Transport technic and technology
Volume XVIII Issue 1 Year 2022
DOI: 10.2478/ttt-2022-0003

COMPARISON OF CZECH AND SLOVAK RAILWAY INFRASTRUCTURE IN THE CONTEXT OF BASIC OPERATIONAL INDICATORS

Abstract. The level of development of railway transport is one of the indicators of the economic development of the state. If the state regularly invests in large volumes in railway infrastructure, it creates conditions for the operation of quality passenger and freight rail transport. Analytical comparison of railway infrastructures is key to understanding the increasingly abysmal differences between the quality of railway infrastructure in the two countries. The comparison will be made mainly from the Network Statement of both countries.
Keywords: railway infrastructure, SŽ, ŽSR, Czech republic, Slovak republic

Zuzana Židová[1]
[1] *Faculty of Operation and Economics of Transport and Communications University of Žilina, Univerzitná 8215/1, 010 26 Žilina; +421 513 34 34*
Juraj Čamaj[2]
[2] *Faculty of Operation and Economics of Transport and Communications University of Žilina, Univerzitná 8215/1, 010 26 Žilina; +421 513 34 23*

Introduction

Quality railway infrastructure is the basis for operating quality rail transport. Infrastructure wear and tear is one of the factors that reduces its quality. Extensive investment is needed not only in its maintenance and reconstruction, but also in the construction of new lines, which will create new connections for the transport of people and goods.

The comparison of railway infrastructures is carried out through various indicators. The trend today is to build high-speed railways that are designed for fast passenger transport. Article (Song & Zhai, 2011) compares the load indicators of high-speed lines, which are important for the overall safety of operation.

Each infrastructure produces costs and revenues. The optimal situation is when revenues are higher than costs. The infrastructure manager's revenues are mainly from the use of the railway infrastructure by the carriers. On the contrary, the costs are mainly associated with maintenance and renovation work. Article (Olson, Okland, & Halvorsen, 2012) compares the cost-benefit methodologies produced by the railway infrastructure in the countries of Northern Europe (Norway, Finland and Sweden).

The comparison of operational reliability based on station and track intervals was performed on the Žilina - Rajec line in the conditions of the ŽSR infrastructure manager in a conference paper (Čamaj & Dolinayová, 2018). This article dealt with the comparison of the calculation of intervals according to the new regulation of the infrastructure manager DP1, which entered into force in 2016.

From a historical point of view, comparisons from various points of view have already dominated the construction of railways. It was mainly about construction technology or political decisions. The construction of lines and related decisions are discussed in article (Fuchs, 2006).

The comparison of infrastructures between Slovakia and the Czech Republic is based on basic operational indicators (length, gauge, traffic management), as well as on the performance of individual carriers in passenger and freight transport. The comparison will be all the more interesting, as the management of the railway infrastructure is based on a common regulation from the time of the Czechoslovak State Railways, when the Czech Republic and Slovakia still formed one state.

1. Basic geographical indicators

To better compare the basic operating indicators of the two railway infrastructures, it is necessary to look at the basic geographical context of both countries. The basic geographical indicators are listed in Table 1.

Table 1. Comparison of geographical indicators of the Czech and Slovak republic (Sources: Statistical office)

Indicator/State	Slovak republic	Czech Republic
The population	5 449 270 inhabitants	10 701 777 inhabitants
Area	49 035 km^2	78 870 km^2
Number of regions	8	14
Number of districts	79	76
Population density	111.3 imhabitant/km^2	136 inhabitant/km^2

We can see from the table that in almost all indicators the Czech Republic is almost twice as high as Slovakia. An interesting paradox is the number of districts, which is higher in Slovakia by three districts, despite its smaller area. The data on the population refer to the year 2021, when the census took place in Slovakia and the Czech Republic, which takes place regularly every ten years.

Figure 1 shows the number of inhabitants in individual regions in Slovakia from 2019.

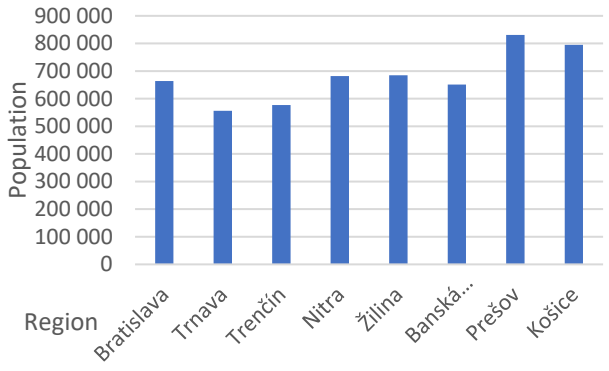


Fig. 1. Population in Regions of Slovakia in 2022 (Sources: Statistical office)

The most populous region is Prešov with a population of 831,000. On the other hand, it has the least population in the Trnava region with a population of 556 000. From the point of view of rail passenger transport, it is important to know the number of inhabitants, because the customer (Ministry of Transport and Construction) also decides on this indicator when ordering traffic performances.

Figure 2 shows the number of inhabitants in individual regions in Czech Republic from 2019.

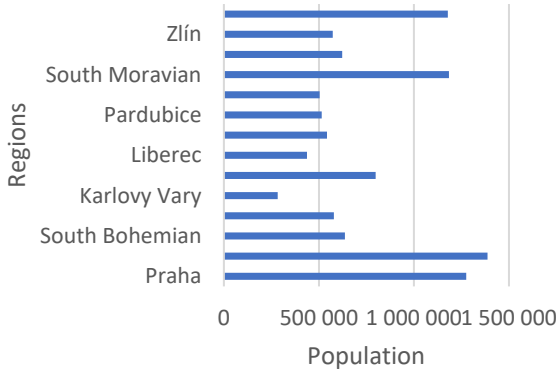


Fig. 2. Population in Regions of Czech Republic in 2022 (Sources: Statistical office)

The most populous region is South Bohemian Region (with capital city Praha) with a population of 1 386 824. On the other hand, it has the least population in the Karlovy Vary region with a population of 283 210. From the point of view of rail passenger transport, it is important to know the number of inhabitants, because the customer also decides on this indicator when ordering traffic performances. As in Slovakia, long-distance passenger transport is ordered by the Ministry of Transport, but regional passenger rail transport is ordered by individual regions. The regions must agree among themselves when financing regional trains between regions.

2. Analysis of the railway network in the Czech republic and Slovakia in the context of operational indicators

The comparative analysis of the railway infrastructure of the Czech and Slovak Republics contains a cross-section of operational and performance indicators of both railway networks. These indicators are available in the network statement of the infrastructure managers, which they are obliged to publish on their websites.

The following indicators are compared:

- method of origin,
- international railway corridors,
- track typologies,
- track gauges,
- connecting railway networks,
- power supply,
- train control systems,
- signalling systems,
- operating control points,
- railway undertakings performance.

Each of these indicators tells you about the infrastructure differences and the specifics of the infrastructure in a given country. Based on them, the current state of railway infrastructure in the countries being compared can be better understood.

2.1 Method of origin

Železnice Slovenskej republiky (hereinafter referred to as "ŽSR") was established in accordance with the Act of the National Council of the Slovak Republic No. 258/1993 Coll. of 30 September 1993 on Železnice Slovenskej republiky as amended by later regulations and has a special legal status.

Figure 3 shows the division of the Czechoslovak State Railways after the demise of Czechoslovakia since 1993 and the emergence of independent infrastructure managers in both countries.

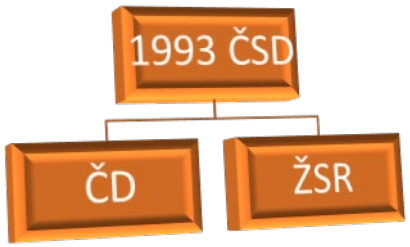


Fig. 3. The process of creating an infrastructure manager in Slovakia and the Czech Republic.

In accordance with Act No. 513/2009 Coll. On Railroads and on amendments of some acts as amended, Železnice Slovenskej republiky as the infrastructure manager, primarily provides for activities related to the operation of railways, traffic management and the operability of railways.

Správa železnic, státní organizace (hereafter „Správa železnic"), is a state organization under public law. It was established in 2003 and gradually from the then infrastructure manager of ČD, a. s. took over the competencies and components of the infrastructure so that

it could be a full-fledged infrastructure manager in the context of the conditions for accession to the European Union. Správa železnic wishes to contribute to sustainable mobility within the European rail network in order to boost economic and social development in the Czech Republic. It is responsible for the operation, maintenance, and renewal of railway infrastructure, for the control and the safety of all train traffic as well as for participating in the development of the infrastructure. In Czech Republic, basic legal conditions for the construction of railways, the conditions for the operation of railways, the operation of railway transport on these railways, as well as rights and obligations of natural and legal persons associated with them are stipulated by the Rail Act and its implementing regulations, as amended, as well as directly effective regulations of the European Union.

Core activities of ŽSR and SŽ, s. o. in relation to applicants for infrastructure capacity and to railway undertakings shall comprise (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)**:**

1. Management and operation of the railway infrastructure.
2. allocation of infrastructure capacity.
3. Provision of services to railway undertakings by means of:
    - minimum access package,
    - track access including access to service facilities,
    - services in service facilities,
    - negotiated additional service,
    - negotiated ancillary services.
4. Establishment and operation of railway, telecommunication, and radio networks.
5. Construction, repair and maintenance of railway lines.
6. Other business activities as incorporated into the Business Register.
7. Levying charges for access to the railway infrastructure.

This core business is basically the same for all infrastructure managers across Europe.

2.2 Railway corridors

The ten Pan-European transport corridors were defined at the second Pan-European transport Conference in Crete, March 1994, as routes in Central and Eastern Europe that required major investment over the next ten to fifteen years (Wikipedia contributors, 2022).

In 2010 the European Parliament and the Council laid down the rules for the establishment of a European railway network for competitive rail freight, consisting of international freight corridors (hereinafter referred to as "RFC") in order to meet the following goals:

- strengthening co-operation between IMs/ABs on key aspects such as the allocation of paths, deployment of interoperable systems and infrastructure development,
- finding the right balance between freight and passenger traffic along the RFCs, giving adequate capacity for freight in line with market needs and ensuring that common punctuality targets for freight trains are met,
- promoting intermodality between rail and other transport modes by integrating terminals into the corridor management process.

Table 2 contains a list of RFC corridors and their classification in the Czech and Slovak Republics

Table 2. Basic information about RFC corridors (Rail Net Europe, 2022)

Name RFC	Member states	Start of operation
Rhine-Alpine	NL, BE, DE, IT	10. 11. 2013
North Sea – Mediterranean	NL, BE, LU, FR, UK	
Scandinavian – Mediterranean	SE, DK, DE, AT, IT	10. 11. 2015
Atlantic	PT, ES, FR, DE	10. 11. 2013
Baltic-Adriatic	PL, CZ, SK, AT, IT, SI	10. 11. 2015
Mediterranean	ES, FR, IT, SI, HU, HR	10. 11. 2013
Orient – East-Med	CZ, AT, SK, HU, RO, BG, EL, DE	
North Sea – Baltic	DE, NL, BE, PL, LT, LV, EE	10. 11. 2015
Rhine – Danube	FR, DE, AT, SK, HU, RO, CZ	10. 11. 2020
Alpine-Western Balkan	AT, HR, SI, BG, RS	March 2020
Amber	SI, HU, SK, PL	January 2019

The RFC, which passes through Slovakia, is marked in green in the table, and the RFC, which passes through the Czech Republic, is marked in red in the table.

We can see from the table that a total of four RFCs pass through Slovakia and total of three RFCs pass through Czech Republic. Figure 4 shows the RFC map.

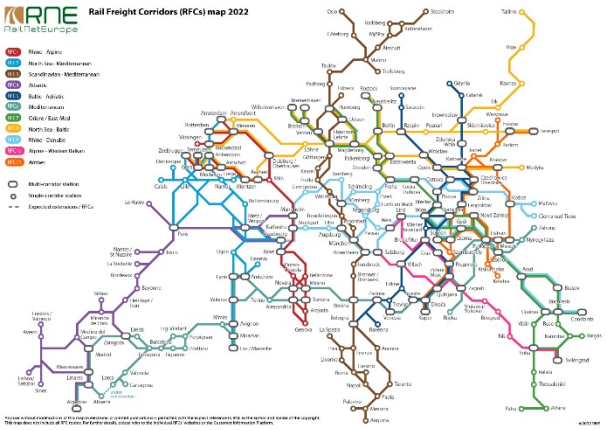


Fig. 4. Rail Freight Corridors (Rail Net Europe, 2022)

The dense network of freight corridors is intended to ensure competitive freight transport and ease the

congested road network. Despite the efforts, the main problem in Slovakia is outdated infrastructure with a number of restrictions (temporary line speed restrictions, closures, non-functional diversion routes, etc.).

In the Czech Republic, the infrastructure, at least on the main corridors, is being reconstructed on an ongoing basis, but here (especially around Prague) there is a problem with the capacity of the tracks. Freight transport must wait, at peak times, at various intermediate station until heavy passenger transport has subsided.

2.3 Track typologies

Railway lines are numbered, separately for passengers and separately for railway staff. Table 3 shows the service numbering of lines on the ŽSR and SŽ network with the designation of areas (if they are divided).

Table 3. Service numbering of lines on the ŽSR and SŽ network (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Country & infrastructure manager	Numeric range	The area
Slovak republic – ŽSR	101 – 130	-
Czech republic – SŽ	301 – 326	Moravia and Silesia
	501 – 548	Central Bohemia
	701-720	Western Bohemia

Železnice Slovenskej republiky and Správa Železnic, s. o. ensures serviceability of railway infrastructure in railway tracks, structures, and buildings.The railway lines managed by ŽSR & SŽ comprise the main and the secondary lines in terms of the Act on Railroads and this classification is published on the Ministry website www.mindop.sk (in Slovakia) and www.mdcr.cz (in Czech Republic) in the section "Ministry/Transport/Railway transport/State railway administration department/List of main and secondary lines". ŽSR & SŽ ensures serviceability of railway infrastructure in railway tracks, structures and buildings, bridges and tunnels, electrical and power engineering installations and signalling systems. The Company takes care of railway infrastructure maintenance and development in accordance with technical progress and requirements for safety and the fluidity of railway traffic. ŽSR ensures these activities by own capacities and also by contracted relationships with suppliers (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021).

Table 4 compares the basic operating indicators of the two railway infrastructures compared.

Table 4. Comparison of basic operating indicators (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Railway tracks & structures	31. 12. 2021 in Slovakia	31. 12. 2021 in Czech Republic
Construction length of operated lines	3 580 km	9 358 km
Construction length of managed lines	3 627 km	9 254 km
Construction length of lines	6 866 km	11 358 km
Number of crossings	2 079 pc	7 734 pc
Number of switches	8 372 pc	25 458 pc
Number of bridges	2 326 pc	6 719 pv
Total length of bridges	52 544 m	154 845 m
Number of tunnels	76 pc	166 pc
Total length of tunnels	45.007 m	54 072 m

Given the size of the area, it was possible to assume that all operational indicators will be larger in the Czech Republic than in Slovakia.

2.4 Track typologies

In rail transport, track gauge is the distance between the two rails of a railway track (Wikipedia contributors, 2021).

In Slovakia, similarly to the Czech Republic, most railway lines are of normal gauge, 1435 mm. Figure 5 shows a comparison of track lengths in the Czech and Slovak Republics by gauge.

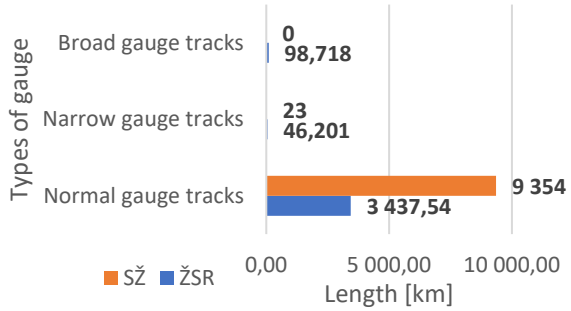


Fig. 5. Rail Freight Corridors (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

We can see from the graph that more than 90% of the lines in both countries are of normal gauge. At the same time, there are half as many narrow-gauge tracks in Slovakia as in the Czech Republic. There is also one wide gauge line in Slovakia, which leads from Eastern Slovakia to Ukraine. Table 5 shows the wide gauge and narrow-gauge lines in both countries under comparison.

Table 5. Comparison of basic operating indicators (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Types of gauges	ŽSR	SŽ
narrow gauge tracks	Poprad – Štrbské Pleso (1000 mm)	Jindřichúv Hradec – Obrataň (760 mm)
	Starý Smokovec – Tatranská Lomnica (1000 mm)	Jindřichúv Hradec – Nová Bystřice (760 mm)
	Štrba – Štrbské Pleso (1000 mm)	Třemešná ve Slezsku – Osoblaha (760 mm)
	Trenčianska Teplá – Trenčianske Teplice (760 mm)	
broad gauge tracks	Haniska pri Košiciach – Užhorod (1520 mm)	

Operation on most narrow-gauge lines is year-round, mostly with passenger transport. Only freight transport is operational on the wide gauge line. Thoughts on the operation of passenger transport are still stopped.

2.5 Connecting railway networks

Border crossing stations form a liaison point between two neighbouring railway administrations. A border station is a railway station intended for communication with the railways of a neighbouring state. It is usually the last station before the state border. The primary difference between the border station and the border crossing station is that the handover and acceptance of wagon consignments is carried out at the border crossing station and the related operations are performed here. Which station is a border station and which station is a border crossing station is determined by the regime of border transport railway communication (Šperka, 2022). Figure 6 shows the number of border crossings on the ŽSR.

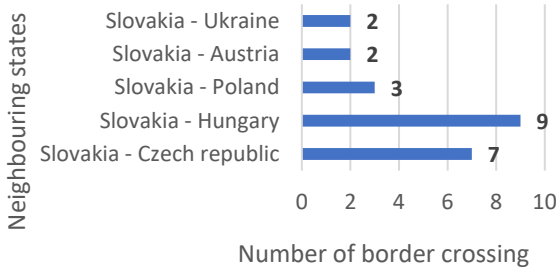


Fig. 6. Railway border crossings in Slovakia (Železnice Slovenskej republiky, 2021)

The main problem of cross-border transport in Slovakia is declining regional passenger transport. This can be seen especially in transports in the direction Slovakia - Hungary and back. Passenger transport is operated in year-round mode only at three border crossings. On others, only freight transport is operated, on some very sporadically. The gradual decline of regional passenger transport can also be seen at the border crossings between Slovakia and the Czech Republic.

Figure 7 shows the number of border crossings on the SŽ network with neighbouring railway infrastructures

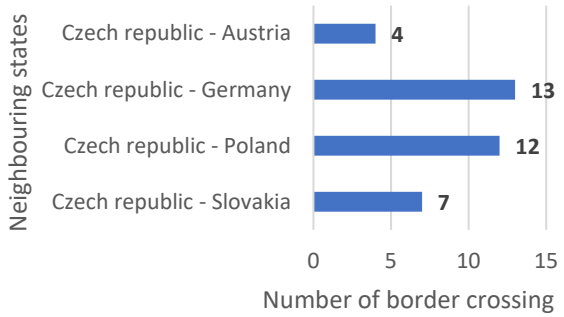


Fig. 7. Railway border crossings in Czech Republic (Správa Železnic, s. o., 2021)

SŽ and its foreign partners chose the exact opposite direction. In the last ten years, several border crossings with Germany have been renewed, and a new privileged transit traffic has been created. At the same time, passenger and freight transport is operated at almost all border crossings, at least to a satisfactory extent.

The border crossings between Slovakia and the Czech Republic are analysed in more detail in Table 6.

Table 6. Czechoslovak railway border crossings (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Border crossing	Interchange station	Electrification
Čadca – Mosty u Jablunkova	Čadca	3kV
Kúty – Lanžhot	Kúty	25kV/50Hz
Lúky pod Makytou – Horní Lideč	Horní Lideč	3 kV
Holíč nad Moravou – Hodonín	Hodonín	25 kV/50Hz
Skalica na Slovensku – Sudoměřice nad Moravou	Skalica na Slovensku	-
Vrbovce – Velká nad Veličkou	Vrbovce	
Horné Srnie – Bylnice	Horne Srnie	

More than half of the railway border crossings are electrified by either a one-way or an alternating traction system. At the same time, passenger rail transport is maintained at most railway border crossings, at least to a limited or long-distance extent.

2.6 Power supply

Railway lines managed by ŽSR are divided into electrified and non-electrified and the extent is distinguished in different colour in figure 8.

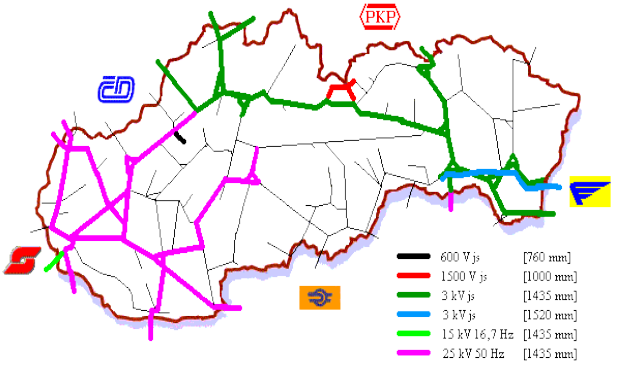


Fig. 8. Electrification of tracks in Slovakia (Kožuch, 2002)

Slovakia is dominated by a 3 kV unidirectional traction system (in the north and east of Slovakia) and an alternating traction system of 25 kV / 50Hz (center, south and west of Slovakia). In addition to them, there are also traction systems separately for the Tatra Electric Railway (1.5 kV) and separately for the Trenčín Electric Railway (750V). A short section from the Bratislava-Petržalka station to the Slovak-Austrian border is electrified by the Austrian 15kV / 16.7Hz AC traction system. A total of 1,585 km of railway lines are electrified in Slovakia.

In the Czech Republic, the dominant traction systems are the same. As described in Figure 8. In the Czech Republic, the dominant traction systems are the same. As described in Figure 9.

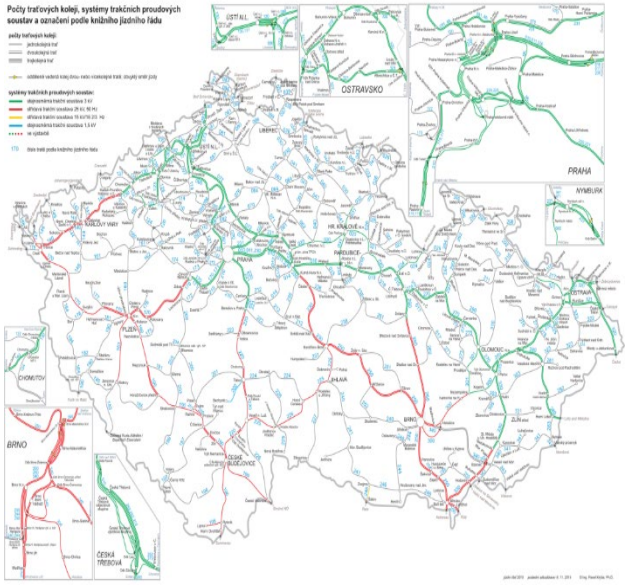


Fig. 9. Electrification of tracks in Czech Republic (Molek, 2015)

The same traction systems that dominate in Slovakia alternate to a lesser extent specific (1.5 kV on the Tábor - Bechyně track). The Austrian alternating traction system is also on a short section from Znojmo to the Austrian border. A total of 3 215 km of railway tracks are electrified in the Czech Republic.

2.7 Train control systems

The European Train Control System (ETCS) is the signalling and control component of the European Rail Traffic Management System (ERTMS). It is a replacement for legacy train protection systems and designed to replace the many incompatible safety systems currently used by European railways. This system has a total of three levels (Wikipedia contributors, 2021).

This system is not very widespread on the ŽSR network. Table 7 lists the sections where it is installed with the appropriate levels.

Table 7. Comparison of basic operating indicators (Železnice Slovenskej republiky, 2021)

Track section	Level ETCS
Bratislava – Rača – Púchov	L1
Považská Teplá (outside) – Žilina (outside)	L1
Žilina (outside) – Čadca	L2

We can see from the table that ETCS is installed on only three main tracks. It is very small out of the total number of tracks (Správa Železnic, s. o., 2021).

The use of ERTMS/ETCS system of Level 2 requires the use of encryption keys to encrypt useful data for radio transmission between the radio block central (RBC) and the ETCS mobile part. Encryption keys for ETCS mobile parts are issued at request of Správa železnic for RBC under its administration. Requirement for the application and detailed procedure are to be found in a separate Správa železnic document published on the Infrastructure Operation Portal (Správa Železnic, s. o., 2021).

On the Kolín – Česká Třebová – Brno – Břeclav state border Austria/Slovakia track section, a trackside part of the ERTMS/ETCS system of Level 2 in the version according to the set of specifications No. 1 of the TSI CCS (2.3.0d). The conditions for operating locomotives, control wagons and special traction vehicles with the enabled ETCS mobile part and controlled by this system are specified in the internal regulations of the railway operator (Správa Železnic, s. o., 2021).

On the sections Petrovice u Karviné st.hr. PL – Přerov – Břeclav (outside), Brodek u Přerova - Česká Třebová (outside), Český Brod - Praha-Běchovice - Praha-Malešice - Praha-Uhříněves a trackside part of the ERTMS/ETCS system of Level 2 in the version according to the set of specifications No. 3 of the TSI CCS (3.6.0) in system

version 1.1 (allows operation of vehicles with the ETCS mobile part version according to specification set No. 1 [2.3.0d], No. 2 [3.4.0] and No. 3 [3.6.0] according to TSI CCS) (Správa Železnic, s. o., 2021).

Furthermore, the construction of the line part of the ERTMS / ETCS system is underway with commissioning before the entry into force of the 2022 timetable in the sections Hrušovany u Brna (outside) - Židlochovice and Hustopeče u Brna - Šakvice (outside), within which the ERTMS / ETCS level 2 system is implemented. in the version according to the specification set No. 1 (2.3.0d) according to the TSI CCS (Správa Železnic, s. o., 2021).

Furthermore, the construction of the line part of the ERTMS / ETCS system is underway and is being prepared with the expected commissioning before the entry into force of the 2022 timetable or during its validity in the sections Plzeň hlavní nádraží (outside) - Cheb (outside), Cheb - Cheb st. hr. DE, Beroun - Plzeň main railway station, České Budějovice - Votice (outside), Votice - Prague-Uhříněves (outside), Prague-Hostivař (outside) - Prague-Vršovice, Prague-Libeň - Prague-Malešice (outside), Prague-Malešice (outside) - Prague-Garden City, Kolín (outside) - Český Brod (outside), Prague-Běchovice (outside) - Prague-Libeň - Prague- Holešovice - Kralupy nad Vltavou (outside), Ústí nad Orlicí (outside) - Lichkov st. hr. PL, Přerov (outside) - Brodek u Přerova (outside), Prosenice - Dluhonice, Mosty u Jablunkova st. hr. SK - Dětmarovice (outside) / branch Závada (outside), Uničov - Olomouc main railway station (outside), within which the ERTMS / ETCS level 2 system is implemented in the version according to the set of specifications No. 3 according to TSI CCS (3.6.0) in system version 1.1 (Správa Železnic, s. o., 2021).

2.8 Signalling systems

Railway signalling (BE), also spelled railway signaling (AE), is a system used to direct railway traffic and keep trains always clear of each other. Trains move on fixed rails, making them uniquely susceptible to collision (Wikipedia contributors, 2021).

As there was a common rule based on both states, we present in Table 8 a comparison of the two neighboring states.

Table 8. Signalling systems in ŽSR and SŽ (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Kind of signalling system	ŽSR	SŽ
Track signalling system – automatic block	478 km	874 km
Track signalling system – automatic block system	370 km	587 km
Track signalling system – semi-automatic block	714 km	1 045 km
Track signalling system – Line with telephone communication system	1 793 km	2 124 km
Station signalling system	513 pc	1 147 pc
Remote controlled signalling systems operated by dispatcher	396 km	600 km
Train signalling system	753 km	1 478 km
Crossing signalling system	2 079 pc	4 747 pc
Hump signalling systems	218 pc	396 pc

We can see from the table that the development of railway infrastructure in Slovakia is slower than in the Czech Republic. Old security devices prevail over modern technologies also on corridor railway tracks. At the same time, there is a so-called AVV (Automatic Train Control) system in the Czech Republic, which enables remote train control without the assistance of a train driver.

2.9 Operating control points

The operating control point is a specific point within the operation characteristic of a technical device (Šperka, 2022).

A comparison of the number of operating control point in the Czech Republic and Slovakia is shown in Figure 10.

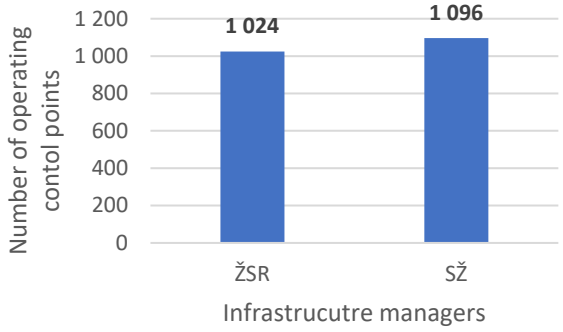


Fig. 10. Number of operating control points (Železnice Slovenskej republiky, 2021) (Správa Železnic, s. o., 2021)

Despite the area, the difference in the number of operating control point is not so great. There is a significant difference in remotely controlled operating control point, of which there are almost half of the transport in the Czech Republic in Figure 10.

2.10 Railway undertaking performance

A carrier is a legal person performing transport for someone else's own or own use on a railway line. To start providing services, a license is required, which is issued separately for passenger transport and separately for freight transport (Šperka, 2022).

From the year-on-year perspective, a decrease of 4,087 thousand train-km was recorded in transport performance, which was caused by the impact of COVID-19 measures. The decrease in total performance was largely on the side of passenger transport, where we record a year-on-year decrease of 2,998 thousand train-km. The decrease in rail passenger services was caused by a change in the Timetable – suspension of international passenger services, a significant decrease in domestic transport due to mobility restrictions. The largest decrease in transport performance by 2,169 thousand train-km reported Železničná spoločnosť Slovensko, a. s., while the carrier RegioJet recorded a decrease of 454 thousand train-km and, Leo Express s. r. o. reported decrease of 252 thousand train-km (Železnice Slovenskej republiky, 2021).

In freight transport, we record a year-on-year decrease in transport performance by 1,089 thousand train-km. The largest decrease of 996 thousand train-km reported Železničná spoločnosť Cargo Slovakia. For other railway undertakings, there was a year-on-year decrease in transport performance by 93 thousand train-km (Železnice Slovenskej republiky, 2021).

Figure 11 shows the performance of carriers for 2020 separately for passenger and separately for freight transport.

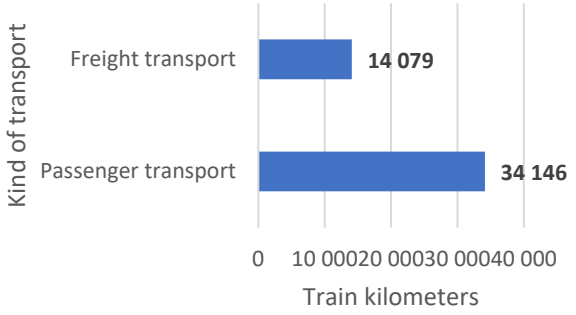


Fig. 11. Performance of carriers on the ŽSR network in 2020 (Železnice Slovenskej republiky, 2021)

It can be seen from the picture that passenger transport dominated in 2020, but for the COVID-19 pandemic, the performance is still lower than in previous years. At present, a total of 24 carriers in passenger and freight transport operate on the ŽSR network.

In the Czech Republic, the performance of carriers in train-kilometres is calculated as a percentage separately for passenger transport and for freight transport separately.

Figure 12 shows the performance of passenger transport in 2020 in train kilometres.

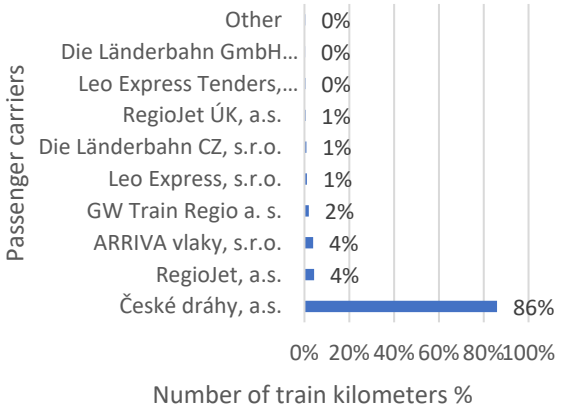


Fig. 12. Performance of passenger carriers on the SŽ network in 2020 (Správa Železnic, s. o., 2021)

Despite the drop in performance due to the liberalization of the passenger transport market, the state carrier remained in the first place. The shares of other carriers are significantly smaller.

Figure 13 shows the performance of freight carriers for 2020 as a percentage.

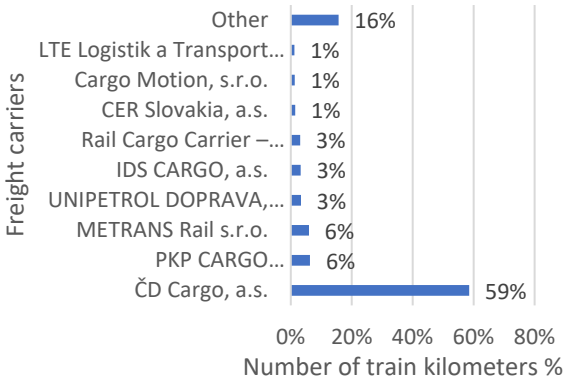


Fig. 13. Performance of freight carriers on the SŽ network in 2020 (Správa Železnic, s. o., 2021)

Due to the more developed liberalization of rail freight, the situation is different in this case. Although the carrier ČD CARGO, a. s., but several companies do business in freight transport and so its share is not as high as in passenger transport. The differences between the shares are also smaller.

The result of this analysis is the fact that the liberalized railway transport market is at a higher level in the Czech Republic than in Slovakia. This brings several benefits to the final consumer, i.e. the customer in freight transport and the passenger in passenger transport (price, time of transport, services provided by the carrier).

Conclusions

The aim of the presented analysis was to find out how much the operational indicators of railway infrastructure managers differ in the Czech and Slovak Republics.

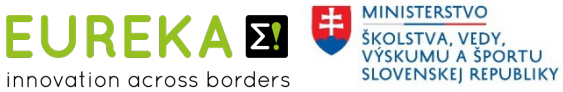
The results led to the following conclusions:

- the railway infrastructure in Slovakia is significantly underfunded,
- repairs and maintenance are carried out only up to the amount of allocated funds, which is not enough in the long run,
- the infrastructure in the Czech Republic has undergone several major modernizations,
- carriers also complain about poor quality infrastructure in Slovakia,
- it is necessary to take the example of the Czech Republic and try to increase the amount of funds allocated to infrastructure managers and carriers in Slovakia

If these conclusions are fulfilled, the railway infrastructure may be of better quality and the differences between the railway infrastructure in Slovakia and the Czech Republic will no longer be so significant.

Acknowledgment

The paper was supported by the project EUREKA E!13629 – MoP4Rail - "Mobile platform for rail transports" at Faculty of Operations and Economics of Transport and Communication, University of Žilina, Slovakia.



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