The influence of road transport infrastructure on tourist movement in selected European Union countries

Introduction

Road infrastructure is a concept that covers man-made, firmly placed basic facilities used for transportation, i.e. roads (linear infrastructure) and transport nodes (point infrastructure) [11]. Linear infrastructure includes transport roads and conveyance facilities (pipes and power lines) used for movement: railroads, highways, waterways, bridges, tunnels, rails, embankments etc. [6] In the case of point infrastructure, there are harbours, airports, marinas, piers, intermodal freight transport terminals, warehouses etc. [8] Some authors add various auxiliary facilities to linear and point infrastructure that are used directly to service roads and nodes as well as access roads and pedestrian paths [9, 13].

Road transport is especially popular because it provides an opportunity to get directly to almost every point. In addition, this branch of transport is relatively most reliable and fast, i.e. has features that are advantageous for customers. The main drawbacks to this transport are too little safety and high costs. There are many transportation companies so their services are most easily available for customers [1]. Every vehicle owner can use the road infrastructure free of charge or for a low toll. Moreover, the use of that infrastructure guarantees punctuality and journey flexibility, and almost unlimited availability [18]. Therefore, it is the kind of infrastructure that tourists who visit a foreign country use first of all. It is extensively differentiated as far as its quantity and quality are concerned. In the case of high quality standard, access to it usually requires that the users pay a toll [5].

Logistic infrastructure is a broader concept than transport infrastructure and covers the basis for companies’ operations in the economy from the macro-economic point of view but without general legal and administrative conditions for companies’ operations and politics. In the micro-economic sense on the other hand, logistic infrastructure means buildings and premises (warehouses, etc.), which serve individual entities [16]. All these facilities constitute a logistic system. The term: transport system is a narrower concept. It covers only some elements connected with the movement of goods and persons, i.e. road network, transport nodes, human resources and organizational systems connected with management, flow of information, traffic regulations etc. [4]

From the point of view of the European integration, transport is one of the most important industries. Its role in the European Union is extraordinary, which is shown by the statements made in the foundation treaty of 1957 and all the successive treaties: of Maastricht of 1990 and of Amsterdam of 1999 [12]. Countries who joined the European Union used to have worse roads as far as both quality and quantity are concerned. The need to develop an appropriate standard of roads and transport nodes always was one of the most urgent objectives for the new member states [15]. However, the unification of infrastructure is
not possible in a day. This is a process that requires dozens of years and enormous funds.

Tourism is a specific kind of people’s mobility. This mobility is connected with the change of a person’s stay, their life environment and mode. It is a voluntary change. Moreover, tourism includes all phenomena and relationships connected with this tourist movement. The word ‘tourism’ originates from a French word ‘tour’. It means a trip from one place to another and then a return trip to the first place [10].

Tourism covers all the activities performed by people who travel and stay somewhere in order to relax, on business or for other purposes for not longer than a year without a break away from their everyday environment, with the exception of trips aimed at finding employment and earning money in the visited place [3]. It is one of the quickly growing industries in Europe and all over the world. The development of tourism is a process that influences economic, social, political and ecological areas [14].

In its broader sense, tourism means all the space mobility phenomena connected with any voluntary change of residence, mode and environment of life and personal contact with the visited environment (natural, cultural or social one) [7].

World Tourism Organization divided tourism into [17]:

- Business tourism;
- Recreational tourism, active and special one;
- Small border and transit tourism;
- Urban tourism;
- Rural tourism – agritourism;
- Hard tourism (that aims to provide tourists with luxury, comfort and fast sightseeing) and soft tourism (that aims at new experience, learning new skills and physical exercise).

In relations to a particular country, one can distinguish the following types of tourism [2]:

- Domestic tourism – residents travelling within their own country;
- Inbound tourism – non-residents travelling in the given country;
- Outbound tourism – residents travelling in another country.

For many regions, tourism is becoming an important factor in the economic development, reduces unemployment, establishes market for food and handicraft and creates new workplaces. For many people it is a way of earning extra income. It forces the development of infrastructure, e.g. facilities necessary to protect the environment, sports and recreational facilities, retail outlets, gastronomic services and other services connected with tourists’ needs (medical and veterinary clinics, vehicle and other equipment repair stations, post offices, banks etc.).

The connection between tourism and transport infrastructure is unquestionable. If there is an appropriate network of transport roads and nodes in the given country, it is an incentive for tourists to visit the region. Individual countries’ tourism attractiveness differs, e.g. they may have a friendly climate, beautiful landscape or interesting cultural and recreational places. Another factor that has impact on the tourists’ choice of the given country may be its good transport infrastructure.
**Research organization**

The article aims to define interdependencies of the road infrastructure state and tourist movement in selected European Union countries. The complete data for comparison have been obtained from 18 counties. This number constitutes 2/3 of the total population of the European Union member states. There are states that joined the European Union at a different time. The later the accession, the worse the economic situation and the transport in the country were. The new member states had to catch up with the old ones. The 18 countries that are subject to the analysis are:

- Founding states: Belgium, France, Germany and Italy;
- States that joined the EU in 1973: the United Kingdom;
- States that joined the EU in the second stage in 1980s: Spain and Portugal;
- States that joined the EU in 1995: Austria and Finland;
- States that joined the EU in 2004: Cyprus, the Czech republic, Estonia, Lithuania, Poland, Slovakia and Slovenia;
- States that joined the EU in 2007: Bulgaria and Romania.

The source materials are: literature on the topic, EUROSTAT and the World Bank statistical data. Tourism is discussed based on the data in relation to foreign visitors. The work uses a ratio analysis method. The article discusses the ratios showing the interdependence of the number of tourists and the state of roads, i.e. the linear infrastructure. Individual states are made distinct from the other based on their total area and population. These factors are also taken into account to create adequate ratios. There is also a correlation made between the number of foreign tourists and individual factors defining the state of road infrastructure. Due to the availability and completeness of information for the analysis, the data refer to 2010. It was not possible to obtain more up-to-date data at the time of their collection.

**Research results**

Before the comparison, general rates specifying the country’s tourism potential must be presented. The first ratio is the proportion of the number of foreign tourists to the population of the given country (Fig. 1). In that case, there are states that have a very big tourism potential. Austria with its excellent conditions for winter sports attracts tourists in winter. A similar situation is with Cyprus in summer. As far as other countries are concerned, the number of foreign tourists in a year per 1,000 inhabitants was from 246 in Slovenia to 1,774 in Estonia. The same rate for Poland was 327 foreign tourists in a year.

The correlation ratio between the number of citizens and the number of foreign tourists visiting the county was 0.78 (p-value = 0.05). Thus the discovered interdependence is important.
Fig. 1. Number of foreign tourists per 1,000 citizens of the given country in 2010

Individual states differ in respect of their population density so the next ratio relates to the proportion of the number of foreign tourists to the total area of the country (km²) (Fig. 2). In that case, Austria and Cyprus also hold top positions because there were respectively 262 and 242 foreign tourists per 1 km². A similar rate was observed in Belgium. This result confirms high population density in this country. Belgium had a ratio of foreign tourists per 1,000 citizens similar to that of Finland. The result obtained by Finland (Fig. 2) shows low population density in this country. In 2010 in Poland, there were 40 foreign tourists, which is one of the lowest rates. The result also means that there are big reserves in the field of tourist traffic services. The correlation ratio between the area of the country and the number of foreign tourists was 0.82 (p-value = 0.05). Thus, the interdependence is even stronger than in the case of population.

Fig. 2. Number of foreign tourists per 1,000 km² of the country area in 2010

An important instrument measuring the quantity and quality of the infrastructure in the given country is road density (Fig. 3). The data relate to the highest standard roads, i.e. motorways. In that case, it can be noticed that this density is strictly connected with the time of the state’s accession to the European Union.
The founding states and those that joined still in the 80s and 90s had the best results. In the case of the last wave of accession, the road density was still low. Of course, there are exceptions: Cyprus and Slovenia among the new member states and Finland among the old member states. Poland’s position was very low. The correlation ratio was 0.19 (p-value = 0.05), which means there was no correlation between the road density and the number of foreign tourists visiting the given country.

Fig. 3. Road density (km per 1,000 km² of the country area) in 2010

In the case of the number of cars per 1,000 citizens of the given country, the disproportions were smaller (Fig.4). Older member states showed higher rates but the differences were not so big as in the case of the former comparison. Of course, a figure does not always mean the same quality. A car purchase (especially a second-hand one) is no longer a big expense for the new member states’ citizens. Ratios presented in Fig.3 and Fig.4 together show that there was no appropriate road infrastructure adequate to the number of cars owned by the citizens. This may result in transportation problems occurring in the form of traffic congestion.

Fig. 4. Number of cars per 1,000 citizens of the given country in 2010
The relationship between the number of foreign tourists visiting the given country and the mileage of roads is presented in Fig. 5. The biggest volume of road traffic was in Bulgaria and Portugal, followed by Cyprus and Austria. The lowest volume of road traffic was in Lithuania, Slovakia and Poland. The ‘old’ member states observed higher volume of traffic than those that joined the EU at the beginning of the 21st century. The correlation ratio between the mileage of roads and the number of foreign tourists was 0.93 (p-value = 0.05). The increase in the infrastructure by 1% resulted in the increase in the number of tourists by 0.93%. Thus, the interdependence is strong.

![Fig. 5. Number of foreign tourists visiting the given country per 1 km of road in 2010](image)


The long distance movement of tourists often makes them use motorways. Due to that, it is necessary to present the relationship between number of foreign tourists and the mileage of motorways in the given country (Fig. 6). In general, in the ‘new’ member states the ratio was higher than in the ‘old’ ones, which means that they possess more motorways. The most difficult situation was in Romania, Estonia, Bulgaria and Poland. Among the ‘old’ member states, the highest ratio was I Austria but one must remember that this country is especially popular with tourists in winter. The interdependence between the motorways mileage and the number of foreign tourists was important (the correlation ratio was 0.84, p-value = 0.05).

![Fig. 6. Number of foreign tourists per 1 km of motorway in the given country in 2010](image)

The alternative means of transport for foreign tourists is air transport. The use of aeroplanes has become common thanks to cheaper tickets. The number of foreign tourists who were carried by air shows that airlines can provide services for the whole tourist movement in the given country (Fig. 7). The rates for Estonia and Slovenia exceeded 100%, while for Bulgaria, Austria and Romania were close to 100%. Air transport in those countries would not be able to provide services for the whole tourist movement. That is why road infrastructure is so important, especially the one of the highest standard (motorways), which ensures the provision of transportation for tourists.

![Fig. 7. Number of foreign tourists against the number of passengers carried by airlines in the given country in 2010 (%)](image)


In the case of ‘old’ EU member states, the rates presented in Fig. 7 were at a lower level than for the ‘new’ member states. This may also mean that the air transport infrastructure in the ‘new’ member states is poorer than in the founding member states and the states that joined the EU during the earlier accession waves. The correlation ration between the number of passengers carried by airlines and the number of foreign tourists in the given country was 0.76 (p-value = 0.05). Thus, the strength of this relationship was weaker than in the case of road infrastructure.

**Conclusions**

Transport infrastructure, including road infrastructure, play a very important role in tourism services. In the case of road transport, road infrastructure is of key importance. Individual EU states differ from one another in respect of their road infrastructure state. States are also different as far as their population, area and tourist attractiveness are concerned. The factor of the attractiveness of a particular place due to the advantages of its nature is not taken into consideration in this work. The comparison between road infrastructure and the volume of foreign tourists flow shows that there is a strong interdependence of the number of tourists and the total mileage of roads (the correlation ratio 0.93) and motorways (the correlation ration 0.84). There is no interdependence of road density and the number of tourists.
In the case of the rate showing the number of foreign tourists per 1 km of road, there are differences between the EU states. In the ‘new’ member states, there are generally fewer tourists per 1 km of road. If we look at the number of tourists per 1 km of motorway, there are more tourists in the ‘new’ EU member states. The rates for air transport demonstrate similar interdependence to the motorways one. The analysis shows that airports in Estonia and Slovenia were not able to provide services for the whole tourist movement. The correlation ratio between the number of passengers carried by air and the number of foreign tourists visiting the given country was 0.76. The research proves that road infrastructure is critical for tourism services. There is a strong interdependence of the road mileage and the number of foreign tourists. The dependence is stronger than in the case of other means of transport, e.g. air transport.

Abstract
The article presents the dependence of road transport infrastructure and the number of foreign tourists. The analysis is based on the data from 18 European Union countries that have a different road infrastructure. The data come from different Eurostat databases and the World Bank. It is proved that there is a strong relation between the road mileage and the number of foreign tourists. There are also differences between the individual European Union states. The situation is clearly worse in the ‘new’ member states, where the mileage of motorways is too short. Air transportation cannot satisfy the needs of the whole tourist movement in the ‘new’ member states. Thus, the importance of road infrastructure is enormous. Moreover, the dependence of the number of passengers in air transport and the number of tourists is weaker than in the case of road infrastructure. The development of road infrastructure contributes to the increase in foreign tourists’ interest.

Wpływ infrastruktury transportowej drogowej na ruch turystyczny w wybranych krajach Unii Europejskiej

Streszczenie
W pracy przedstawiono zależności między infrastrukturą transportu drogowego a liczbą turystów zagranicznych. Do analizy posłużyły dane dotyczące 18 państw członkowskich UE, które były zróżnicowane w zakresie infrastruktury drogowej. Informacje pochodziły z baz danych Eurostatu i Banku Światowego. Stwierdzono silną zależność między długością dróg a liczbą turystów zagranicznych. Występowały również różnice między poszczególnymi krajami UE. Wyraźnie w gorszej sytuacji były „nowe” państwa członkowskie, w których długość autostrad była zbyt mała. Transport lotniczy nie byłby w stanie obsługiwać całego ruchu turystycznego w „nowych” państwach członkowskich. Dlatego też tak duże znaczenie ma infrastruktura drogowa. Dodatkowo zależność między liczbą pasażerów w transporcie lotniczym a liczbą turystów była słabsza niż w przypadku infrastruktury drogowej. Poprawa stanu infrastruktury drogowej przyczynia się do większego zainteresowania turystów zagranicznych.
Literatura