Peculiarities of Formation of the Region's Logistics Infrastructure on the Basis of Eco-Innovations Within the Framework of Stakeholders' Partnership in the Enterprise-Region-State System[i]

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Implementation of Ukraine's European integration in all spheres of development increases the requirements for regional policy and expands the criteria for its effectiveness. It is important to choose effective methods and approaches to management, the use of which will ensure the competitiveness and sustainable development of the region. Under such conditions, the task of regional authorities is to initiate the formation of qualitatively new institutional foundations for a new regional development model, which harmoniously combines economic, social and environmental factors, which will be implemented in active cooperation with other businesses. Many years of experience in the development of cross-sector partnerships in European countries show that such a partnership contributes to a constant and well-established dialogue in society. Therefore, in the context of Ukraine, the issue of developing and adhering to the rules and principles of partnership, constructive cooperation of stakeholders and creating a model that will increase socio-environmental and economic responsibility of all participants in implementing measures to ensure sustainable development of the region. Taking into account the interests of all stakeholders becomes especially important in the logistics infrastructure development; its functioning affects both the socio-economic development of the region and the state of the environment. The main purpose of the investigation was to study the problems of forming the regional logistics infrastructure, which necessitates a responsible attitude of business and government to society and the environment. Foreign and Ukrainian publications on the formation of regional logistics infrastructure and allegations of social and environmental responsibility of stakeholders were analyzed. The study proposes the basic principles of logistics infrastructure planning based on cross-sector stakeholder partnership, which, according to the authors, would contribute to sustainable development of the region and increase the level and efficiency of regional logistics.

Keywords: cross-sector partnership, logistics infrastructure, region, stakeholders.

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Introduction. Regional infrastructure facilities become especially relevant taking into account the interests of all stakeholders, whose activities affect both the socio-economic development of the region and the state of the natural environment.

The increased interest to the facilities of the logistics infrastructure is due to their significant negative impact on the environment, in particular, they account for 9−10 % of greenhouse gas emissions and other environmentally hazardous substances, and the transport that is widely used in logistics is the source of 50 % of emissions (90 %) [1]. In this regard, European countries placed the emphasis of the implemented logistics solutions for overcoming the following phenomena: air pollution caused by solid particle emissions from diesel fuel, nitrogen oxides, hydrocarbons; noise pollution; high traffic; producing household solid waste [1], etc.

Problem statement. The following scientists discovered the optimal location of logistics infrastructure facilities (warehouses, logistics centers): Krykavskyy [6], Mukhtarova [7], Oláh [8], Rodymchenko [2, 10], Shusheng [13], Velychko [14], etc.

Foundations for the study of social, environmental and economic responsibility of stakeholders were formed by the work of such scientists as Ginevičius [3], Karintseva [5], Onyshchenko [9], Shkarupa [12], etc.

In our previous studies [1, 2, 10] we analyzed the influence of economic entities on the formation of social, economic and environmental indicators of the region development. Taking into account the above mentioned authors we consider it appropriate to justify the need for a responsible attitude of business and government to society and the environment, and to confirm this by investigation.

The purpose of the article is to investigate the main trends of global logistics development and to define main requirements of all stakeholders to regional logistics infrastructure based on the principles of sustainable development.

Results of the research. Characteristic features of Industry 4.0 are fully automated productions, where all processes are managed in real time and taking into account changing external conditions.

In Industry 4.0, the essence of logistics operations will not change, however the executor of these operations will change – cyberphysical and mechatronic systems, autonomous work, etc. will replace humans. A person from an active participant in logistics processes and executor of logistics operations will become an observer, who is assigned the role of controller.

The main trends in the field of global logistics:

1) Digitalization. There is a growing use of technologies, including blockchain, big data, artificial intelligence, augmented and virtual reality.

Robots. Many manufacturing companies have begun to automate warehouses (for example, to attract robots), to use autonomous vehicles.

Drones. Companies seek to fully automate the delivery process from point A to point B. Therefore, drones and airships are already beginning to be used in the cargo delivery process, as they are not only environmentally friendly, but also eliminate possible congestion and speed up the entire cargo delivery process [11].

Blockchain technologies allow to keep confidentiality in transport logistics. After all, the blockchain greatly simplifies the exchange of data between the shipper, carrier, and forwarder. However, to use blockchain technology, you need to digitize all your company's data. This is implemented in order to create its own system of partnership with world leaders and optimize its own supply chain [11].

2) Consistency of supply chains. More and more companies are implementing the "supply chain as a service" model.

Technology of this format is a necessity to respond in a timely manner to changes that occur on the route. Its data will allow not only to determine the traffic pattern on the route and its exact geolocation at any time, but also the weather conditions in a particular point or region to predict possible force majeure.

In addition, those companies that implement this technology in their activities, work 20 % efficiently than their competitors, according to a study by TransMetrics in January 2020. However, such technology works only on a special IOT database (Internet of Things), which operates through closed servers, ie only participants in a particular process have access to data [11].

Changes in the Ukrainian logistics sector:

– more and more entrepreneurs understand the impact of logistics on business development and see it as a driver for the development of their own companies;

– competition is increasingly occurring at the level of business models and supply networks;

– placement of goods becomes closer to the customer. Today it is not enough to deliver the goods in 2-3 days, the customer wants to receive it faster. This makes changes in the logistics of the city, there is a demand for "microfilm centers" [15].

The future of logistics in Ukraine, taking into account these trends: the potential of the country is great: 4 out of 10 busiest transit corridors pass through the Ukrainian territory - both automobile and railway. However, according to 2018, Ukraine ranked only 66th in the world. According to statistics, we use our transit potential by 25-30%. Ukraine has 13 ports, but none of them is included in the world rankings because it does not meet the standards. The index of port infrastructure in Ukraine is 3.9 points out of a possible 7. And in the EU the average is 4.8 [16].

Professor Ye. V. Krykavskyy and Associate Professor N. V. Chornopyska [6] define the logistics infrastructure as follows: “Logistic infrastructure is a system of means for spatiotemporal transformation of logistical flows (material, information, financial, human), as well as a combination of enterprises of various organizational and legal forms, which form organizational and economic conditions for the passage of these flows by building the capacity of appropriate logistics services”. The logistics infrastructure should include: roads, railways, airports, railway stations, container terminals, logistics centers, various types of vehicles, etc.

Thus, the effectiveness of transformation of the regional logistics infrastructure in order to comply with the requirements of sustainable development directly depends on the level of consistency of stakeholder views of various sectors (public, financial, social), that is cross-sector partnership, concerning the structure and scale of this infrastructure, the location of specific logistics facilities, their participation in the process of investment support of transformational changes [6]. Such cooperation is beneficial for solving social, environmental and economic problems and useful to each of the parties and residents of the territory where it is implemented.

We suppose that the influence of the local community is determining in the cross-sector partnership, since it endangers the health of its members in case of low social, environmental and economic responsibility of the business that initiates the transformation of the logistics infrastructure. As regards the issue of guarantees of a quality of environment, we believe that the authorities (state or local authorities) should play the main role and the authorities have entrusted with the function of monitoring the compliance with the current legislation. Business

structures, public organizations should comply with the norms of legislation and respond to the requests from the community, whose members can be their customers, consumers and influence the results of their activities. Thus, society needs to interact fully with business and government to meet their own interests.

The fact that business and government institutions do not always perceive society as a full partner, capable of dialogue, conducting and defending their interests, and, in fact, do not perceive the partnership model, also causes concern. At the same time, the public also demonstrates an inert attitude to the solution of social, environmental and economic issues, shifting responsibility for them to the state. And this, in turn, prevents the active development of the state as a whole.

We have determined the basic principles of planning the logistics infrastructure based on the cross-sector stakeholder partnership (Table 1).

Table 1

Principles of planning the logistics infrastructure based on the cross-sector stakeholder partnership

Principle	Essence
Principle of system approach	The approach to the logistics infrastructure as a system - the maximum effect can be obtained only if the logistics flows are optimized throughout the entire logistics chain.
Principle of logistics coordination	Ensuring the consistency of all links of the logistics chain in time, i.e. the development of mutually agreed plans for logistics management with the minimum permissible level of impact on the ecosystem.
Principle of optimization	The chosen optimal variant of planning the logistics infrastructure should take into account the interests of all partners.
Principle of rational location	While locating the facilities of the logistics infrastructure, the distance to the city should be taken into account as the distance to a source of skilled labor, as well as the distance between the facilities themselves and accessibility to consumers and suppliers.
Principle of sustainability and adaptability	Facilities of the logistics infrastructure should contribute to the formation of sustainable development of the region while fulfilling their functions.

**Source: designed by authors*

In our opinion, the suggested principles of planning the logistics infrastructure based on the cross-sector stakeholder partnership contributed to socio-economic development, improve the level and efficiency of regional logistics, and support of the sustainable development of the region.

To find out the impact of innovation on logistics we made analyzes that show regression between Global Innovation Index and other data such as Logistics Performance Index, Infrastructure Investment On Roads, Final Consumption Expenditure of Households, Internet Speed, Secure Internet Servers.

Global Innovation Index (GII) takes the pulse of the most recent global innovation trends. It ranks the innovation ecosystem performance of economies around the globe each year while highlighting innovation strengths and weaknesses and particular gaps in innovation metrics. The GII's overall formula for measuring an economy's innovative capacity and output provides

clarity for decision makers in government, business and elsewhere as they look forward to creating policies that enable their people to invent and create more efficiently [16].

Logistics Performance Index (LPI) is an interactive benchmarking tool created to help countries identify the challenges and opportunities they face in their performance on trade logistics and what they can do to improve their performance. The LPI is based on a worldwide survey of operators on the ground (global freight forwarders and express carriers), providing feedback on the logistics "friendliness" of the countries in which they operate and those with which they trade. They combine in-depth knowledge of the countries in which they operate with informed qualitative assessments of other countries where they trade and experience of global logistics environment [18].

As we can see from the figure 1, the R-square is 0.69 or 69 %. This is mean that the calculated parameters of the model explain on 69% the relation between them. Coefficient -5.1539 shows how much will be Y (GII), if all variables in the model will be equal to 0. So, the value of analyzed parameter is influenced by other factors, which are not described in the model. Coefficient 15,3876 shows the significance of the variable X (LPI) on Y (GPI). Thus, Logistics Performance Index affects Global Innovation Index with a score of 15.3876, what is a huge degree of influence. As the coefficient is positive, there is a positive impact between indexes: the larger Logistics Performance Index, the larger Global Innovation Index.

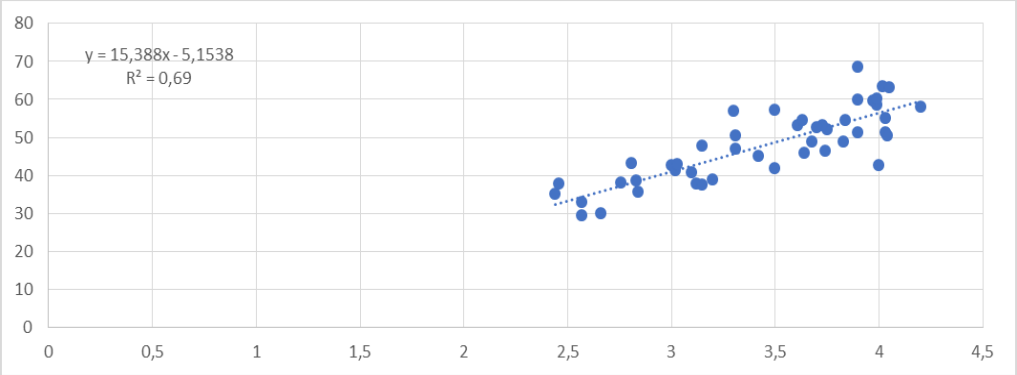

Figure 1. Graphic regression between GII and LPI [18,19]

Conclusions and prospects of further research. Today, although different types of models and mechanisms of cooperation between government, business and the public are offered by different researchers, scholars and practitioners, it should be agreed that only a sufficient level of development and capacity of these institutions can lead to productive partnership and cooperation.

It is important that local entrepreneurs and residents are actively involved in discussing plans for the development of the city's logistics infrastructure, as convenience for consumers and doing business is a prerequisite for long-term and sustainable functioning of the local business environment. This is especially important when implementing measures in the context of sustainable development of the region, when it is necessary to take into account not only transport, geographical and economic factors of logistics infrastructure, but also special attention should be paid to environmental impact.

The activities of the regional logistics center of any importance can significantly improve the quality and efficiency of transport processes during transportation, both regionally and interregionally, as well as reduce the burden on the environment by optimizing the optimization of transport routes, and therefore each region sooner or later will face the need to create a regional logistics center. In our opinion, taking into account the social, environmental and economic indicators of regional development, an algorithm for determining the location of the regional logistics center, taking into account the social, environmental and economic indicators of the region. regional development, allows to take into account not only transport-geographical, economic and social indicators (important for business and government), but also environmental indicators (important for the population), which, in turn, will support the concept of sustainable development. development in the region.

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Особливості формування логістичної інфраструктури регіону на основі екоінновацій в рамках партнерства стейкхолдерів в системі «підприємство-регіон-держава»

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Реалізація євроінтеграційних прагнень України в усіх сферах суспільного розвитку підвищує вимоги до регіональної політики та розширює критерії її ефективності. Важливим при цьому є вибір ефективних методів і підходів до управління, використання яких забезпечить конкурентоспроможність та сталий розвиток регіону.

За таких умов завданням регіональних органів влади є ініціювання формування якісно нових інституційних основ нової моделі розвитку регіону, де гармонійно поєднуються економічні, соціальні та екологічні чинники, яка реалізовуватиметься при активній взаємодії з іншими суб'єктами господарювання.

Багаторічний досвід розвитку міжсекторного партнерства (моделі партнерства держави (влади), бізнесу та громади) у країнах Європи доводить, що таке партнерство сприяє постійному та налагодженому діалогу у суспільстві. А тому в умовах проведення реформи в Україні актуальним стає питання розробки і дотримання правил і принципів партнерства, конструктивного співробітництва стейкхолдерів, тобто створення моделі, що сприятиме

підвищенню соціо-еколого-економічної відповідальності усіх учасників при реалізації заходів, спрямованих на забезпечення сталого розвитку регіону.

Врахування інтересів усіх стейкхолдерів стає особливо актуальним при розбудові логістичної інфраструктури, функціонування якої впливає як на соціально-економічний розвиток регіону, так і на стан навколишнього природного середовища. Головною метою дослідження стало дослідження проблем формування логістичної інфраструктури регіону, які обумовлюють необхідність відповідального ставлення бізнесу та влади до суспільства та навколишнього середовища. Для цього було проаналізовано зарубіжні та українські публікації, що стосуються формування регіональної логістичної інфраструктури та твердженнях про соціальну та екологічну відповідальність зацікавлених сторін. У дослідженні запропоновано основні принципи планування логістичної інфраструктури на основі міжгалузевого партнерства зацікавлених сторін, що, на думку авторів, сприяло б сталому розвитку регіону та підвищило рівень та ефективність регіональної логістики.

Ключові слова: кроссекторне партнерство, логістична інфраструктура, регіон, стейкхолдери.

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