Interreg CENTRAL EUROPE

Co-funded by the European Union

Rail4Regions

WORK PAPER INDUSTRIAL SIDINGS

D.2.1.2.

Final

March 2024

Introduction

Shifting freight transport from road to rail is the key opportunity for the European Union to significantly reduce CO2 emissions and energy consumption - for a better quality of life and greater independence from fossil fuels in Europe. Transporting goods by rail not only causes 9x lower CO2 emissions compared to lorries, but also requires 6x less energy. While the general volume of transport in the EU is increasing from year to year, the modal share of rail transport continues to fall from its current level of approx. 16% (EU average 2022). The main reason for the low rail modal share is that it is still easier to drive a lorry across Europe than a goods train. The lack of EU-wide harmonisation at operational, technical and regulatory level makes rail more expensive and less flexible than road, which is why customers often opt for road rather than rail.

In order to halt the decline in rail's share and to shift freight from road to rail, it is essential to revitalise and develop industrial sidings. Industrial sidings offer a significant contribution to the transportation of goods in an efficient and environmentally friendly manner without changing the mode of transport. An industrial siding opens up a company's direct access to the public rail network and, therefore, to efficient rail freight transport. As a result, goods can be transported directly in door-to-door transport without changing the mode of transport: punctually, reliably and in an environmentally friendly manner. Expanding the entire logistics chain opens up an optimal connection to the most important European ports and terminals as well as industrial and economic centres.

Although the European Union is united in many areas, it is highly fragmented in terms of rail transport, and despite efforts to achieve interoperability, national borders are real and problematic for rail freight. The European countries, especially those of central and eastern Europe, are small in terms of their territorial size and small in terms of distances, so that the classic advantages of rail transport can be exploited primarily by international traffic. It is therefore essential that the international network of single wagonload traffic is maintained and that this service is available in all EU countries.

1. Industrial sidings in Europe

Industrial sidings in Europe refer to the tracks or rail lines that extend from the main railway network to serve industrial facilities such as factories, warehouses, ports, and other industrial sites. These sidings play a crucial role in facilitating the transportation of goods and raw materials between industrial areas and the broader rail network. Key points about industrial sidings in Europe include:

- ***Connectivity***: Industrial sidings are designed to connect directly to the main railway lines, providing seamless transportation links for industrial enterprises. This connectivity enhances the efficiency of transporting goods by rail, reducing the need for additional truck transportation.
- ***Diverse Industries***: Industrial sidings cater to a wide range of industries, including manufacturing, mining, energy, and logistics. They are particularly important for industries that rely on bulk transportation of materials or finished products.
- ***Logistical Efficiency***: By having direct rail access, industries can efficiently transport large quantities of materials and products over long distances. This can be especially beneficial for heavy and bulky goods that may be more challenging to transport by road.
- ***Multimodal Transportation***: Some industrial sidings are strategically located near ports or other transportation hubs, facilitating multimodal transportation. This allows for easy transfer of goods between trains, ships, and trucks, providing a comprehensive logistics solution.
- ***Customization***: Industrial sidings can be customized to meet the specific needs of individual industries. This includes factors such as track layout, loading and unloading facilities, and storage areas. This flexibility ensures that the infrastructure is tailored to the requirements of the businesses it serves.
- ***Rail Freight Growth***: The use of industrial sidings contributes to the overall growth of rail freight transportation in Europe. Rail is considered an environmentally friendly mode of transportation, and as sustainability becomes a more significant concern, industries may increasingly opt for rail solutions.
- ***Regulatory Considerations***: The development and maintenance of industrial sidings are subject to regulatory frameworks that vary across European countries. Compliance with safety standards, environmental regulations, and other guidelines is essential for the construction and operation of these facilities.

Overall, industrial sidings in Europe are integral to the efficient movement of goods by rail and play a vital role in supporting various industries across the continent. They contribute to the overall transportation infrastructure and help optimize logistics for businesses in diverse sectors.

The transport volume at industrial sidings can vary widely depending on factors such as the type of industry, the specific goods being transported, geographical location, and overall economic conditions. Here are some factors that influence transport volume at industrial sidings:

- ***Industry Type***: Different industries have varying transportation needs. Industries involved in bulk goods, such as mining, agriculture, and heavy manufacturing, may generate higher transport volumes compared to industries dealing with lighter or more specialized goods.
- ***Economic Conditions***: The overall economic health of a region or country can significantly impact industrial activities and, consequently, transport volumes. During periods of economic growth,

industrial production tends to increase, leading to higher transportation needs. Conversely, economic downturns may result in reduced transport volumes.

- ***Seasonal Variations***: Certain industries, such as agriculture, may experience seasonal fluctuations in production and transportation. For example, harvest seasons may lead to increased transport volume for agricultural products.

- ***Infrastructure Development***: The expansion or development of industrial facilities and infrastructure can influence transport volumes at industrial sidings. New factories, warehouses, or distribution centers may increase the demand for rail transportation.

- ***Multimodal Connections***: Industrial sidings that are well-connected to other modes of transportation, such as ports, can attract higher transport volumes. The ability to seamlessly transfer goods between rail, sea, and road transportation modes enhances the overall logistics efficiency.

- ***Government Policies and Incentives***: Government policies and incentives, such as support for rail freight, can impact transport volumes. Subsidies, tax incentives, or infrastructure investments aimed at promoting rail transport may influence businesses to use industrial sidings.

- ***Market Demand***: The demand for certain products in the market can directly impact transport volumes. Industries producing goods with high market demand may experience increased transportation requirements, leading to higher utilization of industrial sidings.

- ***Logistics Efficiency***: Efficient logistics planning and operations can contribute to higher transport volumes at industrial sidings. Streamlined processes, well-designed sidings, and effective transportation management systems can enhance the overall efficiency of rail transportation.

- ***Environmental Considerations***: As environmental sustainability becomes a more significant concern, industries may opt for rail transport over road transport, leading to increased utilization of industrial sidings and higher transport volumes.

It's important to note that transport volume at industrial sidings is subject to dynamic and interconnected factors. Regular monitoring, adaptability to market changes, and a robust understanding of the specific industry's logistics needs are crucial for optimizing the use of industrial sidings and rail transportation.

2. Slovenia

Public railway infrastructure in Slovenia is one of the smallest railway networks in the EU, with only 1,200 km of the lines. Slovenia is located in the central Europe and the railway network spans across the entire country, connecting major cities and towns. The network is also linked to neighboring countries, facilitating international rail transport with four neighbouring states. The transport flows use four rail freight corridors: Mediterranean, Baltic-Adriatic, Amber and Alpine-Western Balkans. Slovenia's railway network plays a crucial role in international transportation, connecting to neighboring countries such as Austria, Italy, Hungary, and Croatia. This facilitates both passenger and freight transport across Europe. While Slovenia doesn't have dedicated high-speed rail lines, it has made efforts to improve rail infrastructure and speed. Upgrades have been made to certain sections of the railway to enhance travel times and overall efficiency.

Lines in Slovenia are divided in two categories main lines and regional lines. Both categories are presented with the share of 50 %. Some of the main railway lines in Slovenia include the main north-south line connecting the capital, Ljubljana, to Maribor in the northeast and Koper on the Adriatic coast. Another significant line connects Ljubljana to the border with Austria. Regional lines are branched from the main lines. 50 % (over 600 km) of the all network is electrified with the direct current electrification with 3 kV. Over 52 % of the railway network, mostly main lines, are acceptable for the axle load 22,5 t/axle. Double track railway lines are available at 27 % of the network.

In Slovenia, industrial sidings are likely to play a crucial role in facilitating the transportation of goods and connecting industrial facilities to the national railway network. Here are some aspects to consider:

- Industrial sidings in Slovenia are likely to connect various industries, including manufacturing, logistics, and other industrial facilities, to the main railway lines. These connections enable efficient transportation of goods by rail, contributing to the overall logistics infrastructure.
- Slovenia's geographic location, with access to ports on the Adriatic Sea, can influence the design and importance of industrial sidings. Ports and industrial areas near the coast may have a higher demand for rail connections to facilitate multimodal transportation.
- Slovenia is part of several key European rail corridors, such as the Baltic-Adriatic Corridor. These corridors aim to enhance rail connectivity between different regions in Europe, and industrial sidings may play a role in supporting efficient freight transportation along these corridors.
- Like other European countries, Slovenia adheres to European Union regulations and standards for rail transportation. Compliance with safety standards, environmental regulations, and other guidelines is essential for the construction and operation of industrial sidings.
- Economic conditions, industrial activities, and trade volumes can impact the demand for rail transportation and, consequently, the use of industrial sidings. Economic growth and industrial development tend to drive higher transport volumes.

Industry sidings in Slovenia are not part of the public rail network. Facing or trailing (i.e. diverging or converging) turnouts of an industry sidings and the entire branching point are maintained by the Infrastructure Manager on behalf of the industry line owner. The cost of installing, maintaining and removing an industry line’s branching point and the associated safety equipment and other costs associated with the branching point are borne by the industry line owner or by the Infrastructure Manager.

If an industry siding is discontinued, the cost of restoring normal conditions of travel is borne by the Infrastructure Manager or by the owner of the sidings.

The owner or operator of an industry siding and the Infrastructure Manager enter into a contract to define their relationship with respect to the installation, maintenance and discontinuance of the sidings.

Pursuant to the provisions of the Railway Transport Safety Act ZVZelP (Official Gazette of the Republic of Slovenia No 30/2018 and No 54/2021), each industry siding must have its own working rules which set forth the procedures and obligations of the siding owner and its collaboration with the Infrastructure Manager and/or RUs which run trains on the industry sidings.

Industry siding working rules are produced by the owner or the operator of the siding, and must contain, at minimum, the following chapters:

- General provisions
- Description of track and trackside equipment
- Organising of shunting work
- Maintenance and its equipment and monitoring of track condition
- Disruptive events on the sidings
- Final provisions
- Annexes (industry line layouts and other specific instructions)
- Medical fitness and competence of operations staff in charge of safety-critical tasks on the industry line.

Shunting movements of rolling stock between the industry line and public rail infrastructure must obtain, pursuant to Article 92 of the Railway Transport Safety Act (Official Gazette of the Republic of Slovenia No 30/2018 and No 54/2021), consent of the Infrastructure Manager for the section of the working rules regarding public rail infrastructure.

Where shunting movements from the industry sidings to public rail network are carried out by the industry owner operations staff with own shunting vehicles, the Infrastructure Manager shall determine, through its safety management system, the conditions of such movement and the part of public rail infrastructure where such movements may be conducted so as to ensure safety of traffic on the railway.

On the Slovenian public railway network is connected about 200 industrial sidings. Most of them is connected to the nearest public railway stations. Some of the sidings are directly connected to the open line sections. 56 % of them is active, but the frequency of the rail deliveries is very different. Some sidings get the deliveries every day, other every week or month, some with the low frequencies only few times per year. It also exists active sidings, without deliveries in the last few years. The other 44 % of sidings are closed or abandoned with removed tracks.

The maintenance of the operating sidings is expensive for the industry, beside the infrastructure, the industrial sidings demands additional shunting locomotives or similar devices for the movement of the wagons inside the factory.

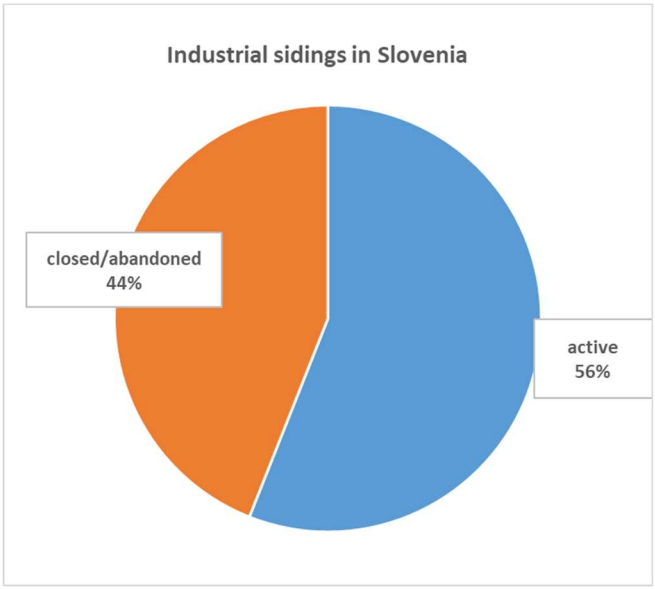

Figure 1: Industrial sidings in Slovenia
Source: SŽ-Infrastruktura

The Port of Koper has the longest industrial sidings network in Slovenia, with more than 40 kilometres of tracks. The port cannot be directly compared with industry and factories, as it does not produce anything, but only transfers cargo from ships to wagons and vice versa.

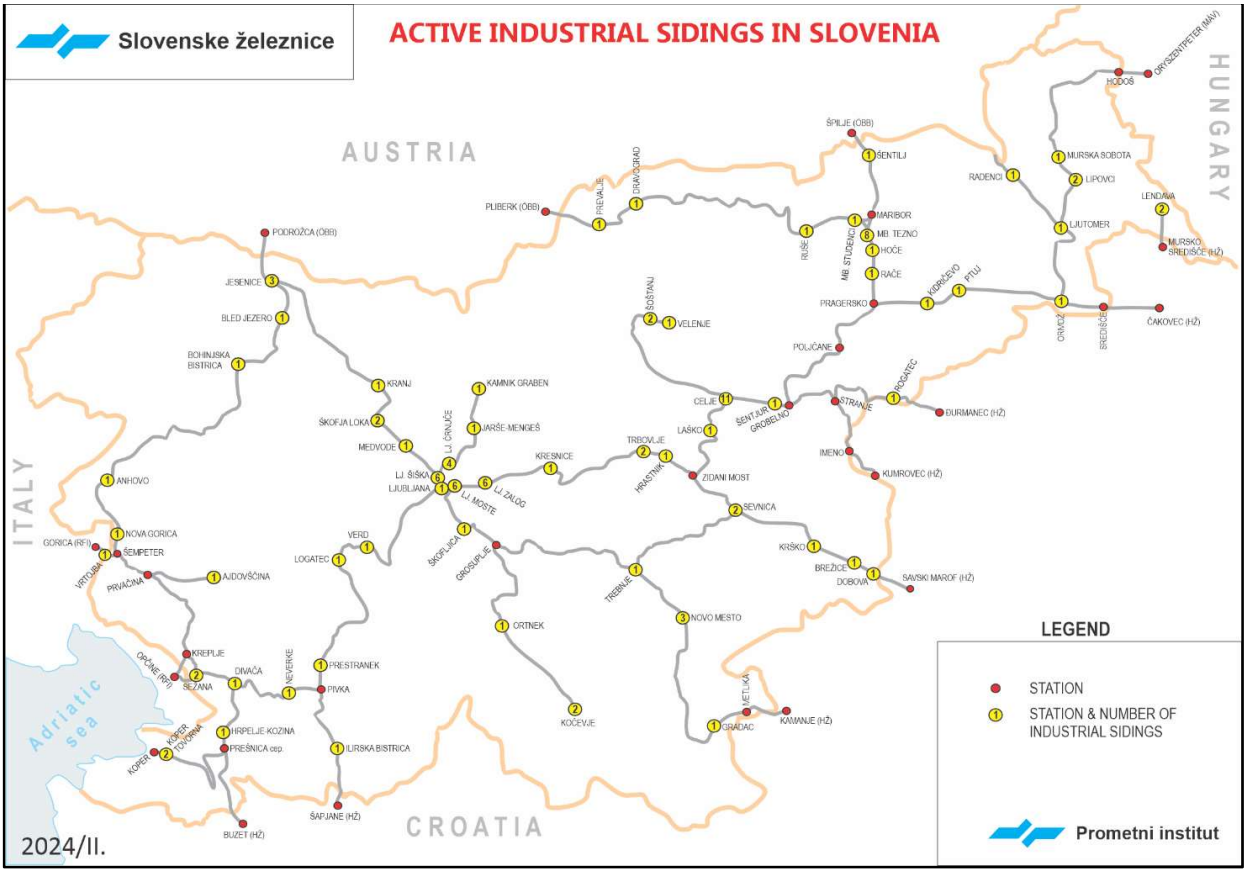

Figure 2: Active industrial sidings in Slovenia
Source: Prometni Institut Ljubljana

Figure 3: Railway doors to the transformer factory at Ljubljana and branch of the industrial siding for the paper factory at Medvode
Source: Prometni Institut Ljubljana and Marjana Hanc (right side)

Most of the industrial sidings were built after World War II. According to the available data, 75% of the industrial tracks active today were built in the period 1941-1990, 19% were built before 1940, of which 8% are between 70 and 90 years old, and 11% are more than 90 years. After the independence of Slovenia, only 6% of active industrial tracks were built, which also shows the fact that the railway infrastructure was neglected during this period.

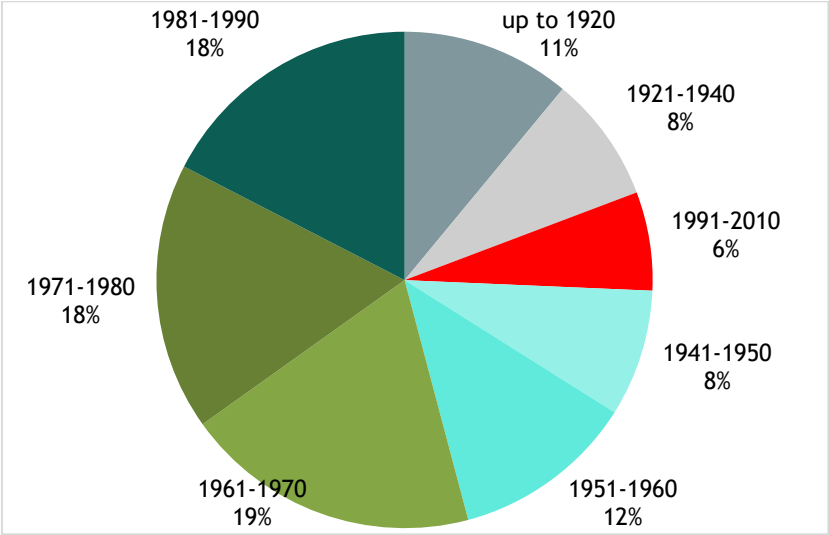

Figure 4: Construction year of the industrial sidings
Source: Prometni Institut Ljubljana

The industrial sidings are divided to the two type of classification of the lines in Slovenia. Each siding is suppled from the main or regional railway line.

Railway Line	Share
Main corridor lines	59 %
Regional sekundär lines	41 %

Source: Prometni Institut Ljubljana

The total length of the handover tracks between rail carriers and siding's owner in relation to the axle load was analysed separately for the main and regional lines and can be seen in more detail in the figures below.

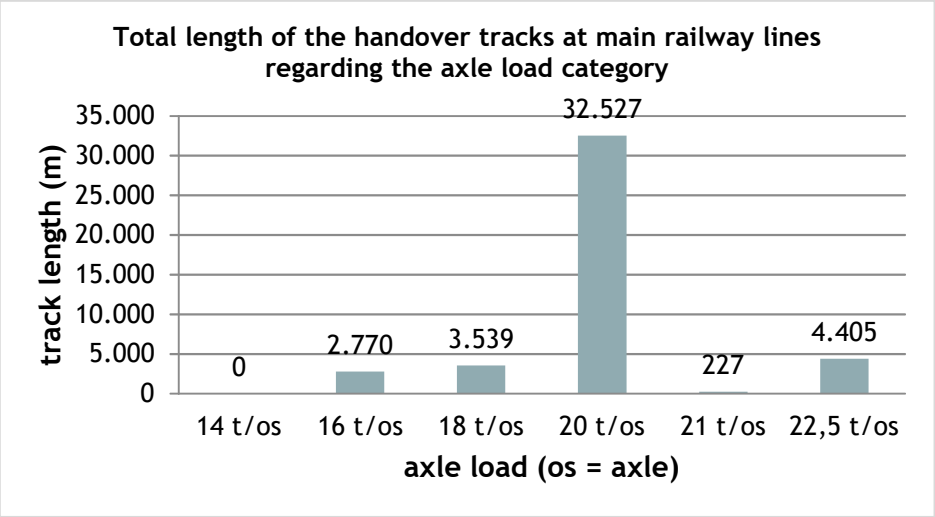

Figure 5: Total length of handover tracks according to axle load category for main lines
Source: Prometni Institut Ljubljana

From the figure above, it can be seen that on the main lines there are the most handover tracks of industrial sidings or 75% declared for an axle load of 20 t/axle, with 10% followed by the category 22.5 t/axle, with 8% category 18 t/axle, and finally with 7% category 16 t/axle. In fact, only 10% of the handover tracks with an axle category of 22.5 t/axle correspond to the intended axle load of the main lines. If we want to establish an axle load of 22.5 t/axle, it would be necessary to upgrade a 39 km of handover tracks.

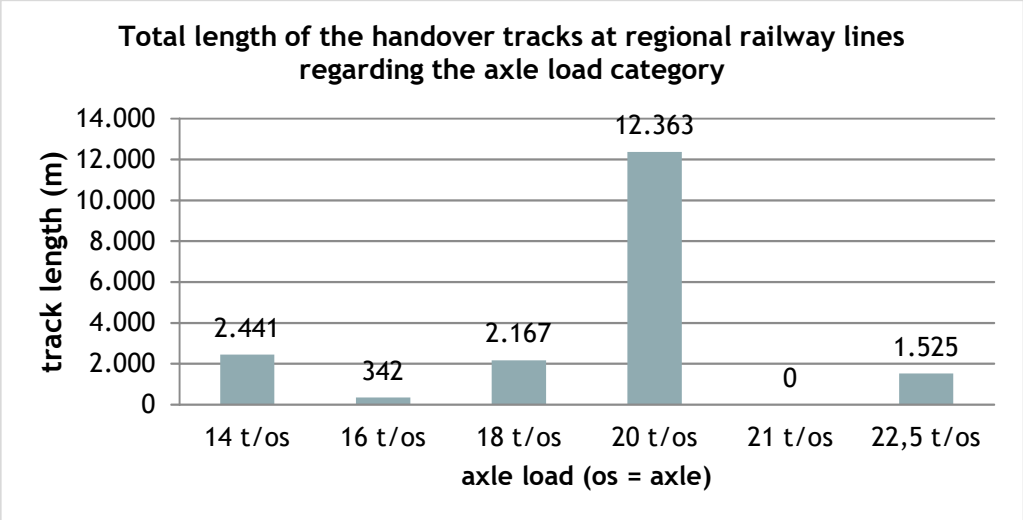

Figure 6: Total length of handover tracks according to axle load category for regional lines
Source: Prometni Institut Ljubljana

On regional lines, there are the most handover tracks of industrial sidings or 66% declared for an axle load of 20 t/axle, with 13% followed by category 14 t/axle, with 11% category 18 t/axle, and finally with 8% category 16 t/axle, and 2% belonging to category 16 t/axle. Given that regional lines are mostly declared for 20 t/axle, the axle loads of industrial tracks are also adequate. Although the current axle load of industrial tracks connecting to regional lines corresponds to the axle load of regional lines, it is necessary to draw attention to the fact that future upgrades of regional lines will also be aimed at increasing axle loads.

2.1. Transport volume at industrial sidings

The volume of transport at industrial sidings can vary widely and is influenced by several factors. The key factors that typically impact the transport volume at industrial sidings.

- Different industries have varying transportation needs. Heavy industries dealing with bulk materials may generate higher transport volumes compared to industries dealing with lighter or specialized goods.
- The overall economic health of the region or country can significantly impact industrial activities and, consequently, transport volumes. During periods of economic growth, industrial production tends to increase, leading to higher transportation needs.
- Some industries, such as agriculture, may experience seasonal fluctuations in production and transportation. Harvest seasons, for example, may lead to increased transport volumes for agricultural products.
- The expansion or development of industrial facilities and infrastructure can influence transport volumes at industrial sidings. New factories, warehouses, or distribution centers may increase the demand for rail transportation.
- Industrial sidings that are well-connected to other modes of transportation, such as ports, can attract higher transport volumes. The ability to seamlessly transfer goods between rail, sea, and road transportation modes enhances overall logistics efficiency.
- Government policies and incentives, such as support for rail freight, can impact transport volumes. Subsidies, tax incentives, or infrastructure investments aimed at promoting rail transport may influence businesses to use industrial sidings.
- The demand for certain products in the market can directly impact transport volumes. Industries producing goods with high market demand may experience increased transportation requirements.
- Efficient logistics planning and operations can contribute to higher transport volumes at industrial sidings. Streamlined processes, well-designed sidings, and effective transportation management systems enhance overall efficiency.
- As environmental sustainability becomes more significant, industries may opt for rail transport over road transport, leading to increased utilization of industrial sidings and higher transport volumes.

Slovenian national freight railway carrier every year transported about 20 million net tonnes. 30 % of the volume is loaded or unloaded at the industrial sidings in Slovenia (not included Port of Koper).

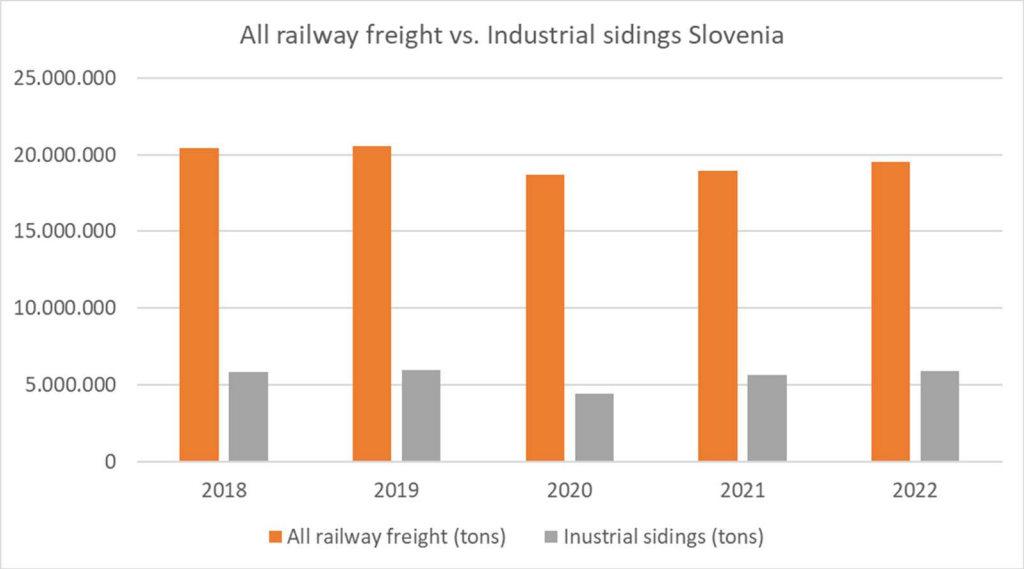

Figure 7: All railway freight transport vs. industrial sidings
Source: SŽ-Tovorni promet

Transport volume at industrial siding in Slovenia is about 6 million net tons yearly. Share of unloaded tons is 57 %.

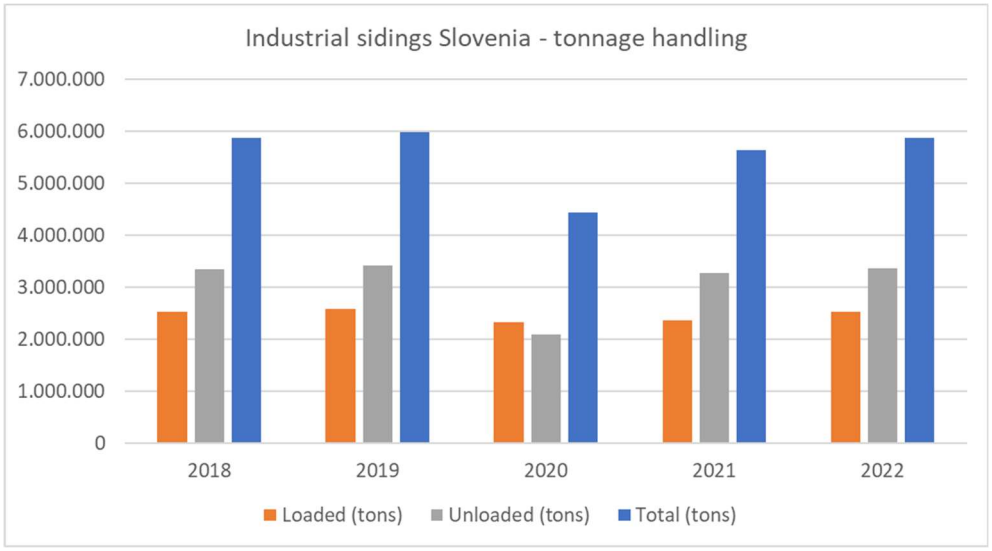

Figure 8: Industrial sidings in Slovenia - tonnage handling
Source: SŽ-Tovorni promet

Over 140.000 wagons every year is loaded/unloaded at industrial sidings in Slovenia, 55 % of them is unloaded.

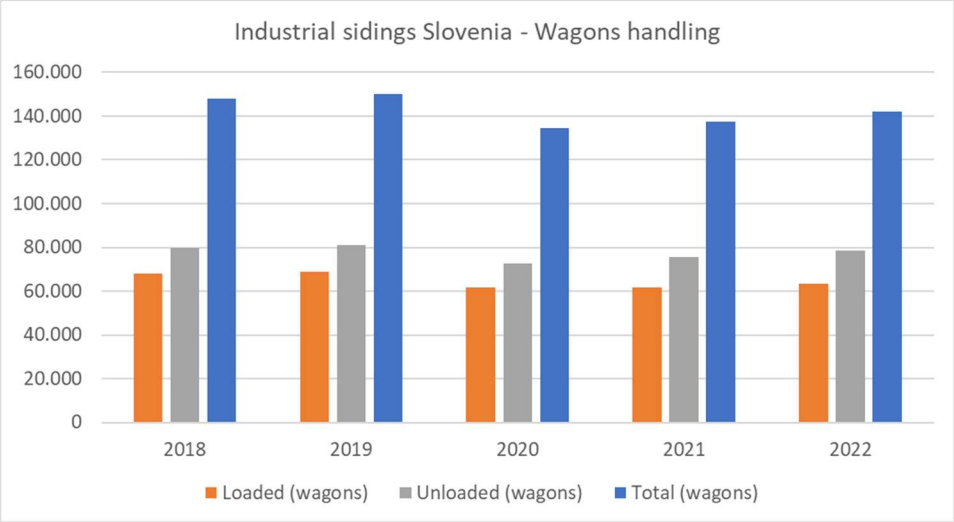

Figure 9: Industrial sidings in Slovenia - wagons handling
Source: SŽ-Tovorni promet

Figure 10: Shunting operations with 4-axle diesel locomotive and "Eas" freight wagons at iron factory
Source: Acroni Jesenice

2.2. Rolling stock at industrial sidings

The rolling stock at industrial sidings in Slovenia, as in other countries, can vary depending on the specific needs and activities of the industries served. Rolling stock refers to the vehicles that move on a railway track, and it includes various types of locomotives and railcars. Industrial sidings primarily handle freight traffic, and freight trains are commonly seen at these locations. These trains may include boxcars, flatcars, tank cars, and other specialized freight cars depending on the nature of the cargo being transported. Depending on the industries present, industrial sidings may see specialized railcars designed for specific types of goods. For example, industries involved in bulk commodities like minerals, grain, or chemicals may use hopper cars or tank cars. Industrial sidings often require shunting operations to move railcars within the industrial area or connect them to the main rail network. Shunting locomotives, also known as switchers, are used for this purpose. Some industrial sidings may be involved in intermodal operations, where goods are transferred between trains and other modes of transportation, such as trucks or ships. This could involve the use of flatcars for container transport. In some cases, industries or businesses with their own rail sidings may have their dedicated fleet of railcars, marked with their company logo. These private railcars are often used for transporting goods specific to that industry. Industries with facilities for the transportation of vehicles or other rollable cargo may use Ro-Ro trains, which allow for the easy loading and unloading of wheeled cargo. The specific types of rolling stock at industrial sidings in Slovenia would depend on the nature of industries in the region, the types of goods being transported, and the scale of industrial activities.

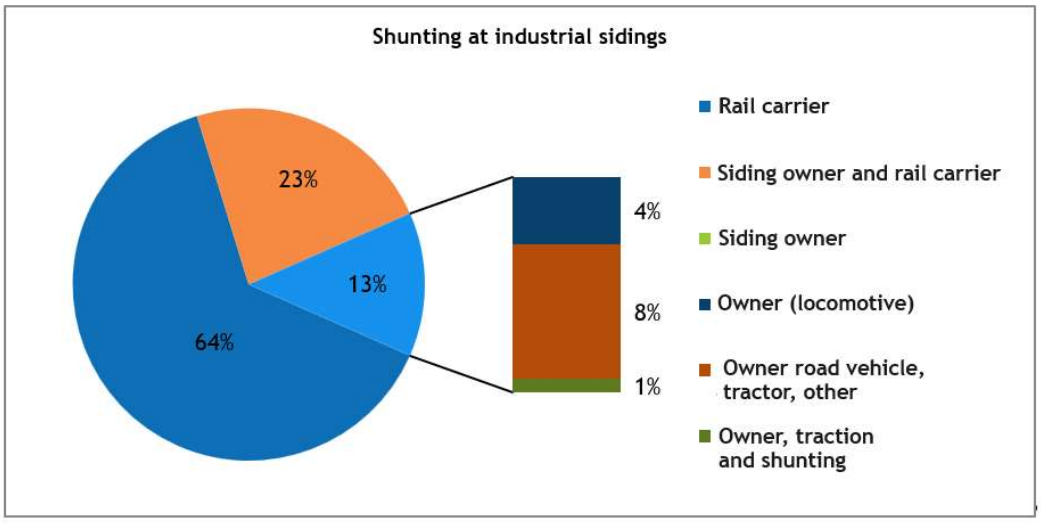

Figure 11: Shunting operations at industrial sidings
Source: Prometni institut Ljubljana

Its own industrial shunting locomotives has the biggest industry or logistics companies in Slovenia, some of them are:

- Port of Koper
- steel/iron factories at Jesenice, Celje and Ravne
- paper industry at Jarše and Medvode
- chemical industry at Hrastnik
- the cements industry at Anhovo

Figure 12: New shunting 3 and 4 axle diesel locomotives at Port of Koper
Source: Port of Koper

3. Slovakia

3.1. Analysis of traffic on sidings in Slovakia

A siding is a railway track that serves the specific needs of an operator or other business entity and branches off from a national or regional railway track or another siding. It usually connects a railway station to an industrial site and also includes tracks within the site of the industrial site. The length of a siding can vary from a few tens of metres to several hundred kilometres, especially for large industrial sites. Like any other railway track, a siding requires a track operator and one or more traffic operators on the track.

In the past, the owner of the siding usually managed both the siding and the traffic on it. However, due to increasing demands on these activities, many sidings have gradually been outsourced (allocated), where the owner entrusts the operation of the siding to a specialised company.

The number of permits issued by the Transport Office, which has been decreasing year by year in recent years, is evidence of the decline in general interest in the operation of sidings. According to the current list of permits issued by the transport authority, Slovakia has about 350 administrative sidings. From this number it is difficult to determine how many sidings are operated by private operators.

1456	FORTISCHEM a. s.	46693874	31.12.2025	Nováky	Nováky
1457	Xylo Machinery SK s.r.o.	31733085	31.12.2025	Prešov	Šarišské Lúky
1458	SAM - SHIPBUILDING AND MACHINERY a. s.	36246093	31.12.2025	Bratislava	Komárno
1459	EKODATEX, s.r.o.	47093561	31.08.2027	Bardejov	Bardejov
1462	CHEMOSVIT FOLIE, s.r.o.	31719724	31.10.2027	Svit	Svit
1465	Duslo, a.s.	35826487	31.12.2030	Šaľa	Bratislava - predmestie
1467	TOMEGAS SK, s. r. o.	36410811	29.02.2028	Čadca	Spišské Vlachy
1469	Koľajové a dopravné stavby s.r.o. Košice	31721401	31.12.2028	Košice	Košice - Barca
1472	ACHP Levice a.s.	0005819	31.12.2028	Levice	Spišská Belá
1477	Východoslovenská distribučná, a.s.	36599361	31.07.2028	Košice	Košice
1479	Chemko, a. s. Slovakia	36210625	30.09.2028	Bratislava	Strážske
1480	Chemko, a. s. Slovakia	36210625	31.10.2028	Bratislava	Strážske [Max Aicher GmbH & Co. KG]
1481	Chemko, a. s. Slovakia	36210625	30.11.2028	Bratislava	Strážske [Slovenská oceliareň Maxa Aichera s.r.o.]
1482	Priemyselný park Štúrovo, a. s.	31410146	31.12.2028	Štúrovo	Štúrovo
1484	P R O B U G A S a. s.	47695421	28.02.2029	Bratislava	Čierna nad Tisou
1485	P R O B U G A S a. s.	47695421	28.02.2029	Bratislava	Haniska pri Košiciach
1486	P R O B U G A S a. s.	47695421	28.02.2029	Bratislava	Martin
1487	Agropodnik a. s. Trnava	31420494	30.04.2029	Trnava	Dunajská Streda
1488	Agropodnik a. s. Trnava	31420494	30.04.2029	Trnava	Lehnice
1489	Agropodnik a. s. Trnava	31420494	30.04.2029	Trnava	Dolný Štál
1490	PRP, s.r.o.	31619665	31.03.2029	Veľký Krtíš	Tomášovce
1492	DELTA Realtrade, s.r.o.	36290289	30.04.2029	Levice	Levice
1493	TAJBA, a.s.	36188981	31.07.2029	Čaňa	Michaľany
1499	TSR Slovakia, s.r.o.	47258811	30.04.2030	Bratislava	Bytča
1500	Rettenmeier Tatra Timber, s.r.o.	36387592	31.05.2030	Liptovský Hrádok	Liptovský Hrádok
1503	STEEL CONNECT s.r.o.	46907386	31.12.2023	Banská Bystrica	Trnava [Západoslovenská distribučná, a.s.]
1504	HORNONITRIANSKE BANE zamestnanecká, akciová spoločnosť (v skratke HBz., a.s.)	36002887	31.01.2024	Prievidza	Kúty
1505	DEPON ZH s.r.o.	44091303	31.03.2024	Ladomerská Vieska	Žiar nad Hronom
1506	Privéefina s. r. o.	36869074	31.05.2024	Bratislava	Sereď
1507	Privéefina s. r. o.	36869074	31.05.2024	Bratislava	Sereď
1508	FEOX s.r.o.	45468087	31.07.2024	Žilina	Nižná Slaná
1509	Mesto Spišské Podhradie	0329622	31.07.2024	Mariánske námestie 37	Spišské Podhradie
1510	TIDLY real estate s.r.o.	50245937	31.12.2024	Bratislava	Komárno
1511	BRENNTAG SLOVAKIA s.r.o.	31336884	31.10.2024	Pezinok	Slovenská Ľupča
1512	RT LOGISTIC, a.s.	43814662	31.10.2024	Leopoldov	Bánovce nad Ondavou
1513	Poľnonákup Sečovce, s. r. o.	50070665	31.12.2024	Sečovce	Sečovce
1514	MJM agro Slovakia, s.r.o.	50902393	31.12.2024	Levice	Levice
1515	JDMR s.r.o.	43839649	31.12.2024	Veľké Kostoľany	Veľké Kostoľany
1516	Continental Tires Slovakia, s.r.o.	36709557	30.09.2028	Púchov	Púchov
1518	MFC, s.r.o.	31441319	31.03.2025	Sereď	Kráľova Lehota

Table 1: Short list of holders of permits for operating railway sidings in the Slovak Republic
Source: UNIZA

3.2. Conditions for operating railway sidings in Slovakia

The operation of a railway track (siding) is only permitted to those who hold a valid licence from the regulatory authority for the operation of the railway track and who also:

a) have a signed agreement for the operation of the track with the owner of the track, if they are not the owner of the track themselves,

b) to employ persons for the operation of the track who are professionally qualified and physically and mentally fit for the job.

The professional qualification required for the operation of a railway pursuant to Section 29(3) of the Railway Act no. 513/2010 is understood to be a second or tertiary university education in transport, construction, mechanical or electrical engineering and at least three years' practical experience in a managerial position in the field of railway operations. Alternatively, a level of education which corresponds to completed secondary education in transport, construction, mechanical or electrical engineering and at least five years' practical experience in a managerial position in the field of railway operations. This qualification shall be evidenced by documents certifying the education obtained and by documents certifying the practical experience acquired. If the practical experience cannot be documented because the documents have been lost or are not available, or if there is no person with whom the practical experience was carried out, a sworn statement may be accepted as proof of the experience.

In the case of an application to operate a private siding, the applicant is required to submit a description of the private siding, including the definition of the start and end of the private siding, the total length of the private siding, the length and designation of the individual tracks, the kilometric position and designation of switches, the track gauge, the maximum gradient, the minimum radius of curvature, the maximum axle load, electrification, signalling, crossings with roads and an up-to-date location plan of the private siding.

In the case of an application for a permit to operate a railway line, financial capability means the ability of the applicant to financially secure the commencement and operation of the railway infrastructure and to fulfil the obligations under the Railway Act for at least one year. The licence to operate a railway line is valid for the specified period, but not less than five years, with the possibility of further extension.

3.3. Performance analysis on railway sidings in Slovakia

The position of rail freight transport on the transport market is currently also significantly influenced by the number of railway sidings on which transport and transport services are actively carried out. The tendency of sidings, which participate in the transport performance in railway freight transport, has been decreasing over the last 25 years. This fact was mainly influenced by the political situation (regime change) and the transition from a planned economy to a market economy. Recently, the decline in the activity of railway sidings was also influenced by the COVID-19 pandemic.

Table 2 shows the statistics of the volume of freight transport (transported tons) loaded and unloaded on railway sidings and container transhipment points for the period 2020 - 2022. The statistics include the amount of domestic transport as well as imports (Add) and exports (Submit).

The weight of the shipment (tons)							
		2020		2021		2022	
		National	Import/Export	National	Import/Export	National	Import/Export
Submit	The railway sidings	2,814,803	6,241,714	2,610416	5,987,233	2,749,105	7,115,175
	Container transhipment points	13,396	20,3790	13,197	16,9639	9,797	103,712
Add	The railway sidings	3,481,689	11,799,556	3,067,795	10,061,222	3,349,815	13,033,588
	Container transhipment points	26,135	15,9213	25,841	183,111	20,881	143,408

Table 2: The weight of the shipment (tons) in years 2020-2022
Source: UNIZA

Figure 13 shows the statistics of the volume of freight transport (transported tons) loaded and unloaded on railway sidings for the period 2020 - 2022.

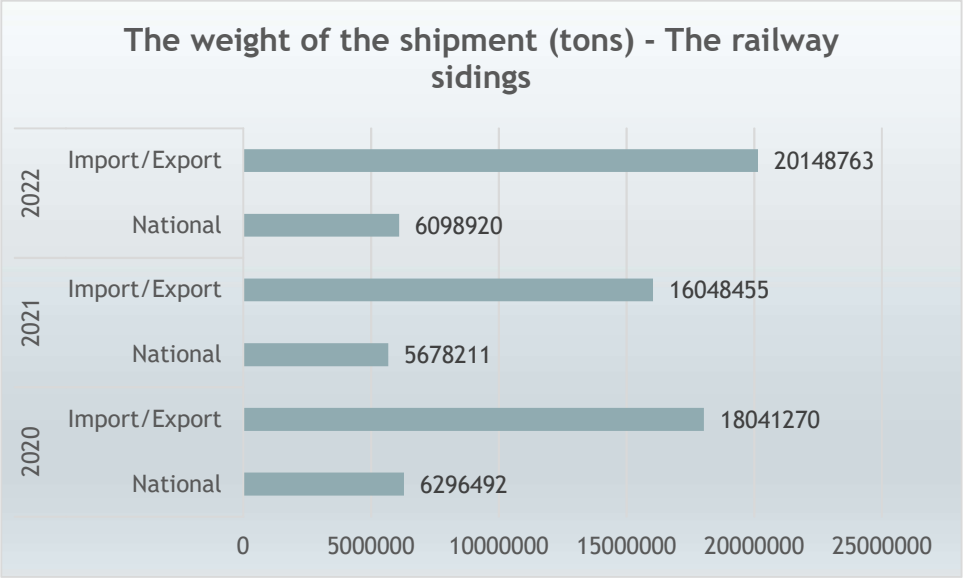

Figure 13: The weight of the shipment (tons) in years 2020-2022
Source: UNIZA

Figure 13 identifies the total number of tons loaded and unloaded on railway sidings for the years 2020 – 2022. In the import/export and national in 2022, an increase in transport performance (loaded and unloaded tons) on railway sidings was recorded, compared to the previous year.

Table 3 shows the statistics of the volume of freight transport (number of loaded wagons (number of unloaded wagons) on railway sidings. The statistics include numbers within domestic transport, but also import (Add) and export (Submit) from/to railway sidings in the Slovak Republic.

Number of transported wagons							
		2020		2021		2022	
		National	Import/Export	National	Import/Export	National	Import/Export
Submit	The railway sidings	89,568	234,306	86,059	220,798	88,638	269,658
	Container transhipment points	1,885	7,572	1,223	7,046	0,736	5,647
Add	The railway sidings	98,638	288,890	92,780	259,013	97,137	314,921
	Container transhipment points	1,538	6,080	0,949	6,508	0,735	5,505

Table 3: Number of transported wagons in years 2020-2022
Source: UNIZA

Figure 14 identifies the statistics of loaded and unloaded wagons overall on railway sidings in the Slovak Republic for the years 2020 - 2022. In the import/export and national in 2022, an increase of loaded and unloaded wagons on railway sidings was recorded, compared to the previous year.

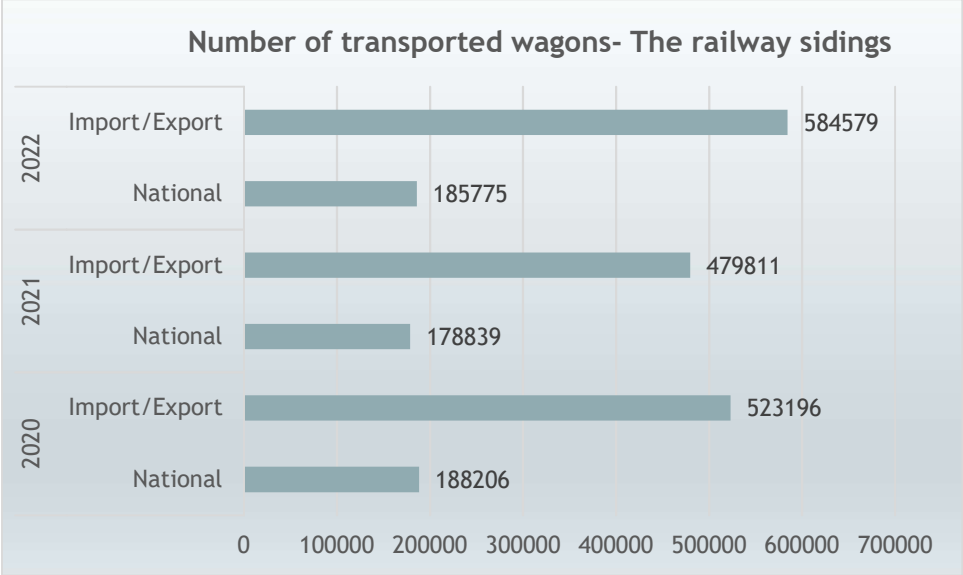

Figure 14: Number of transported wagons in total for sidings
Source: UNIZA

Figure 15 identifies the development of selected indicators on railway sidings (international) for the year 2022. November was the strongest month in 2022 in all monitored indicators.

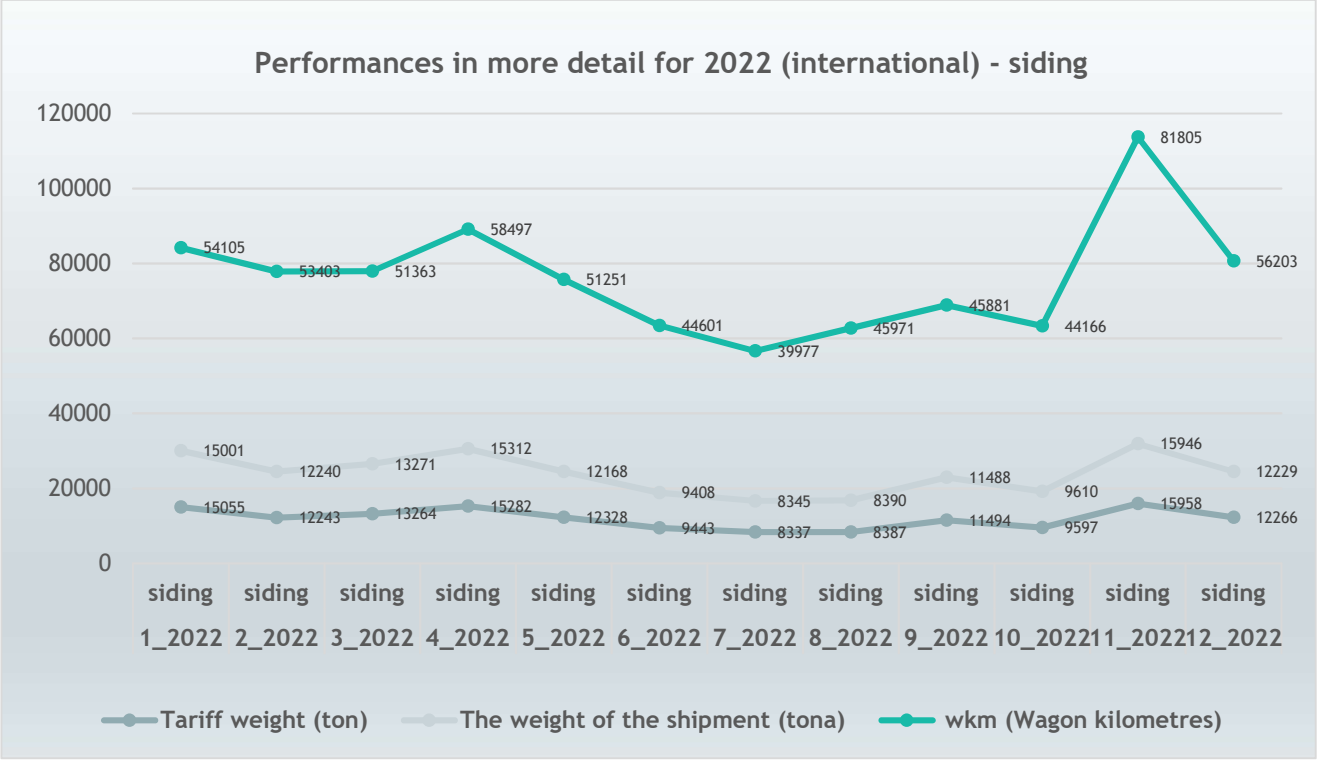

Figure 15: Performance of sidings for the year 2022 for selected indicators (international)
Source: UNIZA

Figure 16 identifies the development of selected indicators on railway sidings (domestic) for the year 2022. December was the strongest month in 2022 in all monitored indicators.

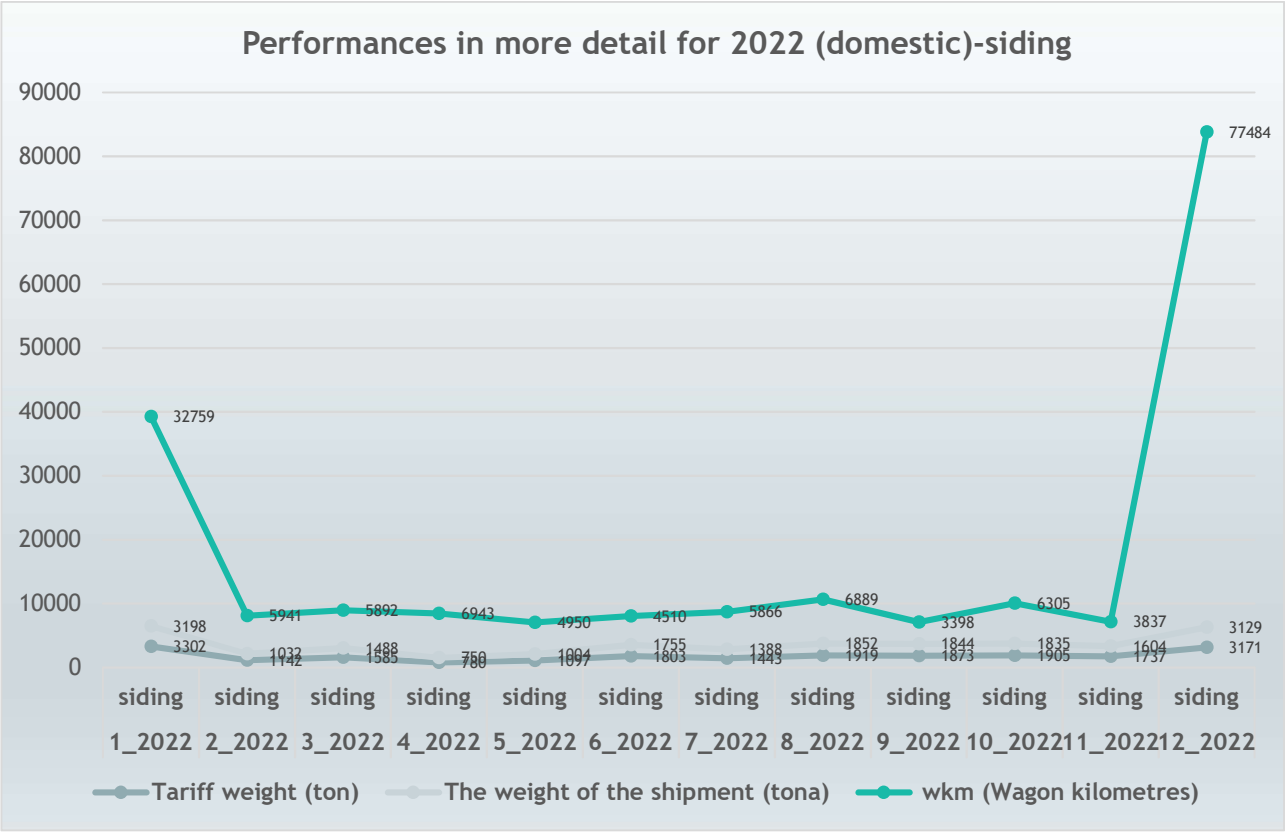

Figure 16: Performances of sidings for the year 2022 for selected indicators (domestic)
Source: UNIZA

The position of rail freight transport in the transport market is currently significantly influenced by the number of active railway sidings where transport and freight operations are actively carried out. The trend in the contribution of sidings to rail freight transport performance has been declining over the last 30 years. This decline has been mainly influenced by political and economic circumstances (regime change) and the transition from a planned to a market economy.

3.4. Issues in Railway Siding Operations in Slovakia

Another negative aspect of siding operation is the transport ordering system, which is very complex and not customer-friendly. It involves a large number of tasks before a consignment is accepted for transport, such as confirmation of the order form, arrival of empty wagons, loading of wagons with mechanised equipment, often accompanied by numerous administrative tasks that complicate the technology on the siding. Another relatively important negative aspect of siding operations is the delivery times for rail transport.

Shortcomings in siding operations also concern the updating of data necessary for communication, the effective use of information and basic information on siding conditions. Other problems in the operation of sidings in Slovakia include stagnating state support, inefficient pricing (insufficient competitiveness with road transport), legislative/economic incentives to favour rail transport, the process of ordering transport, and others. It would also be appropriate for the state to create appropriate instruments to support private sidings through state transport policy, such as better access for infrastructure managers, reduction of obstacles in the form of fees and rents.

Efficient use of information is essential for effective management of sidings in Slovakia. The quality of decision-making depends primarily on the quality of information and the ability to process it. Influences from the external business environment condition the application of innovative information technologies in

the decision-making process of companies, which brings optimal use of company resources. With regard to internal business processes, the use of information and telecommunication technologies is aimed at improving the dissemination and exchange of information within the company.

From the analysis of siding operations, it is evident that in Slovakia, the performances realized on sidings are decreasing, and the number of sidings where transport performances are carried out is also decreasing. The main reasons are currently the financial demands for the construction of new sidings, as well as high fees charged by siding operators to entities that would like to transport on the siding, i.e., users of sidings. Despite this fact, sidings in large enterprises in Slovakia continue to operate, where transport performances are not declining, and the company considers railway transport via siding to be dominant and economically advantageous (e.g., U.S. Steel Košice siding).

3.5. Transport potential volume of the cargo

This chapter presents the results of the transport model of the Žilina self-governing region from the perspective of the accessibility of urban centres to the main and regional railway networks for freight transport. In particular, it focuses on the isochrone accessibility of railway sidings, which is an important prerequisite for the use of rail transport for freight transport.

Figure 17 shows the accessibility of railway stations in the Žilina region to which railway sidings are connected. Regarding the accessibility of settlements to elements of the freight railway infrastructure, we can observe relatively good accessibility for carriers from the time perspective (most settlements are accessible within 30 minutes). Another advantage of the transport points in the railway infrastructure of the Žilina region is the fact that the stations, to which the railway sidings are connected, have loading gauge profiles suitable for small carriers (clients), which creates conditions for the development of railway freight transport in the region. The need for future modernisation of railway sidings may be a challenge.

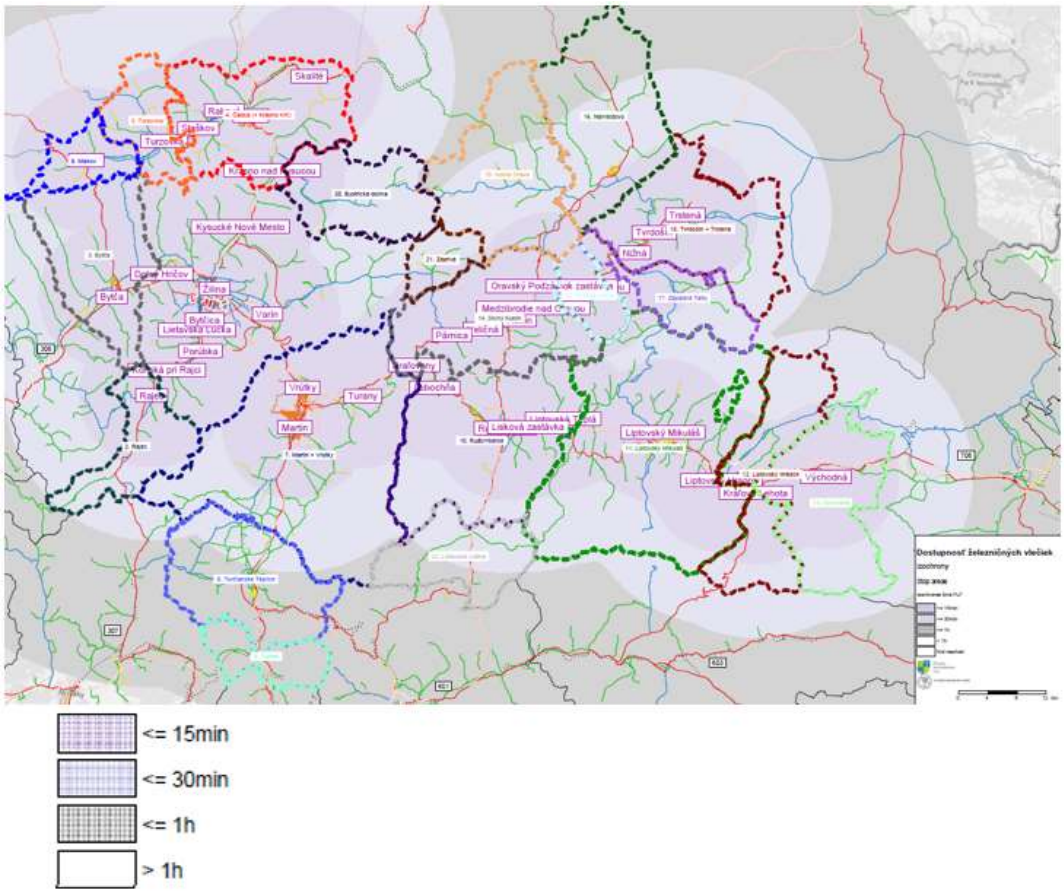

Figure 17: Isochrone accessibility of railway stations with sidings in the Žilina region
Source: UNIZA

3.6. Public railway infrastructure in selected region (Žilina region)

Railway transport in the Žilina region occupies an important position in terms of its location and the services it provides to the region's micro-regions. The backbone of the railway network in the Žilina region is the section of railway connecting the cities of Košice and Bratislava (lines 105 and 106 A according to TTP), which is part of the 5th Pan-European Corridor (also part of corridor RFC 9, and in the section Predmier - Žilina - Čadca (Mosty u Jablunkova, Czech Republic) it is part of corridor RFC 5). Equally important are the railway lines Žilina - Čadca (106 A) and (Zvolen) Horná Štubňa - Vrútky (118 A). Other railway lines: Makov - Čadca (114C), (Zwardoň)/Skalité - Čadca (114B), Žilina - Rajec (114A) and Trstená - Kraľovany (113) are regional lines. With regard to the development of railway transport and infrastructure in the Žilina region, it is essential to continue the modernisation of the railway lines because of their technical wear and tear and parameters that do not meet the requirements of a modern, fast infrastructure that enables the operation of environmentally friendly transport.

Connections and arrangement of the railway network in the inter-state and national context of the region

All railway lines on the territory of the Žilina region are managed by the infrastructure manager - Slovak Railways (Železnice Slovenskej republiky or ŽSR). The region also has narrow-gauge railway lines: Kysucká úvraťová železnica Vychylovka and Oravská lesná železnica in the Orava Forest, but their operation is exclusively for tourist purposes and does not contribute to the transport services of the Žilina region.

The railway lines (Košice) Važec - Kraľovany (105), Kraľovany - Predmier (Puchov/Horní Lideč) (106 A) and Žilina - Čadca/Mosty u Jablunkova (106 D) with their routes in the Žilina region play an important role in international passenger and freight railway transport. Lines 105 and 106A are also part of the main northern railway corridor between Košice and Bratislava on the territory of the Slovak Republic.

The main railway line in the Slovak Republic is also the (Zvolen) Horná Štubňa - Vrútky line (118A), whose importance lies primarily in the operation of domestic passenger rail transport, although it has the potential for international transport on the Zvolen (Banská Bystrica) - Žilina (Čadca/Horní Lideč) - Prague international line. The 118 A railway line is important for both domestic and international freight transport.

The line Čadca - Skalité/Zwardoň (114B) belongs to the main railway lines. This line is mainly used for domestic passenger transport to ensure regional rail transport in the Žilina region. In terms of passenger transport, it is essential for regional connections between the Žilina region and the Silesian voivodeship in Poland.

Other railway lines Čadca - Makov (114C), Žilina - Rajec (114A) and Trstená - Kraľovany (113) are classified by the ŽSR as secondary lines. As far as passenger transport is concerned, they primarily serve the transport needs of the Žilina region within the framework of regional railway transport. Freight transport is also carried out on these lines.

Table 4 characterises the railway lines in terms of their position and importance in international and domestic transport.

Railway track		Significance for Slovakia		International Significance				
Connection	No.	Main	Regional	Passenger transport	RFC 5	RFC 9	PAN V.	PAN VI.
Važec - Žilina	105, 106A	X		X		X	X	
Žilina - Predmier	106A	X		X	X	X	X	
Horná Štubňa - Vrútky	118 A	X						
Trstená - Kraľovany	113		X					
Žilina - Rajec	114A		X					
Žilina - Čadca (Mosty u Jablunkova)	106D		X	X	X			X
Čadca - Skalité (Zwardoň)	114B		X	X				X
Čadca - Makov	114C		X					

Table 4: Railway lines of Zilina region and their affiliation to international corridors
Source: UNIZA

Localization, functional division, and categorization of railway lines

Railway lines in the Žilina Self-Governing Region (ŽSK) play a significant role in both international and domestic railway transportation. In terms of developing the railway network in the ŽSK territory, investment measures are essential to achieve the set goals of integrating them into international railway corridors and fulfilling the function of modern, safe, and fast railway infrastructure. The current technical condition of both main and secondary railway lines is unsatisfactory, not meeting the qualitative requirements imposed on it.

The categorization of railway lines under the conditions of ŽSR is based on the charging of railway infrastructure, carried out according to Measure No. 2/2018 of the Transport Authority dated September 7, 2018, as amended. For the purposes of railway infrastructure charging, the tracks are classified into the following categories:

Main Lines:

1. Category – Main lines of significant economic and societal importance, generally double-track and single-track electrified railway lines of supra-regional significance, connecting railway lines in major hubs, and their connections to PPS and corridors.

2. Category – Other main lines with express traffic of supra-regional significance not included in category 1.

Secondary Lines:

3. Category – Secondary lines of regional significance.

4. Category – Secondary lines with simplified traffic control.

5. Category – Narrow-gauge lines for passenger transport.

The current classification of railway lines in the ŽSK territory in terms of their categorization is presented in Table 5.

Session	Track number	Category	Number of stations	Number of stops
Važec - Žilina	105, 106A	1	15	14
Žilina - Predmier	106A	1	4	2
Horná Štubňa - Vrútky	118 A	2	6	8 (10)
Trstená - Kraľovany	113	3	10	11
Žilina - Rajec	114A	3	4	8
Žilina - Čadca (Mosty u Jablunkova)	106D	1	4	7
Čadca - Skalité (Zwardoň)	114B	1	3	7
Čadca - Makov	114C	4	4	8

Table 5: Categorization of railway lines in the territory of Žilna region
Source: UNIZA

The reconstruction of the main railway corridor Bratislava - Košice - Čierna nad Tisou is currently underway, with the aim of achieving a speed of 160 km/h. As far as construction in the Žilina region is concerned, the Púchov - Žilina section is expected to be completed in the near future. Subsequently, a gradual reconstruction towards Košice is planned, which, in an optimistic scenario, should be completed within the next decade. The aforementioned reconstruction concerns the 106A and 105 railway lines.

With regard to the further development of rail transport, it is essential to consider the continuation of the reconstruction works on the Žilina - Čadca/Mosty u Jablunkova railway line with a speed of 140 km/h. This railway line plays a key role in the development of rail transport. This railway line has a crucial position in the conditions of the Railway Company of the Slovak Republic (ŽSR) and is part of the freight railway corridors. From the perspective of serving the region, it could form the backbone of the Integrated Transport System (IDS) in Zilina region, building on the transport services of the Kysuce region.

The Čadca - Skalité/Zwardoň railway line serves as an international railway corridor, but its operational characteristics are significantly below the requirements for international corridors. Reconstruction of the line is necessary not only to provide faster and higher quality passenger rail transport, but also to increase its use for freight transport.

Regional (secondary) railway lines on the territory of Zilina region, such as Čadca - Makov (114C), Žilina - Rajec (114A) and Trstená - Kraľovany (113), have their potential primarily in passenger transport. However, reconstruction of these lines is necessary to meet the parameters of sustainable mobility.

3.7. Industrial sidings

At present, the provision of private sidings is in sharp decline. Every year, several of these railway operating licences are deleted from the list of valid licences. The reason for this is the unfavourable conditions for siding operators. As many companies that owned sidings are in liquidation or have already ceased to exist, the construction of new sidings is decreasing. The operation of a siding is a financial burden for the siding operators, mainly to meet all the conditions resulting from the current legislation. The following chapter provides an overview of the number of sidings and loading points in the Žilina region.

Railway lines in the Žilina region are characterised by mixed operation of freight and passenger transport. When modelling the accessibility of the railway infrastructure, it is necessary to consider the possibility of access to the railway infrastructure for carriers (customers). The possibility for carriers to access the railway infrastructure is either through the use of railway sidings connected to the national railway network (in this case, sidings also include intermodal transport terminals) or through the use of general cargo and unloading tracks (GCU) in railway stations.

Railway Line		Station	No. Of Rail sidings	Public loading track
Connection	Line number			
Važec - Žilina	105	Kráľová Lehota	3	yes
		Liptovský Hrádok	1	yes
		Liptovský Mikuláš	2	yes
		Liptovská Teplá	2	yes
		Lisková	2	
		Ružomberok	5	yes
		Ľubochňa	1	yes
		Kraľovany	0	yes
	106A	Turany	1	yes
		Vrútky nakl. St.	4	
		Vrútky	3	yes
		Varín	2	yes
		Žilina Teplička nad Váhom	1	
		Žilina	3	yes
Žilina - Predmier	106A	Žilina zr.st.	1	
		Dolný Hričov	3	yes
		Bytča	2	yes
Žilina - Čadca – Skalité	106D	Kysucké Nové Mesto	3	yes
		Krásno nad Kysucou	1	yes
		Čadca	0	yes
	114B	Skalité	0	yes

Table 6: Overview of the number of rail sidings and loading points in the Žilina region – main railway lines
Source: UNIZA

The international freight corridors RFC 5 and RFC 9 pass through the Žilinaregion . Sections of railway lines (according to TTP) 105, 106A, 106D and 114B are included in these international corridors. The respective sections are also part of the main railway lines of the ŽSK. Specifically, in the Žilina region, these sections include the lines: (Košice) Važec - Žilina (105, 106A), Žilina - Predmier (Bratislava/Horní Lideč) (106A), Žilina - Čadca (Mosty u Jablunkova/Zwardoň) (106D, 114B).

Railway Line		Station	No. Of Rail sidings	Public loading track
Connection	Line number			
Trstená - Kraľovany	113A	Trstená	1	yes
		Tvrdošín	2	yes
		Podbiel	1	yes
		Dlhá nad Oravou		yes
		Oravský Podzámok	2	yes
		Medzibrodie n.O.	1	
		Dolný Kubín		yes
		Veličné	Loading points	
		Párnica	1	yes
		Kraľovany	0	yes
Horná Štubňa-Vrútky	118A	Horná Štubňa	0	yes
		Diviaky	0	yes
		Príbovce-Rakovo	0	yes
		Martin	0	yes
		Vrútky	3	yes
Žilina - Rajec	114A	Žilina	3	yes
		Bytčica	1	
		Lietavská Lúčka	1	yes
		Porúbka	Loading points	
		Konská pri Rajci	Loading points	
		Rajec	1	yes
Čadca - Makov	114C	Čadca	0	yes
		Raková	Loading points	
		Staškov	Loading points	
		Turzovka	0	yes
		Makov	0	yes

Table 7: Overview of the number of rail sidings and loading points in the Žilina region – regional railway lines
Source: UNIZA

Other railway lines serve as connecting lines to freight rail corridors. From the point of view of passenger transport, they function as regional railway lines, with the exception of line 118A Horná Štubňa - Vrútky, which is included in the first category of ŽSR railway lines. These include the lines Trstená - Kraľovany (113), Žilina - Rajec (114A) and Čadca - Makov (114C).

Railway sidings Lietavská Lúčka

The owner of the private siding is Cementáreň Lietavská Lúčka a.s. At the railway station, it joins track no. 1, point no. C1. The boundary between the track and the siding is defined by the final connection of switch no. C1 at km 8.408. The operation of the siding is ensured on the basis of the Permission for the Operation of the Siding no. 0174/1997/P issued by the State Railway Office on 12 November 1997 in accordance with the Railway Act for an indefinite period.

Railway sidings description:

- slopes conditions: maximum slope 10,33‰,
- maximum speed: 20 km/h,
- minimum curve radius R=125m,
- load per axis is 20t.

Figure 18: Private siding Cementáreň
Source: UNIZA

Railway sidings of KLF Energetika

The company KLF - Energetika, a. s. (hereinafter referred to as KLF, a. s.) was established by the deed of foundation on 19 June 2001. KLF, a. s. is an important regional supplier of all types of energy and a provider of various services, especially in the Dolné Kysuce region.

On the KLF siding, there are restrictive slope ratios on tracks no. I. and II. and IV. 2.5 ‰, the maximum permitted speed is 10 km/h, the smallest arc radius is R = 150 m and the permitted weight per axle is 20 tons. Siding is divided into two plants - Upper (old) Z1 and Lower (new) Z2 plant.

Railway siding Mondi SCP, a.s.

The company Mondi SCP, a.s. Ružomberok (hereinafter referred to as Mondi SCP), is among the largest manufacturing facilities within the Mondi Group and is also the largest integrated paper and pulp production plant in Slovakia. The plant has a production capacity of 100,000 tons of dried pulp designated for sale, 560,000 tons of uncoated paper, and 66,000 tons of packaging paper. After the construction of a new recovery boiler, the company achieved energy self-sufficiency of 100%, where more than 94% of production comes from renewable sources. Certified wood from FSC™1a and PEFC™2 schemes is used in the production process.

The permit to operate the track for the Mondi SCP siding is issued based on § 36 of Act No. 164/1996 Coll. of the National Council of the Slovak Republic on Railways and on the amendment of Act No. 455/1991 Coll. on Trade Licensing by the State Railway Authority, under registration number 0004/1997/p. With this permit, the company is authorized to operate the track. The license for providing railway transport services was issued to the Mondi SCP siding by the Track Office for sidings with an indefinite validity period from October 5, 2017, for freight transport under decision identification number 13358/2017/OPLI-015. This license is required to commence providing transport services. A company conducting freight railway transport in private ownership does not need a license for this activity unless it transports dangerous goods or live animals.

The operator and owner of the siding is Mondi SCP, while the provider of transport services on the siding is Železničná spoločnosť Cargo Slovakia, a.s. (hereinafter referred to as ZSSK Cargo), with whom the siding operator has a contract. Maintenance and repairs of telecommunication, signaling, and security devices are handled by Železnice Slovenskej republiky (hereinafter referred to as ŽSR). The branching railway station (hereinafter referred to as ŽST) is station Lisková, and the chief's office is located at station Ružomberok. The operation on the siding is continuous, 24-hour.

Figure 18: Enterance gate tot he company
Source: UNIZA

3.8. Railway transport

On railway sidings, the same technical foundation is used as on the ŽSR network. Stable facilities such as tracks, ramps, warehouses, storage yards, and others are employed. Additionally, mobile assets, such as a fleet of wagons structured according to the needs of the siding operator, or intermodal transport vehicles, are utilized. Ownership of transport assets is advantageous for the siding operator, primarily because it provides the necessary resources in the required structure and at the required times. From the perspective of transport operations on the railway siding, it is not always beneficial for the operator of the siding to own traction rolling stock. In such cases, siding operations (e.g., shunting) are handled by the equipment of the servicing carrier.

The freight yard of the siding comprises an area designated for the implementation of selected siding activities, equipped with the corresponding technical foundation, i.e., the internal infrastructure of the siding.

Mobile Technical Base of railway sidings

The structure of the mobile technical base consists of railway wagons, rail vehicles, track machines, mechanization equipment (according to the needs of the siding), transport means (e.g., pallets, containers, interchangeable superstructures), detachable parts of wagons, and more.

The mobile technical base depends on the size and focus of the siding, or its transport performance. The structure of the vehicle fleet, the scope, and performance of mechanization equipment on the siding depend on the siding operator, who must consider the operational need for the mobile technical base and the economic feasibility of its operation. The structure and specifications of individual elements of the mobile technical base depend on the performance carried out on the siding, the financial capabilities of the siding operator, and the type of commodity loaded/unloaded on the siding. The type of rail vehicle is dependent on the load quantity and the gradient ratios of the siding. In the case of small performances, siding operators secure railway wagons or rail vehicles for shunting on the siding through leasing. In other cases, siding operators may purchase rail vehicles and railway wagons for their operations.

Railway wagons

On the figure 19, a railway carriage of the Eas series with front-opening walls is depicted. The carriage is designed for the transport of bulk, free-flowing cargo, and piece goods that do not require a covered space and protection from weather conditions during transportation. Due to its versatility, this type of carriage is frequently used for loading substrates on railway sidings.

Figure 19: Railway wagon type Eas
Source: UNIZA

A special construction tank wagon, pressure unloading, of the Uacs series (figure 20) is designed for the transport of freely flowing powdered materials that need to be protected against adverse weather conditions.

Figure 20: Railway wagon type Uacs
Source: UNIZA

This type of wagon is almost exclusively owned by carriers or sidetrack operators. In Slovakia, these wagons are used, for example, on the railway siding of Považská cementáreň for loading and transporting cement.

Locomotives

The selected shunting locomotives listed below are often used for shunting operations within connection and siding services.

Shunting locomotives of the 740 series (figure 21), formerly designated as T448.0, were developed for servicing railway sidings and have become a widely used series of shunting locomotives. The 740.3 series resulted from their re-motorization (this type is not represented in Slovakia).

Figure 21: Locomotive 740.307
Source: UNIZA

Figure 22: Locomotive 744.708
Source: UNIZA

On Figure 22, an older type of shunting locomotive, the 744.7 series, is presented. They are produced under license by ŽOS Zvolen, and in Slovakia, they are used on sidings at Slovnaft Bratislava and Duslo Šaľa

4. Hungary

4.1. General description of the sidings used in Hungary

The Hungarian legislation distinguishes between the concepts of siding and private, own-use railway network as defined by Act CLXXXIII of 2005 on railway transport:

“Siding" means a track or railway line not owned by the state, located in the territory of an agricultural or industrial plant or establishment, industrial park, whose main function is to provide the necessary railway connection for the transport of raw materials, semi-finished and finished products used for the business activity.

“Private, own -use railway network”' means railway infrastructure not owned by the state, which is used exclusively by owner of the railway network for its own freight transport operations and the infrastructure which serves or may serve more than one end-user and is not classified as a railway siding.

These two definitions are very similar, a key element is that none of them is owned by the state; often no distinction is made in the railway infrastructure registers. For the sake of convenience, the term "siding" will be used in the rest of the study to refer to the specific, own -use railway network.

The siding can branch off from a station or open track. The siding is served by a connecting track or, in the case of multiple sidings, a towing track (Figure 23).

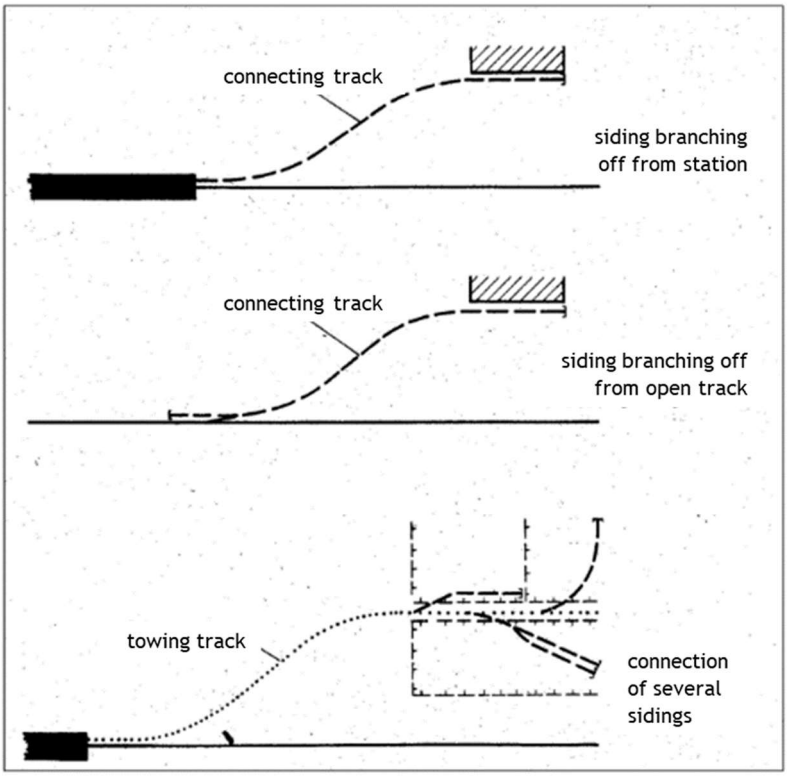

Figure 23: Siding
Source: Railway lines written by Dr. László Kazinczy

Sidings are an integral part of rail freight transport. There is always some complex operation on the tracks, whether loading or unloading, filling and emptying the wagons, and the associated weighing and shunting activities. Traffic on such "invisible" tracks can replace annually up to 100,000 lorries on the roads, reducing greenhouse gas emissions, road safety risks and contributing to a more efficient use of railway capacity.

Door-to-door service is best provided by sidings, because freight wagons can be loaded on the premises. Until the rapid development of road transport in the 1960s and 1970s, many factories had their own sidings, on which the majority of their goods movements took place.

The loading and unloading of goods at stations and siding loading has been underused in many places due to the recent decline in traffic. The remaining ones are, with few exceptions, in a poor state of repair and are largely speed restricted. Only a fraction of the sidings is still in use and their maintenance is costly and bureaucratic, making them a rational solution only for large goods generators.

The growth of rail traffic is conditional on an adequate level of rail infrastructure. The decline in rail traffic in recent decades and the imposition of direct market principles have led to a significant reduction in the quantity and quality of loading and siding infrastructure; in 2022, 885 loading points were available to the public, compared with well over 900 in 2010 (the change includes not only closures but also the reopening of new areas by the Hungarian State Railways (MÁV)), and restrictions have been introduced due to lack of maintenance.

In Hungary, there are currently more than a thousand remaining sidings, many of which have long since ceased to carry freight by rail. (Source: Data relating to sidings provided by MÁV and Győr-Sopron-Ebenfurti Vasút (GYSEV) in 2020-2021).

Technical parameters of the sidings in Hungary are illustrated in the diagrams below:

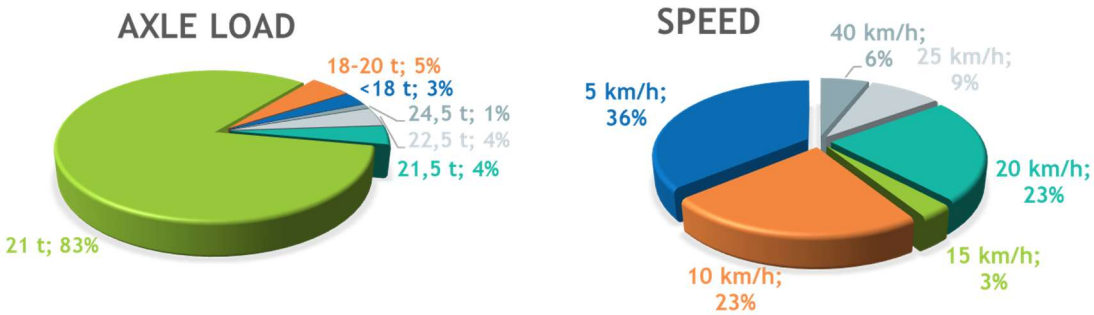

Figure 24: Technical parameters of the sidings in Hungary
Source: MÁV Zrt.

The maintenance of the remaining and operating sidings is expensive: building infrastructure involves high costs, there is a shortage of suitable qualified workforce to maintain the track. In order to get a licence to operate the siding, the owner of the siding must fulfil a number of requirements, that are difficult and costly to meet such as the employment of qualified rail professionals, the provision of infrastructure, the organisation of services, etc. The ageing of qualified rail professionals poses a problem of replacement for all rail freight undertakings, and this is no different for siding operators. The slow amortisation of the track and the need to adapt to changes in rail freight transport requirements (e.g. 225 kN axle load) mean that there is significant development need for sidings.

On a larger scale, Hungary has only one-tenth the number of sidings per hundred kilometres of railway line as Austria. Of the 2,000 railway stations in Hungary, 935 are open to freight traffic - even if all of them had a siding connection, Hungary would still have only half as many sidings as Austria.

In addition to sidings, used by the industry, there are also military sidings, which are necessary because they enable the transport by rail of defence equipment and munitions produced or stored by factories and industrial plants. The benefits of military siding include increased transport capacity, environmentally friendly operation, safer and cheaper transport, and reduced road-to-road traffic. However, military sidings also face a number of challenges, such as unresolved legal relationship, high investment costs, difficulties in maintenance and licensing, and the utilisation of the rail network.

In all cases, sidings are connected to the national railway line operated by either MÁV Zrt. or GYSEV Zrt., where not directly, via so-called connecting or towing railway lines. Restrictions on these track sections have a significant impact on the economic, temporal (e.g. longer service times due to slow running) and physical (e.g. exclusion or restriction of certain vehicles due to axle loads) possibility of serving the sidings.

The traffic analysis in the National Rail Freight Concept showed that in 42 districts with already high traffic (50,000 tonnes/year), the expected growth exceeds 100%, so that rail freight transport needs to be developed. In addition to development, new loading facilities are needed in the 10 other locations where the potential traffic is high but where the demand cannot be met with a small expansion of the existing rail infrastructure.

Figure 25 shows the districts of counties where expected economic development and traffic growth will require improvements to siding. A district may have more than one siding factory/plant.

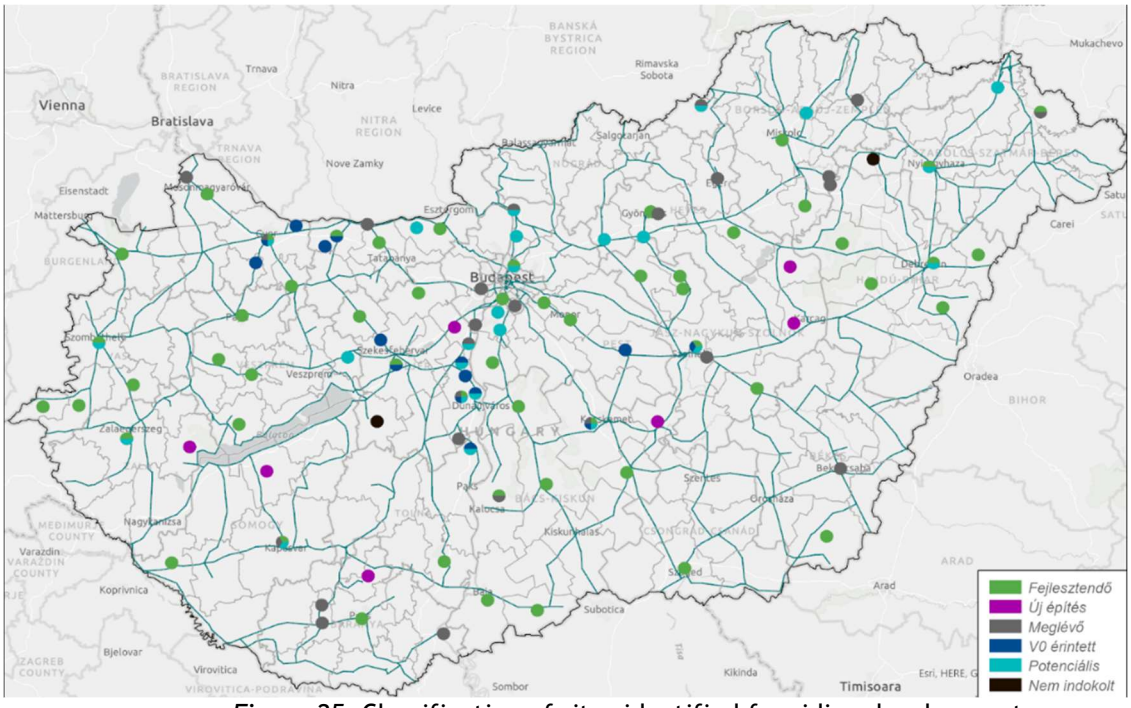

Figure 25: Classification of sites identified for siding development
Source: National Freight Concept

1. To be developed: development is justified - traffic forecasts suggest it is worth developing and there is a working siding in the municipality (52 districts)
2. New construction: based on traffic forecasts, new sidings need to be built because at present there are no sidings (7 districts)
3. Existing siding with a high traffic - operating and serving currently over 6,000 wagons annually (27 districts)

4. V0 affected: major districts affected by the V0 (planned railway line bypassing Budapest) (16 districts)
5. Potential/announced - already announced manufacturing plant with expected output requiring siding, or potential economic area that will also generate more trade in the future
- No development is required: traffic potential is shown but not worth developing for other technical/economic reasons (3 districts)

4.2. Development of industrial sidings

The rail freight transport market is managed and supervised by the Ministry of Construction and Transport on the regulatory and official side. The railway network is operated by MÁV Zrt. and GYSEV Zrt. based on a railway track operation contract with the Ministry, while the railway undertakings order the train paths from the infrastructure managers through an independent capacity allocation body, Vasúti Pályakapacitás Elosztó Kft (Railway Track Capacity Allocation Ltd). The economic operators (siding owners/operators) can also connect to the network based on contracts with the infrastructure managers. The operation and development of privately owned infrastructure elements are of course the responsibility of the economic operator. However, the contractual, technical and legal aspects of this are much more complex than for public roads, which makes siding only competitive for the larger players.

The scarce resources for rail track maintenance is also the cause of the deteriorating condition of railway branch lines. In order to serve the logistics system, greater attention needs to be paid to the development of rail lines with feeder and distribution functions, where rail transport on these routes is also proving efficient. In particular, it concerns rail lines linking operating sidings with traffic. On these lines, the axle load of 225 kN and the train length of 740 m would be of primary importance, with speed parameters being less important (unlike on main lines)

The capacity of existing loading points is not sufficient/adequate to manage the higher rail freight traffic and new rail loading points are needed to handle the freight. In the area of agricultural or industrial plants and facilities or industrial parks, existing sidings need to be extended (upgraded and improved), but new ones can also be built, and freight trains can run again on tracks that are currently not in use.

In the future, these tracks should be able to carry an axle load of 225kN. Their renewal pays off economically over 400 freight wagons/year (about half of the sidings in operation today do not meet this freight threshold!)

New siding is only justified if the industrial area traffic can be demonstrated to be at a sustained high level for at least the first 10 years of operation. The threshold may vary by commodity, but over 600 freight wagons/year is expected to be economical, and more than 400 freight wagons/year may be considered depending on the extent of interventions required.

Moreover, where there is a concentration of goods in an area of an industrial park or production area, it is recommended to support the establishment, renewal and maintenance of a siding, as the most efficient railway solution is a train departing from a siding.

4.3. The establishment of sidings

To set up a siding in Hungary, you must go through the following process:

- Identify the purpose of the siding, its location, length, traffic demand and connection to the public railway network.
- Apply for and obtain the necessary permits from the Railway Transport Authority:

  a) application of conditions manual,

  b) construction in principle,

  c) railway construction,

  d) reconstruction, upgrading (renewal),

  e) authorisation for putting into service,

  (f) temporary entry into service,

  (g) maintenance,

  (h) abandonment or demolition,

  (i) shutdown,

  (j) derogation permit.

- Organize and commence operation and maintenance of the siding under the responsibility of the operating entity.

4.4. Modernising the regulatory environment for siding

Regulatory changes over the last decades have tended to converge the level of on-site and open line rail regulation at the expense of on-site regulation. It would be necessary to reduce the requirements for staff and equipment where the movement of vehicles is exclusively on-site or does not affect open lines.

Ownership of sidings (including the different ownership of siding, superstructure and land) needs to be reviewed, to allow public ownership of sidings and to address as a regulatory issue the status of redundant sidings (from the railway track to the site boundary) that are maintained purely for property value, because these sidings are problematic and generate costs for both the infrastructure managers and railway undertakings.

Legal regulation is needed in order to prevent the establishment of a site without a siding and an open railway connection for certain productive activities including the transport of goods (e.g. large quantities of raw materials, transported mainly by rail; hazardous goods).

Development of industrial parks may require the construction of rail connections and the mandatory development of a given percentage of transport volume by rail. The current regulatory regime imposes a number of additional burdens on the plant that owns/intends to build an industrial siding. The improvement of the current regulatory regime would facilitate the practice of companies operating such a track network and would reduce their operating costs.

4.5. Situation of sidings in the Dél-Alföld region

Railway infrastructure of the Dél-Alföld region has an important role within country's transport network. The region has a lot of important railway lines that connect the region with other regions and with Budapest, the capital of the country.

The importance of the Dél-Alföld region in terms of rail freight is demonstrated by the fact that it is crossed by three rail freight corridors: the RFC 7 Orient-East-med, the RFC 9 Rhine-Danube and the RFC 11 Amber.

The region is also crossed by the Helsinki Corridors (Pan-European Transport Corridors), one waterway (Danube), two railways and two road corridors, and the TEN-T (Trans-European Transport Network), with one road and one rail corridor.

In addition to the above, there are a number of railway branch lines in the region, connecting smaller towns with larger cities.

Connection	Line number	Raitng of lines	Electrified	Number of tracks
Szolnok - Lökösháza border (RO)	120	Trans-European rail freight network RCF7, RCF9	Yes	2
Kétegyháza - Újszeged	121	Nationwide Secondary Railway Line	No	1
Mezőtúr - Mezőhegyes	125	Nationwide Secondary Railway Line	No	1
Gyoma - Körösnagyharsány	127	Nationwide Secondary Railway Line	No	1
Kötegyán - Püspökladány	128	Nationwide Secondary Railway Line	No	1
Murony - Békés	129	Nationwide Secondary Railway Line	No	1
Tiszatenyő - Makó	130	Nationwide Secondary Railway Line	No	1
Szeged - Kötegyán	135	Nationwide Core Network	No	1, small section with
Szeged-Rendező - Röszke border (SRB)	136	Trans-European rail freight network	No	1
Cegléd - Szeged	140	Trans-European rail freight network	Yes	1, small section with
Kőbánya-Kispest - Kecskemét	142	Nationwide Core Network	No	1
Kecskemét - Szolnok	145	Nationwide Secondary Railway Line	No	1
Kiskunfélegyháza - Kunszentmárton	146	Nationwide Secondary Railway Line	No	1
Kiskunfélegyháza - Orosháza	147	Nationwide Secondary Railway Line	No	1
Ferencváros - Kelebia oh.	150	Trans-European rail freight network	Under construction until 2025	
Kunszentmiklós-Tass - Dunapataj	151	Nationwide Secondary Railway Line	No	1
Fülöpszállás - Kecskemét-alsó	152	Nationwide Secondary Railway Line	No	1
Kiskörös - Kalocsa	153	Nationwide Secondary Railway Line	No	1
Bátaszék - Kiskunhalas	154	Nationwide Core Network	No	1
Kiskunhalas - Kiskunfélegyháza	155	Nationwide Core Network	Yes	1

Table 8: Railway lines in the Dél-Alföld region
Source: MÁV Network Statement

The figures in the table reflect the state of the Hungarian railway infrastructure: few lines are electrified (41% at national level) and even fewer are double tracked (17% at national level). In many cases, even lines that are part of the national core network are not electrified and/or double tracked.

In the Southern Great Plain region, the proportion is even worse: only line 120, which is part of the Trans-European Rail Freight Network and also part of RFC7 and RFC 9, is double-tracked. The Budapest-Kelebia (Hungarian-Serbian border) line, also part of the trans-European rail freight network and part of RFC 11, is under construction. This line was also previously single track, but will be double track when completed (2025).

The state of the infrastructure does not make rail transport attractive in the region, which is reflected in the number of active sidings.

A detailed list of the slightly over 1,000 sidings on the network of MÁV can be found in Annex 2.2.2-3 of the Network Statement. In the Dél-Alföld region there are 189 sidings.

Network Statement 2023/2024 — Annex 2.2.2-3

Railway networks in own operation and industrial tracks connected to the open access railway network

Modification: 1A, 19F

Szeged Regional Directorate

Name of the service place	Name of the privately owned railway network	Branching-off					Handing-over/taking-over point
		From stations (name of the stations)	From open line (between stations)	From a connecting track (name of the connecting track)	Number of the branching-off turnout (switch)	Profile section of the branching-off turnout (switch)	
Algyő	MOL Nyrt.	Algyő	-		11	1690+43	Own operation track R.I, R.II, V/a.
					2	1702+67	
Algyő	M.B.Kőolajkutató Rt.	Algyő	-		7/22	0+20	-
Bácsalmás	Bácsalmási Agráripari Zrt.	Bácsalmás	-	-	14	441+49	-
Bácsalmás	Kerényi Réka e.v.	Bácsalmás	-	-	6	442+04	-
Bácsalmás	IWINEX GMK	Bácsalmás	-	0	17	435+03	-
Bácsbokod-Bácsborsód	TRIGO Kft.	Bácsbokod-Bácsborsód	-	-	8	584+06	Own operation track I.
Baja	Baja-Dunapart - lejáróvágány	-	Baja- Pörböly állomásköz	-	A/1	782+79	-
Baja	ÁTI DEPO Közraktározási Zrt.		-	Baja-Dunapart - lejáróvágány	6/1	31+45	Own operation track I.
Baja	ÁTI DEPO Közraktározási Zrt.	-	-	Baja-Dunapart - lejáróvágány	II/1	28+72	Own operation track I.
					II/2	29+31	Own operation track I.
Baja	Gemenci Erdő és Vadgazdaság Zrt.	-	-	Baja-Dunapart - lejáróvágány	I/1	26+92	Own operation track I.
Baja	P+H Immobilien	-	-	Baja-Dunapart - lejáróvágány	III/1	29+72	-
Baja	MAHAJOSZ	-	-	Baja-Dunapart - lejáróvágány	3	34+30	-
Baja	MOL Rt.	-	-	Baja-Dunapart - lejáróvágány	4	30+83	-
Baja	AXIÁL Kft.	Baja			30	767+24	-
Baja	MW-Baja Bútoripari Kft.	Baja	-		I/1	2+52	-
Baja	Baja Külső csatlakozó vágány	Baja	-	-	3	760+40	-
Baja	PinguinLutosa Foods Hungary Kft.	-	-	Baja Külsü csatlakozóvágány	II/1	15+15	-
Baja	DIAMANT Internationál Malom KFT.	Baja	-		22/1	767+01	-
Baja	Búza Fészek	-	-	Baja Külsü csatlakozóvágány	I/1	14+90	-
Baja	MOGYI Kft.	-	-	Baja Külső csatlakozóvágány	III/1	1+42	-
Baja	W. W. Impex Kft.	-	-	Baja Külső csatlakozóvágány	VI/2	7+25	Own operation track I.
Baja	PICK Szeged Zrt. Bajai gyáregysége	-	-	Baja Külső csatlakozóvágány	V/2	1+67	Own operation track I.
Baja	DAKK Zrt.	-	-	Baja Külső csatlakozóvágány	VII/1	4+17	-
Békéscsaba	CARGO-TEAM	Békéscsaba	-	-	2	838+10	-
Békéscsaba	Északi Ipartelep csatlakozó vágány	Békéscsaba	-	-	A/1	826+95	-
Békéscsaba	BONDUELLE Zöldségfeldolgozó Kft.	-	-	Északi ipartelep csatlakozóvágány	A/1	826+95	Own operation loading track
Békéscsaba	ÁTI-DEPÓ Közraktározási Zrt.	-	-	Északi ipartelep csatlakozóvágány	III/1	30+04	Own operation loading track
Békéscsaba	TransPlus Hungary Kft.	-	-	Északi ipartelep csatlakozóvágány	VIII/2	0+58-2+46	Own operation loading track
Békéscsaba	BAÉV Zrt.	-	-	Északi ipartelep csatlakozóvágány	VIII/2	0+58-2+46	-
Békéscsaba	Békéscsabai Önkormányzat	-	-	Északi ipartelep csatlakozóvágány	VIII/1	35+74	Own operation loading track
Békéscsaba	TEGOMETÁL	-	-	Északi ipartelep csatlakozóvágány	A/3	2+60	-
Békéscsaba	UNIVERSAL	-	-	Északi ipartelep csatlakozóvágány	VI/1	3+30,20	-
Békéscsaba	MAVIR Zrt.	Békéscsaba	-	-	C/1	910+20	Own operation loading track
Békéscsaba	Sovtyi János ev.	Békéscsaba	-	-	401/1	859+86	Own operation loading track
Békéscsaba	Göngyöleggyártó Kft	Békéscsaba	-	-	401/2	858+14	-
Békéscsaba	GEATRADE	Békéscsaba-Barneválból	-	-	421/1	0+26	-
Békéscsaba	Bábolna Rt.	Békéscsaba	-	-	421	857+42	-
Békéscsaba	Békéscsabai Hűtőipari Zrt.	Békéscsaba	-	-	9	877+22	-
Békéscsaba	Borealis L.A.T. Hungary Kft	Békéscsaba	-	-	401/3	865+27	Own operation loading track
Békéscsaba	GYERAJ és Társai Kft.	-	-	Északi ipartelep csatlakozóvágány	VII/1	32+32	Own operation loading track
Békéscsaba	WIENERBERGER Zrt.	Békéscsaba	-	-	101	827+77	Own operation loading track
Békéscsaba	MÉH Rt.	Békéscsaba-összekötő	-	-	101/2	1+28	-
Békéscsaba	Grósz és Társai Kft.	Békéscsaba-összekötő	-	-	101/6	1+28	-
Biharnagybajom	BIMEKSZ Kft.	-	Füzesgyarmat-Biharnagybajom állomásköz	-	D/1	257+88	Own operation loading track
					C/1	262+02	
Biharnagybajom	Id. Szabó Jenő	-	Füzesgyarmat-Biharnagybajom	-	C/2	0+87,29	-

Table 9: Extract from the list of sidings in the Dél-Alföld region
Source: MÁV Network Statement

According to the information available, in 2023 about sixty siding owners had a contract with a railway undertaking for siding services, but only 22 siding were actually in use (11%).

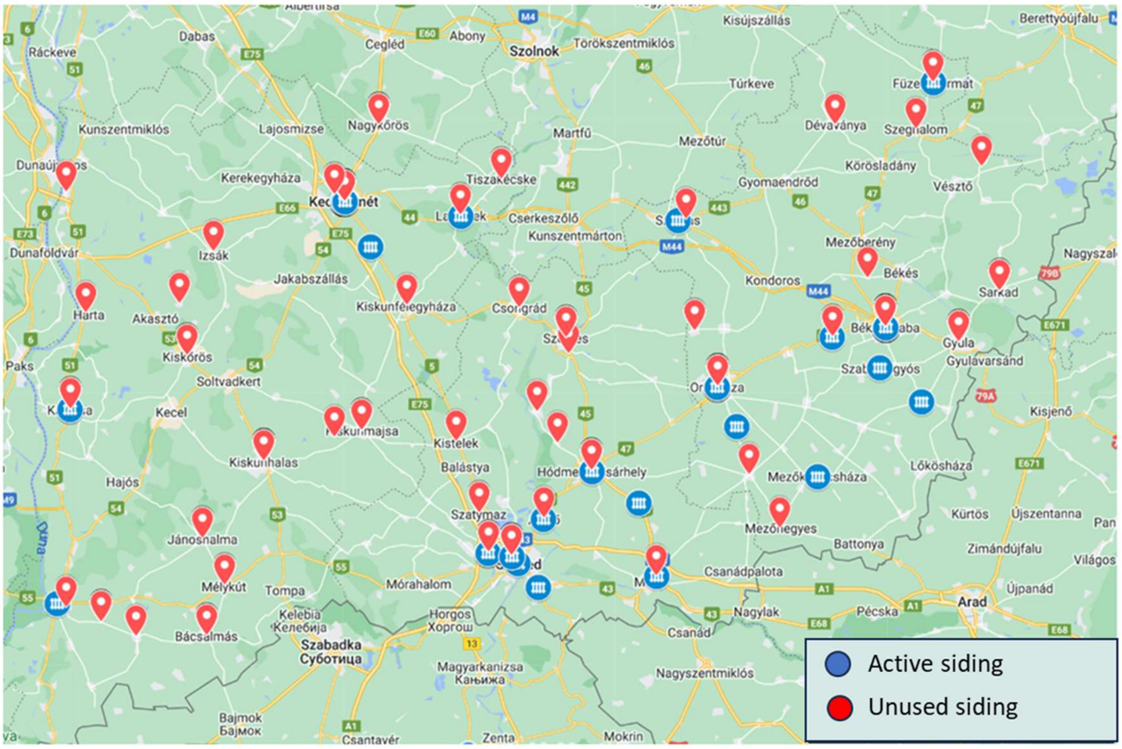

Figure 28: Sidings in the Dél-Alföld region by use

Source: RCH

The economic structure of the Dél-Alföld region is strongly influenced by its history and natural endowments. The region has a diverse economic structure, agriculture and food industry have a long historical tradition here. Due to the climatic conditions and the nature of the soil, agriculture has been a decisive factor in shaping the life and diversity of this region over the centuries. 34,8% of the region's population works in the agricultural sector and the majority of its territory, 76.4%, is cultivated.

High quality of the topsoil determines the industrial structure. Traditionally, cereal production and livestock farming are dominant. Food production i.e. cereal and meat production, canning and dairy plants account for around 20-25% of national production. Sandy soil in the western part of the region and sunshine hours exceeding the national average give an increased potential for agriculture, providing scope for growing vines and fruit. In addition to food industry, there is a significant agricultural machinery industry and, thanks to mineral resources (clay, sand, gravel) found here, brick, tile and glass production is also of national significance. Production of hollow blown glass launched earlier, has also contributed to the production of plate-glass. A significant share of the total extracted gas and oil volume in Hungary stems from this region. Despite the fact that this region is not rich in forests, there are a lot of wood processing plants here. The region has a significant thermal water resource.

In terms of development, the Dél-Alföld region is very divided. Whereas Bács Kiskun County is a highly industrialised region with a lot of companies seated there, Békés county is shaped by food processing and is at the bottom of the league in terms of the number of business enterprises established here. In recent years, the service sector in Csongrád-Csanád county has been significantly increased. The university located here has made a significant contribution to this development.

While in Bács-Kiskun and Békés County, the majority of jobs are provided by heavy industry (especially by the automotive industry and the manufacturing sector), in Csongrád-Csanád county, light industry and the service sector are dominant.

Within the region, the city of Szeged has a special feature, because compared to the other cities it is not dominated by the heavy industry, but by a so-called "diversified knowledge-intensive" industry. In addition to the proliferation of shared service centres (SSCs) of multinational companies, the IT sector is gaining ground in the city. The largest employer of the city is the University of Szeged.

As far as agricultural production is concerned, this region is one of the most productive areas in Hungary, producing annually significant quantities of cereals, fruit and vegetables. There are a lot of food processing companies in the region, including meat processing plants and dairy factories and food processing machinery producers.

Overall, the Dél-Alföld region has a diverse and dynamic economy that offers many opportunities for investors and business enterprises.

According to the traffic analysis of the National Rail Freight Concept mentioned above, in 8 districts of the Southern Great Plain region, the expected economic growth would require the upgrading of existing sidings and the construction of new ones in 2 other places.

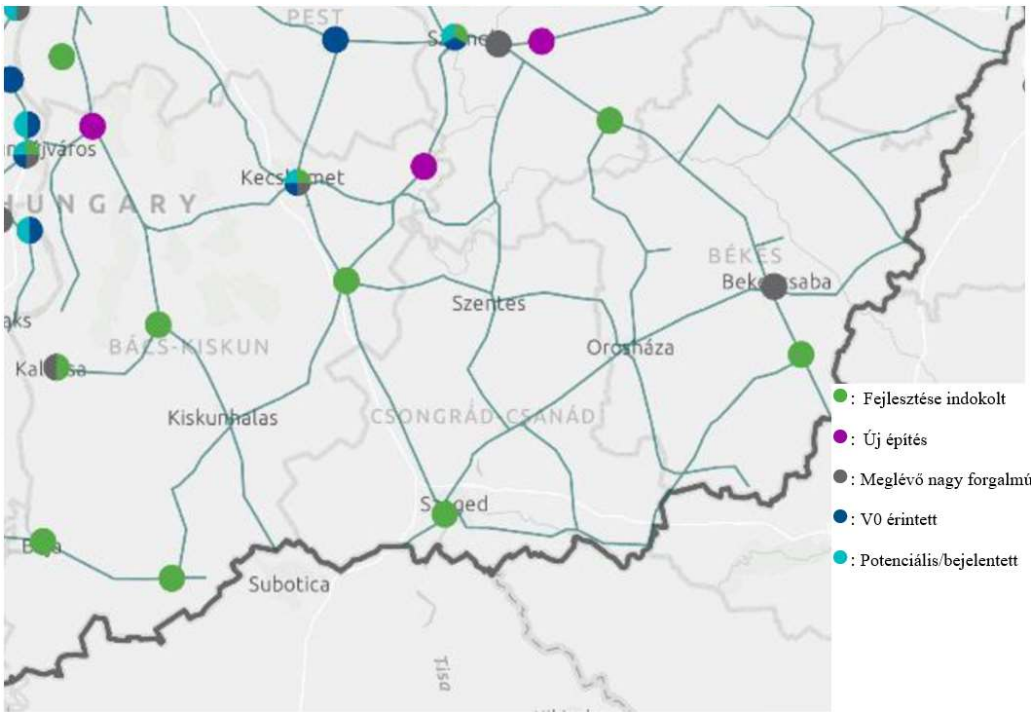

Figure 29: Situation of sidings in the Dél-Alföld region
Source: National Freight Concept

1. To be developed: development is justified - traffic forecasts suggest it is worth developing and there is a working siding in the district
2. New construction: based on traffic forecasts, new sidings need to be built because at present there are no sidings
3. Existing siding with a high traffic - operating and serving currently over 6,000 wagons annually
4. V0 affected: major districts affected by the V0 (planned railway line bypassing Budapest)
5. Potential/announced - already announced manufacturing plant with expected output requiring siding, or potential economic area that will also generate more trade in the future

5. Czech Republic

5.1. Sidings in the South Moravian Region

Siding is a track which serves the operator's or other undertaking's own needs and is connected to a national or regional railway or another siding. They are most often used for industrial purposes or for transporting raw materials from mining locations.

Railway sidings were used most frequently at the end of the 19th century and in the first half of the 20th century. In the 1970s, however, the situation was beginning to change as rail transport began to compete with road (truck) transport. A relatively important moment was also the change in the fuel base - coal no longer powered steam engines, but now natural gas began to displace it even in business heating. However, social changes after 1989 significantly reduced the use of sidings. Many freight forwarding companies emerged, against which the railways had no chance. Industrial production was gradually reduced and replaced by logistic centres. In addition, some former factories were gradually converted into offices or leisure and shopping centres. Therefore, the traffic on the railway sidings is very low compared to the past. For example, in Brno, where there is a dense siding network, the number of freight wagons used has dropped from 10 000 per year in the 19th century to hundreds per year at present.

Currently, based on information from the Railway Authority (Drážní úřad in Czech), there are about 100 railway sidings in the South Moravian Region. The sidings are owned by private operators. Based on this and other sources, an interactive map of railway sidings in the South Moravian Region has been created (https://kordis-jmk.cz/r2r/,). We have also created a questionnaire for owners of railway sidings. The return rate of the questionnaire was not sufficient to draw general conclusions. In map the orange colour indicates those sidings that belong to the selected case studies. For each siding it is possible to click on it to view more detailed information - for example, the owner and operator of the siding, the length of the siding, etc. Looking at the map, we can notice that most of the sidings are located in Brno and its surroundings.

The intensity of siding's use is rather lower, the sidings transporting raw materials are used to a greater extent. For example, the Czech-Moravian Cement - an important company, mainly cement is transported from Mokrá. Sand from Bzenec-Přívoz, gravel from Vyškov na Moravě or Rakšice are also transported to a greater extent; the transport of clay and refractory bricks from Velké Opatovice is also remarkable. The transport of glass sands to the Vetropack Moravia Glass plant in Kyjov is also significant in the transport of minerals.

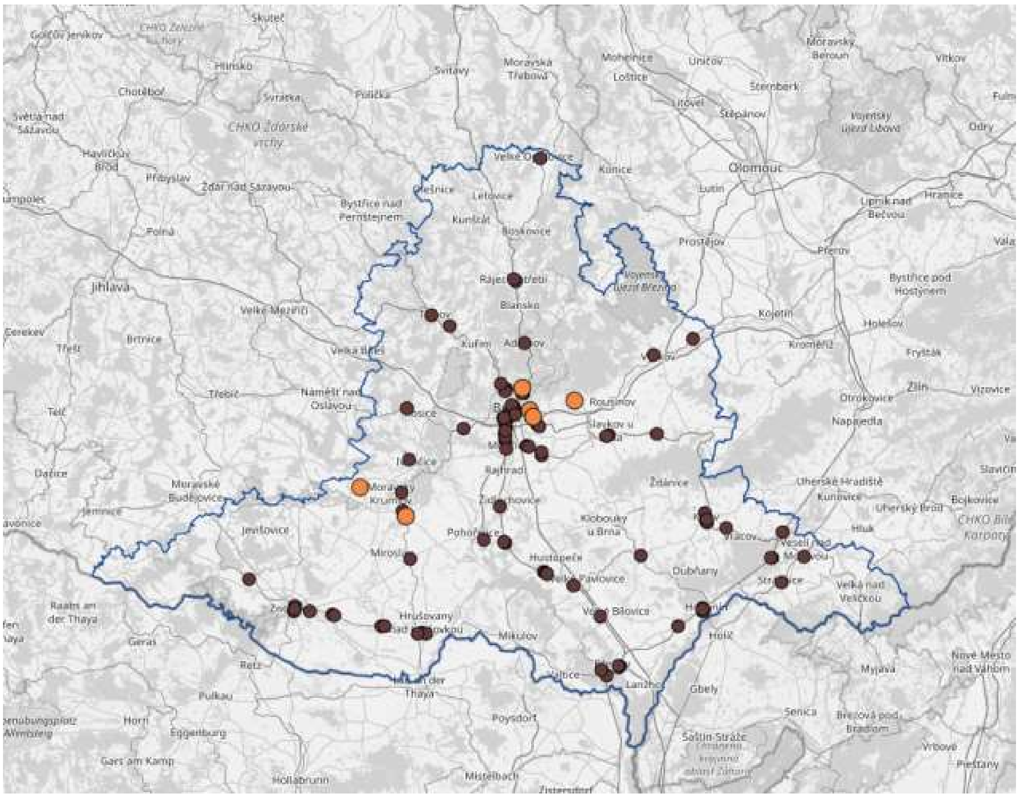

Figure 30: Map of railway sidings in the South Moravian Region
Source: KORDIS

5.2. Infrastructural and organizational aspects of freight transport on regional lines based on specific example

All freight transport depends on two parameters - technical infrastructure and organisation of work. These parameters will be identified on the example of the railway line Znojmo – Breclav (). We have examined planning documents for modernization of railways and based on the information we have found; we have selected this line because in our opinion it is the most representative.

Figure 31: Railway network in the South Moravian Region
Source: KORDIS

This is a non-electrified singletrack line, which is representative and can show what bottlenecks and challenges on the line should be solved. It is a line that has a large number of sidings that are used by rail freight, so there is a relatively large number of destinations for freight traffic. The line is situated in cross-border area, from Znojmo the line leads to Austria. The line is currently non-electrified, but its electrification is being considered, and the line is also to be connected to high-speed lines. These plans link the overall development in the Czech Republic, as similar plans exist for some lines at national level.

The line may also show the challenges and bottlenecks that rail transport has to deal with. We can mention the insufficient length of tracks in railway stations. Wagons then have to be uncoupled and divided into more trains, which slows down the whole process of loading/unloading and transporting goods. The length of the tracks is also limiting in Znojmo, as trains running in the direction Breclav - Znojmo - Okříšky have to change direction and tracks necessary for shunting are missing.

Traffic during night hours was also problematic before, when no passenger traffic runs and freight trains could theoretically run here. There were no train dispatchers on the line during the night hours and so traffic was stopped. The situation has improved during 2020 and freight trains can be operated here overnight with minor restrictions.

There is also a problem with the lack of switch supervisors on the line. This increases travel times, and the switchman is often alone in the station and has to move around the station.

The line is equipped with outdated signalling equipment, which is one of the oldest in the whole Czech Republic. On the line Breclav - Znojmo, all trains had to pass through most stations at a reduced speed of 40 km/h. Furthermore, the crossing intervals were extended and simultaneous train entries were prevented (for example, a freight train had to arrive at the station well ahead of another train, etc.). During the years 2017-2020, partial improvements were made, but there are still some sections that have not been reconstructed.

The route is not electrified, so it is necessary to use locomotives of independent traction. Therefore, operators have to take into account higher operating costs.

In Znojmo, there is no rail scale. This means that all wagons loaded with, for example, scrap iron going towards Vienna have to be routed through the Brno-Maloměřice marshalling yard, where the wagons are weighed. This reduces the competitiveness of the railway and increases the price of transport.

If the line is connected to the high-speed railway, a new line is being considered to connect to the high-speed railway. This would mean that the sidings would have to be relocated and reconnected.

The following table shows the stations equipped with railway sidings and used for transporting raw materials. The table shows the number of wagons loaded/unloaded in 2019 and the type of material transported. The most frequently transported raw material is wood and scrap iron. The rawest materials and also the most types of material are transported in Hrušovany nad Jevišovkou-Šanov. The fewest wagons go to Božice near Znojmo, but in previous years there was much stronger traffic (around 100 wagons per year). For example, tiles were also transported here. At the Boří les station, the amount of material transported is unknown.

Railway station	Approximate number of loaded/unloaded wagons per year	Transported commodity
Hrušovany nad Jevišovkou-Šanov	3607	Sugar, molasses, wood, scrap iron, fertiliser, beet
Hodonice	1355	Malt, grain, scrap iron
Znojmo	1000	Scrap iron, wood
Božice u Znojma	7	Wood
Valtice	Dozens of wagons maximum	Wood
Boří les		Phosphorus

Table 10: Use of sidings on the line Znojmo-Breclav
Source: KORDIS

For selected railway stations on the line Znojmo-Breclav, it is possible to observe the variaton in the number of loaded/unloaded wagons, for the others no data was available. In general, we can see that the highest frequency of transport is in 2018, followed by a decrease in 2019, which is strongest at Hrušovany nad Jevišovkou-Šanov.

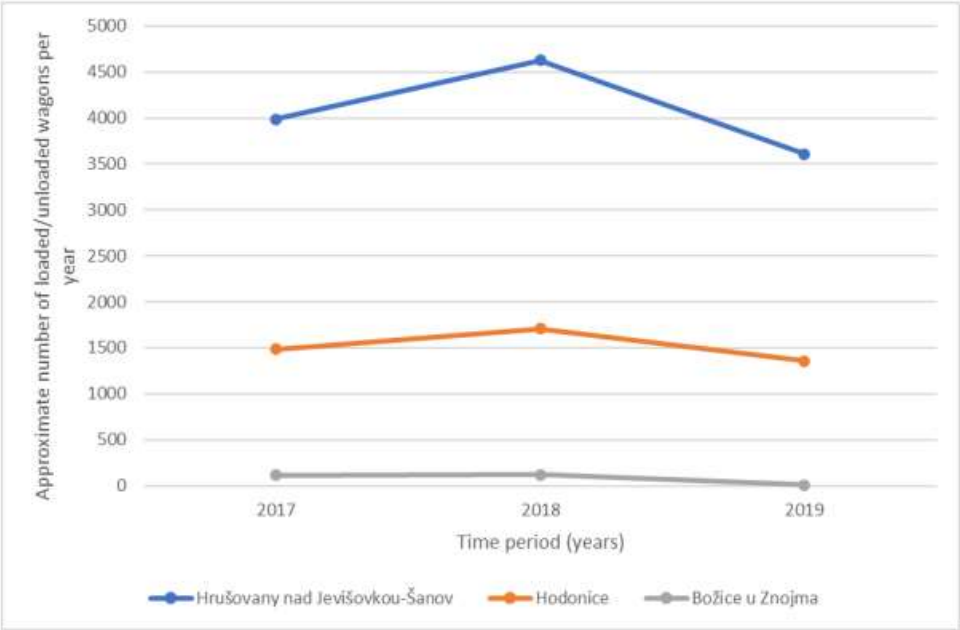

Figure 32: Variations in freight tranposrt on selected sidings during the period 2017-2019
Source: KORDIS

Loading/unloading on the sidings is only a partial process of the whole transport, the limiting factor for the efficiency of freight transport is the traffic on the railway network. The sidings are privately owned and the development of the railway infrastructure is consulted with these owners to meet their needs. From the point of view of the public administration, the development of railway sidings in the Czech Republic is subject to private business plans. For the development of railway sidings, their use for regular passenger or tourist transport while maintaining freight traffic can be considered. An example of a railway siding that could be used in this way is given in the following chapter.

5.3. Development possibilities on railway sidings in the South Moravian Region

As a possibility of development on railway sidings in the South Moravian Region we can mention the use of the siding to the Mokrá cement plant for passenger transport. The siding is marked in orange on . The railway runs through the villages of Pozořice, Sivice, Holubice and is not located on the outskirts of the villages, therefore the walking distance would be relatively short. The area is relatively densely populated, with more than 5000 inhabitants. The objective would be to provide a direct train connection to Brno. This would mean improved transport services, as rail transport is higher capacity and is not affected by congestion during, for example, morning and afternoon rush hours, so it could also save travel time.

The basic assumption of the project is the reconstruction of the existing siding to a higher line speed (80 km/h), its electrification to AC traction and the construction of railway stations in Holubice, Pozořice and Sivice. Freight traffic on the siding to the Mokrá Cement Works must not be limited by the extent of passenger traffic; on the contrary, it will benefit from the higher line parameters and higher line speed. These facts should result in the transfer of regular commuter passengers from bus and individual car transport to the railway, an increase in the share of passenger transport work in the suburban area of Brno and a subsequent relief of the already overloaded road network in the area.

Figure 33: Railway siding to Mokra
Source: KORDIS

6. Germany (Thuringia)

6.1. Current situation

Overview of the rail network

The length of the railway lines operated in Thuringia according to the Railway Construction and Operating Regulations (EBO) is 1,607 km (as of January 2023). Of these, 1,372 km are operated by DB Netz AG as the Federal Railroad and 235 km by non-Federal rail infrastructure companies (NE-EIU). In relation to the area of Thuringia, this results in a specific density of about 100 track meters per square kilometer of area. The dense rail network in Thuringia corresponds to the polycentric settlement structure of the state. The regional rail network is systematically coordinated with this and ensures good connections between local and long-distance traffic. Almost all central locations in Thuringia can be reached by local trains at regular intervals. Although the rail network in Thuringia has been expanded over the past 15 years, the number of network kilometres has remained largely constant during this period (Table 1). The proportion of double-tracked and electrified lines has increased moderately. Since 2007, 115 km have been electrified and 130 km double tracked. However, the proportion of electrified lines in the dense network is still low at 33 percent. Currently, 523 line kilometers (km) of the Thuringian rail network are electrified. This is the second lowest rate in Germany. On a national average, about 61 percent of the lines in the DB network are electrified, and 53.9 percent in the overall network. The currently planned electrification of the Weimar-Gera-Gößnitz, Gotha-Leinefelde and Gera-Leipzig lines would significantly increase the electric transportation capacity in Thuringia. 565 km of the rail network in Thuringia has been upgraded to double track. This corresponds to 35 percent of the total network. Nationwide, about 56 percent of the lines are double tracked.

Beside the sidings that are handled beyond, there is also a need for loading points that enable goods to be loaded from road to rail and vice versa, irrespective of existing sidings. Loading points are equipped in different ways and can consist of loading lanes, loading tracks and loading ramps, among other things. In Thuringia, there are around 20 DB Netz AG loading points as well as other loading points on routes operated by non-federally owned railroad infrastructure companies (as of April 2023).

Combined transport facilities, known as CT terminals, are used to transfer containers and swap bodies from road to rail and vice versa. There are currently two CT terminals in Thuringia: the DUSS terminal in Erfurt-Vieselbach (Deutsche Umschlaggesellschaft Schiene-Straße mbH) and the terminal in Eisenach, operated by Hörseltalbahn GmbH.

Railports are used for the handling, storage and transportation of goods. Companies whose shipping and receiving volumes are less than block trains or groups of wagons and which do not have their own siding can thus obtain transportation services from a single source. In Thuringia, a railport is operated in Nordhausen by the company Paul Will GmbH & Co. KG in Nordhausen.

Statistics about sidings

In Thuringia private sidings are an important requirement to directly transport goods from and to the companies and industrial areas on rail (on the first and last mile). A distributed network of private sidings exists but there is no public listing detectable as the sidings are privately administered. Nevertheless, the following data base give a picture of the sidings in Thuringia:

- In the Interreg Project "REIF" (2018) 80 private sidings were counted with a decrease from 120 sidings in 2006
- In a request in the federal parliament to the government (Drucksache 20/10180, 29.01.2024) about the amount of sidings, 80 active sidings were answered.
- The Thuringian Ministry of Infrastructure talks in the "Masterplan" (2023) about 100 active sidings, 10 of them are public accessible
- The project "SIDING"[1] located in Thuringia 2023 172 sidings in total, 67 of this were in use and 105 not in use or dismantled
- The Thuringian railway supervisory authority (Eisenbahnbundesamt, Außenstelle Erfurt) sent a list of 99 private sidings in Thuringia and 6 sidings that provide a public access.

Between 2004 and 2018 12 applications for promotion of private sidings of the federal government have been made in Thuringia (last one in 2015). Of these 12 applications only 4 have been granted (last one in 2016) with a total funding of 4.7 Mio Euros. This fact results from the requirement to prove the amount of goods by the applicant in order to get funding. In Thuringia this often becomes apparent to be uneconomic.

But the trend of removing and closing of railway sidings is continuing. Compared to 2006 where still approx. 120 private sidings existed in Thuringia, the amount shrank about 1/3 (33 %) nowadays. Without these private sidings a shift from road to rail will be hampered or even change to the contrary.

In addition to sidings, there is also a need for loading points that enable goods to be loaded from road to rail and vice versa, irrespective of existing sidings. Loading points are equipped in different ways and can consist of loading lanes, loading tracks and loading ramps, among other things.

In Thuringia, there are around 20 DB Netz AG loading points as well as other loading points on routes operated by non-federally owned railroad infrastructure companies (as of April 2023).

Combined transport facilities, known as CT terminals, are used to transfer containers and swap bodies from road to rail and vice versa. There are currently two CT terminals in Thuringia: the DUSS terminal in Erfurt-Vieselbach (Deutsche Umschlaggesellschaft Schiene-Straße mbH) and the terminal in Eisenach, operated by Hörseltalbahn GmbH.

[1] About the methodology of the project "Siding": The sidings are identified in a two-stage process. First, the geographically relevant study areas are defined, which are characterized by their proximity to the rail network and commercial or industrial land use. In the second step, the sidings are identified using artificial intelligence methods. Methodologically, automated pattern recognition of satellite images is being developed for this purpose. Using learning and test data, researchers are training a neural network that adapts existing image recognition methods for use in rail infrastructure.
More information about the project: https://www.scs.fraunhofer.de/de/referenzen/siding.html
List of Sidings: https://www.scs.fraunhofer.de/content/dam/scs/DE/referenzen/siding/FHG_SCS_SIDING_Ergebnispunkte.xlsx

Railports are used for the handling, storage and transportation of goods. Companies whose shipping and receiving volumes are less than block trains or groups of wagons and which do not have their own siding can thus obtain transportation services from a single source. In Thuringia, a railport is operated in Nordhausen by the company Paul Will GmbH & Co. KG in Nordhausen.

6.2. Future Development

The further development of the rail freight transport in Thuringia is determined particularly in the Regional Development Program Thuringia (LEP Thüringen 2025). This is an informal document and instrument with goals and guidelines to develop the regional and spatial potentials of Thuringia. It was declared as obligatory by the federal state government in 2014, based on the Thüringer Landesplanungsgesetz ThürLPlG (State Planning Act Thuringia) from 2012.

Concerning rail freight transport, it is stated in the general principles of transport infrastructure that the rail network, stations and transhipment facilities shall be arranged to meet the future requirements of rail passenger and freight transport. Therefore, the rail hub Erfurt is an important node not only for the city but for the whole state. The hub has centrality and good preconditions for railway freight transport. At the same time, it has to be considered, that it is not useful to maintain roads or rails that lost their function and will not be used anymore.

In the regional plans, locations for freight loading points can be considered as a principle of spatial planning, provided that a regional significance is justified in terms of spatial planning and a rail transport related freight transport potential has been demonstrated or is to be expected. To ensure the location of existing (often inner-city) areas, the functional relationship must be represented and evidence of existing or projected goods must be provided. The volume of goods must be suitable both for the quantity and the types of goods for transport by rail and for the corresponding transhipment. A determination of location areas for freight loading points without proven freight potential is not possible.