THE ROLE OF INTERMODAL LOGISTIC CENTERS IN ENHANCING TRANSPORT CORRIDORS

The article attempts to determine the preconditions of the development of transport logistics in Europe and the prospects for effective formation in the border region of Transcarpathia and in certain aspects of Ukraine as a whole. It has been indicated on the essence of transport corridors and their real scheme of branching on the map of Europe. The consequences of inefficient state policy in the field of transport and their significance for foreign trade flows in the Transcarpathian border region have been illustrated. The essence and significance of transport and logistics centers and their development perspectives in the context of intermodal transportation from Transcarpathia to the countries of the European Union have been explored. There has also been analyzed some components of the operation of the Zakhon (Hungary) reloading center.

Key words: transport logistics, international transport corridors, intermodal transportation, transport and logistics centers, Zakhon transshipment center.

DOI: 10.15276/mdt.3.2.2019.1

Statement of the problem in general form and it's connection with important scientific or practical tasks. The logistics processes that are taking place today in the western border regions of Ukraine in connection with the passage of pan-European transport corridors through them, increase the attention to various intermodal logistics systems. That is, two or more modes of transport are actively used for the transport of one cargo, and thus the development of an intermodal system using combined transport is being implemented. These processes greatly enhanced the role of logistics in the organization of transport flows, formed transport and logistics systems that ensure the integration of production and distribution systems.

© 2019 The Authors. This is an open access article under the CC BY license (http://creativecommons.org/licenses/by/4.0)
In the transport sector, the Association Agreement between Ukraine and the European Union aims to promote the development of stable, efficient, safe, interoperable and operationally compatible transport systems and to strengthen the main transport links between the territories of the Parties. Cooperation in the field of transport involves the development of a sustainable national transport policy covering all modes of transport, based on the intermodality and multimodal transport network associated with the Trans-European Transport Network – Articles 367, 368 and 369 of the Association Agreement [1; 2]. However, Ukraine's transport and logistics system still does not meet the EU standards and requirements and is marked by significant lag in terms of infrastructure, equipment and norms.

Thus, intermodal logistics centers should play a leading role in the formation of a cargo turnover system in the transboundary regions of Ukraine through which European transport corridors pass.

Analysis of the latest research and publications, which initiated the solution of this problem and on which the author relies. Research on the problems of the creation and operation of intermodal logistics systems was covered in the works of domestic and foreign scientists, among them T. Prokofiev, N. Pashynska, V. Klyvenko, O. Lopatyn, I. Komarnytsky, N. Pytulyak, I. Kogut, V. Kulyk, O. Onyshchenko, G. Mykhailov, S. Garhkov, R. Garington and others.

Highlighting the previously unresolved parts of the general problem to which the article is devoted. Taking into account the peculiarities of the development of the market of transport services in the transboundary regions of Ukraine, it is necessary to significantly improve the organizational and economic mechanisms of its functioning and to develop mixed transport in foreign economic relations of Ukraine with Western foreign countries.

Topicality, urgency, theoretical and practical importance of the study of these problems mentioned above and their insufficient complex study led to the choice of this topic and the purpose of this study.

Formulation of the purpose of the article (statement of the problem). We will try to explore the possibilities of the intermodal-logistic center as a leading link in the system of mixed cargo transportation in transboundary regions and to determine the essence and role of such entities for increasing the efficiency of the delivery process of various cargoes.

Statement of the main material of the research with full justification of the scientific results obtained. EU countries are among the first among the other countries and regions of the world that face with problems of transport logistics. The main reason was a significant number of countries in the world rather small area when integration processes abstain centrifugal trends in the transport sector, which remains an important weapon of the state and national corporations against monopolies in other countries.

The experts calculated that the damage caused by the well-known autonomy and protection of economic sovereignty in the EU member states at the end of the 80's amounted to about 400 billion dollars per year [3; 4].

In the 80 years of the twentieth century, the question arose about the integration of individual transport systems into the pan-European regional transport system, which purpose should be the continuous process of transportation of goods, reducing their delivery time, cost and certain risks. Since the creation of the European Union (the European Conference of the European Communities in Luxembourg in 1985, which adopted the European Act), having emphasized four freedoms in the international flow of goods, people, services and capital, a new type of interstate economic and industrial ties was created that was in need in the unification of the national transport systems of these countries into a single transport system and its development in the direction of creating the missing links in the network; increase in throughput and the number of natural transport transitions and collisions; change in the ratio of
modes of transport in transportation, connected with the composition of the cargo mass by types of cargo and long-distance transportation; improvement of the work of transport and the development of a common transport policy in connection with the intensification of competition between individual modes of transport and foreign transport expedition companies that have access to the national transport services market [3; 5].

For decades, the European Union has decided on the development of a common transport policy. Therefore, the development of international transport corridors begins with the mid-80s of the XX century, when the trend of increased commodity exchange between the countries of the European Community and the Asia-Pacific region has become steady in growth.

The concept of the "international transport corridor" is interpreted by the Working Group of the European Commission on the development of transport corridors, such as the availability of automobile, rail, water and mixed modes of transport, operating in close proximity to each other or remote for many kilometers, but oriented in one general direction. [6].

Ukraine has an active policy of supporting European initiatives on international transport corridors, and offers its variants of corridors to the European Community [7]. Currently there are 10 pan-European corridors (Figure 1).

Figure 1 – Scheme of major pan-European international transport corridors
An international transport corridor No 5 (Crete) runs through the Transcarpathian region, along the route Lisbon-Trieste-Ljubljana-Budapest-Kiev-Volgograd connecting Western and Eastern European road, rail and river national networks for the purpose of intercontinental transit freight traffic in the direction of Europe – Asia. The specified transport corridor, in particular its auxiliary transport networks in the territory of our region, intersects with the branches of the interstate transport corridor Baltic Sea – Black Sea (Gdansk – Odessa).

Globalization and international cooperation contribute to the growth of transnational flows and the international transit of goods. For many countries, transit traffic is an important source of services export, foreign exchange earnings, creation of additional job places, and so on.

At the same time, the systematic non-use of domestic transport potential, increasing competitive advantages in the market of transport services of neighboring countries, led to the loss of the image of our country as a transit state (Figure 2).

![Graph showing dynamics of foreign trade flows through the Transcarpathian border of Ukraine](image)

* 2018 contains data for 11 months

Figure 2 – Dynamics of foreign trade flows through the Transcarpathian border of Ukraine (summarized on the basis of source [8])
Continuing to protract with the delayed reforms in the transport sector, we lose the opportunity to achieve European standards of quality and speed of movement of the goods, which will have negative consequences not only in the transit field, but also, in general, in the economy.

Transport logistics becomes extremely important in the current conditions of globalization of the world economy. Transportation and logistics operations for the delivery of goods have always played a very important role in the international economic relations. The organization of international transport and logistics complexes aims at unification of national legislation, harmonization of transport infrastructure, which will have uniform technical parameters, and will ensure the application of a unified transportation technology as the basis for the creation of a global logistics system and the integration of national transport systems into the world transport system.

According to expert estimates, over the past 25 years, domestic freight traffic in Western Europe has doubled. Within the framework of the EU, the formation of new transit trunk lines is based on the Trans-European Transport Network.

In the basis of the concept of its development there is the principle of integration of various types of transport into the multimodal transport network, which, when expanding to the east (especially to Russia and China), connects with transport networks of the third countries.

Transport states must create the necessary conditions for the movement of goods, guarantee the targeted transportation. As a way out of this situation, it is suggested to use overload points at nodal stations of transport corridors. Such points of overloading are transport and logistics centers.

Transport and logistic center is an inter-sectoral voluntary association of business structures, transport and logistics infrastructure, public and other organizations specializing in cargo transportation, storage and freight processing, freight forwarding, logistic service and management, cooperating with scientific, educational institutions, authorities of the state and regional levels in order to increase the competitiveness of the domestic and world market of transport and logistics services [9].

When constructing a cluster model of a transport and logistics center it is expedient to allocate the following structural elements [10]:

1) "core" – the objects around which the cluster is grouped. These objects perform the main activity, position the cluster, produce the final product or provide services taking into account the regional specialization and geographic advantages of the region. It is recommended to include the leader companies in the field of transport and logistics business to the "core", mainly large cargo owners and potential investors;

2) "complementary objects" – objects the activity of which directly ensures the functioning of the "core" objects;

3) "serving objects" – objects, the presence of which is mandatory, but the activities of which are not directly related to the operation of the "core" objects. Service objects may include information and communication systems, sales, repair enterprises. In addition, the service facilities include the financial center of the cluster, that is, the banking structure, which provides financial support to the cluster enterprises;

4) "auxiliary objects" – objects of a cluster, the presence of which is desirable, but not necessary for the operation of other objects of the cluster. These include service and consulting companies, the functions of which can be carried out both within the cluster, and through outsourcing. In addition, these objects include various financial capital institutions that are not part of the financial center. The purpose of these enterprises, if they exist in the cluster, is to search for internal reserves to ensure the continuity of reproductive processes, achievement of
strategic benefits, first of all associated with increasing the mobility of the development and the realization of the technological potential of the entire cluster.

The introduction of new advanced logistics transport technologies is based on the experience of the operation of a vast network of European transport and storage centers of the Euro-Platforms system (Naples, Livorno, Marseilles, Barcelona, Madrid, Sevilla, Bourgas, Victoria, Bordeaux, Turin, Parma, Bergamo, Strasbourg, Paris, Reno, Bremen, Manchester, Glasgow, etc.). These centers perform at the most up-to-date level all necessary basic operations for the processing and transportation of goods with the provision of all types of services.

As a successful application of the logistics center, one can cite an example at the Zakhon (Hungary) transshipment center (on the border with Ukraine – the Transcarpathian region).

Zakhon transshipment center is one of the largest land ports in Europe. It is an important point of the railway connection from Asia to Europe, because there are docked railway networks of wide (1520 mm) and European (1435 mm) tracks.

Zakhon transshipment center has an area of 84 km², its working areas extend to 11 settlements. It has a length of roads: the European road – 260 km, and a wide track 140 km. It has 140 thousand sq m of open and 7500 sq m of closed hangar customs warehouses for warehousing, storage and shipment at the destination station for goods arriving from outside the European Union. The existing technology provides warehousing, storage and processing of semi-finished goods and raw cargoes during their overload. The transshipment capacity of the Zakhon Center is 18 million tons per year (Table 1).

Table 1 – Capacity of freight terminals in the Zakhon transshipment center

| The name of the terminal                                      | Power          |
|--------------------------------------------------------------|----------------|
| Flow base of chemical goods, Zakhoni                         | 7 200 t. / day |
| Zahony, Transfer 500                                        | 2 900 t. / day |
| Epereshke Reloading                                         |                |
| Bulk cargoes transported in an open rolling stock            | 18 000 t. / day|
| Bulk cargoes shipped in an enclosed rolling stock            | 1 800 t. / day |
| Crane truck overload                                        | 7 000 t. / day |
| Oil Terminal, Warehouse                                     | 7 200 t. / day |

The transshipment center is covered by modern information and telecommunication infrastructure, which allows organizing the rapid transfer of information flow to the Zakhon center and through this center to any point of the world through the possibility of using Internet channels.

The old road highway No. 4 is being restored on the territory of the Zakhon transshipment center. Above the railroad line No. 100 is the motorway to provide access from the highway №4 to the work terminals without crossing the railroad at the same level. Motorway M3 in the near future will reach the area and will be prepared to shipping projects of the river Tysa.

Thus, with the intention of creating an accelerated railway connection, the formation of an intermodal center is expected.

Through the terminals in the Zakhon center, the entire complex of multimodal logistics services for cargo handling, distribution, storage, insurance, customs clearance, trade is carried out.

In world practice, logistics services showed the following most demanded types (Table 2).
Table 2 – Evolution of logistics services

| Services                                           | 1960-1970 | 1970-1990 | After 1990 |
|----------------------------------------------------|-----------|-----------|------------|
| Sending and receiving goods                        | +         | +         | +          |
| Transportation and dispatch in the zone of the logistics center | +         | +         | +          |
| Warehousing                                        | +         | +         | +          |
| Processing orders for deliveries                   | +         | +         | +          |
| Packing, marking and repacking                     | +         | +         | +          |
| Packing and containerization                       | +         | +         | +          |
| Paperwork                                          | +         | +         | +          |
| Information services                               | +         | +         | +          |
| Exhibition services                                | +         | +         | +          |
| Cross-docking                                      | +         | +         | +          |
| Electronic information and electronic document management services | +         | +         | +          |
| Regional distribution of goods                     | +         | +         | +          |
| Customs clearance                                  | +         | +         | +          |
| Organization of long-distance transportation       | +         | +         | +          |
| Inventory management                               | +         | +         | +          |
| Quality control of goods                           | +         | +         | +          |
| Work in a free economic zone                       | +         | +         | +          |
| Claim processing                                   | +         | +         | +          |
| Rotary logistics functions                         | +         | +         | +          |
| A simple collection of products                    | +         | +         | +          |
| Localization of the goods                          | +         | +         | +          |
| Financial Transactions                             | +         | +         | +          |

The presence of logistics centers in the supply chain allows not only carrying out operations with goods, but also managing commodity flows, distributing volumes of goods between destinations, determining the optimal delivery time, the size of the lot, choosing the carrier, etc.

The main factor suspending the formation of logistics centers is the lack of sufficiently developed projects and operation of logistics centers in Ukraine.

It is worth noting that recently the question of building a high-speed rail from China to Europe through Ukraine is being discussed. The profitability of the project is due to the expectations of a sharp increase in exports of goods from China to the EU, which is likely to change the flow of traffic in Europe.

Taking into account the scale of the project and the forecasted large volumes of movement of goods, none of the European states is able to independently provide by their own efforts the reception, logistics support, storage with the subsequent direction of cargo in the right way. As a result, the acceptance of most of the Chinese goods that enter the EU will be able to take place on the Ukrainian border with the EU. For example, in the Transcarpathian region, the creation of a logistics center would be de facto placed in the city of Mukachevo. To do this, it is necessary to carry out reconstruction of the Mukachevo airport in accordance with international standards. There are already railway lines with double canvas (Soviet and European standards) from Mukachevo to Nyiregyzha (Hungary), which will provide trains to these European cities. Developed transportation and logistics infrastructure is also provided by
Uzhhorod and Chop. The EU is interested in creating such corridors, which are a cheaper and faster alternative to the existing ways of goods delivery.

Creation in the region of a special customs zone of Mukachevo Industrial Park with the elements of logistics and the possible introduction of a special customs zone regime in accordance with the Kyoto Convention on simplification and harmonization of customs procedures will significantly improve both the regional economy and international economic relations between East and West in general. This is explained by the advantageous geographical location at the intersection of the routes of cargo and passenger traffic almost in the center of the Transcarpathian region and other advantages that are present and create the preconditions for the Mukachevo industrial park with elements of logistics to become the center of economic development of the region, such as this happened in Ireland after the creation of an economic zone based on the Shannon International Airport [11].

Taking into account the considerable interest of cargo and forwarding companies of the countries of Western, Central and Southeast Europe to intermodal transport of goods under the scheme of rail-road, water and air transport, in order to implement measures for the development of the infrastructure of international transit a comprehensive program for the approval of Ukraine as a transit state presupposes the construction of a river port on the Tysa River near the town of Chop (border of Ukraine, the Hungarian Republic and the Slovak Republic).

It should be noted that the organization of transportation is possible only with the opening of the Tysa River for international navigation, which requires the conclusion of the Convention on the Mode of Navigation on the Tysa River by the countries of the Tysa River basin (Ukraine, Hungary, the Slovak Republic, the former Yugoslav Republics). The opening of the waterway between Ukraine and the countries of the Danube river through the territory of the Hungarian Republic and the countries of the former Yugoslavia will have significant consequences at the international, national and regional levels, since the location of the port, which will become the starting point (and the final point) of the Tisza waterway network, will provide direct access to a shorter and, accordingly, cheaper, compared with a route through alternative ports, a transport route from the UIS countries to the markets of Central and Southern Europe and in the opposite direction. The joint use of the Tysa water-transport network will contribute to the integration of Ukraine into the European transport system, as a transit state, will become an integral part of the European Union and UIS countries [11].

Consequently, in case of presence of logistics centers, all processes related to management, maintenance, optimization of flows of different types, will occur in much shorter time, at a high quality level. Significantly lower logistic costs of individual enterprises, significant will be deductions to local and regional budgets. Within cities where logistics centers will be formed, infrastructure will be improved and new jobs places will be created [12].

Conclusions from this research and prospects for further developments in this area. In the modern economy, the transport sphere is combined with the field of logistics services. The market value of integrated transport and logistics services is becoming more and more relevant. The priority direction of the development of international transport corridors for Ukraine is the provision of transit cargo transportation, that is, the export of transport and logistics services. Competitive advantages of Ukraine, which should contribute to the increase of cargo flows are as follows:

1. excellent transit situation of the country, which is at the crossroads of the main trade routes: East – West, North – South;
2. transboundary - has the greatest length of the state border among European countries (7590 km);
3. availability of numerous neighboring countries (six European countries and the Russian Federation). Since transport component plays a significant role in the value of the product, it is advantageous to establish ties with neighbors, thus reducing transport costs;  
4. relatively developed transport system; 
5. availability of non-freezing ports of the Black Sea.  
The important tasks of the state transport policy in the sphere of interaction with the EU should be:  
– technical and technological modernization of the infrastructure of the checkpoints across the state border of Ukraine; 
– grounded reduction of the time of control procedures, simplification of control mechanisms at the points of entry through the state border of Ukraine; 
– accelerated development of the container service;  
– development of customs technologies, information systems and electronic document circulation, transit transportation infrastructure, which accelerates delivery and customs processing of transit goods and the formation of a multifunctional integrated electronic customs system;  
– integration into international customs databases; creation of an effective system of interstate information exchange and control at points of entry through the state border of Ukraine with full transition to a paperless information and communication environment;  
– improvement of the system of collection and distribution of customs statistics, which will enable to create a system of monitoring and forecasting of international transit of cargoes;  
– providing an effective system for controlling the weight and dimensions of vehicles at the checkpoints across the state border of Ukraine.

1. Karpenko, O.O. (2017). Yevropeisky vektor klasteryzatsii transportno-lohistychnykh pidpriemstv u ploshchyni informatsiino-komunikatsiinykh tehnolohii [European vector of clustering of transport and logistics enterprises in the field of information and communication technologies]. Kyiv: TOV «SIK HRUP UKRAINA». (in Ukrainian)  
2. Uhoda pro Asotsiatsiiu mizh Ukrainoiu, z odniiiei storony, ta Yevropefiskym Soiuzom, Yevropeiskym spivtovarystvom z atomoi enerhii i yikhnim derzhavamy -chlenamy, z inshoi storony. [Association Agreement between Ukraine on the one hand, the European Union, the European Atomic Energy Community and their member states on their part.] zakon.rada.gov.ua. Retrieved from: http://zakon3.rada.gov.ua/laws/show/984_011/page (in Ukrainian)  
3. Sidorov, V.I., & Azibekian, H.Ya. Rol suchasnykh lohistychnykh system v aktyvizatsii zovnishnoekonomichnoi diaalnosti v novykh krainakh-chlenakh YeS [The role of modern logistics systems in activating foreign trade activities in the new member states of the EU] btie.kart.edu.ua Retrieved from URL : http://btie.kart.edu.ua/article/download/57487/53772 (in Ukrainian)  
4. Platov, R.O. (1998). Evropejskaya transportnaya politika: tendencii i prioritety [European Transport Policy: Trends and Priorities] Vestnik tranzitnogo biznesa - Herald Transit Business, no. 41, pp. 6-8. (in Russian).  
5. Emirova, A.E. (2014). Transformation transportnyh sistem v usloviyah globalizacii mirovoj ekonomiki [Transformation of transport systems in the conditions of globalization of the world economy] Nauchnyj zhurnal NIUITMO. Seriya “Ekonomika i ekonomicheskij menedzhment [Scientific journal NYUTTO. Series "Economics and Economic Management"], no. 1, pp. 18-23. (in Russian)  
6. Prokof'eva, T.A., & Kliwenko, V.V. Metodologicheskie aspekty postroeniya klasternoj modeli transportno-logisticheskoj infrastruktury regiona. [Methodological aspects of building a cluster model of the region’s transport and logistics infrastructure.] www.lscm.ru Retrieved from: http://www.lscm.ru/index.php/ru/ro-rubrikam/item/1122. (in Russian)  
7. Kontseva, V.V., & Makarova T.V. (2009). Do pytannia vyboru mahistralei dlia analizu transportnykh potokiv [Prior to the selection of tools for the analysis of traffic flows]. Zbirnyk naukovyh prats DAAT.
I. M. Чучка, кандидат економічних наук, доцент, Закордонний член Угорської академії наук, доцент кафедри обліку і оподаткування та маркетингу, Мукачівський державний університет (Мукачево, Україна).

М. Гайдош, доктор філософії, професор, старший науковий співробітник, Центр суспільних та психологічних наук Словацької академії наук (Братислава, Словацька Республіка).

О. В. Гаврилець, кандидат економічних наук, доцент, доцент кафедри обліку і оподаткування та маркетингу, Мукачівський державний університет (Мукачево, Україна).

Роль інтермодальних логістичних центрів у посиленні транспортних коридорів
У статті зроблена спроба визначити передумови розвитку транспортної логістики в Європі та перспективи ефективного формування в прикордонному регіоні Закарпаття й в окремих аспектах України загалом. Вказано на сутність транспортних коридорів та їх реальну схему розгалуження на карті Європи. Відображено наслідки неефективної державної політики у сфері транспорту та їх значення для зовнішньоекономічних вантажопотоків в прикордонному Закарпатті. Досліджено сутність та значення транспортно-логістичних центрів та їх перспектив розвитку в контексті інтермодальних перевезень із Закарпаття в країні Європейського Союзу. А також проаналізовані окремі складові функціонування Захонського (Угорщина) перевантажувального центру.

Ключові слова: транспортна логістика, міжнародні транспортні коридори, інтермодальні перевезення, транспортно-логістичні центри, Захонський перевантажувальний центр.

Received to the editor February 11, 2019.