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## Prospects for the development of transport network in Transcarpathia within cross-border territories with EU countries

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**Abstract.** The article is devoted to the study of the transport network development in Transcarpathia along the border with the EU neighboring countries. The historical stages of the Transcarpathian transport network formation are considered. The main criteria for evaluation and conformity of the transport network in Ukraine have been determined in

accordance with European standards. A number of legislative, regulatory, strategic and programme documents covering the development of the national transport network and border infrastructure within the study area are analyzed. The main factors proving the foreign economic activity of the Transcarpathian region towards the EU market are considered and highlighted. The capacity of transit through Ukraine and Transcarpathia within the cross-border territories are revealed. The necessity of the transport network construction is considered due to the fact that the number of passengers and cargo flows on the state border is increasing. It is described, for example, the capacity of rail and road transport across the border of Ukraine and the borders of neighbouring countries, in particular: Poland, Slovakia, Hungary, Romania. It is statistically concluded that the most congested is the Ukrainian-Hungarian border area. The main obstacles to the effective implementation of transport and transit work in the study area are identified and possible solution is proposed involving reconstruction of old units and construction of new checkpoints on the border area of Transcarpathia and its neighbouring countries. The dimensional picture of the border areas is presented: Ukraine - Poland; Ukraine - Slovakia; Ukraine - Hungary; Ukraine - Romania. Within each part the natural resource potential, transport load, features of tourism development, necessity for development and the existing transport network modernization are characterized. Suggestions for construction the new checkpoints as well as their advantages and disadvantages are analyzed and discussed. The priorities of Ukrainian state policy, Transcarpathia as well as the priorities of neighbouring countries in the development of the national transport network within the cross-border territories have been determined.

**Key words:** national transport network, integration, foreign economic activity, passenger and cargo flows, checkpoints, cross-border territories

## Перспективи розбудови транспортної мережі Закарпатської області в межах транскордонних територій з країнами ЄС

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**Анотація.** Стаття присвячена дослідженню питань розбудови транспортної мережі Закарпатської області вздовж кордону з країнами-сусідами ЄС. Розглянуто історичні етапи формування транспортної мережі Закарпатської області. Визначено основні критерії оцінки та відповідності транспортної мережі України європейським стандартам. Проаналізовано низку законодавчих, нормативно-правових, стратегічних та програмних документів, що регулюють розвиток національної транспортної мережі та прикордонної інфраструктури в межах території дослідження. Розглянуто та виокремлено основні чинники, які доводять, що зовнішньоекономічна діяльність Закарпатської області повністю зорієнтована на ринок ЄС. Розкрито суть та потенціал транзитності території України та Закарпатської області в межах транскордонних територій. Вказано на необхідність розбудови транспортної мережі, оскільки навантаження пасажиро- та вантажопотоків на ділянках державного кордону зростає. Наведено, як приклад, пропускну спроможність залізничного та автомобільного транспорту через кордон України та її сусідів, зокрема: Польщі, Словаччини, Угорщини, Румунії. Статистично доведено, що найбільш завантаженою є українсько-угорська

ділянка кордону. Визначено основні проблеми, що перешкоджають ефективній реалізації транспортно-транзитних функцій території дослідження та запропоновано шляхи їх вирішення за рахунок реконструкції старих та побудови нових пунктів-пропуску на ділянці кордону Закарпатської області та її країн-сусідів. Подано просторову картину прикордонних територій: Україна – Польща; Україна – Словаччина; Україна – Угорщина; Україна – Румунія. В межах кожної території охарактеризовано природно-ресурсний потенціал, транспортне навантаження, особливості розвитку туризму, необхідність розбудови та модернізації наявної транспортної мережі. Подано пропозиції побудови нових пунктів-пропуску, виділено їхні слабкі та сильні сторони. Визначено пріоритети державної політики України, Закарпатської області та її країн-сусідів в розвитку національної транспортної мережі в межах транскордонних територій.

*Ключові слова:* національна транспортна мережа, інтеграція, зовнішньоекономічна діяльність, пасажиро- та вантажопотоки, пункти-пропуску, транскордонні території

**Introduction.** The transport network of any country, state or region plays a key role in the development of its economy. It is a significant source of the state budget replenishment; the transport network provides domestic and international transfer of goods and passengers. In fact, the transport network provides links between production and consumption, among different branches of the economy, among countries and regions.

Transcarpathia is a part of the Carpathian region of Ukraine, and makes so called «western gate» into the EU countries, as a result its transport network faces more and more congestion; besides it provides transport and economic links within the cross border territories. The integration of Ukraine and its regions into the European and world economy will be successful due to the existence of highly developed transport network. It must comply with international standards of legal, technical, economic and information base. The criteria for its characteristics are the intensity of traffic, amount of cargo and passenger transportation, safety, the quality of the transport network in compliance with European standards. It is this range of issues that prompts research into the development of the national transport network in Transcarpathia and its integration into EU transport networks.

There are many Ukrainian scientists who dealt with the issue of cross-border transport infrastructure and its role in accelerating Ukraine's integration into the EU. For instance, the works by M.L. Tsyhaniuk, I.H. Smirnov (2015), V.V. Goblik (2013), I.G. Smirnova (2012), I.G. Smirnova, T.V. Kosareva (2008) and others are devoted to the formation of transport and logistics clusters (TLCs) as one of the main components of the transport and logistics system (TLS); the works by I.G. Smirnova (2007, 2004), A.M. Novikova (2003), O.B. Bordun (2003) and others – to the development of transport infrastructure of the border territories. So, in the dissertation «Western Border Transport Infrastructure: Economic and Geographic Survey» by A.B. Bordun (2003) the author presents the background for improving the geo-spatial organization of the Border Transport Infrastructure PMU in the context of regions and neighboring coun-

tries and Transcarpathia region is among them. Lately the researchers focus their attention on the role of the border transport infrastructure of the PMU in tourism development (Bordun and Kotik, 2010). Despite the amount of scientific publications in the Ukrainian scientific literature there is still no thorough assessment of the existing transboundary transport infrastructure of Transcarpathia region and its perspectives.

**The research methods.** The national legislation of Ukraine about the development of transport and border infrastructure, construction of checkpoint network was analyzed during the research; legislative support for the development of transport networks in the EU and the national strategies of the Transcarpathian neighboring countries, in particular: Poland, Slovakia, Hungary and Romania regarding the spatial development of border areas.

The provisions on the development of the border and transport infrastructure in Ukraine, which are covered in the national transport strategy of Ukraine for the period up to 2030 are studied as well as two important programs, in particular: the Program on the development of the border infrastructure in Transcarpathia for 2018-2022 and the Regional program of the road development for 2019- 2022 years.

The following methodology was used in the study: method of analysis and synthesis, historical, statistical and comparative analysis.

**Outcome and its analysis.** Transcarpathia is a unique, western region of Ukraine bordering with four EU countries (Poland, Slovakia, Hungary and Romania) with a border length of 470 km. The cross-border location of the region creates additional opportunities to make effective use of the transit potential and its development for entering the European markets for goods and services through enhanced interaction and mechanisms of cross-border cooperation and adaptation of European legislation in the field of regional policy, etc (Promizhnyi zvit Instytutu rehionalnykh doslidzhen NAN Ukrainy, 2019).

The economy of Transcarpathia, in comparison with other regions, is small – in 2016-2017, the region's GRP made up about 1.4% of Ukraine's GDP.

The volume of GRPs per person in Transcarpathia in 2017 was up to UAH 34 202, which is more than 2 times less than on average in Ukraine. At the same time, the index of physical volume of GRP per capita in Transcarpathia during 2014-2017 (except 2016) exceeded the average indicator in Ukraine, that is a sign of the development potential of this region (Promizhnyi zvit Instytutu rehionalnykh doslidzhen NAN Ukrainy, 2019).

The favorable geographical location of the study area, favorable natural and climatic conditions, significant natural and recreational potential, as well as the mental characteristics of the population and their economic forms in total make the key feature of this region – high (with a tendency to further dynamic growth) foreign economic and transboundary orientation of its economy (Promizhnyi zvit Instytutu rehionalnykh doslidzhen NAN Ukrainy, 2019).

Transcarpathia has a strong transit potential, as there are two trans-European corridors approaching to its border, such as:

1) «The Mediterranean Corridor» is a railway branch that reaches the Záhony-Chop checkpoint and the car branch leads to the Bereghurany-Luzhanka checkpoint;

2) «The Rhine-Danube Corridor» with a railway branch passing through the border of Slovakia to Ukraine at the crossing Čierna nad Tisza – Chop (Strazh) and road – to the border Uzhhorod - Vyshne-Nemetskoye.

The study area is the leader in Ukraine in terms of export-import orientation in the economy. The share of export in the output of the region in 2018 was 56%, which is 2.9 times higher than on average in the regions, and the share of import in total consumption in 2018 was 52%, that is 20 times higher than in Volyn, which economy is also import-oriented (Statystychnyi shchorichnyk Zakarpattia, 2018). The foreign economic activity of this area is fully oriented towards the EU market. In 2018, EU countries accounted for 95.5% of the region's commodity exports, with an average of 42.6% in the regions of Ukraine (Statystychnyi shchorichnyk Zakarpattia, 2018). Therefore, the issue of border infrastructure development is relevant to Ukraine's national transport strategy and requires the creation of new transport networks. Thus, the Law of Ukraine «On the General Scheme of Territory Planning in Ukraine» sets out priorities and defines conceptual decisions on the planning and use of the territory of the country.

Special emphasis is focused on the development of industrial, social and engineering transport infrastructure. For instance, in order to meet the needs

of the population and the economy of the country in passenger and cargo transportation, the Law includes the necessity of (Pro Heneralnu skhemu planuvannia terytorii Ukrainy. Zakon Ukrainy, 2012»):

1) effective use of the country's powerful transit potential with the integration of its transport complex into the European and world transport and communication system;

2) creation of a national network of international transport corridors, which will ensure the connection of the main scientific, industrial and socio-cultural centers of Ukraine with other countries and stimulate the development of the territories adjacent to these transport corridors;

3) intensive development of high-speed types of electric transport, organization of high-speed movement of passenger trains with integration of the railway network and highways of Ukraine to the European system of highways.

Historically, the transport network of Transcarpathia was formed in several stages:

Stage I – the Eneolithic Age, when first wheeled means of transport drawn by animals were used, it is still in use by the local rural population;

Stage II – the end of the XVII century, when the lands of Transcarpathia for six centuries were part of Hungary, and later – of the Austro-Hungarian Empire. There was a well-developed rail transport network and in the 80's of the XIX century the supply of forests from the Ukrainian Carpathians and minerals such as salt from Solotvyno were transported through Transcarpathia railways that was laid from Lviv via Stryi to Chop.

Stage III is related to the development of trade at the end of the XIX century – the beginning of the XX century, construction of suburban roads began in the largest cities of Transcarpathia – Uzhhorod, Khust, Mukachevo, and on the territory of neighboring countries – in Maramorosh, Sigeti.

Stage IV began in 1946, when the territory of Transcarpathia became a part of the Ukrainian SSR. It was characterized by a significant strengthening of the border crossings role due to its strategic function (mm. Chop, Uzhhorod, Batoryovo).

Later road, aviation and pipeline transport began to be actively used in transportation (Istorychnyi narys ta chynnyky formuvannia transportnoi systemy Zakarpatskoi oblasti, 2019).

The modern transport network of Transcarpathia is being fully developed, improved at the expense of the state, local budgets and with the assistance of neighboring states.

The region's foreign economic activity is fully



oriented towards the EU market, accounting for over 90% of exports and 60% of imports of the region's goods. The regime of autonomous trade preferences is the unilateral (by the EU) abolition of import duties, which accounted for 94.7% of the total volume of industrial goods and 83.4% of agricultural and food products imported from the EU from our country.

During 2015–2018, exports of goods and services grew by 53.4% and imports by 49.6% (Promizhnyi zvit Instytutu rehionalnykh doslidzhen NAN Ukrainy, 2019). Such dynamics require the development of border and transport infrastructure. It is stated that in February 2020 nineteen (19) operating checkpoints have been opened across the Transcarpathian state border and it is proposed to build 18 more.

According to the types of connections among the operating checkpoints are: 9 automobile; 5 rail; 2 pedestrians (Fig. 1).

The analysis of statistics for the period 2015–2019 showed that 48 million citizens and 111 million tons of cargo crossed these checkpoints. Positive growth dynamics are common for all types of traffic

and means of transportation: 1) 28.5% – pedestrian; 2) 5% – cars; 3) 35.5% – trucks; 4) 6% – buses.

In fact, only the number of freight cars, crossing the border, has decreased, that is actually connected not only with the economic crisis but also with the military conflicts between Ukraine and Russia in the southeastern part of the country.

The analysis of the number of passenger and cargo flows through the existing border crossing points of Transcarpathia region and European neighboring countries in accordance with the Association Agreement between Ukraine and the EU showed that their redistribution and foreign trade volumes change every year. For example, in 2018, 42% of all rail transport and 60% of all road transport crossed the border with four EU Member States.

The parts of the railway crossing through the Polish, Slovak, Hungarian and Romanian sections of the state border of Ukraine are shown in Fig. 2. It shows that the Polish and Slovak border areas are the most intensive in terms of the number of rail crossings and their shares have increased steadily during 2010–2018.

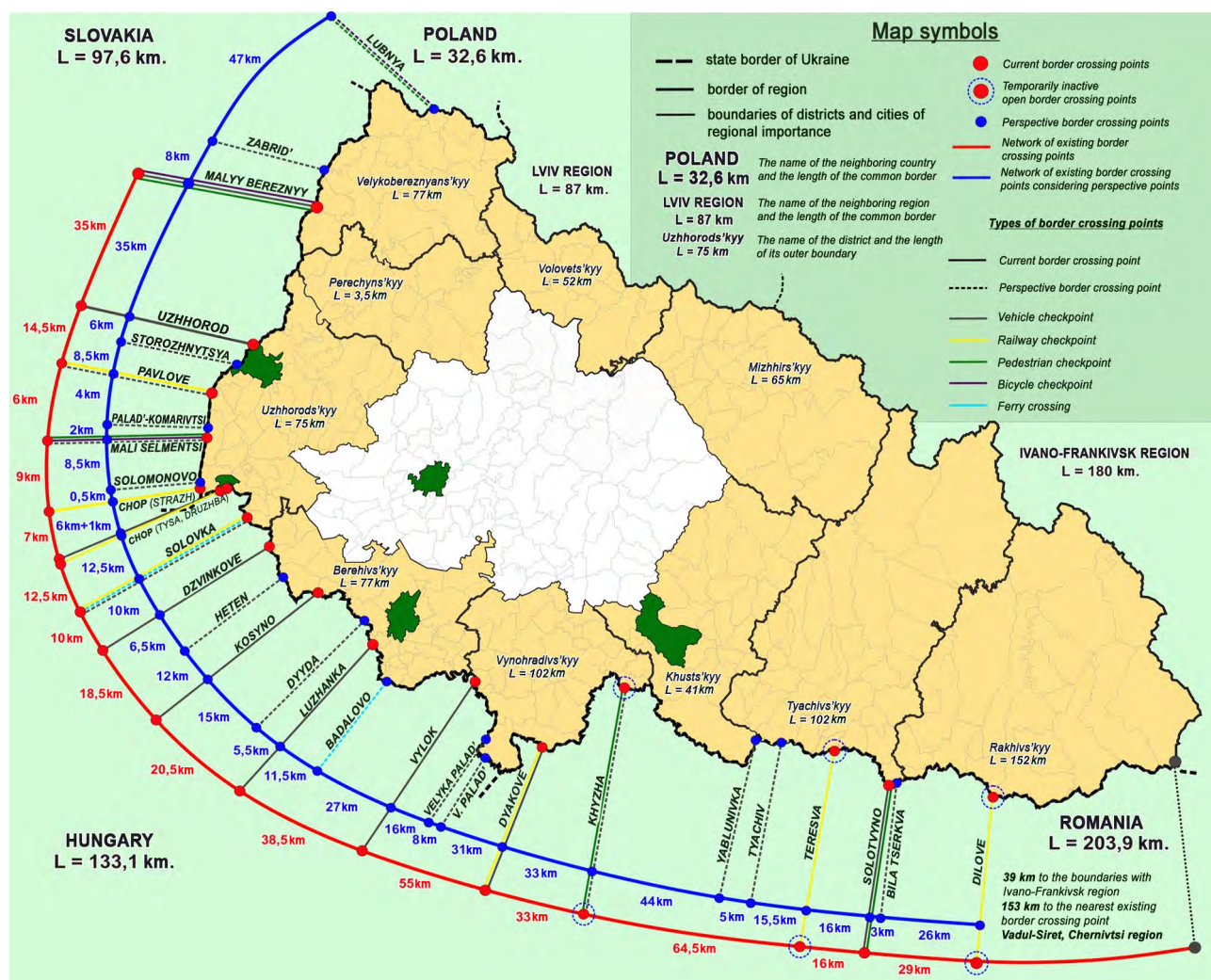
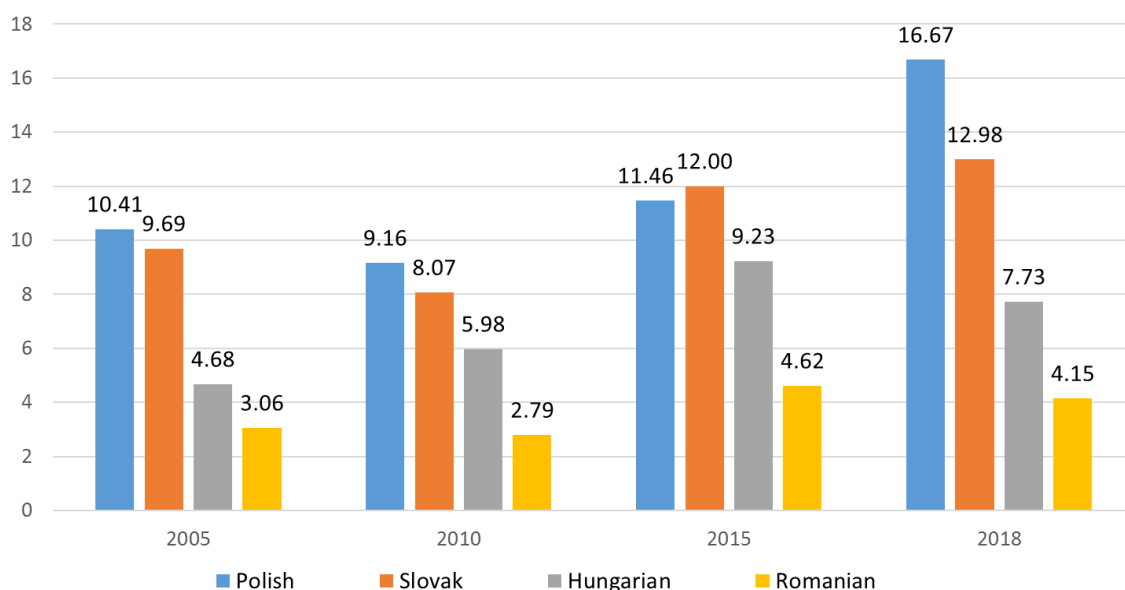


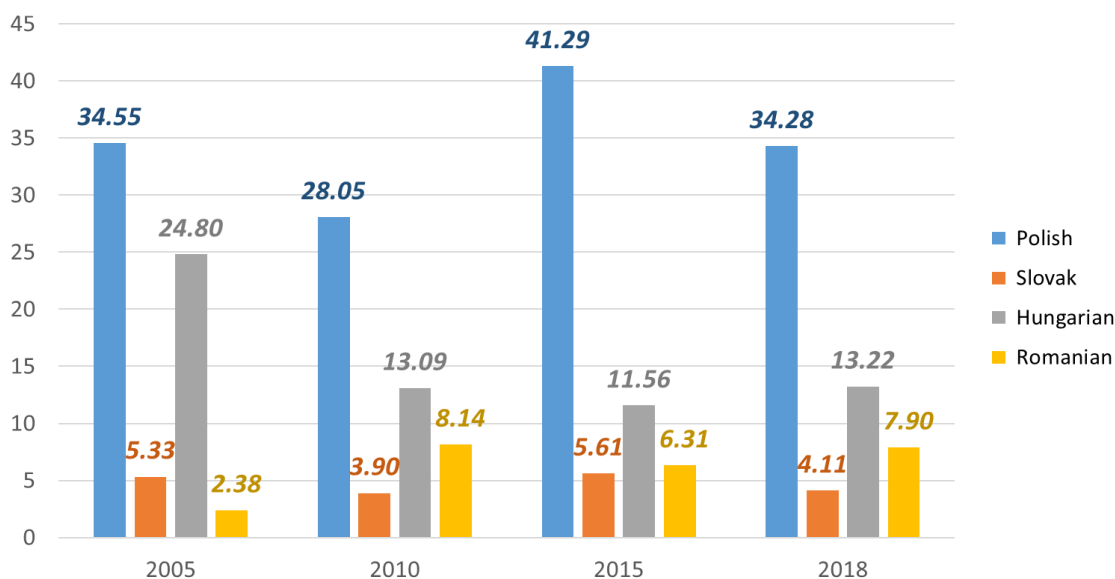
Fig. 1. Scheme of current and perspective border crossing points in Transcarpathia (based on Promizhnyi zvit Instytutu rehionalnykh doslidzhen NAN Ukrainy, 2019)



**Fig. 2.** Crossing of railway transport divided by sections of the state border (share of the certain section of the border in the total amount of the crossing), % (made according to the materials *Transport i zviazok Ukrainy*, 2018)

The share of road transport through the Polish, Slovak, Hungarian and Romanian sections of the state border of Ukraine is shown in Fig. 3. The most intense border crossings regarding road crossing are Polish and Hungarian (in 2018 – 34.28 and 13.22% consequently).

The border area between Ukraine and Poland within the Transcarpathia region is bordered with the Beszczadsky County of the Subcarpathian Voivodship with a population of 21.9 thousand people, mountain ranges of the Polish Beskyds and centers of ski tourism development, with three nature protected



**Fig. 3.** Crossing of road transport on sections of the state border (share of the respective section of the border in the total volume of crossing), % (made according to the materials *Transport i zviazok Ukrainy*, 2018)

The indicator of the load on the state border in the context of Transcarpathia region shows its growth at the existing checkpoints, so most of them need reconstruction and in the future – the construction of new ones. The busiest is the Ukrainian-Hungarian border area, but unloading is required on both Ukrainian-Romanian and Ukrainian-Slovak (Zakarpatska oblasna administratsiia. *Transportne perevezennia*, 2019).

areas. Perspective on the state and regional level is the construction of the crossing point (hereinafter – PE) «Lubnya-Volosate», namely, pedestrian and bicycle. In the Carpathian Euroregion strategy (2020), its construction is outlined as a priority project and its implementation is expected for 2019-2024 (The Carpathian Euroregion Strategy 2020 Beyond. Carpathian Euroregion, 2015), which aims at cross-border mobility of

territories and tourism development.

The border area Ukraine-Slovakia includes Prešov and Kosice self-governing countries, which have not only ecologically clean territories but also historical and cultural sites, four of them are considered to be UNESCO World Heritage Sites. There are several industrial parks in the outskirts of Kosice. On the other side of the Slovak border, there are three districts of the Transcarpathia region: Velyky Bereznyi, Perechyn and Uzhhorod. Within the given territory the Uzhansky national park has the environmental perspective, and therefore, in the future that is a perspective for the development of rural (green) tourism.

Only the Ukrainian-Slovak cross-border region has its own Development Strategy, which envisages the development and modernization of border infrastructure. Six new car crossing points are planned to be built, namely: «Zabrid-Ulich», «Storozhnytsa-Zagor», «Pavlove-Matyovce», «Palad-Komarivtsi - Ruska», «Mali Selmentsy - Velke Slemence» and «Solomonovo-Chierna».

Analyzing the legal acts on the opening of the checkpoints, identifying the pros and cons that determine the prospects and construction of these objects, we'd like first of all highlight the construction of «Pavlove-Matyovce» and «Solomonovo-Chierna».

During the period 2015-2018, the Ukraine-Hungary border area was characterized by the following indicators: first of all, 65% of citizens crossed the border here; secondly, the volume of border rail crossings by citizens was 90% in 2018, and the volume of cargo accordingly – 26.18%; thirdly, the share of total rail freight traffic increased from 15.14% in 2015 to 29.48% in 2018 (Statystychnyi shchorichnyk Zakarpattia, 2018).

It should be noted that the Ukrainian-Hungarian borderland has significant tourist potential, in particular, it is famous for its historical and cultural monuments, thermal springs (Lake Bath «Tofurdo», and Park Bath «Aquarius»), ethnographic open air museum – Shoshto, thirteen industrial parks and intermodal terminals.

The Ukrainian lands of Uzhhorod, Berehiv and Vynohradiv districts are relevant to the territory of Hungary. These are investment attractive tourist areas of Transcarpathia, in particular, Berehiv district with thermal waters (Kosyno), developed gastronomic tourism (Hungarian and Ukrainian cuisine, wine tasting) and rural green tourism (villages of Vary, Hecha, Bene). Mukachevo is famous for its sanatorium-resort complexes such as «Synyak», «Carpathians», «Vodohrai», «Belle Royale», that operate on healing mineral waters. Therefore, it is obvious that the num-

ber of those who want to recreate will increase every year at this section of the border. Six checkpoints are considered to be promising, but after being examined on their technical features, to our mind, only three are about to be built in the coming years. These are «Dyida-Beregdarots», «Grand Palad – Little Palad (Kishpalad) and «Grand Palad – Nod-godosh».

As for the Ukraine-Romania border, it connects two counties – Satu Mare and Maramuresh on the Romanian side and Vynohradiv, Khust, Tyachiv and Rakhiv districts on the Ukrainian side. Despite the predominance of mountainous terrain, the northwestern part of Romania has significant tourism and recreational potential, like Maramuresh County, it is an authentic village with wooden churches, entrance carved gates, hand-made carpets and narrow rugs. Satu Mare County is a festival area, and the shepherd festival is of the highest demand among tourists. There are many temples, local architectural monuments and the ruins of the medieval Ardud Fortress as well, and in the village of Medieshu – Aurit there is a palace of the Renaissance time.

Some Transcarpathian districts (Vynohradiv, Khust, Tyachiv and Rakhiv) are interesting as well, as territories on the Ukrainian side (Sotsialno-ekonomichne stanovyshe Vynohradivskoho raionu, 2019). Vynohradiv district is promising as well due to the prospect of construction modern health resorts on the basis of mineral water deposits such as «Olegivske» and «Teplytsa». Such enterprises as «Genterm Ukraine LLC, PJSC «Grono-Tex» and «Sanders-Vynohradiv» LLC have significant export potential of industrial product (Sotsialno-ekonomichne stanovyshe Khustskoho raionu. Statystychnyi biuletyn, 2019).

Direct investment in Khust district is made into industry (62.5% of total volume). Most of the export-import operations have taken place within countries such as Italy, Czech Republic and Hungary. The involved foreign capital provides a positive balance of foreign trade in the field of light industry and livestock in agriculture (Sotsialno-ekonomichne stanovyshe Khustskoho raionu, 2019). Tourism of the study area covers the Carpathian Nature Reserve «Narcissus Valley»; the famous mineral waters of Dragovo, Shayan, Vyshkovo with a spa-sanatorium network; a unique cheese factory in the village of Nyzhnye Selyshche; a deer farm; folk crafts – weaving in the village of Iza, pottery in Khust and Vyshkovo, etc. (Khustskoho, 2019).

In 2018, the largest amount of direct investments (\$ 7.1 million, USA) of the Tyachiv district involved in industry (95.6%) come from Austria, Italy, the Netherlands, Germany (Publichnyi zvit holovy Tiachivskoi raionnoi derzhavnoi administratsii, 2018).



The tourism and recreation industry is developing and has 114 tourist infrastructure objects. The volume of services rendered to the subjects of tourism, recreation and hotel sphere amounted to 9910.7 thousand UAH (Zakarpattia onlain, 2020). Gastronomic tourism, including wine, is also in high demand in the study area; military tourism with elements of the defensive structures of the Arpad line from World War II; speleotourism in karst caves – Chur, Crest, Milk stone, Friendship (Karstovi pechery Zakarpattia, 2019).

The economic complex of Rakhiv district is poorly developed and based on the forest complex. At the same time, Rakhiv district has extremely favorable conditions for winter recreation and development of skiing. The core rehabilitation part of the Kvasiv spa complex is mineral water with arsenic content used for summer and winter recovery and here an extensive network of tourist sites of various fields operates as well. Among them are: Yasyňa – Sports Base «Tysa»; Dragobrat; Dragobrat LLC; «Tysa» and «Trembita» wellness complexes. New facilities are being constructed, especially in the mountainous area, including private mini-hotels, recreation centers, health resorts, villas' estates, which welcome guests in accordance with the rural green tourism requirements. Pedestrian, ski, water, bicycle, horse and car tours are developed and are in demand.

The current situation in this part of the state border requires the building of modern checkpoints. In the future, the governments of two countries have identified four promising ones; most likely in the first five years the following checkpoint will be built and operate successfully: PE «Yablunivka-Remete (Guta)» as a motor vehicle and PE «Bila Tserkva – Sigetu – Marmatsiya» for automobile cargo and passenger service.

**Conclusions.** Therefore, the existing network of border checkpoints in Transcarpathia region is characterized by its outdated infrastructure, long waiting times for citizens to cross the border, and high levels of passenger and freight traffic load. Therefore, the opening of new checkpoints will ensure the redistribution of these flows, more uniform distribution along the state border. The most modern logistic transport network is able to provide:

- 1) inclusion of Ukraine, Transcarpathia in the transport system of Eastern Europe;
- 2) increase in transit of passengers and cargo through the territory of the study;
- 3) increase of capacities and quality indicators of the transport network;
- 4) optimization of passenger and cargo flows;
- 5) ensuring the growth of the investments volume

in the fixed capital of the region;

- 6) development of the tourist and recreational branch in the study area.

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