Safety of Cargo Transportation in the Ukrainian Supply Chain: Risk Management and Legal Issues

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Abstract. The safety of cargo transportation widely impacts the economy and ecology of the state and region. This article aims to detail the legal issues related to transporting goods in Ukraine. We have taken into account various risks associated with the movement of goods in Ukraine. We have described the dangers of physical impact on people and the impact on the nature of accidents with dangerous cargo. We have summarized the possibilities of adapting the risk management methodology to the realities of cargo transportation in Ukraine. After analyzing the safety problems of hazardous and oversized loads transported in Ukraine, we concluded that it is necessary to eliminate inconsistencies in legal documents and the discordance between them and the non-compliance with the norms of technical progress. We also stressed the need for Ukraine to comply with Directive 2008/68/EC in the framework of the European integration process.

Keywords: cargo, transportation, dangerous goods, legal inconsistencies, European integration process.

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1. INTRODUCTION

Transport companies provide cargo transportation services to meet the needs of the national economy and those of the country's private sector, as well as to enable transit traffic through the country. Due to the transportation process, producers are connected with consumers and cargo. Also, national and interstate trade, both in raw materials and in finished products, is made possible due to transport. The efficient functioning of the transport sector contributes to the rise in the population's welfare and strengthening the country's sustainability. This study presents the investigation results on the transportation of goods in Ukraine, especially security, sustainability and legal support. We relied in part on the results of interviews with managers of logistics companies in Ukraine. We tried to compare them with the real situation in the legal regulation of transport issues. This study is theoretical and designed to stimulate interest in the development of legal support of freight in Ukraine in view of European integration processes.

2. RESULTS

2.1. Management of transportation risks in Ukraine

Cargo transportation is a business process that requires a responsible attitude since its main purpose is to deliver goods safely to the place of destination. Therefore, guaranteeing safety – the absence of losses during transportation – is a vital task of transport and logistics companies, which select the most secure mode of transportation, taking into account a range of parameters, including the type of goods, conditions and ways of carriage (Heydecker, 2011).

Risk management in a transport company is a set of methods, techniques, and measures that allow predicting the occurrence of risky events while carriage and take measures to reduce them for saving money and time (Mehrara Molan, 2020). Therefore, risk management is expected to be carried out consistently, starting with the preparation of transport and transporting goods and finishing with the shipment of goods.

In general, in Ukraine, every year, an average of 7 thousand are killed in accidents and injuries of various degrees of severity happen to 57 thousand people. The consequences of accidents are hard. A separate factor of risk is the volume of the truck parking. The number of vehicles in Ukraine currently exceeds 9 million. The bulk of commercial vehicles, namely trucks and buses, has now moved to private ownership. As a result, the national provision of maintenance conditions and traffic safety has been destroyed, and the decisive criterion is profit, usually gained by violating the legislation and traffic safety requirements. The presence on the market of transport services of almost 15 thousand automobile carriers, who do not have the specialised education and experience of transportation organisation, also considerably worsens road safety (National Department of Transport in Ukraine, 2019).

An insufficient level of road safety in Ukraine remains a serious problem. Thus, according to statistics for 2021, 217 accidents occurred on the roads of Ukraine due to drivers of licensed road transport, in which 33 people died, and 536 were injured to varying degrees of gravity (208 accidents happened in the same period in 2020, in which 85 people were killed and 504 got injured). One hundred ninety-one accidents occurred due to the drivers of the buses, in which 29 people were killed, and 498 got injured. Already this year, there were 43 accidents, in which 15 people were killed, and 119 were injured (for the same period in 2020, there were 40 accidents in which ten people were killed and 115 injured) (Minenko, 2021).

In the territory of Ukraine, over 1000 types of various dangerous goods are transported. In a country where military action is taking place, knowledge of the handling of dangerous goods and the legislative regulation of this aspect of transport activity is not merely formal but a vital need. Thus, according to statistics, only in 2021 there were 33 emergencies during the transport of dangerous goods. The natural environment was "enriched" by 134 tons of industrial waste – chemicals, toxic substances, etc. Fortunately, it passed without sacrifices.

Over the past years, there have been more massive catastrophes. An example is a catastrophe in the Lviv region in 2007 when 15 cisterns with yellow phosphorus got off the rail track. Then a fire began, during which a cloud

of combustion products formed (the damage zone was about 90 square kilometres), and people from the nearest villages had to be evacuated. Due to poisoning with combustion products, 13 people in a state of high or moderate severity were hospitalised. Indeed, in the most industrially developed member states of the European Union, the share of dangerous goods transportation is about 20% of the total volume of transport. Almost 40% is for flammable liquids (in particular, fuel) (UNIAN, 2007).

The acknowledgement of the European experience may be the adoption of Draft Law 7387, "On Amendments to Some Laws of Ukraine on bringing them in line with the legislation of the European Union in the field of transportation of dangerous goods". It was included on the Council's agenda at the end of March, after the previous law, registered back in 2016, with the same name and in fact, the same bill, which was not adopted at the second reading.

2.2. The stages of transport risk management in Ukraine

To commence the risk management process in transportation, one must identify the external and internal risks of the logistics system under study. Each supply chain and each logistics system – or even a single fraction thereof – has its own risk system, whose characteristics depend on the logistic functions performed (transportation, warehousing, purchasing management, etc.), industry affiliation, the scale of activity (local, regional, national, international, global), technologies, development strategies and a number of other factors. Therefore, while identifying company risks, a manager should first detect all types of risk specific to this enterprise.

According to the interview of managers, the following types of risks that transport enterprises confront in Ukraine can be distinguished:

1. Managerial – risks related to documentation (no application for transport services for transportation, no necessary documents for the carriage of dangerous goods, no necessary documents for the moment of transportation to the driver of a tanker truck; risks associated with marking; incompleteness and insufficiency of cargo information); transport risks (incorrect definition of the moment of transfer of responsibility for the cargo in the process of transportation, the risk of choosing a vehicle, the risk of poor quality cargo, uncoordinated time of shipment, uncoordinated itinerary of loading and unloading of the tanker, uncoordinated transportation route); personnel risks (the risk of cargo damage during transportation, low level of skills of employees, failure of the employee to fulfil their job duties).
2. Technical – risks associated with the operation of technical equipment in the logistics system, the risk of differences in the load's weight indices at the vehicle's entrance and exit.
3. Unplanned – the risk of theft of goods; risk of an accident; natural disasters; cargo damage; cargo loss due to overloading.
4. Commercial – supply failure; lack of production; violation of delivery terms.
5. Unpunctuality-related – the risk of cargo delay during transportation; the risk of delaying the unloading of the tanker.
6. Entrepreneurial – change of contractual conditions by the customer of transportation; the liquidation of the enterprise.
7. Depreciation – rapid physical wear of transport and equipment; outdated transport and equipment.
8. Financial – the risk of inflation; fluctuations in exchange rates.

Then, qualitative and quantitative risk assessment is carried out. The mere detection of logistic and non-logistic risks appropriate to an enterprise does not make it possible to identify the dangers they represent and choose the risk management procedures that will most effectively counteract them. To solve such problems, the manager should estimate the size of possible losses resulting from those risks and their probability. The main task of qualitative assessment is to obtain information on the logistics system's structure and properties and its inherent risks and to identify the factors and circumstances leading to these risks. Quantitative assessment allows one to get the

numerical value of the risks inherent in the logistic system of the enterprise, to find out about the probabilities of their occurrence and to obtain the prognosis on their consequences. At this stage, risk assessment methods such as the statistical, expert, or analogue methods can be used (Radu, 2020). The essence of statistical methods for assessing transport risk is to determine the probability of occurrence of losses in transportation on the basis of statistical data of the previous period and the establishment of a risk zone, risk factor, etc. Often, as a character in the methods of statistical risk assessment, the variance and standard deviation coefficient of variation is used. The essence of the method of expert assessments of transport risks is the rational organization of expert analysis of the problem during transportation with the quantitative assessment of judgments and the processing of their results. Summarized expert opinions are considered as a solution to a specific problem. Analogue methods are used to identify potential risk factors during transportation based on previous transportation experience (Budzynski, 2019).

What is important is the further diagnosis of risks. It involves the analysis of the impact of risk factors on logistic performance indicators (Chytilova, 2019). These analytical measurements are carried out using such tools as correlation, regression analysis methods, or expert assessments. In correlation, certain risk factors for transport are exposed to stress-relief, while others vary according to their correlation under normal conditions. Regression analysis is helpful to assess the significance of the values of these coefficients and the degree of the adequacy of the model. By summarizing the experts' opinion about the probability of losses during transportation, expert assessments allow obtaining the amount of acceptable risk or the loss magnitude.

Another step in the risk management process is the prediction and modelling of the outcome of the risk and the consequences of the decisions made (Pinto, 2007). This stage involves the use of tools such as the decision tree, method of analysis of danger and efficiency, or analysis of scenarios. The decision tree method is a situational analysis method, the essence of which is the process of making managerial decisions in terms of assessing the level of risk of a project that arises as a result of the carriage process implementation. The method of analysis of danger and efficiency is about studying the impact of technological parameters (temperature, pressure, etc.) and deviations from regulated regimes in terms of danger. Analysis of scenarios for the development of project transport allows one to assess the impact on the project of the possible simultaneous change of several factors depending on the probability of each scenario. The next step – the assessment of risk acceptability – is to make one realize that in most cases, it is not possible to completely get rid of the risk, which can only be reduced to an acceptable level at which it ceases to be dangerous.

Finally, there is the choice of an appropriate method for managing the risk of the logistics activities of an enterprise. Such methods in enterprise management are often preventive measures to reduce the risk, transfer of risks, external insurance, or the refusal of risk. These methods minimise the risk affecting the transport company and share some part of responsibility with another subject.

2.3. Safety of cargo transportation in Ukraine

Cargo damage in transportation (loss of merchantability or the deterioration of cargo properties) and cargo theft are examples of the risks confronted by transport companies. However, modern logistics develops a range of methods and means of ensuring the safety of freight traffic (Jaller, 2015).

When it comes to counteracting cargo damage, one of the methods is to design pre-drawn schemes for the correct loading and placement of goods in the vehicle and the use of modern fastening elements that prevent the displacement of goods during transport. Our interview shows that only 30 per cent of the companies in Ukraine develop the above schemes. This issue is not a big deal, as companies believe that classical schemes that were developed at the beginning of the century, or even in the Soviet period, are universal and suitable for each type of transportation. Enterprises that develop such schemes do not attach much importance to this issue either,

though on average, they allocate 10 per cent of the cost to this purpose. Another method of preventing such damage is the provision of additional fillings. In Ukraine, this method is more popular than the previous one but also not very common. Among the respondents, 40 per cent use it. Other companies do not use it because of additional costs connected with the content. It is important for companies with a limited budget to use existing transportation facilities without extra cost.

As regards the prevention of theft, available methods involve the employment of armed guards, the use of GPS satellite tracking, the involvement of independent observers, and additional insurance. Each of these methods has its own specificity and fields of application. For example, it is expedient to decide for the expensive maintenance of armed security only during the transportation of particularly valuable and excisable goods to reduce the risk of theft considerably. Therefore, only 5 per cent of the enterprises surveyed incorporate armed security in the budget expenditures since this method is rather expensive and may even consume 40 per cent of the budget. Five per cent of enterprises that implement this cargo protection method are, basically, engaged in the transportation of highly financially assessed cargo. The use of satellite control systems to monitor vehicles with cargo is becoming more and more widespread. It allows to record the vehicle's stops on the road, planned or unplanned, and certain systems, owing to special sensors, prevent the vehicle from becoming subject to unauthorized entry. Therefore, more than 55 per cent of surveyed carriers use GPS in their work since they believe that this method helps to optimize time and money. The remaining respondents who could not afford to include it in the budget due to lack of funds do not use this method.

The involvement of independent observers to guard transported cargo has become increasingly popular in recent years and is widely used by transport carriers worldwide. The participation of independent observers in the loading and unloading of industrial goods in transhipment warehouses often disciplines cargo carriers and the senders and the recipients of the cargo, forcing them to treat their contractual obligations in a responsible way. Unfortunately, the involvement of independent observers in Ukraine is quite rare, as shown by the survey conducted. Only 7 per cent of respondents use this method; thus, its popularity is similar to the popularity of armed security hiring. Involving an independent observer in Ukraine is expensive. Therefore, firms generally consider this method unprofitable, that is, a waste of money.

2.4. The safety of dangerous and oversized loads transported in Ukraine

A proper supply chain is not only about delivering fast but also about delivering safely and in compliance with international standards. This is especially important for dangerous goods such as petroleum products, fertilizers, cement, pesticides, etc. Dangerous loads, which often have a form of, e.g. flammable liquids or toxic or explosive substances, can cause harm to humans and/or the environment when they evaporate, leak, or crumble during transportation. Therefore, avoidance of accidents involving such loads is particularly important within the area of load safety.

Road transport of oversized loads, despite its highest popularity, is struggling with the greatest number of problems, mainly related to technical and legal obstacles occurring on the transport route from the place of shipment to the destination.

Today, in Ukraine, regulatory documents provide for the carriage of goods with a total mass (including the mass of the vehicle) of no more than 40 tons. The above norm does not differ from the European one. On an exceptional basis, it is 44 tons for container vehicles, and for vehicles moving on special routes established by Ukravtodor and corresponding units of the Ministry of Internal Affairs, it is up to 46 tons. Besides, weights are controlled as regards axle load: the amount of loading on a single axle – 11 tons, for double loads – 16 tons, for the building – 22 tons. According to the State Dignity Institute data, about 74% of highways were constructed under the estimated load on the axle totalling 6 tons and the total weight not exceeding 24 tons.

The annual losses incurred by the road economy because of the destruction of roads caused by the traffic of heavy vehicles exceed 2 billion UAH. According to World Bank studies,

annual losses of the country's GDP due to the unsatisfactory state of highways comprise 3–4% of GDP. More than 90% of highways in Ukraine are in need of repair and construction work.

The route planning process in transporting oversize loads usually takes into account road conditions such as the assessment of the width of roads, the turning radius, the existing signs and poles, the height and width of trips under overpasses and bridges and the permissible load of bridges and viaducts; the occurrence of the elements of infrastructure such as roundabouts, pedestrian crossings and islands; the allowed pressure on the surface; as well as the location of electric tractions, railway tractions, road repairs etc. There is a frequent need to remove road obstacles for the time of the passage of an oversized transport vehicle. It happens that the distance between the point of sending and the destination is small; however, to carry a given element, a much greater distance should be covered. As a result, the recipient pays more for transportation while the time of carriage lengthens.

In order to preserve the roads of general use, there is a central executive body: Ukrtranssabspekta, which is responsible, in particular, for the implementation of dimensional and weight control over vehicles as well as dimensional and weight parameters that exceed the normative ones, and for the measures to prevent and avoid the destruction of highways.

The implementation of the overall and weight control of vehicles is regulated by:

- Law of Ukraine "On Automobile Transport";
- Law of Ukraine "On Road Traffic";
- Rules of the Road, approved by the Cabinet of Ministers on 10 October 2001 (as amended);
- The Resolution of the Cabinet of Ministers of 27 June 2007 no. 879 "On Measures for the Safekeeping of Motorways of the Common Use".

At this time, the territorial bodies of Ukrainian transport safety, together with the services of motor roads in the regions and relevant units of the National Police of Ukraine in districts, started to carry out measures on dimensional and weight control using mobile weight machines and weight systems. As a result of their work, 4,556 vehicles have already been checked, of which 319 revealed a violation of weight parameters. The travel fare is charged with 150 thousand UAH. Penalties amounting to about 148 thousand UAH were imposed.

The first step in planning the logistics chain in oversized load transport is the analysis and assessment of the transport's capability. Then, legal requirements are to be met, and necessary permits must be obtained that allows the carriage of oversized cargo on public roads. An important factor conditioning the safety of oversize cargo transportation is the coordinated work of qualified staff and effective communication among them. Another important step of the process mentioned above is the reliable planning of the transport route that minimizes the risk for both people involved in the carriage and the environment. Adequate marking and lighting of the load is another factor important for maintaining safety in this type of transport. Another factor is compliance with permits and recommendations pertaining to the carriage of a given load along a given route and possession of necessary documents by the driver.

Another action aimed at maintaining safe transportation of oversized cargo is the preparation of the load by guaranteeing relevant means of protection (checking the state of the equipment, e.g. hooks or tension belts; ensuring the appropriate distribution of the load on the trailer, etc.). One also needs specialized vehicles selected and adjusted to manage the transported cargo to transport an oversized load. The final points concerning the safety of oversized transport are ensuring that the weight of the load will not damage the means of transport and that the transportation processes performed by other road users will not be hampered.

3. CONCLUSIONS

Nowadays, the carriage of dangerous goods in Ukraine is regulated by the law "On the Transport of Dangerous Goods" and laws on certain types of transport, Government acts, and orders of the Ministry of Infrastructure and the Ministry of Internal Affairs.

By concluding the Association Agreement with the European Union, Ukraine has

undertaken to harmonize existing transport standards with those prevailing in the EU, particularly with Directive 2008/68/EC on the internal carriage of dangerous goods, which extends international agreements on dangerous goods for domestic transport. In 2015, the Ministry of Infrastructure, together with the Ministry of Internal Affairs, met the European requirements by approving the "Procedure for inspection of tanks for the transport of dangerous goods" and adopting the rules for the carriage of dangerous goods by inland waterways of Ukraine.

The main shortcomings of the current legislation that regulates the process of transporting dangerous goods are the inconsistencies in the legal documents and the discordance between them and the non-compliance with the norms of technical progress. For example, in the law "On the Transport of Dangerous Goods", there is no list of vehicles intended for the carriage of such cargoes. Thus, the requirements regarding such vehicles' condition, design, or equipment are also absent.

Also, domestic law does not regulate the procedure for resolving disputes related to the transport of dangerous goods, as well as the procedure for monitoring compliance with the requirements for carriage; there is no answer to the question of who should be responsible for controlling the transportation of dangerous goods at different stages of transportation. The current situation of freight transport security in Ukraine does not meet the expectations of society; it leads to numerous human, material and economic losses while creating social tension in the state and unfavourable conditions for investment in the transport sector of Ukraine. A possible solution to this problem would be, e.g. the introduction of an effective state system of control in compliance with transport companies operating and rest regimes and improving the requirements regarding the safety level of the design of vehicles.

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