Time Availability of the Public Terminal of Intermodal Transport Žilina with a Selected European Maritime Port

Vremenska raspoloživost javnog terminala za intermodalni prijevoz Žilina s odabranom europskom morskom lukom

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Summary

In most cases, the availability of seaports is declared through availability isochrones based on the distance determined by the beeline, what is a very simplified manner of determining the availability of seaports and presenting their benefits to customers. Therefore, the paper aimed to determine the availability of selected seaports in Europe on the basis of the proposed methodology using a professional route planner for road freight and distance directory managed by UIC (International Union Railways) for rail freight. The intermodal transport terminal in Žilina, Slovakia and eight seaports from seven European countries were selected to verify the proposed methodology for the assessment of time availability. Time availability is one of the key factors in the choice of mode of transport by carriers and also for the use of seaports. The scientific benefits are in the design of the methodology and its application to real conditions with the evaluation of outputs for the individual transport route. The contribution also assessed the impact of other factors affecting the observance of planned transport times in rail and road freight transport.

KEY WORDS
intermodal transport
seaports
time availability

Sažetak

U većini slučajeva raspoloživost morskih luka objavljuje se s pomoću izokrona raspoloživosti koji se temelje na udaljenosti prema najkraćoj putanji, a to je pojednostavljen način određivanja raspoloživosti morskih luka i prezentiranja njihovih prednosti klijentima. Stoga je cilj ovoga rada bio utvrditi raspoloživost odabranih morskih luka u Europi na osnovi predložene metodologije uporabom profesionalnog planera rute za cestovni prijevoz i priručnik s izračunatim udaljenostima koji vodi UIC (Međunarodna željeznička unija). Intermodalni prijevozni terminal u Žilini (Slovačka) i osam morskih luka u sedam europskih država odabran je kako bi se provjerila predložena metodologija za utvrđivanje vremenske raspoloživosti. Vremenska raspoloživost jedan je od ključnih čimbenika u odabiru načina prijevoza od strane prijevoznika te za odabir morske luke. Znanstveni doprinos rada očituje se u izradi metodologije i njezinoj primjeni u stvarnim uvjetima, uz procjenu učinaka za pojedinu transportnu rutu. Doprinos također predstavlja procjena utjecaja drugih čimbenika koji utječu na praćenje planiranog vremena za željeznički ili cestovni prijevoz.

KLJUČNE RIJEČI
intermodalni prijevoz
morske luke
vremenska raspoloživost

1. INTRODUCTION / *Uvod*

The availability of intermodal transport terminals is one of the key factors for customers when choosing the place of dispatch or the arrival of goods. However, the strategic location does not necessarily mean good time availability, as there is not enough infrastructure to serve the terminal, either by road or rail. Similarly, the authors of the paper met several times at presentations of seaport representatives with the attribute of their ports accessibility by rail and road freight transport for customers and logistics companies from the Slovak Republic. In most cases, the availability of seaports is declared through availability isochrones based on the distance determined by the beeline. This is a very simplified determination of port availability for customers. The aim of the paper was to determine the availability of ports on the basis of the proposed methodology using a professional route planner for road freight and distance directory managed by the International Union Railways (UIC) for rail freight.

A public intermodal transport terminal in Zilina, Slovakia, has been selected to verify the proposed time availability assessment methodology, which is currently one of the two intermodal transport terminals in the north of the Slovak Republic, which should represent a competitive advantage over the terminal in terms of transit times. It is a public terminal built with the support of the EU Structural Funds and must have open access to the infrastructure for all users on a non-discriminatory basis and on the basis of a European Commission Decision [1]. The European Commission authorized state aid only for the construction of this terminal and did not approve the other planned intermodal transport terminals. According to the original notification of the Slovak Republic to the European Commission, the measure envisaged the financing of the construction and operation of a network of public intermodal transport terminals suitable for the continental combined transport of goods. Specifically, Slovakia originally intended to finance the construction of four publicly available intermodal transport terminals in Bratislava - Pálenisko, Leopoldov - Hlohovec, Žilina - Teplička and Košice - Bočiar. However, due to the possible distortion of competition resulting from the notified measure as set out in the opening decision, Slovakia decided to limit the measure to finance the construction and operation of a public intermodal transport terminal in Žilina - Teplička suitable for continental combined goods transport. This terminal is intended to act as a pilot project for the possible future construction of a network of public intermodal transport terminals throughout Slovakia. For these reasons, too, this terminal was chosen to investigate its availability in selected seaports.

In particular, multinational companies that came after the accession of the Slovak Republic to the EU reviewed the possibilities of using the transport of goods from Asia to their production plants in the Slovak Republic through other seaports than was used mainly in former Czechoslovakia. KIA Motors Slovakia, the only manufacturer of KIA passenger cars in Europe, started to use mainly the port in the Adriatic Sea of Koper in Slovenia to transport some parts, sheet metal, etc. from South Korea and export manufactured cars. It also pointed to shorter shipping routes for ships, shorter routes for rail and road transport from the port, prices for port operations, etc. Similarly, the contribution of Beskovnik, B. et al. [2] also point to these factors, but also to the environmental impacts and the reduction of energy intensity of logistics chains using the ports of the Eastern Adriatic. The issue of the need to optimize the type of transport and logistics processes for manufacturing companies is addressed by Peceny, L. Et al. [3]. A model of transatlantic intermodal transport between Europe and the United States was published by Kalasova, A. Et al. (2016) [4]. Special goods require special planning and transportation. Piala, P. et al. published a system for the transport of tropical fruit to central Europe [5]. Similarly, the transport of dangerous goods has specific requirements for the planning and implementation of transport, especially in road transport. in tunnels, water sources, etc. [6]. For traffic planning purposes, models published by Cavone, G. et al. [7] can be used.

The potential for the development of intermodal transport and the legislative conditions for this mode of transport in the Slovak Republic was published in Jagelcak et al. [8], [9]. The use of intermodal transport is addressed in a contribution [10]. Bendekovic, J. et al. [11] and Kolar, J. [27] deal with the use of intermodal transport both to Croatia's seaports and transport corridors. [32]

The European Union has published its plans in the White Paper on Transport Policy. It plans to create a single European transport area and a competitive and resource-efficient transport system. One of the plans is that 30% of road freight transport over 300 km should be switched to other modes of transport, such as rail or inland waterways, by 2030 and more than 50% by 2050. Efficient and green freight corridors [12] should facilitate the achievement of this objective. For these reasons, there is also a need to build and modernize multimodal corridors and connect them to seaports. The issue of optimization of the railway network in relation to the current transport corridors also using the methods of network analysis is dealt with by a contribution from Dedik, M. et al. [13] and Intermodal Logistics Centres and Freight Corridors-Concepts and Trends from Wagener, N. [28].

The article, therefore, addresses this requirement and compares, on the basis of the proposed methodology, the transport time of rail and road freight transport to selected European seaports in order to identify possible infrastructure deficiencies. Especially in the vicinity of large cities, but also on monorail railways, passenger transport is preferred within integrated transport systems, which extends the transport times of freight trains. The issue of comparison of methodologies for the calculation of railway line capacity is dealt with in a paper from Cerna, L. et al. [14]. Proposal to make railway infrastructure capacity more efficient on a specific line section in the context of the introduction of an integrated passenger transport system was given in Stopka et al. [15].

In particular in road freight transport, deployment of intelligent transport systems can be particularly helpful, particularly in places with frequent traffic congestion [16].

In order to decide on the mode of transport, it is necessary to take into account criteria other than the price for transport and transit times, but also the environmental impacts of individual modes of transport on the environment and energy efficiency [17], [18], [29]. For the customer it is also important the monetary cost of transportation via rail freight. This issue is more thoroughly described in paper by Lupi M. et al in Railway Lines across the Alps: Analysis of Their Usage through a New Railway Link Cost Function [33].

2. RESEARCH METHODOLOGY / *Metodologija istraživanja*

The research methodology was based on the establishment of transport times for road and rail transport along the actual current rail and road transport infrastructure of Europe.

The following European seaports were chosen for time comparison due to the size of seaports and frequent transports from and to the Slovak Republic:

- Gdańsk (PL),
- Gdynia (PL),
- Rijeka (HR),
- Koper (SI),
- Trieste (IT),
- Hamburg (DE),
- Rotterdam (NL),
- Antwerp (BE).

The shortest distance by rail, which also includes border crossing stations, has been calculated using DIUM distance directory. DIUM is a directory used by members of UIC (International Union Railways), which contains various data related to international rail freight. Customers use it to fill in an international consignment note CIM to calculate freight charges, etc. In the next step, the individual transit times were calculated, with the average train set speed being set at 75 km / h for the calculation model. In addition, the delay at border crossing points was added to the transit time, which was set at 20 minutes for each border crossing point. The resulting time was determined as the minimum transport time in rail transport. The maximum transport time in rail transport has been established under the Convention concerning International Carriage by Rail (COTIF). The resulting values for each route are shown in Table 2.

Transport times in road freight were determined using the Map & Guide route planning software from the PTV Group, which also takes into account the Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonization of certain social legislation relating to road transport.

The driver of a lorry with a gross vehicle weight exceeding 3.5 tonnes must comply with a maximum uninterrupted driving time of 4.5 hours in EU countries, followed by a minimum 45-minute break of work. Only actual driving is included in the driving time, other work (e.g. fixing a shipment on the vehicle, obtaining documents, etc.) is not included in the driving time limit (Figure 1). After driving for 1 hour, the driver took the first part of a 15 minute split break at work. A maximum of 3.5 hours may be driven before the second part of the break is started. After 1.5 hours of driving, the driver carried out another job for 30 minutes (e.g. handling documents or loading a container). This time counts up to the driver's working time but not to the driving time. This means that the driver can drive the vehicle for a maximum of 2 hours until the second part of the break. After the second part of the split break, the driver can start a new continuous driving time. The driver may drive the vehicle for a maximum of 9 hours from the previous rest. This time can be extended twice per calendar week to 10 hours. Within 24 hours, the driver must have a regular daily rest period of at least 11 hours, which can be reduced to 9 hours but only three times a week. These restrictions have been applied in the route calculations, assuming that the driver starts transporting after a prescribed weekly rest period of 45 hours and may be reduced to 24 hours every two weeks.

In addition to the mode of working for road freight drivers, the Map & Guide route planner also works with different truck speeds on different road categories. This means that the average speed is closer to reality and is not fixed as in rail transport. Road routes were subsequently selected on the basis of the shortest transit time. For the purpose of comparison, the transit times calculated when driving the vehicle with one or two drivers were determined. In the case of a two-person vehicle crew, some different provisions of Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonization of certain social legislation relating to road transport apply [19]. The basic mode of operation of a two-man crew in road freight transport for the calculation of time availability of TIP Žilina is shown in Fig. 2. Drivers do not need to take a break after 4.5 hours but may continue to move after changing the line.

In Slovakia, so-called mobile workers must have a break after 6 hours of work and have a break of at least 45 minutes if their work shift is over 9 hours. With a two-person crew, drivers may have a common daily rest period of 9 hours, the vehicle must be stopped and this rest period must be used up within 30 hours of the start of the transportation.

The results of the calculations for rail freight and road freight are given in Chapter 4 and Table 2.

When transporting high-risk goods for thefts, it should be taken into account the planning of the transport route and the taking of safety breaks and rest periods for road freight drivers in safe car parks [20].

3. PUBLIC TERMINAL OF INTERMODAL TRANSPORT OF ŽILINA AND ITS SPACIAL AVAILABILITY / *Javni terminal za intermodalni prijevoz Žilina i raspoloživost prostora na njemu*

The public terminal of intermodal transport Žilina is a bimodal container terminal, which has been operated by TIP Žilina s.r.o., which belongs to the METRANS group since April 2019. The terminal TIP Žilina is public situated on a railway line included in the AGTC network and has reloading tracks of 750 m length, which is a standard of the AGTC Agreement.

TIP Žilina, s.r.o., a member of the METRANS group, won a public tender for the operation of a public intermodal, which

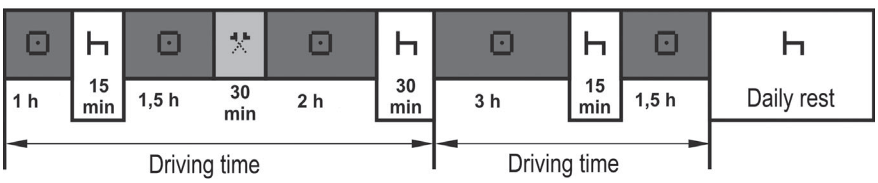

Figure 1 Example of single-driver working mode in road freight transport for time availability calculation TIP Žilina
Slika 1. Primjer rada jednog vozača u cestovnom prijevozu za izračun vremenske raspoloživosti TIP Žilina
Source: Authors at [19]

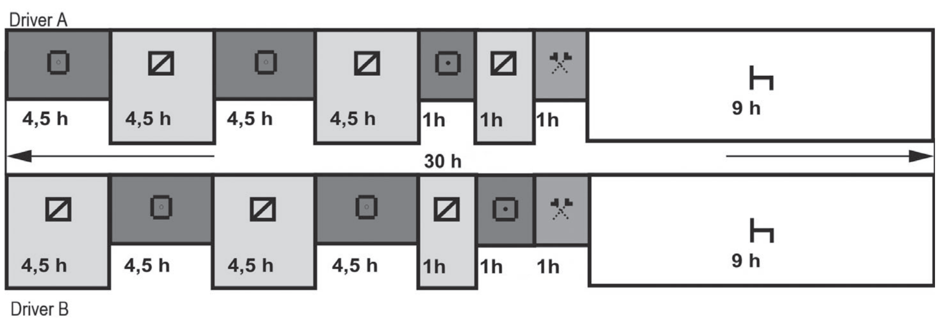

Figure 2 Basic mode of work of a two-man crew in road freight transport to calculate time availability TIP Žilina
Slika 2. Osnovni način rada posade od dvaju vozača u cestovnom prijevozu za izračun vremenske raspoloživosti TIP Žilina
Source: Authors at [19]

was built with the help of the EU Structural Funds. As the operator of the combined transport terminal, it has signed a concession contract under which it is to ensure the operation of the terminal in Žilina for a period of 30 years. Based on the concession contract TIP Žilina, s.r.o., there is access to open infrastructure for all users on a non-discriminatory basis under transparent conditions. For example, a terminal transaction price list is published for all customers.

The basic services provided by TIP Žilina are:

- terminal manipulation of intermodal loading units (including visual inspection);
- extraordinary manipulations caused by a change of disposition (customs control, rope manipulation, etc.);
- storage of intermodal loading units;
- cooling and heating of ITUs;
- processing of CIM consignment notes, photo documentation of technical condition of ITU, personal inspection of empty or other ITU;
- container repair services;
- customs services;
- determination of the verified gross mass (VGM) for the purposes of the SOLAS maritime convention.

Table 1 Basic parameters TIP Žilina

Tablica 1. Osnovni parametri TIP Žilina

Terminal area	151 854 m2
Storage area	11 650 m2
Length of tracks	2 x 750 m
Handling equipment	2 x gantry cranes 2 x reach-stackers
Parking capacity of trucks	41
Storage capacity	1 368 TEU
Address	SK – 013 01 Teplička nad Váhom
Train station	žst. ŽILINA – TEPLIČKA
Waypoint number	189 399
Expected transhipment capacity at start-up	40 000 TEU /year

Source: authors based on [21]

The terminal is located in Teplička nad Váhom, close to the KIA Motors Slovakia production plant and is mainly used to serve the Žilina region and the adjacent region (Fig. 3). The Žilina region is one of the most important industrial sites in the northwestern part of the Slovak Republic with several well-known manufacturing companies, which results in regular and strong import and export of cargo. In FIG. 3, within the transport model of the Žilina region, the accessibility of the territory with operated terminals in Žilina and the terminal in Ružomberok-Lisková, which is currently out of operation, has been processed.

From the model of availability of FUA residential centres and large industrial parks e.g. KIA MOTORS, GLOVIS, Schaeffler Kysuce, MONDI SCP to the superior network of intermodal transport, it follows that the availability is good and after completion of the highway network in the Žilina region will be very good. At present time availability is good if there are no extraordinary events on the road infrastructure, especially traffic accidents and traffic jams that arise between Čadca and Žilina, Between Martin and Žilina and in Ružomberok.

Explanation: Availability isochrones are processed in road infrastructure within 15 min (green colour), within 30 min (blue colour) and within 1 hour (pink colour).

The strategic location of the terminal close to the border with the Czech Republic and Poland opens up further logistical possibilities for the transport of goods to neighbouring countries and sea ports. In the attractive district of the public TIP Žilina, which has a range of 80 km, lies the entire Žilina region, the northern part of the Trenčín region, the Ostrava region in the Czech Republic and the southern part of the Katowice province in Poland. The task of the terminal will be to ensure the handling of cargo units from northern Slovakia and

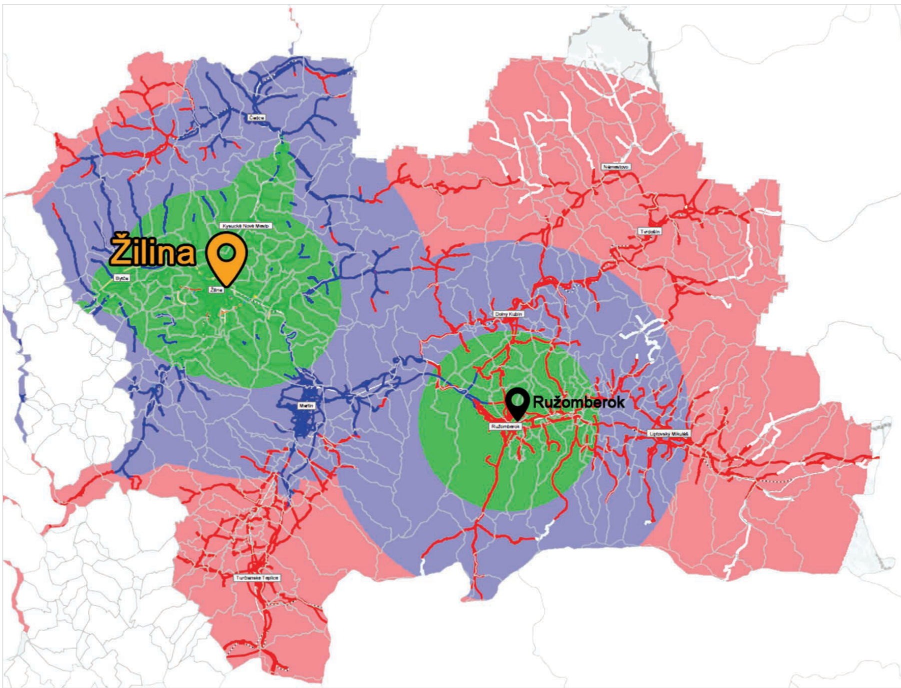

Figure 3 Availability of intermodal transport terminals in Žilina and in Ružomberok for the territory of the Žilina Region

Slika 3. Raspoloživost intermodalnih terminala u Žilini i u Ružomberoku za oblast Žilina

Source: Authors at [22]

eventual completion of Ro-La lines in the north-south direction. In the future, the terminal may become a logistics centre for the area of northern Slovakia after completion [22], [30], [31].

The public intermodal transport terminal is connected to the HUB Dunajská Streda, which allows interconnection to the current regular intermodal transport lines from and to Hamburg, Bremerhaven, Koper, Duisburg and Rotterdam (Fig. 4).

4. ASSESSMENT OF TIME AVAILABILITY TIP ŽILINA WITH SELECTED EUROPEAN MARITIME PORTS / *Procjena vremenske raspoloživosti tip Žilina s odabranim europskim morskim lukama*

To find time accessibility were selected European seaports, the selection criterion was their size and the most frequently implemented transportation to and from the Slovak Republic.

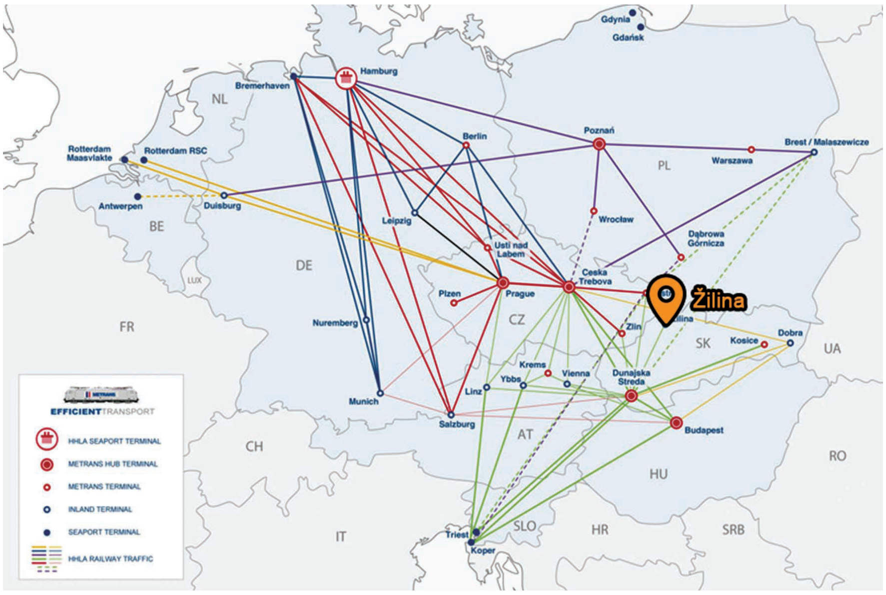

Figure 4 The current connection of TIP Žilina to the network of regular lines of the METRANS group

Slika 4. Trenutna povezanost TIP Žilina s mrežom redovitih linija METRANS grupe

Source: Authors at [21]

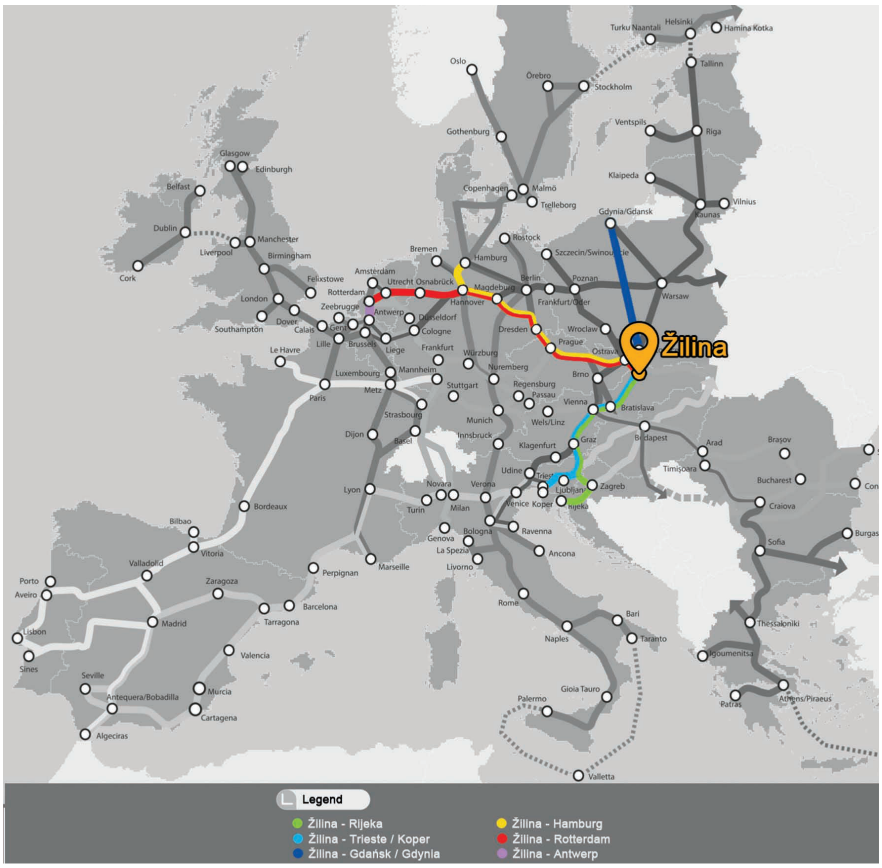

Figure 5 Graphical representation of individual transport relations to selected seaports from TIP Žilina

Slika 5. Grafički prikaz individualnih prijevoznih linija za odabrane morske luke iz TIP Žilina

Source: authors

Table 2 Comparison of distances and transport time to selected seaports from TIP Žilina

Tablica 2. Usporedba udaljenosti i vremena potrebnog za prijevoz do odabranih morskih luka iz TIP Žilina

Name of seaport (country code)	Rail transport					Road transport		
	Distance [km]	Crossing station	Duration of transport [h]	RAIL - Maximum duration of transport according to COTIF [h]	RAIL - Minimum duration of transport [h]	Distance [km]	ROAD - Duration of transport (1 driver) [h]	ROAD - Duration of transport (2 drivers) [h]
Gdańsk (PL)	703	Čadca (SK) Bohumín (CZ)	9.37	48	10.04	745	22.65	10.9
Gdynia (PL)	723	Čadca (SK) Bohumín (CZ)	9.64	48	10.31	760	22.93	11.18
Rijeka (HR)	813	Komárno št. hr.(SK) Gyekenyes hatar (HU)	10.84	72	11.51	779	25.08	13.33
Koper (SI)	864	BA - Petržalka št.hr. (SK) Spiefeld Grenze (AU)	11.52	72	12.19	754	25.08	9.95
Trieste (IT)	807	BA - Petržalka št.hr. (SK) Rosenbach Grenze (AU) Nova Gorica meja (SI)	10.76	72	11.76	751	21.7	10.23
Hamburg (DE)	982	Skalité št. hr. (SK) Zasieki gr. (PL)	13.09	72	13.76	988	26.88	14.38
Rotterdam (NL)	1 387	Skalité št. hr. (SK) Bielawa Dolna Gr.(PL) Bad Bentheim Grenze (DE)	18.49	96	19.49	1 329	41.52	18.02
Antwerp (BE)	1 423	Skalité št. hr. (SK) Bielawa Dolna Gr. (PL) Aachen West Grenze (DE)	18.97	96	19.97	1 311	30.12	17.62

Source: authors

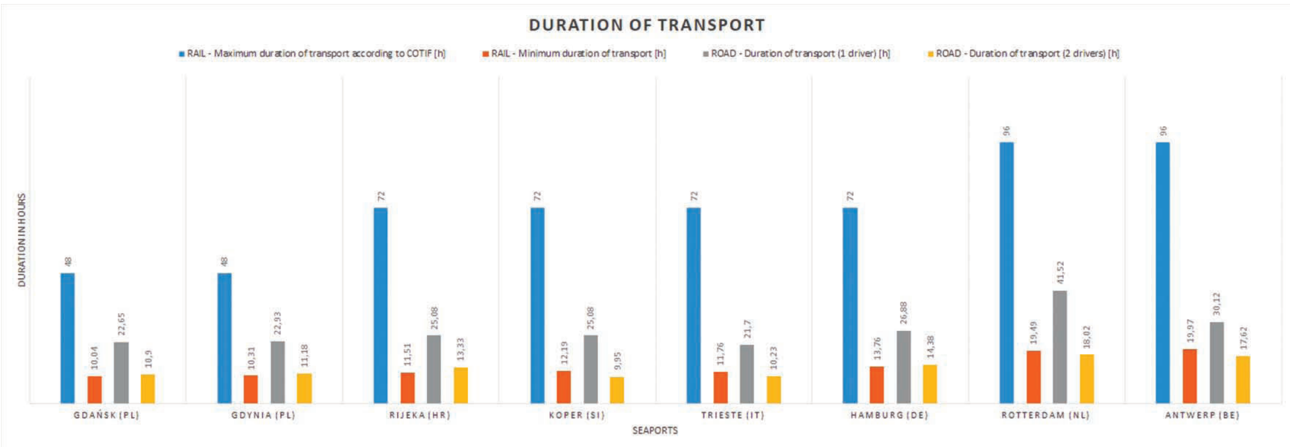

Figure 6 Comparison of transit times from TIP Žilina to selected seaports in Europe

Slika 6. Usporedba vremena potrebnog za prijevoz od TIP Žilina do odabranih morskih luka u Europi

Source: authors

Graphical representation of the individual transport relations under consideration to selected sea ports is processed in Fig. 5.

Availability to selected ports was compared on the basis of the research methodology presented in Chapter 3, taking into account the actual transport distance in road and rail freight, transport time and restrictive legislative conditions. The outputs of the calculations are given in Table no. 2 and graphically depicted in Fig 6.

In Fig. 6 is a comparison for transport times from TIP Žilina (SK) to selected seaports in Europe from the shortest maximum times in rail transport to the longest.

Route Žilina – Gdańsk (PL)

The distance of this route is 703 km by rail, 745 km by road. The difference in this distance is the largest of the selected routes in favour of rail transport, where this distance is shorter by 42 kilometres, which represents a 5.64% difference on the route. The shortest transport time by rail represents 10.04 hours, compared to single-driver road transport, where the transport time was set at 22.65 hours, which is more than 55.73% difference. When using two drivers, the time is set at 10.09 hours, which represents an 8.89% longer transport time compared to rail transport. The longest transport time by rail is 48 hours.

Route Žilina – Gdynia (PL)

The distance of this route is 723 km by rail, 760 km by road. The difference at this distance is 37 km, in favour of rail transport, which represents a 4.87% difference on the route. The shortest transport time by rail represents 10.31 hours, compared to single-driver road transport, where the transport time was set at

22.93 hours, which is more than 55.04% difference. When using two drivers, the time is set at 11.18 hours, which represents an 8.78% longer transport time compared to rail transport. The longest transport time by rail is 48 hours.

Route Žilina – Rijeka (HR)

The distance of this route is 813 km by rail, 779 km by road. The difference at this distance is 34 km, in favour of road transport, which represents a 4.36% difference on the route. The shortest transit time by rail is 11.51 hours, compared to single-driver road use, where the transit time was set at 25.08 hours, which is more than 54.11%. When using two drivers, the time is set at 13.33 hours, which represents a 13.66% longer transport time compared to rail transport. The longest transport time by rail is 72 hours.

Route Žilina – Koper (SI)

The distance of this route is 864 km by rail, 754 km by road. The difference in this distance is 110 km, in favour of road transport, which represents a 14.59% difference on the route. The shortest transport time by rail represents 12.19 hours, compared to single-driver road transport, where the transport time was set at 21.7 hours, which is more than 43.83%. When using two drivers, the time is set at 9.95 hours, which represents a 22.51% longer transport time compared to road transport. At the same time, it is the highest difference in the duration of transport among the selected routes. The longest transport time by rail is 72 hours.

Route Žilina – Trieste (IT)

The distance of this route is 807 km by rail, 751 km by road. The difference at this distance is 56 km, in favour of road transport, which represents a 7.46% difference on the route. The shortest transit time by rail is 11.76 hours, compared to single-driver road use, where the transit time was set at 21.98 hours, which is more than a 46.5% difference. When using two drivers, the time is set at 10.23 hours, which represents a 14.96% longer transport time compared to road transport. The longest transport time by rail is 72 hours.

Route Žilina – Hamburg (DE)

The distance of this route is 982 km by rail, 988 km by road. The difference at this distance is 6 km, in favour of rail transport, which, however, represents only a 0.06% difference on the route. The shortest transport time by rail represents 13.76 hours, compared to single-driver road transport, where the transport time was set at 26.88 hours, which is a 48.81% difference. When using two drivers, the time is set at 14.38 hours, which represents a 5.32% longer transport time compared to rail transport. The longest transport time by rail is 72 hours.

Route Žilina – Rotterdam (NL)

The distance of this route is 1387 km by rail, 1329 km by road. The difference at this distance is 58 km, in favour of road transport, which represents a 4.36% difference on the route. The shortest transport time by rail is 19.49 hours, compared to single-driver road transport, where the transport time was set at 41.52 hours, which is a 53.06% difference. When using two drivers, the time is set at 18.02 hours, which represents an 8.16% longer transport time compared to road transport. The longest transport time by rail is 96 hours.

Route Žilina – Antwerpy (B)

The distance of this route is 1423 km by rail, 1311 km by road. The difference at this distance is 112 km, which is also the biggest difference between the selected routes in absolute terms. In relative terms, the difference is 8.54% in favour of road transport. The shortest transport time by rail represents 19.97 hours, compared to single-driver road transport, where the transport time was set at 30.12 hours, which is more than 34.7% difference. When using two drivers, the time is set at 17.62 hours, which represents a 13.33% longer transport time compared to road transport. The longest transport time by rail is 96 hours.

5. DISCUSSION / *Rasprava*

The results of the calculations show that it is not possible to proceed with the simplification in calculating the availability of seaports, for example, only according to the shortest distance by road and the estimated average transport speed. The results show differences in time availability. In rail freight, there is a large dispersion between the shortest transport time and the maximum (Fig. 6). There are still problems with the permeability of some sections of transport infrastructure in road transport as well as in rail transport (Fig. 7).

In rail transport, priority is given to the use of passenger trains on common rail lines, where both passenger and freight trains are run, leading to an increase in transport times. Possible intermodal trains are run only at night. Some ports have only single-track lines that are insufficient in capacity and this affects the extension of transport time.

If the gross domestic product grows, so does the requirements for the transport of goods. Logistics of the 21st century is based on planning of unloading and loading dates in the so-called system time windows. Logistics and forwarding companies also benefit from the flexibility of road freight transport for long haulage. Also, the transport of containers from sea ports also uses road freight transport for long-distance transport. The reasons why containers are also transported from seaports by road freight transport are the most common problems with the time of transport and compliance with delivery dates of goods, components, etc. for the needs of the automotive and electrical industries and the second reason is that there is insufficient capacity of the railway transport infrastructure from some seaports respectively problems with exceeding the maximum throughput of railway transport infrastructure on routes to the customer (see Fig. 7).

Fig. 7 shows that part of the railway transport infrastructure in the EU countries has a throughput of over 100% (status as of 2015). This means that trains have to wait more than 24 hours for railway lines to be released. Here, it then relies on road hauliers that delivery times can be met even in congestion on the road infrastructure.

Road freight transport is more timely if two-man crew is used for transport, but this increases costs and is not even viable due to the lack of road freight drivers over 3.5 tonnes in EU countries. On the other hand, the prohibition of taking a regular driver's cabin rest period in the EU countries, which affects the planning and execution of carriage operations, in particular by one driver, reduces the benefits of road freight transport [25]. Unfortunately, when planning, some logistics companies do not take into account the requirements for the mode of work of a freight driver, which is increasingly tightly controlled,

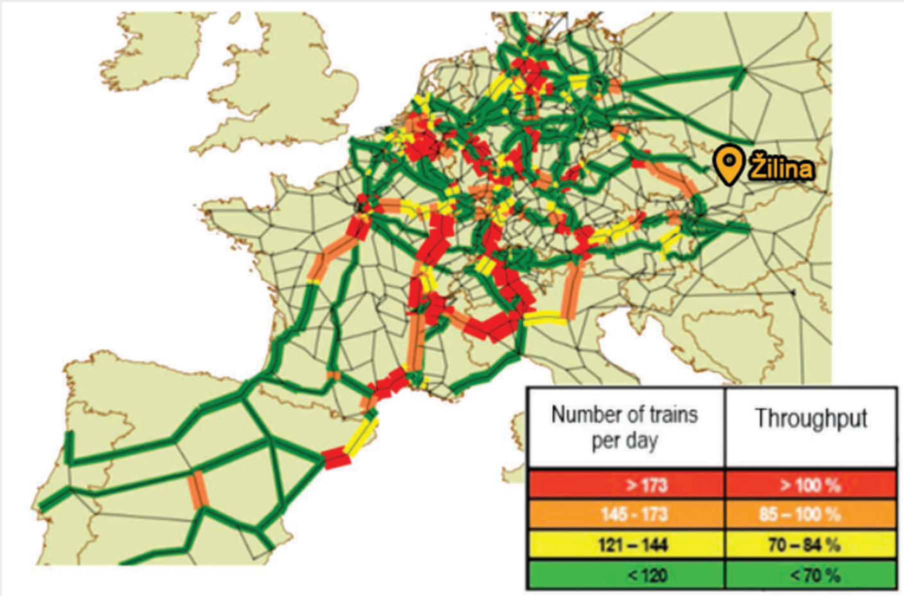

Figure 7 Rate of utilization of railway transport infrastructure before considering investment to increase its capacity by 2015
Slika 7. Iskorištenost željezničke prijevozne infrastrukture prije razmatranja ulaganja u povećanje kapaciteta do 2015.
Source: [24]

particularly in EU Member States. Drivers according to the valid Regulation (EC) No 561/2006 of the European Parliament and of the Council drivers on the road are checked for the current day and the previous 28 days. In the case of inspections at the carrier's premises, they may be inspected 12 months ago from the date of inspection. For newly registered vehicles in EU Member States, it should be noted that since 15 June 2019 digital tachographs are linked to the Global Navigation System (GNSS), the need for accurate planning and adherence to road freight schedules is even more relevant. Road freight traffic is also limited by driving restrictions on public holidays, Sundays and, in some countries, night driving restrictions apply to sections of some roads and motorways.

For road freight transport, the EU 's superior transport infrastructure and its connection to seaports is not yet complete either. Road freight transport also lacks sufficient car park capacity to take breaks and rest even on the TEN-T network, which affects transport times. The times of transport of dangerous goods by road freight transport are influenced by prohibitions of transport, respectively, restrictions on specific goods through tunnels and certain road sections.

Road freight transport, given its negative environmental impacts and high energy intensity, should be used only to a limited extent for transport from and to ports.

6. CONCLUSION / *Zaključak*

The analysis of distances and transit times between the public intermodal transport terminal in Žilina (SK) and selected European seaports shows that in the case of sessions from and to Polish ports, transit times are shorter compared to other selected European ports, even when two drivers are deployed the entire transport session due mainly to shorter distances by rail. On average, the transport time is shorter by 49.84% when using rail transport compared to single-driver road transport. However, when two drivers are deployed on the whole transport session, road transport is on average 3.17% faster than rail transport. Similarly, road transport distances are shorter on average by 3.53%.

However, the resulting railway transit times may be longer as specific factors such as real delay at border crossing points as well as track closures or delays at other crossing stations on selected routes and throughput problems of some sections were not included in the analysis.

The results of the research were processed in January 2019 before the outbreak of the COVID 19 coronavirus pandemic, which also affected Europe. While international road haulage is at the edge of collapse due to limitations on the borders of EU Member States and regulations on inconsistent quarantine of drivers when they return from abroad, freight trains travel abroad without major problems. This is also helped by significantly lower passenger train traffic. For example, through the border crossing station Děčín (CZ) - Bad Schandau (D), approximately 100 integrated freight trains operate daily (as of 23.3.2020) [26].

On the other hand, a number of EU countries have received temporary derogations from the application of Regulation (EC) No 561/2006 of the European Parliament and of the Council on the harmonization of certain social legislation relating to road transport, which increases the maximum daily driving time from 9 hours to 11 hours, reduces the daily rest period from 11 to 9 hours. Some states introduce these exemptions for all shipments e.g. Slovakia and some countries only for the transport of food, medicines, medical devices and fuels e.g. Germany. On the other hand, some international road haulage services have been prolonged since some countries have closed a large part of the border crossing points for freight traffic over 3.5 tons of total weight e.g. Hungary.

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