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**TRANSPORT INFRASTRUCTURE AS A FACTOR OF THE EU COUNTRIES'  
ECONOMIC DEVELOPMENT**

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**Abstract**

**Introduction.** *The driving force behind the economic development of the regions and the countries-members of the European Union is modern transport infrastructure. For this reason, to draw up the level with the countries of Western Europe, there is funding for the countries of the former socialist bloc in the construction and modernization of road routes.*

**The purpose of the article** *is studying the condition of road infrastructure in the EU and, in particular, Poland as a factor in the economic development of countries and regions.*

**Results.** *The article analyzes the current development of road infrastructure in Europe and, in particular, Poland and the implementing investments for this purpose. The Regulations of the General Director for National Roads and Motorways as well as legal acts concerning this issue were analyzed. The prospects for the development of Polish road engineering till 2030 were indicated. The types of roundabouts on motorways built in the EU countries are presented. Scientific articles on the situation of EU countries in the field of road infrastructure have proven to be important sources of information. However, the most important source when it comes to road infrastructure in Poland turned out to be materials of General Directorate for National Roads and Highways, in which all national road programs are described.*

**Conclusions.** *The authors justify that each year Poland is getting closer to the Western countries of EU on the level of road infrastructure development. The main reason for the increase in the level of road infrastructure in Poland is the projects of the General Directorate for National Roads and Highways, as well as the National Road Construction Program for the years 2014-2023 (with a perspective till 2030) and the National Road Traffic Management System for TEN-T networks, which will have a significant impact on economic growth and the comfort of movement of the society.*

**Keywords:** *road infrastructure, economic development, Trans-European Transport Network, sustainable transport development strategy.*

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## **ТРАНСПОРТНА ІНФРАСТРУКТУРА ЯК ФАКТОР ЕКОНОМІЧНОГО РОЗВИТКУ КРАЇН ЄС**

Ворналкевіч В., Каплуновська А. М., Падченко О. О. Транспортна інфраструктура як фактор економічного розвитку країн ЄС. *Український журнал прикладної економіки*. 2021. Том 6. № 2. С. 137 – 146.

### **Анотація**

**Вступ.** Рушійною силою економічного розвитку регіонів та країн-членів Європейського Союзу є сучасна транспортна інфраструктура. Саме тому, щоб вирівняти рівень економічного розвитку із країнами Західної Європи, країнам колишнього соціалістичного блоку надається фінансування на будівництво та модернізацію автомобільної інфраструктури.

**Метою статті** є дослідження стану дорожньої інфраструктури в ЄС, зокрема у Польщі, як чинника економічного розвитку країн та регіонів.

**Результати.** У статті проаналізовано поточний стан розвитку дорожньої інфраструктури в Європі та, зокрема, в Польщі та реалізацію інвестицій для досягнення цієї мети. Було проаналізовано Розпорядження Генерального директора з національних доріг та автомагістралей, а також нормативно-правові акти, що стосуються сфери дорожньої інфраструктури. Було досліджено перспективи розвитку польського дорожнього будівництва до 2030 року. Представлені типи кругових розв'язок на автостадах, побудованих у країнах ЄС. Наукові статті про становище країн-членів ЄС у сфері дорожньої інфраструктури виявились важливими джерелами інформації. Однак, найважливішим джерелом, що стосується дорожньої інфраструктури в Польщі, стали документи Генерального директорату національних доріг та автомагістралей, у яких описано усі національні дорожні програми.

**Висновки.** Автори доводять, що Польща з кожним роком наближається до західних країн ЄС щодо рівня розвитку дорожньої інфраструктури. Основною причиною підвищення рівня розвитку дорожньої інфраструктури в Польщі є проекти Генерального директорату національних доріг та автомагістралей, а також Національна програма будівництва доріг на 2014-2023 роки (з перспективою до 2030 року) і Національна система управління дорожнім рухом для мереж TEN-T, яка має значний вплив на економічне зростання та комфорт руху.

**Ключові слова:** дорожня інфраструктура, економічний розвиток, Транс'європейська транспортна мережа, стратегія сталого розвитку транспорту.

**JEL classification: R41**

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### **Introduction**

Transport is one of the basic activities of the national economy, which creates conditions for successful balanced and proportional development of the economy of regions and countries. Among many factors that determine the effectiveness of the process of integrated regional development, an important role belongs to the transport system, transport support of the economies of regions, countries, and the system of their transport and economic relations, i.e. transport infrastructure. One of the most important components of the EU's transport infrastructure is road infrastructure.

The road infrastructure on the territory of the European Union is developing at a fairly fast pace, at the expense of other countries. Its member states, especially those under the leadership of the host, make themselves a priority for the development of communication

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infrastructure. It should be added, however, that the European Union itself recognizes and obliges all its members to adhere to the standards of development and thus adopt them through membership in it. One of the essential foundations of the development of the communication network is the fulfilment of the outlined standards arising from art. The developed infrastructure facilitates slow communication to the general public and regions. This also results in benefits related to the Schengen acquis, the avoidance of passport control in Europe, as well as the advantage of doing long distances [1].

International routes in the European Union are marked with one, two, or three digits preceded by the letter E. Supervision over the European road network and thus possible proposals for changes in their route belong to the United Nations Economic Commission for Europe (UNECE). However, in some regions, such as Germany and Poland, the numbering of other European countries is convenient with the regional numbering system. If we are talking about drugs mediocre and basic, they are marked as category "A" and have a two-digit number. If we are talking about various drugs, drugs, and branches, it belongs to the category "B" (three-digit number). In the case of the base roads running from the north to the south of Europe, they are marked by an unpaired two-digit number with the ending "5", increasing from west to east. However, the basic roads running from west to east have a two-digit even number with the ending "0" [1]. As for intermediate roads, they have the two-digit odd and even numbers between the numbers of primary roads. In the case of roads of "B" category, they are marked with three digits, the first of which refers to the main road closest to the north of the "B" road, the second refers to the main road closest to the west of this "B" road, while the third is the so-called ordinal number [2].

An extensive road network, in which motorways play a leading role, is a feature of countries with a high degree of economic development. Among the European countries where their development is at an advanced level, there are undoubtedly such countries as Spain, Germany, and France. In Spain, the total length of roads exceeds 17000 km, in Germany it is 15000 km, while in France 11000 km. For comparison, the countries of Scandinavia, especially those with a small area, as well as countries located in Central and Eastern Europe belonging to the former socialist bloc, fare worse in this area [3]. The differences in the standard of roads in different European Union countries result primarily from various types of factors, mainly economic, but also geographical. However, mainly in Central and Eastern Europe, the development of roads and their infrastructure has gained special dynamics.

There are several terms in the presented subject matter.

United Nations Economic Commission for Europe (UNECE) is one of the United Nations regional commissions, established in 1947 [4].

Trans-European Transport Network (TEN-T) is the instrument to coordinate and ensure a coherence and complementarity of infrastructure investments [5].

The intelligent highway is a motorway with active traffic management and signs above a road showing the appropriate speed on a given section or blocked lane [6].

ATM is Active Traffic Management system on intelligent highways [7].

Cross-border section is a section that crosses the state border [8].

Connecting Europe Facility (CEF) is a new financial instrument to replace the current TEN-T program. It supports the development of three areas: transport, energy and telecommunications networks [9].

Strategy for Responsible Development (SOR) is an update of the National Development Strategy 2020 [10].

White Book is a report by a government, institution, or organization that provides an analysis of a given product, service, technology, or program [11].

General Directorate of Roads and Motorways (GDDKiA) is the central government administration office in Poland, supporting the General Director for National Roads and

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Motorways (as an authority), established to manage national roads and motorways and expressways, as well as to implement the state budget in this regard [12].

The Infrastructure and Environment Operational Programme (POIiŚ) defines the main directions of support under the Cohesion Policy 2014-2020, which also includes OP Infrastructure and Environment [13].

### **Review of related literature**

The role and place of transport infrastructure in the economic development of cities, regions, countries are the subject of research for many scientists. Thus, T. Nestorenko considers infrastructure, including transport, as one of the factors of urban competitiveness [14]. The works of N. Remzina [15], Y. Zahorodnia [16] are devoted to the analysis of the impact of port infrastructure on the competitiveness of enterprises and the country.

The development of transport infrastructure will contribute to the deepening of economic and personal ties between EU member states and their neighbours, in particular, Ukraine [17], the formation of an effective socially oriented labour market [18], increase the efficiency of logistics systems [19, 20, 21], is a necessary prerequisite for the development of enterprises' innovative potential [22]. Implementation of the investment policy of the state or association of states in the field of transport infrastructure will contribute to the formation and increase of investment potential of this industry [23]. The direction and dynamics of road infrastructure development, as well as the quality of life, are directly influenced by the state and development of the automotive industry [24, 25].

It is worth considering that the most common mode of transport used in international and interregional trade activities in the EU, as well as in the movement of people, is road transport. Therefore, further research requires an analysis of the state and directions of development of road infrastructure of EU member states and, in particular, Poland, as a necessary factor in accelerating and facilitating the flow of goods and people between European countries.

### **Purpose**

The article aims to study the state of road infrastructure in the EU and, in particular, Poland as a factor in the economic development of countries and regions.

### **Results and discussion**

The European Union is currently focusing on the intensive development of road communication, which results from its policy aimed at facilitating the flow of goods and people between its different countries, in which roads and extensive communication infrastructure play the main role. The priority in the field of developing the discussed infrastructure is co-financing investments for the development of roads in Eastern European countries. This is to make their level of development equal to the leading countries in this respect, or at least to bring them closer to this level.

Several prospective communication facilities are being built in Central and Eastern Europe, but the pace of their development has been estimated by union experts to be very significant. At the end of April 2020, it was approved that, at the end of the remaining six years, the territory of the former socialist bloc, which had been only 400 km long, was completed [26]. It should be added that for 13 years (2007-2020) the Member States of the European Union received a total of almost EUR 78 billion as part of co-financing for the construction of new roads and modernization of the existing ones. A significant part of these funds, around EUR 40 billion, was allocated to the construction of roads in the TEN-T network. Over the 10 years (2007-2017), a total of about 3.1 thousand jobs were created, while in the period (2014-2020) almost 2 000 km of highways, of which the already mentioned 400 km were completed on December, 2019. Thus, the construction of the TEN-T network is progressing at a slower pace than originally assumed, as indicated in a specially prepared report by the auditors and experts from the European Court of Auditors. The implementation rate of road networks in Bulgaria in

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2020 was 46%, in the Czech Republic 78%, and in Poland 75%. As for countries located in Western Europe, it is over 90% (the Netherlands, France, Belgium, Austria) [26]. The European Commission is mobilizing the Member States to implement the construction of the TEN-T network in their national plans. But for this purpose, countries allocated only 1/3 of the total EU funds for the period 2014-2020. When the regulation on the TEN-T network was adopted in 2013, the priority goal was to complete the road network, which was to connect all regions in the European Union by 2050, and the core network by 2030.

In Poland, in order to develop road infrastructure the National Road Construction Program for the years 2014-2023 (with a perspective until 2030) is being implemented. This document is provided for the completion of the construction of expressways and motorways as well as the construction of bypasses along national roads. The implementation of all investment tasks will allow the creation of a network of motorways and expressways.

Figure 1 shows the development of Poland in terms of newly constructed kilometers of roads as on May 16, 2020 and those that are under construction. We can also notice those road sections that were planned to be completed next. One of the important planned sections that will improve both the comfort of residents in moving and improve transport is, among others, the route connecting Bydgoszcz and Szczecin, the route connecting the cities of northern Poland, Gdańsk-Słupsk-Koszalin, the road between Olsztyn and Białystok. The figure also shows the planned route connecting Białystok and Lublin, which will be a part of the *Via Carpatia* route, connecting the northern and southern parts of Europe.



**Fig. 1. The condition of expressways and highways in Poland [27]**

Figure 1 shows how Poland is developing in the construction of expressways and motorways. The green color shows the existing roads and the ones that have been put into use, while the red color shows the road sections under construction, and the gray color shows the planned sections of expressways and motorways. We can add that in countries located in Western Europe, roads are characterized by a high level of comfort (Luxembourg, the Netherlands, Belgium). Thus, their high density is accompanied by good bandwidth and trouble-free connections between regions and countries. Apart from France, Germany, and Spain, Slovenia and Switzerland can also boast a decent level of road development.

As shown in Figure 2, most expressways in the European Union are relating to the road network with a maximum permitted speed of up to 200 km / h. Roads with speeds of up to 230 km / h are in second place, while the fewest are roads with speeds above 300 km / h. The policy pursued by the European Union is focused on the creation of intelligent highways that use the latest and innovative technologies to manage the flow of traffic on highways and main roads. Many of them use various types of cameras to monitor and control the speed of drivers as well as lanes. Thanks to active traffic management systems called ATM, the flow of traffic on

European roads is controlled by special speedometers that display the appropriate speeds on panels on the sides of the roads, ensuring that traffic flows smoothly.



**Fig. 2. Main road routes in the European Union [28]**

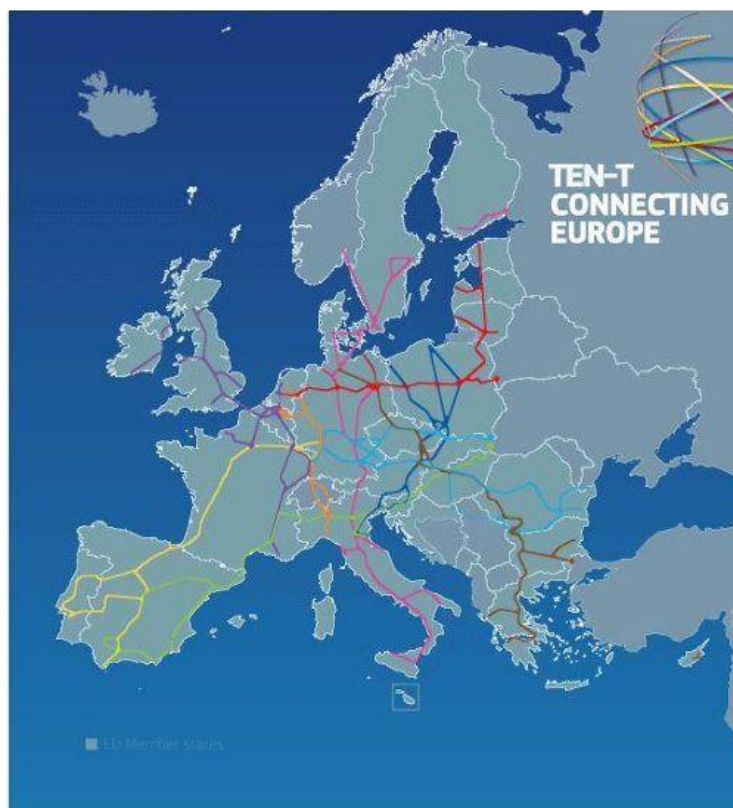
The most important task carried out within the European Union is the creation of the core network, i.e. the Trans-European road network, whose task is to connect all EU regions by motorways. The implementation of this program began in 2013 and its completion is scheduled for 2030. According to Regulation 1315/2013, all EU Member States must complete work related to the core network by 2030 [29]. The development of the TEN-T is a tool that serves appropriate coordination as well as ensuring the coherence and complementarity of investments in road infrastructure. As part of the guidelines for the TEN-T road network, its layout in the territories of the Member States of the European Union was established. It includes the core network which is the basis for the development of the overall transport network. The current activities undertaken by the European Union are mainly oriented towards works within the framework of:

- road sections in cross-border places,
- missing links,
- preserving the bandwidth in the most important bottlenecks,
- expansion of comprehensive networks,
- multimodal connections,
- connectivity of all regions of the European Union [5].

The Trans-European Transport Network is comprehensive, as it includes road, air, rail, sea and inland routes. Figure 3 shows the planned location of the corridors within the TEN-T network [5].

The development of the TEN-T road network will be fully guaranteed by the delimitation of the territorial integrity of all member states of the European Union, as well as the development of free float and towage. An efficient transport system should also lead to the improvement of the single foreign market and be a stimulator of the growth of the economic

regions of the European Union. It is important to build a more cohesive and uniform network of roads and transport – in line with the same standards and while maintaining high technical parameters [5]. One of the most important ventures undertaken by leading European Union countries in the field of road infrastructure development is cooperation on the line France – Germany – Spain.



**Fig. 3. Planned core network corridors within the TEN-T network [30]**

The main assumption is the further expansion of the existing road networks as well as the construction of new sections, although the latter element is not so important due to the fact that these countries already have a very well-organized road infrastructure. There were several prospects for the expansion and modernization of the road network:

- execution of a special plan for the expansion of communication nodes,
- elimination of bottlenecks in cross-border sections,
- development towards more effective use of transport infrastructure,
- getting rid of barriers to interoperability (the ability of entities to cooperate to achieve the intended effects) of road networks,
- increasing the safety of road network participants [5].

The creation of TEN-T core network corridors was approved in two regulations of the Council of the European Union and the European Parliament. The main document is Regulation 1316/2013 on the establishment of a new financial instrument *Connecting Europe Facility* (CEF) [31]. The second regulation is the document 1315/2013 concerning the guidelines of the European Union on the development of TEN-T [31]. This regulation mainly defines the organizational matters of the operation of core network corridors throughout Europe, which are presented in Figure 4.

In the first of these documents, the individual corridors of the European TEN-T core network were precisely defined. In total, 9 corridors have been established to replace the previous 30 TEN-T priority projects, including corridors:

- connecting the Adriatic Sea with the Baltic Sea,
- connecting the Baltic Sea with the North Sea,
- within the Mediterranean Sea,

- connecting the East with the Eastern Mediterranean,
- connecting Scandinavia with the Mediterranean Sea,
- connecting the Rhine with the Alps,
- within the Atlantic,
- connecting the Mediterranean Sea with the North Sea,
- connecting the Danube with the Rhine [32].



**Fig. 4. TEN-T Trans-European transport network planned by 2050 [5]**

One of the most important Trans-European networks is the Baltic-Adriatic Corridor, which includes, in addition to roads, the rail route. This corridor connects the Baltic Sea with the Adriatic Sea and passes through the industrialized areas from Upper Silesia (Southern Poland) to northern Italy via Bratislava, Vienna, and the Eastern Alps [32].

Today the most of the modernizations carried out by major European countries are aimed at seamlessly combining different types of transport (road, rail, and sea ones) into comprehensive multimodal lines that support transport by various means. To develop these corridors within the framework of this core network, the European Commission has appointed special coordinators who act on behalf of the European Union in consultation with the leading Member States of the European Union [29]. Although some roads within the European communication networks are functioning, modernization works are currently being carried out to expand the possibilities and potential. And Poland plays an important role in the development of EU road infrastructure.

### Conclusion

Each year Poland is getting closer to the Western countries of EU on the level of road infrastructure development. The main reason for the increase in the level of road infrastructure in Poland is the projects of the General Directorate for National Roads and Highways, as well as the National Road Construction Program for the years 2014-2023 (with a perspective till 2030) and the National Road Traffic Management System for TEN-T networks, which will have a significant impact on economic growth and the convenient traffic for the society.

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