For this, the company has its own specially equipped warehouses that meet international safety standards. These storages are tanks that are located on the territory of the oil depot - a specially equipped area that has security and meets strict safety and fire safety requirements (fig. 2.16).

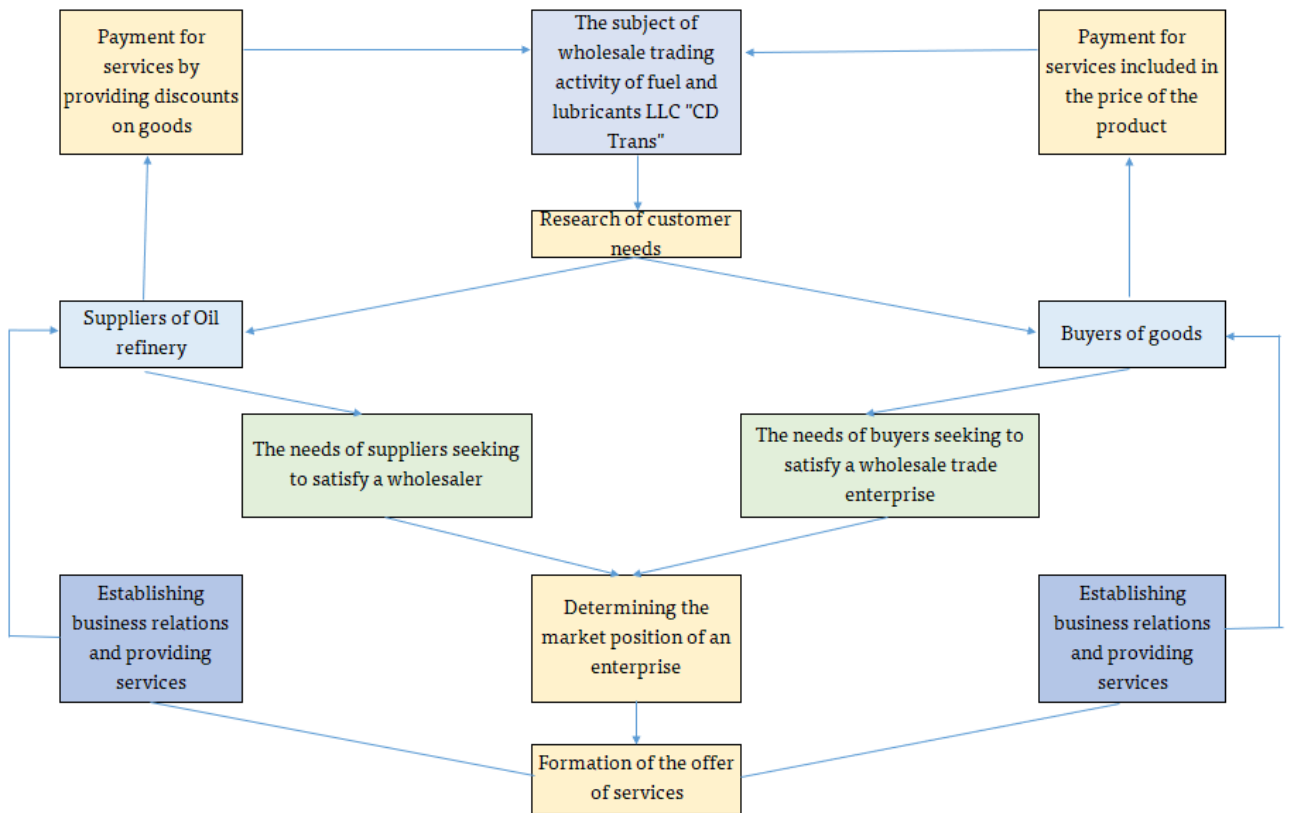


Figure 2.15 – The main business processes of the wholesale trade activity of «CD-Trans» LLC to ensure the supply of diesel fuel

Source: developed by the author according to input data of the company



Figure 2.16 – «CD-Trans» LLC oil base in western Ukraine (Lviv region)

Source: developed by the author according to input data of the company

In the table 2.6 contains information on the assortment and technical and economic characteristics of the available equipment of the oil depot. The total volume of the company's tank park is 4.3 thousand cubic meters, which allows creating reserves to meet the needs of consumers in the event of an increase in demand for gasoline or diesel fuel. It should be noted that the technical equipment of the oil depot fully meets the requirements for the safekeeping of cargo and the safety equipment of the company's employees.

Table 2.6 – Characteristics of the enterprise's tank park for storage of light petroleum products

№	Type	Quantity, items	Year put into operation	Volume of the 1st tank, cubic metres	Total, cubic metres
1.	PBC-400	8	2013	400	3200
2.	PBC-200	3	2013	200	600
3.	PFC-75	6	2013	75	450
4.	PFC-50	1	2013	50	50
5.	Total volume		-	-	4300

Source: developed by the author according to input data of the company

For the reception of petroleum products, there is a railway overpass on the territory of the oil depot with the possibility of simultaneous discharge of 6 (six) four-axle railway tanks or 3 (three) eight-axle tanks. The release of petroleum products is carried out by tanker trucks with the possibility of simultaneous delivery of 4 types of petroleum products. Reception and delivery of each group of petroleum products is organized separately.






As a wholesale agent seeking to respond to a variety of customer requests, «CD-Trans» LLC delivers products directly to the location specified by the customer. The type of transport for delivery is determined by the quantity of the product: for volumes of up to 40,000 liters, a car gasoline truck is most often used, the minimum shipment rate is 2,000 liters.

«CD-Trans» LLC is responsible for compliance with safety measures during road transportation. All fuel trucks are equipped with meters, pumps for pumping, dispensing guns. This allows you to save time and refuel the equipment at the place of delivery. The vehicle fleet of «CD-Trans» LLC is presented in the table 2.7.

Delivering light petroleum products to the place of their use by customers, «CD-Trans» LLC provides related services, in particular:

- freight forwarding,
- development of optimal transportation routes,
- detailed calculation of the cost of transportation,
- daily monitoring of fulfilment of consumer orders.

Table 2.7 – Characteristics of the vehicle fleet of «CD-Trans» LLC

№	Model	External appearance	Quantity
1	MAN TGS 26.400		8
2	Renault Premium 2011		6
3	Mercedes-Benz Actros 2017		7
4	DAF XF 105		7
5	DAF XF 2015		4
6	Total		32

Source: developed by the author according to input data of the company

The conducted analysis of the organization of business processes of storage and transportation of fuel and lubricant materials indicates the existence of many opportunities for their improvement. In particular, there are customer complaints of non-compliance with the terms of delivery of diesel fuel to the place specified by the buyer of the goods, which indicates the need for management measures regarding transportation dispatching. There are also complaints from consumers regarding the quality of diesel fuel. This requires additional measures to control product quality along the entire supply chain. Since diesel fuel manufacturers have quality certificates, quality deterioration may occur during delivery.

To identify the strengths and weaknesses of «CD-Trans» LLC, we will use the SWOT analysis method, which allows us to conduct a detailed study of the external and internal environment. The strengths of the enterprise are designed to ensure its accelerated progress towards the achievement of strategic goals, while its «weaknesses» cause inhibition. The results of the analysis are summarized in the table 2.8.

It should also be noted that «CD-Trans» LLC operates in a highly competitive environment, where there are a large number of market participants, strict rules and restrictions from government agencies, and a high level of shady schemes and devices.

In particular, more than 10 large companies and as many small traders, who most often rent tanks and fuel trucks from third-party companies, conduct small wholesale sales from various oil depots in Kyiv.

Based on the results of the analysis, the priorities in the distribution of available resources were determined in accordance with the external opportunities and threats of the company «CD-Trans» LLC, which is engaged in the wholesale trade of petroleum products. The main reasons that have a negative impact on the company's activity are identified and alternative solutions are proposed, aimed at their elimination and increasing the competitiveness of this company in the process of strategy formation.

Table 2.8 – Results of the SWOT analysis of the wholesale supply of fuel and lubricants at «CD-Trans» LLC

Strengths	Weak sides
<ul style="list-style-type: none"> - the company directly cooperates with fuel suppliers from manufacturers; - fuel is purchased in large batches at certified oil refineries; - flexible pricing policy and individual approach to each client; - the company has its own oil depot, which allows you to create fuel reserves to ensure the continuity of consumer demand, - available capacities allow fuel delivery to any point in Ukraine. 	<ul style="list-style-type: none"> - presence of customer complaints about non-compliance with delivery deadlines; - lack of technical capabilities to control the movements of gasoline trucks; - the impossibility of guaranteeing 100% of the volume when draining petroleum products (there are losses); - low level of staff motivation to attract new clients; - slow response to changes in market conditions and high dependence on price fluctuations.
Opportunities	Threats
<ul style="list-style-type: none"> - availability of regular customers; - experience in participating in tenders and the possibility of receiving discounts; - having experience of cooperation with car carriers and the possibility of attracting gasoline trucks of different capacities; - diversification of fuel supply sources and the search for reliable suppliers with the possibility of concluding direct contracts with manufacturers, - existence of a state program to stimulate domestic production. 	<ul style="list-style-type: none"> - high competition on the market of light oil products; - significant diminution of the market and opacity of pricing; - high excise duties and taxes; - change in demand in favour of more ecological products; - a limited fleet of tankers and guarantees of timeliness of delivery from the carrier; - growing political risks, which threatens the supply of fuel from the most profitable suppliers.

Source: developed by the author according to input data of the company

The SWOT analysis helped to understand what factors hinder the company's development, reduce its income and pose a threat in the future. And seeing the opportunities available in the market, «CD-Trans» LLC focused their strengths and advantages to expand their own position in the market. From our point of view, political factors create threats to the efficient operation of the enterprise in the market of light petroleum products. Constant shelling of oil storage plants on the territory of Ukraine. Opportunities for development are related both to the improvement of internal business processes of operational activity, and to macroeconomic factors that will stimulate the increase in diesel fuel production by Ukrainian oil refineries.

Chapter 2 summary

The analysis of the market of oil products in Ukraine shows the crisis state of the industry. Despite the sufficient capacities of oil refineries, with qualified personnel, the domestic production of diesel fuel is no more than 20% of the total need. The following factors led to this:

1. Constant shelling of oil storage plants on the territory of Ukraine.
2. Morally outdated technical base and long-worn fixed assets. After the privatization of oil refineries, although the relevant requirements were foreseen by the conditions of the competition, the reconstruction of fixed assets by investing in their development was not carried out. Plans to transfer Ukrainian oil refineries to the production of products according to European standards (Euro-4, Euro-5) have not been implemented.
3. Unfavourable price situation on the domestic market of petroleum products. Traditionally, as soon as the exchange rate of the hryvnia changes, fuel prices rise. The concentration of oil refineries in the same hands does not contribute to the healthy competition that should take place in the market. As a result, on the Ukrainian market there is a trend of increasing prices for fuel and lubricants and an increase in the volume of imports of light petroleum products

The analysis of the activities of «CD-Trans» LLC as a wholesale supplier of fuel and lubricants allows us to draw the following conclusions. Despite the fact that the company was established in 2012, it has a good competitive position in the market of light products not only in the Kyiv region, but also in Ukraine. The strengths of this company are the presence of direct contracts for the supply of fuel with its manufacturers and its sales representatives, which makes it possible to make purchases in large wholesale lots and sell it in small wholesale deliveries, to offer customers flexible prices and an individual approach.

Analysis of the performance of «CD-Trans» LLC on the fuel and lubricants market shows that the company has regular customers, due to which it increases sales volumes.

«CD-Trans» LLC is a profitable enterprise that receives income from the provision of services for the supply, storage and transportation of light petroleum products directly to the place of their consumption. For this purpose, the company has its own oil depot and tank trucks, which allows the delivery of fuel to various regions of Ukraine and its supply from Europe. The stability of the company's income ensures the presence of regular customers among industrial, agricultural, transport and other enterprises, as well as the military sector.

The analysis of financial indicators of the company's commercial activity shows its profitability and business profitability.

The SWOT analysis made it possible to identify the following weak points of activity of «CD-Trans» LLC:

- presence of customer complaints about non-compliance with delivery deadlines;
- lack of technical capabilities to control the movements of gasoline trucks;
- the impossibility of guaranteeing 100% of the volume when draining petroleum products (there are losses);
- low level of staff motivation to attract new clients;
- slow response to changes in market conditions and high dependence on price fluctuations.

At the same time, we note the presence of problems in the organization of the company's key business processes and the need to improve commercial activity and diesel fuel supply chains.

CHAPTER 3

DESIGN PROPOSALS FOR THE MANAGEMENT OF THE TRANSPORTATION OF FUEL AND LUBRICANTS OF «CD TRANS» LLC IN INTERNATIONAL TRAFFIC

3.1 Development of a conceptual model for managing the transportation of fuel and lubricants by «CD-Trans» LLC

The conceptual model of adaptive management of wholesale supplies of diesel fuel should be aimed at improving the interaction of manufacturers, wholesale suppliers, industrial and agricultural enterprises, which will help all participants of supply chains realize their strengths, reveal competitive advantages and respond to environmental threats with joint efforts. In this context, management should be focused on responding to market changes, ensuring the synergy of operational strategy and various adaptation tactics.

We will assume that adaptation is a model of behaviour of a wholesale trading company in the conditions of a changing environment in the diesel fuel market of Ukraine. Then the adaptive management of the company will express the way of implementing such a model of behaviour, when the company's management flexibly responds to changes and adapts to them to prevent crisis situations [24].

The specified interpretation determines the need for a diagnostic stage, when the management of the enterprise must determine problematic situations and factors influencing the solution of existing problems, which will precede the development of management solutions. In the table 3.1 provides an approximate list of factors affecting the business processes of diesel fuel supply.

The main goal of diagnostics is to identify factors that impair the adaptability of the supply chain of fuel and lubricants, i.e. to assess the ability of the counterparties of the trading company «CD-Trans» LLC to detect changes in the environment, the

configuration of supply chains and to restructure their activities in accordance with these changes.

Table 3.1 – Factors causing the emergence of problematic situations and the need for changes in fuel and lubricant supply chains

№	External factors			Internal factors		
	General economic factors	Market factors	Other factors	Operational factors	Investment factors	Financial factors
1.	Reduction of national income, decrease in business activity	Reducing the capacity of the domestic market, increasing imports	Political instability, economic crisis	Ineffective marketing, lack of marketing strategy	Inefficient investment portfolio, lack of technological initiatives	Inefficient structure of assets (low liquidity), predominance of liabilities
2.	Rising unemployment, shrinking population	Strengthening monopoly in the market, strict conditions for entering the market	Negative demographic trends, rapid aging of the population	Inefficient structure of current costs, excess of fixed costs	Inefficient investment management, low investment attractiveness	High share of debt capital, low financial autonomy of enterprises
3.	Decrease in the level of real incomes of the population, devaluation of the national currency	Significant decrease in demand, implementation of import substitution policy	Worsening of the criminogenic situation in connection with military operations	Low level of use of fixed assets, their slow renewal	Non-achievement of planned profit volumes for investment projects, duration of their payback	Inefficient financial strategy, lack of financial alternatives in the strategy
4.	Instability of regulatory legislation, change in the vector of development	An increase in the supply of substitute goods	Natural disasters, escalation of military conflicts	Low diversification of products and diversification of production processes	Significant overspending of investment resources	Inefficient financial management
5	The instability of the tax system, the growth of the shadow sector of the economy	Decrease in stock market activity, reduced presence	Stability of international relations	Ineffective production marketing	High duration of investment payback	High financial risks
6	Rising inflation, increasing exchange rate differences	Instability of the currency market	World technological trends, inventions, innovations	Morally outdated material base	The difficulty of attracting loan funds for development	High cost of capital
7	Slowdown of payment turnover, long-term circulation of funds	Solvency of the population, decrease in real incomes	Emergence of new technologies of production, its technical support	Lagging in innovative development, loss of efficiency and loss of clients	Lack of development	The growth of receivables, problems with working capital

Source: [24]

For example, importers of diesel fuel to Ukraine have been focused on Belarusian producers for a long time, but the current political situation requires a quick reorientation. An analysis of the situation with the supply of diesel fuel after February 2021 showed that most importers have switched to Russian producers that are under the influence of sanctions. It also increases the risks. At the same time, the country's government is developing measures to stimulate the domestic production of diesel fuel, but wholesale intermediaries are not interested in such changes, because they do not trust either the government or the quality of domestic factories' products. Therefore, the diagnostic stage is necessary for the correct assessment of the situation and the generation of possible scenarios for the development of the problematic situation (fig. 3.1).

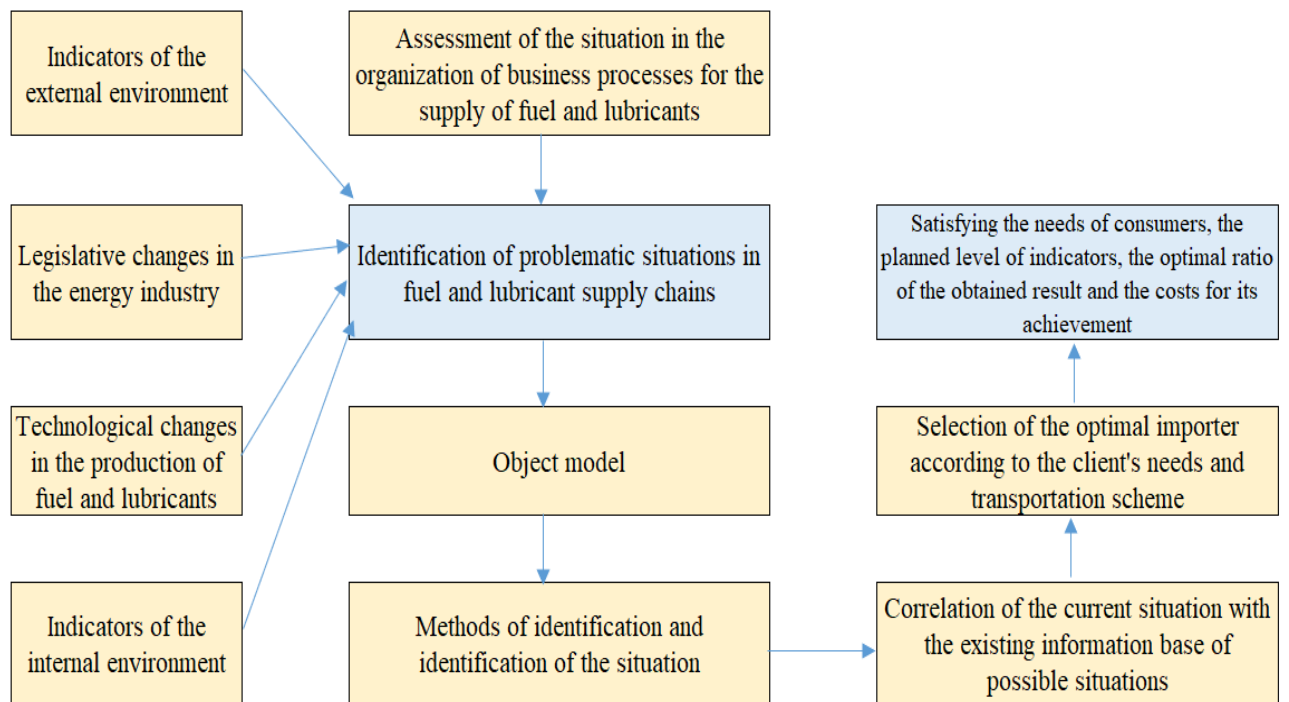


Figure 3.1 – Diagram of diagnosis of a problematic situation in the management of the supply of fuel and lubricants, which requires adaptation measures

Source: developed by author

Diagnostics of a problematic situation in the supply of diesel fuel is implemented in stages:

- first, it is necessary to build an object model of adaptive development of the company and the supply chain;
- then create a database of possible situations (scenarios) of adaptation to changes in the external and internal environments.

The result of assessing the problem situation will be the basis for building forecasts and making management decisions, i.e. for adaptive management.

Note that the main features of adaptive management are the development of a mechanism for managing uncertain characteristics of the external environment, and the criterion for the effectiveness of such a mechanism is the degree of satisfaction of consumer needs, the planned level of indicators or the optimal ratio of the obtained result and the costs for its achievement.

To achieve this goal, it is proposed to change the parameters, process, structure or characteristics of fuel and lubricant transportation routes. This approach will make it possible to take into account the needs of consumers and create added value for them through the flexible design of system parameters to make adaptive changes under the conditions of changing customer behaviour. Thus, the mechanism of adaptive management should include not only changes in internal processes, but also cooperation with counterparties throughout the diesel fuel supply chain from producers to end consumers.

The organization of international transportation of fuel and lubricants is a process that requires compliance with international conventions and agreements on transportation of high-quality service, compliance with customs formalities and procedures for transportation on the territory of foreign countries.

The efficiency of the transport process largely depends on the chosen technological solution for the transportation of goods. The development of the specified technological solution includes the selection of the type of transport and the search for the route of movement, which ensure the maximum efficiency of the transportation of goods from the place of their production to the place of consumption.

- When choosing transport, as a rule, the following factors are taken into account:
- reliability of compliance with the delivery schedule;

- delivery time;
- cost of transportation.

Then create a model for the development of a conceptual model for managing the transportation of fuel and lubricants by «CD-Trans» LLC on the example of the Lviv - Gdansk route. As mentioned in the analytical part of the work, the supplier Grupa Lotos S.A. is located in Gdansk. The organization of delivery along the indicated route can be carried out according to the following options:

- rail monomodal transportation – the cargo goes by rail from the point of departure (Gdansk) to the destination in Lviv, Ukraine;
- auto monomodal transportation – the cargo goes by road from the departure point (Gdansk) to the destination (Lviv).

To date, cargo transportation is carried out by gasoline tankers by road transport, so we will consider 2 routes of transportation of fuel and lubricant materials with the participation of road transport and railway transport. Let's schematically present it in fig. 3.2.

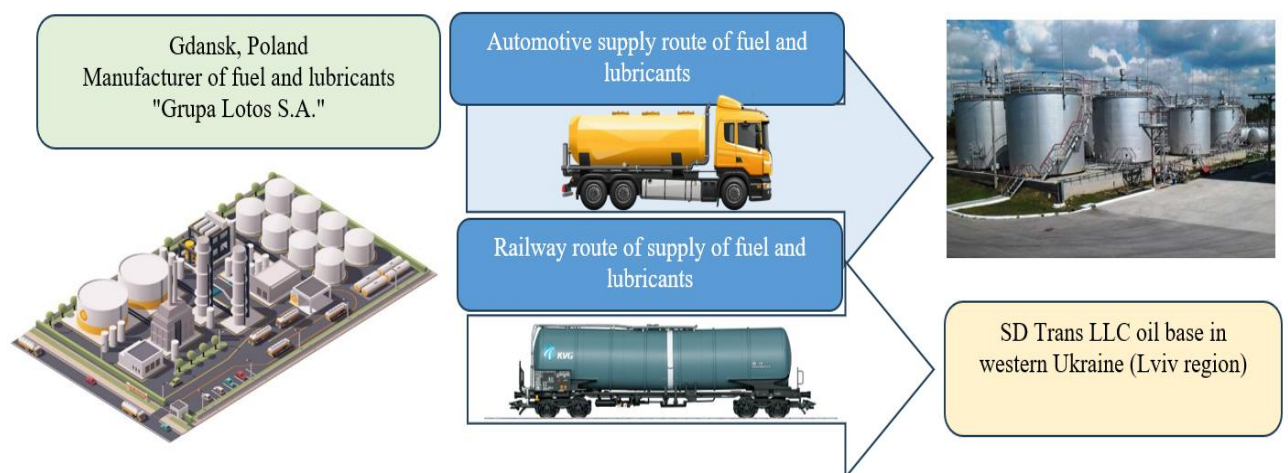


Figure 3.2 – Fuel and lubricant transport scheme of «CD-Trans» LLC on the route Gdansk - Lviv

Source: developed by author

The choice and development of the traffic route is connected, first of all, with the analysis of compliance with the technical requirements imposed on the carrier for

access to the transport infrastructure. At the same time, the selection of the route from the set of permissible options is carried out on the basis of technical and economic calculations.

When carrying out import transportation by railways, there is a need to tranship products from the rolling stock of one railway system to the wagons of another system (ensuring interoperability), in particular, when switching from a 1520 mm track to a 1435 mm track. At the same time, it is known that the performance of additional cargo operations has a negative effect on the preservation of the transported cargo, as well as increases the terms and cost of its delivery.

One of the ways to solve this problem is the use of ISO tanks for transportation - a standardized multi-turn container designed for the transportation of goods by road, rail, and transport and adapted for mechanized transshipment from one vehicle to another.

The platform for transporting large-tonnage containers and tank containers is shown in fig. 3.3.



Figure 3.3 – Platform for transportation of tanks by rail transport [39]

Source: [39]

Transportation by rail transport is carried out according to the established routes of the formation plan, while the transportation fee is calculated on the basis of the tariff distance - the distance between the departure station and the destination station, which is calculated according to the shortest route. The selected transportation route is shown in fig. 3.4. In particular, trains from Gdańsk will arrive at the Ukrainian station

Mostyska in the Lviv region. And from there the goods will go to Kyiv, Ternopil, Vinnytsia, Kharkiv, Dnipro and Odesa.

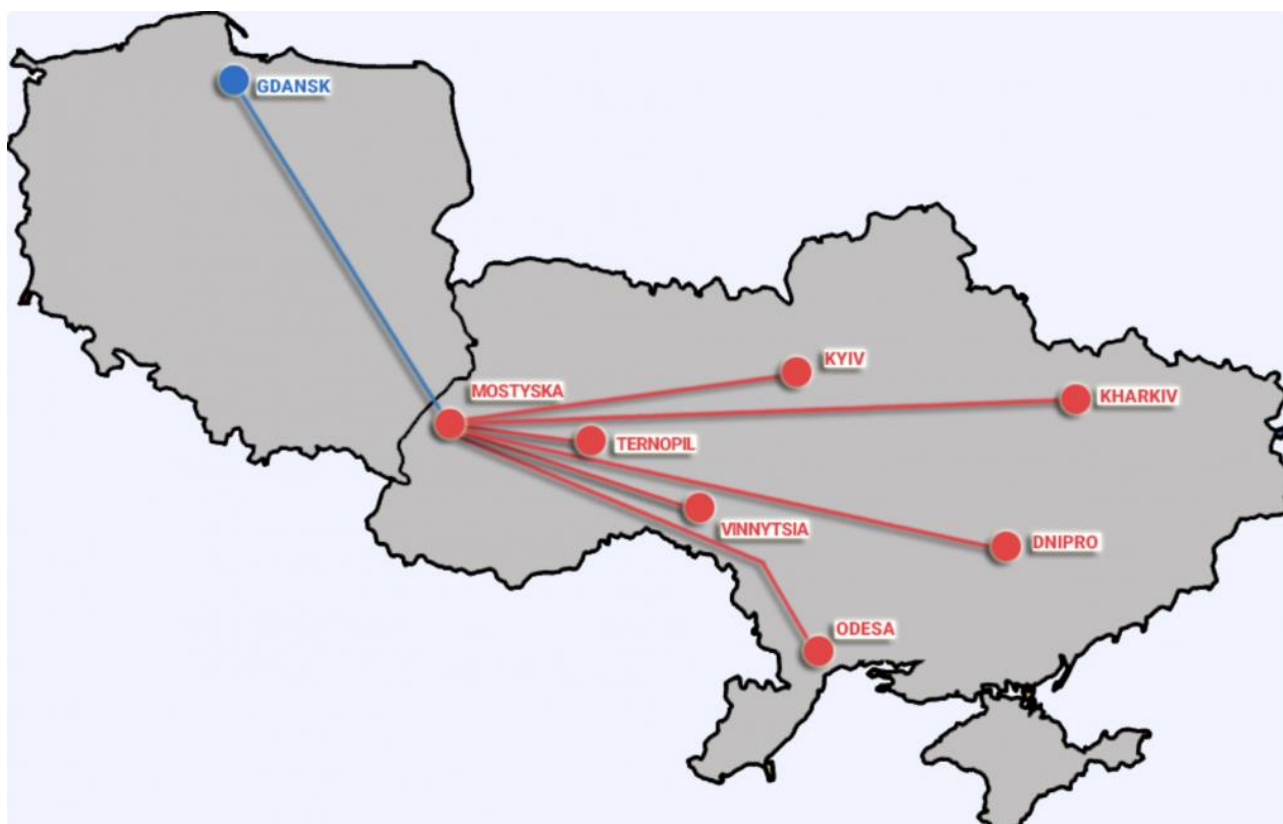


Figure 3.4 – Railway connection on the route Gdansk – Lviv

Source: [39]

This route will become part of the Baltic - Black Sea transport corridor, which should be operational in the first quarter of 2021. The corridor will connect Turkey, the Ukrainian port of Chornomorsk and Poland. In Ukraine, the main operator that performs combined transportation, including trailer transportation, is the "Lisky" transport service centre.

The route of transportation of fuel and lubricants by motor vehicle includes three stages: transportation from Gdańsk from the supplier Grupa Lotos S.A., transportation across Poland to the Ukraine-Poland border crossing ("Rava-Ruska" checkpoint or «Krokovec» checkpoint), and then transportation across the territory of Ukraine to Lviv

The road transportation route is shown in fig. 3.5, and its total length is 907 km.

Also, in the qualification work, consider the technology of delivering fuel and lubricants with the help of trailer transportation (fig. 3.6).

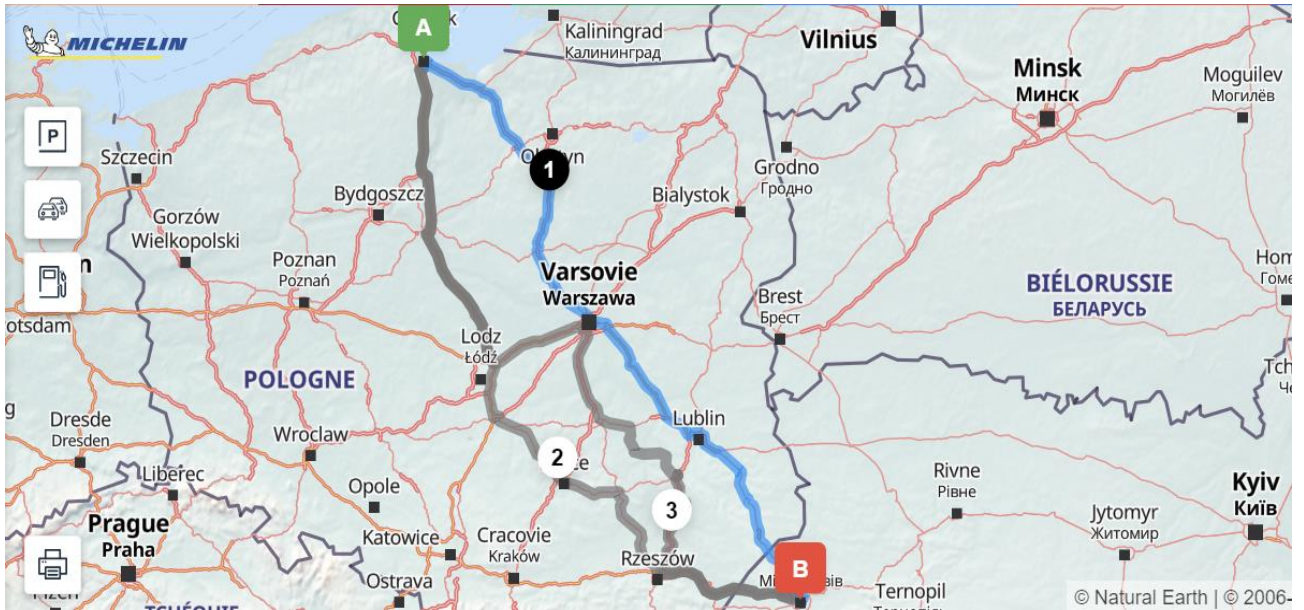


Figure 3.5 – Automobile route from the importer of fuel and lubricants in Gdansk to Lviv

Source: developed by author according to google.map

Counter-trailer transportation is one of the progressive logistics technologies. This is when loaded trucks or semi-trailers are transported to them on special platforms. In the European Union, the technology of cross-trailer transportation is most developed in France, Switzerland, Austria, Italy and Germany. Railways adapted for the transportation of cars (Rolling Highway) run, in particular, through the Alps.



Figure 3.6 – Contrarily transportation of fuel and lubricants

Source: [39]

Thus, in this chapter develop 3 technological schemes for the import of fuel and lubricants to Ukraine from Poland (the city of Gdansk): the first option provides for transportation only by rail, according to the second option, transportation is performed by road transport, and the third option provides for delivery by trailer transportation. The main parameters of the routes according to the developed technological solutions are given in the table 3.2.

Table 3.2 – The main parameters of the routes according to the developed technological solutions for the supply of fuel and lubricants along the Gdansk - Lviv route

Transportation option	Distance, km			In total	Border crossings Poland - Ukraine
	highways		Railways		
	Ukraine	EU	Ukraine / EU		
Railway	10	10	867	887	Mostyska 2– Medyka
Automobile	72	835	–	907	Krakowiec - Korczowa
Con trailer shipments	10	75	835	920	Krakowiec - Korczowa

Source: developed by author

The efficiency assessment and selection of the optimal solution for the international transportation of fuels and lubricants from Gdansk by Grupa Lotos S.A. to Ukraine will be based on technical and economic calculations.

3.2 Evaluation of the efficiency of technological schemes for the transportation of fuels and lubricants in international traffic

The efficiency of the developed technological solutions for the import of fuels and lubricants by «CD Trans» LLC is assessed on the basis of technical and economic calculations. This takes into account the following costs: cargo transportation, loading, unloading and transshipment operations, cargo security escorts, etc.

1. Calculation of the cost of delivery by rail transport.

In order to evaluate the efficiency of cargo transportation by rail, we will determine the costs for the delivery of a tank along the route Gdansk - Lviv. Let's assume that the transportation is carried out by own tanks on the platform of the transport logistics center by wagon, route shipment, and also as part of a container train. The costs of the cargo owner for the transportation of the tanker by railway can be determined by the formula 3.1:

$$C_{rail.tr.}^{tanker} = C_{load} + C_{del}^{imp} + C_{del}^{recip} + C_{rail} + C_{add}, \quad (3.1)$$

where C_{load} – cost of loading the tanker at the point of departure, UAH;

C_{del}^{imp} – costs of tanker delivery to the importer's point, UAH;

C_{del}^{recip} – costs of tanker delivery to the recipient, UAH;

C_{del} – cost for the delivery of the tanker to the recipient, UAH.

C_{rail} - cost for transportation by railway, UAH;

C_{add} - additional costs, UAH.

Since the cargo is loaded into the shipper's own tank on its own warehouse territory, in order to organize its transportation, it is necessary to deliver the tank to the terminal of the cargo station Lviv (Sknyliv-Lisky). The indicated delivery is carried out by road transport consisting of a semi-trailer tractor and a tanker semi-trailer, and the cost of this service is $C_{del}^{recip} = 7600$ UAH, $C_{del}^{imp} = 9350$ UAH.

In turn, the costs of loading a tank onto a road train on the territory of the consignor are carried out with the involvement of rented specialized equipment, and the cost of loading is $C_{load} = 2500$ UAH.

Rail transport costs can be defined according to formula 3.2:

$$C_{rail} = P_{rail} + P_{add}, \quad (3.2)$$

where P_{rail} - the railway tariff, UAH,

P_{add} - additional fees and payments, UAH.

Formula 3.3 can define the railway tariff:

$$P_{rail} = P_{rail(load)} \cdot k_{rail(load)} + F_{load} + P_{rail(empty)} \cdot k_{rail(empty)} + F_{w.platform}, \quad (3.3)$$

where $P_{rail(load)}$, $P_{rail(empty)}$ – accordingly, the tariff rate for the transportation of rented loaded and empty tankers for the tariff distance (infrastructural component), UAH;

$k_{rail(load)}$, $k_{rail(empty)}$ – adjusting coefficient to the tariff;

$F_{w.platform}$ – fee for renting a wagon platform for the transportation of a tanker.

The fee for the transportation of bulk cargoes (Clause 2 of Section 5 of the Collection of Freight Tariffs by the Railways of Ukraine) in tanks is determined by the estimated weight of the cargo in the wagon for:

- oil and oil products - according to tariff scheme 4;
- liquefied gases, hydrocarbons - according to tariff scheme 5.

In the qualifying work, the tariff distance of railway transportation $L_{rail} = 867$ km was determined, then for this distance the tariff rates are equal to $P_{rail(load)} = 4385$ hryvnias. and $P_{rail(empty)} = \text{UAH } 3554$; specifying coefficients for own loaded and empty tankers are $k_{rail(load)} = k_{rail(empty)} = 1.813$.

The empty mileage of the fitting platform is determined by the formula 3.4:

$$L_{rail(empty)} = k_{empty} \cdot L_{rail}, \quad (3.4)$$

where k_{empty} – empty mileage ratio. According to the tariffs for fitting platforms, $k_{empty} = 0.21$.

So, $L_{rail(empty)} = 0,21 \cdot 887 = 186,27$ km.

The infrastructural component for empty fitting platforms owned by the transport logistics center is determined according to scheme 14.1 and the tariff distance

of an empty flight (186.27 km) and is $P_{rail(empty)} = 214.1$ UAH, and the clarifying coefficient for empty platforms $k_{rail(empty)} = 1.885$.

In addition, the coefficient T_{add} was introduced, which is 1 day and is added to the estimated delivery time of both the loaded wagon platform T_{load} and the return time of the empty wagon T_{empty} for all traffic in the connection.

The total time of delivery of cargo by rail is determined by the formula 3.6:

$$T_{del} = (T_{load} + T_{add}) + (T_{empty} + T_{add}), \quad (3.6)$$

Accordingly, with formula 3.7 can be calculated the delivery time of a loaded or empty wagon:

$$T_{load(empty)} = \frac{L_{rail(load,empty)}}{V_{del}}, \quad (3.7)$$

where V_{del} – delivery speed of the tanker transportation, km/day.

The delivery speed is calculated as follows: when transporting a tank by wagon shipment, the delivery speed is 200 km/day and when transporting as part of a container train, it is 700 km/day. Thus, the delivery time for a loaded platform is:

- dispatch of the wagon platform: $T_{load} = 867/200 = 4.34$ days, accept 5 days;
- contrailer shipment: $T_{load} = 867/700 = 1.23$ days, accept 2 days;

Additional payments and fees will include:

- weighing of a road train with a tank when entering the territory of the station terminal of the city of Lviv: Sknyliv-Lisky - 380 UAH;
- overloading of the tank from the road train to the fitting platform with a crane - UAH 800;
- locking and sealing device –250 UAH.

Thus, the additional costs of transporting a tank by rail transport are equal to:

$$C_{add} = 380 + 800 + 250 = 1430 \text{ UAH.}$$

The calculation of the total costs for the delivery of a tank by rail on the Gdansk - Lviv route with various options for organizing the shipment is given in the table 3.3.

Thus, several factors, such as distance, type of cargo, tariffs and other costs related to transportation, were taken into account to calculate the costs of delivering a tank by rail on the Gdansk - Lviv route. The main steps for calculating the cost of shipping a tank by rail were the distance of transportation, the calculation of the delivery time and the cost of delivery. On the basis of the received tariffs and requirements, the costs of tank transportation were calculated in 2 options: wagon delivery and contrailer shipment. The obtained results showed the expediency of fuel and lubricant delivery by container train, the delivery cost of which is 850 USD.

Table 3.3 – Calculation of costs for the delivery of a tank by rail along the route Gdansk – Lviv

Index/ scheme	Unit of measure	Railway transportation	Con trailer shipment
Delivery speed of the wagon platform,	km/day	200	700
Costs for loading the tank at the point of departure	UAH	2500	2500
Costs for the delivery of the tank to the importer	UAH	7600	7600
Costs for the delivery of the tank to the destination	UAH	9350	9350
The term of delivery as a loaded wagon platform	days	5	2
The term of delivery of loaded and empty wagon platform	days	6	3
The tariff rate for the transportation of a loaded wagon platform for the tariff distance	UAH	7950,01	7950,01
Payment for the lease of a railway platform in a loaded state	UAH	4888,8	2444,4
The deadline for returning an empty wagon platform	days	2	1
The deadline for returning an empty wagon platform and additional downtime	days	3	2
The tariff rate for the transportation of an empty wagon platform for the tariff distance	UAH	403,6	403,6
Payment for the lease of the railway platform in an empty state	UAH	2444,4	1629,6
Additional costs when transporting the tank	UAH	1430	1430
Total costs	UAH	36566,78	33307,58
Total costs	USD	932,83	849,68

Source: developed by author

Then, calculate the cost of delivery of fuel and lubricants by tank trucks of «CD Trans» LLC. The total cost of road delivery can be determined by the formula 3.8:

$$C_{road.tr.}^{tanker} = C_{road}^U + C_{road}^{EU} + C_{load} + C_{unload} + C_{add}, \quad (3.8)$$

where $C_{road}^U, C_{road}^{EU}$, – accordingly, costs for the transportation of fuel and lubricants by motor vehicle on the territory of Ukraine and the European Union;

C_{load}, C_{unload} – the cost of loading and unloading at the point of departure and destination;

C_{add} – costs for additional operations (customs, costs for additional services in the EU, etc.).

With formula 3.9 calculate the costs for the transportation of cargo by motor vehicle on the territory of Ukraine and the European Union:

$$C_{road}^{U(EU)} = L_{del} \cdot c_{del} \quad (3.9)$$

where L_{del} – transportation distance, km;

c_{del} – cost per 1 km, UAH (USD).

It should be noted that the cost of delivery by road transport depends on a significant number of random factors. Thus, the type of cargo, the route of transportation (domestic, international), and the type of rolling stock significantly affect the cost of road transportation. In addition, the cost of road transportation is also affected by fluctuations in the cost of fuel, the condition of the roads along the transportation route, the season of transportation, weather conditions, etc.

It should be noted that when organizing transportation in international communication, a single tariff is established for 1 km of transportation both on the territory of the sender's country and on the territory of other (third) countries.

According to the dynamics of the cost of delivery per 1 km on the route Lviv - Gdansk - Lviv, we will present calculations for sections of the route Gdansk - Lviv:

$72 \text{ km} * 28 \text{ hryvnias/km (in Ukraine)} + 835 \text{ km} * 53 \text{ UAH/km *(in an EU country)} = 46271 \text{ UAH (1180 USD)}$.

The cost of loading (unloading) products can be set at the level of $C_{load} = 2500 \text{ UAH}$.

Additional costs when carrying out international road transport may include payment for traffic on toll highways on the territory of the EU, costs for issuing permits and customs documents. Let's take C_{add} equal to 5,880 UAH (150 USD). Thus, the total cost of delivering one shipment of cargo by road transport LLC «CD Trans» on the route Gdańsk - Lviv is:

$$C_{road.tr.}^{tanker} = 2016 + 44255 + 2500 + 2500 + 5880 \text{ UAH} = 57151 \text{ UAH (1458 USD)}$$

According to the results of the calculations, we will perform a comparison of the total costs for the delivery of the annual volume of cargo according to the developed technological schemes of transportation along the route Gdansk - Lviv, which we will present in the table 3.4 and graphically in fig. 3.7.

Table 3.4 – Costs by variants of transportation of fuel and lubricants of LLC «SD Trans» on the route Gdansk – Lviv

Type of transportation	Transportation distance, km	Type of rolling stock	Delivery time	Transportation costs, UAH	Transportation costs, USD
Railway transport	887	fitting platform + tanker	6	36566,78	932,83
Automobile transport	907	Tank trucker	3 days + possible long delays of up to 2 weeks at customs	57151,00	1457,934
Trailer transportation	920	fitting platform + tanker	3	33307,58	849,68

Source: developed by author

The calculations obtained in this way showed the effectiveness of the use of trailer transportation along the route Gdansk - Lviv for the transportation of fuel and

lubricants. The total cost for this route is 849.68 USD. Therefore, trailer transportation is an effective way of delivering fuel and lubricants, as it combines the advantages of road and rail transportation. This type of delivery allows you to save time and reduce the cost of transportation, and also ensures the safety and reliability of transportation.

The main advantages of rail transport for the delivery of fuel and lubricants are efficiency, as rail transport allows more logistics units to be used in time, which ensures optimal use of resources and cost reduction. Also, cross-trailer transportation provides reliable fixation and protection of fuel and lubricant materials on platforms, which reduces the risk of leakage or damage to the cargo.

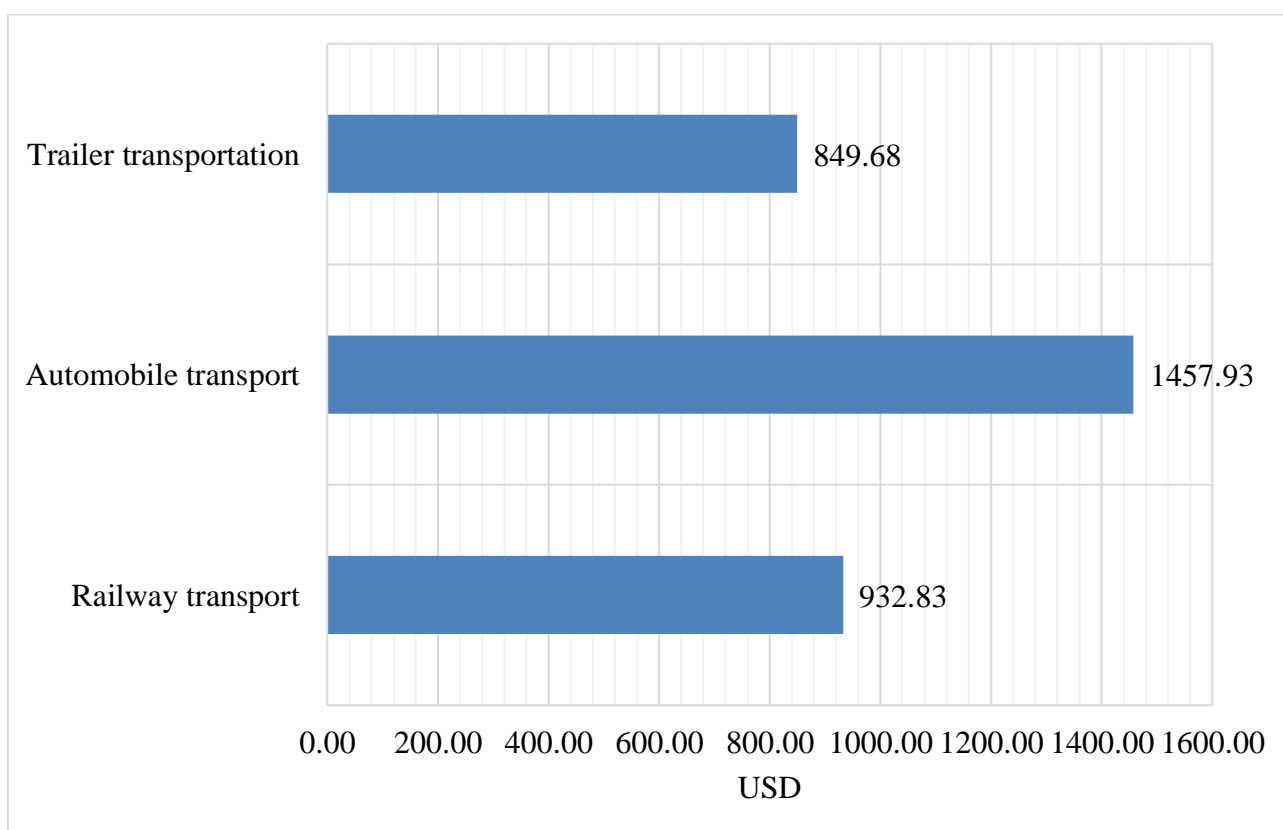


Figure 3.6 – Costs of one-time delivery according to options for transporting fuel and lubricants of LLC «CD Trans» on the route Gdansk - Lviv

Source: developed by author

Cross-trailer transportation allows you to choose the optimal route that takes into account the specifics of the delivery of fuel and lubricants and ensures fast and uninterrupted delivery.

Today, environmental friendliness is also a very important element. Trailer transport contributes to the reduction of emissions of harmful substances into the air, as it replaces road transport with rail transport, which is more environmentally friendly.

The performed calculations and the presented recommendations show the feasibility of the design of the proposals, which allow the LLC «CD Trans» company to reduce the cost of transportation due to the choice of contrarail cargo delivery schemes and to more effectively manage the supply chains of fuel and lubricants in international traffic. In fig. 3.7 present the chain of supply of fuel and lubricants in the international connection of LLC «CD Trans», taking into account the proposed recommendations and presented calculations.

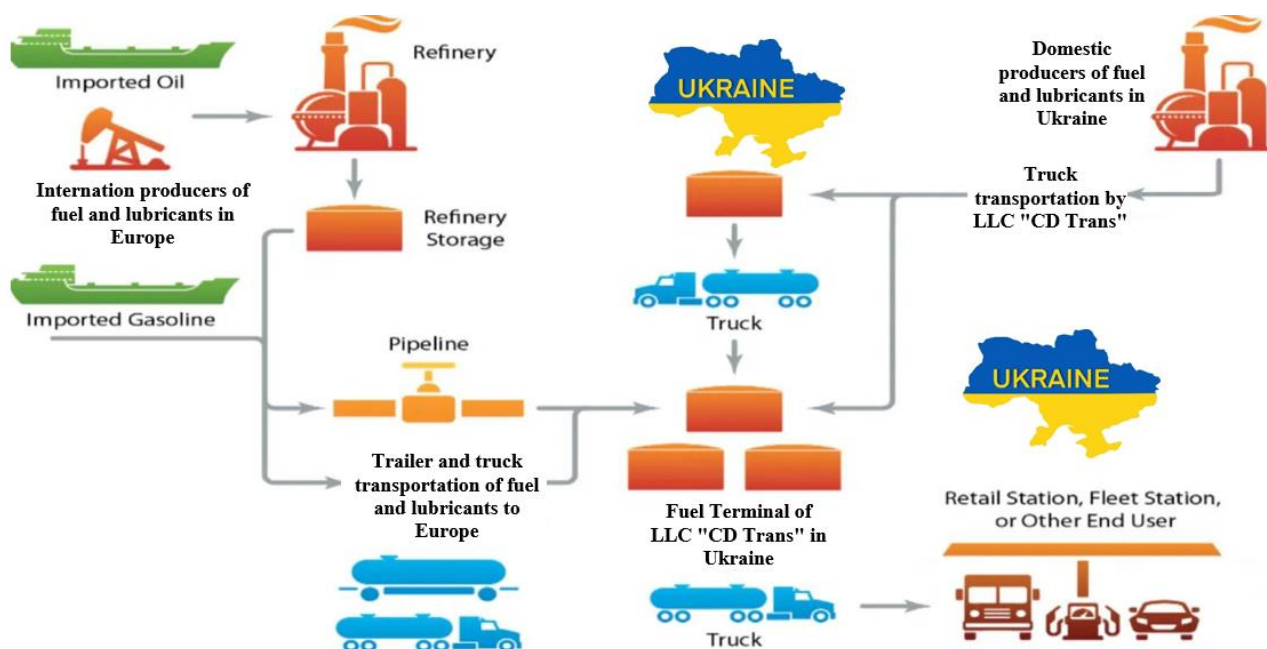


Figure 3.7 – The supply chain of fuel and lubricants in the international connection of LLC «CD Trans», taking into account the proposed recommendations

Source: developed by author

Presented in fig. 3.7 supply chain of fuel and lubricants in the international connection of LLC «CD Trans» is an important element of ensuring an effective company. This chain includes several stages that ensure the supply of fuel and lubricants to the final consumer in Ukraine.

The main stages of the supply chain of fuel and lubricants in the international connection of LLC «CD Trans» are search for a manufacturer-importer of fuel and lubricants in Europe, then transportation. After choosing an importer, fuel and lubricants are transported to Ukraine by a contra-rail delivery option or by road. This stage includes logistics, security and compliance with international transportation standards. Then there is the storage stage. After transportation, fuel and lubricants are stored at the terminals of LLC «CD Trans». This allows you to ensure the constant availability of fuel and lubricant for further use. And the last stage is distribution. At this stage, fuel and lubricants are delivered to various points of sale, such as gas stations, car repair shops or industrial plants. This process includes optimization of delivery routes, quality control and on-time delivery.

Thus, fuel and lubricant materials are transported by LLC «CD Trans» over long distances, which creates challenges in the field of logistics and transportation. It is necessary to ensure the safety and quality of fuel and lubricants during transportation, as well as timely delivery to the destination. The proposed scheme will allow the import of fuel and lubricants within 3 days at the expense of contrail transportation.

Chapter 3 summary

The project and recommendation chapter of the qualification work is devoted to the proposal for managing the transportation of fuel and lubricants by LLC «CD Trans» in international traffic.

The project part provides recommendations for the development of a conceptual model of adaptive management of wholesale diesel fuel supplies. It was stated that it should be aimed at improving the interaction of manufacturers, wholesale suppliers, industrial and agricultural enterprises, which will help all participants of supply chains realize their strengths, reveal competitive advantages and respond to environmental threats with joint efforts. In this context, management should be focused on responding

to market changes, ensuring the synergy of the operational strategy and various adaptation tactics.

The efficiency of the transport process largely depends on the chosen technological solution for the transportation of goods. The development of the specified technological solution includes the selection of the type of transport and the search for the route of movement, which ensure the maximum efficiency of the transportation of goods from the place of their production to the place of consumption. To date, cargo transportation is carried out by gasoline tankers by road transport, therefore it was proposed to consider 3 technological schemes for the import of fuel and lubricants to Ukraine from Poland (the city of Gdansk): the first option provides for transportation only by rail, according to the second option, transportation is performed by road transport, and the third option provides for delivery by trailer transportation. along the route Gdansk - Lviv.

Evaluation of the efficiency and selection of the optimal solution for the transportation of fuel and lubricants in the international connection to Gdańsk from the supplier Grupa Lotos S.A. to Ukraine carried out on the basis of technical and economic calculations.

The obtained calculations showed the effectiveness of the use of trailer transportation along the route Gdansk - Lviv for the transportation of fuel and lubricants. The total costs for this route is 850 USD, which is on 84 USD less than rail transportation and on 609 USD less than road transportation. Therefore, trailer transportation is an effective way of delivering fuel and lubricants, as it combines the advantages of road and rail transportation. This type of delivery allows you to save time and reduce the cost of transportation, and also ensures the safety and reliability of transportation.

The performed calculations and the presented recommendations show the feasibility of the design of the proposals, which will allow the LLC «CD Trans» company to reduce the cost of transportation due to the choice of contrarail cargo delivery schemes and to more effectively manage the supply chains of fuel and lubricants in international traffic.

The proposed scheme will allow the import of fuel and lubricants within 3 days at the expense of contrail transportation.

The calculations carried out and the recommendations presented show the feasibility of the design of the proposals, which will allow LLC «CD Trans» to reduce the cost of transportation due to the choice of contra-railway cargo delivery schemes and to more effectively manage the supply chains of fuel and lubricants in international traffic.

CONCLUSIONS AND RECOMMENDATIONS

The qualification paper is devoted to the management of international supplies of fuel and lubricants on the example of SD Trans LLC.

In the theoretical part of the qualification paper, the basics of transportation management of fuel and lubricants in international traffic were considered, which made it possible to draw the following conclusions.

The conducted analysis showed that the economy of Ukraine is in a state of crisis due to the war. The transport industry was significantly affected by military operations, which in turn led to a decrease in the ability to transport goods by all available modes of transport. The study of the market of road freight transportation and the search for opportunities for its further development in the post-war period requires special attention and a thorough approach to the study of this issue.

Today, during the war, the importance of road transport has increased, as it makes it possible to carry out both import and export operations. «Agreement on the liberalization of freight transportation», or the so-called «transport visa-free», is one of the key results of the support of the state from the EU in the field of transport and provision of export logistics, which means the economy. Thanks to the Agreement, the export of goods by trucks in the direction of the EU countries in 2023 increased by 30% this year, if compared with 2021, when the permit system of transportation was in effect. In addition, the Agreement is the main element of the «Solidarity Paths» to support grain exports in the absence of stable alternative routes and maritime blockade.

In the paper, a scheme of result-target relations of the process of organization of international road transportation is built. According to the scheme, when designing the route, the main component of the delivery time is the transportation time, which is affected by the transportation distance, although a shorter transportation route requires less costs and reduces the delivery time, but there is a possibility that the poor condition of the highways will reduce the delivery speed, the insufficient number of gas stations on the route will increase the delivery time due to the need to deviate from the route in

search of gas stations, long queues at checkpoints will lead to unproductive downtime that can increase the time and costs of cargo delivery in international traffic.

The research also describes in detail the management of fuel and lubricant supply chains, which is a complex process that requires attention to detail, coordination between various participants and the use of modern technologies. Effective management helps to ensure proper quality and proper supply of fuel and lubricants, reduce costs and increase customer satisfaction.

The analysis of the market of oil products in Ukraine shows the crisis state of the industry. Despite the sufficient capacities of oil refineries, with qualified personnel, the domestic production of diesel fuel is no more than 20% of the total need. The following factors led to this:

1. Constant shelling of oil storage plants on the territory of Ukraine.
2. Morally outdated technical base and long-worn fixed assets. After the privatization of oil refineries, although the relevant requirements were foreseen by the conditions of the competition, the reconstruction of fixed assets by investing in their development was not carried out. Plans to transfer Ukrainian oil refineries to the production of products according to European standards (Euro-4, Euro-5) have not been implemented.
3. Unfavourable price situation on the domestic market of petroleum products. Traditionally, as soon as the exchange rate of the hryvnia changes, fuel prices rise. The concentration of oil refineries in the same hands does not contribute to the healthy competition that should take place in the market. As a result, on the Ukrainian market there is a trend of increasing prices for fuel and lubricants and an increase in the volume of imports of light petroleum products.

The analysis of the activities of «CD-Trans» LLC as a wholesale supplier of fuel and lubricants allows us to draw the following conclusions. Despite the fact that the company was established in 2012, it has a good competitive position in the market of light products not only in the Kyiv region, but also in Ukraine. The strengths of this company are the presence of direct contracts for the supply of fuel with its manufacturers and its sales representatives, which makes it possible to make purchases

in large wholesale lots and sell it in small wholesale deliveries, to offer customers flexible prices and an individual approach.

Analysis of the performance of «CD-Trans» LLC on the fuel and lubricants market shows that the company has regular customers, due to which it increases sales volumes.

«CD-Trans» LLC is a profitable enterprise that receives income from the provision of services for the supply, storage and transportation of light petroleum products directly to the place of their consumption. For this purpose, the company has its own oil depot and tank trucks, which allows the delivery of fuel to various regions of Ukraine and its supply from Europe. The stability of the company's income ensures the presence of regular customers among industrial, agricultural, transport and other enterprises, as well as the military sector.

The analysis of financial indicators of the company's commercial activity shows its profitability and business profitability.

The SWOT analysis made it possible to identify the following weak points of activity of «CD-Trans» LLC:

- presence of customer complaints about non-compliance with delivery deadlines;
- lack of technical capabilities to control the movements of gasoline trucks;
- the impossibility of guaranteeing 100% of the volume when draining petroleum products (there are losses);
- low level of staff motivation to attract new clients, - slow response to changes in market conditions and high dependence on price fluctuations.

At the same time, we note the presence of problems in the organization of the company's key business processes and the need to improve commercial activity and diesel fuel supply chains.

The project part provides recommendations for the development of a conceptual model of adaptive management of wholesale diesel fuel supplies. It was stated that it should be aimed at improving the interaction of manufacturers, wholesale suppliers, industrial and agricultural enterprises, which will help all participants of supply chains

realize their strengths, reveal competitive advantages and respond to environmental threats with joint efforts. In this context, management should be focused on responding to market changes, ensuring the synergy of the operational strategy and various adaptation tactics.

The efficiency of the transport process largely depends on the chosen technological solution for the transportation of goods. The development of the specified technological solution includes the selection of the type of transport and the search for the route of movement, which ensure the maximum efficiency of the transportation of goods from the place of their production to the place of consumption. To date, cargo transportation is carried out by gasoline tankers by road transport, therefore it was proposed to consider 3 technological schemes for the import of fuel and lubricants to Ukraine from Poland (the city of Gdansk): the first option provides for transportation only by rail, according to the second option, transportation is performed by road transport, and the third option provides for delivery by trailer transportation. along the route Gdansk - Lviv.

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delivery schemes and to more effectively manage the supply chains of fuel and lubricants in international traffic.

The proposed scheme will allow the import of fuel and lubricants within 3 days at the expense of contrail transportation.

The calculations carried out and the recommendations presented show the feasibility of the design of the proposals, which will allow LLC «CD Trans» to reduce the cost of transportation due to the choice of contra-railway cargo delivery schemes and to more effectively manage the supply chains of fuel and lubricants in international traffic

REFERENCES

1. Про перевезення небезпечних вантажів: Закон України із змінами і доповненнями, внесеними Законами України від 18 листопада 2021 року N 1909-IX. База даних «Законодавство України» / ВР України. URL: <https://zakon.rada.gov.ua/laws/show/1644-14#Text> (дата звернення 08.05.2024).

2. Про затвердження Інструкції про порядок приймання, транспортування, зберігання, відпуску та обліку нафти і нафтопродуктів на підприємствах і організаціях України: Наказ від 20.05.2008 N281/171/578/155. База даних «Законодавство України» / ВР України. URL: <https://zakon.rada.gov.ua/laws/show/z0805-08#Text> (дата звернення 08.05.2024).

3. Про затвердження Технічного регламенту щодо вимог до автомобільних бензинів, дизельного, суднових та котельних палив: Постанова Кабінету Міністрів України від 1 серпня 2013 р. № 927. База даних «Законодавство України» / КМУ України. URL: <https://zakon.rada.gov.ua/laws/show/927-2013-%D0%BF#Text> (дата звернення 06.05.2024).

4. Про схвалення Національної транспортної стратегії України на період до 2030 року. Документ 430-2018-р. Редакція від 07.04.2021. URL: <https://zakon.rada.gov.ua/laws/show/430-2018-%D1%80#Text> (дата звернення: 06.05.2023).

5. Болквядзе Л.І., Мигаль О.Ф. Вантажні перевезення автомобільним транспортом в міжнародному бізнесі. *Економіка та суспільство*. 2022. №46. DOI: <https://doi.org/10.32782/2524-0072/2022-46-20>

6. Величко, Ю. Ю. Організація і методика обліку і оподаткування діяльності транспорно-експедиторських компаній: зб. тез доп. VII Всеукр. наук.-практ. заоч. конф., 17 квітня 2020 р. м. Черкаси: Вид. ЧНУ ім. Богдана Хмельницького, 2020. С. 93-96.

7. Волинець Л. Лібералізація міжнародних автомобільних перевезень – новий імпульс розвитку транспортної галузі. *Економіка транспортного*

комплексу. 2021. Вип. 37. С. 161–176.

8. Державна служба статистики України. Офіційний сайт. Перевезення вантажів автомобільним транспортом за видами вантажів. URL: <https://ukrstat.gov.ua/> (дата звернення: 06.05.2023).

9. Дуна Н., Матвієнко А. Перспективи розвитку українського ринку автомобільних вантажоперевезень: євроінтеграційний аспект. *Науковий вісник Ужгородського національного університету*. 2022. Випуск 44. С. 21–29.

10. Зелена Книга. Міжнародні вантажні автомобільні перевезення. URL: <https://regulation.gov.ua/book/156-zelena-kniga-rinok-miznarodnih-vantaznih-avtomobilnih-perevezen> (дата звернення: 10.05.2024).

11. Інформаційно-аналітична група: новини, аналітика, дослідження. URL: <https://autoconsulting.ua/article.php?sid=55752> (дата звернення 07.05.2024).

12. Клименко В.В., Новальська Н.І. Людський фактор у забезпеченні ефективності технологічного процесу транспортування вантажів. *Features of innovative development in the field technology*. Baltija Publishing. - Wrocław, the Republik of Polska, 2022. С.74-77.

13. Коба О. Організація обліку паливно-мастильних матеріалів на підприємстві. *Молодий вчений*. 12 (88)., 127-131. URL: <https://molodyivchenyi.ua/index.php/journal/article/view/33> (дата звернення 06.05.2024).

14. Козяр Н., Кириченко О.В., Ковбаса В., Дядюшенко О., Ващенко В.А., & Колінько, С.О. Визначення критичних значень параметрів зовнішніх термічних впливів на піротехнічні вироби на основі нітратно-металевих сумішей в умовах їх зберігання та транспортування. *Науковий вісник: Цивільний захист та пожежна безпека*, (2 (16)), 42-57. URL: <https://fire-journal.ck.ua/index.php/fire/article/view/157> (дата звернення 06.05.2024).

15. Кунда Н.Т., Соломка А.О. Особливості підготовки та організації змішаних перевезень автомобілів у міжнародному сполученні. *Міжнародний науковий журнал «Грааль науки»*. No 9. С. 235 – 231. URL: <https://www.researchgate.net/publication/356053531>. (дата звернення 15.05.2024).

16. Лебідь М., Лужанська Н.О., Лебідь І.Г. Розробка проектів альтернативних способів доставки зовнішньоторговельних вантажів у період воєнного часу за участю логістичних посередників. *Розвиток транспорту*. № 1(16), 2023, 149 – 163 URL: <https://journals.onmu.in.ua/index.php/journal/article/view/210/346>. (дата звернення 16.05.2024).

17. Міністерство розвитку громад, територій та інфраструктури України. Офіційний сайт. <https://mtu.gov.ua/news/35049.html>. (дата звернення 06.05.2024).

18. Насанчук О. Види та умови страхування вантажів. Офіційний сайт BritMark Insurance Brokers. URL: <https://brit-mark.com/ua/articles/vidyi-i-usloviya-strahovaniya-gruzov>. (дата звернення 16.05.2024).

19. Славич В.П., Єльнік В.В. Оптимізація процесу доставки вантажу газопостачального підприємства. *Вісник ХНТУ*, № 2(85), 2023, 84 – 89. <https://doi.org/10.35546/kntu2078-4481.2023.2.11>. (дата звернення 16.05.2024).

20. Смерічевська С.В. Стратегічні тренди розвитку ланцюгів поставок нового покоління в епоху цифровізації економіки. *Бізнес, інновації, менеджмент: проблеми та перспективи*, 2021, 282-283.

21. Смерічевська С.В., Мацишина О.В. Моделі стратегічного управління ланцюгами постачання в умовах цифрової економіки. *Проблеми підготовки професійних кадрів з логістики в умовах глобального конкурентного середовища*, 2022, 173-178.

22. Смерічевська С.В., Постніков О.О. Моделі управління державними закупівлями в світовій практиці. *Бізнес, інновації, менеджмент: проблеми та перспективи*, 2023, 176-177.

23. Смерічевська С.В., Феоктістова, Н.О. Концепція реверсивної логістики: сутність і практика застосування на виробничих підприємствах в умовах циркулярної економіки: міжн. наук.-практ. конф., (травень 13–15, 2020). Perfect Publishing, Vancouver, Canada, 2020. С. 952-958.

24. Смерічевська С.В., Штик Ю.В., Стріжов О.С. Аналіз стану і тенденції розвитку транспортної інфраструктури України. *Цифрова економіка та економічна безпека*, (9 (09)), 2023, 56-62.

25. Стасюк О., Чмирьова Л., Федяй Н. Ринки вантажних та пасажирських перевезень в Україні: проблеми та тенденції. *Ефективна економіка*. 2020. № 9. С. 1–19. URL: http://www.economy.nauka.com.ua/pdf/9_2020/56.pdf (дата звернення: 10.05.2024).

26. Швець В., Бойченко М. Аутсорсинг в логістиці автомобільних вантажоперевезень в Україні: стан, проблеми та перспективи. *Економічний вісник Донбасу*. 2019. № 3 (57). С. 103–109.

27. Шульдінер Ю.В., Примаченко Г.О., Пашенко Г.С. Підвищення ефективності перевезень вантажів у міжнародному сполученні через сухопутні прикордонні переходи України. *Збірник наукових праць УкрДУЗТ*, 2023, вип. 205. С. 132 – 140. DOI: <https://doi.org/10.18664/1994-7852.205.2023.288837>. (дата звернення 16.05.2024).

28. Aftanaziv I., Shevchuk L., Strohan O., Strutynska L. Improvement of the mine explosion and exploration complex. *Transport Development*, (2(17), 2023, 90-104. <https://doi.org/10.33082/td.2023.2-17.08>. (date of access 16.05.2024).

29. Ajanovic A., Haas R. Prospects and impediments for hydrogen and fuel cell vehicles in the transport sector. *International journal of hydrogen energy*, 2021, 46(16), 10049-10058.

30. Aleksandrovna L.E. Model for determining the optimal size of a multi-nomenclature cargo batch, taking into account the weight and volume characteristics of the transport vehicle. *International Journal of Advanced Studies*, 2020, 10(1), 26-34.

31. Al-Enazi A., Okonkwo E.C., Bicer Y., Al-Ansari T. A review of cleaner alternative fuels for maritime transportation. *Energy Reports* 2021, 7, 1962-1985.

32. Batarlienė N., Šakalys R. Mathematical model for cargo allocation problem in synchromodal transportation. *Symmetry*, 2021, 13(4), 540.

33. Bychkovsky, Y. Project-oriented management in shipping as a basis for ensuring safety. *Transport Development*, 2023, (1(16), 197-210. <https://doi.org/10.33082/td.2023.1-16.16>. (date of access 16.05.2024).

34. Chernova L., Titov S., Chernova L. Model approach in project management methodology. *Transport Development*, 2022, (4(11), 40-51. <https://doi.org/10.33082/td.2021.4-11.04>. (date of access 16.05.2024).

35. Chislov O., Bogachev V., Zadorozhniy V., Kravets A., Bakalov M., Bogachev T. Mathematical modeling of cargo flow distribution in a regional multimodal transportation system. *Transport problems*, 2021, 16.

36. Cullen D.A., Neyerlin K.C., Ahluwalia R.K., Mukundan R. New roads and challenges for fuel cells in heavy-duty transportation. *Nature energy*, 2021, 6(5), 462-474.

37. Dai B., Nu Y., Xie X., Li J. Interactions of traceability and reliability optimization in a competitive supply chain with product recall. *European Journal of Operational Research*. 2021. № 290 (1). P. 116–131. DOI: 10.1016/j.ejor.2020.08.003. (date of access 16.05.2024).

38. Fedorov V., Kovtsur K., Ptytsia, N. Interaction of transport modes: features of servicing vehicles at cargo-handling facilities. *Transport Development*, 2023, (4(15), 123-130. <https://doi.org/10.33082/td.2022.4-15.10>. (date of access 16.05.2024).

39. Georgiy P., Myroslav O., Olexiy C. Optimization model of freight transportation on the routes of international transport corridors. *Journal of Sustainable Development of Transport and Logistics*, 2020, 5(1), 66-76.

40. Gryshchuk O., Petryk A., Yerko Y. Determination of functional characteristics of customs and logistics infrastructure in transport systems of international direction. *Transport Development*, 2022, (1(12), 143-155. <https://doi.org/10.33082/td.2022.1-12.12>. (date of access 16.05.2024).

41. Gryshchuk O., Petryk A., Kozlov A., Litus T. Infrastructure provision of commercial activities of production systems of international forwarding to the market

of transport services. *Transport Development*, 2023, (2(17)), 119-132. <https://doi.org/10.33082/td.2023.2-17.10>. (date of access 16.05.2024).

42. Hryhorak M., Karpenko O., Semeriahina M. Formation of the multimodal transportation ecosystem in Ukraine. *Intellectualization of logistics and supply chain management*, 2020, 2, 111-130.

43. Hu Q., Gu W., Wang S. Optimal subsidy scheme design for promoting intermodal freight transport. *Transportation Research Part E: Logistics and Transportation Review*, 2022, 157, 102561.

44. International Road Transport. URL: <https://maritimasureste.com/en/land/road-internacional>. (date of access 16.05.2024).

45. Kis I. Mechanism of environmental risk management at transport enterprises. *Transport Development*, 2022, (4(11)), 16-24. <https://doi.org/10.33082/td.2021.4-11.02>. (date of access 16.05.2024).

46. Klymenko V., Novalska N., Lozova G., Pasichnyk I. Prospects for restoring the transport and logistics infrastructure of airport complexes in Ukraine and ensuring the efficiency of its operation. *Transport Development*, 2023, (4(19)), 186-199. <https://doi.org/10.33082/td.2023.4-19.13>. (date of access 16.05.2024).

47. Korobkova O., Pavlovska L., Shpak N. Modeling of logistics costs in supply chains of foreign trade goods. *Transport Development*, 2023, (2(17)), 133-142. <https://doi.org/10.33082/td.2023.2-17.11>. (date of access 16.05.2024).

48. Kovtsur K., Ptytsia N., Kuziev I. Implementation of a motivational policy for the activities of logistics departments at enterprises. *Transport Development*, 2022, (2(13)), 53-63. <https://doi.org/10.33082/td.2022.2-13.05>. (date of access 16.05.2024).

49. Kovtun T., Dmytrieva L. Reengineering as a stage of the micro-logistics system life cycle. *Transport Development*, 2024, (1(20)), 18-26. <https://doi.org/10.33082/td.2024.1-20.02>. (date of access 16.05.2024).

50. Kravets A., Bogachev V., Egorova I., Bogachev T. Multimodal freight transportation based on multicriteria optimization by time indicators. *Transportation Research Procedia*, 2021, 54, 243-252.

51. Kunda N., Naumovets, D. Logistics approach to optimization of international road transportation. *Transport Development*, 2023, (3(18)), 196-208. <https://doi.org/10.33082/td.2023.3-18.16>. (date of access 16.05.2024).

52. Lebid I., Luzhanska N., Lebid I. Development of alternative international shipment projects involving logistics intermediaries in wartime. *Transport Development*, 2023, (1(16)), 149-163. <https://doi.org/10.33082/td.2023.1-16.12>. (date of access 16.05.2024).

53. Luzhanska N. Influence of the client-oriented approach on logistics chain formation involving a freight customs complex. *Scientific Letters of Academic Society of Michal Baludansky*. 2020. № 8 (2-2020). P. 8-14.

54. Maneengam A. A bi-objective programming model for multimodal transportation routing problem of bulk cargo transportation: *7th International Conference on Industrial Engineering and Applications (ICIEA)*, 2020, P. 890-894.

55. Naumov V., Shulika O., Orda O. Shaping the optimal technology for servicing the long-distance deliveries of packaged cargo by road transport. *Sustainability*, 2022, 14(12), 7283.

56. Okyere S., Yang J., Adams C.A. Optimizing the Sustainable Multimodal Freight Transport and Logistics System Based on the Genetic Algorithm. *Sustainability*, 2022, 14(18), 11577.

57. Pamucar D., Ecer F., Deveci M. Assessment of alternative fuel vehicles for sustainable road transportation of United States using integrated fuzzy FUCOM and neutrosophic fuzzy MARCOS methodology. *Science of the Total Environment*, 2021, 788, 147763.

58. Pan M., Pan C., Li C., Zhao J. A review of membranes in proton exchange membrane fuel cells: Transport phenomena, performance and durability. *Renewable and Sustainable Energy Reviews*, 2021, 141, 110771.

59. Pencheva V., Asenov A., Sladkowski A., Ivanov B., Georgiev, I. Current issues of multimodal and intermodal cargo transportation. *Modern trends and research in intermodal transportation*, 2022, 51-124.

60. Pents V., Savyk V., Molchanov P., Yurii I., Ichanska N. The development and calculation of tanks for storage of fuels and lubricants in the field: *International Conference building innovations*, 2022, P. 253-269.

61. Pinheiro C.T., Quina M.J., Gando-Ferreira L.M. Management of waste lubricant oil in Europe: A circular economy approach. *Critical Reviews in Environmental Science and Technology*, 2021, 51(18), 2015-2050.

62. Prokudin G., RemekhI., Khobotnia T. Organization of unbalanced freight transportation with the use of freight customs complexes. *Transport Development*, 2020, (1(6), 116-126. <https://doi.org/10.33082/td.2020.1-6.010>. (date of access 16.05.2024).

63. Prymachenko H., Shkurenko O., Budnyk, V., Hryhorova Y. Methodology apparatus of scientific studies of the system of multimodal transportation. *Transport Development*, 2023, (3(18), 209-221. <https://doi.org/10.33082/td.2023.3-18.17>. (date of access 16.05.2024).

64. Pysarchuk O., Konrad T., Lytvynenko M., Shevyakov Y. Assessment of the reliability of multicriterial choosing the optimal route of cargo transportation in the multimodal transport network. *Polish Journal of Science*, 2021, (35-1), 25-34.

65. Rana R.S., Kumar D., Prasad K. Sustainable production-inventory system for perishables under dynamic fuel pricing and preservation technology investment. *Environmental Science and Pollution Research*, 2023, 30(39), 90121-90147.

66. Ricci S., Abdelbary A., Elgazzar S., Bayoumi E. The Role of Road Transport Infrastructure Investments on Logistics Performance: A Research Agenda. *International Business Logistics Journal (IBL)*. 2021. Volume 1, Issue 2. URL: <http://dx.doi.org/10.21622/IBL.2021.01.2.016> (date of access 16.05.2024).

67. Safronova A., Reshetko N., Majerčák J., Kurenkov P. Choosing a scheme for the delivery of foreign trade cargo. *Transportation Research Procedia*, 2021. 53, 314-320.

68. Savchenko L.V., Lysenko M.I., Ihnatova A.O., Semeriahina M.N. Analysis of the features, difficulties and advantages of transportation of less-than-truck loads. *Менеджмент та підприємництво: тренди розвитку*, 2018, (4), 119-125.

69. Shkurenko O., Budnyk V., Perepichko M. Strategic guidelines for the functioning and development of port terminals as a component of the transport infrastructure of multimodal transportation. *Transport Development*, 2023, (4(15)), 140-151. <https://doi.org/10.33082/td.2022.4-15.12>. (date of access 16.05.2024).

70. Shkurenko O., Korniiiko Y., Popov R. The role of chartering in the management system of international freight transportation. *Transport Development*, 2023, (4(19)), 9-18. <https://doi.org/10.33082/td.2023.4-19.01>. (date of access 16.05.2024).

71. Shramenko N., Muzylyov D., Shramenko V. Model for choosing rational technology of containers transshipment in multimodal cargo delivery systems. *New Technologies, Development and Application*, 2020, 621-629).

72. Sudnyk N., Sofronov A. Review of ukraine's freight market during the war. *Transport Development*, 2024, (1(20)), 91-99. <https://doi.org/10.33082/td.2024.1-20.08>. (date of access 16.05.2024).

73. Sun J., Fang X., Yao J., Guan R., Zhang Z., Zhang G. Study on the effect of oil supply on the sound field characteristics of full ceramic ball bearings under oil lubrication. *Lubricants*, 2023, 11(3), 146.

74. Taran I., Olzhabayeva R., Olishevych M., Danchuk V. Structural optimization of multimodal routes for cargo delivery. *Archives of Transport*, 2023, 67(3), 49-70.

75. Van der Westhuizen S., Collard F.X., Görgens J. Pyrolysis of waste polystyrene into transportation fuel: Effect of contamination on oil yield and production at pilot scale. *Journal of Analytical and Applied Pyrolysis*, 2022, 161, 105407.

76. Vyshnevskaya O., Vyshnevskiy D., Onyshchenko S. Organizational features of cargo delivery using flexitanks. *Transport Development*, 2023, (2(17)), 105-118. <https://doi.org/10.33082/td.2023.2-17.09>. (date of access 16.05.2024).

77. Wang B., Zhang H., Yuan M., Guo Z., Liang Y. Sustainable refined products supply chain: A reliability assessment for demand-side management in primary distribution processes. *Energy Science & Engineering*. 2019. № 8 (4). P. 1029–1049. URL:doi: 10.1002/ese3.566. (date of access 16.05.2024).

78. Xu B., Sun J., Zhang Z., Gu, R. Research on cold chain logistics transportation scheme under complex conditional constraints. *Sustainability*, 2023, 15(10), 8431.

79. Yin C., Lu Y., Xu X., Tao X. Railway freight subsidy mechanism based on multimodal transportation. *Transportation Letters*, 2021, 13(10), 716-727.

80. Zhu Y., Fan L. (2022). Fuel delivery system for alternative fuel engines: a review. *Potential and challenges of low carbon fuels for sustainable transport*, 2022, 67-95.