

Formation of transport-logistic clusters in Ukraine

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Abstract: Transport play an important role in the development of the economy. For efficient functioning of the transport system there should be not only high technical condition of rolling stock, but also developed transport infrastructure. The geographic position of Ukraine makes it a promising transit state. Thanks to the research, it has been found that in Ukraine there are priority terrestrial modes of transport in comparison with other types. Since transport is one of the main components of economic development, it is relevant to study this sector of the economy and identify prospective directions for improvement, namely the formation of Transport-Logistics Clusters (TLC) in Ukraine. Having analyzed the experience of other countries in the establishment of TLC, they have identified the benefits of different cluster strategies for the formation of TLCs in Ukraine.

Keywords: clustering, transport-logistic cluster, cluster, transport network.

1. Introduction

One of the main tasks of the present time for Ukraine is to increase the competitiveness of the national economy. Transport has a great influence on all spheres of the economy, as it provides the promotion of material flows in macro-logistics chains. The development of the transport-logistic system is one of the important components of the Ukrainian economy. Considering the experience of economically developed countries, it can be argued that in order to increase the level of technological potential of the country, it is necessary to introduce innovative methods into its general economic system.

One of the modern innovative technologies for the development of the transport-logistic system is the formation of a transport-logistic complex in Ukraine. This requires effective operation of the transport infrastructure, the attraction of an efficient rolling stock for the transport process, as well as investments to ensure the quality work and competitiveness of the transport industry in the European and domestic markets of transport services. The modern direction of improving the efficiency of transport sector enterprises is the creation of transport-logistic clusters.

Many foreign and domestic scientists consider issues relating to the functioning of cluster units and the peculiarities of the formation and development of transport-logistic clusters, among them: Porter M. [1], Solvell O. [2], Williams M. [2], Kergel H. [3], Hatsch S. [3], Delgado M. [4], Stern S. [4], Wennberg K. [5], Lindqvist G. [5], Ketels Ch. [6], Kovbatiuk M.V. [7], Doroshchuk V.O. [8], Chupaylenko O.A. [9, 10], Grytsenko S.I. [11], Karpenko O.O. [12], Goblyk V.V. [13], Ivanov S.V. [14], Popova N.V. [15], Volkovska G.G. [16], Yanovskyi P.O. [16] and many other.

In scientific works of these authors the theoretical and methodological aspects of cluster formation, the preconditions for their creation and influence on the competitiveness of the region, within which formed cluster structures, were studied.

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The founder of the cluster approach, M. Porter has defined the cluster as a concentration in the geographic region of interconnected and interrelated enterprises and institutions within a particular region [1].

Researchers O. Solwell and M. Williams in their work have considered the evolutionary and constructive factors which influence the mechanisms of cluster creation and determine its development and competitiveness [2].

In the work of the scientist K. Ketels [6] it has been put forward a hypothesis regarding the most effective policy of cluster support. It is a policy of cluster activation aimed at overcoming the negative factors that hinder the evolution of clusters, improving the business environment, infrastructure development, etc., which creating the conditions that allow the cluster to develop on its own.

Author Kovbatyuk M.V. in his scientific work has determined that the cluster represents itself a networked production and commercial structure that has the ability to concentrate and bring together related manufacturers, often even competing, for the purpose of co-operation for the production of competitive products [7]. This is confirmed by the development of a network of clusters in Europe and their integration into global, primary and secondary TLCs.

Doroshchuk V.O. is engaged in research of the concept of clusters. He has given a generalized definition of the concept of "cluster", having determined that the cluster is a territorial and voluntary association of business structures, scientific institutions, institutions of market infrastructure and institutions of the authorities for the purpose to increase the competitiveness of its own products and promote the economic development of the region and enhance the competitive advantages of each other through the effect of synergy [8]. They are created from a small (10-15 companies) and a large number of enterprises and structures (6-7 thousand companies) in various forms of associations and organizations. The cluster is considered as the geographical concentration of companies operating in a separate business, and the conglomeration of large and small firms, some of which may be the property of foreigners. They appear in traditional industries and in the areas of high technology, in the production and commercial segment or in the service sector, as well as in social spheres.

Author Chupaylenko O.A. in its researches has defined the transport-logistic cluster as a set of regional motor transport enterprises, representatives of enterprises of other types of transport, logistics companies, licensed warehouses, local authorities and research institutes in the form of associative unit with adequate financial contributions of participants, operating infrastructure, modern communications that enhance the interaction and benefits compared to other competitors, which allows to increase investment attractiveness and sustainable development of regional areas. They are divided into three categories: port, border and territorial (regional) [9].

Author Grytsenko S.I. in his monograph has described the concept of a transport-logistic cluster, which involves the unification of certain regional, functional and economically connected logistics units: international transport corridors, transport nodes of main infrastructure, transport and distribution logistics centers, main, regional and local routes of connection into a single system of transportation process, able to provide high-quality logistic service to internal or external consumers in minimizing general logistics expenses [11].

Having examined the work of clusters, author Karpenko O.O. has determined that the creation of clusters will contribute to the growth of productivity and innovative activity of enterprises that are the parts of the cluster, as well as to increase the intensity of development of small and medium enterprises, to increase the attraction of investments, will help accelerate socio-economic development of regions, where the cluster will placement, which will allow to increase the number of jobs, salaries, revenues to budgets of all levels, increase the stability and the competitiveness of the regional economy [12].

Among the strategic priorities of the European Commission is the development of cluster concepts, since cluster policy has been recognized as one of the foundations for building Europe's competitiveness and its dynamic development through the introduction of innovations. The purpose of the European Commission for clusters is to maximize the contribution of clusters to the development of the European economy, the growth of entrepreneurship and the enhancement of regional economic competitiveness [17].

3. Materials and Methods

An essential condition for obtaining new knowledge on the basis of discovered scientific facts during the conduct of scientific research is the use of well-founded scientific research methods. Obtaining the desired result directly depends on the original theoretical position, from the principle approach to the problem statement and the definition of the path of research.

In order to reveal the theoretical foundations, peculiarities and characteristics of the processes of formation of transport-logistic clusters in Ukraine, a statistical analysis of the activity of international transport-logistic clusters and indicators of activity of the transport industry of Ukraine and modes of transport included in its transport system was used, and the general scientific methods of research were used: method of empirical research (monitoring, comparison), method of theoretical research (formalization), general methods of research (analysis, synthesis, analogy).

4. Results

The leading countries of the world with high indicators of development of the national economy have achieved their competitiveness through the introduction of innovative technologies.

The world experience of recent decades confirms that cluster initiatives are rapidly expanding in developed countries. Due to the fact that a number of states have a federal structure, in some of them the cluster policy began to be implemented at the regional level earlier than at the federal level. According to the European cluster observatory in Europe there are more than 2 thousand regional clusters, and the potential for the development of cluster entities for the future is estimated at 9 thousand units [18].

In the EU countries, demand for transport-logistics services is growing every year. One of the most promising technologies at present time is the formation of Transport-Logistic Clusters (TLCs). There are more than 86 logistic clusters in the territory of Europe, of which about 25 are the main ones that can be considered as global clusters of European significance (through them pass the main cargo flows), as well as about 60 secondary clusters. The qualitative functioning of the TLC will contribute to the high level of service of transport and logistics consumers. In this case, it is necessary to take into account the needs and wishes of consumers, to establish a strong relationship between all enterprises involved in the process of cargo transportation, which will promote competitiveness and customer satisfaction with logistics services.

EU countries adhere to the principles of the operation of TLCs, which allow the provision of quality logistics services, the main of which are:

- the offer of the most complete list of transport and related services on the basis of contractual relations with each participant of the logistics chain (the formation of a data bank of logistic chains);
- organization of complex transport services on the basis of a single contract for integrated services and a single order for all services, the formation of tasks for participants of the logistics chain based on the order of the user of transport services, centralized control of the order fulfillment;
- standardization and unification of transport and other documents used by participants in logistics chains and which are necessary for carrying out transportation, in order to ensure the possibility of creating a single information space;
- development of a unified marketing strategy and tactics of logistics chain participants in the market of transport services, joint conducting market researches and marketing activities that ensure the promotion of all participants in the logistics chain in the market of transport services and formation of demand for integrated transport services;
- the distribution of structural units of the cluster on a geographic basis in order to maximize the coverage of the market of transport services, the implementation of operational management of the work of logistics chains in the places of formation and intersection of freight traffic;
- organization of cooperation with Ukrainian and international organizations involved in transport logistics;
- development of organizational principles of work on the basis of world standards and international treaties, agreements, conventions;
- integration with international logistics centers and provision of information exchange;

- standardization of information interaction of logistic chains of participants of the international transport-logistic cluster [13].

Joining the cluster it gives a number of benefits to the enterprises and institutions that it includes, the main of which are: a clearer orientation to the market of transport services and the possibility of adjusting it to the needs of consumers; the opportunity for the cluster participants to more effectively defend their interests at the level of local authorities, participate in large investment projects and join the joint promising program of their development. The transport-logistic cluster should include transport, transport-logistics enterprises, as well as enterprises that serve the service, institutions of legislative and executive power of different levels. Carrying out high-quality transport activity depends on cooperation of business, science and authorities. Therefore, the formation of a transport-logistic cluster is influenced by certain sectors, such as the manufacturing sector, the administrative sector, the transport-logistic sector, the service sector, the financial sector, the innovation sector (specialized universities, research institutes that develop new innovative methods for implementation in the transport process, consulting centers), state-legal sector [19].

The geographic and geopolitical position of Ukraine is positioning it as a country with a high transit rate. According to forecasts, 5 of the 11 branches of Hyperloop high-speed ground transport can pass through the territory of Ukraine, of which three pass through Kyiv: the first will connect China, Europe and Canada; the second one - Asia, the Middle East, Europe and North Africa; the third - Spain and China [14]. The main part of clusters is expected to be formed at the intersection of main cargo streams and in places of passage of transport corridors, which allows to reach the objects of warehouse infrastructure. Therefore, the formation of TLC will provide the need for both external and internal logistics services.

Today, the world practice of forming and functioning TLC considers several models that have their own peculiarities in work. There are three varieties of clusters: scientific clusters, transferring their technologies to industry; clusters that combine research and production; clusters that arise on the basis of innovative firms operating in a competitive environment.

The Italian cluster model consists of a set of small firms (small and medium enterprises), which are united in various associations to enhance their competitiveness. In this model, the state plays a significant role, providing its support. Significant role in the development of Italian clusters has "collective institutes" - national conferences, industrial parks, financial and marketing consortia, technological institutes [15, 16].

The peculiarity of the American model of the cluster is the joint activity of state structures, industrial enterprises and academic organizations. Such a model of cluster development is aimed at increasing global competitiveness on the basis of scientific and technological advances and innovations.

In the German model of clustering, the preference is given to the development of the economy on the basis of high technology - this is precisely in this direction the consolidation of the efforts of industrial and scientific centers.

The British model of clustering involves reviewing the priorities of industrial policy, which results is the formation of a so-called promising technological program on the basis of a mixed sector-cluster approach [15]. An example of the operation of the British TLC model can be the see cluster, which was established in 2003. Its aim was to increase investment in the industry and increase its efficiency at the local, regional, national and international levels.

An important component of the TLC is transport and its infrastructure. For a better understanding of the opportunities and prospects of an indicative selection of a TLC model for Ukraine, we need to consider trends in transport and transport infrastructure development in our country, using statistical data [20].

The analysis of freight volumes (Figure 1) has showed that there has been a tendency for their increase during the last four years, even though the volume of transportation in 2018 decreased by 4.9% compared to 2017. However, compared to 2015, volumes of transportation grew by 8.7%.

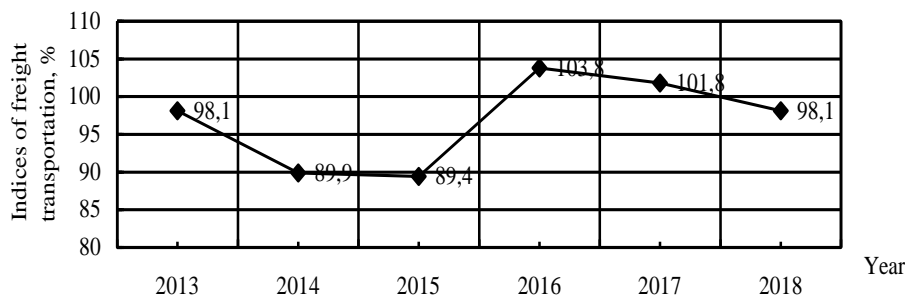


Figure 1. Indices of freight transportation (percentage to the previous year) for the period 2013-2018

Transportation of goods by land transport in the period of 2013-2017 was a priority (Table 1).

Table 1. Volumes of freight transportation by types of transport, (million tons)

Type of transport	Year					
	2013	2014	2015	2016	2017	2018
Rail	441,8	387,0	350,0	344,1	339,5	322,3
Road	183,5	178,4	147,3	166,9	175,6	187,2
Pipeline	125,9	99,7	97,2	106,7	114,8	109,4
Water	6,3	6,0	6,4	6,7	5,9	5,6
Air	0,1	0,1	0,1	0,07	0,1	0,1

In the last five years there has been a tendency to increase volumes of transportation of freights by rolling stock of road transport (Table 2). Thus, in 2018 more than 29% of the total volume of freight transportation was carried out by road transport. Compared to 2013, the specific gravity of road transport increased by more than 5%. In 2018, the specific gravity of freight transportation by rail was 51.6% of the total volume and decreased by almost 7% compared to 2013.

Table 2. Specific gravity of types of transport in freight transportation, (%)

Type of transport	Year					
	2013	2014	2015	2016	2017	2018
Rail	58,32	57,66	58,24	55,10	53,39	51,60
Road	24,22	26,58	24,51	26,73	27,61	29,97
Pipeline	16,62	14,85	16,17	17,09	18,05	17,52
Water	0,83	0,89	1,06	1,07	0,93	0,89
Air	0,01	0,01	0,02	0,01	0,02	0,02

The contribution of various types of transport to freight turnover for the period 2013-2018 is shown in Table 3.

Table 3. Freight turnover by type of transport and percentage of growth / decrease to the previous year, (million ton-kilometers / %)

Year	Type of transport									
	Rail		Road		Pipeline		Water		Air	
	million tkm	%	million tkm	%	million tkm	%	million tkm	%	million tkm	%
2013	224017,8	94,2	40487,2	103,2	109651,8	98,2	4615,2	86,7	273,0	75,2
2014	209634,3	95,5	37764,2	94,9	82050,9	118,5	5462,3	73,6	240,0	88,3
2015	194321,6	92,5	34431,1	91,2	80944,1	100,1	5434,1	98,9	210,9	88,2
2016	187215,6	96,0	37654,9	109,1	94378,9	117,0	3998,6	73,6	225,9	107,0
2017	191914,1	102,3	41178,8	108,4	105434,4	111,7	4257,1	106,3	272,7	120,5
2018	186334,1	97,1	42569,5	102,7	99239,9	94,1	3363,0	78,7	339,7	123,4

Analysis of the dynamics of freight flows for the period 2015-2018 showed a tendency to reduce the carrying out of transport work by all types of transport, except for road (Figure 2).

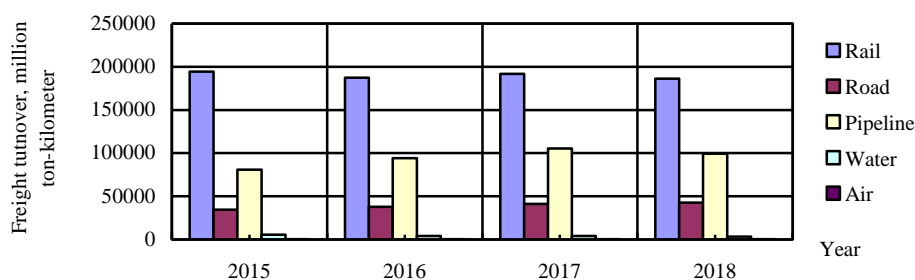


Figure 2. Dynamics of freight turnover by types of transport for the period 2015-2018 years

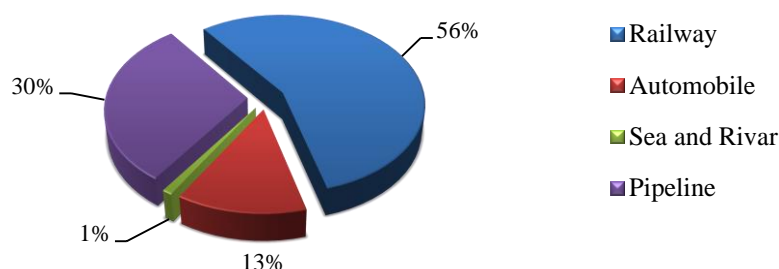


Figure 3. Structure of freight turnover by types of transport for 2018 (in percent)

At the same time, in the first place, as in the analogous period of 2017, rail transport remains. According to the results of the analysis of the data in 2018, freight turnover by rail decreased by 3% compared to the previous year. For the last three years, freight turnover by road transport has a steady upward trend. In 2018, it increased by more than 3% compared with 2017.

There is a tendency to fluctuate data on the average distance of freight transportation by different types of transport (Table 4). According to the data of the table in recent years there is an increase in the average distance of transportation of 1 ton of freight by all types of transport, except water.

Table 4. The average distance of transportation of 1 ton of freight by different

types of transport, (km)

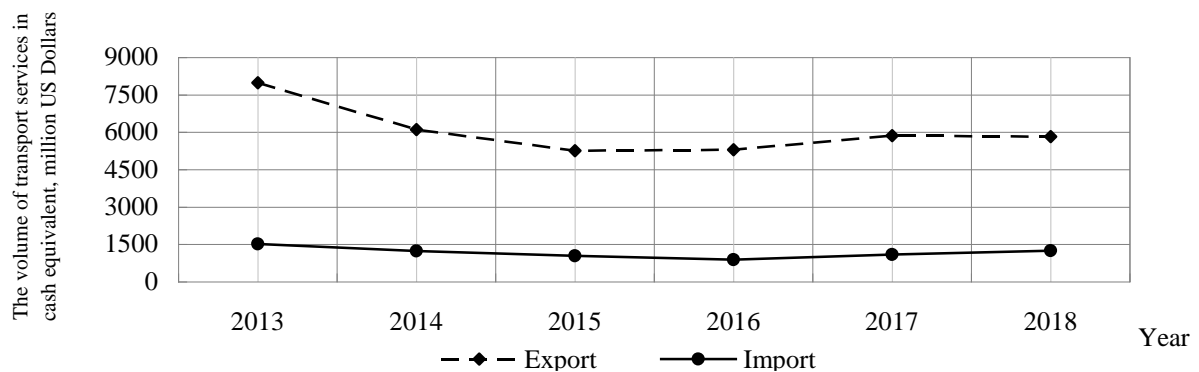
Type of transport	Year					
	2013	2014	2015	2016	2017	2018
Rail	507,0	541,7	555,2	544,1	565,3	578,1
Road	220,3	211,7	233,7	225,6	234,5	227,4
Pipeline	870,9	823,0	832,7	884,5	918,4	907,1
Water	732,6	910,4	849,1	596,8	721,5	601,6
Air	2730,0	2400,0	2109,0	3227,1	2727,0	3397,0

An analysis of the transport sector in the provision of services (Table 5) shows that the volumes of transport services provided in 2018 amounted to almost 5% of the total volume of services sold by enterprises of various types of economic activity. The largest specific gravity has the services of transport, warehousing and enterprises that provide transport services and belonging to the transport infrastructure.

Table 5. Volumes of realized transport services in 2018 for categories of consumers, (million UAH /%)

Service	Volume of services that has been implemented, million UAH	Distribution of services implemented by different categories of consumers (% to total volume)		
		for the population	for businesses	for other categories of consumers
Services provided by enterprises in the sphere of services in different types of activities	7387326,3	22,3	65,9	11,8
Services provided by transport companies	208148,3	14,4	66,4	19,2
Services provided by warehousing and enterprises that provide transport services	135942,4	1,9	92,7	5,4

Ukraine is an active participant in the international transport services market. It has significant potential to increase offers to external parterres and expand their capacity to deliver. Analysis of the dynamics of the transport services structure provided in the "export" and "import" modes (Figure 4) shows that there is a tendency for exports to prevail over imports. But the current tendency to gradually increase the volume of transport services in the mode of "import" shows the growing demand for domestic transport services in the international market.

**Figure 4.** Volumes of transport services in the customs export and import modes for the period 2013-2018 years

Analysis of the volume of provision of transport services in different customs modes by various types of transport (Figure 5, Figure 6), allows us to conclude that in the export mode, the highest rates have a pipeline transport, but in the mode of import the most popular are air and rail transport. It should be noted that for the last three years, the volume of provision of transport services in different customs modes by all types of transport has a steady tendency to increase.

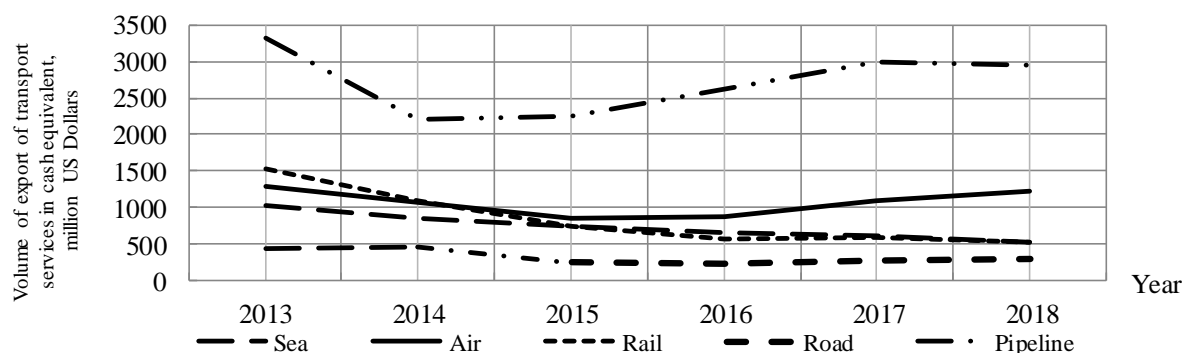


Figure 5. Volumes of transport services in the mode of "export" by different types of transport for the period 2013-2018

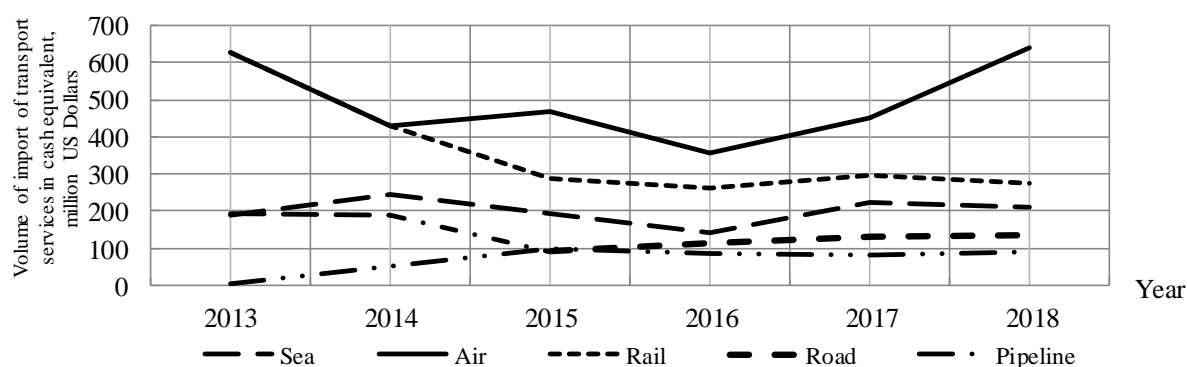


Figure 6. Volumes of transport services in the mode of "import" by different types of transport for the period 2013-2018

Research and analysis of the indicators of the transport industry has shown that they have ambiguous dynamics. The factors influencing the volatility of volumes of freight transportation may include such as the reduction of industrial production due to the external markets, the reduction of domestic demand due to the decrease in purchasing power of the population.

5. Discussion

Ukraine's orientation towards European integration and market transformations, a positive trend towards increased a cargo flows to the European Union requires solutions to issues related to ensuring competitiveness of the transport industry enterprises of the country, scientific substantiation of the possibilities of Ukraine's integration into the European transport system and development of its transport sector by creating effective transport-logistic clusters taking into account the experience of developed countries of the world. Formation of transport-logistics clusters will increase the competitiveness of the transport industry both at the national and regional levels, which will facilitate the process of integration of Ukraine's transport network into European and world transport and trade networks [19]. Introduction of clustering in the processes of management of the transport industry activity contributes to the formation of a new strategy of cooperation between enterprises that are part of the transport- logistics cluster, to increase the efficiency of their operation and promotes the development of the transport sector of the country. Clustering provides the opportunity to increase the competitiveness of the economy of regions and the state as a whole. Due to clustering, opportunities for combining enterprises, organizations and institutions in both separate regions and countries can be

considered in order to increase the efficiency of their activities, to facilitate the formation of new enterprises taking into account their favorable geographical location and the creation of new jobs.

The state, regional and local structures of Ukraine have begun the introduction of clustering in the processes of formation, management and optimization of competitive units in various sectors of social production. The development of clustering in Europe should positively affect the formation of TLCs in Ukraine. Formation of a cluster unit leads to increased competitiveness, the formation of a new strategy for cooperation between enterprises, organizations and institutions of various levels. Cluster associations can perform various functions - industrial, technological, innovative and others. A fundamentally new direction is the use of cluster capabilities in providing information and educational activities, conducting on the basis of clusters of educational and scientific work, creation of advisory and training centers on the development of the transport industry. Taking into account the passage through Ukraine of four out of ten pan-European transport corridors (No. 3; No. 5; No. 7; No. 9) and four transcontinental transport corridors (Europe-Asia, TRACEKA, Baltyka-Black Sea, Black Sea transport ring), and also extremely advantageous transit status of Ukraine, it is possible to talk about the creation of a network of main and major transport-logistic clusters on the territory of Ukraine as an integral part of the pan-European network of TLCs [10].

The transport network of Ukraine has a powerful potential for the efficient operation of transport-logistics clusters. Currently, there are about 50 clusters operating in Ukraine, among which the following can be distinguished: Carpathian region (transport-logistic cluster); Odessa region (cluster "Odessa"); Kherson region (transport-logistic cluster "Southern Gates of Ukraine"). The most promising cluster centers can be considered such large cities as Kiev, Kharkiv, Zaporizhzhia, Odessa, as they are the leading centers of railways and highways of their region.

According to its specificity and territoriality, two categories can be distinguished among clusters: it is the port (Izmail, Bilhorod-Dnistrovsky, Illichivsk, Odessa, Southern, Mykolaiv, Kherson, Mariupol, Zaporizhzhia, Dnipro, and others) and internal ones, which can be divided into border (Kovel, Chop, Kharkiv, Chernihiv and others) and regional (Kyiv, Zhytomyr, Vinnytsia, Poltava, Sumy, Dnipro, Kirovograd, Lviv and others).

One of the important cluster is the Odessa cluster due to its ability to integrate into the trans-European transport network TEN-T and provide transit of goods between the major economic centers of the world: the Asia-Pacific region and the European Union.

Its main components are:

- multimodal transport corridors of Ukraine;
- deep-water port in Hadjibei estuary;
- cargo terminal of Odessa airport;
- International Center for High Technology B-ZONE;
- a comprehensive line of electric transport of Odessa agglomeration;
- Green Island in the center of Odessa.

Such a powerful potential of this cluster could allow it to become the largest port-industrial complex of Eurasia [21].

6. Conclusions

The foreign experience of using a cluster approach to the formation of transport-logistic clusters has shown that at present there are no universal approaches in solving this issue. Each country develops its own models and approaches to creating clusters and managing their development, taking into account the availability of natural, technological, financial, labor and intellectual resources.

An analysis of the models of TLC functioning in the leading countries of the world, an analysis of the state and trends of the transport industry in Ukraine over the last years, allows us to conclude that the Italian model is the closest to the implementation in Ukraine. In the Italian model of the cluster the focus of its operation is given to small competing firms that unite to enhance competitiveness. In such a cluster model, the state exercises its influence at the level of local self-government.

The formation of transport-logistics clusters is an innovative and promising direction for improving the efficiency of the transport industry in Ukraine. The basis for forming a transport-logistic cluster should be the transport, logistics and other enterprises that serve the service function, as well as the legislative and executive institutions of different levels. Merge into a cluster has a number of

benefits for enterprises, organizations and institutions that it includes, the main of which are: a clearer focus on the market of transport services and the ability to respond promptly to its needs. Therefore, the development of theoretical foundations for the formation of TLCs is a topical issue and it needs further research.

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