

SPATIAL DEVELOPMENT OF TERRITORIES: CROSS-BORDER ASPECT

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Abstract

The work assesses innovative processes as the basis of spatial development of territories. Activating innovative processes that contribute to the development of regions. The characteristics of forms and factors of cross-border cooperation are given.

The transport industry and construction have been identified as the defining elements of regional infrastructure and have organized national and global trends in their development. The systematic approach to innovation shows that the effect of innovation extends to related industries and generates interaction between all actors in the region.

It is shown that the spatial organization of economic activity in the cross-border territory requires interaction between regional innovation complexes. This article highlights the forms of integration processes.

Keywords: cross-border cooperation, innovation, infrastructure, economic integration, cross-border region, spatial development of.

ПРОСТРАНСТВЕННОЕ РАЗВИТИЕ ТЕРРИТОРИЙ: ТРАНСГРАНИЧНЫЙ АСПЕКТ

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Реферат

В работе оцениваются инновационные процессы как основа пространственного развития территорий, активизация инновационных процессов, способствующих развитию регионов. Дана характеристика форм и факторов приграничного сотрудничества.

Транспортная отрасль и строительство были определены как определяющие элементы региональной инфраструктуры и определили национальные и глобальные тенденции их развития. Системный подход к инновациям показывает, что эффект от инноваций распространяется на смежные отрасли и порождает взаимодействие между всеми участниками в регионе. Показано, что пространственная организация экономической деятельности на приграничной территории требует взаимодействия региональных инновационных комплексов. В этой статье освещаются формы интеграционных процессов.

Ключевые слова: приграничное сотрудничество, инновации, инфраструктура, экономическая интеграция, приграничный регион, пространственное развитие.

Introduction

The goal of the state's socio-economic development is to ensure high living standards of the population and conditions, which is determined by the transition to a highly efficient economy based on innovation. The level of technology development causes structural restructuring of the economy and is one of the main factors of competitiveness. The activation of innovative processes that contribute to the development of regions necessitates a comprehensive in-depth theoretical and practical study of infrastructure development tools.

Cross-border cooperation as one of the forms of cross-border interaction (including also industrial cooperation, trade, tourism, diplomatic relations, interaction on security issues) is a set of bilateral and multilateral relations between authorities, business entities, public organizations and the population of border regions two or more countries. The ties that emerge and develop in the course of cross-border cooperation contribute to the deepening of other forms of cross-border interaction. A distinctive feature of cross-border cooperation is the regional nature of this process, in contrast to the traditional system of external relations, implemented in order to ensure national interests at the highest state level, cross-border cooperation is carried out at the level of regions and even local communities of neighboring territories, separated state border.

Cross-border cooperation is implemented in the framework of such forms as local border contacts, bilateral contractual relations between neighboring territories, the creation of stable network formations in the form of associations, forums, euro-regions, etc., as well as in the form of ongoing activities in various areas in framework of joint projects.

The typology of foreign neighboring countries obliges to develop and implement different variants of regional policy. These options include the following:

1. The first method is traditional - by attracting foreign investment from companies from neighboring countries. Such companies usually aim to reduce various types of costs for further re-export of products. By large enterprises with foreign participation, one can judge the

development of cross-border cooperation of the regions. The volume of direct foreign investments on a net basis in the real and banking sectors of the economy of the Republic of Belarus, as well as in the sale of real estate in the territory of the republic at the end of 2020 amounted to 1,337.6 million US dollars. The share of the Gomel region - 7.7%, Mogilev region - 7.4%, Grodno region - 7.3%, Brest region - 5.3%, Vitebsk region - 3.0% [1].

2. The second way is through countertrade in various types of products. This method gives a positive economic effect when the cross-border territories have the same level of economic development. In case of unequal conditions, the weaker party will receive less economic efficiency from cooperation.

When developing joint measures to increase the competitiveness of border areas, enhance the movement of goods, services and production factors, factors should be taken into account [2]:

- 1) geographical location, endowment of natural resources and quality of the environment;
- 2) the degree of involvement in interregional and international economic relations, investment flows;
- 3) the presence of a developed transport infrastructure;
- 4) availability of market infrastructure;
- 6) the qualitative and quantitative composition of labor resources, its educational potential, cultural traditions;
- 7) scientific and technological potential and scientific information environment.

A special role in ensuring the sustainable development of the economy of individual regions with cross-border economic cooperation based on an innovative approach is assigned to transport infrastructure and construction.

The studies of international economic integration are devoted to the works of foreign (D. Peng, M. Spindler, E. Vinokurov, R. Evstigneev, A. Libman, P. Minakir, B. Kheifets) [3] and domestic scientists (A. V. Belsky, T. B. Bibik, A. A. Vasilenko, E. S. Danilyuk, L. N. Davydenko, E. A. Semak) [4-7].

conomists paid attention to the innovative development of investment and construction activities: A. N. and V. V. Asaul, V. V. Buzyrev, I. N. Geraskina, Yu. M. Yasinsky and others [8-10].

Innovation is the driver of economic growth. Thus, in developed countries, innovations provide about 75% of the growth in gross domestic product. For example, in Germany this indicator reaches almost 100% of GDP. Small and medium businesses provide 78% of employment and 45% of Taiwan's GDP. The introduction of new technologies, the results of scientific research into industrial production makes it possible to make a qualitative breakthrough in the market of goods and services [11]. In many states, in the development of models of economic growth, the innovation vector is assigned a leading role. In the strategies of innovative development, the following directions can be spelled out: innovative entrepreneurship; improving the management efficiency of national innovation systems; commercialization of results and formation of a market for scientific and technical products; stimulating high-tech exports, developing infrastructure in the fields of scientific, technical and innovation activities. Thus, in Belarus, the National Academy of Sciences has developed a strategy "Science and Technology: 2018–2040". The main goal is to form the basis for the deployment of the fourth industrial revolution and the processes of new industrialization. The basis is digital production technologies, including artificial intelligence systems, quantum computers, the Internet of things and the industrial Internet, smart materials, machines and their systems for the real sector, in energy, construction and ecology are also a priority [12].

Infrastructure of the region: state and development

Construction is one of the key, fund-forming industries that largely determine the rate of development of the country's economy and the solution of the most important socio-economic problems (Table 1). The integrated development of territories depends on the construction complex, when it is necessary to interconnect the renewal of fixed assets, the modernization of enterprises, and housing construction. This not only contributes to the development of other industries, economic growth, but also improves the social situation in society.

Table 1 – Key indicators of the activities of construction organizations

Indicators	2011	2015	2016	2017	2018	2019
The number of construction organizations, units	9 548	10 173	9 515	8 718	8 514	8 332
The volume of contract work in the actual prices; billion rubles.	40 101,0	92 255,8	8 107,8	8 600,0	10 074,3	12 191,3
at comparable prices; percentage of the previous year	106,7	88,7	85,2	96,3	105,2	105,1

Source: [13]

The number of organizations in this area is declining, so in 2011 there were 9,548 units, and in 2019, 8,332 units of contracting were declining until 2015, due to the global trend in the industry, but from 2017 began to grow and averaged 7%.

The industry occupies the most important place in the economic system of the state: it is the largest industry in the economy of the Republic of Belarus (4.5% of the total cost output for 2019).

However, the effects of COVID-19 have affected the industry as well. Revenue from sales decreased by 5.5%, net profit of organizations by 19.7%. The number of loss-making organizations increased by 36%. However, construction remains a significant industry for other industries that are suppliers of products for construction work. The industry's share in intermediate consumption is also very high. In the structure of intermediate demand, the share of the industry is much lower, as the industry mainly produces the final products [14]

As for the transport infrastructure, the functioning checkpoints on the border of the Republic are distributed as follows: automobile - 26; railway - 15; air - 7; river - 3. In accordance with Belarus in 2019, the main share of freight turnover fell on rail transport, the annual freight turnover through

railway checkpoints amounted to about 82.6 million tons, while a slight decrease by 2.5% in railway freight turnover in relation to by 2018 - 84.76 74 million tons. Freight turnover through road passes of the Republic of Belarus in 2019 amounted to about 30.1 million tons, with a wide increase of 11.9% in cargo turnover through road passes of the Republic of Belarus in relation to 2018 - 26.02 million tons. Freight turnover through the air traffic areas of the Republic of Belarus is minimal, the annual cargo turnover in 2019 amounted to no more than 0.0121 million tons, slightly decreasing compared to 2018 - 0.0125 million tons. The total cargo turnover of goods imported through all passes of the Republic of Belarus (85.03 million tons) in 2019 was 3.3 times higher than the turnover of exported goods through all checkpoints of the Republic of Belarus (25.7499 million tons) [15]. On the part of highways, many international transport routes pass through the territory of the republic, which can be divided into Trans-European routes: one European route and the International Highways of the Commonwealth of Independent States. Two international railway transport corridors pass through the territory of the Republic of Belarus: No. II Berlin - Warsaw, Minsk - Moscow - Nizhny Novgorod (within the republic, the railway section Brest - Minsk - Orsha - Osinovka); № IX - Helsinki - St. Petersburg - Kiev - Chisinau - Bucharest - Dmitrovgrad - Alexandroupolis (within the republic, the railway sections Ezerishche - Vitebsk - Mogilev - Zhlobin - Gomel - Teryukha and branch IXB - Zhlobin - Minsk - Gudogai) [16].

In order to assess infrastructure in terms of the priority of its development, the world has analysed the main trends in the world economy in the medium and long term. According to a World Bank study [17], global economic growth is projected at 4.0% in 2021 and 3.8% in 2022. The regional economies of Europe and Central Asia will grow by 3.3% in 2021. In most countries of the world, the load on infrastructure will significantly increase, therefore, to ensure sustainable economic development and growth of trade in the world, its timely modernization is necessary. According to OECD estimates, the volume of passenger air traffic by 2035 will increase 2.5 times, air cargo traffic will grow 3 times, and container traffic - 4 times. The existing transport corridors between Europe and Asia have a capacity that allows an increase in freight turnover by about 50%. However, this potential will be exhausted in the next 6-8 years. In this regard, it is already now necessary to engage in the design, construction and expansion of large infrastructure facilities.

The growth rate of the construction industry in the world is expected at the level of 3.9% per year, which is higher than the rate of global economic growth by almost 1% and by 2030 the industry will grow by 85% to 17.5 trillion. dollars. According to international experts from the organizations Global Construction Perspectives and Oxford Economics [18], the world market of construction services is characterized by the following trends in its development in the long term:

- enlargement of single-industry regional construction organizations to large multi-profile holdings that will perform construction and installation work in all segments of the construction market at objects of any complexity around the world;
- the share of design and construction corporations in the total volume of contracts for the construction of large and unique infrastructure facilities will increase;
- the number of "corporations for the economic development of territories" will increase, creating special financial funds at the expense of equity participation of companies located in this territory. Their funds will be directed to the construction of objects necessary for the full functioning of this territorial-administrative unit - residential and business complexes with shops, restaurants, cafes, hotels, sports facilities, educational and health care facilities;
- the emergence of specialized research centers for construction;
- use of environmentally friendly building materials and technologies;
- an increase in the volume of production of composite and new types of heat-insulating materials, plastics;
- strengthening the role of public-private partnership models such as build-operate-transfer - BOT (construction - operation - transfer of an object to the customer), build-own-operate - BOO (design - ownership - operation), etc.

The trends in the development of the transport aspect of infrastructure are as follows:

- active development of transit potential in the EAEU. The EAEU railways retain a dominant role in transit traffic across the Union;
- The transit potential of the EAEU in the future has opportunities for reorientation from the sea container traffic between the West and the East, a share of 5-10%.

- innovative ways to raise funds for the construction of transport infrastructure without using the resources of the government (state). In particular, financing models will evolve: user charges / electronic toll systems, private sector borrowing and participation, PPP programs, land tax and many other initiatives;
- simplification of border crossing procedures;
- development along the corridors of intermodal mega-terminals, which, either as possible or as necessary, would have their own specialization.

Based on global trends in economic growth, which will cause technological modernization of promising industrial sectors and an increase in urbanization, as well as the contribution of construction and transport to GDP, it can be concluded that the need for infrastructure development, industrial and housing construction will increase.

Innovative processes as the basis for spatial development of territories

A systematic approach to innovation shows that the effect of innovation extends to related industries and generates the interaction of all subjects of the region. Such complex processes change the economic system of the construction complex as a whole.

The spatial organization of economic activity that has developed in the Republic of Belarus on a cross-border territory requires interaction between regional innovation complexes, which is achieved through the free movement of all components of the innovation process to maintain sustainable economic growth [19]. The subjects of the construction complex include research and development, design organizations, construction industry enterprises, contractor operating organizations, etc. The level of integration in the innovation sphere of their main industries determines the innovative potential. It is implemented through purposeful activities to improve the quality of economic development of the territory, taking into account the specifics of the specific characteristics of the region.

Consider the organization of innovative processes in the construction industry in cross-border areas. In this case, the specificity of the region is determined by the geographic location. The implementation of the innovative potential must take into account the innovative processes in the adjacent territory of a foreign state.

There are two models for organizing innovation processes: taking into account such activities of a foreign territorial entity and without it. In the second case, the development model is the most costly.

The presented diagram shows the features of innovation processes in cross-border regions, consisting in the coordination and systematization of managerial decisions, taking into account the socio-economic development of the neighboring border area (Figure 1). The successful implementation of unified approaches to innovative development causes diffusion of innovations in the border areas. Cross-border diffusion of innovations - processes of diffusion of innovations in socio-economic, scientific and technical activities. Diffuse processes across the border contribute to the inflow of new knowledge, management approaches and capital into the organization of economic activity and public life in general.

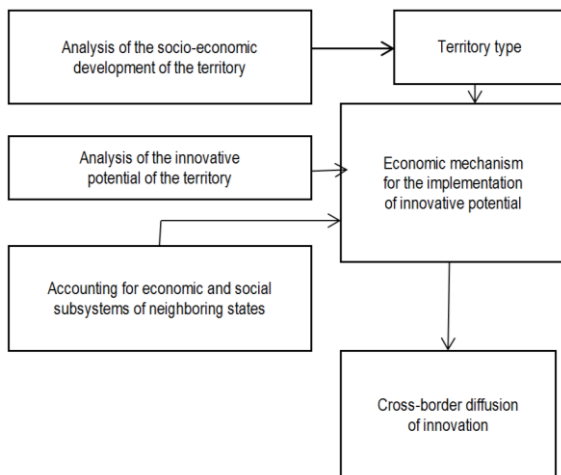


Figure 1 – Innovation processes in cross-border regions (developed by the author)

The type of territory development will determine which territory is the donor and which is the recipient of innovations. The course of innovation processes depends on the speed of movement of economic and technological innovations and on the ability to overcome the barrier environment in the form of a border.

The scientific and technical development of the region determines which state will be the resource center. The key condition for the formation of a cross-border innovation system is that the resource center for it are states that have a monopoly on managerial decision-making.

An example of successful cross-border cooperation was the implementation of a part of the project "Improving the road infrastructure of the border region by ensuring sustainable access to the border region (modernization and construction of the R-16 highway)", implemented under the cross-border cooperation program for 2014–2020. [twenty]. As part of this project, road safety has increased, the illumination of the roadway has improved 3 times, the road section with a length of 13.4 km has been brought to the parameters of the III technical category. The innovation was the concrete pavement, which increased the durability of the road surface.

Cross-border cooperation is developing within the framework of Belarus' activities in integration associations and international organizations. The purpose of creating integrated structures in the innovation sphere in the regional construction complex is to ensure the coordinated development of all technological links in the production of a construction product.

Integration processes are currently taking place in the following forms:

- 1) special and special economic zones created in order to attract investments, create and develop industries, create favorable conditions for the development of regions, and implement joint interstate programs and projects. In accordance with Article 7 of the Convention on Interregional Cooperation of the CIS Member States and national legislation, the States Parties to the Convention are taking measures aimed at simplifying procedures for border, customs, immigration (migration) and other types of control in order to increase the efficiency of cross-border cooperation [20].
- 2) the construction cluster, as an innovative form of integration aimed at the balanced use of innovative potential, voluntarily unites the participants in the construction complex who are bound by obligations throughout all stages of the construction cycle. In this case, mechanisms of sectoral, state and market coordination and regulation of high-tech products and technologies, concentrated on a certain period of time and in a certain economic space, are involved. Diffusion of innovations in the cross-border space increases the efficiency of the entire regional construction complex.

According to D.V. Arutyunova: "the organization of the innovation process is a sequential chain of events during which an innovation is implemented from an idea to a specific product, service technology and spreads in economic practice" [21]. Figure 2 shows the organization of the innovation process in construction in cross-border areas. Innovation starts at the level of subjects - participants in the construction complex.

The innovation process consists of two stages: formation and functioning. At the stage of formation of the innovation process, two functions are implemented. Regulation affects the instruments of purposeful action by the authorities on the part of the state, industry, cross-border cooperation (interregional), region. Incentives are implemented through state and market mechanisms for enhancing innovation activity from intra-firm to inter-firm (commodity) innovation. At the same time, market mechanisms are aimed at increasing the competitiveness of enterprises of the regional construction complex in cross-border interaction, and state mechanisms stimulate activities within the framework of the priorities and goals of innovation policy.

The result of the innovation process is an increase in the efficiency of the construction complex, namely: reduction of design time, saving energy resources, material and labor resources, reducing the cost and construction time, etc.

Regulation and stimulation through scientific, technological and organizational transformations affect the actors of the construction complex, who create, implement and use innovations in the process of economic relations. Subjects include investors, customers, contractors, design and research organizations, research institutes, enterprises of the construction materials industry, products and structures, enterprises related to the construction industries.

New technologies in the design of objects, innovative building materials, structures, methods of organizing production, new methods of organizing and managing construction production, new forms of financing and managing construction objects are considered as innovations.

A building cluster is a holistic economic system consisting of many interconnected elements (sub-sectors) that complement each other and enhance the competitive advantages of individual companies and the cluster as a whole.

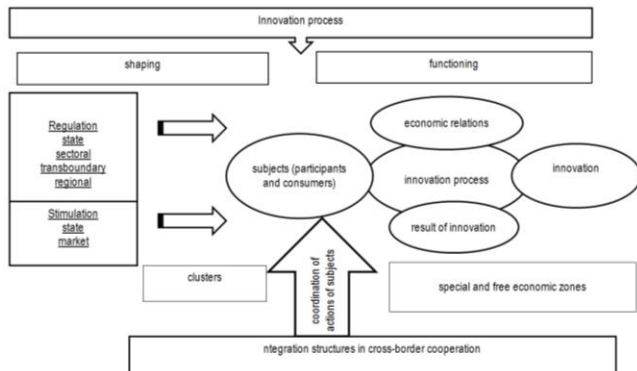


Figure 2 – Diagram of the organization of the innovation process in construction

In our case, the construction cluster is innovative and aims to introduce new innovative products in the field of construction, increase the competitiveness of products and enter new markets.

A special economic zone is a limited area with a special customs, registration and tax regime for national or foreign entrepreneurs. The main purpose of creating such zones is to solve the problems of socio-economic development by creating and developing production facilities based on new and advanced technologies, increasing the number of jobs, exporting certain regions or industries, i.e. creating high-tech enterprises in the construction industry.

Conclusion

The main goal of organizing innovation processes in cross-border cooperation is the integration of infrastructure elements that interconnect all participants in a single innovation-technological chain, thereby ensuring a high continuity of innovations.

Integration processes will allow:

- to optimize relations between companies of border regions of neighboring countries;
- develop a real manufacturing sector;
- to create common projects within the cross-border region to improve territorial and productive infrastructure;
- introduce new architectural and planning solutions, materials, technologies and other innovations.

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