

D.T1.2.3 WORK PAPER

Analysis of regional market potential for rail
freight services - Thuringia

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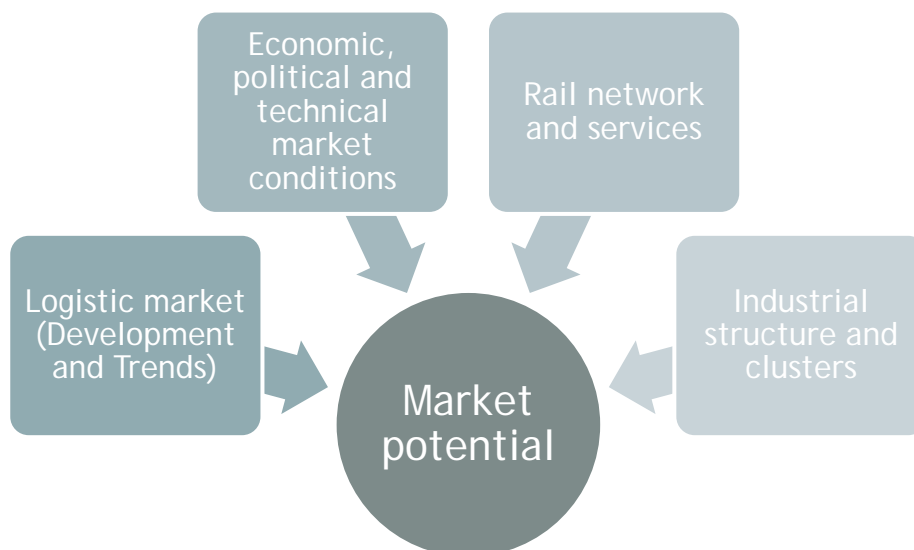
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1. Introduction

The deliverable “Analysis of regional market potential for rail freight services” (D.T1.2.3) is compiled on the basis of the elaborated “Methodology for analysis of market potentials for rail freight transport” (D.T1.2.1) and the realised online training for the implementation of the market potential analysis (D.T1.2.2). The work paper analyses the regional market potential for rail freight services in Thuringia.

Market potential is the total demand for a product or service in a given business environment. For that it is very important to calculate the market potential and the actual value before a product or service can be implemented. Determining the main market potentials for regional rail freight transport and services is quite complex and goes beyond analysing only the market itself (the potential customers). The analysis shall help to find out the potential to shift goods transport from road to rail.

The following figure shall illustrate the impact of various factors on the market potential:



Chapter 2.1. “Analysis of the rail network and services” on regional level serves as the basis for the analysis of the market potential because without existing railway lines and a certain level of network quality and free capacities, freight transport on rail can hardly be implemented. Moreover, existing railway related services play an important role, like the maintenance of wagons or the possibility for shunting trains. This can be seen as the “ecosystem” of rail because the rail network and services are mutually related and dependent.

Chapter 2.2. “Analysis of the logistic market (Development and Trends)” contains both the former development of (rail) freight transport and trends of (rail) freight transport performance including the analysis of current transport flows.

Chapter 2.3. “Analysis of the economic, political and technical market conditions” examines the framework conditions in these fields that can influence the market potential of rail freight transport, like political measures decided or changing in industrial landscape.

Chapter 2.4. “Analysis of the industrial structure and clusters” gives an insight of potential goods and customers for the transport of freight on railway, including the definition of high rail freight suitability and which of the goods and industries are high rail freight suitable. The location of major industries and logistic hubs, loading facilities as well as the transport volume and group of goods are outlined.

The paper concludes with a summary and recommendation of the main market potentials and chances for rail freight transport in Thuringia (Chapter 3).

2. Status quo Analysis of Market Potential

In the regional development plan 2025 it is stated that Thuringia is to be secured and further developed as a logistics location. Therefore, the integration of regional logistic centres into the national and European transport network by using the favourable locations within development corridors is one important objective. In order to assess Thuringia's role and the potentials in this situation, the traffic volumes have to be analysed and questions have to be answered. Which technical and organisational measures will lead to a strengthening of the railway traffic in and through Thuringia along the Scandinavian - Mediterranean axis? Which goods are shipped to and from Thuringia and which volumes could possibly be transferred from road to rail? Which are further relevant parameters for Thuringia to act as an efficient railway region along the corridor? And finally: What are the main market potentials and chances for rail freight transport?

2.1. Analysis of regional rail network and services

The Free State of Thuringia is located close to the Scandinavian - Mediterranean TEN-T Corridor as well as to the Orient/East-Med Corridor and the North Sea-Baltic Corridor. As the railway network has good connections to Saxony and Saxony-Anhalt, there is an indirect, peripheric connection to those corridors. The Free State is covered by 1,500 km rail network and almost 10,000 km of road network. Regarding the rail network Thuringia has the densest (per capita) in Germany. Together with the developments of the locations at the Baltic and Adriatic Sea these are very good prerequisites for Thuringia to participate positively in the development of both transport volumes and logistic concepts.

One of Europe's most important railway connections for passenger and freight traffic - the Paris - Frankfurt am Main - Berlin - Warsaw - Moscow route - runs through Thuringia. Relative to its size and population, Thuringia has the densest rail network in Europe, with around 1,550 kilometres of track currently in service.

Nevertheless, the development of the railway infrastructure in Thuringia nearly stagnated in the last 15 years (figure 1). From an overall length of 1598 kilometres in 2005 it decreased until 2017 to 1558 kilometres. Since 1994 even 41 lines have been closed with an overall length of 467 kilometres.

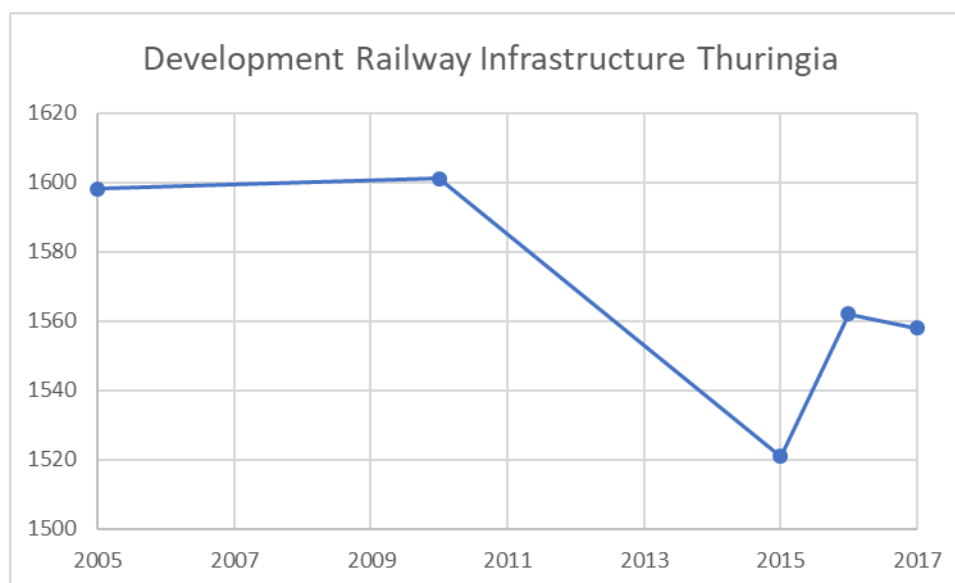


Figure 1: Development of railway infrastructure in Thuringia 2005-2017 (in km),
Source: Statistisches Bundesamt 2009

Moreover, only 452 km of tracks are electrified (figure 2). Hence, only 30 % of all tracks in Thuringia are electrified, which is below the average of Germany as a whole (54 %). In Germany the railway electrification system using alternating current (AC) at 15 kilovolts (kV) and 16.7 Hertz (Hz) is applied.

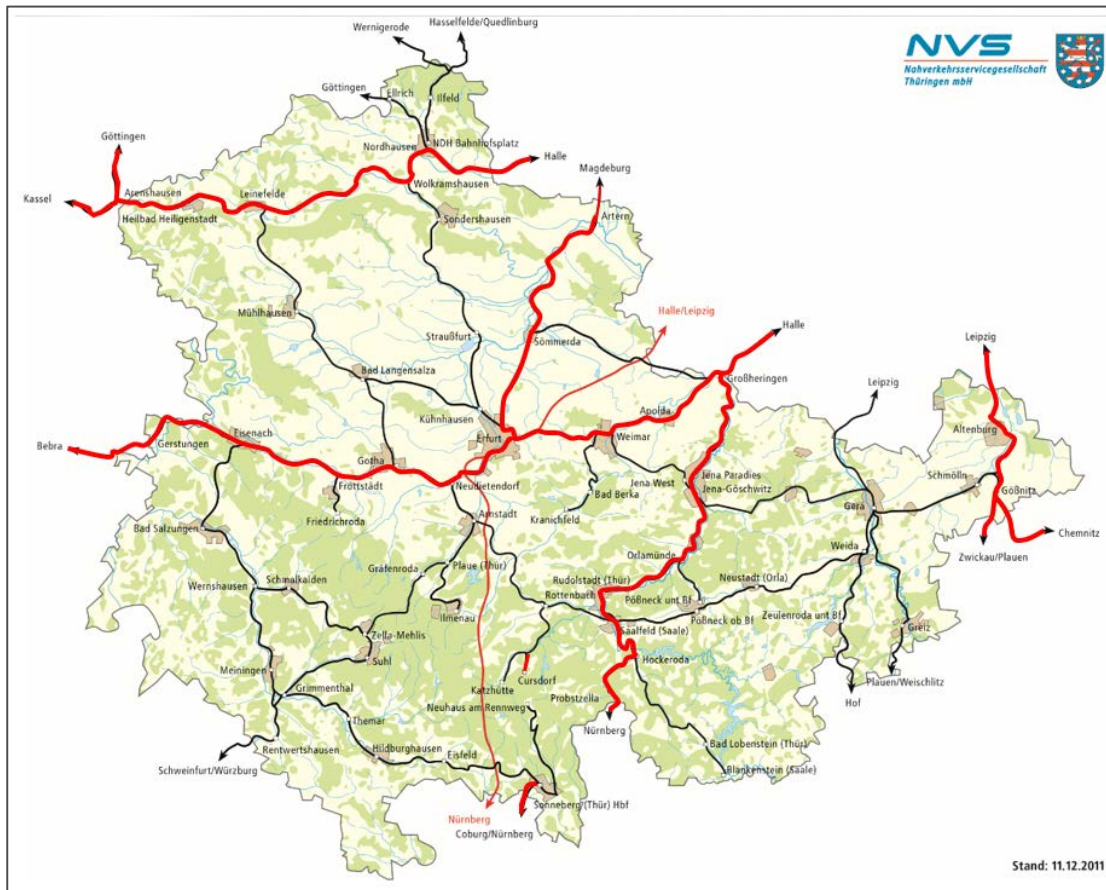


Figure 2: Rail network in Thuringia (red: electrified tracks),
Source: adapted from Nahverkehrsservicegesellschaft Thüringen mbH 2011

The regional railway network in Thuringia (figure 3) has an overall length of tracks of 2.352 km, of which 1.339 km are single tracks (including sidings; blue in the map) and 1.013 km are multi-tracks (red in the map).

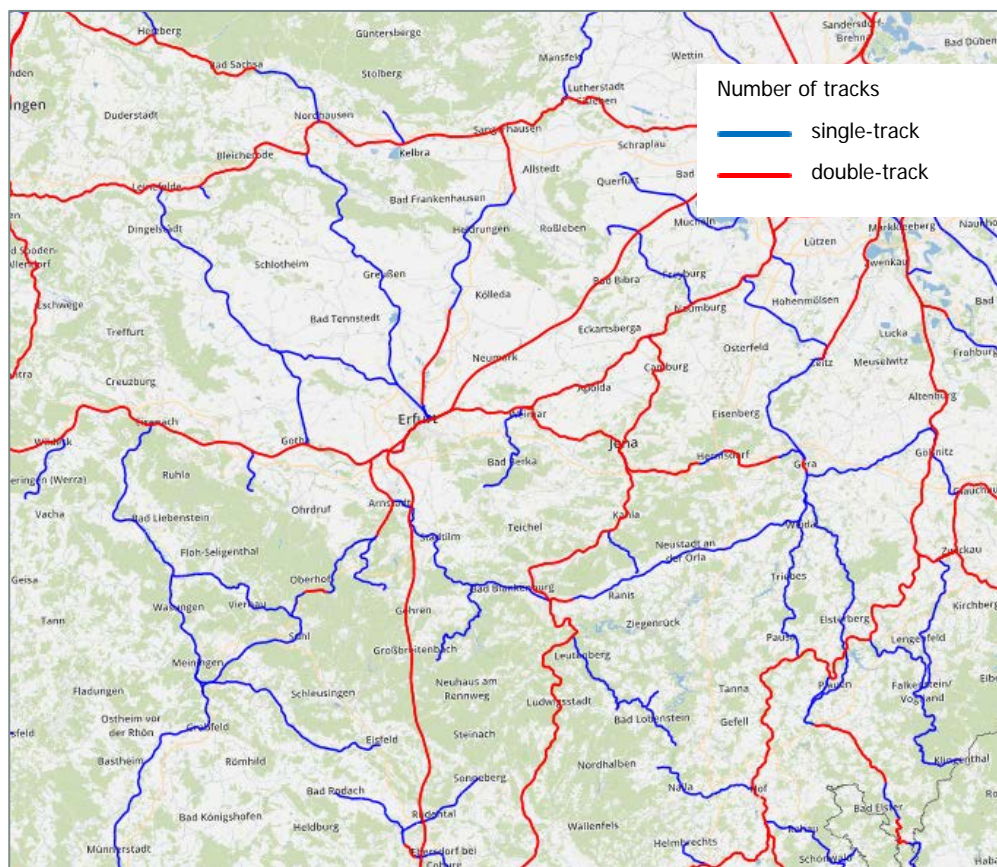


Figure 3: Number of tracks in Thuringia, Source: GeoViewer/Infrastrukturregister, DB Netze

The rail network in Thuringia is not fully stretched as there are reserves in capacity and utilization (see annex figures 17 and 18). The bottleneck analysis in rail infrastructure from the Federal Transport Infrastructure Plan 2030 shows the expectable situation of the utilization of tracks based on the current railway network in Germany without any further infrastructural projects (figure 4) and with infrastructural projects (figure 5). So, the contemporary network utilization is comparable to the one in 2030.

For Thuringia (grey circle) it is visible that nearly the whole network is coloured in green which means that the utilization of the network is below 85 %. Only a few blue lines display that there is full capacity of the rail infrastructure with 85 % - 110 %. There are no red lines (overload with more than 110 %) in Thuringia in contrast to other parts of Germany, for example to the main sea ports or in the Rhine Main area. These lines in turn would be relieved in 2030 with further projects in the railway infrastructure (figure 5).

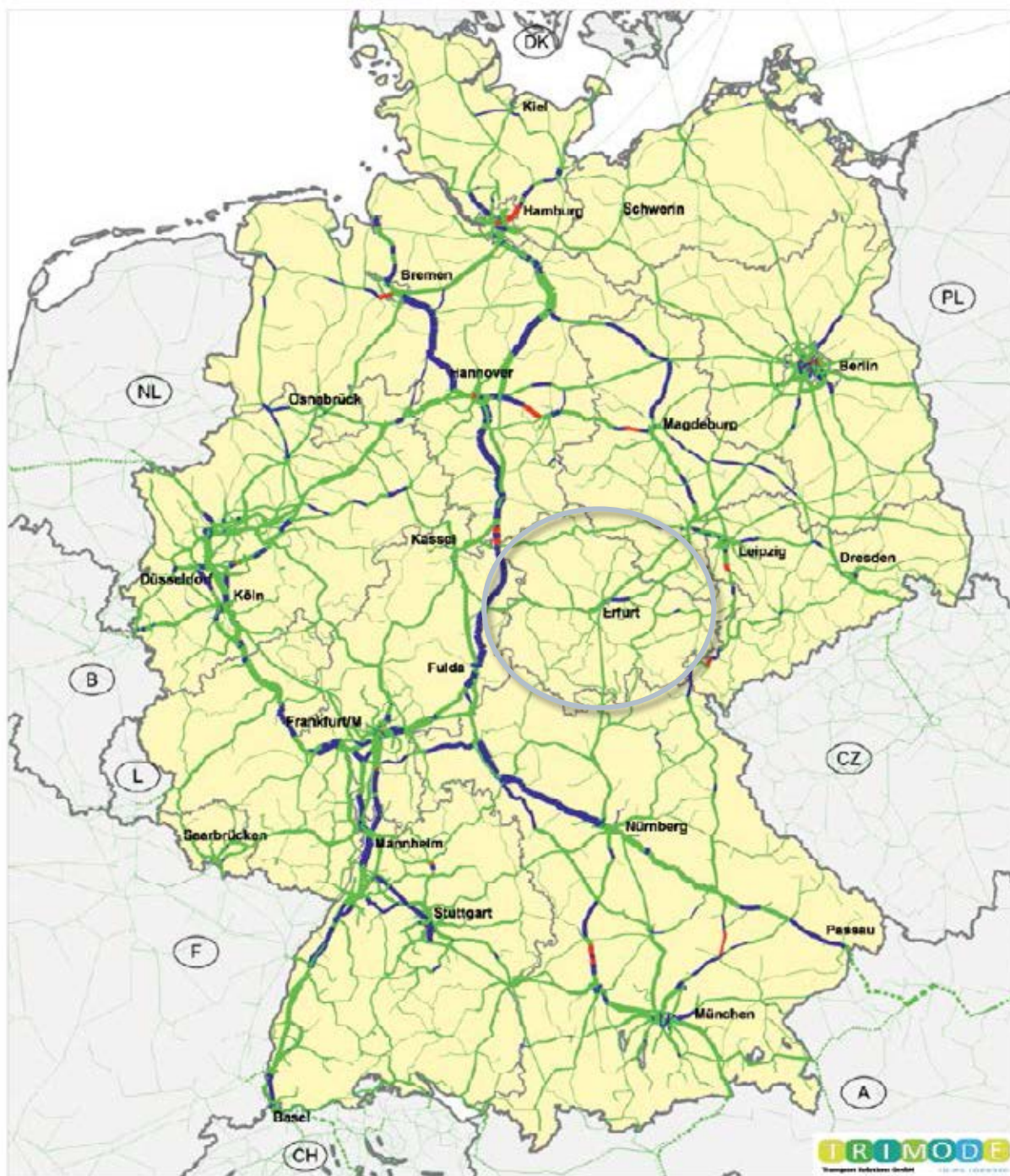
Even if the utilization of the network would be doubled (213 Mrd. tkm), there would be no utilization problem in Thuringia. Between 80 and 120 daily round trips could be made on the main lines for rail freight transport (see annex figure 19).

Bezugsfall BVWP 2030



Figure 4: Analysis of utilization and bottlenecks in rail infrastructure in Thuringia without further infrastructural projects in 2030, Source: adapted from FTIP 2030

Zielnetz BVWP 2030



Line Utilization in %

- < 85% (Capacity Reserves)
- 85% – 110% (Full Capacity)
- 110% (Overload)

Total Trains per Day

- 500 Trains

Figure 5: Analysis of utilization and bottlenecks in rail infrastructure in Thuringia with further infrastructural projects in 2030, Source: adapted from FTIP 2030

Besides the state-owned railway traffic and railway infrastructure undertakings (all part of the DB consortium) there is a significant group of small, local and regional undertakings. They serve as infrastructure operators, railway traffic operators or provide other services, e. g. rental of rolling stock and staff services. A variety of services is provided and it needs to be studied further, whether the lack of specific services prevents third parties and shippers to transport more goods on railways to and from Thuringia.

Public railway undertakings (freight transport) in Thuringia (regional):

C + L Consult & Logistik GmbH
Erfurter Bahn GmbH (EIB)
Erfurter Bahnservice GmbH
Erfurter Gleisbau GmbH
Heavy Haul Power International GmbH
Hörseltalbahn GmbH
L & S Luddeneit und Scherf GmbH
LGM Logistikgesellschaft mbH
Raildox GmbH & Co. KG
Railsystems RP GmbH
Rennsteigbahn GmbH & Co. KG
Stahlwerk Thüringen GmbH
Starkenberger Güterlogistik GmbH
Uwe Adam EVU GmbH
Werra Eisenbahnverkehrsgesellschaft mbH

Public railway undertakings (freight transport) in Thuringia (national):

DB Bahnbau Gruppe GmbH
DB Cargo AG
DB Fahrwegdienste GmbH
DB Fahrzeuginstandhaltung GmbH
DB Fernverkehr AG
DB Regio AG
DB RegioNetz Verkehrs GmbH
DB Services GmbH
Mitteldeutsche Eisenbahn GmbH (MEG)

Non-public railway undertakings (freight transport) in Thuringia (regional):

thomas zement GmbH & Co. KG

Wünschendorfer Dolomitwerk GmbH

Zellstoff- und Papierfabrik Rosenthal GmbH

Non-public railway undertakings (freight transport) in Thuringia (national):

DB Netz AG

DB RegioNetz Infrastruktur GmbH

DB Systemtechnik GmbH

Deutsche Bahn AG

Public railway infrastructure companies in Thuringia (regional):

Deutsche Regionaleisenbahn GmbH (DRE)

Hörseltalbahn GmbH

Rennsteigbahn GmbH & Co. KG

Thüringer Eisenbahn GmbH

ZossenRail Betriebsgesellschaft mbH

Public railway infrastructure companies in Thuringia (national):

DB Netz AG

DB RegioNetz Infrastruktur GmbH

Regarding the maintenance of freight wagons and locomotives, a main actor in Thuringia is the company Villmann-Gruppe. Two of their own companies are the Fahrzeugwerk Niedersachswerfen GmbH in Ellrich (Nordhausen) and the Waggonbau Altenburg GmbH in Altenburg. The focus of the work lies on freight wagon maintenance and repair, wheelset maintenance, storage and management as well as tank wagon and cargo car cleaning. Another service is the storage and parking spaces in depot railway stations.

Of course, the Deutsche Bahn (DB) has got its own locations for maintenance. Figure 6 shows depots of DB Cargo in Erfurt and Saalfeld as well as a rail yard in Meiningen. The latter is the last big steam locomotive works in Western Europe, specialised in the maintenance of historic museum steam locomotives since 1990. Other depots nearby are in Hof (Bavaria), Halle/Saale (Saxony-Anhalt) and Leipzig (Saxony).

Figure 7 displays one factory for the construction of wagons in Gera and one factory for wagon construction and traction unit in Benndorf (Saxony-Anhalt) near Sangerhausen in Thuringia. Several railway workshops of railway undertakings and/or railway infrastructure companies (public or private) complete the overview of factories and workshops for freight transport in Thuringia.



Figure 6: DB Rolling Stock Maintenance in Thuringia,
Source: Eisenbahnatlas Deutschland

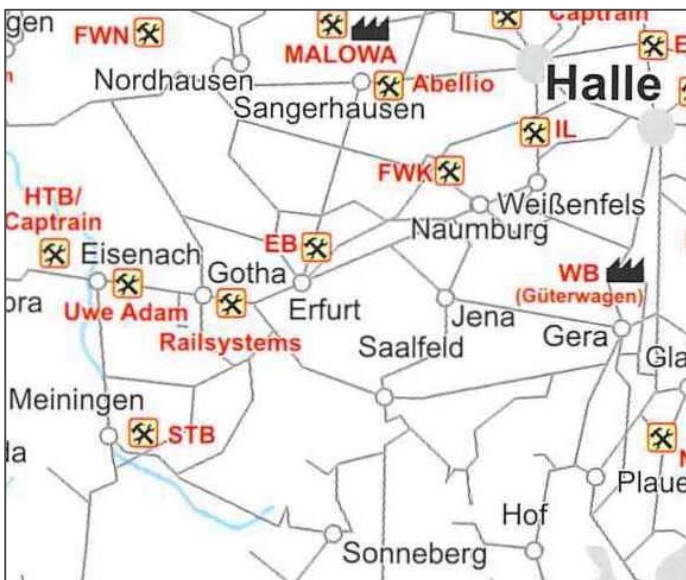


Figure 7: Railway workshops, wagon construction and traction
unit factories in Thuringia, Source: Eisenbahnatlas Deutschland

Regarding filling stations for Diesel there is a network of DB Energie nearly all over Thuringia and bordering federal states (figure 8). Two more Diesel filling stations of non-federal railways are located nearby in Neumark (Saxony) and Halle (Saxony-Anhalt) and one of a company in Schkopau (Saxony-Anhalt).



Figure 8: Diesel filling stations of DB Energie (red), non-federal railways (green) and other companies (brown) in Thuringia, Source: Eisenbahnatlas Deutschland

2.2. Analysis of the logistic market (Development and Trends)

Rail freight activities in Thuringia have diverse developments in recent decades (table 1). Shipping and receiving within the region increased from 317,000 tons in 2001 to more than 428,000 tons in 2017. The inland transport nationwide increased in shipping (1.6 Mio tons to 2.8 Mio tons), but decreased in receiving (3.6 Mio tons to 2.9 Mio tons). The transnational transported goods from Thuringia decreased from 948,000 tons to 865,000 tons in the same period while goods from abroad to Thuringia increased a little bit (620,000 tons to 652,000 tons).

Year	National		Regional (Thuringia)	Abroad	
	Shipping	Receiving	Shipping/Receiving	Shipping	Receiving
2001	1629	3612	317	948	620
2002	1681	3398	355	971	564
2003	1890	4406	787	969	686
2004	1644	3457	482	1094	832
2005	1549	3288	318	1152	728
2006	1802	3578	454	1368	724
2007	2431	3454	443	1293	751
2008	2869	3226	350	1115	742
2009	2580	2861	328	905	525
2010	2616	3372	432	873	629
2011	2825	3873	513	929	722

2012	2612	3585	462	806	645
2013	2826	3446	640	735	558
2014	2567	3069	298	869	566
2015	2763	3408	464	793	538
2016	2505	2972	344	797	624
2017	2840	2905	428	865	652

Table 1: Rail freight transport 2001-2017 from and to Thuringia (shipping and receiving, in 1,000t), Source: Statistisches Bundesamt 2017

The development in transshipment has a declining tendency in Thuringia (figure 6). It is noticeable that in 1991 the amount was around 20.6 Mio tons while four years later it halved itself to 10 Mio tons in 1995. Since 2000 the development in transshipment nearly stagnated at 7.2 Mio tons until today. In the field of rail freight transshipment Thuringia comes in last in Germany (585 Mio tons in total in 2014).

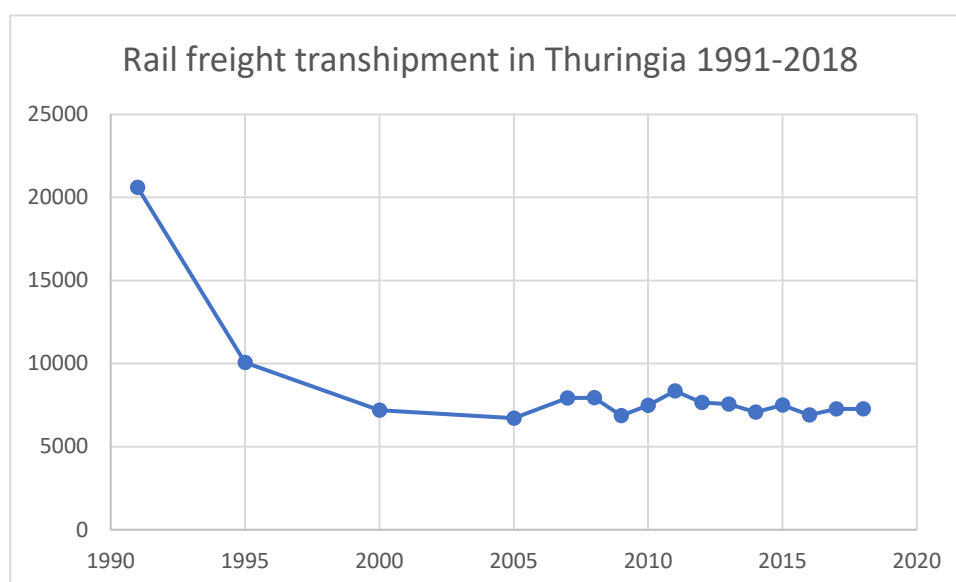


Figure 9: Rail freight transshipment in Thuringia 1991-2018 in 1000t, Source: Statistisches Bundesamt

The modal share for freight transport in Thuringia stagnates in the last years or even decreases to the disadvantage of rail (figure 7). In 2008 a total of 157.7 million tons of goods were transported to, from and inside of Thuringia, 150.1 million tons of which were road transport and 7.6 million tons rail transport. In 2013, the total transported amount of goods added up to around 199 million tons, so there is an increasing development visible.

Road transport is definitely the strongest mode of transport in terms of tonnage transported with a share in modal split of 95.2 % in 2008 and 96.2 % in 2013. The share of rail cargo traffic in the total tonnage transported amounts to 4.8 % in 2008 and 3.8 % in 2017. Inland waterway vessel is non-existent in Thuringia because of the characteristics of the network.

The modal share of railway freight transport in Thuringia is even a lot smaller than in whole Germany (70.7 % on road, 18.7 % on rail, 8 % by inland waterway vessel and 2.6 % by oil pipeline in 2017).

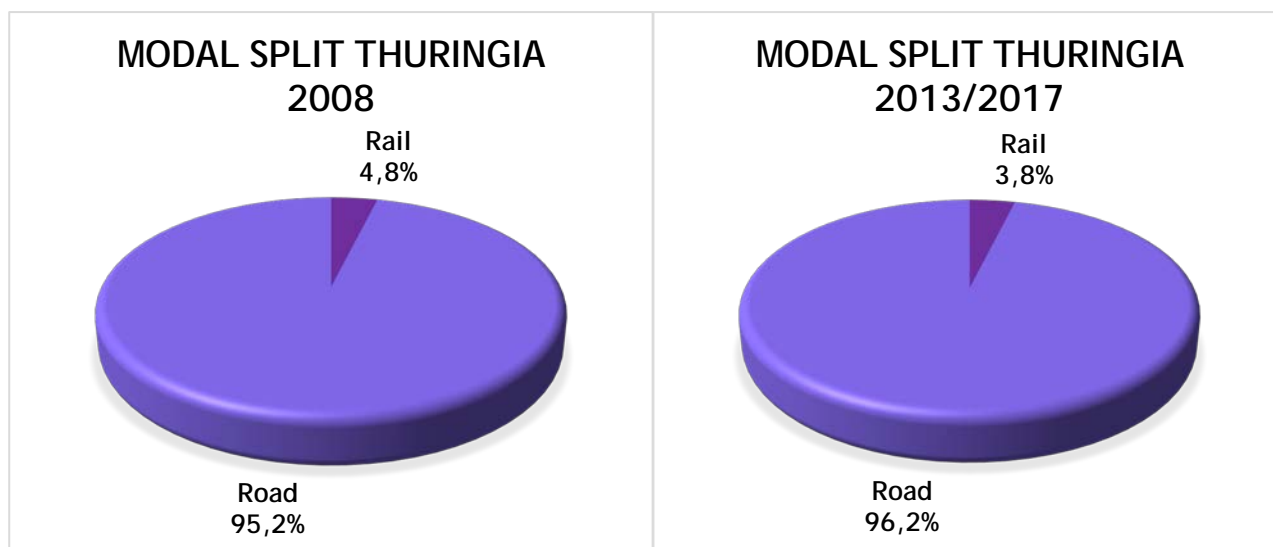


Figure 10: Modal split in Thuringia 2008 and 2013 (road) / 2017 (rail), Source: Statistisches Bundesamt

Freight transport from Thuringia

The current transport flows (rail 2017 and road 2013) are still clearly in favour of road traffic (figure 8, table 2). In total 93 Mio tons of freight are transported from Thuringia on road while only 3.7 Mio tons are shipped on railway. The biggest amount of freight stays in Thuringia and is transported within the region (61.3 Mio tons on road and 0.4 Mio tons on rail). The amount of regional rail freight transport is extremely slight and has massive potential for development. National freight transport from Thuringia is a little more on railway (2.4 Mio tons). 30.8 Mio tons are shipped on the roads. Most of the goods are transported on roads to the neighbouring federal states Saxony, Saxony-Anhalt, Bavaria and Hesse (table 3). On rail most of the goods are transported to federal states further away, like North Rhine-Westphalia and Hamburg (because of the port). Abroad only 0.8 Mio tons are both shipped on railway and on road. Therefore, the direct international transport does not have such an importance than the national and regional one.

	Rail	Road
Total inland	2840	92168
Abroad	865	871
<u>In total</u>	<u>3705</u>	<u>93039</u>

Table 2: Freight transport from Thuringia (Rail 2017 and road 2013) in 1,000t, Source: Statistisches Bundesamt 2017

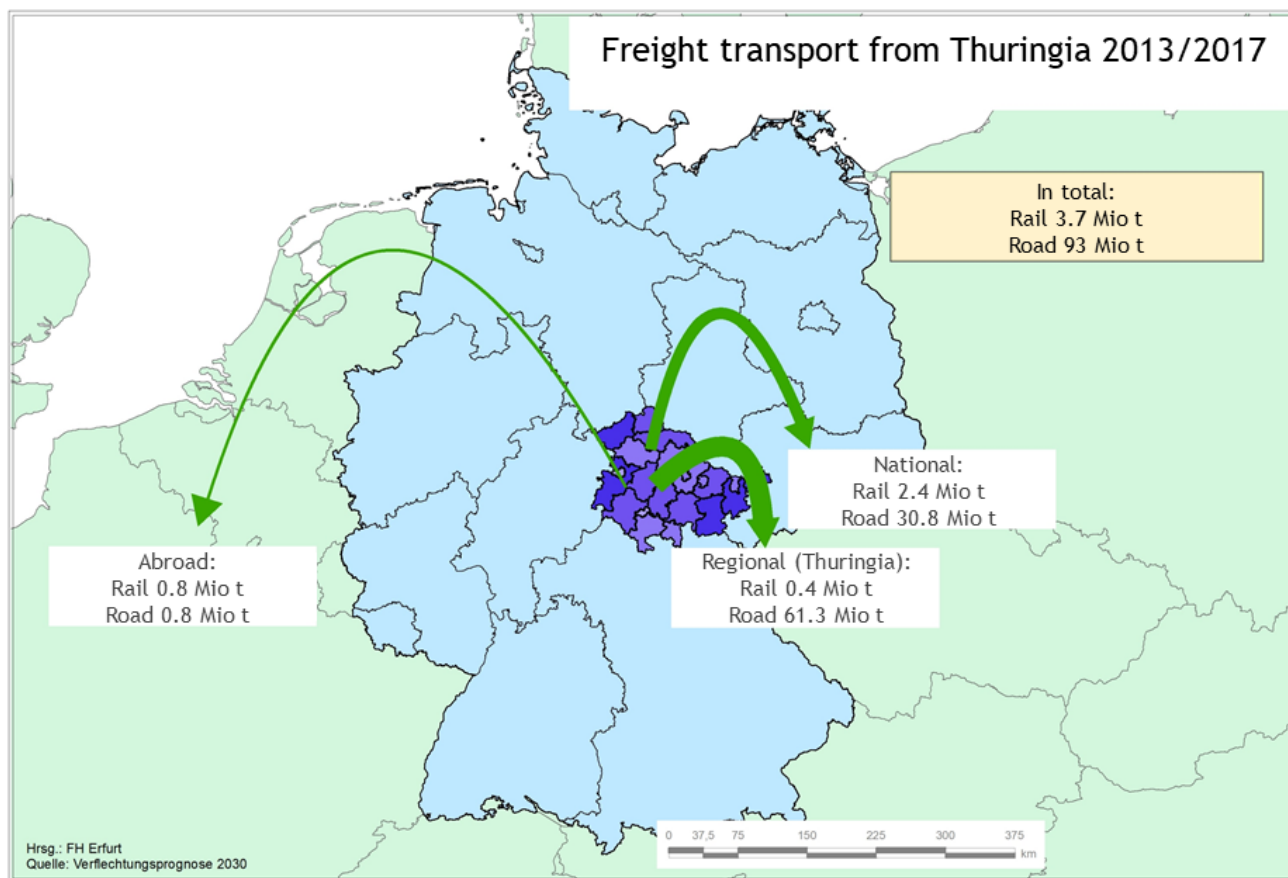


Figure 11: Freight transport from Thuringia (Rail 2017 and Road 2013), Source: own representation, adapted from Verflechtungsprognose 2030 and Statistisches Bundesamt 2017

	Rail	Road
Baden-Württemberg	168	1509
Bavaria	201	5398
Berlin	193	352
Brandenburg	122	1201
Bremen	123	201
Hamburg	319	389
Hesse	65	4001
Mecklenburg Western Pomerania	113	293
Lower Saxony	159	2456
North Rhine-Westphalia	312	2635
Rhineland Palatinate	287	643
Saarland	4	n/a
Saxony	38	5991

Saxony-Anhalt	300	5399
Schleswig Holstein	8	289
Thuringia	428	61269
<u>In total</u>	<u>2840</u>	<u>92168</u>

Table 3: Freight transport (inland traffic) from Thuringia (rail 2017 and road 2013) in 1,000t, Source: Statistisches Bundesamt 2017

Freight transport to Thuringia

The amount of freight transport to Thuringia is nearly the same as from Thuringia. In total approx. 93 Mio tons are received on road and 3.6 Mio tons on rail (table 4). The biggest amount of freight stays in Thuringia and is transported within the region (61.3 Mio tons on road and 0.4 Mio tons on rail). The region receives in Germany most of the goods on road from the neighbouring federal states plus North Rhine-Westphalia (table 5). On rail freight mostly comes from Saxony-Anhalt, Hamburg and Brandenburg. Transnational freight transport to Thuringia amounts only 0.7 Mio tons by railway and 0.8 Mio tons by trucks.

	Rail	Road
Total inland	2905	92661
Abroad	652	779
<u>In total</u>	<u>3557</u>	<u>93440</u>

Table 4: Freight transport to Thuringia (Rail 2017 and road 2013) in 1,000t, Source: Statistisches Bundesamt 2017

	Rail	Road
Baden-Württemberg	147	1317
Bavaria	105	5877
Berlin	25	242
Brandenburg	385	1246
Bremen	46	209
Hamburg	421	405
Hesse	51	3990
Mecklenburg Western Pomerania	74	222
Lower Saxony	198	2339
North Rhine-Westphalia	181	2896
Rhineland Palatinate	30	775

Saarland	24	n/a
Saxony	242	5932
Saxony-Anhalt	538	5634
Schleswig Holstein	9	178
Thuringia	428	61269
<u>In total</u>	<u>2905</u>	<u>92661</u>

Table 5: Freight transport (inland traffic) to Thuringia (rail 2017 and road 2013) in 1,000t, Source: Statistisches Bundesamt 2017

Regarding shipping, receiving and transshipment in Thuringia the biggest amount of freight transport on railway is registered in the latter (7,3 Mio tons). Shipping and receiving more or less balance each other with 3,6 Mio tons and 3,7 Mio tons (figure 9).

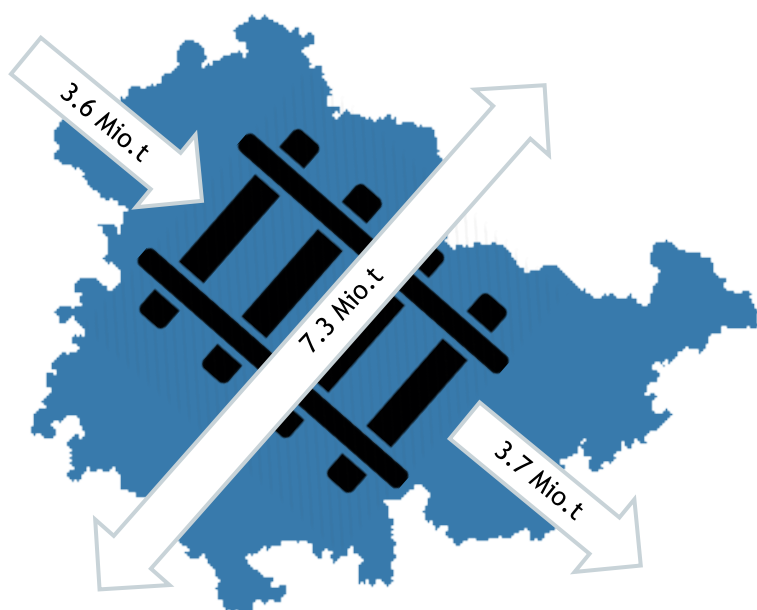


Figure 12: Shipping, receiving and transshipment on railway in Thuringia, Source: Own representation, based on Statistisches Bundesamt

Until 2030 a strong growth in transport performance will be expected in Germany. Towards 2010 the transport performance in freight traffic will increase by 38%.

The continuing high dynamic of international trade will have an impact on freight transport until 2030. Cross-border (+ 42%) and transit traffic (+ 52%) will increase significantly. Domestic traffic is also growing strongly (+ 31%). The railway will have the strongest increase in traffic performance with 43%, followed by the truck with 39% and the inland waterway vessel with 23%. The slightly stronger growth in railways compared to the road is due in particular to the development of combined transport (CT). The transport performance of the railway in the CT will increase by 74% by 2030.

In contrast to the whole country and especially the federal states in Western Germany, freight traffic in the federal states in East Germany will increase limited, in Thuringia not at all, thanks to the weaker economic

development. In road and in railway traffic no significant development becomes apparent until 2030 (table 6). Because of the characteristics of the network, inland waterway vessel is non-existent in Thuringia.

	Railway			Road			Inland vessel			In total		
	2010	2030	Growth rate p.a.	2010	2030	Growth rate p.a.	2010	2030	Growth rate p.a.	2010	2030	Growth rate p.a.
Thuringia	7,4	8,3	0,6 %	200,4	198,5	0,0 %	0,0	0,0	-	207,9	206,8	0,0 %

Table 6: Development of freight traffic in Thuringia by modes of transport (Shipping and receiving, in Mio. t), Source: Verkehrsverflechtungsprognose 2030

2.3. Analysis of the economic, political and technical market conditions

Thuringia has become one of the most dynamic regions with the highest growth rates. By high flexibility and innovation, small and medium-sized companies access quickly to new market developments and offer high employment security for their employees. Thuringia is now considered as top location in the centre of Europe. Life in Thuringia contributes to the feeling of well-being: Rich in quality of life, culturally diverse, family-friendly and modern.

From the viewpoint of an entrepreneur, Thuringia is the prime location in the heart of Europe. Departing from Thuringia no European destination is too far off (figure 10). Central position and modern traffic infrastructure qualify Thuringia as economic location.



Figure 13: Thuringia's central location in Europe, Source: LEG Thüringen

The economy in Thuringia is characterised by small and medium-sized enterprises in the manufacturing sector and several large corporations, like Jenoptik and Zeiss, Bosch and Siemens, Opel and BorgWarner. The concentration of manufacturing enterprises is quite different between the regions: The cities and their surroundings along the Thuringian string of cities are flourishing in means of industrial activities and source of zones. In addition, some regional centres in central and south-western Thuringia benefit of active industrial sites, such as Arnstadt or Schmalkalden. However, nearly all rural regions in the north and east of Thuringia suffer from a less-favoured economy situation with substantial unemployment.

Thuringia has developed positively since reunification and today has a balanced economic structure that is supported by a wide range of industries. Almost a quarter of the state's gross value added is generated in industry and with 81 industrial jobs per 1,000 inhabitants, Thuringia is well above the national average and far ahead of the other East German states.

Economic development has also led to a positive situation on the job market: Thuringia now has around 1.05 million employees, of whom a share of 805,000 are employees working under social security conditions.

The unemployment rate is significantly lower than in the other new federal states and is already almost at German average level. The downside of the good labor market development can now be seen in a significant shortage of skilled workers that affects large parts of the Thuringian economy.

To tackle the future challenges, the most important thing must be to use the profound change processes associated with digitalization and decarbonization to boost innovation in the Thuringian economy and the associated transport industry.

The Thuringian economy and the transport industry must become even more innovative, productive and international so that they can survive in the future with convincing offers in competition on the product markets in Germany and abroad and with attractive employment conditions even in the increasingly international competition for skilled workers.

Regional Innovation Strategy Thuringia

The regional innovation strategy for smart specialization (RIS3) for Thuringia is an innovative and participation-oriented strategy concept for the development of regions. The aim is to develop a strategy with which the region concentrates on its strengths and develops them further on the basis of an "entrepreneurial discovery process". RIS3 Thuringia has determined 5 fields of smart specialization with two of them important fields for transport of goods on rail.

Industrial production and systems

The specialization field "Industrial Production and Systems" is a mainstay of the Thuringian economy. With growing markets and numerous activities in different industries, this field contributes to almost half of the turnover in the manufacturing industry in Thuringia.

Thuringia has a strong entrepreneurial basis in the fields of manufacturing technology, plastics processing industry, machine and tool construction, measurement, control and regulation technology, micro and nanotechnology, optics / photonics, sensors and robotics as well as materials and material systems.

Sustainable and intelligent mobility and logistics

Thuringia has a long tradition and a lot of experience in vehicle construction. The range of offers includes e.g. high-tech sensors, the most advanced lighting technology and high-quality interior and body components. Experts for optimized internal combustion engines, manufacturers of components for hydrogen mobility as well as the largest battery cell manufacturing plant in Europe for electric vehicles use the advantages of Thuringia as a location.

The Thuringian industry benefits greatly from the local logistics industry. The central location of Thuringia in the heart of Germany and Europe, coupled with a modern road and rail infrastructure, has led to the establishment of well-known logistics and trading companies in recent years. It enables Thuringia to develop

its full economic strength, as logistics links raw material producers with processors, manufacturers with integrators, suppliers with customers like no other branches.

Besides these smart specialization fields of industry, Thuringia has two more industrial branches which are important in terms of freight transport on rail.

Wood and Paper industry

The Forest & Wood cluster is made up of all relevant economic sectors that live with and from the forest. These include forestry, sawmills and other wood processors, as well as woodworking.

With an annual gross value added of almost 1 billion euros, the cluster is one of the most important economic sectors in Thuringia.

The almost 40,000 jobs in the Forest & Wood cluster are of particular importance, almost two thirds of which are located in rural Thuringia. Smaller companies with up to 50 employees are at home here.

The varied use of wood plays an extraordinary role for these rather structurally weak regions. Against the background of declining population figures, forestry and timber industries secure employment and future prospects, especially in rural areas. Rail transport should play an important role in the forest and wood cluster especially if transport ranges are higher than 250km.

Ore, stones and earth industry

The ore, stones and earth industry is an important economic sector in Thuringia and the transport volume between 2009 and 2017 has increased by 10 million tons.

The stone and earth raw material potential in Thuringia is divided into the following raw material groups:

Gravel sand, sand/sandstone, limestone for the production of crushed stone and grit, hard rock (silicate rock) for the production of crushed stone and grit, gypsum and anhydrite stone, industrial and decorative stone, heavy ceramic raw materials (clay slate, clay and silt stone as well as clay and silt), raw materials for special purposes, cement raw materials, clay slate for the manufacture of crushed and ground products, clay slate for the production of light aggregates, dolomite stone, industrial limestone, clayey rocks, quartz sand and peat.

Potash and rock salt, natural gas and fluorspar are currently extracted in Thuringia in underground mines.

Development of Economy and Industry in Thuringia 2018

The upturn in the German economy continued in 2018 despite existing trade conflicts, possible consequences of a Brexit and global political risks - nevertheless at a slightly slower pace. This is also reflected in the growth of the Thuringian economy and especially in industry, and continues to have a positive impact on export, employment and the acquisition of investors in Thuringia.

In 2018, the 848 Thuringian industrial companies with 50 or more employees achieved record sales of 32.1 billion EUR and thus growth rate of 2.9 percent compared to the previous year. While domestic sales rose slightly by 159 million EUR to EUR 20.6 billion, export growth in the period was even 7.0 percent. An export quota of 36.0 percent was thus achieved. The highest sales were achieved in the automotive, metal processing, food, mechanical engineering, rubber and plastics industries as well as in electrical engineering/electronics and optoelectronics.

An average of 148,139 people were employed in the Thuringian industrial companies with 50 or more employees in 2018. That was 3,453 people or 2.4 percent more than in 2017. As a result, the headcount per company grew from 170.0 to 174.7 employees.

The job market in Thuringia is still at a stable level and at the end of December 2018 Thuringia still had the lowest unemployment rate in Eastern Germany (5.2 percent). It fell by a further 0.4 percent compared to the same month in the previous year.

Macroscopic trends

Reasons for the stagnation of the modal share of rail freight transport are diverse. Examples for favouring road traffic are the goods structure, logistics and integration effects. The trend goes towards more small-scale shipment of higher value goods and off large-scale bulk goods, like coal, mineral ores and oil (goods structure effect). Furthermore, logistics processes are integrated more and more in closely interconnected production processes, which requires more punctuality and flexibility and promotes the use of trucks (logistics effect). Finally, the integration effect implies the international opening and direction as well as division of labour which results in cross-border traffic with increasing amount of goods. Due to the system property of railway, traditional railway undertakings are therefore at a disadvantage when they are not positioned internationally.

2.3.1. European level

In 1993, the creation of a single market, more open to competition, has noticeably improved the exchange of goods. With the enlargement of the EU in 2004 and in 2007, the free movement of goods has further increased. Within this framework, ten policies are able to influence the European CT market actively:

- the Council Directive 92/106/EEC and its amendment (which is currently ongoing),
- the Council Directive 91/440/EEC, the Communication from the Commission about the Community guidelines on State aid for railway undertakings (2008/C 184/07),
- the Directive 2011/76/EU and its proposed revision,
- the Directive 2012/34/EU, the Regulation (EU) No 913/2010, the EUSALP and the
- White Paper on Transport (EC, 2011).

The White Paper on Transport (EC, 2011) sets a long-term strategy for the development of an integrated European transport system. The first version was released in 2001 (EC, 2001) and the updated version was released in 2011. In this version one of the goals is the shift of 30% of road freight over 300 km to rail and waterborne transport by 2030 and 50% by 2050. Two mid-term revisions of the White Paper have also been provided (EC, 2006; EC, 2015 a). In its final consolidated version, the White Paper underlines the importance of the TEN-T corridors as the main infrastructural elements that can guarantee a more balanced distribution of the traffic according to the different modes.

As far as freight transport is concerned, shipments over short and medium distances (below 300 km) will remain on trucks to a considerable extent. It is therefore important, besides encouraging alternative transport solutions (rail, waterborne transport), to improve truck efficiency, through the development and the uptake of new engines and cleaner fuels, the use of intelligent transport systems and further measures to enhance market mechanisms. Regarding longer distances, freight multimodality has to become economically attractive for shippers. An efficient co-modality is needed. The EU needs developed freight corridors, optimized in terms of energy use and emissions, minimizing environmental impacts. They need to be attractive for their reliability, limited congestion and low operating and administrative costs. The challenge is to ensure that structural changes enable rail to effectively compete and take a greater proportion of medium and long-distance freight.

The Directive 92/106/EEC on the establishment of common rules for certain types of transport of goods between Member States (MSs) aims at reducing the negative side-effects of goods transport on environment (such as CO₂ and other pollutant emissions) and on society (such as congestion, accidents, noise, etc.) by supporting the shift from long distance road transport to long distance by intermodal transport, including rail, inland waterways and maritime transport.

First, this Directive gives a definition of Combined Transport, which has to be adopted by all MSs. It also specifies, in the context of CT operations, who should have the right to carry out initial and/or final road haulage legs that may or may not include the crossing of a frontier (exempted from compulsory tariff regulations). Furthermore, it is indicated that MS should draw up necessary measures to reduce or reimburse road taxes by a standard amount, or in proportion to the journeys that such vehicles undertake by rail. However, the constant evolution of transport modes and their technology, as well as the change of the market dynamics make some parts of the directive outdated and require a conceptual revision. Hence, the EC in 2017 started the amendment of the CT Directive (EC, 2017 b), approving a public consultation, in order to increase regulatory efficiency and reduce costs and burdens.

The Directive 2011/76/EU amending Directive 1999/62/EC on the charging of heavy goods vehicles for the use of certain infrastructures advocates fair and efficient transport pricing. The first document sets common rules on distance-related tolls and time-based user charges (vignettes) for Heavy Goods Vehicles above 3.5t for the use of certain infrastructures. Toll may include an "external cost charge", which reflects the cost of air and noise pollution. It introduces a fundamental concept towards a fairer European transport at the political level, i.e. the internalization of the external costs. The social and environmental costs of transport must be paid in line with the "polluter pays" principle.

The proposed revision of the Eurovignette Directive, dated 31 May 2017, aims at addressing the shortcomings of existing legislation to a better fulfilment of the legislation's objectives. The terms proposed would simplify certain provisions, by redefining the variation of tolls based on Euro emission classes, and by eliminating cumbersome notification requirements. In addition, it is discussed about the inclusion of buses, passenger cars and vans in the scope of the Directive, thereby ensuring more consistent pricing of infrastructure use across the road transport sector. Furthermore, it is also proposed that road charges include Green House Gas emissions in a more consistent way.

The Council Directive 91/440/EEC of 29 July 1991 on the development of the Community's railways facilitates their adoption according to the needs of the single market. At the same time, they increase their efficiency by ensuring access to the networks of MSs for international groupings of railway undertakings and for railway undertakings engaged in the international CT of goods. It shall be granted access on equitable conditions to the infrastructure in the other MSs for operating international CT services.

The Community guidelines on State aid for railway undertakings (2008/C 184/07) emphasize how the rail transport has great potential for contributing to the development of sustainable transport in Europe. Underlining the importance of financial aids to support rail transport, they suggest aids both for railways undertakings and for purchase and renewal of rolling stock, setting also the rules to guarantee such aids at the national and local level. More in detail, the aids can take several forms: (a) aid for infrastructure use (i.e. granted to railway undertakings which have to pay charges for the infrastructure they use, while other undertakings providing transport services, based on other modes of transport, do not have to pay such charges); (b) aid for reducing external costs, designed to encourage a modal shift to rail because it generates lower external costs than other modes; (c) aid for promoting interoperability and to the extent to which it meets the needs of transport coordination, aid for promoting greater safety, the removal of technical barriers and the reduction of noise pollution in the rail transport sector; (d) aid for research and development in response to the needs of transport coordination.

The Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight points out the rules for the establishment and organization of international rail corridors. This regulation sets out rules for the selection, organization, management and the investments. So far, nine Rail Freight Corridors (RFCs) along European transport axes have been established.

The Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area lays down the rules applicable to the management of railway infrastructure and to rail transport activities of the railway undertakings established or to be established in a MS, the

criteria applicable to the issuing, renewal or amendment of licenses by a MS intended for railway undertakings which are or will be established in the Union and the principles and procedures applicable to the setting and collecting of railway infrastructure charges and the allocation of railway infrastructure capacity.

To summarize, the EU has defined (and continues to update) the framework and the objectives for the use of an efficient intermodal transport system. Furthermore, it provides recommendations, which each State has to adopt and to develop through a national legislation, as well as actions, measures and projects. However, the concrete promotion of intermodality and innovation in freight transport depends on the policies developed on the national, regional and local levels, as better explained in the next subsection.

2.3.2. National Level in Germany

At national Level in the Federal Republic of Germany a clear statement for strengthening the transport of freight on rails can be seen.

The German government has published special documents with agendas and promotion programs concerning this purpose. The most important ones are quoted below:

Masterplan Rail Freight Transport - Federal Ministry of Transport and Digital Infrastructure (BMVI)

The Master Plan Rail Freight Transport is the central strategic paper for the future of rail freight transport in Germany. It was introduced in 2017 with the aim to strengthen rail freight transport permanently and make it economically more attractive in comparison to other modes of transport.

Industry and politics are determined to tap the as yet untapped performance and development potential of rail freight transport, which can make a significant contribution to overcoming the transport and climate policy challenges. For this reason, they have agreed on a comprehensive package of measures with the master plan for rail freight transport, with the aim of permanently strengthening rail freight transport and offering the shipping industry more competitive and higher-quality rail transport services. The focus here is on:

- ensuring an efficient infrastructure,
- the comprehensive use of innovation potential and
- the improvement of the transport policy framework.

The master plan for rail freight transport therefore aims to achieve a permanent, demonstrable improvement in the competitiveness and logistics capability of rail freight transport.

Fields of action and milestones are:

1. Providing efficient infrastructure for rail freight transport,
2. Driving digitization of rail freight transport,
3. Automating rail operations more intensive,
4. Promoting technical innovations for rail vehicles, considering the economy and environmental performance of rail vehicles,
5. Strengthening multimodality and secure and expand access to rail,
6. Expanding electromobility on and by rail,
7. Significantly reduce train path and system prices,

8. Limiting taxes and duties,
9. Ensuring comparable standards of labour and social regulations and safety requirements for all modes of transport,
10. Forcing education and training.

Action Plan Freight Transport and Logistics - Federal Ministry of Transport and Digital Infrastructure

The Action Plan Freight Transport and Logistics pursues the strengthening of the logistics location of Germany, the preservation and modernisation of an efficient transport infrastructure, improved crosslinking of all modes of transport as well as the promotion of environmentally friendly and energy-efficient freight transport. In this regard, the Master Plan Rail Freight Transport shall be implemented, advantages of the European Rail Freight Corridors utilized, bottlenecks in rail eliminated and longer freight trains enabled. The action plan will regularly be edited depending on the status of implementation.

Federal Transport Infrastructure Plan (FTIP) 2030 - Federal Ministry of Transport and Digital Infrastructure

The German Federal Transport Infrastructure Plan 2030 is an important strategic instrument for the transport infrastructure planning in Germany for the next 10 to 15 years. It considers the existing network (141,6 billion federal funds) as well as expansion and reconstruction projects (98,3 billion federal funds) on road, rail and waterway. The core objective is the preservation of the existing network and the removal of bottlenecks on main axes and transport hubs.

It is stated that there has to be an efficient, safe and sustainable passenger and freight transport as well as a strengthening of freight transport and shift to rail and waterway. At the same time the intermodal cross-linking and interlocking shall be improved. Especially the different types of combined transport include the eco-friendly modes of transport rail and waterway. Therefore, the state supports financially the construction of transshipment terminals.

In Thuringia the expansion and new construction of the rail connection between Erfurt and Leipzig/Halle was funded as well as the connection Paderborn - Bebra - Erfurt - Weimar - Jena - Glauchau - Chemnitz. Furthermore, current projects are the expansion of the node Erfurt and the rail connection Nürnberg - Erfurt.

Strong traffic growth increases the need for maintenance and expansion:

Transport performance in passenger transport in Germany will increase by a total of 12.2% by 2030 compared to 2010. According to the 2030 traffic forecast, this corresponds to an annual growth of 0.6%. Transport performance in freight transport is expected to increase significantly more strongly in the same period at 38%.

Thus, there is a need for expansion and new construction projects at many points in the network. Current forecasts of the need to maintain or replace the transport infrastructure also show that in the future significantly more money will have to be invested than in the past in order to maintain the existing transport network at a high level.

Efficient transport networks are the top priority:

The FTIP 2030 primarily aims at those goals of transport policy that can be influenced by the further development of the transport infrastructure.

Smooth mobility in passenger transport and efficient freight transport are fundamentally dependent on efficient route networks. They are the central prerequisite for an unimpeded flow of traffic on all modes of

transport. Aspects of traffic safety as well as climate, environmental and noise protection are also reflected in the FTIP assessments.

Strengthening freight traffic:

Due to its location in the middle of Europe, the expected increase in traffic in Germany leads to a disproportionate increase in freight traffic, in particular transit and seaport hinterland traffic. In order to cope with this growth, the federal government also supports freight traffic beyond the FTIP projects. The transport of goods should be more efficient and the growth of freight transport should be shifted as much as possible to the more environmentally friendly modes of transport, rail and waterways.

At the same time, the intermodal networking and integration of modes of transport should be improved. Combined transport optimizes the networking of modes of transport and enables the more environmentally friendly modes of transport, rail and waterway, to be included in the logistics chains. The federal government therefore supports the construction of transshipment facilities of non-federally owned companies with up to 80% of the eligible investment costs as well as the transshipment facilities of Deutsche Bahn AG via the federal rail route expansion law. The handling facilities built with the aid of the Funding Guideline for Combined Transport alone enabled around 14,000 truck trips or approx. saved 5.7 million truck-kilometres per day in the year 2013.

The Federal Government has also set itself the general goal of strongly supporting the logistics sector. Against this background, the Action Plan for Freight Transport and Logistics was further developed i. a. with a strategy for clean, energy-efficient freight transport. The action plan pursues the strengthening of Germany as a location for logistics, the maintenance and modernization of an efficient transport infrastructure, the better networking of all modes of transport and the demand for environmentally friendly and energy-efficient freight transport. It also contributes to securing young talent and maintaining good working conditions in the Transport industry. The action plan is regularly revised with a view to the implementation status of the measures. The first update was published on the BMVI website in June 2016.

In the past, the Seaport-Hinterland-Traffic (SPHT) emergency program was able to implement numerous smaller measures on the rail mode of transport with a capacity-increasing effect in the rail network with a relatively small amount of funds, thereby strengthening rail freight transport. The program will therefore continue in two tranches as SPHT II until 2020 in order to specifically eliminate further bottlenecks.

Promotion of handling facilities of Combined Transport (CT) - Federal Ministry of Transport and digital Infrastructure

Combined Transport (CT) is a special form of freight transport in which loading units (containers, swap bodies or truck semitrailers) are transported over long distances by rail or waterway.

The truck is only used on the shortest possible route to transport the loading units to a CT handling facility or to pick them up from there and take them to the unloading location. The handling facilities are the interfaces of the CT. With suitable cranes or other loading equipment, the loading units change modes of transport.

Invest in CT handling systems:

Forecasts predict that freight traffic in CT will increase by 79.3 percent from 2010 to 2030. The previous CT handling facilities will not be able to handle this volume. Investments in the construction and expansion of transshipment facilities of the CT are urgently required.

Since 1998, private-law companies have been able to receive financial subsidies for the construction and expansion of transshipment facilities for combined transport through federal funding. The amount of the grants is up to 80 percent of the eligible plant components.

Feasibility study for the digitization of the rails - Federal Ministry of Transport and digital Infrastructure

The rail network in Germany shall be digitized based on the results of a study commissioned by the BMVI. This could result in an increase in capacity of up to 20 percent in passenger and freight transport. This would create the prerequisites to be able to absorb the growing volume of traffic in Germany. With the "Digital Rail Germany" program, the entire rail sector wants to promote the nationwide introduction of new control and safety technology (ETCS) and digital interlockings in the 33,000 km rail network.

According to the study, the effects result in a positive overall economic benefit:

- Increased reliability - new technology and systems for quality and punctuality
- Increasing capacity on the rails - gathering of traffic growth and possibility of shifting traffic off the road
- Increased energy efficiency and reduced CO2 emissions - energy-saving control and shift to rail
- Reduction of operating costs - in maintenance and operation
- Ensuring demographic stability - coping with the age and fluctuation-related reduction in the number of operating personnel
- Limitless rail traffic - European interoperability of the systems

Innovation Program Logistics 2030 - Federal Ministry of Transport and Digital Infrastructure

In 2019 the Federal Ministry of Transport and Digital Infrastructure presented the Innovation Program Logistics 2030. It aims at strengthening and extending Germany's global top position as logistics location. Within the program 10 fields of measures for a vision of the logistics sector in 2030 were developed. Concrete measures for innovation, modernization and digitization are presented which shall support freight transport and logistics in the future. The different areas for action and fields of measures are the following:

ACTION AREA 1:

Digital infrastructures, data processing and platform solutions

Goals:

- Germany's development into the lead market for 5G!
- Ensuring high-performance mobile phone coverage that enables mobile telephony and data usage across the board!
- Anchoring the open data principle in the entire business area of the BMVI and providing all data of the business area for which there are no restrictions, for example due to data protection regulations!
- Creation of a future-proof and flexibly expandable data exchange infrastructure, through which innovative new information offers in the field of mobility and logistics can easily be supplied with the available data offers!
- Strengthening Germany as a location for innovation by establishing a start-up culture!
- Use of distributed ledger technologies (blockchain etc.) to make Germany a driving force of these basic technologies!
- Use of artificial intelligence (AI) in the context of innovative applications in logistics!

ACTION AREA 2:

Cross-mode digital transport management Supply Chain Digital

Goals:

- Improving the digitization of the modes of transport by rail, road, waterway, sea and air!
- Development of digital business models and open, user-oriented platform economies with common standards involving small and medium-sized companies!
- Creation of suitable data interfaces to enable communication and the data protection-compliant exchange of information between authorities and companies electronically!
- Promotion of neutral platforms and blockchain solutions that enable transparent and secure information flows across a global supply chain!
- Expansion of distributed ledger technologies!
- Providing comprehensive information for everyone involved in the transport chain about the availability of modes of transport, terminals and means of transport!
- Development of sensors for digital communication from the goods themselves to those involved in transport chains (terminals, modes of transport, etc.) or development of artificial intelligence systems that can digitally identify goods and communicate the relevant information to those involved in the transport chain!
- Further development of platforms for mobility data such as mCLOUD or Mobility Data Marketplace (MDM)!
- Consistent open data policy with a focus on real-time data while securing data protection and cybersecurity!

ACTION AREA 3:

Professional world of the future

Goals:

- Consistent improvement of working conditions in all logistics professions!
- Increase in the proportion of women in the logistics professions!
- Political support for measures to improve the image of logistics and to increase the attractiveness of professions in the logistics industry!
- Improvement of training and qualification and adaptation to modern requirements!
- Securing young talent by consistently implementing the measures in the master plans for rail freight and inland waterway transport!
- Working towards easier access requirements, for example in the language regime for international rail freight transport in Europe!
- Shortening waiting times and improving the social framework for truck drivers at loading docks and in handling facilities!

ACTION AREA 4:

With innovative freight transport on a climate protection course

Goals:

- Strengthening the environmentally friendly mode of transport by rail and increasing its share of the modal split and its performance, economy and social acceptance!
- Increasing the electrification rate of the rail network and launching new drive systems for rail vehicles with batteries and fuel cells for non-electrified lines!

ACTION AREA 5:

Networked transport world

Goals:

- Increasing the attractiveness and competitiveness of rail and inland waterways!
- Improve conditions for more multimodality!
- Build or expand CT handling facilities in sufficient quantities so that the growth in CT forecast by 2030 can be managed! To process the envelopes as quickly as possible and to reduce the length of stay of all means of transport, digitize CT terminals and automate the operation increasingly!
- Establishment or expansion of multimodal rail access points close to customers and in the immediate vicinity of transport hubs!
- Ensuring comprehensive information for everyone involved in the transport chain about the availability of terminals and means of transport!
- Novel and efficient transport and handling systems that can complement the existing ones are implemented!

ACTION AREA 6:

Smart rails, intelligent trains

Goals:

- Significant increase in rail's market share!
- Improving the economic efficiency of rail freight transport and improving the attractiveness and competitiveness of rail transport compared to the road!
- Targeted expansion of the rail infrastructure!
- Increasing the electrification rate of the rail network!
- Increasing digitization and automation of rail freight transport!
- Improving the efficiency and logistical ability of rail transportation!
- Expansion and maintenance of track connections!
- Increasing the utilization and effectiveness of shunting systems!
- Introduction of the digital automatic clutch across Europe!
- Advancing the development of innovative freight cars and an intelligent freight train!
- Promotion of targeted railway research!
- Accelerated establishment of innovations in the rail freight market!
- Increased acceptance among the population through noise prevention and noise reduction!
- Further improve of energy efficiency and environmental friendliness of rail freight transport!

ACTION AREA 7:

Smart ports and waterways

ACTION AREA 8:

Innovative air freight

ACTION AREA 9:

Street of the future

ACTION AREA 10:

Paths on the last mile

Goals:

- Development of logistics concepts in the municipalities and counties for the last mile!
- Increased integration of rail freight and inland waterway transport in the supply of goods at close range and linkage of delivery traffic with rail nodes and ports!
- Use of public transport vehicles and train stations for freight transport!
- More efficient design of logistics services in rural areas while ensuring supply!
- Consideration of the requirements of multimodal logistics in the spatial and land use planning and securing of the necessary areas in the plans!

Railway Siding Funding Guideline (Promotion of private sidings - Federal Ministry of Transport and Digital Infrastructure / Federal Railway Office)

Guideline for the promotion of new construction, expansion and reactivation of private sidings

In order to shift more freight traffic from road to rail, the federal government has been promoting the construction, expansion and reactivation of private sidings since 2004. The current sidings subsidy guideline has been in effect since January 31, 2017 and will expire on December 31, 2020.

On the basis of the sidings subsidy guideline, the federal government grants companies in private legal form for the construction of new sidings, for reactivating closed or no longer used sidings and for expanding existing sidings. With this funding program, the federal government intends to shift parts of freight traffic from the road to the environmentally friendly mode of transport by rail.

Up to 50 percent of the eligible capital expenditures are paid as a non-repayable subsidy for the construction, expansion and reactivation of a siding. The maximum allowance per tonne per year or per 1,000 tonne-kilometers of rail freight transport achieved is up to 8 euros per tonne or up to 32 euros per 1,000 tonne-kilometers. For light goods, the funding amounts to 220 euros per freight wagon and 90 euros per 100 freight wagon kilometers.

An essential prerequisite for the financial support is that the companies undertake to transport a certain additional freight volume (additional traffic) by rail connection within the funding period. If this freight volume is not reached, the grant must be repaid proportionately.

VDV Railway Siding Charter - Verband Deutscher Verkehrsunternehmen e.V.

The Railway Siding Charter was developed by associations and organisations out of industry, commerce, logistics and public institutions in 2019 with the aim to focus in the transport political discussion more on the key role of railway sidings, customer-oriented access points and regional railway infrastructure. For this purpose, it takes efficient transport systems in Combined Transport and in Single Wagonload Transport. The charter defines central demands for politics, economy and logistics that complement respectively specify the Master Plan Rail Freight Transport. These demands are the following: Central requirements of the charter:

- Reduce bureaucracy and simplify regulations
- Improve sidings support
- Reduce costs for connection to the public network
- Secure upstream infrastructures and make them more efficient
- Ensure the operation of track connections and customer-oriented access points
- Expand and secure public loading plants
- Link commercial areas to rail and secure areas
- Strengthen trimodal / multimodal nodes
- Promote multimodality
- Create new transport concepts with the integration of track connections
- Advancing innovations on the "first / last mile" (digitization, automation, modern locomotives)
- Increase interest in own sidings

Strategy program "Strong Rail" - Deutsche Bahn AG

Deutsche Bahn has a fundamental objective: getting more traffic on the rails - for the climate, for people, for the economy and for Europe. With its core strategy "Strong Rail" the conditions for a strong rail in Germany are created.

Climate change and growing traffic volumes mean that rail will become more important in the coming years. In order to limit global warming, a massive shift from traffic to climate-friendly rail is necessary.

Growing trade flows also lead to more freight traffic. By 2030, an increase of more than 20 percent is expected - quantities that cannot be managed by the roads. That is why rail freight transport is becoming increasingly important. A smooth transport of goods across European borders is crucial for the economy of Germany and Europe. But rail does even more here: it enables exchanges within Europe and is therefore an important factor for the communication and cooperation on the continent.

Specifically, Deutsche Bahn has set itself these goals:

FOR THE CLIMATE

Reduction of CO₂ emissions by 10.5 million tons annually by shifting traffic to rail.

FOR THE PEOPLE

A doubling of the number of passengers in long-distance rail passenger transport means five million fewer car trips a day and 14,000 fewer air trips in Germany.

FOR THE ECONOMY

Increase of market share of rail freight transport from 18 to 25 percent. This corresponds to 13 million fewer truck trips per year on German roads.

On the most important European corridors the supply in rail freight transport will be extended und the number of daily round trips increased. In the terminals for Combined Transport, Railports, facilities for train composition and rail transport stations the DB trusts on new technologies for efficient and speedy processes. Digital platforms facilitate the costumers the booking of transports and the tracking of shipments.

FOR EUROPE

Realization of European networking through a strong railway.

Federal future rail freight transport program to promote innovation (Z-SGV) - Federal Ministry of Transport and Digital Infrastructure

The federal government grants for the testing and market launch of innovative rail freight transport technologies in the areas of digitization, automatization and rail vehicle technology.

The aim of the grant is to make rail freight transport more competitive. For this purpose, an innovation boost in rail freight transport is to be achieved, e.g. with the Digital Automatic Coupling (DAC). This means that innovative technologies that make rail freight transport more competitive are ready for use as soon as possible and a push for market launch is given. The federal government grants are intended to shift freight traffic to rail. Rail's market share in total freight transport in Germany is expected to increase and single wagon traffic to be strengthened.

The funding comprises various stages of development, which are grouped into two funding lines within the framework of this funding guideline: On the one hand, the testing of innovative technologies in the context of test fields and pilots or demonstrators (funding line 1), and on the other hand there is the market launch of innovative technologies (funding line 2).

The guidelines for this funding program apply from May 19, 2020 to December 31, 2024.

Coal exit creates space in rail transport

While more and more goods are on the roads and rails, the transportation of coal collapses - also thanks to renewable energies. The coal phase-out will create a lot of space for climate-friendly freight transport by rail.

Whether food, consumer goods or industrial products - freight traffic is growing almost everywhere. In 2018, a total of 4,441.9 million tons of goods were moved in Germany - on land, on water and in the air. That is an increase of one percent compared to 2017. A further increase in freight transport is expected in the coming years, as the consulting company Intraplan Consult predicts in an analysis commissioned by the Federal Ministry of Transport. But while machines and other durable consumer goods, for example, show a strong plus of 5.9 percent, the transport volume of coal, crude oil and natural gas drops sharply.

The transportation of fossil energies in 2018 showed a minus of 9.5 percent compared to 2017. While the transportation of natural gas is stagnating, the decline is primarily due to the falling demand for coal and crude oil.

The declining transport volume of coal can be attributed to several reasons. This primarily concerns hard coal, whose primary energy consumption fell by 11.2 percent in 2018. A mild winter and increased energy efficiency in all sectors reduced the demand for fossil fuels. Added to this is the expansion of renewable energies, which now accounts for almost 50 percent of German electricity generation. The generation of electricity from hard coal also pays less and less due to the lack of subsidies.

In the first half of 2018, coal shipments even fell by 16 percent, and the overall decline leveled off to around eight percent in 2018.

In Germany, the federal government set up the Commission for Growth, Structural Change and Employment in June 2018, which was to draw up a plan and a date for a coal phase-out. On January 26, 2019, the coal commission decided to phase out coal by 2038 at the latest.

The forecast decline in hard coal transport will primarily affect rail transport in the future, since coal is only moved by ship or train. There is an opportunity here for a fundamental restructuring of freight transport. When Germany leaves coal, this will also have a positive impact on rail freight transport. Capacities are freed up for climate-friendly freight transport by rail, i.e. for goods that currently still produce emissions and traffic jams on the roads with trucks.

2.3.3. Regional Level in Thuringia

In order to avoid the expected traffic burden on the road, the Free State of Thuringia is relying on an integrated transport concept for freight transport, in which the various forms of transport are efficiently linked. The rail bound freight transport has to take over a huge portion of the growth. A key prerequisite is the investments in rail infrastructure made till today in Thuringia like new and expanded construction measures, e.g. VDE 8. VDE 8 is a group of rail projects to close infrastructure and capacity gaps between East and West Germany from Nuremberg to Berlin through Erfurt. Another important contribution to the strengthening of rail transport is also possible through the sound competition of railway companies. Here, in particular, further measures to promote competition on the rail network by the Federal Government and the European Union are required. Freight transport policy can only shape the investment and regulatory environment, while transport companies are responsible for providing modern, customer-friendly services. The freight transport hubs and the combined transport have an important role in this process. At least for Long Distance Freight Transport rails have the chance to cooperate successfully with road transport and gain a higher share from the transport market. To support this the freight transport hub Thuringia has been developed. The hub is conveniently located and close to the state capital and the main road and rail links including the new line trans-European high-speed rail VDE 8.1 and 8.2 which in the future can be used for the fast freight transport from southern and south-eastern Europe through the eastern federal states to Scandinavia.

At regional Level in the Free State of Thuringia the government has positioned itself clearly for strengthening the transport of freight on rails. This is recorded in the coalition agreement of the governing coalition in Thuringia.

Coalition agreement between the parties DIE LINKE, SPD and BÜNDNIS 90/DIE GRÜNEN Thuringia 2020

The state government is committed to reactivating disused railway lines for passenger and freight transport. These include i.a. the Werra Railway, the Höllentalbahn, the Rennsteigbahn, the Ohratalbahn and the Pfefferminzbahn.

Furthermore, the Free State is working towards an accelerated double-track expansion with electrification of the central Germany rail link and is committed to the electrification of further railway lines in Thuringia.

The Round Table Freight Transport will be continued with the aim of increasing again the potential for freight transport by rail i.a. by more railway sidings for freight.

Regional Development Program Thuringia (LEP Thüringen 2025)

The Regional Development Program Thuringia 2025 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 ThürLPIG (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 transshipment 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 transportrelated

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 transshipment. A determination of location areas for freight loading points without proven freight potential is not possible.

2.4. Analysis of the industrial structure and clusters (potential customers)

In Thuringia exists a wide range of industrial branches. No branch is particularly dominant (figure 11). The machine and vehicle construction is the strongest in terms of sales. But metal processing, the food and electronics industries follow closely behind.

Except in vehicle construction, there are few rail-related goods such as bulk goods and chemical primary products in the industries with the highest sales. The paper industry and stone and earth processing industries, which rely more heavily on rail-bound freight transport, are only ranked 6th and 7th in the industry ranking.

These may be one reason why the share of rail freight transport in total freight transport in Thuringia is currently so small. If, in the future, technical and organizational innovations make single-wagon transport and combined transport more competitive, the industrial sectors dominating Thuringia will also shift more freight transport to rail.

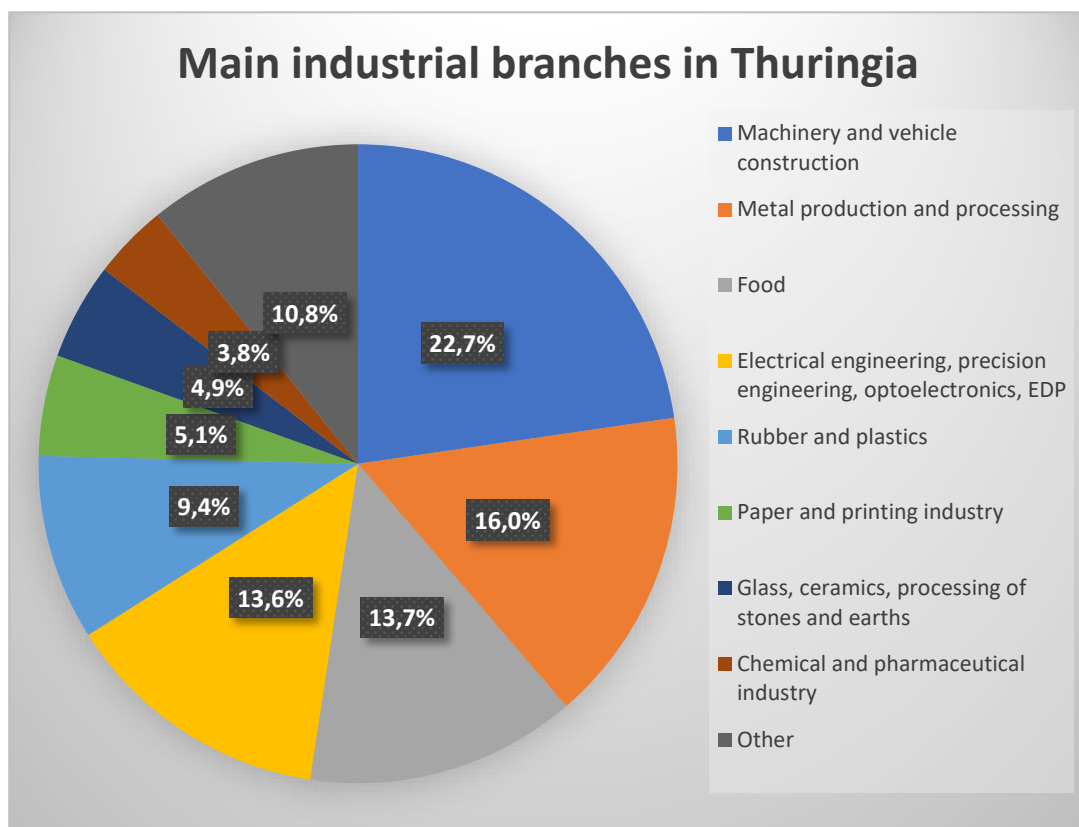


Figure 14: Main industrial branches (volume of sales) in Thuringia 2013, Source: Thüringer Landesamt für Statistik

Regarding major logistic hubs in Thuringia especially the area around Erfurt with the multimodal transport hub Erfurter Kreuz and the freight village in Erfurt (GVZ Erfurt-Vieselbach) needs to be mentioned. It is the only freight village in Thuringia and has with 218 ha nearly three times the size than the second largest international logistic centre in the capital. From 1992 on the area was planned with a sponsored access for traffic in 1993 and the settlement of first companies in 1995. Since 1999 the freight village has besides the access to the motorway its own railway terminal for combined transport (see DUSS Terminal Erfurt-Vieselbach). Today more than 20.000 shipment containers are transhipped from road to rail in the terminal each year. Additionally, i.a. BLG, the logistics provider of IKEA, profits from its own railway siding in the terminal. Besides various wholesalers and logistic companies, also productional companies have found themselves located in the area (in total around 85 today).

With a significant gap to Erfurt follow the medium sized towns and centres Eisenach, Jena and Gera as well as several motorway corridors as logistic areas in Thuringia.

The following large industrial areas in Thuringia with high structural and supraregional importance are bindingly defined in the Regional Development Program Thuringia (figure 12). These industrial sites have at least a surface of 20 ha and an existing or a potential rail connection to railway freight transport. They are spread nearly all over Thuringia, but mostly along the Thuringian string of cities.

1. Altenburg/Windischleuba
2. Andislebener Kreuz
3. Artern/Unstrut
4. Bad Langensalza
5. Eisenach-Kindel
6. Eisfeld-Süd
7. Erfurter Kreuz
8. Gera Vogelherd/Cretzschwitz
9. Grabfeld/Thüringer Tor
10. Hermsdorf Ost III
11. Hermsdorfer Kreuz/Schleifreisen
12. Hildburghausen Nord-Ost
13. Hörsel (Waltershausen/Hörselgau)
14. Hörselgau/Marktal
15. Industriegroßstandort Ostthüringen (Gera/Ronneburg)
16. Leinefelde-Worbis
17. Merkers
18. Nordhausen „Goldene Aue“
19. Ohrdruf/Gräfenhain
20. Sömmerda/Kölleda
21. Sömmerda/Rohrborn
22. Sonneberg/Rohhof
23. Triptis-Nord II

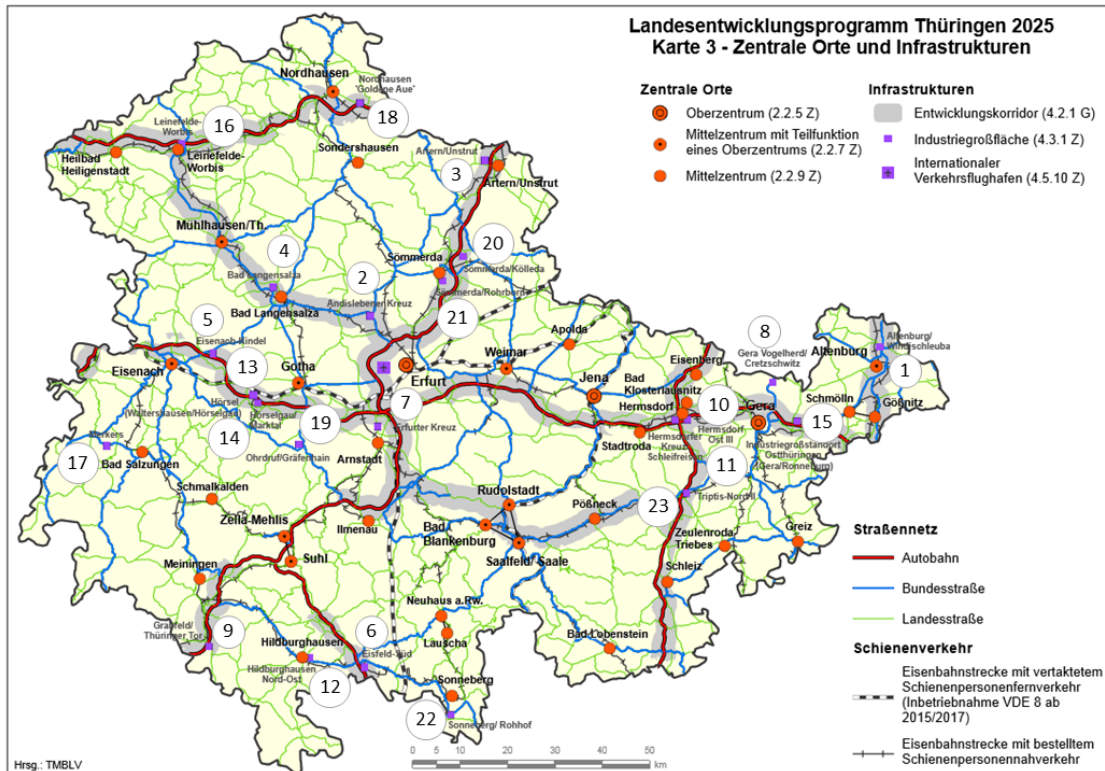


Figure 15: Location of large industrial areas in Thuringia, Source: own representation, based on Landesentwicklungsprogramm Thüringen 2025

Due to the fact that destinations of shipments are not always accessible by rail, transshipment from rail to road, or vice versa, offers a suitable alternative. Alongside intermodal terminals (for combined transport), loading points are of particular significance in this regard. DB Netz AG therefore offers its customers a Germany-wide network of loading points. It currently operates around 400 loading points of which 13 are in Thuringia (figure 13). The loading points operated by DB Netz AG enable access costumers to tranship their goods from road to rail and vice versa. The configuration of the loading point can consist of various components depending on the local circumstances. Loading points are variously configured:

- End-loading platform (goods transhipped at the same level),
- Side-loading platform (goods transhipped at the same level),
- Loading lane/loading track

Loading points are extended, where necessary, by additional facilities (e.g. power connection), lighting or access roads.

The loading points (track, road, ramp) in Thuringia are the following:

- **Altenburg** (One loading track, single sided, 325 m)
- **Arnstadt Hbf** (Two loading tracks, single sided, 2 x 230 m)
- **Bad Salzungen** (One loading track, single sided, 650 m)
- **Ebersdorf-Friesau** (One loading track, double sided, 240 m)
- **Eisenach** (One loading track, single sided, 250 m)
- **Erfurt Gbf** (One loading track, single sided, 300 m)

- Gera Hbf (Three loading tracks, single sided, 170 m, 308 m, 130 m)
- Immelborn (One loading track, double sided, 189 m)
- Leinefelde (One loading track, single sided, 465 m)
- Lobenstein (One loading track, single sided, 191 m)
- Nordhausen (Three loading tracks, single sided, 58 m, 52 m, 45 m)
- Saalfeld/Saale (Two loading tracks, single sided, 350 m, 300 m)
- Themar (Two loading tracks, single sided, 285 m, 200 m)
- Walldorf (Werra) (One loading track, single sided, 351 m)

Additionally, there is a distributed network of approx. 80 further private sidings in Thuringia which are not all listed and collected. 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). 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.

Between 2004 and 2018 only 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.

Two container terminals for combined transport (intermodal transport) complete the network access points in the region:

DUSS Terminal Erfurt-Vieselbach (EV)

The terminal in Erfurt-Vieselbach opened in the mid-1990s with a takeover by DUSS in 2003. Due to the successful settlement of companies and industries in the surroundings the transshipment volume increases continuously. Together with freight forwarders and CT-operators flexible solutions mainly for the local furniture storage sector are realised in the terminal. Since implementing a second gantry crane in 2007 the terminal has an improved infrastructure, but nevertheless operates at capacity limit. In the future the terminal and infrastructure of the site will be still developable if the demand for intermodal transport operations in the region will continue to increase. Measures for expansion are in progress.

The terminal is connected to the main railway line Halle/Erfurt-Berlin via the station Vieselbach and via the regional road network to the autobahn A4 to all directions.

The opening hours are from Monday to Friday 5 am to 9 pm and Saturday from 5 am to 12 pm.

Handling of: Container, Swap Body, Semitrailer

Rails: 3 x 370 m, total number of tracks: 3, total usable length: 1110 m

Gantry Cranes: RMG (Rail mounted Gantry Cranes), Rail: 1 x 35 t / 25 handlings per hour, Rail: 1 x 38 t / 30 handlings per hour

Reachstackers: 1 x 35 t / 15 handlings per hour

Interim Storage: Capacity: 96 TEU

Depot: Capacity: 120 TEU

Dangerous goods: possible

Captrain-Terminal Eisenach

Up to 120 container and swap container with a length of 20 to 45 feet and an overall weight of up to 35 tons are transhipped daily. The terminal in Eisenach is equipped with modern transshipment machines and can also deal with semitrailers. The opening hours are from Monday to Friday 6 am to 10 pm and Saturday as required.

Number of rails: 2

Length of rails: 210 m / 244 m

Dangerous goods: possible

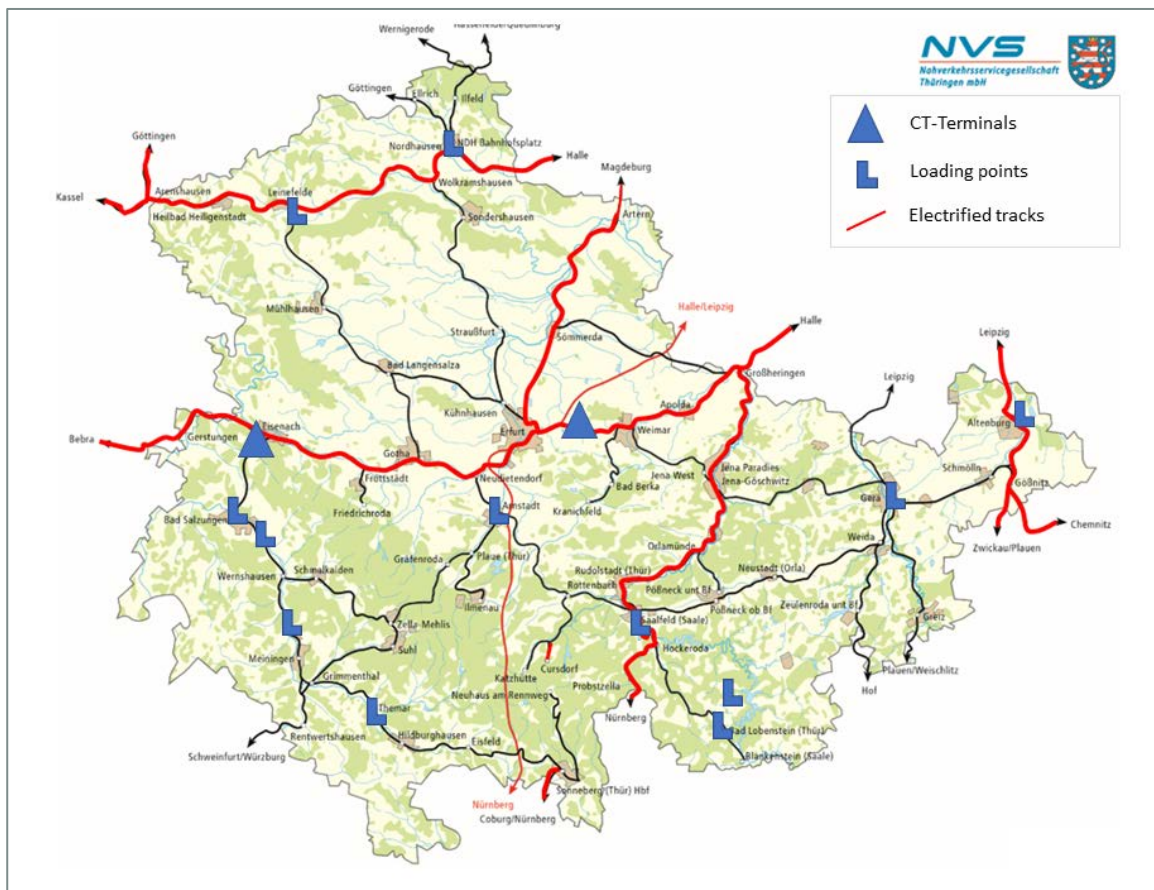


Figure 16: Loading points of DB Netz AG and Container Terminals in Thuringia, Source: own representation, adapted from Nahverkehrsservicegesellschaft mbH Thüringen 2011 and railway.tools, DB Netze



	Shipping		Receiving	
	Rail	Road	Rail	Road
Products of agriculture, forestry; fish and fishing products	419	5868	324	4687
Coal and lignite; crude petroleum and natural gas	279	n/a	543	n/a
Metal ores and other mining quarrying products; mining products	358	35180	255	34697
Food products, beverages and tobacco	0	7950	0	7940
Textiles and textile products; leather and leather products	0	155	0	224
Products of wood; paper and paper products; printed matter	456	4057	177	4476
Coke and refined petroleum products	29	1354	656	2398
Chemical products etc.	4	3259	91	3755
Other non-metallic mineral products (glass, cement, plaster etc.)	1028	10179	24	9130
Basic metals; fabricated metal products	559	2765	293	3390
Machinery and equipment, household appliances, etc.	1	1059	0	1199
Transport equipment	201	2054	420	1555
Furniture; other manufactured goods etc.	0	573	0	398
Secondary raw material	137	8488	461	9379
Mail, parcels	0	1535	0	1137
Equipment and material utilized in the transport of goods	25	2043	2	2230
Removal goods and other non-market goods	0	2060	0	1992
Grouped goods	0	4235	0	3947
Unidentifiable goods	188	n/a	189	n/a
Other goods n.e.c. ¹	24	0	119	0
In total	3705	93039	3557	93440

Table 7: Freight transport (shipping and receiving) by modes of transport (rail 2017, road 2013) and group of goods (NST-2007) in Thuringia in 1,000t, Source: Statistisches Bundesamt 2019

¹ Not elsewhere classified

The five most important product groups account for more than ¾ of the rail goods shipped in Thuringia. This is a good reflection of the rail-related industries located here. The chemical and mineral industry is the strongest.

Although there is only one steelwork in Thuringia, metals and metallic products follow in second place. No major increases are to be expected in this field.

The fact that agricultural and forestry products as well as consumer goods and wood products follow can be attributed to the widespread agriculture and the relatively strong wood production and wood processing in the region.

Potash mining and quarries mainly serve the ore, stone and other mining products category in Thuringia. Therefore, the decision to phase out coal by 2038 will not play a major role in the transports from Thuringia.

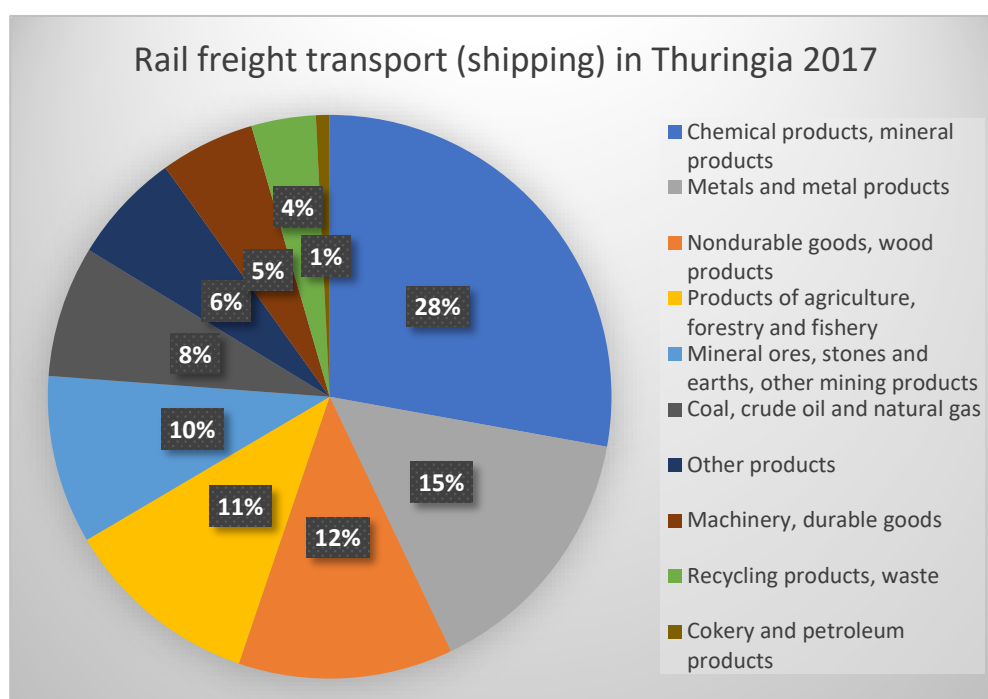


Figure 17: Rail freight transport (shipping) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt

Chemical products, mineral products	1,032,000t
Metals and metal products	559,000t
Nondurable goods, wood products	456,000t
Products of agriculture, forestry and fishery	419,000t
Mineral ores, stones and earths, other mining products	358,000t
Coal, crude oil and natural gas	279,000t
Other products	237,000t
Machinery, durable goods	201,000t
Recycling products, waste	137,000t
Cokery and petroleum products	29,000t
In total	3,705,000t

Table 8: Rail freight transport (shipping) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt

Rail freight transport with Thuringia as destination is dominated by substances for energy generation and processing in the chemical industry. As renewable energy sources advance, carbon-based energy transport will decrease. If hydrogen technology develops positively, hydrogen could fill this gap in the future.

Machines and durable goods are underrepresented in terms of their share of total freight traffic. This proportion can be increased with new technologies for loading and single wagon management.

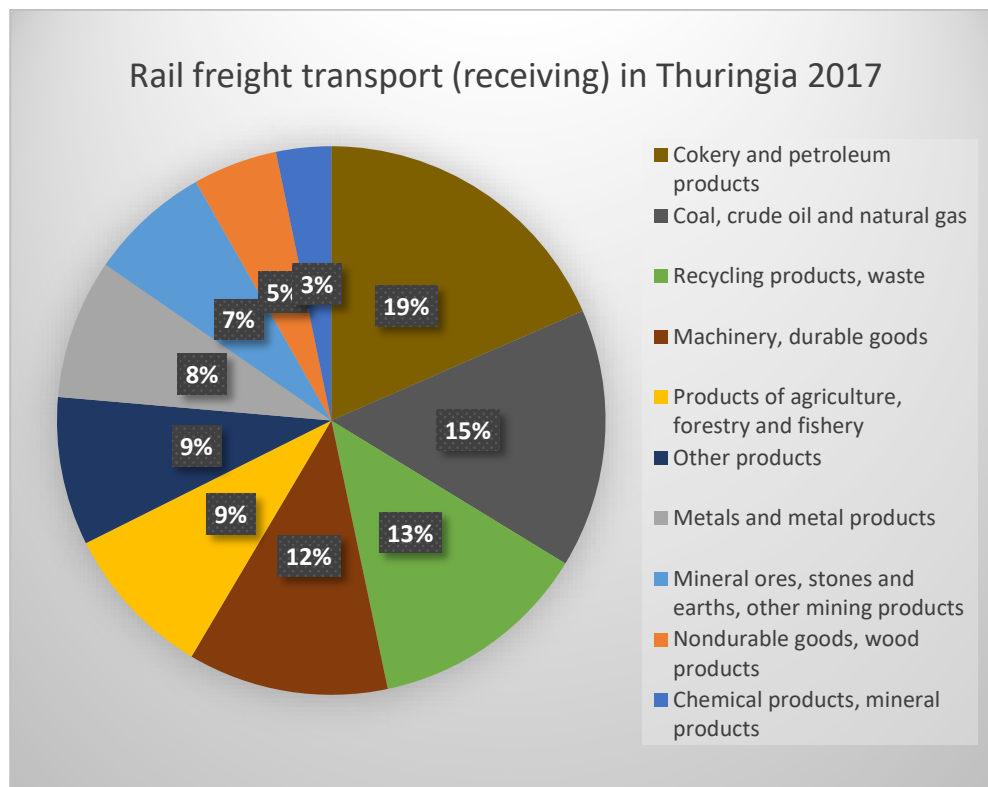


Figure 18: Rail freight transport (receiving) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt

Cokery and petroleum products	656,000t
Coal, crude oil and natural gas	543,000t
Recycling products, waste	461,000t
Machinery, durable goods	420,000t
Products of agriculture, forestry and fishery	324,000t
Other products	311,000t
Metals and metal products	293,000t
Mineral ores, stones and earths, other mining products	255,000t
Nondurable goods, wood products	177,000t
Chemical products, mineral products	115,000t
In total	3,557,000t

Table 9: Rail freight transport (receiving) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt

When it comes to transshipment through Thuringia, there is a greater balance between the groups of goods. This is due to the fact that there is practically no interaction with the economic structure in Thuringia.

There are also virtually no regional possibilities for influencing these circumstances, especially since the rail infrastructure in Thuringia has not yet reached its capacity limits.

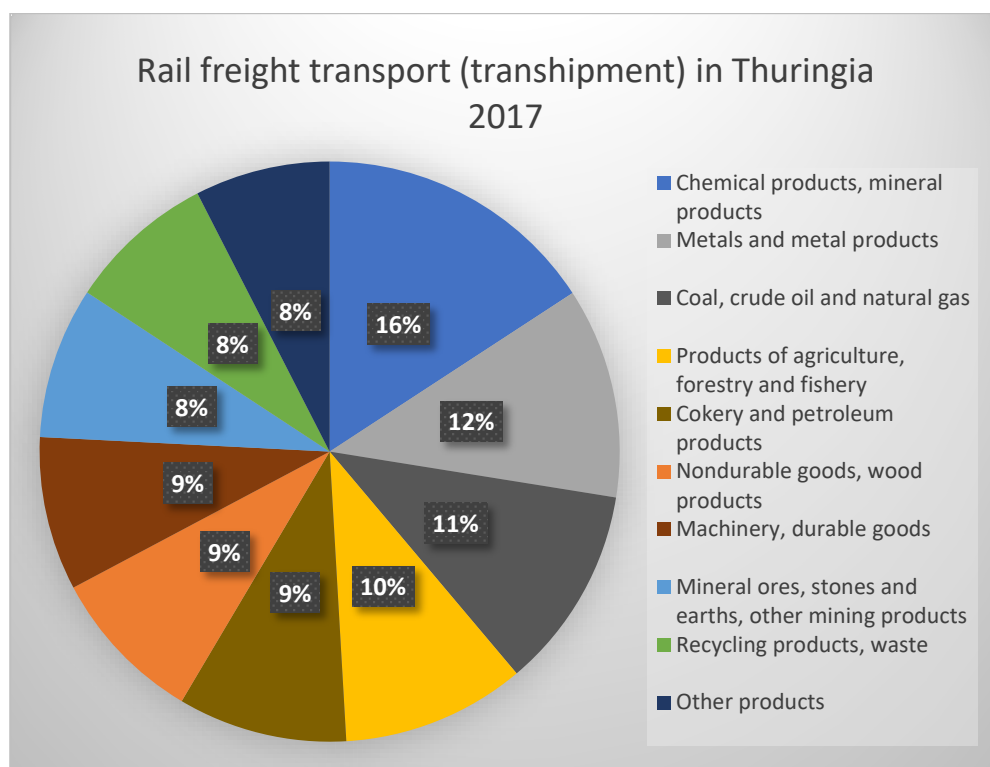


Figure 19: Rail freight transport (transshipment) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt

Chemical products, mineral products	1,147,000t
Metals and metal products	852,000t
Coal, crude oil and natural gas	822,000t
Products of agriculture, forestry and fishery	743,000t
Cokery and petroleum products	685,000t
Nondurable goods, wood products	633,000t
Machinery, durable goods	622,000t
Mineral ores, stones and earths, other mining products	613,000t
Recycling products, waste	597,000t
Other products	547,000t
In total	7,262,000t

Table 10: Rail freight transport (transshipment) in Thuringia 2017 by group of goods,
Source: Statistisches Bundesamt



The following table shows the classification of the group of goods (NST-2007) in high rail freight suitability and low rail freight suitability:

Goods	High rail freight suitability	
	yes	no
Products of agriculture, forestry; fish and fishing products	x	
Coal and lignite; crude petroleum and natural gas	x	
Metal ores and other mining quarrying products; mining products	x	
Food products, beverages and tobacco		x
Textiles and textile products; leather and leather products		x
Products of wood; paper and paper products; printed matter	x	
Coke and refined petroleum products	x	
Chemical products etc.	x	
Other non-metallic mineral products (glass, cement, plaster etc.)	x	
Basic metals; fabricated metal products	x	
Machinery and equipment, household appliances, etc.		x
Transport equipment	x	
Furniture; other manufactured goods etc.	x	
Secondary raw material	x	
Mail, parcels		x
Equipment and material utilized in the transport of goods		x
Removal goods and other non-market goods		x
Grouped goods		x

Table 11: Goods with/without high rail freight suitability, Source: own representation

Regarding the largest companies in Thuringia by the number of employees, it can be seen that the sector focus lies on industry, especially the production of vehicles and vehicle parts as well as on the electrical industry and mechanical engineering (see annex table 13). The companies are spread nearly all over the federal state. The following table shows the most important industries and companies with high rail freight suitability in Thuringia:

Name of company	Sector/Industry	Headquarter in Thuringia
Opel Eisenach GmbH	Automotive industry	Eisenach
Continental Gruppe	Automotive supplier	Mühlhausen, Waltershausen
Siemens	Electrical engineering	Erfurt, Mühlhausen, Rudolstadt
K+S Kali GmbH	Quarrying of crude salt	Unterebreizbach, Merkers
Schott Thüringen	Glass industry	Jena
MDC Power GmbH	Automotive supplier	Kölleda
Mitec Dr. M. Militzer Gruppe ²	Automotive supplier	Eisenach
Magna Gruppe	Automotive supplier	Schleiz, Heilbad Heiligenstadt
Stahlwerk Thüringen	Metal production	Unterwellenborn
Bayer HealthCare Pharmaceuticals	Pharmaceutical industry	Weimar, Jena
Tupag-Holding-AG	Agriculture	Mühlhausen
Viega GmbH & Co. KG	Mechanical engineering	Großheringen
Fiege	Logistics	Apfelstädt
Mubea	Automotive supplier	Weißensee
BorgWarner Gruppe	Automotive supplier	Arnstadt
Stollwerk GmbH	Food industry	Saalfeld
Wiegand GmbH	Metal and plastic products, Automotive supplier	Schlotheim
Mann+Hummel GmbH	Automotive supplier	Sonneberg
Schuler Pressen GmbH	Mechanical engineering	Erfurt
Gothaer Fahrzeugtechnik GmbH	Metal production	Gotha
ae group ag	Automotive supplier, metal processing	Gerstungen
Silbitz Guss GmbH	Metal processing	Silbitz
Jahn GmbH	Automotive supplier, metal processing	Tambach-Dietharz
BHK Saalburg GmbH	Wood industry	Saalburg-Ebersdorf

² Went into administration in 2018; Sold in 2019 and shrunk but still existent

Dagro Eissmann Automotive GmbH	Automotive supplier	Gera
Glaswerk Ernstthal GmbH	Glass industry	Lauscha
Griwe GmbH	Automotive supplier	Haynrode
Erdrich Umformtechnik GmbH	Automotive supplier	Sömmerda
Meuselwitz Guss Eisengießerei GmbH ³	Metal processing	Meuselwitz
Samag Saalfelder Werkzeugmaschinen GmbH	Mechanical engineering	Saalfeld
Benteler Automobiltechnik Eisenach GmbH	Automotive supplier	Eisenach
Borbet Thüringen GmbH	Automotive supplier	Bad Langensalza
Zellstoff- und Papierfabrik Rosenthal GmbH & Co. KG	Paper and paperboard industry	Blankenstein
Mercer Timber Products	Wood industry	Friesau
Hirschvogel Automotive Group	Automotive supplier, metal products	Marksuhl
Griesson - de Beukelaer GmbH & Co. KG	Food industry	Kahla
Werra Papier Group (Sofidel)	Paper and paperboard industry	Schmalkalden
Breckle Matratzenwerk Weida GmbH	Furniture industry	Weida
Möllergroup	Automotive parts and accessories	Ohrdruf
Villmann Fahrzeugwerke	Rail vehicle maintenance	Nordhausen
Federn Oßwald	Automotive supplier	Mühlhausen
Wiegand Glas GmbH	Glass Industry	Schleusingen

Table 12: Industries/companies with high rail freight suitability, Source: own representation

³ Downsizing after economic difficulties in 2018; shrunk but in the market

3. Summary and recommendation

What are the main market potentials and chances for rail freight transport?

- Thuringia's central location in Germany and Europe
- Thuringia has the densest rail network (per capita) in Germany
- Sufficient capacities in and low utilization of railway infrastructure, even with a doubling of the utilization
- Small modal share in favour of rail in Thuringia (below-average of Germany) -> vast potential to increase
- Especially in regional rail freight transport there are potentials of shift from road to rail (small modal share in comparison to road transport)
- European, national and regional funding programs and initiatives to promote rail freight transport and private sidings
- Available container terminals (for combined transport) and loading points -> further extension necessary
- Reactivation and extension of private sidings
- Potentials in combined transport and single wagon traffic
- Predominant industries, companies and goods with high rail freight suitability
- Development in digitalization and automatization (e.g. Digital Automatic Coupling)

Annex

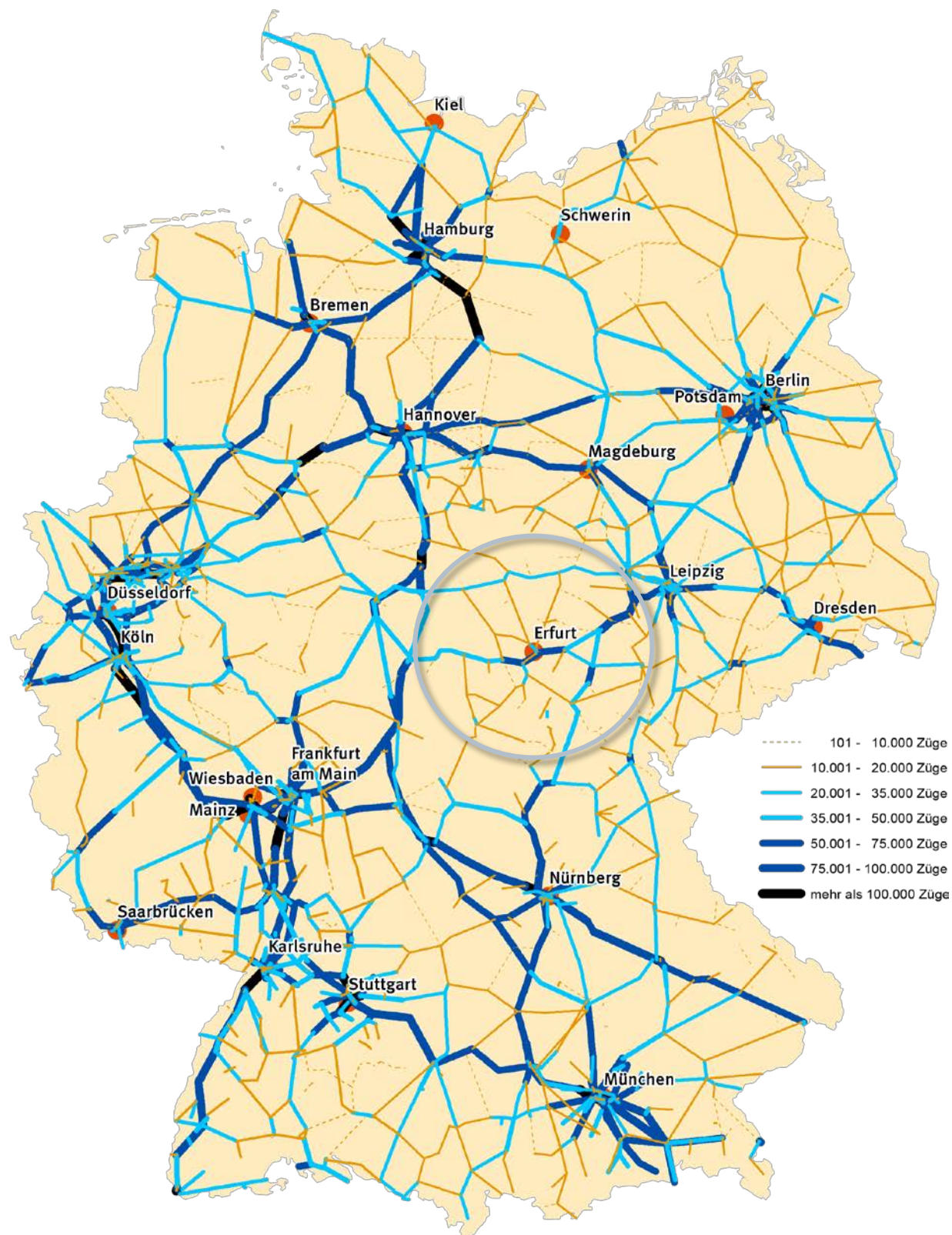


Figure 20: Railway network utilization by all trains 2015, Source: Statistisches Bundesamt 2018

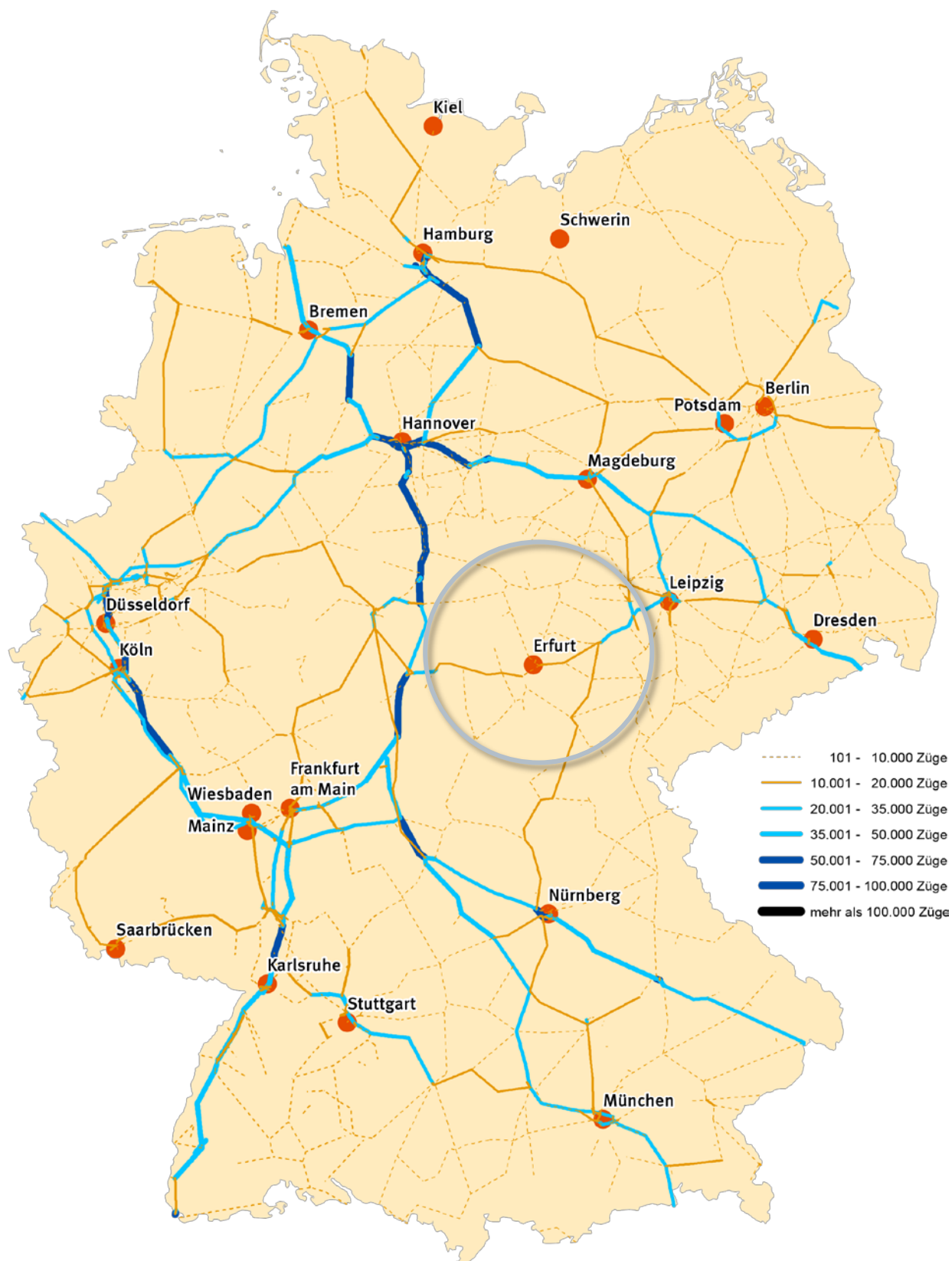


Figure 21: Railway network utilization by freight trains 2015, Source: Statistisches Bundesamt 2018

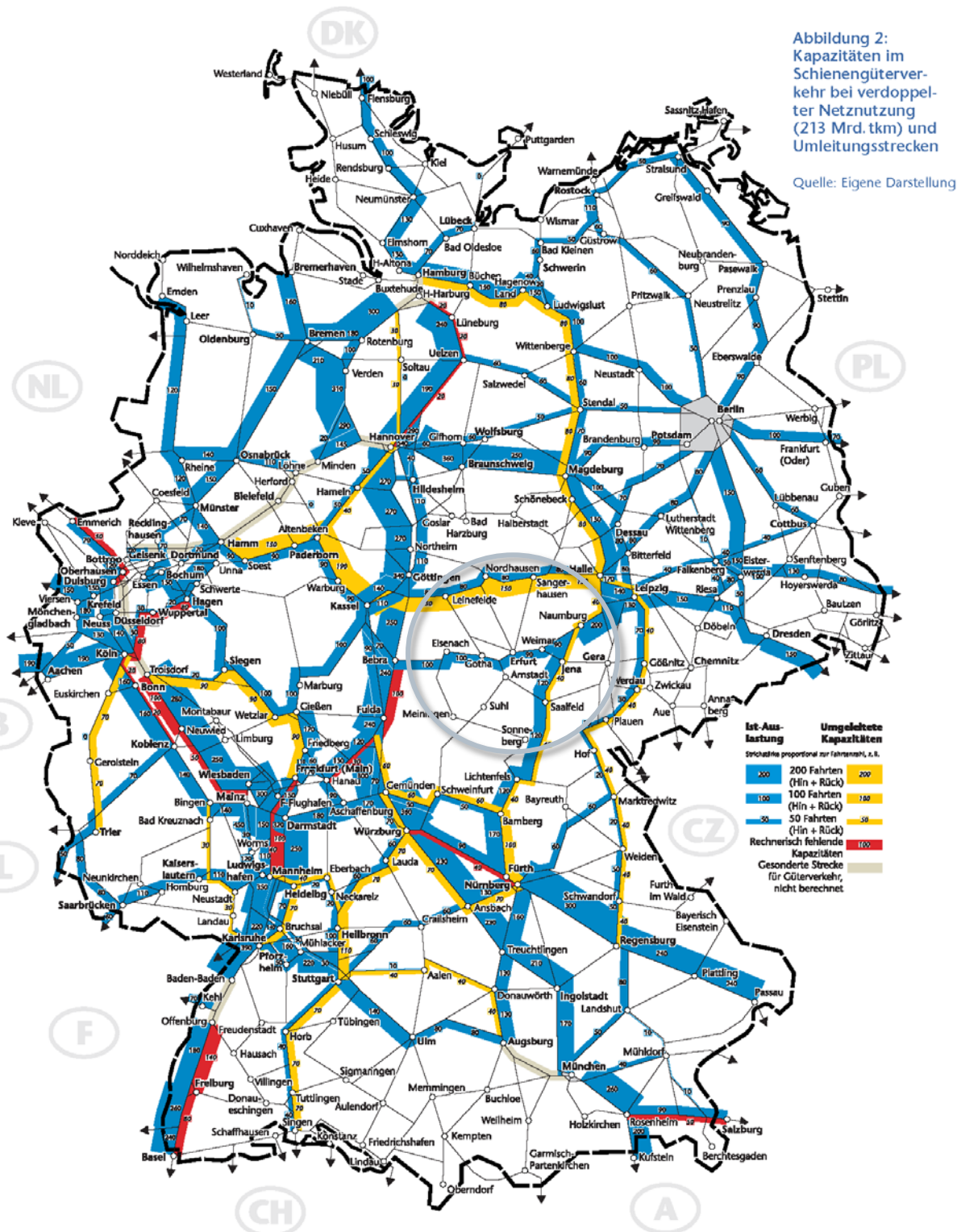


Figure 22: Capacities in rail freight transport with doubled use of network (213 Mrd. tkm, blue lines) and redirecting routes (yellow lines) (line thickness proportional to number of round trips), Source: Umweltbundesamt



Name of company	Sector/Industry	Headquarter in Thuringia
Edeka	Trade	diverse
Deutsche Post AG	Communication, logistics	Erfurt
Bosch	Electrical engineering	Arnstadt, Eisenach, Erfurt
Rewe Markt Region Ost	Trade	Neudietendorf
Mediengruppe Thüringen	Publishing industry	Erfurt
Carl Zeiss AG	Optical goods and electrical industry	Jena
Opel Eisenach GmbH	Automotive industry	Eisenach
Continental Gruppe	Automotive supplier	Mühlhausen, Waltershausen
Jenoptik Konzern	Optical goods and electrical industry	Jena
Metro Group	Trade	diverse
Bertelsmann (GGP Media)	Printing industry	Pößneck, Erfurt
August Storck KG	Food industry	Ohrdruf
Siemens	Electrical engineering	Erfurt, Mühlhausen, Rudolstadt
K+S Kali GmbH	Quarrying of crude salt	Unterbreizbach, Merkers
Schott Thüringen	Glass industry	Jena
Schachtbau Nordhausen GmbH	Metal construction	Nordhausen
Wago Kontakttechnik GmbH & Co. KG	Electrical engineering	Sondershausen
MDC Power GmbH	Automotive supplier	Kölleda
Bauerfeind AG	Medical engineering aids	Zeulenroda-Triebes
Mitec Dr. M.Militzer Gruppe ⁴	Automotive supplier	Eisenach
Magna Gruppe	Automotive supplier	Schleiz, Heilbad Heiligenstadt
Stahlwerk Thüringen	Metal production	Unterwellenborn
Bayer HealthCare Pharmaceuticals	Pharmaceutical industry	Weimar, Jena
X-FAB Semiconductor Foundries AG	Electrical engineering	Erfurt
Automotive Lighting Brotterode GmbH	Automotive supplier	Brotterode
Tupag-Holding-AG	Agriculture	Mühlhausen
Nidec GPM Group	Mechanical engineering/ Automotive supplier	Merbelsrod

⁴ Went into administration in 2018; Sold in 2019 and shrunk but still existent



Viega GmbH & Co. KG	Mechanical engineering	Großheringen
Fiege	Logistics	Apfelstädt
Mubea	Automotive supplier	Weißensee
BorgWarner Gruppe	Automotive supplier	Arnstadt
Stollwerk GmbH	Food industry	Saalfeld
Wiegand GmbH	Metal and plastic products, Automotive supplier	Schlotheim
Weru Fenster und Türen GmbH	Building supplier	Triptis
Max Bögl Gruppe	Building industry	Gera, Harth-Pöllnitz, Nöbdenitz
Analytic AG	Electrical engineering	Jena, Ilmenau
Mann+Hummel GmbH	Automotive supplier	Sonneberg
Schuler Pressen GmbH	Mechanical engineering	Erfurt
Gothaer Fahrzeugtechnik GmbH	Metal production	Gotha
ae group ag	Automotive supplier, metal processing	Gerstungen
Norma	Trade	Erfurt
Silbitz Guss GmbH	Metal processing	Silbitz
Jahn GmbH	Automotive supplier, metal processing	Tambach-Dietharz
BHK Saalburg GmbH	Wood industry	Saalburg-Ebersdorf
Dagro Eissmann Automotive GmbH	Automotive supplier	Gera
Glaswerk Ernstthal GmbH	Glass industry	Lauscha
Astenhof Frischgeflügel Produktions- und Handels GmbH	Agriculture	Hainspitz
Griwe GmbH	Automotive supplier	Haynrode
Erdrich Umformtechnik GmbH	Automotive supplier	Sömmerda
Meuselwitz Guss Eisengießerei GmbH ⁵	Metal processing	Meuselwitz
Samag Saalfelder Werkzeugmaschinen GmbH	Mechanical engineering	Saalfeld
Electronicon Kondensatoren GmbH	Electrical engineering	Gera

⁵ Downsizing after economic difficulties in 2018; shrunk but in the market

Benteler Automobiltechnik Eisenach GmbH	Automotive supplier	Eisenach
Borbet Thüringen GmbH	Automotive supplier	Bad Langensalza
Zellstoff- und Papierfabrik Rosenthal GmbH & Co. KG	Paper and paperboard industry	Blankenstein
Deckel Maho Seebach GmbH (DMG Mori)	Mechanical engineering	Seebach
Hirschvogel Automotive Group	Automotive supplier, metal products	Marksuhl
Griesson - de Beukelaer GmbH & Co. KG	Food industry	Kahla
Gealan Tanna Fenster-Systeme GmbH	Building supplier	Tanna
Fleisch- und Wurstwaren Schmalkalden GmbH (Thüringer Landstolz)	Food industry	Schmalkalden
Docter Optics GmbH	Optical goods and electrical industry	Neustadt/Orla
EJOT Tambach GmbH	Metal products	Tambach-Dietharz
Werra Papier Group (Sofidel)	Paper and paperboard industry	Schmalkalden
Breckle Matratzenwerk Weida GmbH	Furniture industry	Weida
Streicher GmbH Tief- und Ingenieurbau Jena	Building industry	Jena
Möllergroup	Automotive parts and accessories	Ohrdruf
Hermes Fulfilment GmbH	Logistics	Ohrdruf
Schmitz Cargobull AG	Automotive supplier	Gotha
Dirk Rossmann GmbH	Trade	diverse
JTJ Sonneborn Industrie GmbH	Building supplier	Sonneborn

Table 13: Largest companies of manufacturing and/or transporting industry of the 100 largest companies (by number of employees) in Thuringia (2011), Source: HELABA 2011