

ЛОГИСТИЧЕСКИЕ КЛАСТЕРЫ: ИСТОКИ ФОРМИРОВАНИЯ И ПЕРСПЕКТИВЫ РАЗВИТИЯ

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История создания кластеров тесно переплетена с историей развития логистики. Взаимодействие субъектов хозяйствования в рамках кластерных образований позволяет эффективнее использовать благоприятные конъюнктурные условия мировых рынков. Исследование научных работ по данной теме дало возможность представить генезис развития кластеров как совокупность факторов и условий формирования, имеющих уникальные характеристики на каждом историческом этапе. Это позволило дать классификационную характеристику понятия «логистический кластер», описать условия его формирования, участников и направления (специализации) развития. Логистический кластер, являясь сетевой формой взаимодействия предприятий и организаций, усиливает их конкурентные преимущества и смягчает негативные воздействия межстрановой конкуренции. Определение специализации территории и использование европейского опыта в части построения кластерных образований делают возможной реализацию интеграции субъектов хозяйствования регионов в рамках создания ресурсной и процессной синергии логистической системы.

Ключевые слова: логистическая система; кластер; сетевое взаимодействие; регион; территория.

LOGISTICS CLUSTERS: ORIGINS OF FORMATION AND DEVELOPMENT PROSPECTS

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The history of the creation of clusters is closely intertwined with the history of the development of logistics. The interaction of business entities within the framework of cluster formations allows more efficient use of favorable market conditions in world markets. A study of scientific papers on this topic made it possible to present the genesis of cluster development as a combination of factors and formation conditions having unique characteristics at each historical stage. This made it possible to give a classification characterisation of the concept of «logistics cluster», to describe the conditions for its formation, participants and development directions (specialisation). The logistics cluster, as a network form of interaction between enterprises and organisations, enhances their competitive advantages and mitigates the negative effects of cross-country competition. The determination of the specialisation of the territory and the use of European experience in building cluster entities make it possible to integrate regional business entities in the framework of creating resource and process synergies of the logistics system.

Keywords: logistic system; cluster; network interaction; region; territory.

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The implementation of the most countries strategies in the field of cluster policy has revealed one undoubted nuance: they all differ according to their national traditions and the culture of the cluster formation process. The advantages, disadvantages and opportunities for developing such networked forms of counterparty interaction are examined in sufficient detail by O. A. Freidman [1], G. A. Yasheva [2] and other researchers in a number of publications devoted to this problem.

In most cases, subjective recommendations are based on the individual experience of the developer in organising clusters, in particular logistics [2–4]. This situation is connected with the relative novelty of the analysed problem in domestic economic science and with the fact that the formation of regional clusters is limited by the level of the economy and their narrow geography.

Considering the history of the development of clusters, it should be noted that the first cluster theory, as well as the definition of the concept of cluster were developed and applied by M. Porter in the study of competitiveness problems. «Clusters are geographic concentrations of interconnected companies or institutions that manufacture products or deliver services to a particular field or industry» [5, p. 78]. Closely related to this point of view, the following definition of a cluster is «a territorial-sectoral voluntary association of structures that works closely with scientific institutions and authorities in order to increase the competitiveness of products and the region's economic growth» [6, p. 5]. Similarly, the content will be the definition of «clusters of firms as a group of companies located nearby. In some cases, such concentrations form groups of companies that belong to the same industry» [7, p. 7]. It should be noted that the common characteristic features, in addition to mentioned, include the presence of research universities, entities primarily from small private companies as well as an experience of their employees in various organisations of the relevant industry.

M. Porter also notes that the boundaries of clusters are wider than the industry, because include related industries and cover a significant number of various types of entrepreneurial structures that are important for competition. In addition, «...many clusters include government bodies and other institutions – such as universities, standardisation centres, trade associations that provide education, specialised retraining, information, research and technical support» [5, p. 79].

Representing the composition of the main participants in the clusters, M. Porter defined them as «a group of independent and informally related companies and institutions, representing a reliable organisational form that offers advantages in efficiency and flexibility» [8]. However, it is necessary to take into account the fact that with the expansion of the knowledge-based economy, the active presence of participants from higher education, research organisations and the state is increasingly seen as a decisive factor for the development of clusters. Moreover, clusters are understood as regional innovation systems. According to this theory, the development of regions is subject to the laws of cluster development – system formations that have a group of closely specialised businesses that rely on the business and form the central core of the territory specialisation. Competitive clusters help cities, regions and countries to carry out rational interaction of business entities and meet the socio-economic problems of globalisation.

The American researcher V. Price wrote that «the creation of clusters and the introduction of a cluster model of organisational behaviour is a way to restore trust between government and business and transform isolated firms into an entrepreneurial community» [9, p. 3]. In other words, a cluster is a concentration of the most effective and interrelated types of economic activity, i. e. the set of successfully competing firms that form the «golden section» of the entire economic system of the state, providing competitive positions in the industry, national and world markets [10].

The evolution of this category in logistics should be considered from the point of view of continuity, variability and adaptability to the economic system within which clusters get their development.

The study of the authors reasoning in the field of cluster interaction [1; 9–16] allowed us to conditionally distinguish three periods of the logistics clusters development (see fig. 1):

- 1) practical development period (1990–2000s);
- 2) the network period (2000s–2010);
- 3) system period (2010s – nowadays).

Periods differ in cluster approaches. The structure of the logistics cluster developed at the University of Augsburg (Germany) is of particular interest. A good example of practical development is the creation of cargo nodes, which are clusters of the first (lower) level of this structure.

The hub may include simple storage space for trading companies, production and distribution networks. In principle, a cargo hub is a place, where goods change the mode of transport in the transport chain, which happens by prior arrangement or will happen later with subsequent storage of the cargo [16]. The first distribution centre based on the logistics cluster model was built in Bremen (Germany) in 1985.

The system period is characterised by the identification of the network essence of clusters. This was facilitated by the large-scale cluster mapping carried out in the USA and the EU, expanding the idea of clusters, the conditions for their creation, existence and place in the economy. Further development of logistics clusters is

based on the concept of a freight transport centre, which plays a major role in optimising intermodal transport. Their formation has led to a decrease in total transportation costs, a reduction in the time of delivery of goods to consumers, decrease in stocks, and shift in the part of cargo flows from road to rail. An example of such a transformation can be considered organisation Europlatforms, which is the European Association «Freight village». In these transport centres (second-level cluster), the relations between transport companies, logistics companies and companies with transport needs are regulated. At this level, network processes arise.

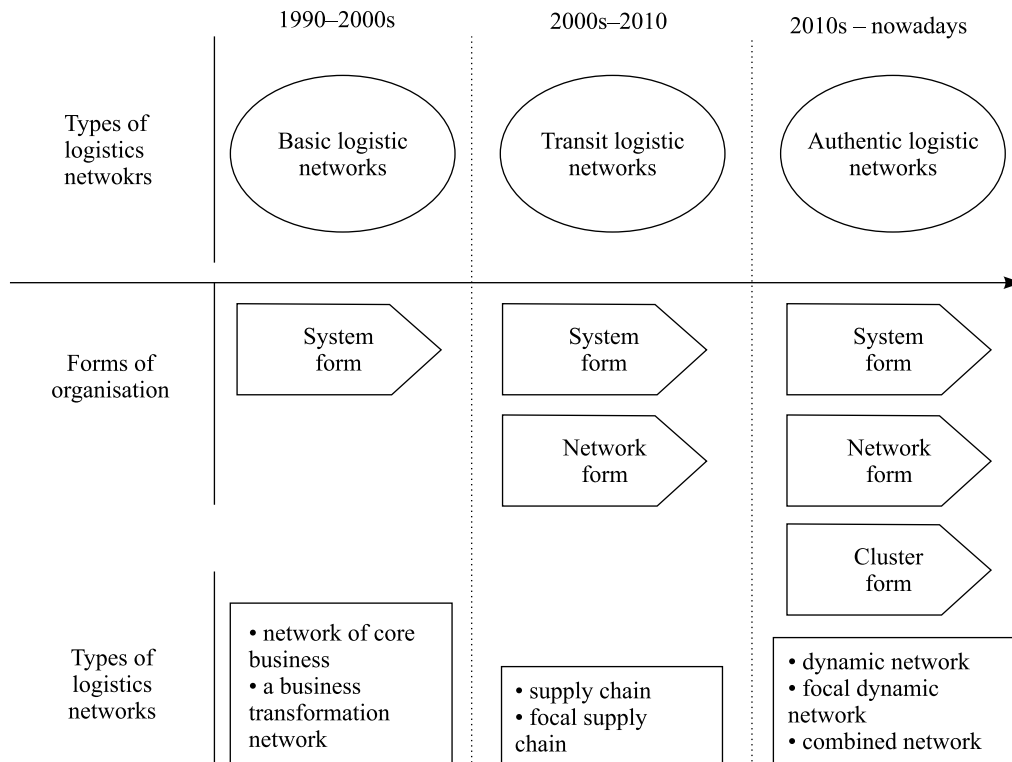


Fig. 1. The evolution of organisational forms of logistics networks.

Source: the authour own research results

A number of papers [1; 12] noted the fact that researchers do not distinguish between the terms «cluster» and «network». However, the two terms must be separated. Networks are characterised by interconnections and cooperation between individual companies and can be created at the national and international levels. Clusters are a regional phenomenon, and they are based on cooperation and competition. A network at the regional level can be part of a cluster (but not necessarily), in which case the cluster can be classified as «network type clusters». Clusters can have subnets, within which so called actors (an actor is an acting entity), an individual, a social group, organisation, institution or people community perform actions directed at others [17, p. 21].

Based on this logic, the consideration of the cluster as the main form of network organisation of intercompany interaction in the region is not entirely correct, the main cluster characteristics are missed, essence of a cluster is revealed through the interconnections of its member organisations, whose activities are value chains. So, clusters are organised as a system of flows, a system of supply chains.

The third-level cluster can be considered a logistics agglomeration, which is a regional concentration of logistics companies, specialised suppliers, service providers and associations, relevant educational institutions and research institutions [14]. Clusters of the third level include the network of transport and logistics clusters (TLC) formed in the European Union (EU) (fig. 2) consisting of 80 structural units.

The main component of multimodal logistics agglomeration is a freight transportation center. At the top of this multi-level system is a logistics cluster, which is a regional agglomeration of logistics companies, logistics industries, specialised suppliers, and service providers organised in multidimensional networks [13].

In general, logistics clusters are similar to economic clusters, combining the features of logistics systems and economic clusters, obeying the general principles of functioning and development of complex organisational systems. Because of this, the logistics cluster is a specially organised logistics system – the concentration of logistics activity, which is shown by groups of firms and organisations aimed at organisational, structural, and organisational and analytical improvement of flow processes and flow functions of any content in the logistics cycle [18].

The structure of the logistics cluster, as a rule, is formed by organisations and enterprises connected by uniform material, information and financial flows. «A logistics cluster is a sustainable interaction of independent geographically concentrated market entities that implement logistics functions, the efforts of which are aimed at maintaining a full cycle of main and associated flows and through optimisation of resources from source suppliers to final consumers» [19, p. 78]. However, some features of this definition can be attributed only to the logistics cluster.

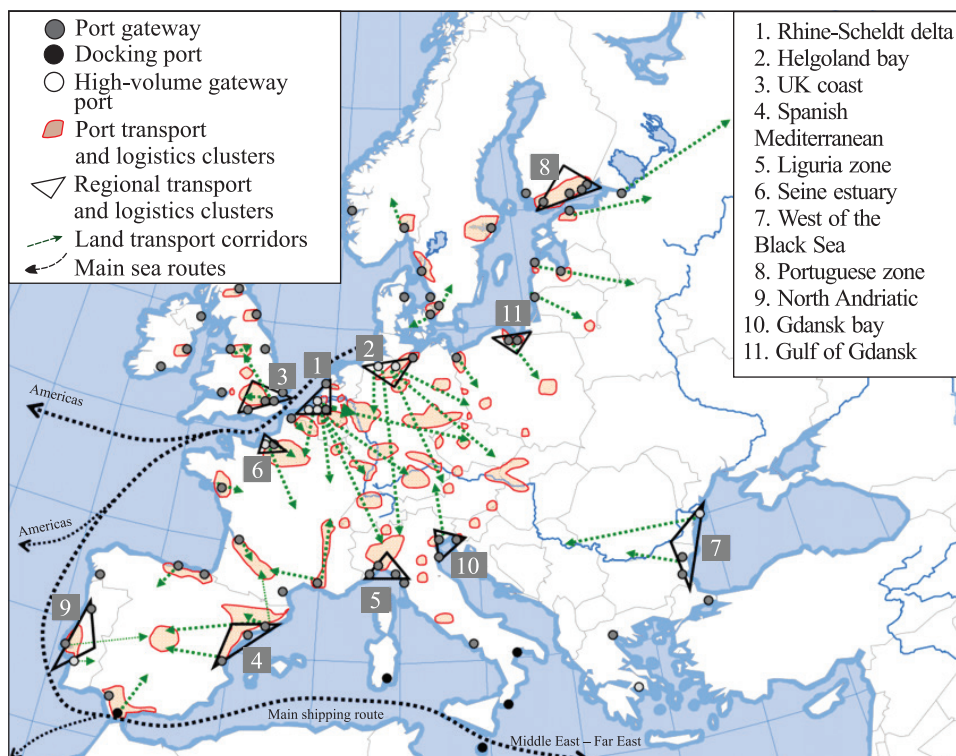


Fig. 2. European network of transport and logistic clusters: the interaction of port and intercontinental clusters. Source: [15, p. 73]

The classification presented in [12] covers almost the entire spectrum of features by which clusters in the economy can be systematised, but it does not always reflect the presence of a logistic component.

Typically, classification of logistics clusters contains the following groups: displays form (transport, customs, industrial and innovative logistics), a number of serviced economic clusters (monologicistic, duologicistic and heterologicistic clusters), signs of territorial positioning (port, regional, border), functional attribute (areas of operating activities and the number of logistics operations and functions implemented by enterprises and organisations of the cluster).

In some researches [20] the concept of «logistics cluster» is considered as applied to a certain type of activity. In the region clustering, i. e. in the logistic integration of territories and business sectors, the development of transport infrastructure is crucial. Infrastructure, as a rule, has a multiplier effect, in other words, investments in this area have a stimulating effect on the development of production and employment in other industries.

The logistics cluster often manifests itself in the form of a transport and logistics cluster, the main purpose of which is to develop transport infrastructure and improve transport services. A cluster of this type cannot be capable without concentration centres of freight flows, freight forwarding, repair and service enterprises, insurance companies, institutions that form the scientific and personnel basis of the cluster and other functional structures.

In the theory and practice of logistics, there are two concepts: «logistics cluster» and «transport and logistics cluster». Analysing the research of domestic and foreign scientists in the field of logistics clusters [20–22], it should be noted that most of them use the term «transport and logistics cluster». Clusters of this type are associated with transit flows and they are located in the regions, through which international transit corridors pass.

Transport and logistics clusters include complex infernal infrastructure, companies specialising in delivering of goods and passengers, companies specialising in the river, land, air transportation, logistics complexes.

The transport and logistics cluster combines regionally, functionally and economically interconnected logistics links: international transport corridors, transport hubs, transport and distribution logistics centres, regional and local routes into a single transportation process system that can provide high-quality logistics service to internal or external consumers minimising overall logistics costs at the same time.

Of course, logistics or transport-logistics clusters, being sources of achieving competitive advantages better use important business links, complementarily of its industry, the dissemination of technology, information, etc., than other industries. This is due to the fact that the most participants do not directly compete with each other, but simply serve different segments of the industry. The organisation of such groups of companies allows us to identify favourable opportunities for coordination and mutual cooperation in the spheres of common interests.

Connections between organisations in a cluster can be of a different nature. They include relations between the main company and suppliers, between the suppliers themselves, interaction with suppliers of equipment and specialised services, between companies, universities and research institutes in the framework of cooperation in the implementation of common R&D and educational programs. Contacts between small and medium-sized companies can also be associated with the coordination of their efforts to collectively promote goods and services to existing and new markets [23].

So the integration and coordination management of mentioned economic facilities, united by a commonality of material and accompanying flows, allows obtaining a synergistic effect both in the economic and social spheres. By synthesising the logistic and clustered approaches to management in logistic systems, we can get the highest positive effect in the economic and social spheres of each region.

A unique foundation of national policy in many European countries is the policy of cluster development. The formation of logistics clusters in the system of international transport corridors, their further development in border regions increase the transit potential of any country in the global system of Euro-Asian international transport corridors.

The European network of transport and logistics clusters (TLC) is a three-level hierarchy [15]:

- 1) port TLC;
- 2) border TLC;
- 3) territorial (regional) TLC.

Port TLCs are formed on the basis of seaports and they mainly operate in cargo sector. At the same time, passenger seaports, where they exist, can be components TLCs'ports.

Today river ports, due to the general decrease of the inland waterways and river transport, are not the basis for the cluster formation, but they can be an important part of territorial TLCs. The exception is ports located on inland waterways, but accessible to sea vessels (e. g., ports in the lower reaches of rivers), that is, functionally being sea ports.

Border and regional TLCs can be combined into the category of intercontinental TLCs. Border TLCs are formed on the basis of transport hubs at the intersections of large international transport corridors with state borders. As a rule, they have a cargo specialisation. Historically, clusters of this type developed on the basis of railway border crossings. However, at present, in many TLCs truck operations are commensurate with railway ones, or even surpass them.

Regional TLCs are formed on the basis of transport systems of medium and large cities, as well as urban agglomerations, where the city is integrated with suburbs and other closely located settlements. In the regional clusters there are passenger and cargo sectors. These two sectors share a common infrastructure. At the same time, each sector has own specialised infrastructure. In particular, the main differences between regional transport and logistics clusters from urban transport systems (complexes) can be distinguished:

1) clusters does not include the entire transport system, but only those firms, which are in close relation to each other;

2) a cluster can include not only transport companies, but also enterprises of other local infrastructure sectors that are integrated into it, e. g., transport service institutions (gas station networks, traction substations), vocational education institutions (for training and retraining personnel for the cluster), research and development organisations in the field of transport, logistics companies, etc.

At one or another stage of development regional TLCs can be found in any large city. With a minimum level of development, they serve the needs for freight transportation and population mobility only within the territory of the city itself (urban agglomeration). These are clusters based on urban transport systems.

A study of scientific sources [22; 24; 25] and the practice of organising clusters showed that significant differences are determined by the national and regional characteristics of the economies of countries, caused by the specialisation of regions.

A very interesting study on the cluster analysis of economics (cluster mapping project) was conducted by the Institute of Strategy and Competitiveness at Harvard University, led by M. Porter.

In this project, all sectors of the economy, followed by the clusters and presented in the Standard industrial classification code (hereinafter – SIC code) are divided into three categories: local, resource dependency and merchandising. M. Porter observed that the diversity of clusters, and not the diversity of industries, is the best indicator of diversification of the economy. Mutually overlapping clusters form a stronger economy than a set of unconnected clusters [4].

It should be noted that transport and logistics are classified in this study as a trading cluster (transportation and logistics), while water transport (NED water transport) is classified as resource-dependent clusters, local logistical services, local motor vehicle products and services to the local clusters group of the US economy.

The principles and factors affecting the organisation and functioning of regional logistics clusters, as well as the positioning of the functional cycle of order execution within the organisational framework of global cluster cooperation and its impact on increasing their competitiveness, have been studied by many national and foreign scientists [1; 10; 15; 16].

Factors determining the functioning and development of cluster formations are presented in the table.

Factors of logistics clusters environment formation

Factors' types	Scope
The ability to enter foreign markets	Assessment of barriers to entry Market share Customs barriers
Competition	Assessment of the competition level in the industry and foreign market
Infrastructure	The level of the networks of highways, railways, river or seaports, airports The level of storage facilities ICT level Accessibility and cost of electricity connection and utilities The existence of specialised suppliers, that is, software developers for logistics
Financial resources	Availability of financing (public, private) Availability of loans and their interest rates
Human resources	The skill level of employees The number of colleges and universities graduates in the required specialties The existence of specialised educational institutions that offer special courses and training related to transport industry
Administrative regulation	The existence of free economic zones, specialised technology parks and other institutions Assessment of administrative barriers
Investments	Customs and taxes benefits and advantages Investing in the industry

Source: the author own research results.

The study of formation factors allows us to identify the most important and typical for both foreign and national logistics clusters features:

- territorial concentration;
- interaction of manufacturing, transport companies, educational institutions, and others specialising in certain spheres of the economy of this territory;
- active participation of regional and local authorities.

A certain impact on the formation and development of cluster formations have:

- 1) the most economically active organisations, which include small and medium-sized firms, which form a skeleton diagram of the cluster interaction;
- 2) companies that make up the logistics infrastructure and determine the basis of the economic interconnections of the regions, taking into account the geographical features of the country's territories.

It should be noted that the successful functioning of the logistics cluster requires the following additional factors:

- demand;
- auxiliary industries;
- type of structure (horizontal, vertical connections);
- innovative activity.

Demand factors are formed on the basis of the requirements of specific logistics services actors, while individual participants can specialise and develop innovative products to meet this demand. The presence of related and ancillary industries plays a central role in the success of logistics clusters. Forwarders, infrastructure operators, as well as service providers are very dependent on each other [13].

The cluster infrastructure is based on the principle of voluntariness of the totality of material and elements of the logistic system such as flows of material, resources, investments and service, information, with the aim to meet needs, from raw materials, fuel, materials to delivery of finished products to the final consumer. At the same time, the logistics chain management concept is focused on «end-to-end» resource optimisation along its entire length – from source suppliers to final users. In this case, common priorities are shifted from disparate flow management in the organisational framework of each individual participant to active innovative and cluster cooperation with inter-functional and inter-organisational coordination based on a logistic approach.

Innovative activity and cooperation are an indispensable feature of cluster structures. Principally the cooperation of cluster members is their logistic integration. The cluster, as a logistics system, unites all participants in the logistics chain on the path to creating value from suppliers of raw materials to sellers of finished products to final consumers. At the same time, the cluster solves the problems of streamline process optimisation and efficiency increase due to the synergy of not a single participant, but the system as a whole. Innovative activity is a potential advantage of clusters that play a major role in accelerating the process of innovation within their organisational form. The enterprises and organisations included in the cluster are more acutely aware of the trends in consumer demand; they are responding promptly to them due to innovative complementarity that brings competitive advantages. The implementation of the tasks of forming logistics clusters contributes to increasing the competitive potential of cluster organisations and the territory as a whole, creating resource and process synergies of the logistics system.

The use of European experience is necessary to develop a strategy for the formation of logistics clusters in the Republic of Belarus. In the author's opinion, the following conditions are necessary for its implementation:

- 1) the statement of purpose;
- 2) assessment of the logistics potential;
- 3) phased creation of the prerequisites for logistics clusters formation;
- 4) monitoring the state of the logistics clusters development;
- 5) mechanism for the implementation of priority of national, sectoral, regional directions for the development of transport and logistics clusters.

The development of clusters is an important direction in the formation of the regional logistics system, therefore, their creation is viewed as a synergy of international flows and industrial innovative complexes that manufacture and process high value-added products in high demand, including export.

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