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Development of Transport Infrastructure in Europe: Exploring the shrinking and expansion of railways, motorways and airports.

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Frederic Rudolph, Nils Riach, Jessica Kees

T.3 TRANSPORTATION THINK TANK

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T3 Transportation Think Tank gGmbH
Clayallee 177
14195 Berlin
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and

Wuppertal Institut für Klima, Umwelt, Energie gGmbH
Döppersberg 19
42103 Wuppertal
www.wupperinst.org

Contact:

Dr.-Ing. Frederic Rudolph
Phone: +49-1515-4880210
Email: frederic.rudolph@t3-forschung.de
Twitter: @fre_rud

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Key Findings

- EU-27, Norway, Switzerland and UK spent € 1.5 trillion between 1995 and 2018 to extend their road infrastructure. This equals 66 % more of their budgets to extend roads than to extend railways (931 billion).
- During the years 2018-2021, the gap decreased to some degree: The 30 European countries spent 34 % more on extending roads than on extending railways. Austria, Belgium, Denmark, France, Italy, Luxembourg, and the United Kingdom invested more in rail than in road during these four years. All other countries still spent more on road than on rail.
- The length of motorways in the 30 analysed European countries grew from 51,494 km to 82,493 km (by 60 %) between 1995 and 2020. Growth was highest in Ireland, Romania, and Poland. Growth was lowest in Lithuania, Latvia, and Belgium. In 15 out of 30 analysed countries, the motorway lengths more than doubled.
- The provision of additional road infrastructure creates an additional demand for individual motorised transport. Demand for rail transport grew as well and can be attributed to the extension of high-speed rail sections.
- The research revealed that 13,717 km of regional passenger rail lines have been temporarily or permanently closed since 1995. As a rough estimation, out of these lines 7,300 km could be re-opened relatively easily. The length of the overall railway network decreased by 6.5 % in the period from 1995 to 2020.
- A total of at least 2,582 train stations have been (temporarily or permanently) closed.
- Since 1995, twelve new airports for civil aviation have been opened, which now have a volume of at least 150,000 passengers per year. In addition, ten new runways have been inaugurated.

1 Aim of the study

The European continent is equipped with a dense network of inland transport infrastructure. The European Union (EU) has one of the densest transport networks in the world.

The highest motorway densities can be found in Northwest-Europe, around big cities and in the proximity of seaports. Most European capitals and large cities are surrounded by a ring of motorways. High motorway densities are also found around major seaports of northern Europe: the motorway densities of Bremen (205 km/1,000 km²) with the port of Bremerhaven, of Zuid-Holland with the port of Rotterdam (124 km/1,000 km²) and of Hamburg (107 km/1,000 km²) are among the highest of all European regions.

Railway density is highest in the regions of Germany, Czechia, Hungary, the Netherlands, Poland and Romania (Germany, Czechia and the Netherlands are also among the most densely populated countries). The density of railways is high in western and central parts of Europe and relatively lower in coastal areas. The highest network densities, which are above 300 km/1,000 km², can be found in three regions in Germany, one in Czechia and one in Hungary (see figure 1.1, Eurostat 2020 data).

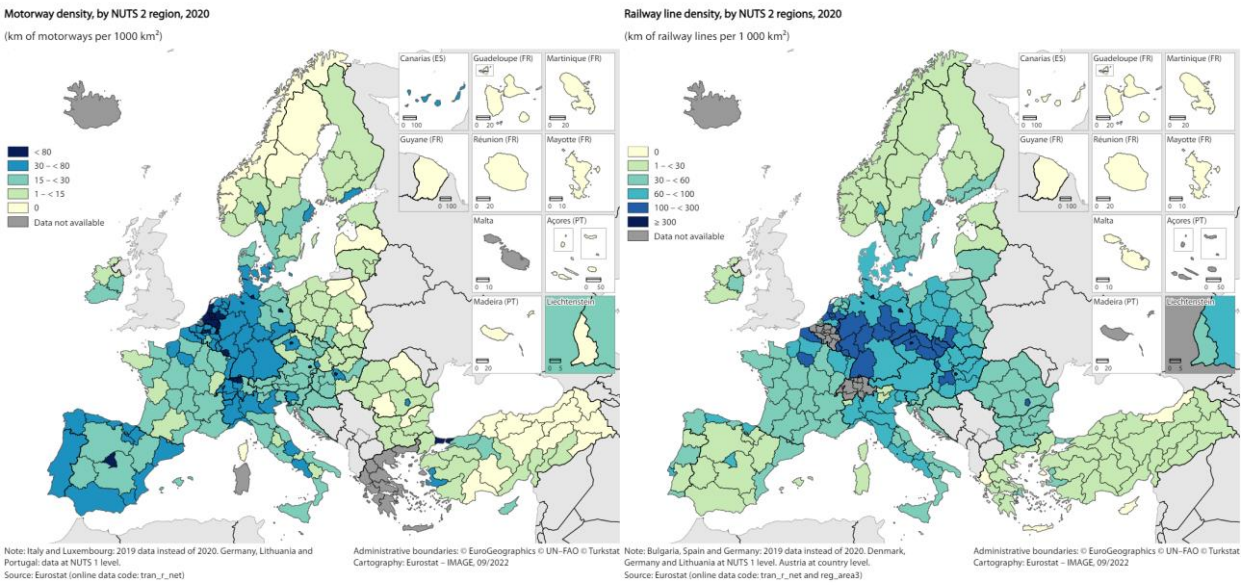

Figure 1-1 Motorway and railway density in Europe 2020. Source: Eurostat 2022

Transport infrastructure has positive effects on economic growth and prosperity (e.g., Hong et al. 2011, Lenz et al. 2018). However, a further look into the details of the relation between productivity/economic growth and transport infrastructure investment also leads to controversial and inconclusive results (Deng 2013, Wadud & Baierl 2017). More importantly, there are questions as to the marginal economic effects of further transport infrastructure expansion and to the meaningfulness of motorway and airport expansion in the face of the climate crisis (e.g., Metz 2008, Cervero 2009, Creutzig et al. 2018, Givoni & Perl 2020, Lin et al. 2021).

In the same vein, scientists have highlighted for decades that more transport infrastructure will lead to more demand for transport (SRU 2005, Martens 2006).

Another angle to discuss necessities of transport infrastructure provision is the social dimension. The term "transport poverty" is relatively new to both academic and political debates, but it increasingly receives attention. It includes problems of affordability, mobility and accessibility (Simcock et al. 2021), for all of which appropriate transport infrastructure is a prerequisite. People may have no access to public transport and therefore rely on private cars (Mattioli et al. 2017).

In 2021, the EU endorsed a new Social Climate Fund, which shall "support European citizens most affected or at risk of energy or mobility poverty". The financial envelope for the implementation will be € 23.7 billion for the period 2025-27.[1] This is a support measure of the "Fit for 55 Package", which shall ensure a green transition and decarbonise transport.

Against this background, this report discusses the following three research questions:

1 | Which are the transport infrastructure investment priorities in Europe?

The report investigates the investment priorities of EU-27, Norway, Switzerland and the United Kingdom as measured in annual public spending for road and rail infrastructure expansion.

2 | How has transport infrastructure developed over the last decades and to what extent interrelates this supply of infrastructure with actual demand for the respective modes?

The report investigates the development of railways, motorways and airports in the mentioned 30 European countries. It provides a regression analysis of supply and demand for transport.

3 | How has railway infrastructure developed in Europe over the recent decades?

The report will provide a detailed analysis of the railway sector's development in the 30 countries. The analysis is meant as a measuring stick about local communities' access to railway services.

Data and methodology

The research included two basic steps: a) data and information gathering, and b) their interpretation and documentation. The research area included EU-27, Norway, Switzerland and the United Kingdom ("core Europe"). We gathered data from 1995, because earlier years turned out to be sparsely documented. In order to answer the above research question 1, information is about:

- rail and road infrastructure investments for and expansion of existing new lines/roads, and
- an overview for planned investments in these sectors.

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: 'Fit for 55': delivering the EU's 2030 Climate Target on the way to climate neutrality (COM(2021) 550 final).

The International Transport Forum (ITF) provides information on investments into road and rail infrastructure (ITF-OECD 2023). This is an annual survey of ITF staff in collaboration with ITF member countries. The data includes national budgets.

For research question 2 we searched for the evolution of road and rail infrastructure [kilometres, km] and for the development of demand for transport on this basic transport equipment [passenger kilometres, pkm].

The first step included going through data bases from Eurostat (2023a), ITF-OECD (2023), Worldbank (2023) and the European Commission's statistical pocketbook (EC 2022). In some cases, same indicators included different information. We proceeded as follows:

Step 1) Plausibility of all data was checked: Some single year numbers were outliers; some time series were outliers as compared to the other two time series of the same country. Finally, EC numbers were used for road and rail pkm; Eurostat data for motorway lengths and Worldbank data (via International Union of Railways) for railways lengths.

Step 2) In case of data gaps or remaining implausibility, national numbers were searched.

The investigation of abandoned railway lines and stations, i.e., research question 3 demanded to deviate from the path of official sources. Only in a few cases official data about closed railway lines was available online, and if so, it was available in different degrees of detail. We contacted national railway operators and other national (personal) contacts and could in some cases receive additional official material. In many cases we complemented our research by using unofficial sources such as Wikipedia, news articles or private sites about abandoned railways.

Therefore, our data comes with omissions, inaccurate information and estimates. In particular, we dealt with the following challenges:

- We tried to find the potential of closed lines to be re-opened in the future. However, the transition from "ready to be re-opened" and "dismantled forever" is fluid and we could not exactly determine the state of the tracks. We interpreted our sources. Nevertheless, we made efforts to distinguish between the possibility to reuse a section/line and its impossibility. Ultimately, this is a matter of financial abilities/priorities and legal options.
- The research focuses on passenger transport. Therefore, we did not account for lines that historically were exclusively used for freight transport. However, in many cases freight tracks may become useful for passenger traffic and vice versa.
- If a line was converted into or replaced by railbound urban public transport, it was not counted. It is hard to find information for each and every case.

As the research includes data gaps and inaccurate estimations, we ensured to stay conservative with our numbers: We did not use data which we could not find. That is, there may be more closed railway lines and stations than are listed in this report.

Definitions

The research focuses on middle and long distances and therefore not on local traffic. However, as we use ITF data to answer research question 1 about investment priorities, we partly include metros/tramways and urban roads, see below. Else, railways contain conventional rail and high-speed rail. Lines are counted in kilometres, irrespective of the number of their parallel tracks.

A motorway is a road with at least two lanes per direction with a barrier between the two directions (except in tunnels or special sections) and which is restricted for certain vehicles (such as bikes, tractors). Motorways comprise the highest categories of roads in the respective countries.

In the case of Austria, this includes not only motorways, but also “Schnellstraßen” (clearway). In the case of Latvia, we used the category “main roads” due to the lack of a dedicated motorway category.

The research also includes airport expansions to complement the perspectives about infrastructure extensions. Although not a focus, as we compare data about roads and rail, air transport is a third option of long-distance transport and oftentimes new roads and railways are built to develop them. Airport expansions are defined as new airport runways, which are finished or under construction. We also searched for new airports that do not replace older ones. For example, military fields which had not been used for civil aviation and were redesignated as international airports are included. Only those airports are included that had at least 150,000 passengers in 2019, according to the database of CAPA - Centre for Aviation. Some airports were inaugurated after 1995 but remain under this threshold.

Regarding the data on investments into rail and road, this report uses the ITF definitions (ITF-OECD 2023). The ITF collects data about all rail-borne infrastructure and all roads. This concept includes local infrastructure. However, country data varies. Some countries/sources do not include urban transport infrastructure investments. Chapter 7.1. specifies the investments which are included per country, as reported by the ITF.

Investment expenditure on both road and railways infrastructure include capital expenditure on new infrastructure or extension of existing roads/railways, including reconstruction, renewal (major substitution work) and upgrades (major modification work). Infrastructure includes land, permanent way constructions, buildings, bridges and tunnels, as well as immovable fixtures, fittings and installations connected with them, as opposed to road vehicles/rolling stock. Data should also include both government and private investment, unless specified otherwise.

2 Funding of transport infrastructure

Motorways and railways are usually built and extended based on national political long-term strategies and corresponding investment decisions such as the French National Transport Infrastructure Scheme or the German Federal Transport Infrastructure Plan. Investment priorities are usually set using some combination of transport project appraisal methods such as multi-criteria analysis (Bueno et al. 2015).

Funding strategy of the European Union

The European Union's long-distance transport strategy is focused on the Trans-European Transport Network (TEN-T). TEN-T is a Europe-wide network of railway lines, roads, waterways, and airports. A main rationale to develop this network is to strengthen social, economic and territorial cohesion in the EU.[2]

During the period 2014-2019, one of main sources of EU funding for transport infrastructure, the Connecting Europe Facility (CEF Transport) has awarded € 23.3 billion in grants to co-finance projects of common interest, i.e., for TEN-T (EC 2023). The vast majority (69 %) of the CEF transport budget is allocated to railways (see figure 2.1, rounded numbers).

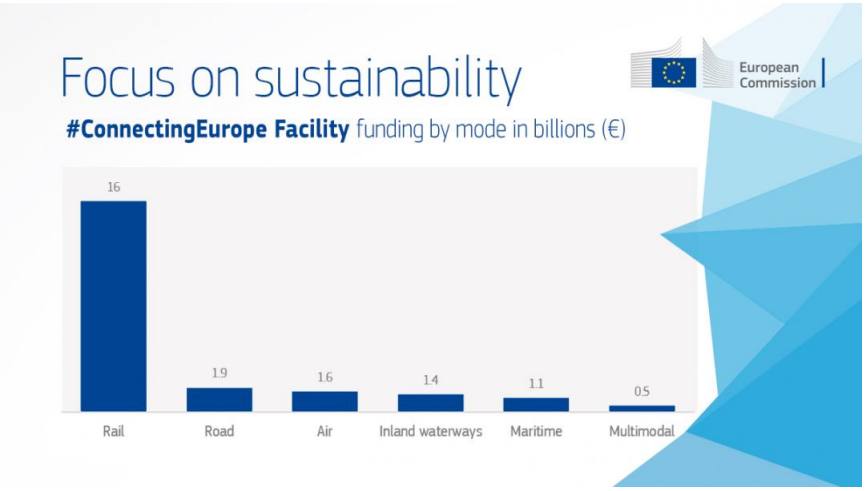

Figure 2-1 Funding of the CEF by mode in the period 2014-2019. Source: EC 2023

Therefore, it seems that the TEN-T investments follow the European Union's general policy objectives of a green and socially inclusive Europe.[3] However, according to an analysis of several EU funds by Investigate Europe, rail has not been a priority in this timespan. The research found that almost € 19 billion of the Cohesion Fund and European Regional Development Fund (ERDF) was spent on rail projects, of which € 12

[2] The current TEN-T policy is based on Regulation (EU) No 1315/2013.

[3] For example, see the European Commission's current cohesion policy objectives: https://ec.europa.eu/regional_policy/policy/how/priorities_en.

billion was for TEN-T in the period 2014-2020. The corresponding amount for road projects was € 33.7 billion, of which € 19.5 billion was for TEN-T.[4]

Investment priorities of the countries since 1995

On a general level, funding of roads is still a priority in Europe. Table 2.1 provides an overview of the national budget of road and rail infrastructure investments in the 30 countries under scrutiny (EU-27, Norway, Switzerland and United Kingdom). The first two columns on the left-hand side show the cumulative annual budget, which the countries spent between 1995 and 2018 for road and rail, respectively.

The third column divides the road budget (first column) by the rail budget (second column). If the ratio of these two figures is above one, then the spending priority was road extensions, if it is below one, then the priority was with rail networks.

The countries spent more than € 1.5 trillion between 1995 and 2018 to extend their road infrastructure.[5] It turns out that only three out of 30 countries prioritised rail over road in their budgets, namely Austria, Belgium and the UK.

As a common theme, the ratio of road to rail investments becomes higher as the countries' national income gets lower, but there are significant differences and exceptions. For instance, Romania's ratio is the highest (12.2), whereas the Bulgarian ratio (4.4) appears to be relatively moderate as compared to Romania. From this perspective, one can assume that infrastructure development may have different itineraries. The Bulgarian State railways closed 13 lines in the early 2000s. The closure of these loss-making lines was one of the most important measures stipulated in a national railway rehabilitation programme and also one of the demands of the Worldbank, which provided funds for the State railways' restructuring. However, during the 2010s, further closings were debated but ultimately not realised. Instead, Bulgaria upgraded some main connections.

A number of relatively rich states have a ratio close to one, namely Denmark, Italy, Luxembourg, Spain, Sweden and Switzerland.

The fourth column creates a ratio as in the third column, but for the four years from 2018 to 2021, which were the most recent reported in the database.[6] A comparison of the fourth to the third column indicates if a shift of priorities may have started to take place in these years (i.e., more funding for railways than for roads).

This was the case in Denmark, France, Italy, and Luxembourg. In Denmark, the age of the rail network became problematic in the early 2000s.[7] Since 2011, Denmark has considerably increased railway investments (ITF-OECD 2023). A similar story can be

[4] https://www.investigate-europe.eu/en/2021/despite-public-support-for-rail-trains-remain-underfunded-in-europe/

[5] The ITF-OECD database (https://doi.org/10.1787/trsprt-data-en) also provides investment spendings for motorways only; however, data gaps are extensive. These values therefore cannot be used for an appropriate overview.

[6] In many cases, 2018 or 2019 was the last reported year. Netherlands reported investments only by 2011. Standard deviation of the countries' annual figures is high, but each ratio is representative of the most recent reported budget.

[7] https://nyheder.tv2.dk/2004-02-23-danske-tog-paa-gamle-skinner

told for Luxembourg: The Grand Duchy aims to lift the share of public transport to 25 %. Consistently, the country's railway investments have an upward tendency (ibid.).

Table 2-1 **Comparison of road and rail infrastructure investments of European countries [€ current prices]. Source: ITF-OECD 2023, own analysis.**
Although there are clear definitions for all the terms used in the ITF survey, caution is required when comparing data between countries (see annex, chapter 7.1).
[1]2019/20 data missing for a number of countries (see annex, chapter 7.1).

	Cumulative road investments 1995-2018 [bn €]	Cumulative rail investments 1995-2018 [bn €]	Ratio road/rail 1995-2018	Ratio road/rail 2018-2021 (those available[1])
Austria	12.70	33.22	0.38	0.27
Belgium	7.49	23.26	0.32	0.84
Bulgaria	8.39	1.91	4.39	3.74
Croatia	12.00	1.75	6.87	3.27
Czechia	21.78	12.04	1.81	1.44
Cyprus	not available	not applicable	not applicable	not applicable
Denmark	19.22	17.05	1.13	0.80
Estonia	2.49	0.55	4.53	6.43
Finland	19.37	8.40	2.31	2.62
France	277.76	129.87	2.14	0.91
Germany	278.39	132.11	2.11	1.84
Greece	38.84	12.41	3.13	12.63
Hungary	16.93	7.71	2.20	2.56
Ireland	25.69	3.99	6.44	13.25
Italy	150.83	117.89	1.28	0.90
Latvia	2.84	1.15	2.48	4.70
Lithuania	5.25	1.82	2.88	3.63
Luxembourg	4.12	3.27	1.26	0.91
Malta	0.42	not applicable	not applicable	not applicable
Netherlands	46.85	22.11	2.12	not available
Norway	50.18	13.41	3.74	2.63
Poland	59.33	9.03	6.57	4.72
Portugal	23.41	7.65	3.06	not available
Romania	43.02	3.53	12.17	11.93
Slovakia	10.01	4.41	2.27	3.90
Slovenia	7.63	1.93	3.96	1.26
Spain	139.65	93.89	1.49	1.60
Sweden	36.64	28.72	1.28	1.45
Switzerland	74.40	59.09	1.26	1.24
United Kingdom	150.23	179.25	0.84	0.68
Total	**1,545.86**	**931.41**	**1.66**	**1.34**

Interestingly, Austria and the UK have shifted their spendings even more towards rail development. For the UK, this is remarkable, as the country was long well-known for the poor condition of its railway tracks, a consequence of their liberalisation process.

Finally, the data analysis finds Germany as a long-term advocate of roads/motorways: The country is among those with the highest motorway density (see figure 1.1), it spends roughly double the amount of their budget on roads as compared to railways, and the recent years do not indicate significant change.

The following figure 2.2 serves as a visualised summary of table 2.1. The 28 countries with railways are divided into four categories of investment spendings in the period from 1995 to 2021. The first category includes countries that spent three times more for rail than for road. The second category comprises countries that spent more for rail. The third category includes those countries which spent more for road than for rail. It also includes a subcategory for countries which started shifting budget towards rail, as they spent more for rail than for road in the recent years 2018-2021. The fourth category includes countries which spent at least three times more budget for the extension of roads than for extending railways between 1995 and 2021.

It turns out that no country prioritised rail three times over road. The bulk of countries belongs to the third category, which represents countries that spent up to 2.9 times more for road than for rail.

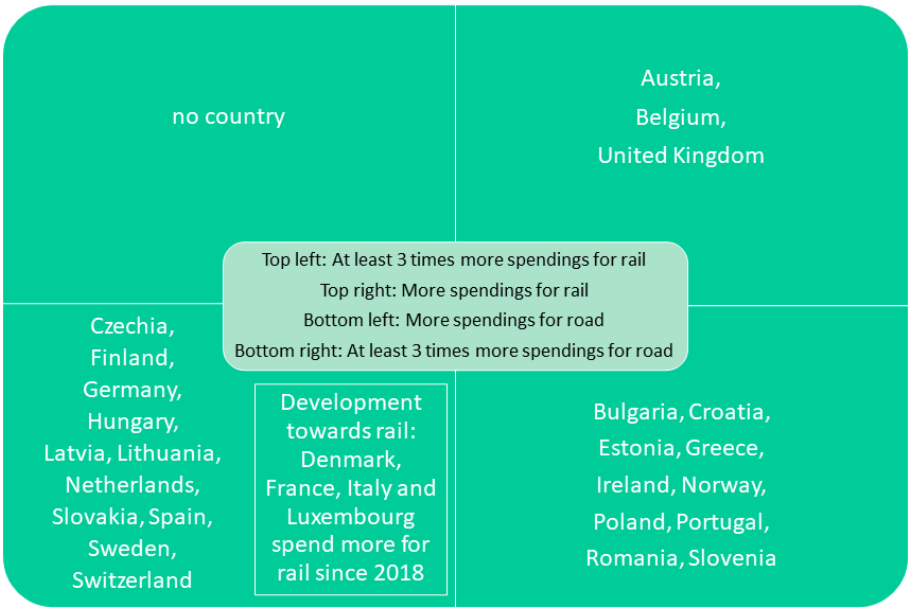

Figure 2-2 Comparison and categorisation of road and rail investment spendings in 28 European countries 1995-2021. Source: own analysis based on ITF-OECD 2023, see table 2.1

The following table 2.2 (next page) uses a different perspective on investment priorities by depicting per capita spendings. The two columns on the left-hand side use the same raw data as table 2.1, which is investments into new infrastructure. The two columns on the right-hand side provide an insight on maintenance spendings.

First, richer countries tend to spend more money per capita than their poorer counterparts in absolute terms, both for existing and new infrastructure. Second, the countries usually spend more money for new investments than for maintenance. Third, the spread between road and rail per-capita investments is high, indicating different priorities all over Europe. This can only partly be explained with different income levels.

Data is not available for a number of countries. However, some interesting cases can be depicted:

- Only Austria, Belgium, Denmark, Luxembourg and the United Kingdom spend more per capita on railways than on roads. France almost equally invests in rail and road.

- Luxembourg and the United Kingdom spend more than the double on rail maintenance than on road maintenance. This may be due to a backlog, but could also point to a shift of priorities. The latter interpretation is more likely given the overall political commitments and recent investment priorities.
- In the three years from 2018 to 2020, Bulgaria and Norway were spending much of their budget for road extensions. For Bulgaria, this appears to be catching up with investments as compared to Western Europe, i.e., favouring roads. In Norway, this can be attributed to the Sotrasambandet project (a new road in Norway's Vestland county), which started in 2018 and involves tunnels, bridges and viaducts.

Table 2-2 **Rail infrastructure investments of European countries.**
Source: ITF-OECD 2023, own analysis. 2018 data is used, because it is available for most countries

	Road: per capita new investments 2018 [€]	Rail: per capita new investments 2018 [€]	Road: per capita maintenance 2018 [€]	Rail: per capita maintenance 2018 [€]
Austria	52.4	190.3	82.1	63.3
Belgium	59.6	81.0	18.9	28.0
Bulgaria	125.6	13.7	36.5	5.1
Croatia	69.8	24.4	47.3	23.6
Czechia	98.3	69.7	82.0	63.1
Cyprus	not available	not applicable	not available	not applicable
Denmark	187.1	233.3	198.7	not available
Estonia	165.7	20.0	29.5	not available
Finland	276.7	89.0	98.4	40.1
France	147.2	153.1	35.3	51.4
Germany	190.7	91.5	not available	not available
Greece	201.1	14.1	not available	not available
Hungary	182.1	82.2	38.8	65.1
Ireland	142.4	9.0	18.1	44.1
Italy	108.5	47.3	121.7	69.3
Latvia	114.9	10.8	104.8	58.1
Lithuania	116.0	23.2	51.4	55.7
Luxembourg	310.2	434.1	110.1	260.4
Malta	not available	not applicable	not available	not applicable
Netherlands	not available	not available	not available	not available
Norway	764.5	247.9	not available	133.8
Poland	70.3	12.2	12.2	18.9
Portugal	not available	12.8	not available	not available
Romania	112.0	9.4	not available	not available
Slovakia	141.2	51.3	54.3	2.8
Slovenia	159.1	73.8	55.5	59.3
Spain	75.2	46.3	not available	not available
Sweden	245.4	140.0	101.5	70.1
Switzerland	448.3	361.5	304.6	64.1
United Kingdom	130.5	203.8	35.1	102.9
Total	**145.2**	**100.6**	*(not applied)*	*(not applied)*

Priorities in the near future

After many decades of predominantly funding road transport, priorities seem to start shifting away from motorways. However, there is still leeway for investments into the road. For instance, Switzerland opened the Ceneri base tunnel in 2020, thereby accomplishing the first stage of the new rail link through the Alps. This new rail link was supposed to shift not only goods, but also passengers towards this mode (Ehrbar 2021). The promised capacities could be made available, but the Swiss government expects additional demand for freight transport – and plans to respond with additional capacities for both railways and motorways.[8] There is debate about significant future increase from two to three lanes.

In the following, we provide an example for a country that still puts much emphasis on motorway extensions, namely Germany, and an example for a country that has completely shifted its focus towards sustainable modes, namely Wales. In both cases, we provide some background on the infrastructure plans for the upcoming years.

The German government decided in its coalition agreement to start a dialogue about priorities for the expansion of federal infrastructure. The public expected this to happen for projects which are planned by 2030 under the current Federal Transport Infrastructure Plan. The current plan still prioritises motorway expansion, which includes high risks of very high investment cost (Gehrs & Donat 2023). However, the government aims at informing the preparation of the *new* infrastructure plan for the decade *after* 2030. A number of motorway extension projects of the current plan shall even be accelerated.[9]

In contrast to these practices, the National Transport Delivery Plan of the Welsh Government explicitly reduces and re-prioritises investment on new road schemes. Amongst others, it includes a vision to achieve "an accessible, sustainable and efficient transport system", and it introduces a sustainable transport hierarchy, which prioritises walking and cycling, followed by public transport. The list of programmes, projects and interventions consequently includes a long number of projects and initiatives for public transport, active travel, electric vehicle charging support of multi- and intermodal travelling and behavioural change. Only some road schemes are under construction and will be completed (Welsh Government 2022).

[8] https://www.admin.ch/gov/de/start/dokumentation/medienmitteilungen.msg-id-86919.html

[9] https://taz.de/Autobahnausbau-in-Deutschland/!5928755/

3 Comparison of transport supply and demand

Railway construction in Europe started in the 19th century. In Western Europe, peak lengths were realised during the first half of the 20th century. After World War II, plans to increase efficiency led to closures (e.g., "Beeching cuts" in Great Britain). In Central and Eastern Europe, such closures started after the fall of the Iron Curtain.

After World War II, road transport infrastructure was extended all over the continent. Motorisation and demand for individual motorised transport increased.

Development of transport infrastructure in Europe

Figure 3.1 describes the development of motorway and railway network lengths since 1995 in kilometres; and the development of distances covered on roads and railways in billion passenger kilometres. Data for regional roads' lengths (federal, state and urban roads) is not available (solid black line). Therefore, we compare motorways (and not all roads higher than the local level) to railways.

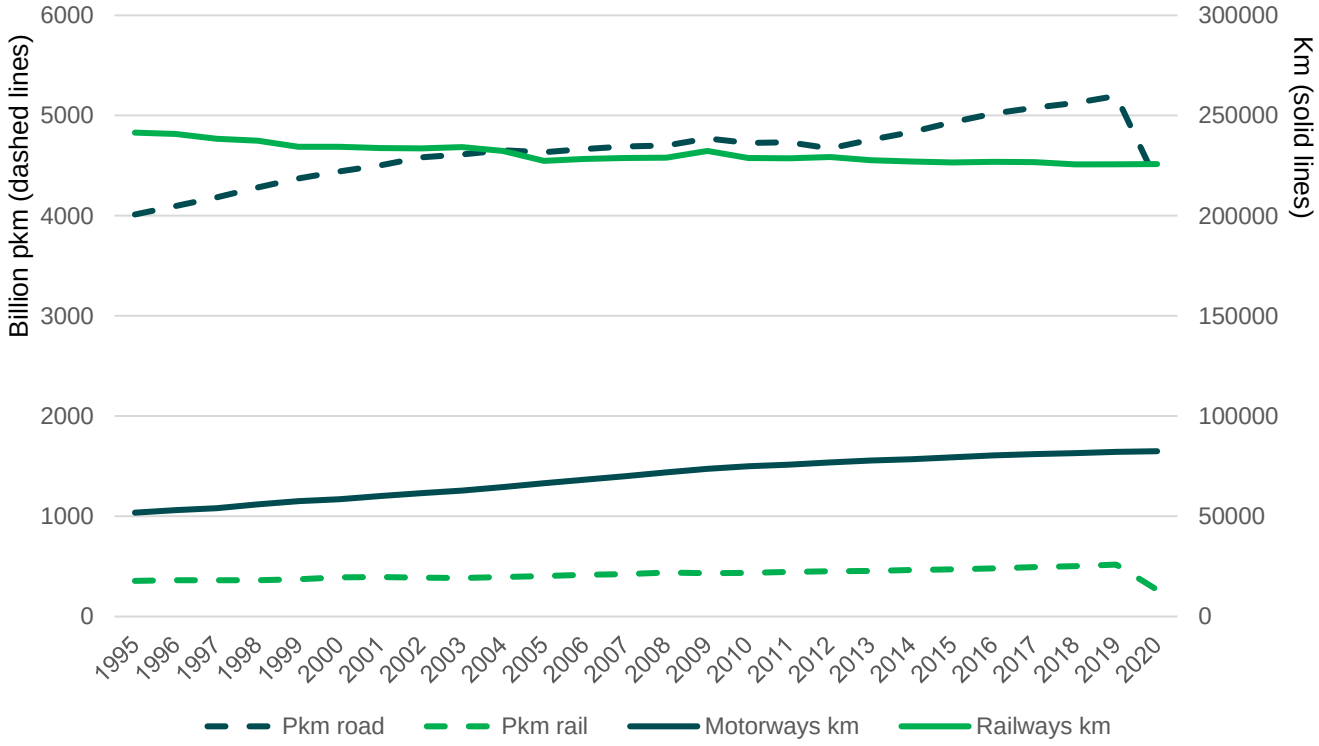

Figure 3-1 **Comparison of road and rail demand and supply in Europe 1995-2020.**
Left axis: Demand for road and rail transport [bn pkm], dashed lines
Right axis: Lengths of motorways and railways, solid lines
Green: rail; black: road
Sources: Pkm road and rail, motorways km: European Commission (2022). Railways km: International Union of Railways and national/other statistics (see annex, chapter 7.3).

The two black lines in figure 3.1, which designate the development of road supply and demand, are trending upwards. That is, the length of motorways grows between 1995 and 2020. The distances covered grow as well, but there is a drop between 2019 and 2020 (COVID-19 pandemic). The country data that deliver these European-wide

results are provided in the annex (chapter 7.3). The overall development of motorways (from 1995 to 2020) in the European countries can be summarised as follows:

- The length of motorways in the 30 analysed European countries grew from 51,494 km to 82,493 km (by 60 %).
- Growth of the motorways' lengths was highest in Ireland (1,321 %)[10], Romania (714 %) and Poland (596 %).
- It was lowest in Lithuania (2 %), Latvia (3 %) and Belgium (6 %).
- In 15 countries (one half), the motorway lengths more than doubled. These countries are Bulgaria, Croatia, Czechia, Estonia, Finland, Greece, Hungary, Ireland, Portugal, Norway, Poland, Romania, Slovakia, Slovenia, and Spain.

The distances covered on roads in the 30 European countries can be summarised as follows:

- Overall demand as expressed in road pkm increased by 29 % between 1995 and 2019.
- In every single of the 30 analysed countries, demand increased in this period.
- In every single country, demand decreased between 2019 and 2020. This is a COVID-19 ramification; in 2020 the distances covered fell by 17 % on average, as compared to 2019.
- Only in six out of 30 countries, demand for road transport in 2020 was below 1995 levels, despite the massive restrictions during the COVID-19 pandemic in 2020. These countries are Belgium, France, Germany, Italy, Netherlands, and the United Kingdom.

Unsurprisingly, as these European countries spent billions into the extension of roads (as investigated in chapter 2), motorway networks extended.

Historically, it could be proven, that the provision of road infrastructure to cater for expected growth leads to higher levels of service and consequently longer trip distances. As car owners travel longer distances under these new and more car-oriented circumstances, they are also expected to travel more in the future which leads to the provision of more infrastructure. These consequences are well-known as a circle of self-fulfilling prophecies (SRU 2005, Martens 2006, Rodrigue 2020). The recent decades in Europe confirm these findings, as illustrated in figure 3.1: If supply grows, so does demand.

Statistically, the relationship between the evolution of transport supply and demand is less obvious, yet it exists. Calculations based on the available data, which test the causal dependency of the evolution of motorway lengths (railway lengths) and the actual demand for passenger transport by car (by train) on national territory, point to a high to very high positive association for most European countries. That is, the statistical perspective supports the historic perspective in most countries.[11]

[10] A visualisation of this remarkable expansion can be found here: http://www.irishmotorwayinfo.com/inex/roads/misc/timeline_maps/big/index.html

[11] We applied Kendall's Tau in order to understand the relationship between the evolution of road/rail infrastructure [km] and the development of demand for transport on the respective basic transport equipment [pkm]. Kendall's Tau rank correlation is a widely used non-parametric, i.e. distribution independent correlation coefficient that is robust against the influence of outliers.

As a long-term investment, the creation of motorways implies lock-in effects with all its negative consequences. Science has pointed out for a long time now that “radical interventions will be necessary in order to escape carbon lock-in in the transport system” (Driscoll 2014, see also IPCC 2022). As long as planners treat different transport modes as fungible goods, then “it is likely that the existing path dependencies will reinforce and reproduce a high-carbon transport system” (ibid.).

In other words: Any scenario in which humankind achieves substantial greenhouse gas emission reductions includes a significant shift from road to rail (e.g., Barisa & Rosa 2018, Lefèvre et al. 2020, Kany 2022).

Both the historic and statistical perspectives about transport supply of and demand for railways are less obvious: Whereas the overall network length in Europe has slightly but continuously decreased, the demand for transport by train has slightly but continuously increased (see figure 3.1). However. in a statistical analysis for each of the 30 countries, we found a moderate to high positive correlation between rail kilometres and demand for rail transport in most cases (see annex, chapter 7.2).

Chapter 4 will provide more detail to the development of rail infrastructure in European countries. In the following, we provide some more detail of development of demand for high-speed rail and travelling by air.

The evolution of high-speed rail

In the recent decades, many European countries have developed high-speed rail (HSR) train sections (see figure 3.2). Spain and France currently have invested most, but the network is increasing all over Europe. Our research about newly opened railway lines confirms that HSR extension was a priority amongst newly built railways in Europe.

Evidence suggests that HSR has some positive results on tourism; and knowledge-based industries are more likely to cluster near stations (Chen & Vickerman 2017). However, Vickerman (2018) argues that dramatically enhancing the accessibility between cities cannot help with convergence (similar economic structure) in Europe per se, but HSR can complement other cohesion policies relating to labour markets and skill development.

In terms of modal shifts, results are partly counterintuitive. For instance, in the case of Italy a reduction of air passengers was measured in the period of HSR openings between certain cities, suggesting an intended shift from airplanes to trains (Eurostat 2023b). However, an analysis of panel data from Italy could not find evidence of a modal shift from motorway to HSR services. The authors highlight that general conclusions for effects of HSR programmes cannot be drawn and suggest further research (Borsati & Albalate 2020).

Figure 3.2 compares transport supply of and demand for high-speed rail. The pattern filled columns show the development of built HSR sections in 1,000 km in the

The null hypothesis is that there is no association between these two variables, which can be rejected for most countries. The country-specific values can be found in the annex (chapter 7.2).

respective countries from 1995 to 2020. The green line represents the distances covered with HSR trains on these sections in billion passenger kilometres. The growth of supply and demand go hand in hand. Apparently, the major share of railway demand growth in Europe between 1995 and 2019 can be attributed to HSR (104 billion passenger kilometres out of 161 billion pkm, 64 %).

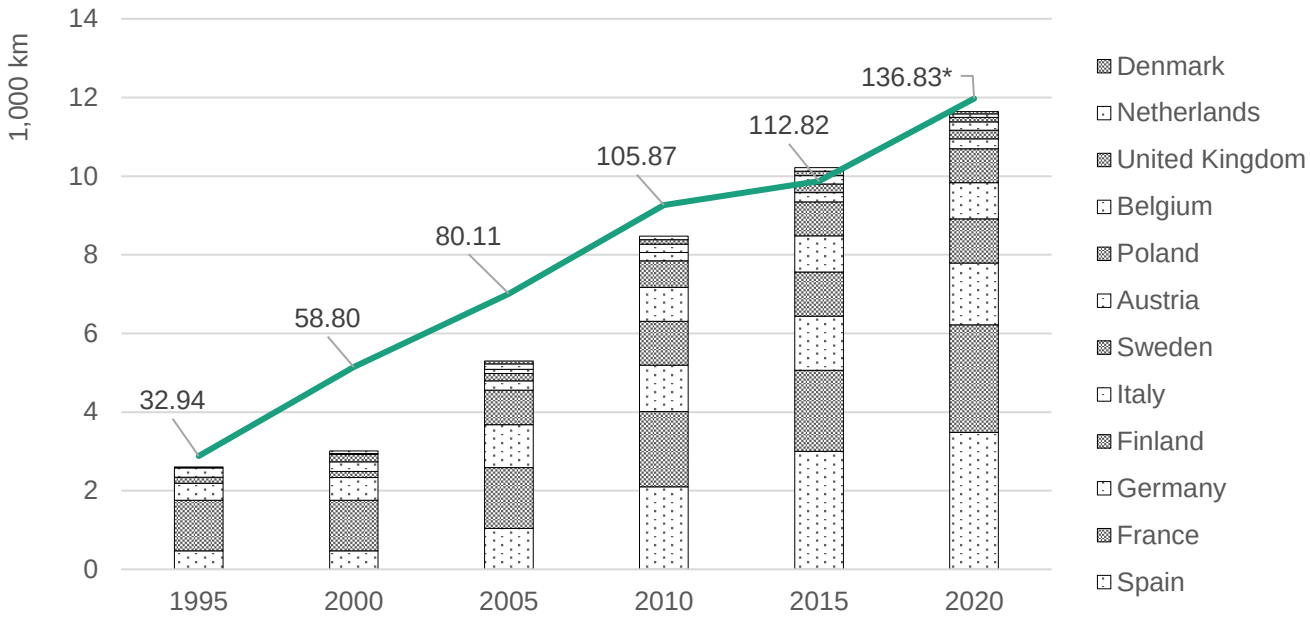

Abb. 3-2 **Comparison of HSR lengths (pattern filled columns) and demand for HSR (green line, bn pkm) in Europe. Source: European Commission (2022). *2019 value to avoid COVID-19 bias**

Newly built airports

Roads and railways are landbound infrastructure and therefore travelling by car and train incur substantial investments and maintenance as compared to travelling by plane. However, airports do need significant infrastructure as well, both for the airplanes themselves and for approaching roads and rails.

According to the ITF database, European countries have spent € 5.4 billion per year on average since 1995 for airport infrastructure investments (ITF-OECD 2023).[12] Moreover, new railways have been built in the recent decades to connect airports with city centres, e.g., between Bucharest city centre and Bucharest airport.

Below is a list of new airports and airport runways which have been built since 1995. (order descending by number of passengers in 2019).[13] Further capacity extensions were realised through new terminals and longer runways.

- Amsterdam Schiphol, new runway 2003
- Frankfurt, new runway 2011
- Madrid Barajas Airport, new runway 1998 and further two runways 2006
- Barcelona El Prat Josep Tarradellas, new runway 2002
- Rome Fiumicino, new runway 1999
- Dublin, new runway 2022
- Stockholm Arlanda, new runway 2003
- Athens Eleftherios Venizelos, 2001
- Helsinki Vantaa, new runway 2002
- Malaga, 2010
- Warsaw Modlin, 2012
- Memmingen Allgäu (Germany), 2004
- Doncaster Sheffield (United Kingdom), 2005
- Karlsruhe/Baden-Baden (Germany), 1997
- Weeze (Germany), 2003
- Murcia Corvera (Spain), 2019
- Cornwall Newquay (United Kingdom), 2008
- Bydgoszcz (Poland), 2004
- Comiso (Italy), 2007
- Patrai Araxos (Greece), 2007

According to the International Civil Aviation Organization (ICAO), the number of passengers carried in the European Union rose from 193.5 million in 1995 to 803.7 million in 2019 (via Worldbank 2023). Thus, aviation probably experienced the sharpest relative increase of passenger kilometres travelled of all modes in Europe. Aviation has also been one of the fastest growing sources of greenhouse gas emissions in the EU in this period.

[12] These numbers are the sum of all 30 European countries' annual investments as provided by the ITF database. The database does not include information from Cyprus, Malta and Netherlands; and has further gaps few and far between, so the actual number is higher.

[13] The list only includes airports with more than 150,000 passengers in 2019. Smaller airports may have been opened since 1995, as is the case in Spain (see chapter 4). There are also further projects for new airports and runways being planned.

4 Development of railway networks

In this report it has already been noted that extension of transport infrastructure induces additional demand for transport, that extension of motorways leads to lock-in effects regarding carbon-intensive mobility, and that decarbonisation of transport has to rely on a shift to rail. European countries do acknowledge these facts in their decarbonisation strategies.[14]

However, in the past decades, many railway lines have been closed all over the continent. This section will provide the facts about the extent of closed lines in EU-27, United Kingdom, Switzerland and Norway since 1995. The intention is to provide a further perspective for eventual national discussions about the future priorities of transport infrastructure development.

These discussions should also take into account the social perspective of transport infrastructure, i.e., a dense rail network ensures mobility for various population groups.

Transport poverty

Simcock et al. (2021) define transport poverty as the "inability to attain a socially and materially necessitated level of transport services." This definition is based on extensive literature research. More precisely, the authors elaborate on

- the inability to meet essential travel costs (affordability),
- difficulties in moving around due to a systemic lack of sufficient transport (mobility), and
- the difficulty reaching key activities, such as employment or education, at reasonable time, ease and cost (accessibility).

Why are railway networks relevant to reduce transport poverty?

When it comes to affordability and mobility, low-income households are less likely to own a car and therefore rely on public transport. This in turn causes accessibility problems in areas poorly served by public transport (Mattioli 2014). Older people experience decreased mobility, as active travel such as walking and cycling is a less feasible option. Moreover, many older people cease their licence in order to avoid unsafe driving. Therefore, they tend to rely on public transport (Lucas 2012).

There is a growing body of evidence that transport infrastructure in Europe has become car-centric to the extent that even in areas which are well served with public transport (cities), car dependence plays a role (see Mattioli 2021). In other words: If households do not have access to a car, then accessibility poverty may become relevant. E.g., households with children have to afford additional expenditure on transport services because of increased trip numbers for day care and other purposes. In such cases, public transport needs to have a high quality and be affordable to avoid forced car ownership (McLaren 2016).

[14] Recent analysis of selected countries' National Determined Contributions (NDCs) ambitions under the Paris Agreement, and inherent implementation risks can be found here: https://www.ndc-aspects.eu/publications/deliverables

In principle, accessibility shortfalls can be addressed through a variety of interventions at the demand side of mobility and transport, through smart land-use patterns and also by supplying public transport infrastructure. But it can be argued that public transport infrastructure is particularly relevant to reduce accessibility shortfalls. Many interventions are tailor-made for certain target groups such as commuters or business travellers, but they fail to serve multiple population groups, and they do not account for space and time as a whole (Martens 2017). Mees (2010) describes that access destinations increase exponentially with an increase in the number of connecting links of a network. The more nodes are connected, the more destinations can be reached by persons with access to the system. This network effect should always be accounted for to serve multiple population groups (Martens 2017).

Overview of railway network development

The following sections describe the development of railway infrastructure in Europe during the recent decades. As described in the methodology, data collection started with the year 1995, because development in previous years turned out to be sparsely documented.

The research revealed an overall decrease (see figure 4.1). The sum of all networks in 28 European countries with railways amounted to 241,470 km in 1995 (see annex, chapter 7.3 for sources). Networks decreased until 2005, reaching a first low point at 227,365 km. Since 2005, the sum of all national networks remained relatively stable, however reaching the low point in 2019 with an overall length of 225,661 km (see annex, chapter 7.3 for sources).

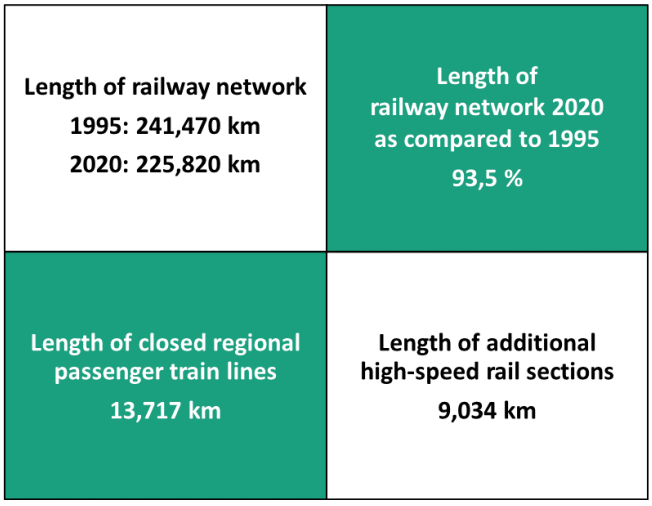

Figure 4-1 Development of the European railway network (EU-27, CH, NO, UK). Source: own compilation of sources, see chapters 7.3 and 7.4

Ten countries report a net increase of their railway networks' lengths since 1995, according to the last available official data (see annex, chapter 7.3). These are Belgium, Croatia, Estonia, Finland, Ireland, Italy, Netherlands, Slovenia, Spain and Switzerland. The bulk of the reduction took place in Germany (by 6,706 km), Poland (by 4,660 km) and France (by 4,125 km). These three countries also still represent the longest total network lengths, followed by the UK and Spain.

It is important to note that these numbers represent the overall network development and do not distinguish between lines open for passenger and those open for freight transport only. For instance, the UK continually reduced routes open for freight traffic only. While the overall network size decreased, the size of routes open for passenger traffic could still be increased.[15] In addition, quite some reduction can probably be attributed to streamlining the network without necessarily reducing connections and stations. As operators work on increasing allowed speeds on their network, the tracks' routing needs to be adjusted.

As described earlier, new lines can in many cases be attributed to HSR, whereas the closure of lines usually involved single-track, narrow gauge and/or branch lines. For instance, according to our research, Spain cut approximately 950 km of branch lines between 1995 and 2020. In the same time, it opened 2,900 km of additional HSR network.

Temporal suspension of operation, closed and abandoned lines

The research revealed that at least 13,717 km of regional lines have been temporarily or permanently closed since 1995. Apparently, the exceptions are Luxemburg, Norway, Slovenia and the United Kingdom. In these countries no lines were closed.

Only in a few cases we could find official data about closed stations. In other cases, we could not find any source at all (see annex for details). Similarly, it is unclear to what extent stations have been opened. Only for the UK we have received a confirmed number of newly opened stations (116 new stations between 1997 and 2023).

As is depicted in table 4.1, a total of 2,582 stations have been (temporarily or permanently) closed during that time span. This number partly relies on estimates: In the cases of Bulgaria, Germany, Poland, Romania, and Spain no sources were found providing numbers.[16]

The table also depicts the potential to re-open lines which are currently closed. Here we can distinguish between lines/segments which are currently officially open, but no operation takes place and those lines/segments which are officially closed, but the tracks are in a legal and technical condition which allows a re-opening. In the latter case (re-opening of officially closed lines), it can still be argued that potential investments equal investments for new lines. However, this is out of the scope of this research. Instead, we relied on the sources describing the lines' conditions. In sum, a total of 7,263 km could be opened (in this incomplete estimate).

[15] We could not find such distinction for many countries. All sources we used can be found in the annex.

[16] The estimates for these five countries are kept conservative by applying a ratio of one closed station per ten kilometres of closed segments. Station density used to be lower than one per ten kilometres at all of the closed lines for which numbers of closed stations are known.

In addition, in many countries it was not possible to find numbers about closed stations at open lines. Therefore, the actual number of closed stations in the 30 European countries is probably higher than reported.

Tab. 4-1 **Overview of closed regional railway lines in EU-27, CH, UK and NO since 1995. Sources: own research based on sources as documented in chapter 7.4. *assumption: 10 km section = 1 station; **assumption: 50 % of overall network decrease**

	No. of lines	Length of lines [km]	No. of closed stations	Potential length of re-usage [km]
Total Europe	**>242**	**13,717**	**2,582**	**7,263**
Austria	31	655	230	376
Belgium	17	188	62	47
Bulgaria	13	348	35*	0
Croatia	5	118	28	118
Czechia	33	329	104	263
Cyprus	no railways			
Denmark	1	23	1	0
Estonia	5	367	43	267
Finland	2	271	70	271
France	7	339	74	39
Germany	unknown	2,700	270*	1,093
Greece	4	389	97	389
Hungary	28	919	259	919
Ireland	1	50	4	0
Italy	40	1,831	384	1,711
Latvia	6	499	81	269
Lithuania	5	298	14	158
Luxembourg	0	0	0	not applicable
Malta	no railways			
Netherlands	3	34	17	25
Norway	0	0	9	not applicable
Poland	unknown	2,330**	233*	unknown
Portugal	8	460	101	379
Romania	unknown	300	30*	100
Slovakia	2	37	222	0
Slovenia	0	0	0	not applicable
Spain	22	949	95*	604
Sweden	4	234	35	197
Switzerland	5	38	13	38
United Kingdom	0	0	71	not applicable

Table 4.1 does not depict the length of opened lines. According to the research, lines and sections with a length of at least 13,902 km were opened in the 30 European countries in the same time span.[17]

The subsequent sections provide a more detailed picture of the development of regional passenger railways in selected countries, namely Austria, Czechia, Greece, Hungary, Latvia and Spain.[18] The full list of abandoned railway lines and stations is added to the annex (chapter 7.4).

[17] The difference between closed and opened lines does not match the official numbers about overall network lengths. Reasons may be tracks with freight transport only, routes adjustments, closed sidings, maintenance works etc.

[18] In each country, the research about abandoned railways since 1995 included intensive internet consultation. Only in few cases, official data was available. The list of sources can be found in the annex. T3/WI also let national contacts double check the information. However, omissions, mistakes, and inaccuracies may still have occurred.

Austria

Austria is among the countries with the highest per capita budget for both new railway investments and railway maintenance (see table 2.2). The national rail company ÖBB claims Austrian trains to be among the most punctual in Europe.[19] However, since 1995, 29 lines have been put out of service, totalling a length of 665 km (see annex, chapter 7.4). In this process, 230 stations have been closed. One example is the famous Ybbstalbahn.

Figure 4-2 Ybbstalbahn in Hollenstein – December 2006. Picture: Siegfried Nykodem

The Ybbstalbahn is a narrow-gauge railway in Lower Austria. ÖBB operations ended on December 11, 2010. The main route follows the valley of the Ybbs from Waidhofen to Lunz am See. From there, the railroad follows a mountain route to Kienberg-Gaming. There is also a branch line from Gstadt to Ybbsitz. The original route has a length of 50 km with 25 stations along the way, but tracks are partly dismantled. The Ybbstalbahn is famous, because it is used as a museum train on parts of the original route. Two local associations operate the so-called "Ötscherland-Express" on weekends between July and September, also undertaking track maintenance works.

Czechia

In 1993, a programme to modernise four rail transit corridors was launched. This programme has not yet been completed, but most sections have already been upgraded to speeds of up to 160 km/h.

In the early 2000s, some passenger services on lines with weak demand were discontinued. For example, the line between Kralovice and Mladotice stations was closed on January 1, 1997 due to the state of emergency of the tracks. The entire Rakovník - Kralovice - Mladotice line lies near the border of the Central Bohemia and Pilsen regions, which complicates the resumption of traffic. Both regions consider this line as peripheral. Although a citizens' petition was filed, repairing the line would be very

[19] https://www.oebb.at/de/rechtliches/puenktlichkeit

expensive after many years of disrepair. In addition, the area is sparsely populated. This is also the reason why there are no longer regular passenger trains from the district town of Rakovník to the town of Kralovice. However, some seasonal tourist trains run on this section, so a re-opening is not completely out of the realm of possibilities.

The photo shows the Trojany stop between Kralovice and Mladotice stations. The picture was taken on April 12, 2007, i.e., 10 years after the line was closed. Today, nature has reclaimed the area – the building is completely overgrown with trees.

Figure 4-3 Abandoned railway station "Trojany" in Czechia, 12 April 2007. Picture: Marek Binko

Greece

For many years, large parts of the Greek railway systems were not operational. Only in recent years, some unused sections in East Macedonia/Thraces were re-opened. On February 28, 2023, a head-on collision of two trains happened near Larissa in central Greece with dozens killed and injured. The crash put a spotlight on the poor condition of the railway infrastructure and chronically underfunded rails.

Once this accident happened, Hellenic Train, the Greek train operator, paused all operations, both for passenger and for freight transport. The operations are re-starting gradually. For some sections it may be decided to close them longer term or permanently. Hopes in Greece are that the incident will lead to a swift upgrade of the sector. The research in this report has taken into account active and inactive sections as depicted by a map from the Website Hellenic Railways Organisation in February 2023, i.e., before the train crash.[20] In this map, the Peloponnese railway network remained largely unused, and some further sections.

There are also a number of ongoing projects to modernise the network, such as the high-speed rail between Tithorea and Domokos.

[20] https://ose.gr/en/railway-network/network-map/

Hungary

Railway density is very high in Hungary. Since 2006, some upgrades of the network are in progress, co-funded by the EU. However, on 7 December 2006, as part of a broader economic restriction package, the Hungarian government announced its intention to stop operation on 14 regional lines with a total length of 474 km. With a change in the timetable on 13 December 2009, the national railway MÁV suspended passenger services on further 24 railway lines and sections with a total length of around 800 kilometres. However, in 2010, the then new government announced that they would undo a plethora of transportation decisions made by the former government. In this context, ten rural railway lines, which previously had been closed due to low revenues, were reopened.

The railway lines are not formally ceased and tracks not dismantled, but the service suspended indefinitely. However, the infrastructure is in bad condition, and scrap metal theft diminishes the probability of future reopenings.

Latvia

Changes of the railway systems in all three Baltic states have the same goals. First, they need to be integrated with the network of European rails. All three states operate on 1,520 mm wide gauge, which was developed in Russian Empire times. Second, the network of train transport developed in the Soviet times included stops in small towns, located to functional infrastructure, valid to that specific period. When migration took place from the land to urbanised areas, many stations were abandoned. Large parts of the existing lines are now mainly used for cargo transportation.

Figure 4-4 Rail Baltica project. Source: RB Rail AS

The biggest network extension is “Rail Baltica”, which is expected to provide a fast rail connection between the Baltic capitals every two hours, cutting the time en route by three. Up to four trains a day are supposed to run from Tallinn via Riga to Vilnius, with additional trains between Vilnius and Warsaw running ten times a day. Two night-trains are expected on the route Tallinn-Riga-Kaunas-Warsaw-Berlin and Vilnius-Kaunas-Warsaw-Berlin. Travellers shall be able to reach Riga International

Airport from the Riga Central Station in around 10 minutes, and the minimum train frequency shall be 30 minutes.

Spain

In the recent decades, Spain has invested heavily into motorways, high-speed rail and airports, and its transport infrastructure has therefore become a "paradigmatic case of oversupply and of mismatch with demand" (Albalate et al. 2015). The country ranks first in Europe in high motorway density as expressed in km per inhabitant, and sixth as expressed in km per 1,000 km² (Rodriguez-Pose et al. 2018 with data from 2011, see also figure 1.1). It has the longest network of HSR among European countries (see figure 3.2).

Moreover, many newly built airports in Spain are known as "cathedrals in the desert", because they account for less than 50,000 passengers per year (Rodriguez-Pose et al. 2018). Examples for such questionable investments are the airports of Castellón-Costa Azahar (inaugurated 2014), Lleida-Alguaire (inaugurated 2010), Ciudad Real (inaugurated 2008), and Huesca-Pirineos (inaugurated 2007).

Another example of inefficient investments in Spain is the airport "Base Aérea de San Javier", a military field which was used for civil aviation between 1995 and 2018. It received a passenger terminal with a capacity of 1.5 million passengers per year. With the opening of the new international airport Aeropuerto Internacional de la Región de Murcia, 30 km to the west, in January 2019, the airport was closed to civil aviation. Another airport nearby is the Aeropuerto de Alicante, which is located 80 km to the north.

In the very proximity of this military airport, two local train lines existed but were closed: The connection Torre Pacheco to Los Alcazares was closed in 1970, the connection Albatera to Torrevieja was closed in 1986, both are dismantled.

In conclusion, many regional train lines were closed during the recent decades, that is, in a period of large-scale investments into motorways, airports and HSR: According to private research of Pablo Marinas, since 1995 approximately 950 km of railway tracks were closed[21] (see also annex, chapter 7.4).

[21] https://www.eldiario.es/economia/seria-espana-si-no-hubieran-desaparecido-7-600-kilometros-vias-tren-mapa-muestra_1_7241934.html

5 Conclusions

This report analyses data from 30 countries (EU-27, Norway, Switzerland and the UK) in the period between 1995 and 2020. With respect to the three research questions from the introduction, we can summarise the following.

1 | Which are the transport infrastructure investment priorities in Europe?

The priorities in the recent decades have been road over rail: Between 1995 and 2018, EU-27, Norway, Switzerland and the UK spent 66 % more of their budgets to extend roads than to extend railways. While some parts of the EU funds focus on sustainable transport and mobility, the relevance of these funds is minor given the national priorities. However, data indicates that in the recent years 2018-2021, the gap decreased to some extent: The analysed countries spent 34 % more on extending roads than on extending railways. Austria, Belgium and the United Kingdom invested more in rail than road since 1995. Denmark, France, Italy and Luxembourg started to invest more in rail than road in the period 2018-2021. All other countries still focus on the road.

At this point it has to be highlighted that this (potential) shift of priorities appears to be slow, given the saturation of transport infrastructure in many countries, the climate emergency, and financial disparities of the European countries' inhabitants. The three big and therefore important countries Germany, Poland and Spain have not yet turned the wheel.

2 | How has transport infrastructure developed over the last decades and to what extent interrelates this supply of infrastructure (in length) with actual demand for the respective modes?

Between 1995 and 2020, the length of motorways in the 30 analysed European countries grew from 51,494 km to 82,493 km, which equals a growth of 60 %. Half of the countries have at least doubled their motorways' lengths.

We counted a total length of closed regional rail sections of 13,717 km since 1995. In the same period, lines or sections of lines on which trains can go faster than 250 km/h at some point during the journey (high-speed rail) have increased from 2,605 km to 11,639 km.

In addition, eight airports have added at least one new runway and further twelve airports were converted from pure military to an international civil airport.

Road transport, high-speed rail and air transport have experienced high growth in terms of passenger kilometres travelled in the recent decades. There is a historical and statistical relationship between this transport demand and supply.

3 | How has railway infrastructure developed in Europe over the recent decades?

Long-distance, high-speed railway has been extended in twelve European countries, whereas regional passenger trains have been thinned out. A total length of 13,717 km of train sections has been closed temporarily or permanently. The biggest absolute losses took place in Germany, Poland, and Italy, but also smaller countries such as Austria, the Baltic states and Portugal had substantial closings.

As a consequence of closed railway lines, the research estimates a total loss of 2,582 stations and stops in the 30 countries (of which 28 countries have railways). This number is likely higher, because of unknown cases of closed stations along open railway lines, especially in the three Baltic states and Poland.

In the three countries Greece, Hungary and Portugal, long sections of regional railways are temporarily not operated. The longer they remain unused, the more probable it is that they will not be re-opened. According to the research, 7,263 km of closed passenger lines could be re-opened relatively easily in Europe. On a positive note, it seems that the reduction of lines has halted, and some selected lines have re-started service.

Policy recommendations

European nations have a commitment to reduce energy and transport poverty, and they are committed to the Paris Agreement. Therefore, from a social and environmental perspective, the funding priorities for transport infrastructure need to shift accordingly.

Many countries have realised the assets they have at their disposal for their population, namely local and regional railways. This year, Germany has introduced a ticket that allows unlimited travelling in local and regional trains nationwide at a monthly price of € 49.[22] All the other countries in North-West Europe start shifting priorities and expand their train networks.

While these (investment) policies are laudable achievements, they should mainly be regarded as starting points for more investments into an infrastructure that already exists, i.e., infrastructure for regional trains. The € 49 ticket in Germany had its origin in 2022, when it was sold for € 9 in period of three months. 52 million tickets were sold, leading to capacity limits of the network and the rolling stock.

Spain, France, Germany, Italy, and other countries also invest into HSR which can be an alternative to private cars and airplanes on long distances. It only makes sense to increase accessibility by train for large parts of the population by re-investing into regional train networks and connecting these regional with long-distance trains.

More precisely, countries could do the following:

1) Cut budgets ring-fenced to extend motorways

Motorway extensions are a pure political decision. If budgets are allocated, they will be spent for the given purpose. Decision-making tools such as cost-benefit analysis or strategic environmental assessment are downstream stages that will not change a political decision that was made in the first place. Countries should consider moratoria to stop long-term carbon lock-in.

[22] Austria and Hungary offer similar tickets, which are relatively affordable and can be used throughout the country, see: https://greenpeace.at/uploads/2023/05/report-climate-and-public-transport-tickets-in-europe.pdf

2) Elaborate taxation schemes earmarked to re-open regional railway lines

Transport poverty is determined by insufficient levels of mobility, affordability and accessibility. Regional train networks provide mobility, can be kept affordable for everybody, and guarantee accessibility in those (remote) areas they serve. In this regard, society has to find ways to pay for their re-opening.

Some transport taxation schemes assume the principles of "users pay" or "polluters pay". In addition, society as a whole should fight transport poverty. Some scientists suggest that everyone is entitled to a minimum level of transportation service (van der Veen et al. 2020). If decision makers agree with this suggestion, then appropriate taxation should be developed to accommodate for the cost. That is, an additional principle could be that "society pays to fight transport poverty".

3) Complement these budget shifts with other policies which aim at modal shifts

Finally, such new budgetary priorities should be complemented with policies that internalise external costs of transport and phase out environmentally harmful subsidies, to make rail transport more affordable compared to road and aviation. This will lead to higher demand for rail, and more revenues that can be used for maintenance works and comfort improvement. This can in consequence again lead to more demand for railways and more revenues.

Other regulatory and informative policies are helpful and necessary as well. For instance, current planning cycles and public decision-making processes can significantly delay re-openings of regional trains.

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7 Annex

7.1 Details on national data about funding of infrastructure

The ITF Transport Statistics database (https://doi.org/10.1787/trsprt-data-en) comprises statistics collected by the International Transport Forum on transport networks, equipment, freight and passenger transport, road safety and spending on infrastructure. Additionally, there are quarterly data covering road traffic, new vehicles, and fuel use. Most of the ITF data series start in 1995.

The dataset on transport infrastructure investment and maintenance spending is used in chapter 2 and comprises data collected on an annual basis from the International Transport Forum (ITF) member countries. Data are collected from Transport Ministries, statistical offices and other institutions designated as an official data source.

The original data is collected in national currency, current values. Data are converted and published in Euros, current prices. Data should include both government and private investment, unless otherwise specified in the country-level metadata (see below).

Investment expenditure on both road and railways infrastructure include capital expenditure on new infrastructure or extension of existing roads/railways, including reconstruction, renewal (major substitution work) and upgrades (major modification work). Infrastructure includes land, permanent way constructions, buildings, bridges and tunnels, as well as immovable fixtures, fittings and installations connected with them, as opposed to road vehicles/rolling stock.

Maintenance expenditure includes non-capital expenditure to maintain the condition and capacity of the existing road/railway infrastructure. For road, this includes surface maintenance, patching and running repairs (work relating to roughness of carriageway's wearing course, roadsides, etc.).

Variable	Road infrastructure investment																									
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Country																											
Austria	1	457.000.000	426.000.000	365.000.000	400.000.000	391.000.000	475.000.000	640.000.000	532.000.000	650.000.000	720.000.000	687.000.000	802.000.000	870.000.000	875.000.000	665.000.000	390.000.000	303.000.000	327.000.000	383.000.000	463.000.000	455.000.000	444.000.000	515.000.000	483.000.000	562.000.000	548.000.000	480.000.000
Belgium	1	160.000.000	159.000.000	153.000.000	152.000.000	161.000.000	149.000.000	147.000.000	172.000.000	185.000.000	156.000.000	156.000.000	166.000.000	156.000.000	175.000.000	348.000.000	248.000.000	553.000.000	587.000.000	417.000.000	778.000.000	810.000.000	655.906.000	681.000.000	735.000.000	607.000.000	1.311.000.000
Bulgaria	1	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	272.011.453	256.161.162	213.211.985	256.161.162	150.892.729	370.892.300	511.811.024	586.949.484	505.164.127	563.452.296	839.042.847	163.104.612	115.942.438	882.503.323	528.172.615	525.104.816	151.856.018
Croatia	1	70.802.674	135.115.544	184.540.440	341.318.962	340.016.418	304.259.104	304.674.346	615.691.776	1.047.333.448	876.453.643	750.192.513	874.960.750	1.086.943.500	1.101.298.414	909.103.292	515.318.232	465.691.547	478.640.661	424.198.443	279.516.936	238.376.675	197.358.816	196.532.876	288.517.885	354.803.052	442.003.608	536.983.172
Czech Republic	1	282.514.209	305.765.051	382.031.170	374.699.290	322.285.882	308.618.743	382.459.965	518.284.867	625.637.901	1.031.226.395	1.414.691.140	1.491.555.568	1.493.848.724	2.041.828.599	1.985.424.195	1.719.545.029	1.293.210.027	876.329.248	647.511.082	604.013.684	885.358.255	849.231.714	984.191.255	1.044.764.479	1.383.064.925	1.640.906.428	1.817.146.779
Denmark	1	351.844.522	403.679.448	399.577.704	387.743.873	413.468.503	454.533.258	497.034.433	399.166.601	586.620.372	727.882.363	927.707.771	1.190.760.279	1.028.882.805	835.622.318	713.777.312	938.593.619	1.051.981.893	1.323.651.888	1.046.943.510	1.101.557.365	1.088.396.911	1.099.470.814	1.065.643.190	1.088.963.935	-	-	-
Estonia	1	8.000.000	12.000.000	10.000.000	17.000.000	21.000.000	22.000.000	47.000.000	48.000.000	58.000.000	102.000.000	130.000.000	126.000.000	142.000.000	119.000.000	137.000.000	158.000.000	198.400.000	214.530.000	147.660.000	185.650.000	148.900.000	197.000.000	219.000.000	230.000.000	244.000.000	281.000.000	-
Finland	1	457.000.000	429.000.000	436.000.000	443.000.000	458.000.000	488.000.000	589.000.000	520.000.000	533.000.000	599.000.000	595.000.000	690.000.000	862.000.000	973.000.000	922.000.000	890.000.000	973.000.000	1.126.000.000	1.146.000.000	1.238.000.000	1.243.000.000	1.178.000.000	1.235.000.000	1.526.000.000	1.522.000.000	1.444.000.000	1.375.000.000
France	1	10.805.287.015	10.947.662.219	10.819.524.890	10.532.981.894	10.276.291.951	10.940.364.409	10.920.413.960	10.345.177.749	10.960.328.004	11.526.363.522	12.402.864.253	12.915.322.777	13.883.209.568	14.086.319.131	14.277.760.990	14.497.093.953	12.604.291.274	13.173.701.931	12.866.198.552	10.867.238.024	10.011.226.322	9.216.000.000	9.080.000.000	9.883.630.000	10.413.000.000	9.630.572.000	10.153.386.000
Germany	1	12.218.000.000	11.126.000.000	10.916.000.000	10.856.000.000	11.146.000.000	11.967.000.000	11.598.000.000	11.395.000.000	10.790.000.000	10.710.000.000	10.206.000.000	10.730.000.000	10.946.000.000	11.410.000.000	12.820.000.000	12.256.000.000	12.390.000.000	11.130.000.000	11.360.000.000	11.810.000.000	11.430.000.000	12.090.000.000	15.520.000.000	15.910.000.000	16.730.000.000	17.090.000.000	16.465.000.000
Greece	1	1.140.000.000	1.131.094.971	1.121.848.952	1.090.210.788	1.060.673.285	1.408.000.000	1.408.000.000	1.664.000.000	1.691.000.000	1.902.000.000	1.902.000.000	1.902.000.000	1.902.000.000	1.902.000.000	1.902.000.000	1.902.000.000	1.902.000.000	994.576.000	2.206.562.891	1.543.210.370	1.340.729.715	2.107.061.728	1.894.982.179	2.198.913.344	2.298.877.729	760.394.404	730.714.966
Hungary	1	131.094.971	121.848.952	90.210.788	60.673.285	108.514.742	75.764.495	284.222.217	287.668.499	242.985.340	1.491.869.915	1.793.145.270	1.582.691.997	1.446.617.023	1.787.887.700	1.965.229.784	1.146.717.008	1.132.469.946	994.576.000	2.206.562.891	1.543.210.370	1.340.729.715	2.107.061.728	1.894.982.179	2.198.913.344	2.298.877.729	760.394.404	730.714.966
Ireland	1	282.000.000	281.000.000	473.000.000	547.000.000	742.000.000	893.000.000	1.228.000.000	1.400.000.000	1.516.000.000	1.562.000.000	1.662.000.000	2.019.000.000	2.369.000.000	2.191.000.000	1.769.000.000	1.414.000.000	1.017.000.000	886.000.000	594.000.000	638.000.000	612.000.000	622.000.000	547.000.000	490.000.000	837.000.000	-	-
Italy	1	4.980.000.000	5.652.000.000	5.144.000.000	6.258.000.000	6.365.000.000	6.930.000.000	4.582.000.000	5.071.000.000	6.874.000.000	7.572.000.000	9.169.000.000	14.298.000.000	13.664.000.000	13.851.000.000	5.941.000.000	3.380.000.000	4.129.000.000	3.107.000.000	2.841.000.000	3.860.000.000	5.151.000.000	3.755.000.000	3.409.000.000	6.595.000.000	4.310.000.000	4.393.000.000	-
Latvia	1	3.000.000	4.000.000	1.000.000	1.000.000	5.000.000	8.000.000	8.000.000	46.000.000	55.000.000	139.000.000	158.000.000	231.000.000	272.000.000	132.000.000	131.000.000	222.000.000	190.000.000	190.000.000	188.000.000	203.000.000	190.000.000	226.000.000	221.400.000	223.000.000	198.000.000	201.000.000	
Lithuania	1	15.000.000	24.000.000	40.000.000	96.000.000	130.000.000	109.000.000	70.000.000	112.000.000	142.000.000	137.000.000	165.000.000	242.000.000	312.000.000	437.000.000	448.000.000	422.000.000	343.000.000	243.000.000	253.000.000	224.000.000	258.000.000	357.000.000	345.000.000	325.000.000	382.000.000	466.000.000	434.000.000
Luxembourg	1	113.741.291	107.367.648	101.302.475	112.859.211	145.516.902	166.020.801	185.872.401	212.893.775	188.405.582	135.202.790	127.657.002	175.887.340	157.402.017	137.772.605	148.466.157	182.571.021	221.976.449	213.399.365	219.297.196	213.746.154	226.217.136	213.537.132	225.977.736	188.596.004	260.016.913	246.225.525	-
Malta	1	148.129	4.559.862	485.310	1.421.060	5.350.175	5.690.478	4.401.961	9.894.943	8.030.706	13.928.688	35.791.797	26.546.946	25.885.222	16.097.173	3.701.352	12.983.742	17.340.553	26.747.405	11.066.059	38.522.825	38.522.825	38.522.825	38.522.825	-	-	-	-
Netherlands	1	1.122.000.000	1.122.000.000	1.122.000.000	1.350.000.000	1.500.000.000	1.727.000.000	1.847.000.000	2.279.000.000	2.328.000.000	2.334.000.000	1.636.000.000	1.654.000.000	1.680.000.000	2.194.000.000	2.363.000.000	2.300.000.000	2.287.000.000	2.287.000.000	2.287.000.000	2.287.000.000	2.287.000.000	2.287.000.000	2.287.000.000	2.287.000.000	-	-	-
Norway	1	826.273.743	782.079.282	868.486.043	948.335.666	1.001.503.398	908.709.960	1.018.896.992	1.163.899.282	1.073.567.098	1.138.451.248	1.461.268.704	1.474.839.367	1.734.532.257	2.136.830.075	2.488.314.545	2.673.994.504	2.811.945.901	3.301.050.097	3.844.281.303	3.804.023.890	3.593.166.601	3.383.300.871	3.717.706.837	4.060.996.188	4.051.596.480	3.272.508.578	-
Poland	1	638.234.072	180.319.724	227.286.607	299.220.646	296.678.338	1.019.511.952	1.093.924.457	1.035.941.352	1.010.617.738	1.235.382.375	1.874.906.777	2.605.324.639	3.444.000.952	4.504.566.015	5.337.669.938	6.509.637.046	8.323.257.338	4.382.811.940	2.464.797.122	1.721.113.634	2.170.794.683	3.075.442.295	3.209.955.188	2.668.638.220	2.415.357.766	3.307.598.127	3.169.807.187
Portugal	1	737.000.000	748.000.000	970.000.000	905.000.000	952.000.000	961.000.000	1.686.000.000	1.620.000.000	1.937.000.000	1.933.000.000	2.112.000.000	1.940.000.000	1.483.000.000	1.366.000.000	951.000.000	1.511.000.000	892.900.000	274.000.000	211.000.000	211.000.000	211.000.000	211.000.000	211.000.000	211.000.000	-	-	-
Romania	1	352.112.676	389.546.112	457.411.298	490.265.398	443.271.120	630.549.285	735.486.351	834.280.594	707.380.084	1.094.879.704	1.330.885.601	1.950.886.642	2.803.898.714	3.889.798.702	3.305.245.778	2.851.137.605	3.283.631.388	3.092.797.380	2.728.712.892	2.492.631.011	2.870.287.051	2.366.794.335	2.133.948.521	2.181.564.246	-	-	-
Slovak Republic	1	53.000.000	79.000.000	315.000.000	300.000.000	204.000.000	227.000.000	201.000.000	260.000.000	210.000.000	240.000.000	360.000.000	411.000.000	520.000.000	566.000.000	662.000.000	342.000.000	432.000.000	311.000.000	360.000.000	560.000.000	751.418.000	1.133.782.000	749.813.000	768.840.000	-	752.200.000	1.113.000.000
Slovenia	1	186.000.000	284.000.000	293.000.000	263.000.000	352.000.000	372.000.000	294.000.000	337.000.000	470.000.000	496.000.000	450.000.000	573.000.000	666.000.000	694.000.000	406.000.000	221.000.000	112.000.000	102.000.000	104.000.000	128.000.000	145.000.000	149.000.000	217.000.000	330.000.000	306.000.000	235.000.000	299.000.000
Spain	1	4.263.000.000	4.010.000.000	3.977.000.000	4.787.000.000	4.328.000.000	4.732.000.000	5.538.000.000	6.874.000.000	7.321.000.000	7.244.000.000	8.580.000.000	8.411.000.000	8.077.000.000	8.522.000.000	9.422.000.000	7.851.000.000	5.966.000.000	5.316.000.000	4.646.000.000	4.358.000.000	4.259.000.000	3.880.000.000	3.690.000.000	3.518.000.000	3.445.000.000	3.957.291.764	3.959.000.000
Sweden	1	911.535.618	1.013.551.599	890.100.749	1.047.089.898	926.199.178	912.040.161	1.007.379.237	1.295.666.466	1.399.105.695	1.443.068.493	1.297.938.600	1.407.281.727	1.422.704.035	1.604.051.202	1.573.673.852	1.666.090.563	1.911.693.030	2.212.089.940	2.013.062.829	1.864.811.089	1.861.457.053	2.086.339.294	2.374.415.099	2.497.001.960	2.503.424.108	2.941.619.550	2.910.555.161
Switzerland	1	2.520.219.994	2.418.696.595	2.335.948.428	2.297.688.883	2.603.098.225	2.716.184.118	2.765.492.585	2.946.919.302	2.734.924.706	2.729.097.866	2.766.259.769	2.710.571.483	2.674.295.798	2.840.400.731	2.996.887.211	3.418.463.319	3.822.528.363	3.880.361.736	3.731.416.037	3.647.291.289	4.225.708.278	3.968.196.208	3.930.182.108	3.816.554.663	4.300.737.024	4.700.409.536	-
United Kingdom	1	5.223.160.434	4.864.200.565	5.079.410.915	4.784.087.548	4.754.247.573	5.563.676.702	5.932.213.861	6.246.819.338	5.195.837.549	4.949.896.846	5.630.940.196	6.340.569.082	6.199.078.294	6.036.456.999	6.566.820.651	6.482.927.057	5.564.989.629	5.557.509.855	6.029.949.384	7.845.556.796	9.067.911.846	8.561.410.429	9.082.089.706	8.673.208.374	9.642.561.268	-	-

data shaded green is interpolated to retrieve cumulative investments 1995-2018

Variable	Rail infrastructure investment																								
Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Country																											
Austria	521.000.000	590.000.000	710.000.000	979.000.000	1.120.000.000	1.199.000.000	1.071.000.000	1.191.000.000	1.145.000.000	1.335.000.000	1.330.000.000	1.489.000.000	1.505.000.000	1.683.000.000	2.062.000.000	1.938.000.000	2.143.000.000	1.688.000.000	1.648.000.000	1.567.000.000	1.549.000.000	1.523.000.000	1.552.000.000	1.682.000.000	1.737.000.000	2.002.000.000	2.249.500.000
Belgium	668.000.000	537.000.000	635.000.000	637.000.000	764.000.000	1.012.000.000	856.000.000	1.049.000.000	959.000.000	976.000.000	948.527.538	929.448.431	820.740.802	982.865.787	1.404.314.281	1.376.467.073	1.296.068.383	1.333.431.630	1.200.786.096	1.107.978.558	1.005.993.900	959.083.669	880.000.000	926.000.000	899.000.000	1.008.252.225	1.137.261.091
Bulgaria	45.506.257	28.905.830	13.704.406	22.851.920	21.474.588	77.876.832	77.507.443	50.790.068	26.167.265	31.230.801	45.505.675	39.370.079	44.483.076	71.981.961	49.596.073	129.870.130	89.988.751	114.019.838	123.734.533	167.195.010	301.155.537	153.389.917	92.033.960	96.124.348	124.245.833	171.285.408	166.172.410
Croatia	7.168.039	13.337.586	29.515.008	25.402.439	24.806.693	19.228.757	20.979.789	36.423.484	104.383.449	128.160.674	93.757.177	121.503.385	92.258.214	125.688.658	98.211.488	83.416.796	80.528.071	61.824.419	181.137.617	130.720.666	60.021.014	44.329.418	62.563.635	99.621.197	128.198.215	126.154.091	140.654.261
Czech Republic	112.319.718	159.803.372	280.063.375	302.455.738	268.707.142	370.746.943	393.952.582	473.793.692	415.919.504	411.744.610	484.400.023	465.026.007	612.539.718	1.217.156.136	740.621.740	563.179.265	446.822.182	381.534.889	334.864.788	454.245.019	1.164.925.783	881.496.031	965.612.750	741.057.048	762.841.939	1.123.320.293	1.448.913.705
Denmark	726.071.706	1.033.587.869	872.255.409	818.021.814	634.648.524	563.873.461	459.730.013	478.433.484	337.922.403	341.536.949	240.894.630	178.171.629	232.055.618	372.988.197	356.687.214	396.390.590	862.871.945	915.795.696	996.124.915	1.159.371.688	1.308.422.482	1.185.026.997	1.229.171.589	1.351.366.856	-	-	-	-
Estonia	4.000.000	-	0	15.000.000	24.000.000	19.000.000	15.000.000	18.000.000	16.000.000	20.000.000	20.000.000	21.000.000	30.000.000	23.000.000	37.000.000	35.000.000	94.000.000	47.700.000	26.500.000	15.500.000	13.100.000	14.500.000	13.800.000	26.400.000	31.500.000	32.000.000	60.000.000
Finland	226.000.000	192.000.000	224.000.000	254.000.000	264.000.000	233.000.000	204.000.000	225.000.000	275.000.000	328.000.000	281.000.000	234.000.000	211.000.000	327.000.000	361.000.000	388.000.000	355.000.000	450.000.000	605.000.000	643.000.000	567.000.000	537.000.000	521.000.000	491.000.000	462.000.000	684.000.000	606.000.000
France	2.765.572.479	2.963.000.000	3.024.000.000	2.879.000.000	2.891.000.000	2.954.750.000	2.443.638.000	3.044.642.000	3.633.564.000	3.680.498.000	4.171.382.500	4.303.020.000	4.616.418.000	4.696.513.302	4.968.770.094	5.103.166.000	7.060.006.000	8.043.087.000	10.467.884.000	9.125.321.000	8.797.194.000	8.614.650.000	9.334.770.000	10.284.883.399	11.528.382.879	10.789.379.413	11.557.639.689
Germany	5.747.000.000	5.200.000.000	4.745.000.000	4.423.000.000	7.350.000.000	5.305.000.000	5.481.000.000	7.437.000.000	7.228.000.000	6.404.000.000	3.411.000.000	3.971.000.000	3.836.000.000	3.816.000.000	3.412.000.000	3.807.000.000	4.086.000.000	5.915.000.000	5.773.301.077	6.948.115.139	6.857.149.428	6.413.000.000	7.056.000.000	7.590.000.000	8.577.000.000	9.615.000.000	10.078.000.000
Greece	591.000.000	591.000.000	591.000.000	591.000.000	591.000.000	591.000.000	304.000.000	983.000.000	1.699.000.000	1.786.000.000	420.000.000	247.000.000	324.000.000	340.000.000	467.000.000	503.562.715	164.317.672	246.098.252	142.647.288	59.358.735	343.564.394	449.573.425	223.801.714	150.967.153	97.855.566	50.895.099	49.384.983
Hungary	84.591.378	102.938.520	79.737.527	135.276.508	188.116.128	196.793.653	227.570.120	277.905.523	279.364.646	154.510.341	170.675.846	91.468.668	376.435.452	298.159.789	317.614.836	271.989.024	348.777.344	472.418.139	622.201.662	626.656.305	701.286.716	323.165.093	556.053.319	803.129.312	879.842.869	717.621.882	645.515.782
Ireland	29.000.000	2.000.000	9.000.000	35.669.485	5.223.189	245.005.372	86.127.938	151.516.434	195.394.807	194.179.561	180.829.605	173.899.708	251.038.590	147.379.149	138.532.474	101.666.638	143.086.989	64.607.367	65.741.390	1.560.069.268	63.845.201	34.831.490	68.810.087	43.610.567	71.688.996	101.000.000	-
Italy	1.950.000.000	2.013.000.000	2.078.000.000	2.170.000.000	3.681.000.000	4.549.000.000	4.956.000.000	5.525.000.000	7.403.000.000	8.809.000.000	10.175.000.000	8.970.000.000	7.702.000.000	7.109.000.000	5.687.000.000	4.773.000.000	4.466.000.000	4.238.000.000	4.103.000.000	4.742.000.000	2.861.000.000	3.874.000.000	3.296.000.000	2.855.000.000	4.246.000.000	9.768.000.000	-
Latvia	7.000.000	9.000.000	17.000.000	21.000.000	19.000.000	24.000.000	19.000.000	24.000.000	32.000.000	29.000.000	35.000.000	29.000.000	36.000.000	63.000.000	63.000.000	73.000.000	53.000.000	102.000.000	77.000.000	136.000.000	209.000.000	24.400.000	23.500.000	20.900.000	26.505.000	48.520.000	83.960.000
Lithuania	4.000.000	17.000.000	22.000.000	29.000.000	19.000.000	18.000.000	25.000.000	58.000.000	85.000.000	70.000.000	68.000.000	50.000.000	76.000.000	85.000.000	67.000.000	107.000.000	116.000.000	140.000.000	139.000.000	264.000.000	180.000.000	70.000.000	49.000.000	65.000.000	86.000.000	174.000.000	109.000.000
Luxembourg	23.231.763	167.914.273	28.696.427	35.507.475	29.761.824	39.218.601	72.480.890	68.805.000	88.265.000	106.899.000	126.527.000	103.884.868	138.483.654	149.743.176	172.348.101	156.537.840	150.428.284	124.893.429	145.888.748	191.503.382	277.740.939	317.180.824	269.998.924	263.917.942	235.449.619	265.778.926	-
Malta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	497.000.000	487.000.000	487.000.000	503.000.000	488.000.000	710.000.000	816.000.000	1.348.000.000	1.298.000.000	1.651.000.000	1.100.000.000	703.000.000	845.000.000	820.000.000	778.000.000	1.097.000.000	1.136.000.000	1.136.000.000	1.138.000.000	1.138.000.000	1.138.000.000	1.138.000.000	1.138.000.000	1.138.000.000	1.138.000.000	-	-
Norway	323.655.058	489.647.039	389.527.777	348.361.625	197.125.504	362.719.844	199.157.649	189.479.169	200.282.516	221.932.895	193.188.484	258.255.347	310.940.782	287.544.986	358.583.081	479.265.951	561.123.016	675.807.838	838.882.400	1.218.297.808	1.281.411.812	1.460.608.865	1.249.062.824	1.316.688.540	1.537.091.127	1.476.867.377	-
Poland	247.532.358	292.541.033	292.941.033	337.549.508	237.056.768	198.113.679	119.014.351	108.472.817	194.358.288	219.981.466	236.185.864	351.264.368	646.824.033	903.580.483	649.914.546	890.112.941	925.291.961	430.896.446	268.809.585	51.052.933	340.441.809	326.565.221	310.302.375	461.906.774	654.739.302	625.675.189	683.829.974
Portugal	196.000.000	267.000.000	478.000.000	538.000.000	342.000.000	401.000.000	448.000.000	523.000.000	704.000.000	464.000.000	415.000.000	307.000.000	329.000.000	392.000.000	433.000.000	339.000.000	384.000.000	210.000.000	120.000.000	177.000.000	79.000.000	262.000.000	192.000.000	216.000.000	220.000.000	307.000.000	-
Romania	57.000.000	57.000.000	57.000.000	44.403.122	27.000.497	43.140.286	58.801.081	241.846.900	91.009.492	57.672.134	169.045.729	101.161.310	207.674.378	214.402.555	175.775.224	273.805.545	298.324.039	117.753.173	238.855.668	276.659.024	278.950.078	211.661.387	214.553.031	279.405.459	-	-	-
Slovak Republic	59.000.000	107.000.000	121.000.000	37.000.000	37.000.000	16.000.000	15.000.000	21.000.000	21.000.000	59.000.000	42.000.000	12.000.000	84.000.000	12.000.000	72.000.000	121.000.000	108.000.000	72.000.000	140.000.000	270.000.000	276.000.000	84.400.000	100.000.000	153.000.000	208.000.000	176.800.000	220.000.000
Slovenia	16.000.000	16.000.000	16.000.000	16.000.000	16.000.000	16.000.000	15.000.000	20.000.000	21.000.000	59.000.000	42.000.000	12.000.000	82.000.000	12.000.000	72.000.000	121.000.000	108.000.000	72.000.000	140.000.000	270.000.000	276.000.000	84.400.000	100.000.000	153.000.000	208.000.000	189.000.000	277.000.000
Spain	767.000.000	816.000.000	686.000.000	944.000.000	1.391.000.000	1.860.000.000	2.456.000.000	3.652.000.000	3.791.000.000	4.388.000.000	5.764.000.000	6.336.000.000	8.345.000.000	8.881.000.000	8.772.000.000	7.669.000.000	7.553.000.000	5.350.000.000	2.710.000.000	3.042.000.000	2.613.000.000	1.857.000.000	2.215.000.000	2.168.000.000	2.218.000.000	2.380.557.000	2.519.000.000
Sweden	1.141.240.880	1.045.663.629	701.981.431	763.852.691	682.390.865	989.990.410	556.846.052	666.120.756	652.318.865	1.093.632.877	1.301.085.118	1.250.526.839	1.445.790.685	1.536.170.699	1.527.972.180	1.955.636.908	1.586.351.278	1.570.135.643	1.286.192.218	1.485.713.210	1.630.006.948	1.501.653.658	1.524.982.100	1.424.327.513	1.691.537.495	2.080.691.450	2.249.044.239
Switzerland	1.079.282.375	1.170.131.361	1.231.527.094	1.290.302.694	1.342.786.303	1.463.054.933	1.643.935.381	2.011.995.638	2.004.340.107	2.115.795.859	2.191.435.768	2.350.722.360	2.329.092.348	2.622.393.044	2.898.270.746	3.092.122.703	3.410.048.622	3.463.867.917	3.666.610.529	3.590.139.964	4.193.514.172	3.805.993.396	3.120.726.880	3.078.186.588	3.434.888.110	3.797.066.243	3.666.955.699
United Kingdom	2.413.751.508	2.734.423.006	3.361.247.473	3.910.085.773	4.316.444.175	4.874.487.285	5.875.542.692	6.749.363.888	7.493.857.494	5.450.926.382	5.756.688.574	7.939.278.381	7.729.667.741	7.538.440.678	6.307.135.218	6.987.090.422	7.532.693.017	8.765.858.710	8.426.350.683	10.306.706.349	14.665.633.609	13.611.090.487	13.161.511.071	13.542.947.559	13.298.380.880	-	-

data shaded green is interpolated to retrieve cumulative investments 1995-2018

Austria

Source: Ministry of Transport and Infrastructure.

Rail infrastructure expenses do not include investment in Brenner Basistunnel (BBT), which started in 2004. Road infrastructure expenses do not include investment in urban and provincial roads. Since 2002, road infrastructure expenses only include investment in motorways (in 2002 at the exception of motorways, the whole federal road network was assigned to the Austrian provinces).

Belgium

Rail infrastructure expenses refer to investment carried out by Infrabel (the Belgian infrastructure manager), including the estimated investments through PPP-constructions. Rail infrastructure expenses also include investment in maritime ports. Between 2013 and 2014, the reorganisation of the Belgian railways has influenced the perimeter of Infrabel, changing the scope of the managed investments, that creates a break in the series.

Bulgaria

Source: Rail: National Railway Infrastructure Company. Road: Road Infrastructure Agency.

In 2010, rail infrastructure expenses include 13 million BGN Levs for supervision and technical assistance for preparation of projects. Road infrastructure expenses do not include investment in urban roads nor municipal roads. Road infrastructure expenses do not include road projects realised under the Phare Programme.

Croatia

Data do not include private investment. Road infrastructure expenses do not include investment in urban roads.

Czech Republic

Road infrastructure expenses include investment in motorways and roads of class I, II and III. Road infrastructure expenses do not include investment in urban roads.

Denmark

Source: Denmark Statistics

Rail infrastructure expenses include investment in the Great Belt Bridge, the Øresund Bridge and the metro of Copenhagen. Since 2011, the increase in rail infrastructure expenses is due to the extension of the metro of Copenhagen. Road infrastructure expenses include investment in urban roads.

Estonia

Source: Rail: Estonian Railway Ltd., Ott Koppel and since 2021 Rail Baltic investments (State Budget Unit of Estonian Ministry of Economic Affairs and Communications). Roads: State Budget Unit of Estonian Ministry of Economic Affairs and Communications.

Road infrastructure expenses include investment in some urban roads. Since 2005, road infrastructure expenses increased due to the construction of state roads in

accordance with the TEN-T requirements. Until 2011, road infrastructure expenses include government investment in state roads and EU structural funds. Since 2012, data include government investment in state roads and local roads, as well as structural funds and local co-financing for local roads.

Finland

Source: Finnish Road Administration.

Data refer to investment carried out by State and municipalities assuming that investment carried out by municipalities is made on roads. Data include investment in urban and suburban railways. Data include investment in urban roads, but not in private roads.

France

Data include investment in the main rail network, the rail network in the Île de France region, RATP network, the Grand Paris project, urban and provincial public transport, subways and tramways. Data do not include investment in the French part of the Eurotunnel. Data include investment in the entire French road network, including urban roads.

Germany

Source: German Institute for Economic Research and German Aerospace Center.

Data include investment in stations. Between 2005 and 2012, data refer only to investment in Deutsche Bahn AG. Data include investment in urban roads.

Greece

Source: EL.STAT.

Data include investment in rolling stocks. Data include investment in urban roads.

Hungary

Data refer only to investment carried out by the State. Data include investment in urban roads.

Ireland

Data include investment in computer equipment, plant and machinery, property, safety buildings, signal equipment, signalling renewals, structures and track in the financial year.

Italy

Since 2002, data do not include investment in urban roads.

Latvia

Data include investment in suburban railways. Until 2002, data include only investment in state roads. Since 2003, data include investment in state roads, local roads and urban streets.

Lithuania

Data include investment in state and local roads carried out by the State. Data do not include investment in urban roads.

Luxembourg

(no information on sources and data provided)

Malta

Source: National Statics Office with figures derived from the Ministry for Transport and Infrastructure, the Ministry for Local Councils and Transport Malta.

Data include investment in urban roads.

Netherlands

(no information on sources and data provided)

Norway

Data include investment in urban roads.

Poland

Data include investment in urban roads, except from 1996 to 1999 when they include only investment in national roads.

Portugal

Source: Until 2008, Estradas de Portugal (EP); in 2009 and 2010, Instituto de Infraestrutural Rodoviárias (inIR); in 2012 and 2013, Instituto de Mobilidade et dos Transportes.

Between 2000 and 2008, data refer to the value of the annual investment in long-term infrastructure under the management of REFER. Data do not include investment in municipal and urban roads. Data include ongoing investment. Since 2009, data include investment in the entire national road network (common roads and highways).

Romania

Source: National Institute for Statistics.

Data do not include investment in urban roads.

Slovak Republic

Data include the total gross investment in intermodal infrastructure administrated by Railways of the Slovak Republic (ZSR). Since 2009, data do not include the total gross investment in intermodal infrastructure administrated by the private sector. Data include investment in state and regional road segments, which may lead through urban areas. Data do not include investment in local roads.

Slovenia

Data include investment in state roads (main and regional), but do not include investment in urban roads. Data include investment in research and development.

Spain

Since 2006, data include investment carried out by Sociedad Estatal de Infraestructuras del Transporte Terrestre.

Sweden

Source: National Accounts.

Data include investment in trams and metro. Until 2003, data do not include reinvestment (e.g. major renovations and reconstructions). Data include investment in urban roads and only investment carried out by the public sector.

Switzerland

Data include investment in urban roads.

United Kingdom

Data refer to investment in Great Britain. Data include investment in all urban and suburban railways, underground, Metrolink and Tramlink. Data do not include investment in rolling stocks. Until 2006, data include investment in the UK part of Eurotunnel. Until 2014, data include the Government grant to Network Rail (manager of the railway track). Since 2015, data include investment carried out by Network Rail. Data include investment in urban roads carried out by local authorities. Data include investment in motorways carried out by the private sector (DBFO schemes). Data refer to fiscal years ending on 31 March.

7.2 Statistical relationship between transport supply and demand

Kendall's Tau rank correlation is a widely used non-parametric i.e., distribution independent correlation coefficient that is robust against the influence of outliers. The value range of Kendall's Tau spans from -1 to 1. A correlation coefficient of 1 means that there is a perfect positive linear relationship between the tested variables. Correspondingly, -1 is a perfect negative linear relationship between the tested variables. If the correlation coefficient is 0, no linear relationship between the variables exists. As a rule of thumb, correlation coefficients between 0.5-0.7 can be interpreted as moderate, positive correlations; 0.7-0.9 as high positive correlations and above 0.9 as very high correlations. The same interpretation applies for negative correlations.

Statistical significance is tested by calculation of the p value. The smaller the p value is, the more significant are the results, i.e., the probability that the results occurred randomly are minimal. The threshold value for significance is usually assumed to be a p value of 0.05.

On the following two pages, the association is tested between the variables:

- billion passenger km travelled on national roads by car (on railways), and
- the variables: km lengths of motorways (railways)

per country (EU-27, Norway, Switzerland, UK) between 1995 and 2020. Kendall's Tau rank correlation is applied. The null hypothesis is that there is no association between these two variables.

The table below shows for road transport that for most countries, the null hypothesis can be rejected, meaning that there is a high to very high positive correlation between road kilometres [km] and demand for road transport [pkm]. Additionally, moderate correlations are found for Czechia, Switzerland, Latvia, France, United Kingdom and Spain. Negligible correlations are found for Sweden, Ireland, Italy and the Netherlands. A moderate negative correlation is found in Lithuania.

Kendall's Tau rank correlation for road kilometres [km] and demand for road transport [pkm] 1995-2020.

Country	tau
Austria	0.78***
Belgium	0.74***
Bulgaria	0.93***
Croatia	0.79***
Czechia	0.64***
Denmark	0.85***
Estonia	0.91***
Finland	0.83***
France	0.55***
Germany	0.73***
Greece	0.87***
Hungary	0.84***
Ireland	0.26
Italy	0.15
Latvia	0.57***
Lithuania	-0.51***
Luxembourg	0.86***
Netherlands	0.10
Norway	0.92***
Poland	0.93***
Portugal	0.76***
Romania	0.92***
Slovak Republic	0.88***
Slovenia	0.72***
Spain	0.32**
Sweden	0.27
Switzerland	0.62***
United Kingdom	0.54***

Significance levels: * P ≤ 0.05, ** P ≤ 0.01, *** P ≤ 0.001

The table below shows for railways that for most countries, the null hypothesis can be rejected, meaning that there is a moderate to high positive correlation between rail kilometres [km] and demand for rail transport [pkm]. Negligible correlations are found for Slovakia, Croatia, Portugal, Sweden and France. Czechia, Denmark, Austria and the United Kingdom show moderate correlations, Germany displays a high negative correlation. Further research is necessary to understand the causes of these differences.

Kendall's Tau rank correlation for rail kilometres [km] and demand for rail transport [pkm] 1995-2020.

Country	tau
Austria	-0.56***
Belgium	0.74***
Bulgaria	0.71***
Croatia	0.19
Czechia	-0.50***
Denmark	-0.52***
Estonia	0.32*
Finland	0.54***
France	-0.24
Germany	-0.82***
Greece	0.38**
Hungary	0.34*
Ireland	-0.27
Italy	0.38**
Latvia	0.59***
Lithuania	0.56***
Luxembourg	0.35*
Netherlands	0.63***
Norway	0.59***
Poland	0.61***
Portugal	0.18
Romania	0.76***
Slovak Republic	0.25
Slovenia	0.57***
Spain	0.73***
Sweden	-0.11
Switzerland	0.67***
United Kingdom	-0.56***

Significance levels: * P ≤ 0.05, ** P ≤ 0.01, *** P ≤ 0.001

7.3 Data on transport supply and demand

Road passenger kilometres

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	59,40	60,46	61,52	62,58	63,64	64,70	65,46	66,22	66,98	67,74	68,50	68,48	68,46	68,44	68,42	68,40	69,30	70,20	71,10	72,00	72,90	74,45	76,00	77,55	79,10	65,20
Belgium	96,40	97,62	98,84	100,06	101,28	102,50	102,56	102,62	102,68	102,74	102,80	104,12	105,44	106,76	108,08	109,40	108,92	108,44	107,96	107,48	107,00	107,10	107,20	107,30	107,40	99,10
Bulgaria	25,00	25,38	25,76	26,14	26,52	26,90	28,54	30,18	31,82	33,46	35,10	37,46	39,82	42,18	44,54	46,90	48,88	50,86	52,84	54,82	56,80	57,13	57,45	57,78	58,10	51,00
Croatia	12,50	14,00	15,50	17,00	18,50	20,00	20,80	21,60	22,40	23,20	24,00	24,34	24,68	25,02	25,36	25,70	25,84	25,98	26,12	26,26	26,40	26,15	25,90	25,65	25,40	20,20
Cyprus	**no data**																									
Czechia	54,50	57,90	59,00	60,80	62,40	63,94	63,47	65,29	67,36	67,57	68,64	69,63	71,54	72,38	72,29	63,57	65,49	64,26	64,65	66,26	69,71	72,26	74,33	77,97	81,18	68,94
Denmark	48,40	48,84	49,28	49,72	50,16	50,60	50,44	50,28	50,12	49,96	49,80	50,18	50,56	50,94	51,32	51,70	52,72	53,74	54,76	55,78	56,80	58,23	59,65	61,08	62,50	58,50
Estonia	5,10	5,42	5,74	6,06	6,38	6,70	7,34	7,98	8,62	9,26	9,90	9,94	9,98	10,02	10,06	10,10	10,54	10,98	11,42	11,86	12,30	12,75	13,20	13,65	14,10	12,40
Finland	50,00	50,40	51,90	53,30	54,90	55,70	57,00	58,30	59,59	60,94	61,91	62,46	63,79	63,40	64,33	64,75	65,49	65,27	65,12	65,52	66,30	57,01	66,60	66,80	66,80	64,10
France	641,20	650,50	659,80	669,10	678,40	687,70	691,08	694,46	697,84	701,22	704,60	695,66	686,72	677,78	668,84	659,90	682,46	705,02	727,58	750,14	772,70	774,48	776,25	778,03	779,80	629,80
Germany	815,30	816,10	817,10	828,10	848,40	831,30	852,60	863,00	857,70	868,70	856,90	863,30	866,50	871,30	881,10	884,80	894,40	896,30	903,10	916,40	927,00	946,30	897,70	898,60	902,60	809,20
Greece	44,00	47,80	51,60	55,40	59,20	63,00	67,40	71,80	76,20	80,60	85,00	87,92	90,84	93,76	96,68	99,60	99,34	99,08	98,82	98,56	98,30	100,05	101,80	103,55	105,30	92,70
Hungary	45,40	45,60	46,10	46,15	46,17	46,18	46,18	46,30	47,52	49,12	49,40	52,32	53,95	54,01	54,40	52,60	52,25	51,79	51,82	52,72	54,60	57,35	60,65	63,95	67,03	63,92
Ireland	31,60	38,20	44,80	51,40	58,00	64,60	60,56	56,52	52,48	48,44	44,40	45,14	45,88	46,62	47,36	48,10	48,86	49,62	50,38	51,14	51,90	53,60	55,30	57,00	58,70	51,80
Italy	614,71	627,38	638,84	662,55	663,32	713,93	717,68	711,73	710,99	716,06	677,01	676,26	677,06	676,36	719,91	698,39	665,33	578,67	620,37	642,92	676,35	704,54	744,92	722,89	732,43	488,30
Latvia	7,50	8,30	9,10	9,90	10,70	11,50	11,62	11,74	11,86	11,98	12,10	12,14	12,18	12,22	12,26	12,30	12,54	12,78	13,02	13,26	13,50	14,00	14,50	15,00	15,50	14,80
Lithuania	16,00	16,00	16,00	16,00	16,00	16,00	16,00	16,03	19,39	25,80	34,79	33,47	39,12	37,99	36,06	32,57	29,91	34,19	33,33	24,37	24,87	25,85	31,36	30,12	31,40	28,50
Luxembourg	4,70	4,88	5,06	5,24	5,42	5,60	5,74	5,88	6,02	6,16	6,30	6,34	6,38	6,42	6,46	6,50	6,66	6,82	6,98	7,14	7,30	7,48	7,65	7,83	8,00	7,10
Malta	1,70	1,72	1,74	1,76	1,78	1,80	1,84	1,88	1,92	1,96	2,00	2,04	2,08	2,12	2,16	2,20	2,26	2,32	2,38	2,44	2,50	2,55	2,60	2,65	2,70	2,40
Netherlands	131,40	132,70	136,50	137,10	141,30	141,10	141,60	144,20	146,10	151,50	148,80	148,00	150,50	147,04	145,62	144,20	144,40	139,60	145,40	145,00	139,50	140,80	138,70	147,53	147,47	105,25
Norway	44,70	46,00	47,30	48,60	49,90	51,20	51,76	52,32	52,88	53,44	54,00	54,96	55,92	56,88	57,84	58,80	59,98	61,16	62,34	63,52	64,70	65,33	65,95	66,58	67,20	62,80
Poland	110,70	121,60	132,00	141,10	143,00	130,13	132,34	135,83	141,30	146,83	152,28	156,64	162,28	172,62	182,76	188,81	189,10	189,32	193,34	197,03	200,57	211,55	222,54	233,52	244,50	224,10
Portugal	52,50	56,20	59,90	63,60	67,30	71,00	73,80	76,60	79,40	82,20	85,00	84,74	84,48	84,22	83,96	83,70	83,86	84,02	84,18	84,34	84,50	87,88	91,25	94,63	98,00	86,70
Romania	40,00	42,20	44,40	46,60	48,80	51,00	53,00	55,00	57,00	59,00	61,00	63,90	66,80	69,70	72,60	75,50	78,38	81,26	84,14	87,02	89,90	95,05	100,20	105,35	110,50	100,90
Slovak Republic	17,98	17,99	18,57	19,30	21,54	23,93	24,06	24,98	25,22	24,33	25,82	25,92	25,99	26,40	26,42	26,88	26,89	26,94	27,16	27,25	27,53	27,84	28,13	28,46	28,62	25,30
Slovenia	16,34	17,79	19,01	18,98	20,07	20,33	20,80	21,29	21,33	21,92	22,51	23,02	24,36	24,88	25,78	25,64	25,71	25,78	25,85	25,93	26,00	26,48	26,95	27,43	27,90	24,30
Spain	250,40	260,84	271,28	281,72	292,16	302,60	306,15	335,87	345,98	330,19	337,80	340,94	343,29	342,61	350,40	341,63	334,02	321,05	316,54	308,70	317,55	329,88	332,86	340,56	342,01	298,20
Sweden	87,60	90,81	94,02	97,23	100,44	103,66	104,83	106,62	107,32	108,36	107,98	108,14	110,24	109,47	108,90	108,01	109,03	108,38	108,25	110,37	111,95	93,74	95,44	96,34	95,62	90,14
Switzerland	69,59	70,77	71,41	72,54	73,53	74,98	75,49	76,37	77,00	77,74	77,84	78,39	79,26	81,40	83,89	85,93	86,72	88,15	89,47	90,70	91,99	93,97	95,74	96,90	97,85	80,14
United Kingdom	617,90	622,27	632,37	635,68	642,09	638,57	651,40	672,72	667,36	672,46	666,71	672,43	673,09	666,60	661,97	651,06	653,68	660,97	659,10	676,61	682,02	697,08	707,38	721,44	737,55	615,46
TOTAL	**4.012,51**	**4.095,68**	**4.184,43**	**4.283,71**	**4.371,31**	**4.441,14**	**4.501,54**	**4.583,61**	**4.612,38**	**4.652,88**	**4.632,91**	**4.664,26**	**4.691,18**	**4.699,53**	**4.769,75**	**4.727,63**	**4.732,96**	**4.672,95**	**4.757,51**	**4.835,55**	**4.933,44**	**5.020,84**	**5.078,18**	**5.126,10**	**5.195,26**	**4.335,24**

Dataset: Passenger road transport on national territory, by type of vehicles registered in the reporting country (Just cars), measured in billion person kilometres

Main source: European Commission (2022). Statistical pocketbook 2021: EU transport in figures, Luxembourg: Publications Office of the European Union. Available at https://transport.ec.europa.eu/media-corner/publications/statistical-pocketbook-2022_en Accessed: 7 Novemb

Further sources: Eurostat (2023). Passenger road transport on national territory, by type of vehicles registered in the reporting country. Available at https://ec.europa.eu/eurostat/databrowser/view/ROAD_PA_MOV/default/table?lang=en&category=road.road_pa Accessed: 27 Janu
ITF (2022). Passenger transport, ITF Transport Statistics (database), https://doi.org/10.1787/g2g55527-en (accessed on 10 November 2022).

Methodology:
1) Plausibility of all data was checked: Some single year numbers were outliers, some time series were outliers as compared to the other two time series of the same country. EC numbers were very plausible with few exceptions.
2) EC was used as main source, because of available data from 1995 to 2020.
3) In case of overlapping (same) numbers, EC numbers were complemented with Eurostat or ITF data, because EC numbers only existed in five-year steps.
4) Implausible numbers were not included.
5) In case of remaining data gaps between the five-year steps, data was interpolated (shaded in green).

Rail passenger kilometres

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	10,12	10,22	8,71	8,54	8,55	8,74	8,76	8,81	8,67	8,27	8,69	8,91	9,17	10,37	10,18	10,26	10,78	11,21	11,80	11,98	12,10	12,50	12,56	13,12	13,25	7,38
Belgium	6,76	6,79	6,98	7,10	7,35	7,73	8,04	8,26	8,27	9,23	8,51	8,96	9,40	10,14	10,24	10,56	10,67	10,86	10,89	10,98	10,33	10,03	10,37	10,71	11,06	7,50
Bulgaria	4,69	5,07	5,89	4,74	3,82	3,47	2,99	2,60	2,52	2,40	2,39	2,41	2,40	2,32	2,14	2,09	2,06	1,87	1,82	1,70	1,55	1,46	1,43	1,48	1,52	1,12
Croatia	1,14	1,21	1,16	1,09	1,14	1,25	1,24	1,20	1,16	1,17	1,23	1,32	1,57	1,77	1,80	1,71	1,46	1,08	0,94	0,92	0,94	0,83	0,74	0,75	0,72	0,45
Cyprus	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Czechia	8,02	8,11	7,71	7,00	6,93	7,30	7,30	6,60	6,52	6,58	6,67	6,92	6,90	6,77	6,47	6,56	6,67	7,20	7,51	7,64	8,13	8,74	9,40	10,22	10,86	6,62
Denmark	4,89	4,82	5,17	5,37	5,31	5,54	5,72	5,75	5,83	5,95	5,97	6,11	6,18	6,28	6,15	6,34	6,37	6,52	6,55	6,51	6,51	6,33	6,28	6,20	6,17	3,94
Estonia	0,42	0,31	0,26	0,24	0,24	0,26	0,18	0,18	0,18	0,19	0,25	0,26	0,27	0,27	0,25	0,25	0,24	0,24	0,22	0,28	0,29	0,32	0,37	0,42	0,39	0,26
Finland	3,18	3,25	3,38	3,38	3,42	3,41	3,28	3,32	3,34	3,35	3,48	3,54	3,78	4,05	3,88	3,96	3,88	4,04	4,05	3,87	4,11	3,87	4,27	4,54	4,92	2,82
France	46,80	50,70	52,20	55,70	57,00	74,90	76,80	78,60	76,60	80,20	82,30	85,80	87,90	93,20	92,30	92,40	95,70	95,80	95,10	94,40	94,70	94,00	100,20	97,20	101,94	59,21
Germany	70,98	71,73	72,40	72,67	73,80	75,40	75,75	70,82	71,29	72,90	76,80	79,00	79,11	82,54	82,25	83,89	85,41	88,80	89,62	90,98	91,71	94,20	95,55	98,20	100,25	57,79
Greece	1,57	1,75	1,88	1,55	1,58	1,89	1,75	1,84	1,57	1,67	1,85	1,81	1,93	1,66	1,47	1,38	0,96	0,83	1,06	1,07	1,26	1,19	1,11	1,10	1,25	0,64
Hungary	8,44	8,58	8,67	8,88	9,51	9,69	10,01	10,53	10,29	10,17	9,85	9,66	8,75	8,29	8,07	7,68	7,76	7,81	7,84	7,74	7,61	7,65	7,73	7,77	7,75	4,85
Ireland	1,29	1,30	1,39	1,42	1,46	1,39	1,52	1,63	1,60	1,58	1,78	1,87	2,01	1,98	1,68	1,68	1,64	1,58	1,57	1,73	1,92	1,99	2,12	2,28	2,40	0,83
Italy	46,65	47,58	46,39	44,19	46,30	49,57	50,08	49,30	48,70	49,25	50,09	50,19	49,78	49,52	48,12	47,17	46,85	46,76	48,74	49,96	52,21	52,18	53,23	55,49	56,59	22,27
Latvia	1,37	1,15	1,15	1,06	0,98	0,72	0,71	0,74	0,76	0,81	0,89	0,99	0,98	0,94	0,75	0,74	0,73	0,72	0,72	0,64	0,59	0,58	0,60	0,62	0,64	0,41
Lithuania	1,13	0,95	0,84	0,80	0,75	0,61	0,53	0,50	0,43	0,44	0,28	0,27	0,25	0,26	0,23	0,24	0,27	0,28	0,28	0,27	0,26	0,28	0,32	0,35	0,36	0,24
Luxembourg	0,29	0,28	0,30	0,30	0,31	0,33	0,35	0,27	0,26	0,25	0,27	0,30	0,32	0,35	0,33	0,35	0,35	0,37	0,39	0,37	0,42	0,42	0,44	0,44	0,46	0,27
Malta	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Netherlands	16,35	14,09	13,88	14,11	14,28	14,67	14,39	14,29	13,85	14,51	15,15	15,89	16,33	16,34	16,46	16,90	17,48	17,77	19,04	20,01	17,52	17,98	18,44	18,90	19,35	9,17
Norway	2,38	2,45	2,56	2,59	2,67	2,64	2,68	2,48	2,38	2,62	2,72	2,83	2,96	3,12	3,08	3,19	3,08	3,09	3,26	3,44	3,56	3,70	3,61	3,76	3,81	1,80
Poland	26,64	26,57	25,81	25,66	26,20	24,09	22,47	20,75	19,64	18,69	18,16	18,55	19,86	20,20	18,64	17,92	18,18	17,83	16,80	16,02	17,37	19,18	20,32	21,04	22,06	12,56
Portugal	4,81	4,50	4,57	4,60	4,33	4,03	3,99	3,93	3,75	3,75	3,81	3,88	3,99	4,21	4,21	4,11	4,24	3,80	3,65	3,85	3,96	4,27	4,52	4,57	5,06	2,56
Romania	18,88	18,36	15,79	13,42	12,30	11,63	10,97	8,50	8,50	8,64	7,99	8,09	7,48	6,96	6,13	5,44	5,07	4,57	4,41	4,98	5,15	4,99	5,66	5,58	5,91	3,72
Slovak Republic	4,20	3,77	3,10	3,09	2,97	2,87	2,81	2,68	2,32	2,23	2,18	2,21	2,17	2,30	2,26	2,31	2,43	2,46	2,49	2,58	3,41	3,48	3,75	3,79	3,96	2,13
Slovenia	0,60	0,61	0,62	0,65	0,62	0,71	0,72	0,75	0,78	0,70	0,72	0,72	0,74	0,77	0,77	0,73	0,69	0,66	0,68	0,62	0,63	0,61	0,57	0,57	0,57	0,34
Spain	16,59	16,80	17,88	18,87	19,66	20,14	20,83	21,21	21,13	20,39	21,62	22,11	21,86	23,97	23,14	22,46	22,80	22,48	23,79	25,07	26,14	26,67	27,52	28,42	28,85	12,06
Sweden	6,84	6,97	7,04	7,23	7,70	8,24	8,73	8,87	8,83	8,63	8,91	9,62	10,26	11,15	11,32	11,16	11,38	11,79	11,84	12,12	12,74	12,80	13,33	13,55	14,62	8,13
Switzerland	11,71	11,89	12,05	12,15	12,50	12,62	13,30	14,15	14,51	14,91	16,14	16,58	17,43	17,78	18,57	19,18	19,47	19,26	19,45	20,01	20,39	20,81	20,87	20,61	21,74	13,34
United Kingdom	30,27	32,35	34,89	36,50	38,69	38,41	39,38	39,92	41,16	43,47	44,64	47,30	50,47	53,00	52,77	55,83	58,46	60,78	61,95	64,71	66,59	68,01	68,91	69,71	71,82	24,19
TOTAL	**357,01**	**362,16**	**362,65**	**362,89**	**370,37**	**392,25**	**395,25**	**388,46**	**384,83**	**392,86**	**403,33**	**416,09**	**424,22**	**440,49**	**433,67**	**436,48**	**445,06**	**450,43**	**456,45**	**464,44**	**472,09**	**479,04**	**494,20**	**501,38**	**518,29**	**266,59**
TOTAL HSR EU-28	**32,94**	**37,52**	**43,36**	**48,47**	**52,69**	**58,80**	**65,13**	**68,01**	**70,66**	**76,11**	**80,11**	**84,32**	**88,70**	**97,60**	**104,10**	**105,87**	**108,06**	**109,80**	**111,67**	**109,28**	**112,82**	**118,91**	**129,06**	**130,90**	**136,83**	**70,38**

Dataset: Distances covered in billion person kilometres (pkm) with rail lines. EU-27 Member States and Norway, United Kingdom and Switzerland from 1995 and 2019.
Source: European Commission (2022). Statistical pocketbook 2021. EU transport in figures, Luxembourg: Publications Office of the European Union. Available at https://transport.ec.europa.eu/media-corner/publications/statistical-pocketbook-2022_en. Accessed: 7 Novem
Source HSR EU-28: Union Internationale des Chemins de Fer, national statistics, partly estimates
Shaded in green: Interpolation

Length of motorways [km]

Country/year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	1.886	1.899	1.907	1.909	1.932	1.934	1.934	1.999	1.999	2.030	2.050	2.050	2.077	2.113	2.113	2.145	2.185	2.185	2.187	2.187	2.192	2.208	2.208	2.232	2.232	2.242
Belgium	1.666	1.674	1.679	1.682	1.691	1.702	1.727	1.729	1.729	1.747	1.747	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763	1.763
Bulgaria	314	314	314	319	324	324	328	328	328	331	331	394	418	418	418	437	458	541	605	610	734	734	734	757	790	806
Croatia	302	318	330	330	382	411	429	613	754	925	1.016	1.081	1.156	1.199	1.244	1.244	1.254	1.254	1.289	1.290	1.310	1.310	1.310	1.310	1.310	1.310
Cyprus	168	168	194	204	216	240	257	268	268	268	276	257	257	257	257	257	257	257	257	257	257	257	257	257	257	257
Czechia	414	423	486	499	499	499	518	518	518	546	564	633	657	691	729	734	745	751	776	776	776	1.223	1.240	1.252	1.276	1.298
Denmark	796	832	855	873	892	953	971	1.010	1.025	1.041	1.056	1.071	1.111	1.128	1.133	1.138	1.143	1.195	1.216	1.232	1.237	1.255	1.308	1.329	1.346	1.354
Estonia	65	65	68	74	87	93	93	98	98	96	99	99	96	104	100	115	115	124	140	141	147	145	154	154	161	199
Finland	394	431	444	473	512	549	591	603	653	653	693	700	700	739	765	779	790	780	810	881	881	890	893	926	926	933
France	8.275	8.596	8.864	9.303	9.626	9.766	10.068	10.223	10.379	10.486	10.800	10.848	10.958	11.042	11.163	11.392	11.413	11.413	11.552	11.560	11.599	11.612	11.618	11.671	11.671	11.660
Germany	11.190	11.246	11.309	11.427	11.515	11.712	11.786	12.037	12.044	12.174	12.363	12.531	12.594	12.645	12.813	12.819	12.845	12.879	12.917	12.949	12.993	12.996	13.009	13.141	13.183	13.192
Greece	421	460	499	537	576	615	675	736	796	857	917	1.045	1.173	1.302	1.430	1.558	1.558	1.558	1.558	1.558	1.589	1.843	2.133	2.098	2.122	2.145
Hungary	335	365	382	448	448	448	448	533	542	569	636	785	858	1.274	1.273	1.477	1.516	1.515	1.562	1.577	1.621	1.628	1.636	1.669	1.723	1.774
Ireland	70	80	94	103	103	103	125	125	176	192	247	258	269	423	663	900	900	900	897	897	916	916	916	916	995	995
Italy	6.435	6.465	6.469	6.478	6.478	6.478	6.478	6.487	6.487	6.532	6.542	6.554	6.588	6.629	6.661	6.668	6.668	6.726	6.751	6.844	6.943	6.943	6.943	6.966	6.977	6.977
Latvia	1.618	1.618	1.618	1.618	1.618	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673	1.673
Lithuania	394	404	410	417	417	417	417	417	417	417	417	309	309	309	309	309	309	309	309	309	309	314	324	324	403	400
Luxembourg	115	115	115	115	115	114	115	126	147	146	147	147	147	147	152	152	152	152	152	152	161	161	165	165	165	165
Malta	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Netherlands	2.208	2.272	2.336	2.225	2.291	2.265	2.499	2.516	2.542	2.585	2.600	2.604	2.582	2.637	2.631	2.646	2.651	2.658	2.666	2.678	2.730	2.756	2.758	2.755	2.790	2.789
Portugal	687	710	797	1.252	1.441	1.482	1.659	1.835	2.013	2.190	2.368	2.545	2.613	2.673	2.705	2.737	2.737	2.988	3.035	3.065	3.065	3.065	3.065	3.065	3.065	3.065
Norway	107	103	109	128	128	144	143	173	183	193	264	271	239	253	344	381	393	392	418	444	471	497	523	599	580	580
Poland	246	258	264	268	317	358	398	405	405	552	552	663	663	765	849	857	1.070	1.365	1.482	1.556	1.559	1.637	1.637	1.637	1.676	1.712
Romania	113	113	113	113	113	113	113	113	113	228	228	228	281	281	321	332	350	550	644	683	747	747	763	823	866	920
Slovakia	198	215	219	292	295	296	296	302	313	316	328	328	365	384	391	416	419	419	420	420	463	463	482	482	495	521
Slovenia	277	310	331	369	382	382	435	456	478	483	569	579	578	696	747	768	768	769	607	607	610	610	618	623	623	616
Spain	6.962	7.295	7.750	8.269	8.893	9.049	9.571	9.739	10.296	10.747	11.432	12.073	13.013	13.518	14.021	14.262	14.531	14.701	14.981	15.049	15.336	15.444	15.523	15.585	15.585	15.585
Sweden	1.262	1.350	1.423	1.439	1.484	1.499	1.507	1.544	1.591	1.684	1.677	1.744	1.836	1.857	1.923	1.971	1.957	2.004	2.044	2.088	2.119	2.118	2.132	2.132	2.133	2.179
Switzerland	1.197	1.244	1.258	1.262	1.267	1.270	1.305	1.304	1.342	1.341	1.358	1.361	1.383	1.383	1.406	1.406	1.415	1.419	1.419	1.429	1.440	1.447	1.458	1.462	1.503	1.544
United Kingdom	3.380	3.408	3.491	3.535	3.564	3.581	3.591	3.592	3.592	3.638	3.633	3.670	3.674	3.673	3.674	3.672	3.686	3.733	3.756	3.760	3.768	3.764	3.803	3.838	3.838	3.838
Total	**51.494**	**52.751**	**54.127**	**55.961**	**57.606**	**58.470**	**60.150**	**61.501**	**62.901**	**64.639**	**66.581**	**68.263**	**70.031**	**71.975**	**73.671**	**75.008**	**75.720**	**76.973**	**77.886**	**78.435**	**79.410**	**80.419**	**81.046**	**81.605**	**82.127**	**82.493**

Dataset	Length of motorways in km. EU-27 Member States and Norway, United Kingdom and Switzerland from 1990 and 2020 in kilometres.
Source	Eurostat (2022). Length of motorways and e-roads. Available at https://ec.europa.eu/eurostat/web/main/data/database. Accessed: 20 January 2023
Dataset Austria	Length of motorways and roads similar to motorway ("Schnellstraßen")
Source Austria	BMK Österreich, Statistik Straße & Verkehr, Seite 10
Source Greece	European Commission (2020) & (2022). EU transport in figures - Statistical Pocketbook 2020 & 2022
Dataset Latvia	Length of "main roads". According to the law "On Roads", main roads are the roads that connect the state road network with the main road network of another country; and the capital city – with other cities in the country or city bypasses.
Source Lativa	Website Latvian State Roads Authority: https://lvceli.lv/celu-tikls/statistikas-dati/valsts-celu-tikla-dati/
Source Switzerland	Bundesamt für Statistik, Sektion Mobilität
Data Gaps	In case of data gaps, data was interpolated (shaded in green).

Length of railway network [km]

Sources: Worldbank — with source organisation: International Union of Railways (UIC); National/other statistics (in case of variation from/complementation of UIC numbers): AUS, BEL, BGR, CZE, ESP, EST, FIN, FRA, GRC, HUN, LTU, LUX, LVA, NLD, NOR, PRT, ROU; CHE, DEU, DNK, GBR, HRV, IRL, ITA, POL, SVK, SVN, SWE

Length of rail lines of the EU-27 Member States and Norway, United Kingdom and Switzerland from 1995 and 2020 in kilometres. Source: Worldbank. Rail lines (total route-km).

Accessed: 15 February 2023.

Green shaded cells are interpolated numbers to fill data gaps to perform the regression analyses

Country/Year	Code	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
Austria	AUT	5.672	5.672	5.672	5.672	5.739	5.740	5.665	5.697	5.779	5.752	5.766	5.782	5.818	5.793	5.784	5.356	5.351	4.917	4.985	4.950	4.956	4.937	4.917	4.953	4.864	4.877	4.966
Belgium	BEL	3.368	3.380	3.422	3.470	3.472	3.471	3.454	3.518	3.521	3.536	3.544	3.500	3.374	3.513	3.578	3.582	3.587	3.592	3.612	3.631	3.607	3.602	3.605	3.615	3.615	
Bulgaria	BGR	4.294	4.293	4.292	4.290	4.290	4.320	4.320	4.318	4.318	4.259	4.154	4.146	4.143	4.144	4.150	4.097	4.072	4.070	4.070	4.032	4.023	4.019	4.029	4.030	4.030	4.030	4.029
Switzerland	CHE	5.059	5.059	5.068	5.014	5.034	5.034	5.032	5.025	5.021	5.007	5.041	5.040	5.043	5.085	5.085	5.085	5.124	5.124	5.124	5.124	5.124	5.124	5.224	5.224	5.224	5.224	5.317
Cyprus	CYP																											
Czechia	CZE	9.430	9.430	9.435	9.430	9.430	9.365	9.365	9.444	9.499	9.501	9.511	9.513	9.491	9.481	9.486	9.477	9.469	9.470	9.468	9.459	9.458	9.467	9.463	9.408	9.406	9.396	9.377
Germany	DEU	45.100	44.500	42.200	41.800	41.800	41.600	41.700	41.100	40.800	41.500	39.853	38.206	38.165	38.005	37.698	37.934	37.877	37.846	39.941	37.860	37.775	38.466	38.623	38.594	38.419	38.394	38.394
Denmark	DNK	2.363	2.363	2.363	2.363	2.363	2.363	2.775	2.777	2.777	2.777	2.798	2.654	2.653	2.653	2.637	2.637	2.637	2.637	2.638	2.638	2.656	2.653	2.573	2.656	2.708	2.640	2.640
Spain	ESP	13.856	13.837	13.853	13.862	13.875	13.868	13.868	13.868	13.856	14.387	14.395	14.272	14.472	15.012	15.041	15.044	15.590	15.681	15.438	15.472	15.506	15.711	15.650	15.559	15.618	15.718	15.848
Estonia	EST	1.021	1.021	966	966	968	968	968	967	967	967	959	959	962	816	816	797	787	792	792	905	1.018	1.034	1.034	1.033	1.033	1.033	1.033
Finland	FIN	5.880	5.859	5.865	5.867	5.836	5.854	5.854	5.850	5.850	5.851	5.741	5.732	5.905	5.899	5.919	5.919	5.919	5.944	5.944	5.944	5.944	5.923	5.926	5.926	5.926	5.923	5.918
France	FRA	31.997	31.910	31.879	31.793	29.171	29.330	29.330	29.503	29.410	29.327	29.304	28.470	29.620	29.976	29.959	33.698	29.929	30.071	29.406	29.979	29.423	28.866	29.237	29.248	28.241	28.157	27.872
United Kingdom	GBR	16.542	16.666	16.666	16.656	16.659	16.649	16.652	16.652	16.652	16.670	16.493	16.116	15.810	15.795	15.814	15.814	15.753	15.777	15.742	15.753	15.753	15.760	15.799	15.811	15.878	15.847	15.904
Greece	GRC	2.474	2.474	2.503	2.299	2.299	2.385	2.377	2.383	2.414	2.449	2.576	2.509	2.551	2.552	2.552	2.552	2.552	2.552	2.208	2.265	2.238	2.240	2.240	2.240	2.393	2.279	2.345
Croatia	HRV	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.726	2.722	2.722	2.722	2.722	2.722	2.722	2.723	2.723	2.723	2.684	2.684	2.684	2.685	2.685	2.617
Hungary	HUN	7.988	7.988	7.988	7.988	7.988	7.988	8.005	7.736	7.736	7.736	7.950	7.950	7.950	7.942	7.893	7.893	7.893	7.893	7.873	7.895	7.895	7.896	7.949	7.772	7.588	7.588	7.587
Ireland	IRL	1.954	1.954	1.945	1.909	1.909	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.919	1.894	1.894	1.894	1.894	2.045	2.045
Italy	ITA	16.003	16.014	16.030	16.080	16.092	16.295	16.357	16.307	16.288	16.627	16.286	16.751	16.627	16.667	16.861	17.004	16.704	16.726	16.742	16.752	16.723	16.724	16.788	16.787	16.781	16.779	16.804
Lithuania	LTU	2.002	1.997	1.998	1.998	1.905	1.905	1.696	1.775	1.774	1.782	1.771	1.771	1.771	1.766	1.765	1.767	1.767	1.767	1.767	1.767	1.767	1.877	1.911	1.911	1.911	1.911	1.911
Luxembourg	LUX	275	274	274	274	274	274	274	274	274	275	275	275	275	275	275	275	275	275	275	275	275	275	275	275	288	288	271
Latvia	LVA	2.413	2.413	2.413	2.413	2.413	2.331	2.305	2.270	2.270	2.270	2.270	2.269	2.265	2.263	1.883	1.897	1.865	1.864	1.859	1.859	1.860	1.860	1.860	1.860	1.860	1.860	1.859
Malta	MLT																											
Netherlands	NLD	2.739	2.739	2.805	2.808	2.808	2.808	2.802	2.809	2.806	2.811	2.811	2.813	2.776	2.896	2.896	2.886	3.016	3.016	3.016	3.016	3.016	3.016	3.016	3.016	3.078	3.078	3.078
Norway	NOR	4.023	4.021	4.021	4.006	4.179	4.179	4.179	4.178	4.077	4.077	4.077	4.087	4.087	4.114	4.114	4.127	4.141	4.154	4.176	4.197	4.219	4.209	4.209	4.208	4.200	4.043	3.885
Poland	POL	23.986	23.420	23.328	23.210	22.891	22.891	22.560	22.560	22.560	22.560	22.560	20.253	20.253	20.253	20.253	20.253	20.228	20.228	20.228	20.228	20.228	19.231	19.231	19.231	19.235	19.398	19.422
Portugal	PRT	3.065	3.071	3.038	2.794	2.814	2.814	2.814	2.801	2.818	2.836	2.839	2.839	2.839	2.838	2.842	2.842	2.843	2.794	2.541	2.544	2.546	2.546	2.546	2.546	2.546	2.526	2.526
Romania	ROU	11.376	11.385	11.380	11.364	11.364	11.364	11.364	11.364	11.364	10.882	10.844	10.781	10.781	10.777	10.777	10.776	10.777	10.777	10.777	10.768	10.770	10.770	10.766	10.766	10.765	10.759	10.769
Slovak Republic	SVK	3.668	3.673	3.665	3.667	3.667	3.662	3.662	3.657	3.657	3.657	3.660	3.658	3.658	3.629	3.622	3.623	3.622	3.624	3.631	3.631	3.627	3.626	3.626	3.626	3.627	3.629	3.627
Slovenia	SVN	1.201	1.201	1.201	1.201	1.201	1.201	1.201	1.229	1.229	1.229	1.229	1.228	1.228	1.228	1.228	1.228	1.228	1.209	1.209	1.209	1.209	1.209	1.209	1.209	1.209	1.209	1.209
Sweden	SWE	10.075	10.064	10.064	10.064	10.787	11.044	11.077	11.077	11.076	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	11.077	10.906	10.919	10.919
SUM		**241.470**	**240.809**	**238.432**	**237.383**	**234.358**	**234.456**	**233.650**	**234.286**	**232.386**	**227.365**	**228.289**	**228.856**	**229.000**	**232.377**	**228.859**	**228.622**	**229.245**	**227.730**	**227.022**	**226.532**	**226.883**	**226.751**	**225.689**	**225.661**	**225.820**	

Length of railway network [km]: statistics used

AUS, BEL, BGR, CZE, ESP, EST, FIN, FRA, GRC, HUN, LTU, LUX, LVA, NLD, NOR, PRT, ROU

Worldbank database: https://data.worldbank.org/indicator/IS.RRS.TOTL.KM?end=2021&start=2019

Denmark

Statistics Denmark: https://www.statbank.dk/BANE41

Croatia

Croatian Railway Network Operator: https://eng.hzinfra.hr/?page_id=418

Germany

German Institute for Economic Research and German Aerospace Center: https://bmdv.bund.de/SharedDocs/DE/Publikationen/G/verkehr-in-zahlen-2022-2023-xls.html

Ireland

EC Statistical pocketbook 2022: https://transport.ec.europa.eu/media-corner/publications/statistical-pocketbook-2022_en

Italy

Italian railway infrastructure manager: https://www.rfi.it/it/rete/la-rete-oggi.html

Poland

Statistics Poland: https://stat.gov.pl/en/topics/statistical-yearbooks/statistical-yearbooks/statistical-yearbook-of-the-republic-of-poland-2022,2,24.html

Slovakia

Slovakian Infrastructure Manager: https://www.zsr.sk/o-nas/vyrocne-spravy/

Slovenia

Republic of Slovenia Statistical Office: https://pxweb.stat.si/SiStatData/pxweb/en/Data/-/2221601S.px/

Sweden

Transport Analysis Sweden: https://www.trafa.se/bantrafik/bantrafik/

Switzerland

Swiss Open Data Portal: https://opendata.swiss/de/dataset/streckennetz-nach-verkehrstragern6

United Kingdom

Office of Rail and Road: https://dataportal.orr.gov.uk/statistics/infrastructure-and-emissions/rail-infrastructure-and-assets/

7.4 Abandoned railways

Austria

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**665.1**	**230**		**376.4**
Mürzzuschlag-Neuberg	1996	12.1	1	no, dismantled	
Obersdorf - Groß Schweinbarth / Bad Pirawarth	2019	35.0	12	unclear	
Emmersdorf-Sankt Nikola (Donauuferbahn)	2009	26.0	8	partly dismantled	
Gleichenberger Bahn (Gleichenberg - Feldbach)	2020	21.0	10	touristic use	21.0
Weissenbach-Hainfeld (Leobersdorferbahn)	2004	24.0	5	dismantled	
Freiland-Türnitz	2001	9.0	4	dismantled	
Freiland-Sankt Ägyd	2010	17.0	8	cargo	17.0
Scheibbs-Kienberg (Erlauftal)	2010	11.0	5	touristic use	11.0
Deutschkreutz-Horitschon	2013	6.0	3		6.0
Leoben-Vordernberg	2001	18.0	10	partly dismantled, partly cargo	
Hieflau-Eisenerz	1999	14.5	5	cargo	14.5
Zeltweg-Wolfsberg (Lavanttalbahn)	2010, 2017	50.0	11	cargo	50.0
Görtschitztalbahn (Hochosterwitz-Hüttenberg)	1995	29.5	9	partly cargo, partly dismantled	
Rosentalbahn (Weizelsdorf-Rosenbach)	2016	18.0	7	cargo, museum railway	18.0
Lavamünd-Sankt Paul	1997	10.0	2	dismantled	
Aschacher Bahn (Haiding-Aschach)	2019	20.5	7	cargo	20.5
Gailtalbahn (Hermagor-Kötschach-Mauthen)	2016	31.0	11	cargo	31.0
[18] Jauntalbahn (Sankt Paul - Bleiburg)	2022	19.0	4	replaced by Koralmtunnel. NOTE: one new station instead of 4 will be built	
[18] Retz-Drosendorf	2001	40.0	11	partly museum train, partly cargo,	40.0
Zwettl-Schwarzenau	2010	21.5	7	cargo	21.5
Drösing-Zistersdorf	2011	11.4	3	cargo	11.4
Pinkatalbahn (Friedberg-Oberwart)	2011	25.5	7	not used anymore	25.5
Thayatalbahn (Schwarzenau-Waidhofen/Thaya)	2010	12.0	4	some touristic use	12.0
Ybbstalbahn	2010	50.0	25	partly museum train, partly not usable	
Waldviertelbahn Gmünd-Groß Gerungs	1996	43.0	17	museum train	43.0
Lambach-Haag	2009	22.0	12	dismantled	
Leoben-St. Michael (alte Trasse)	1998	7.0	1	cargo to Göss, beyond dismantled	
Wittmannsdorf-Wöllersdorf	1997	9.1	2	cargo from Steinabrückl, rest dismantled	
Krems-Emmersdorf	2010	34.0	12	touristic use	34.0
Krumpe Mank-Obergrafendorf	2010	18.0	7	partly touristic	

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Belgium

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**187.6**	**62**		**46.5**
Railway line 15: Eksel - Neerpelt	1996	16.0	5	yes	16.0
Railway line 21B: Waterschei - Eisden-Mijnen	1996	5.8	2	touristic use by 2023	5.8
Railway line 22: Tienen - Grimde	1999	32.1	9	dismantled	
Railway line 28A: Brussel-Thurn en Taxis	2000	1.4	1	dismantled	
Railway line 31: Ans - Roucourt	1996 & 2005	6.4	4	dismantled	
Railway line 45: Trois-Ponts and Weismes	2007	22.1	5	dismantled	
Railway line 45A: Jünkerath - Büllingen	1998	14.9	5	dismantled	
Railway line 48: Sourbrodt – Waimes	2007	12.5	5	touristic use	12.5
Railway line 55: Langerbrugge - Ertvelde	2004	7.7	4	possible	7.7
Railway line 63: Kortemark - Westrozebeke	2003	10.2	3	dismantled	
Railway line 77: Moerbeke-Waas - Y Rostijne	2008	4.8	1	dismantled	
Railway line 85: Ruien - Leupegem	2000	11.5	4	dismantled	
Railway line 86: Frasnes lez Anvaing - Leuze	2006	7.6	2	dismantled	
Railway line 109: Cuesmes - Harmignies	2005	7.2	3	dismantled	
Railway line 138: Châtelet - Disteel	2019	4.5	3	possible	4.5
Railway line 141: Genepiën - Court-Saint-Étienne	2004	19.8	5	dismantled	
Railway line 156: Boussu-en-Fagnes - Mariembourg	1999	3.1	1	dismantled	

Source (website was accessed 28 February 2023)

https://nl.wikipedia.org/wiki/Lijst_van_opgeheven_spoorlijnen_in_Belgi%C3%AB

Bulgaria

Train lines

13 train lines were closed in the years 2001-2003: Pazardzhik - Varvara, Saedinenie - Panagyurishte, Sarafovo - Pomorie, Gorna Oryahovitsa - Elena, Khan Krum - Preslav, Yunak - Staro Oryahovo, Kurtovo Konare - Peshtera, Oresh - Belene, Yambol-Elhovo. The total length of these lines is approximately 348 km. The number of closed stations is unknown.

Source (website was accessed 24 February 2023)

https://www.nzherald.co.nz/travel/struggle-to-save-bulgarias-narrow-gauge-railway-baltic-roller-coaster/TPBF2UW7HNBFKQCCDDBQADUFRQ/

Croatia

Train lines

Line	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Caglin - Nasice		5	operation suspended	
Martin Brod - Knin		9	operation suspended	
Ucka - Rasa		2	operation suspended	
Petrinja - Sisak Caprag		2	operation suspended	
Harmika - Imeno		10	operation suspended	
Total	**118**	**28**		**118**

Source (website was accessed 24 February 2023)

https://eng.hzinfra.hr/?page_id=418

Czechia

Train lines

zrušené (canceled)				
úsek	**stanice a zastávky**	**datum zrušení**	**délka [km]**	**poznámka**
section	***railway stations and stops***	***cancellation date***	***length [km]***	***note***
Frýdlant v Čechách - Heřmanice	Frýdlant v Čechách zastávka Kunratice u Frýdlantu Dětřichov u Frýdlantu Heřmanice zastávka Heřmanice	1996	10	provoz zastaven již 13.1.1976 *operation stopped already on 13.1.1976*
Cheb - Slapany	Slapany	2003	6	provoz zastaven již 1969 *operation stopped already in 1969*
odbočka Dolní Rybník - Otvice	Otvice	01.06.00	1	
Nezamyslice - Morkovice	Těšice Tištín Kovalovice-Osíčany Prasklice Uhřice u Kroměříže Morkovice	11.12.05	12	
Chrast u Chrudimi město - Chrást u Chrudimi	Chrast u Chrudimi město	11.12.05	2	
Praha Masarykovo nádraží Hrabovka - Praha hlavní nádraží		11.12.05	1	nahrazeno novostavbou *replaced by a new line, not counted*
Březno u Chomutova - Chomutov	výhybna Spořice	01.04.07	5	nahrazeno novostavbou *replaced by a new line, not counted*
výhybna Spořice - odbočka Dubina		01.04.07	2	nahrazeno novostavbou *replaced by a new line, not counted*
odbočka Rokytka - Praha hlavní nádraží	výhybna Vítkov	01.09.08	4	nahrazeno novostavbou *replaced by a new line, not counted*

Hostašovice - Nový Jičín horní nádraží	Mořkov Hodslavice Bludovice Nový Jičín horní nádraží	22.04.10	10	
Uhřice u Kyjova - Ždánice	Želetice Dražůvky Ždánice	01.06.10	9	
Kyjov - Mutěnice	Svatobořice Dubňany	31.01.12	16	
Chrást u Plzně - Plzeň-Doubravka		15.11.18	9	nahrazeno novostavbou *replaced by a new line, not counted*
odbočka Záběhlice - Praha-Vršovice	Praha-Strašnice zastávka	13.12.20	4	nahrazeno novostavbou *replaced by a new line, not counted*
Sudoměřice u Tábora - Votice		03.04.22	20	nahrazeno novostavbou *replaced by a new line, not counted*
Soběslav - Doubí u Tábora	Roudná	11.09.22	9	nahrazeno novostavbou *replaced by a new line, not counted*
	23	**celkem** ***total***	**66**	
bez provozu **(without operation)**				
úsek	**stanice a zastávky**	**datum zastavení provozu**	**délka [km]**	**poznámka**
section	***railway stations and stops***	***date of cessation of operations***	***length [km]***	***note***
Kralovice - Mladotice	Trojany	01.01.97	12	
Horní Slavkov-Kounice - Loket předměstí	Horní Slavkov Horní Slavkov zastávka Údolí	31.05.97	8	
Hněvčeves - Smiřice	Hořiněves Račice nad Trotinou Račice nad Trotinou nákladiště Sendražice Smiřice zastávka	12.12.04	11	
Broumov - Otovice zastávka	Otovice Otovice zastávka	10.12.05	5	
Čejč - Uhřice u Kyjova	Terezín u Čejče Krumvíř Klobouky u Brna Dambořice Uhřice u Kyjova	31.03.07	16	
odbočka Bažantnice - odbočka Vrbka		13.12.08	1	
Královec - Žacléř	Lampertice Žacléř	08.03.09	5	
Hrušovany nad Jevišovkou-Šanov - Hevlín	Hrabětice Hevlín	01.07.10	7	

odbočka Kamensko - Dolní Bousov	Ledkov Libáň Dětenice Osenice Rokytňany Rabakov Domousnice Řitonice	15.11.10	23	
Heřmanův Městec - Chrudim město	Klešice Rozhovice Bylany	11.12.10	13	
Velká Kraš - Vidnava	Velká Kraš zastávka Vidnava	11.12.10	4	
Droužkovice - odbočka Dubina		08.12.12	6	
Chotiměř - Radejčín	Dobkovičky	07.06.13	5	
Dobronín - Polná	Dobronín zastávka Polná	14.12.13	6	
Tršnice - Františkovy Lázně		13.12.14	4	
Varnsdorf pivovar Kocour - státní hranice		13.03.15	1	
Praha-Malešice - Praha-Žižkov	Praha-Žižkov	31.12.15	4	
Ivančice - Oslavany	Oslavany	01.05.16	4	
Velké Opatovice - Jevíčko		06.12.20	5	
Vraňany - Lužec nad Vltavou	Lužec nad Vltavou	10.12.21	3	
Straškov - Zlonice	Loucká Černuc Kmetiněves Tmáň Zlonice zastávka	11.12.21	18	
Bošice - Bečváry	Toušice Zásmuky	12.12.21	11	
Krupá - Kolešovice	Lišany u Rakovníka Olešná u Rakovníka Chrášťany zastávka Kněževes Přílepy Kolešovice	27.08.22	12	
Jindřichův Hradec - Obrataň	Horní Skrýchov Dolní Radouň Lovětín Lovětín obec Nekrasín Nová Včelnice Žďár u Kamenice nad Lipou Rodinov Kamenice nad Lipou Včelnička Bohdalín Benešov nad Lipou Chválkov Dobešov Černovice u Tábora Křeč Sudkův Důl Obrataň zastávka	02.10.22	46	

Jindřichův Hradec - Nová Bystřice	Jindřiš Jindřiš zastávka Blažejov Malý Ratmírov Střížovice Kunžak-Lomy Kaproun Senotín Hůrky Albeř Nová Bystřice	02.10.22	33	
	81	**celkem** ***total***	**263**	

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Denmark

The "Gedserbanen" operated until 2010. It was a connection between Nykøbing F and Gedser and had a length of 22.9 km. Train stations en route had already been closed in the 1970s, so only Gedser station itself was closed after 1995.

We also found but did not take into account a section from Vojens to Haderslev By, which had a length of 12 km. Passenger service on this track terminated in 1977, freight traffic operated until 2001.

Sources (both websites were accessed 8 June 2023)

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Estonia

Train lines

The Estonian railway operator AS Eesti Raudtee pointed out that in addition to the list of closed railways as shown below, small intermediate railway stations have been liquidated along operational lines. The number of stations remained undisclosed, but an example is Lehtse station. After its closing, the previous two station intervals Aegviidu–Lehtse and Lehtse–Tapa became one station interval Aegviidu–Tapa.

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**366.9**	**43**		**266.5**
Riispere-Haapsalu	2004	52.8	2	partly dismantled	31.0
Pärnu–Mõisaküla	1996 (passenger), 2001 (freight)	48.6	4	dismantled in 2008	
Valga-Koidula	2001	96.5	8	yes, cargo-uage	96.5
Tallinn–Pärnu	2018	139.0	24	Planned to be re-activated via Rail Baltica project	139.0
Narva-Musta	2001	30.0	5	dismantled	

Sources (all websites were accessed 8 March 2023)

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Finland

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**271.0**	**70**		**271.0**
Kontiomäki–Taivalkoski	2004	157.0	48	possible	157.0
Misi - Kelloselkä	2012	114.0	22	possible, passenger service terminated in 1967	114.0

Sources (the two websites were accessed 5 May 2023)

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France

Train lines

According to French Wikipedia, closures of passenger train lines in France mainly took place before the 1990s. Between 1990 and 2009, 735 km of passenger train lines were closed, and 784 km were re-opened. It remains unclear, which lines where closed or re-opened and when these lines were closed or re-opened in that time span. The following table therefore only lists train lines which were closed since 2010 and not opened since, as declared at French Wikipedia (source no.1).

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**339.0**	**74**		**39.0**
Avallon-Autun	2011	87,0	20	no	0,0
Sarreguemines-Bitche	2014	39.0	9	no	0,0
Verdun-Saint-Hilaire-au-Temple	2013	90.0	12	no	0,0
Ussel-Laqueuille	2014	40.0	10	no	0,0
La Ferté-Milon-Fismes	2016	39.0	10	yes	39.0
Oyonnax-Saint-Claude	2017	31.0	7	no	0,0
La Madeleine-Comines	2019	13.0	6	no	0,0

Sources (the website was accessed 5 March 2023)

1. https://fr.wikipedia.org/wiki/Fermetures_de_lignes_ferroviaires_en_France
2. https://de.wikipedia.org/wiki/Bahnstrecke_Cravant-Bazarnes%E2%80%93Dracy-Saint-Loup
3. https://de.wikipedia.org/wiki/Bahnstrecke_Haguenau%E2%80%93Falck-Hargarten

4. https://de.wikipedia.org/wiki/Bahnstrecke_Saint-Hilaire-au-Temple%E2%80%93Hagondange
5. https://de.wikipedia.org/wiki/Bahnstrecke_Le_Palais%E2%80%93Eygurande-Merlines
6. https://de.wikipedia.org/wiki/Bahnstrecke_Trilport%E2%80%93Bazoches
7. https://fr.wikipedia.org/wiki/Ligne_d%27Andelot-en-Montagne_%C3%A0_La_Cluse#De_Saint-Claude_%C3%A0_La_Cluse_(et_%C3%A0_Bourg-en-Bresse)
8. https://fr.wikipedia.org/wiki/Ligne_de_La_Madeleine_%C3%A0_Comines-France

Germany

Train lines

The federal railway authority provides official lists about railway lines, which were closed between 1994 and 2018 and publicly owned. These lines represent a length of 5,148 km (see source 1 below). This number includes both passenger and freight transport. According to research of the German stakeholder organisation “Allianz pro Schiene”, since 1994 a total number of 3,600 km of railway lines for passenger transport has been cancelled, of which 900 km were re-activated later (see source 2 below). On balance, 2,700 km of passenger railways have been cancelled since 1994.

Allianz pro Schiene also presented an expertise about which lines could be re-activated relatively easy. According to this expertise, these lines amount to a total length of 4,573 km for all lines closed since 1945. Out of these proposals for re-activation, 1,093 km of lines for passenger transport have been cancelled since 1995 (see source 3 below). The majority of these lines is situated in the Eastern part of the country (former GDR).

Sources (the two websites were accessed 15 February 2023)

1. https://www.eba.bund.de/DE/Themen/Stilllegung/ListenStatistiken/listen-statistiken_node.html
2. https://www.allianz-pro-schiene.de/themen/infrastruktur/reaktivierung-bahnstrecken/
3. https://www.allianz-pro-schiene.de/wp-content/uploads/2022/09/Reaktivierung-von-Eisenbahnstrecken_2022_3_Auflage.pdf

Greece

Train lines

The “Hellenic Railways Organization” provides on its network a general and detailed railway network map. It distinguishes between active, inactive and touristic lines. Abandoned railway lines, if existing, remain undisclosed. According to the map, a network length of 389 km is temporarily not operated. There are 97 stations along these lines.

Source (the website was accessed 8 February 2023)

https://ose.gr/en/railway-network/network-map/

Hungary

Train lines

All of the below listed train lines have a potential to be re-opened. Track works will be necessary.

Line	Year of closure	Total length [km]	No. of closed stations
Total		**919.1**	**259**
Környe - Papa	2007	86.0	18
Zalabér-Batyk-Zalaszentgrót	2007	6.0	2
Hajmáskér - Lepsény	2007	31.0	8
Sellye-Villany	2007	58.0	26
Diósjenő – Romhány	2007	17.0	5
Kisterenye - Kál-Kápolna	2007	55.0	12
Mezőcsát - Hejőkeresztúr	2007	17.0	7
Kazincbarcika – Rudabánya	2007	15.0	5
Nagykálló – Nyíradony	2007	23.0	5
Murony - Bekés	2007	7.3	2
Kunszentmiklós-Tass – Dunapataj	2007	49.0	9
Kecskemét – Fülöpszállás	2007	39.0	12
Kiskőrös - Kalocsa	2007	31.0	6
Körmend – Zalalövő	2009	23.0	3
Somogyszob–Balatonszentgyörgy	2009	59.3	8
Pusztaszabolcs–Dunaújváros–Paks	2009	40.0	5
Pécs–Bátaszék	2009	64.0	16
Galgamácsa - Vácrátot	2009	0.0	1
S. Szilvásvárad - Putnok	2009	35.0	7
Sáránd - Létávértes	2009	20.0	4
Ohat-Pusztakócs – Tiszalök	2009	65.0	12
Nyíregyháza – Balsa-Tiszapart	2009 & 2018	39.5	21
Herminatanya - Dombrád	2009	15.0	9
Kisskánás - Kondoros	2009	6.0	1
Körösnagyharsány - Vészt	2009	32.0	11
Szolnok–Hódmezővásárhely–Makó	2009	34.0	23
Kecskemét KK – Kiskőrös KK	2009	52.0	21

Sources (the two websites were accessed 15 February 2023)

1. https://hu.wikipedia.org/wiki/2007-es_magyar-orsz%C3%A1gi_vas%C3%BAtbez%C3%A1r%C3%A1sok
2. https://hu.wikipedia.org/wiki/2009-es_magyar-orsz%C3%A1gi_vas%C3%BAtbez%C3%A1r%C3%A1sok

Ireland

Train lines

The train line from Waterford to Rosslare Strand was closed in 2010 along with four stations on route. Its total length was approximately 50 km.

Source (the website was accessed 8 February 2023)

https://www.steamtrainsireland.com/museum-tickets/learning/irish-railway-history#:~:text=Irish%20Rail%20(Iarnr%C3%B3d%20%C3%89ireann)%2C,Ireland%20Railways%20operates%20another%20357km

Italy

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**1,831**	**384**		**1,711**
Alcamo Diramazione – Trapani	2013	47.118	8	yes, closed due to landslides	47.118
Alcantara – Randazzo	1995	37.04	9	yes, but poor condition	37.04
Ancona – Ancona Marittima	2015	1.72	1	possible, maintenance necessary	1.72
Aosta – Prè S. Didier	2015	31.369	11	yes, good condition	31.369
Asti – Castagnole delle Lanze	2012	20.128	5	yes, good condition	20.128
Bastia Mondovì – Mondovì – Cuneo	1986-2012	42	10	yes, but poor condition	42
Bosco Redole – Benevento	2013	66.324	14	yes, but poor condition	66.324
Bra – Cavallermaggiore	2020	12.896	1	yes, good condition	12.896
Brindisi – Brindisi Marittima	2006	1.666	1	dismantled	
Caltagirone – Gela	2011	45.113	7	good condition, but a viaduct crashed	45.113
Cancello – Torre Annunziata Centrale	2005	30.928	8	yes, but poor condition	30.928
Cantalupo – Nizza Monferrato – Alba	2012	59.636	13	yes, good condition, some touristic use	59.636
Castellammare di Stabia – Gragnano	2010	4.749	2	yes, good condition	4.749
Ceva – Ormea	2012	35.432	8	yes, good condition, some touristic use	35.432
Chivasso – Asti	2011	51.316	16	yes, good condition	51.316
Codola – Sarno	2012	7.8	2	yes, but poor condition	7.8
Pergola - Fabriano	2013	35	10	yes, but poor condition	35
Gemona del Friuli – Pinzano – Maniago	2012	41.897	9	yes, good condition, freight transport	41.897
Gioia Tauro – Cinquefrondi	2011	31.737	13	yes, good condition	31.737
Gioia Tauro – Palmi – Sinopoli S. Procopio	2011	26.283	5	unclear	
Mandas – Gairo – Arbatax	1997	159.393	23	possible, maintenance necessary	159.393
Marina di S. Vito – Crocetta – Castel di Sangro	2003-2006	102.6	32	yes, but poor condition	102.6
Marzi – Soveria Mannelli	2010-2012	31.5	8	yes, closed due to landslides	31.5

Mortara – Casale Monferrato – Asti	2010	73.449	18	possible, tunnel crashed	73.449
Palazzolo sull'Oglio – Paratico Sarnico	1966-1999	9.648	1	yes, good condition, some touristic use	9.648
Palmanova – S. Giorgio di Nogaro	1997	11.389	1	dismantled	
Pedace – S. Giovanni in Fiore	1997-2011	67.1	25	yes, good condition, some touristic use	67.1
Pinerolo – Bricherasio – Torre Pellice	2012	16.449	5	yes, good condition	16.449
Portomaggiore – Dogato	2016	13.148	1	yes, good condition	13.148
Rocchetta S. Antonio Lacedonia – Avellino	2010	118.72	31	yes, good condition, some touristic use	118.72
Romagnano Sesia – Grignasco – Varallo Sesia	2014	25.091	8	yes, good condition, freight transport	25.091
Rovato Borgo – Bornato Calino	2018	5.75	3	yes, good condition	5.75
S. Nicola di Melfi - Gioia del Colle	2011-2016	127.076	14	yes, good condition, freight transport	127.076
S. Stefano Magra – Sarzana	1999	6.519	1	possible, maintenance necessary	6.519
Santhià – Arona	2012	65.009	9	yes, good condition	65.009
Sassari – Luras – Palau Marina	1997-2015	150.2	27	yes, good condition, some touristic use	150.2
Sulmona – Castel di Sangro – Carpinone	2011	118.1	15	yes, good condition, some touristic use	118.1
Velletri – Terracina	2012	80.8	5	no, almost dismantled	
Vercelli – Casale Popolo	2013	19.224	4	yes, good condition	19.224

Source (the website was accessed 8 March 2023)

https://www.ferrovieabbandonate.it/

Lithuania

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**298.4**	**14**		**158.4**
Panevėžys-Joniškis	2000-2003	90.0	4	cargo	90.0
Panevėžys - Anykščiai - Rubikiai	2001	68.4	4	touristic use	68.4
Alytus-Varėna	1997	50.0	2	dismantled	
Alytus-Šeštokai	1997	60.0	1	limited use	
Pabradė - Geležnė - state border	2003	30.0	3	dismantled	

Sources (all websites were accessed 8 March 2023)

1. https://siaurukas.eu/istorija/
2. https://en.wikipedia.org/wiki/Auk%C5%A1taitija_narrow_gauge_railway
3. https://lt.wikipedia.org/wiki/U%C5%BEnemun%C4%97s_gele%C5%BEinkelis
4. https://lt.wikipedia.org/wiki/Pabrad%C4%97s%E2%80%93Kruleu%C5%A1%C4%8Dynos_gele%C5%BEinkelis

Luxembourg

According to the research, no train lines were closed.

Latvia

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**499**	**81**		**269**
Gulbene-Alūksne	2000	20	10	touristic use	
Rēzekne—Daugavpils	1999	84	22	cargo, limited use	84
Jelgava-Reņģe	2010	85	5	cargo	85
Ventspils-Tukums	2010	100	15	yes	100
Skulte-Ipiķi	2005	100	23	dismantled	
Liepāja-Ventspils	1996	110	6	dismantled	

Sources (all websites were accessed 8 March 2023)

1. https://lv.wikipedia.org/wiki/Dzelzce%C4%BCa_l%C4%ABnija_Gulbene%E2%80%94Al%C5%ABksne
2. https://lv.wikipedia.org/wiki/Dzelzce%C4%BCa_l%C4%ABnija_R%C4%93zekne%E2%80%94Daugavpils
3. https://lv.wikipedia.org/wiki/Dzelzce%C4%BCa_l%C4%ABnija_R%C4%ABga%E2%80%94Jelgava%E2%80%94Ma%C5%BEei%C4%B7i
4. https://lv.wikipedia.org/wiki/Dzelzce%C4%BCa_l%C4%ABnija_Ventspils%E2%80%94Tukums_II
5. https://lv.wikipedia.org/wiki/Dzelzce%C4%BCa_l%C4%ABnija_R%C4%ABga%E2%80%94R%C5%ABjiena_(%E2%80%94Ipi%C4%B7i)
6. http://www.railwaymuseum.lv/linijas.htm

Netherlands

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**34.2**	**17**		**24.9**
Roermond – Herkenbosch	1996	7.5	1	possible	7.5
Leeuwarden – Stiens	1997	9.3	5	dismantled	
Boxtel – Veghel	2005	17.4	11	dismantled	17.4

Source (the website was accessed 8 March 2023)

https://nl.wikipedia.org/wiki/Lijst_van_opgeheven_spoorlijnen_in_Nederland#cite_note-1

Norway

According to the research, no train lines were closed, but nine stations along open lines (Askim Næringspark, Takvam, Såner, Sandermosen, Ladalen, Langli, Elnes, Bjørgeseter, Drømtorp).

Poland

Train lines

Polish national statistics provides information about length of the railway network; however, the number of closed passenger lines and stations is not tracked. According to secondary information, the main closings took place until 2005.

Between 1995 and 2021, 4,660 km of the network was reduced.

Sources (the two websites were accessed 15 February 2023)

1. https://stat.gov.pl/obszary-tematyczne/transport-i-lacznosc/transport/transport-wyniki-dzialalnosci-w-2021-roku,9,21.html
2. https://geopolityka.net/analiza-geopolityczna-aktualnego-stanu-sieci-kolejowej-w-polsce/

Portugal

Train lines

A website of "Infraestruturas de Portugal", which is a Portuguese state-owned company entrusted with the management, maintenance and operation of the national rail and road network in Portugal, provides information about length of operational and non-operational train lines. According to this site, the overall network length is 3,622 km, of which 70 % are currently used. Up to 1,095 km of railway lines could be re-opened. The list below shows passenger train lines which have been closed since 1995.

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**460.0**	**101**		**379.0**
Linha de Povoa	1995	29.0	9	no (Ecopista)	
Linha do Alentejo	2012	64.0	6	yes	64.0
Linha de Evora	2009	75.0	12	yes	75.0
Ramal de Caceres	2012	73.0	5	yes	73.0
Ramal de Figueira da Foz	2009	50.0	15	yes	50.0
Linha do Tua	2018	21.0	5	yes	21.0
Linha do Tamega	2009	52.0	19	no (Ecopista)	
Linha do Corgo	2009	96.0	30	yes	96.0

Sources (all websites were accessed 8 February 2023)

1. https://www.infraestruturasdeportugal.pt/pt-pt/infraestruturas/rede-ferroviaria

2. https://www.pordata.pt/portugal/extensao+da+rede+ferroviaria+total++explorada+e+desativada+++continente-3108
3. https://i.ibb.co/SJF030z/L-neas-clausuradas-ES-PT-large.png
4. https://de.wikipedia.org/wiki/Linha_da_P%C3%B3voa
5. https://de.wikipedia.org/wiki/Linha_do_Alentejo
6. https://de.wikipedia.org/wiki/Linha_de_%C3%89vora
7. https://de.wikipedia.org/wiki/Ramal_de_C%C3%A1ceres
8. https://de.wikipedia.org/wiki/Ramal_da_Figueira_da_Foz
9. https://de.wikipedia.org/wiki/Linha_do_Tua
10. https://de.wikipedia.org/wiki/Linha_do_T%C3%A2mega
11. https://de.wikipedia.org/wiki/Linha_do_Corgo

Romania

There is no online information available about closed railway lines. According to oral information from Stefan Roseanu, President of the Romanian Railway Reform Authority, railway closing since 1995 could be in the order of 300 km, of which 100 km are not yet dismantled and could theoretically be re-used.

Slovakia

Train lines

Two lines have been closed since 1995 (see table below). According to the network operator, 222 stations were closed in total, of which 212 could be re-opened.

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**37.0**	**9**		**0**
Jazero - Stupava	2008	7.0	2	dismantled (2012)	0
Rimavská Sobota-Poltár	2000	30.0	7	dismantled (2007)	0

Sources (the two websites were accessed 8 March 2023)

1. https://de.wikipedia.org/wiki/Bahnstrecke_Dev%C3%ADnske_Jazero%E2%80%93Stupava
2. https://de.wikipedia.org/wiki/Bahnstrecke_Rimavsk%C3%A1_Sobota%E2%80%93Polt%C3%A1r

Slovenia

According to the research, no train lines were closed.

Spain

Train lines

The table below lists the train lines which have been closed since 1995. The number of stations which were closed along the lines could not be found and the lengths of lines had to be estimated; except for Villacanas - Quintanar de la Orden and Soria - Castejon (see sources).

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**948.7**			**603.6**
Coruna - Santiago	2009	75		dismantled	
Chapela - Vigo	2011	11		dismantled	
Oviedo - Fuso de la Reina	1999	14		dismantled	
Salou - Vandellos	2020	28		possible	28
Tortosa - Freginals	1997	24		dismantled	
La Robla - Matallana de Torio	open	16		no service	16
Ponferrada - Cubillos del Sil	1996	13		dismantled	
Toral de los Vados - Villafranca del B.	open	8		no service	8
Agramon - Cieza	2019	34		possible	34
Ribarroja - Lliria	1998	12		dismantled	
Villacanas - Quintanar de la Orden	1995	25.1	4	dismantled	
Vicalvaro - Morata de Tajuna	1997	30		dismantled	
Pinto - San Martin de la Vega	2012	13		possible	13
Leganes - Campamento	2002	11		dismantled	
Soria - Castejon	1996	103.6	12	possible	103.6
Soto del Real - Burgos	2011	246		possible	246
Olmedo - Medina	2017	22		possible	22
Algodor - Toledo	2003	15		dismantled	
Huelva - Tharsis - La Zarza	1999	80		dismantled	
Cerro Muriano - Almorchon	open	120		possible	120
Jerez de la Frontera - Arcos de la Frontera	1996	35		dismantled	
Dolar - Minas del Marquesado	1996	13		possible	13

Sources (all websites were accessed 8 February 2023)

1. https://i.ibb.co/SJF030z/L-neas-clausuradas-ES-PT-large.png
2. https://es.wikipedia.org/wiki/L%C3%ADnea_Villaca%C3%B1as-Quintanar_de_la_Orden
3. https://es.wikipedia.org/wiki/L%C3%ADnea_Soria-Castej%C3%B3n

Sweden

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**234.0**	**35**		**197.0**
Repbäcken – Malung	2011	123.0	17	yes	123.0
Eksjö – Hultsfred		62.0	11	yes	62.0
Torup – Hyltebruk		12.0	1	yes	12.0
Vetlanda – Åseda	2006	37.0	6	dismantled (2015)	

Sources (all websites were accessed 14 February 2023)

1. https://de.wikipedia.org/wiki/V%C3%A4sterdalsbanan
2. https://de.wikipedia.org/wiki/Bahnstrecke_N%C3%A4ssj%C3%B6%E2%80%93Oskarshamn
3. https://de.wikipedia.org/wiki/Bahnstrecke_Torup%E2%80%93Hyltebruk
4. https://de.wikipedia.org/wiki/Bahnstrecke_N%C3%A4ssj%C3%B6%E2%80%93Vetlanda%E2%80%93%C3%85seda%E2%80%93Nybro

Switzerland

Train lines

Line	Year of closure	Length of line [km]	No. of closed stations	Potential to re-use	if potential to re-use, then length [km]
Total		**38.4**	**35**		**38.4**
Sumiswald-Grünen – Huttwil	2004-2009	19.5	7	yes	19.5
Fleurier – St-Sulpice	2001	1.6	1	museum train	1.6
Sihlwald – Sihlbrugg	2006	4.2	1	museum train	4.2
Sumiswald-Grünen – Wasen	2004	5.2	4	yes	5.2
Wettingen – Mellingen	2004	7.9	0	cargo	7.9

Source (the website was accessed 5 March 2023)

https://eingestellte-bahnen.ch/

United Kingdom

The Office of Rail and Road (ORR) publishes track and route length for Great Britain, which can be found in table 6320 on this page: https://dataportal.orr.gov.uk/statistics/infrastructure-and-emissions/rail-infrastructure-and-assets/

Every year they publish details of open railway stations as of 31 March in Great Britain. This was used for tracking which stations have closed (table 1415): https://dataportal.orr.gov.uk/statistics/usage/estimates-of-station-usage

The ORR also includes details of open and closed stations in the statistics release: https://dataportal.orr.gov.uk/statistics/infrastructure-and-emissions/rail-infrastructure-and-assets/

According to this data, 71 stations were closed 116 were opened in Great Britain since 1995. No lines were closed.