

## **THE CONSEQUENCES AND EFFECTS OF MODERNIZATION AND DEVELOPMENT OF TRANSPORT LOGISTICS, INFRASTRUCTURE AND SYSTEM IN THE COUNTRIES OF THE VISEGRAD GROUP: THEORETICAL AND PRACTICAL CONTEXTS**

Artykuł analizuje i systematyzuje skutki modernizacji i rozwoju logistyki, infrastruktury i systemu transportu w krajach wyszehradzkich na poziomie teoretycznym i praktycznym. Twierdzi się, że inwestowanie w system transportowy i infrastrukturę krajów Grupy Wyszehradzkiej skutecznie i w różny sposób wpłynęło na poziom działalności eksportowej, ogólny poziom inwestycji i aktywności kapitałowej krajów, wolumeny transportu, a co za tym idzie, na wahania dochodów, produktu brutto i inflacji. Jednak mimo to kraje Grupy Wyszehradzkiej historycznie pozostają w tyle za średnimi europejskimi wskaźnikami inwestycji w transport. Generalnie stwierdzono, że modernizacja i rozwój logistyki, infrastruktury i systemów transportowych w krajach Grupy Wyszehradzkiej na przełomie XX i XXI wieku. miały i mają istotne konsekwencje, różniące się od następstw rozwoju transportu przez większość XX wieku. W efekcie dało to wystarczające podstawy do stwierdzenia, że logistyka, infrastruktura i system transportowy w krajach Grupy Wyszehradzkiej, choć charakteryzują się znaczącymi efektami modernizacji, nadal mają istotne luki w ich rozwoju, które wymagają uzupełnienia.

*Słowa kluczowe: transport, infrastruktura, logistyka, system transportowy, Grupa Wyszehradzka.*

The article is devoted to analyzing and systematizing the effects and consequences of modernization and development of transport logistics, infrastructure and system in the Visegrad countries, in particular at theoretical and practical levels. It was argued that investing in the transport system and infrastructure in the Visegrad Group countries has effectively and variably affected the level of trade activity and exports, the overall level of investment and capital activity of countries, the transportation volumes, and thus the income, gross product and inflation fluctuations. However, the countries of the Visegrad Group have historically been characterized by the lagging behind investment in transport from the European average indicators. In general, it was found that modernization and development of transport logistics, infrastructure and systems in the Visegrad Group countries during the late 20 – early 21 century have significant consequences that differ from the consequences of transport development for most of the 20 century. As a result, it gave sufficient grounds to state that transport logistics, infrastructure and system in the Visegrad Group countries,

although characterized by significant modernization effects, still have significant gaps in their development that need to be solved.

**Keywords:** *transport, infrastructure, logistics, transport system, the Visegrad Group.*

Modernization and development of transport logistics, infrastructure and systems in the Visegrad Group during the late 20 – early 21 centuries had and have significant consequences and effects that differ significantly from the consequences of the transport development in the region for most of the twentieth century. Moreover, these consequences and effects are obvious in both theoretical and practical-empirical terms and are primarily socio-economic, as they affect the competitiveness and competitiveness of national economies of the Visegrad Group. The fact is that transport logistics and infrastructure, or rather their advantages and disadvantages in market conditions, are crucial for achieving competitive priorities and advantages and increasing the productivity of socio-economic systems. This is especially noticeable against the background of the growing integration of world economies and the involvement of the Visegrad Group countries in this process (especially after their reform and accession to the EU). Thus, the presented research is mainly relevant to the need to solve the research problem of clarifying and systematizing, both in theoretical and practical contexts, the consequences and effects of modernization and development of transport logistics, infrastructure and system in the Visegrad Group.

From a purely theoretical and historiographical point of view, it is known that the processes of management and production of goods are constantly characterized by trends: reduction of life cycles of production of goods and services; reduction of prices for goods and services; speeding up the transportation of cargoes, goods, services and passengers and informing about it; implementation of the production process with a view to meeting customer needs<sup>1</sup>. Thus, such permanent changes in the socio-economic environment lead to the increased interest to the control over the flow of people, materials, money and energy in order to efficiently and productively use limited resources, which within the transport system are adjusted logistically and infrastructurally<sup>2</sup>, in particular at the micro (individual enterprises) and macro level (national economy). The fact is that it is empirically and therefore theoretically justified that revenue growth due to improved customer service, as well as increased product availability and punctuality of orders can be directly related to the capabilities of logistics and infrastructure organization in transport<sup>3</sup>. In this regard, D. Waters notes that without transport logistics and infrastructure do not do the processes of production and movement of goods and services, as a result of which

---

<sup>1</sup> Lin S.-C., Liang G.-S., Ye K.-D., Lee K.-S., Relational Analysis between the Indices for Production Stage in an International Logistics System Developed by Airports and National Resources Factors, *Journal of the Eastern Asia Society for Transportation Studies* 2005, vol 6, s. 2852–2867

<sup>2</sup> Klaus P., Logistics as a science of networks and flows, *Logistics Research* 2010, vol 2, nr. 2, s. 55–56

<sup>3</sup> Klaus P., Logistics as a science of networks and flows, *Logistics Research* 2010, vol 2, nr. 2, s. 55–56.

“without logistics there can be no operations or organizations”<sup>4</sup>. A similar conclusion is held by M. Christopher<sup>5</sup>, who notes that infrastructure and logistics have always been and remain the central and essential feature of all economic activity. A. Rushton, P. Croucher and P. Baker go even further, pointing out that although there are costs associated with the movement and storage of goods and services, infrastructure and logistics still have a more positive effect on their value<sup>6</sup>. This is of course explained by the fact that logistics and infrastructure operations provide the means by which a product or service can reach the customer and the end user in the appropriate condition and location. In this way, companies can compete by providing the product with the lowest price factor and the highest value factor for the customer<sup>7</sup>.

At the same time, transport logistics and infrastructure, according to M. Fender<sup>8</sup>, play a very important role in corporate strategy and competition. This can be explained by several factors: the rapidly growing internationalization of the economy and companies not only in their structures but also in their business operations, including production; introduction by internationalized companies of new organizational schemes in the networks of suppliers and distributors, in particular in order to reconcile the needs of globalization with the requirements of adaptation to specific national and local conditions; the existence of a new microeconomic base of competitiveness, which increasingly is the result of the quality and relevance of the relations created among the participants in the “value chain”; the presence of organizational effects that prevail over traditional forms of the “labour productivity”. As a result, most scholars agree that transport logistics and infrastructure affect economic activity and the socio-economic system through at least four manifestations of benefit<sup>9</sup>: the form of benefit (specific product or service that the company offers to potential customers), possession of benefit, time of benefit (value added when the need for a product or service) and place of benefit (availability of goods or services where needed)<sup>10</sup>.

In addition, transport logistics and infrastructure affect the national level of socio-economic development<sup>11</sup>, as they are activities that make extensive use of human and material resources that affect the national economy<sup>12</sup>. In this regard, B. Serhat and S. Harun<sup>13</sup> note that today it is

<sup>4</sup> Waters D., *Logistics: An introduction to Supply Chain Management*, Wyd. Palgrave MacMillan 2003

<sup>5</sup> Christopher M., *Logistics and Supply Chain Management. Creating Value-Adding Networks*, Wyd. Prentice Hall 2005.

<sup>6</sup> Rushton A., Croucher P., Baker P., *The handbook of logistics and distribution management*, Wyd. Kogan Page Limited 2014.

<sup>7</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, “*European Perspectives – Slovenia’s Role in Visegrad Group*” 2015, vol 7, nr. 2, s. 83–100.

<sup>8</sup> Fender M., *Global Supply Chain Management*, [w:] Wieser P., Perret F-L., Jaffeux C. (eds.), *Essentials of Logistics and Management: The Global Supply Chain*, Wyd. Epfl Press 2013

<sup>9</sup> Coyle J., Bardi E., Langley C., *The Management of Business Logistics: A Supply Chain Perspective*, Wyd. South-Western 2003

<sup>10</sup> Fawcett S., Fawcett A., The firm as a value-added system, “*International Journal of Physical Distribution and Logistics Management*” 1995, vol 25, nr. 5, s. 24–42

<sup>11</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, “*European Perspectives – Slovenia’s Role in Visegrad Group*” 2015, vol 7, nr. 2, s. 83–100

<sup>12</sup> Rushton A., Croucher P., Baker P., *The handbook of logistics and distribution management*, Wyd. Kogan Page Limited 2014.

<sup>13</sup> Serhat B., Harun S., Analyzing the Dependency Between National Logistics Performance and Competitiveness: Which Logistics Competence is Core for National Strategy?, “*Journal of Competitiveness*” 2011, vol 4, s. 4–22.

a mistake to look at transport logistics and infrastructure exclusively at the level of individual firms and organizations, but instead more attention needs to be paid to industry at the global / supranational and national levels. Therefore, scientists argue, logistics and infrastructure management is a competitive weapon and an important aspect of competitive strategy. In a somewhat broader context, A. Maciulis, A. Vasiljauskas and G. Jakubauskas<sup>14</sup> believe that modern society can function effectively only through an efficient system of transport, infrastructure and logistics. Another position is mainly determined by the fact that transport logistics and infrastructure are the kind of “amplifiers” and “accelerators” of national economic development, because logistics and infrastructure “permeate” every sector of the national economy. Accordingly, the level of their development is an indicator of the degree of modernization of a particular country and an important indicator of its national strength.

In general, there are two resumptive views on the relationship between economic growth and socio-economic development, on the one hand, and modern transport logistics and infrastructure, on the other. The first, in the form of a “logistical push” theory, argues that logistics and infrastructure can contribute to regional economic development. The second, in the form of the theory of “economic traction”, determines that rapid / intensive economic development contributes to the further development of modern logistics and infrastructure<sup>15</sup>. They are synthesized by J. Stoke and D. Lambert<sup>16</sup>, who note that the main reason for the strong link between logistics and infrastructure and national economy is globalization. After all, as a significant component of each country’s GDP, transport logistics and infrastructure affect inflation, interest rates, productivity, energy costs, affordability and other aspects of the economy<sup>17</sup>. On the other hand, transport logistics and infrastructure itself, given the use of land, labor and capital and their impact on living standards, are business and economic<sup>18</sup>. Accordingly, achieving a high level of efficiency of transport logistics and infrastructure is extremely important for the profitability and efficiency of national and world economies<sup>19</sup>. Therefore, both corporations and states should be interested in infrastructure and logistics efficiency measures at the micro and macro levels. In particular, because efficient logistics and infrastructure are vital for economic growth, diversification and poverty reduction<sup>20</sup>. As a result, transport logistics and infrastructure, including in the Visegrad Group countries, have already become a socio-political interest of governments, regional and international organizations, although mostly by private

<sup>14</sup> Maciulis A, Vasiljauskas A., Jakubauskas G., The impact of transport on the competitiveness of national economy, “*Transport*”2009, vol 24, nr. 2, s. 93–99.

<sup>15</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, “*European Perspectives – Slovenia’s Role in Visegrad Group*”2015, vol 7, nr. 2, s. 83–100.

<sup>16</sup> Stock J., Lambert D., *Strategic Logistics Management*, Wyd. Mc-Graw Hill Irwin2001.

<sup>17</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, “*European Perspectives – Slovenia’s Role in Visegrad Group*”2015, vol 7, nr. 2, s. 83–100

<sup>18</sup> Stock J., Lambert D., *Strategic Logistics Management*, Wyd. Mc-Graw Hill Irwin2001

<sup>19</sup> Brewer A., Button K., Hensher D., *Handbook of Logistics and Supply Chain Management*, Wyd. Elsevier Science Ltd.2001.

<sup>20</sup> Popescu A., Sipos C., *Logistics Performance and Economic Development – A Comparison within the European Union*, Multidisciplinary Academic Conference on Economics, Management and Marketing, 2014.

and private-state operators. At the same time, their analysis demonstrates the relationship between logistics productivity and infrastructure and economic development (including GDP per capita, national competitiveness, prosperity and productivity, trade volumes)<sup>21</sup>.

The example of the Visegrad Group countries is mainly reflected in the fact that increasing the productivity of transport logistics and infrastructure in the region was and remains one of the previous and main prerequisites for increasing national competitiveness in Poland, Slovakia and Hungary<sup>22</sup>. Moreover, one of the main indicators of logistics and infrastructure activities has recently become a modal split in domestic freight. It is obvious (see Table 1) that road freight transport (not to mention the use of cars in passenger and private transport) has become the most common method of freight transport in all countries of the Visegrad Group. At the same time, against the regional background, Poland and the Czech Republic are positioned as countries only with the use of road and to a lesser extent rail freight, and Hungary and Slovakia as countries where the use of inland waterways partially replaces road and rail transport in freight transport.

**Table 1.** Percentage of each mode of transport in the total volume of domestic freight traffic in the Visegrad Group countries, in tonne-kilometers (as of 2013)

| Type of transport  | Railway,% | Automobile,% | Internal water transport % |
|--------------------|-----------|--------------|----------------------------|
| Poland             | 17,0      | 82,9         | 0,1                        |
| Slovakia           | 21,4      | 76,0         | 2,6                        |
| Hungary            | 20,5      | 75,5         | 4,0                        |
| The Czech Republic | 20,3      | 79,7         | 0,0                        |
| On average         | 19,8      | 78,5         | 1,7                        |

Source: Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, "European Perspectives – Slovenia's Role in Visegrad Group" 2015, vol 7, nr. 2, s. 83–100.

Imposing such features of transport logistics and infrastructure in the Visegrad Group countries on the parameters of competitiveness of their national economies, it is obvious that the quality of the logistics and infrastructure sector in transport is directly proportional to the quality of national economies. In particular, it was found that the countries of the Visegrad Group are characterized by a fairly high rate of such a measure of the efficiency of transport logistics as timeliness. At the same time, it was found that the studied countries

<sup>21</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, "European Perspectives – Slovenia's Role in Visegrad Group" 2015, vol 7, nr. 2, s. 83–100; Serhat B., Harun S., Analyzing the Dependency Between National Logistics Performance and Competitiveness: Which Logistics Competence is Core for National Strategy?, "Journal of Competitiveness" 2011, vol 4, s. 4–22.; Karmazin G., Markovits-Somogyi R., Bokor Z., Effects of infrastructure extension on the competitiveness of Hungarian logistics providers, "Acta Technica Jaurimensis" 2013, vol 6, nr. 4, s. 71–78

<sup>22</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, "European Perspectives – Slovenia's Role in Visegrad Group" 2015, vol 7, nr. 2, s. 83–100.

differ significantly regionally. Thus, in Poland the most important factor influencing transport on competitiveness is infrastructure, but in the Czech Republic, Slovakia and Hungary – customs procedures. In addition, it has been recorded that in recent years the indicators of transport logistics efficiency ratings in the region have decreased slightly, in particular against the background of transport development in Western Europe. In the issuance, all this allowed us to argue that the theoretical expectations about the inevitable impact of transport logistics and infrastructure on the competitiveness of national economies and vice versa are somewhat exaggerated, as their correlations are quite variable and sometimes unexpected in practice. Moreover, this indicates that the state of transport logistics and infrastructure in the Visegrad Group countries today is sometimes (particularly in some respects) not quite optimal (see Table 2 for more).

This has different implications and effects for the regional (country level), national, sub regional and even local political and administrative processes, demonstrating that investing, financing and promoting the development of transport logistics and infrastructure in the Visegrad countries can be beneficial not only for transport sector<sup>23</sup>, but also for trade, national and regional growth and governance, etc<sup>24</sup>. However, in contrast, the role of transport logistics and infrastructure in socio-economic growth and governance in the region (especially at the level of several countries) may be smoothed over by other factors. It is in this context that the research position should also be variable – theoretical one and practical-empirical one.

From a purely theoretical point of view, it is obvious that the role of transport logistics and infrastructure is of great importance for economic integration in a particular region or group of countries. This is especially true in the case of the Visegrad Group countries, which, as members of the EU, are served within tools such as: the Cohesion Fund, which forms the EU's spatial planning by supporting some transnational logistics and infrastructure projects and complexes (including environment and transport); structural funds (primarily the European Regional Development Fund and the European Social Fund), which directly allocate funds for the development of transport logistics and infrastructure<sup>25</sup>. However, from a practical point of view, the effectiveness of such programs, and hence the effectiveness of modernization of transport logistics and infrastructure in the Visegrad Group countries depends on: which institutions support the tasks of transport logistics and infrastructure to stimulate socio-economic growth by reducing transaction costs and facilitating trade; what is the connection between the real impact of some countries in the region and the challenges

---

<sup>23</sup> Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, *European Perspectives – Slovenia's Role in Visegrad Group* 2015, vol 7, nr. 2, s. 83–100.

<sup>24</sup> Bafoif F., Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119

<sup>25</sup> Mairate A., The 'Added Value' of the European Union Cohesion Policy, *Regional Studies* 2007, vol 40, nr. 2, s. 167–177.; Barca F., *An Agenda for a Reformed Cohesion Policy: A Place-based Approach to Meeting European Union Challenges and Expectations*, Wyd. DG Regio 2009.

of transport logistics and infrastructure, such as increasing access to public goods for the least developed countries and populations; which groups of actors are involved in the creation of different infrastructure networks, through which transport should unite different groups and activities<sup>26</sup>. In addition, the efficiency of transport logistics and infrastructure depends on the political effect that transport-related economic benefits have or may have. Or, in other words, whether and how transport infrastructure reduces regional disparities (between individual countries and between urban and rural areas), facilitates access to public goods and generates measures to overcome social inequality, thus ensuring the veracity of the scientific position that economic convergence is conducive to political stability.

Theoretically and in general, this means that transport is “first and foremost an access program aimed at fully unlocking the potential for growth and development<sup>27</sup>”. Accordingly, transport logistics and infrastructure are the connecting element between different sectors of management and socio-economic development. The point is that transport is in fact a tool to increase the efficiency of factors of production, as it combines goods with markets, workers with industry, people with services, and the poor in rural areas with growth centers in the cities. In other words, transport infrastructure reduces costs, expands markets and facilitates trade, or in general causes socio-economic growth and poverty reduction in a number of areas of interchange. Additionally, it is important that transport and transport infrastructure support the distribution of benefits from socio-economic growth, promoting trade and regional integration. This is reflected in the fact that transport plays a key role in promoting trade efficiency, and trade openness is a factor in socio-economic growth, in particular due to its positive impact on the economic productivity<sup>28</sup>. As a result, well-developed transport logistics and infrastructure and efficient transport are able to reduce transport delays, make goods and services sold more accessible, increase consumer choice and help developing countries integrate into more complex suppliers and industries network<sup>29</sup>. Together with the reduction of national, regional and international transport costs for trade in goods and services, the price of which is determined by international supply and demand, it can increase the disposable income of producers and contribute to both economic and socio-economic growth<sup>30</sup>. In addition, trade depends on an efficient transport and logistics system, which consists of shippers, traders and recipients. These are

<sup>26</sup> Bafoil F, Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119.

<sup>27</sup> *Safe, Clean, and Affordable Transport for Development – The World Bank Group’s Transport Business Strategy 2008–2012*, Wyd. World Bank 2008

<sup>28</sup> Hallaert J.-J., A History of Empirical Literature on the Relationship between Trade and Growth, *Mondes en Développement* 2006, vol 34, nr. 135, s. 63–77.

<sup>29</sup> Bafoil F, Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119

<sup>30</sup> *Safe, Clean, and Affordable Transport for Development – The World Bank Group’s Transport Business Strategy 2008–2012*, Wyd. World Bank 2008

the main users of the outlined system, who use it for the efficient movement of goods as both source data and business results.

At the same time, under certain circumstances, the assumption and theoretical conclusion presented above may be incorrect. The fact is that transportation and transportation costs depend not only on the quality and capacity of the infrastructure used by suppliers of goods and services, but also on the political and institutional structure and environment, in which they work<sup>31</sup>. These include factors such as rules and regulations on imports and exports of goods and services, financial regulation, registration and licensing of suppliers of goods and services, customs and border crossing procedures, etc. In other words, transport costs also include indirect costs, which can be combined: by slow, incorrect and unreliable transit (which increases the cost of inventory); by excessive operating and storage costs due to poor infrastructure; by losses related to theft, by deterioration and damage to goods (or excessive insurance costs to cover these risks); by bribes to officials. Accordingly, high transport costs can increase the impact of distance and reduce trade opportunities, and thus affect socio-economic growth in a country or even in the region. This is complemented by the position of some researchers that the link between transport logistics and infrastructure and socio-economic growth is not entirely clear<sup>32</sup>. However, according to which the improvement of transport logistics and infrastructure must inevitably lead to socio-economic growth only if the rules of the game are strictly adhered to. This means that more developed transport logistics and infrastructure do contribute to development, but in compliance with competition rules. Hence the general postulate is the fact that reducing of the transport costs leads to improved and simplified trade, greater access to public goods and increased mobility of factors of production. In addition, the straightforward impact of transport development on socio-economic growth may be hampered by such factors as corruption, interest groups and rental behavior. This is compounded by inefficient governance built on mistrust between players or a lack of coordination between different investors, resulting in increased transaction costs that hinder development.

Applying these well-known theorizations to the situation in the Visegrad Group countries, we get the result that the positive correlation between the development of transport infrastructure and logistics and socio-economic growth is often defected by the negative consequences of “bad” governance at national and local levels, and also difficulties in defining the boundaries of decentralization and socio-economic growth<sup>33</sup>. In addition, the

---

<sup>31</sup> Bafoil F, Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119

<sup>32</sup> Hill H., *Regional Development: Analytical and Policy Issues*, [w:] Balisacan A., Hill H. (eds.), *The Dynamics of Regional Development: the Philippines in East Asia*, Wyd. Edward Elgar 2007, 68–92.; Weiss J., *Globalization, Geography and Regional Policy*, [w:] Balisacan A., Hill H. (eds.), *The Dynamics of Regional Development: the Philippines in East Asia*, Wyd. Edward Elgar 2007.

<sup>33</sup> Bafoil F, Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119.



transport systems of the Visegrad Group countries have always worked and continue to work “in pursuit of” with the transport systems of most Western European countries. The situation is complicated by the fact that the level of their national or domestic funding is much lower than in homologous countries in the West. For example, in 2000–2006, the Visegrad countries and other Central and Eastern European countries invested on average only 8 percent of the total investment made by Western European countries in the same period<sup>34</sup>, although over time the situation began to level off primarily in favor of the new countries EU members. In the regional context, the situation was also variable, after all, as of the same 2006 investments in transport per capita, for example, in Hungary amounted to slightly more than 30 Euros (a similar situation was in Poland and Slovakia), and in the Czech Republic – more than 200 Euros (a relatively similar situation was in 2015-2020). Accordingly, the effect of transport logistics and infrastructure was to bring to the fore road and rail transport, but with constant competition between them, which was not previously characteristic of the transport systems of the Visegrad Group (see Table 2). At the same time, it was found that since 2007 the situation has significantly deteriorated, first of all in the framework of the development of rail and partly inland water transport, and instead slightly improved in the development of the automobile transport.

**Table 2.** Indicators of transport infrastructure development in the Visegrad Group countries, cluster section (as of 2007 and 2016)

| Indicators of the transport infrastructure development           | Poland  |         | Slovakia |        | Hungary |         | The Czech Republic |         |
|--|---------|---------|----------|--------|---------|---------|--------------------|---------|
|  | 2007    | 2016    | 2007     | 2016   | 2007    | 2016    | 2007               | 2016    |
| <b>Railway transport cluster</b>                                 |         |         |          |        |         |         |                    |         |
| Transportation of passengers by rail, in million passengers / km | 19 524  | 18 753  | 2 165    | 3 484  | 8 752   | 7 710   | 6 898              | 8 738   |
| Transportation of goods and cargo by rail, in 1000 tons          | 245 307 | 222 523 | 51 813   | 47 548 | 51 523  | 50 047  | 99 777             | 98 034  |
| Total annual passenger turnover, 1000 pass.                      | 265 995 | 285 094 | 46 984   | 69 150 | 149 551 | 146 010 | 184 184            | 178 766 |
| Total annual turnover and cargo turnover, 1000 tons              | 245 307 | 222 523 | 51 813   | 47 548 | 51 523  | 50 047  | 99 777             | 98 034  |
| Length of railway tracks, km                                     | 20 107  | 19 132  | 3 629    | 3 206  | 7 808   | 7 811   | 9 588              | 9 564   |
| Density of railway tracks, in% per 100 square km                 | 6,34    | 6,04    | 7,54     | 7,54   | 8,88    | 8,72    | 12,29              | 12,26   |
| Length of electrified railway tracks, km                         | 11 898  | 11 874  | 1 578    | 1 587  | 2 738   | 3 018   | 3 060              | 3 236   |
| Percentage of electrified railway tracks,%                       | 60,9    | 63,6    | 43,5     | 43,8   | 35,1    | 39,0    | 32,2               | 34,0    |
| Number of locomotives, №   | 4 427   | 4 004   | 1 057    | 940    | 1 036   | 1 170   | 2 414              | 2 003   |
| Number of carriages, №   | 104 982 | 87 598  | 27 538   | 15 786 | 12 966  | 9 145   | 47 659             | 34 596  |

<sup>34</sup> Bafoil F, Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE). *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119.

| Indicators of the transport infrastructure development                    | Poland  |           | Slovakia |         | Hungary |         | The Czech Republic |         |
|---|---------|-----------|----------|---------|---------|---------|--------------------|---------|
|   | 2007    | 2016      | 2007     | 2016    | 2007    | 2016    | 2007               | 2016    |
| <b>Automobile transport cluster</b>                                       |         |           |          |         |         |         |                    |         |
| Total annual passenger turnover, in million passengers / km               | 270 359 | 244 511   | 7 936    | 5 987   |         |         | 87 661             | 87 257  |
| Transportation of goods and cargo by road, in 1000 tons                   | 984 237 | 1 501 811 | 179 409  | 176 750 | 243 299 | 188 250 | 453 533            | 459 433 |
| Total annual freight and cargo turnover, in million tons / km             | 164 930 | 290 749   | 29 276   | 36 139  | 35 759  | 40 002  | 50 877             | 50 315  |
| Length of highways, km  | 663     | 1 640     | 365      | 463     | 858     | 1 924   | 657                | 1 223   |
| Length of national roads, km  | 18 546  | 19 388    | 3 366    | 3 580   | 31 182  | 30 062  | 6 191              | 5 807   |
| Length of provincial / regional roads, km                                 | 155 814 | 153 865   | 3 742    | 3 611   | 166 170 | 174 599 | 48 736             | 48 727  |
| Length of municipal roads, km   | 209 333 | 246 983   | 36 344   | 36 817  | 0       | 0       | 74 919             | 74 919  |
| Density of roads, in km on 100 square km                                  | 125     | 136       | 91       | 114     | 215     | 226     | 72                 | 72      |
| Number of cars, in 1000 units.  | 14 589  | 21 675    | 1 434    | 2 122   | 3 262   | 3 313   | 4 280              | 5 308   |
| Number of cars per 1,000 inhabitants                                      | 383     | 571       | 267      | 390     | 325     | 338     | 414                | 502     |
| <b>Inland water transport cluster</b>                                     |         |           |          |         |         |         |                    |         |
| Transportation of goods and cargo by inland water transport, in 1000 tons | 6 444   | 3 911     | 8 013    | 6 758   | 8 410   | 8 224   | 1 141              | 832     |
| Total annual freight and cargo turnover, in million tons / km             | 277     | 108       | 1 101    | 903     | 2 250   | 1 975   | 28                 | 36      |
| Length of navigational inland waterways, km                               | 3 660   | 3 655     | 172      | 172     | 1 587   | 1 864   | 664                | 720     |
| Number of self-propelled vessels / barges, №                              | 107     | 91        | 26       | 10      | 74      | 68      | 49                 | 30      |
| <b>Other modes of transport</b>   |         |           |          |         |         |         |                    |         |
| Transportation of goods and cargo by sea, in 1000 tons                    | 52 433  | 72 926    | –        | –       | –       | –       | –                  | –       |
| Length of pipelines, km   | 2 278   | 2 483     | 509      | 506     | 2 208   | 2 215   | 675                | 642     |
| Number of commercial airports, №  | 10      | 12        | 4        | 4       | 3       | 4       | 5                  | 5       |
| <b>Other modes of transport</b>   |         |           |          |         |         |         |                    |         |
| Transportation of goods and cargo by sea, in 1000 tons                    | 52 433  | 72 926    | –        | –       | –       | –       | –                  | –       |
| Length of pipelines, km   | 2 278   | 2 483     | 509      | 506     | 2 208   | 2 215   | 675                | 642     |
| Number of commercial airports, №  | 10      | 12        | 4        | 4       | 3       | 4       | 5                  | 5       |

Źródło: Transport Database, Eurostat, Źródło: <https://ec.europa.eu/eurostat/web/transport/data/database>

At the same time, the key indicators of the decline in transport infrastructure on the railway were the decline in such clusters as: transportation of goods and cargo by rail (all countries in the region), transportation of passengers by rail (primarily Hungary), length and density of railways (especially Poland and Slovakia), the number of locomotives and cars (all countries in the region). However, the situation with the length and percentage of electrified railways in the region has improved somewhat over the last decade (with the possible exception of Slovakia). In turn, inland waterway transport has declined mainly due to reduced transport of goods and cargo, as well as a reduction in the number of self-propelled vessels / barges, although it was characterized by some increase in the length of navigational waterways (primarily in Czech

Republic and Hungary). In contrast, the progress of road transport development after 2007 was reflected in the increase in the length of highways (all countries in the region) and national roads (Poland and Slovakia), increasing of the road density (excluding the Czech Republic), increasing the number of cars (except Hungary), increasing the volume of transportation of goods and cargo (especially in Poland and Slovakia), although characterized by some reduction in annual passenger traffic in Poland and Slovakia, etc.

Another feature and even paradox of the transport infrastructure development of the Visegrad Group countries has become and often remains the fact that in one case their relatively small investment per capita (as, for example, in Hungary and Poland) still led to a significant increase in the transport network, and otherwise their relatively significant investment per capita (as, for example, in Slovakia and the Czech Republic) has led and continues to lead to less development of the transport network<sup>35</sup>. This shows that in some countries of the region, the nature and type of investment has been and remains more sophisticated due to the financing of higher technologies and better available transport infrastructure. In addition, this reflects a certain efficiency and inefficiency of investment management in the transport infrastructure of the Visegrad Group countries. This was often due to the fact that these countries were historically part of highly developed empires and were not fully dependent and generated in the era of planned economies<sup>36</sup>. This means that the rationality of investment in transport logistics and infrastructure in the Visegrad Group countries was due to past development experience and theoretical expectations and ideological ideas about the role of transport in the region, in particular within the EU. This was complemented by the burden of the former transport structures that were developed in the region during the communist regime and were focused on the Soviet and later the Russian market. Finally, it should be noted that in the Visegrad countries the vision of the multimodal transport system was voiced in terms of design and theory, but still the development of transport has taken place almost entirely and is funded by automotive projects. This means that the incentives to create cleaner transport infrastructures in the region were and still are less important than the preferences of citizens and the group interests of road transport<sup>37</sup>.

As a result, it can be stated that the development of transport infrastructure in the Visegrad Group countries mainly depended on the successful transition to a market economy, accession to the EU, rapid growth of domestic needs, ability to attract foreign direct investment and increase small and medium enterprises, in particular through As a result, it can be stated that the development of transport infrastructure in the Visegrad Group countries mainly depended on

<sup>35</sup> Bafoil F., Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119

<sup>36</sup> Bafoil F., *Central Europe. Europeanization and Social Change*, Wyd. Palgrave Macmillan 2009.; Barca F., *An Agenda for a Reformed Cohesion Policy: A Place-based Approach to Meeting European Union Challenges and Expectations*, Wyd. DG Regio 2009.

<sup>37</sup> *OECD Territorial Reviews: Poland*, Wyd. OECD 2008

the successful transition to a market economy, accession to the EU, rapid growth of domestic needs, ability to attract foreign direct investment and increase small and medium enterprises, in particular through growth income and trade liberalization. income As a result, it can be stated that the development of transport infrastructure in the Visegrad Group countries mainly depended on the successful transition to a market economy, accession to the EU, rapid growth of domestic needs, ability to attract foreign direct investment and increase small and medium enterprises, in particular through the income growth and trade liberalization<sup>38</sup>. This has led to the liberalization of trade between the old and new EU member states and has been particularly useful for the Visegrad countries, which today have greater access to markets for goods and services. In addition, the countries of the region have also experienced an increase in exports from the EU as a result of the successful internationalization of their products, strong integration with international markets and trade diversification. Although, in contrast, the initially low level of transport infrastructure in the countries of the region, in particular after the collapse of the USSR, was considered as an obstacle to further improving intra-regional trade<sup>39</sup>. The desire of the Visegrad Group countries to integrate into the EU has remedied the situation, as this process has succeeded in building an integrated and single market that requires harmonization of trade rules and regulatory systems, as well as mutual recognition of different national rules that meet all EU guidelines<sup>40</sup>.

At the same time, the development of transport logistics, infrastructure and the system of the Visegrad Group countries resulted in the diversification of the latter, and for different parameters. But the common effects were such processes of significant changes in the geographical directions of foreign trade and quality requirements for transport services, such as: growing demand for high added value of goods instead of raw materials; a radical increase in the importance of the service supply chain; changes in the structure of cities and an increase in the number of private cars; reorientation of transport and trade flows from east to west; growth of the tourist services and flows; changing the nature of the modal split in the direction of the share of the automobile transport increasing and the share of rail transport reducing<sup>41</sup>; introduction of mechanisms of planned investments and reconstruction of transport, which require the application of complex procedures for assessing its efficiency, which is compatible with European transport. As a result, it reflects the construction that more and more EU and Visegrad Group politicians recognize the fact that EU enlargement and its transformation into a more competitive region is impossible without intensive development of transport logistics

<sup>38</sup> Badinger H., Breuss F., What has Determined the Rapid PostWar Growth of Intra-EU Trade, "IEF Working Paper" 2003, nr. 48.

<sup>39</sup> Assawanmanakul N., Bafoif F., Fenn W., LeCompte A., Ruiwen L., Chung-A. P., *Transport Infrastructure and Development in the Greater Mekong Subregion and Eastern Europe – A Comparative Perspective*, Wyd. MPA Sciences Po. 2009

<sup>40</sup> Barca F., *An Agenda for a Reformed Cohesion Policy: A Place-based Approach to Meeting European Union Challenges and Expectations*, Wyd. DG Regio 2009.

<sup>41</sup> Bekefi Z., Kiss L., Tanczos K., Multicriteria Analysis of The Financial Feasibility Of Transport Infrastructure Projects In Hungary, "Information Systems and Operational Research" 2003, vol 41, nr. 1, s. 105–126.

and infrastructure, as only an integrated transport network can “include” new markets in a geographical sense. In this context, it is noteworthy that the development of transport in the region took place and takes place mainly within the so-called “framework dimension” of European integration, when they tried and are trying to establish norms in the areas where conflicts of interest between EU member states allow them to develop only such policies, which are vague and more or less symbolic<sup>42</sup>. Therefore, the Europeanization of transport in the Visegrad Group countries cannot be reduced exclusively to compliance with EU legislation or the transposition and implementation of EU directives. After all, the Europeanization of transport, although less powerful and influential, has also begun to take shape through the formation of relevant beliefs and expectations at the level of EU member states, as internal transformation processes began to manifest themselves in the beliefs and opinions of political and economic players or in the political and socio-economic discourse.

A clear example of this was and remains the state of development of railway transport, not only in the Visegrad countries, but also in the EU and Europe in general. The fact is that despite the plan to liberalize the European passenger and freight market by rail, the relevant measures still remain quite symbolic, without significantly changing the institutional context in which foreign and domestic market players operate, and without offering the specific institutional results to be achieved<sup>43</sup>. Although, in contrast, proposals for the liberalization of European rail transport have been on the European Commission’s agenda since the mid-1970s, however, the relevant legislative proposals did not overcome the initial stage of the legislative process. There were and are several reasons for this. First, there were significant difficulties in reaching an agreement, as rail transport (as opposed to automobile transport), especially in Poland and Hungary, was not only a subject of economic activity, but was also seen as a provider of a socially significant service with social commitments supported for political reasons. Second, the European Commission had limited legal and institutional powers to overcome the resistance of EU member states. Accordingly, since the start of the reform of the railway sector (since the 1990s), the main goal of this process has been to change the policy-making environment in the EU Member States, in particular by increasing support for the suggested reform agenda. However, this did not work, but instead exacerbated the modal divide between rail and automobile transport in the Visegrad countries.

The outlined logic of the development of the transport system, logistics and infrastructure in the countries of the Visegrad Group was supplemented by the fact of their differentiated development not only at the international level, but also at the level and within individual sub regions. As a result, there is a situation when within some countries some sub regions are more developed in transport, and other sub regions – less. This is due to interethnic and sub regional

<sup>42</sup> Prokopenko L., Rudik O., Bashtannyk V., *Protses yevropeizatsii ta yoho osoblyvosti v postkommunistychnykh krainakh Tsentralnoi ta Skhidnoi Yevropy*, Wyd. NADU 2010.

<sup>43</sup> Prokopenko L., Rudik O., Bashtannyk V., *Protses yevropeizatsii ta yoho osoblyvosti v postkommunistychnykh krainakh Tsentralnoi ta Skhidnoi Yevropy*, Wyd. NADU 2010.

territorial differences in the dynamics of socio-economic development, as well as aspects of different quality of life in the countries of the analyzed region<sup>44</sup>. Thus, the socio-economically backward regions of individual countries are usually characterized and determined by the spatially marginal or peripheral state of development of their transport systems and infrastructure, etc<sup>45</sup>. For example, in Slovakia, southern regions of the center of this country and northeastern Slovakia are considered by various researchers to be such regions. They have a peripheral position on important transport corridors and suffer from the low quality of their own intra-regional transport networks – without motorways and well-developed railways. By analogy, some parts of Poland and Hungary, which border on the transport peripheral regions of Slovakia, are relatively marginal. This is primarily due to the fact that in total these subregions of the Visegrad Group countries are outside the European multimodal corridors, which prevents them from applying for funding from EU state or financial resources for the development of transport infrastructure and modernization of their transport networks<sup>46</sup>.

In general, the study found that the Visegrad Group countries have historically lagged behind the average European indicators of investment in transport. Even though, in general, investment in the transport system and infrastructure in the Visegrad Group countries has effectively and variably affected the level of trade activity and exports, the overall level of investment and capital activity of the region, transportation volumes, and hence the level of income, gross product and inflationary fluctuations. In general, the modernization and development of transport logistics, infrastructure and systems in the Visegrad countries during the late 20 – early 21 century had and have significant consequences that differ from the consequences of transport development for most of the twentieth century. Moreover, it was found that these consequences are obvious both in theoretical and practical terms and are primarily socio-economic, as they affect the competitiveness of national economies of the Visegrad Group. But in the end, it still gives grounds to state that transport logistics, infrastructure and the system in general in the Visegrad Group countries, although characterized by significant modernization effects, still have significant gaps in their development that need to be addressed.

## References

1. Assawanmanakul N., Bafoil F., Fenn W., LeCompte A., Ruiwen L., Chung-A. P., *Transport Infrastructure and Development in the Greater Mekong Subregion and Eastern Europe – A Comparative Perspective*, Wyd. MPA Sciences Po.2009.
2. Badinger H., Breuss F., What has Determined the Rapid PostWar Growth of Intra-EU Trade, *“IEF Working Paper”*2003, nr. 48.

<sup>44</sup> Hornak M., *Identification of Regions of Transport Marginality in Slovakia*, Warsaw Regional Forum 2005

<sup>45</sup> Pasiak J., Gajdos P., Faltan E., *Regional Patterns in Slovak Development*, [w:] *Central Europe in Transition: Towards to EU Membership*, Wyd. Regional studies association 2001, s. 330–363.; Halás M., *Cezhraničné väzby, cezhraničná spolupráca (na príklade slovensko-českeho pohranicia s dôrazom na jeho slovenskú časť)*, Wyd. Univerzita Komenského Bratislava 2005

<sup>46</sup> Hornak M., *Identification of Regions of Transport Marginality in Slovakia*, Warsaw Regional Forum 2005.

3. Bafoil F., *Central Europe. Europeanization and Social Change*, Wyd. Palgrave Macmillan 2009.
4. Bafoil F., Ruiwen L., Re-examining the Role of Transport Infrastructure in Trade, Regional Growth and Governance: Comparing the Greater Mekong Subregion (GMS) and Central Eastern Europe (CEE), *Journal of Current Southeast Asian Affairs* 2010, vol 29, nr. 2, s. 73–119.
5. Bekefi Z., Kiss L., Tanczos K., Multicriteria Analysis of The Financial Feasibility Of Transport Infrastructure Projects In Hungary, *Information Systems and Operational Research* 2003, vol 41, nr. 1, s. 105–126.
6. Barca F., *An Agenda for a Reformed Cohesion Policy: A Place-based Approach to Meeting European Union Challenges and Expectations*, Wyd. DG Regio 2009.
7. Brewer A., Button K., Hensher D., *Handbook of Logistics and Supply Chain Management*, Wyd. Elsevier Science Ltd. 2001.
8. Christopher M., *Logistics and Supply Chain Management. Creating Value-Adding Networks*, Wyd. Prentice Hall 2005.
9. Coyle J., Bardi E., Langley C., *The Management of Business Logistics: A Supply Chain Perspective*, Wyd. South-Western/Thomson Learning 2003.
10. Fawcett S., Fawcett A., The firm as a value-added system, *International Journal of Physical Distribution and Logistics Management* 1995, vol 25, nr. 5, s. 24–42.
11. Fender M., *Global Supply Chain Management*, [w:] Wieser P., Perret F-L., Jaffeux C. (eds.), *Essentials of Logistics and Management: The Global Supply Chain*, Wyd. Epfl Press 2013.
12. Halás M., *Cezhraničné väzby, cezhraničná spolupráca (na príklade slovensko-ceskeho pohranicia s dôrazom na jeho slovenskú časť)*, Wyd. Univerzita Komenského Bratislava 2005.
13. Hallaert J.-J., A History of Empirical Literature on the Relationship between Trade and Growth, *Mondes en Développement* 2006, vol 34, nr. 135, s. 63–77.
14. Hill H., *Regional Development: Analytical and Policy Issues*, [w:] Balisacan A., Hill H. (eds.), *The Dynamics of Regional Development: the Philippines in East Asia*, Wyd. Edward Elgar 2007, 68–92.
15. Hornak M., *Identification of Regions of Transport Marginality in Slovakia*, Warsaw Regional Forum 2005.
16. Karmazin G., Markovits-Somogyi R., Bokor Z., Effects of infrastructure extension on the competitiveness of Hungarian logistics providers, *Acta Technica Jaurinensis* 2013, vol 6, nr. 4, s. 71–78.
17. Klaus P., Logistics as a science of networks and flows, *Logistics Research* 2010, vol 2, nr. 2, s. 55–56.
18. Kramar U., Sternad M., Cvahte T., Logistics performance and its connection to competitiveness of the national economy in Slovenia and the Visegrad Group, *European Perspectives – Slovenia's Role in Visegrad Group* 2015, vol 7, nr. 2, s. 83–100.
19. Lin S.-C., Liang G.-S., Ye K.-D., Lee K.-S., Relational Analysis between the Indices for Production Stage in an International Logistics System Developed by Airports and National Resources Factors, *Journal of the Eastern Asia Society for Transportation Studies* 2005, vol 6, s. 2852–2867.
20. Maciulis A., Vasiliauskas A., Jakubauskas G., The impact of transport on the competitiveness of national economy, *Transport* 2009, vol 24, nr. 2, s. 93–99.

21. Mairate A., The 'Added Value' of the European Union Cohesion Policy, "*Regional Studies*" 2007, vol 40, nr. 2, s. 167–177.
22. *OECD Territorial Reviews: Poland*, Wyd. OECD 2008.
23. Pasiak J., Gajdos P., Faltan E., *Regional Patterns in Slovak Development*, [w:] *Central Europe in Transition: Towards to EU Membership*, Wyd. Regional studies association 2001, s. 330–363.
24. Popescu A., Sipos C., *Logistics Performance and Economic Development – A Comparison within the European Union*, Multidisciplinary Academic Conference on Economics, Management and Marketing, 2014.
25. Prokopenko L., Rudik O., Bashtannyk V., *Protses yevropeizatsii ta yoho osoblyvosti v postkomunistychnykh krainakh Tsentralnoi ta Skhidnoi Yevropy*, Wyd. NADU 2010.
26. Rushton A., Croucher P., Baker P., *The handbook of logistics and distribution management*, Wyd. Kogan Page Limited 2014.
27. *Safe, Clean, and Affordable Transport for Development – The World Bank Group's Transport Business Strategy 2008–2012*, Wyd. World Bank 2008.
28. Serhat B., Harun S., Analyzing the Dependency Between National Logistics Performance and Competitiveness: Which Logistics Competence is Core for National Strategy?, "*Journal of Competitiveness*" 2011, vol 4, s. 4–22.
29. Stock J., Lambert D., *Strategic Logistics Management*, Wyd. Mc-Graw Hill Irwin 2001.
30. *Transport Database*, Eurostat, źródło: <https://ec.europa.eu/eurostat/web/transport/data/database>
31. Waters D., *Logistics: An introduction to Supply Chain Management*, Wyd. Palgrave MacMillan 2003.
32. Weiss J., *Globalization, Geography and Regional Policy*, [w:] Balisacan A., Hill H. (eds.), *The Dynamics of Regional Development: the Philippines in East Asia*, Wyd. Edward Elgar 2007.