Annex 11 – Country reports

Austria

Summary Description

Austria has a **developed rail infrastructure**, characterised by a high level of quality, which is planned to be upgraded and extended in the next years, particularly through the development of the high-speed lines.

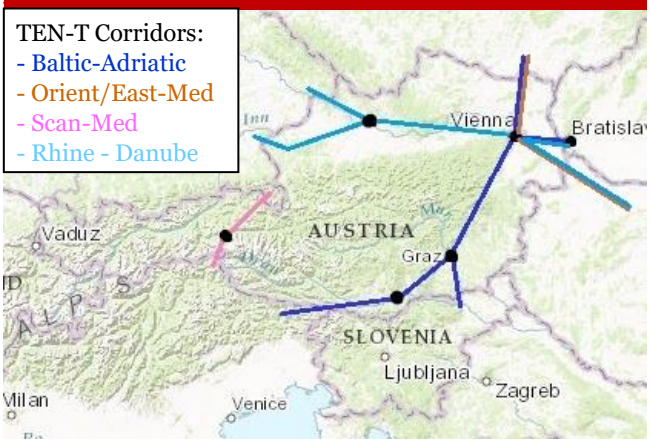
Impact of external factors: the construction of cost of railway infrastructure is impacted by the **orography** of country, requiring the construction of tunnels and structures. Nonetheless, the **base infrastructure cost results in line with the EU average.**

Difference between estimated and final cost: The planning of the infrastructure is based on **detailed estimates**, leading to limited differences between estimated and final cost. Additionally, the procurement process and the dynamics of the construction market do not usually result in an increase of the final cost.

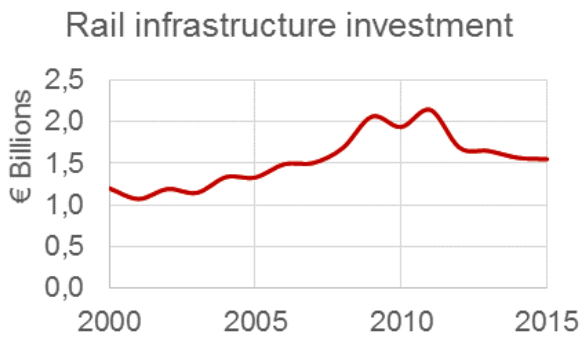
Summary Indicators

Rail Network Length	**4,917 km**
- Of which HSR	48 km
- Of which electrified	3,537 km
- Of which double track or more	2,105 km
- Of which TEN-T	1,387 km
Investment in rail infastructure over the 2000 – 2015 period	**24.5 B€**
% of mountains	73.4%
Population density (ppl/km²)	104.8

Country Map



Investments in rail infrastructure



Investments in rail infrastructure have progress steadily over the 2000-2015 period, reaching 24.5 B€.
In the newt years, investments will be targeted on increasing the competitiveness of rail, especially on TEN-T corridors, by increasing freight transport capacity, implementing an integrated timetable system and building new lines and upgrading old ones. For 2014-2020, total investments in rail infrastructure are committed to be 14.8 B€. For 2021-2030, estimated are 20 B€, broken down into: Core network 15 B€, Comprehensive network 4 B€, other lines (non-TEN-T) 1 B€.

Key Findings

Overview

With approximately 5,000 km of railway lines, Austria has a **developed railway infrastructure** characterised by a high level of quality (ranked **sixth best in Europe**). The investments for the next years will be focused on its **extension** and **modernisation**. Additionally, the future investments focus on the reduction of travel time by investing into HS lines and upgrading old lines to be able to operate at higher speeds.

Impact of external factors

The investments in rail infrastructure carried out in the country, particularly in those related to the construction of new railway lines, are strongly impacted by the **orography**. This leads to the investments per line typically being much higher due to more frequent **tunnels** than on other Member States. Nonetheless, a part from the cost of tunnels and structures, the cost for the **base infrastructure** is comparatively **in line with the EU average** as regards new high-speed lines.

Difference between estimated and final cost

The planning of the infrastructure is based on the elaboration of **detailed estimates** at each stage of the planning phase, specifying costs per cost element rather than a lump sum on project basis. This increases the likeliness of final costs being relatively close to the initial cost estimates compared to countries where the cost estimate is provided only as a lump sum.

Additionally, the **procurement process** does **not usually result in an increase** of final cost compared to estimated cost. Indeed, the procurement system in Austria is characterised by strong administrative capacity and a low number of irregularities. Therefore, the decision making process and the overall procurement procedures are fast and cost efficient. Furthermore, the number of tenders for which only one bid is submitted is at 14%, which is far below the EU average and therefore indicates that there is more competition, thus potentially reducing costs. The competition in the construction market is actually one of the factors that may result in final costs being lower than the estimated cost in the tendering documents.

Belgium

Summary Description

Belgium is characterised by a modern and efficient railway system, which is required to be interoperable with those of the neighbouring countries. As a result, future investment focus lies on improving **interoperability** and installing **signalling and communication equipment**.

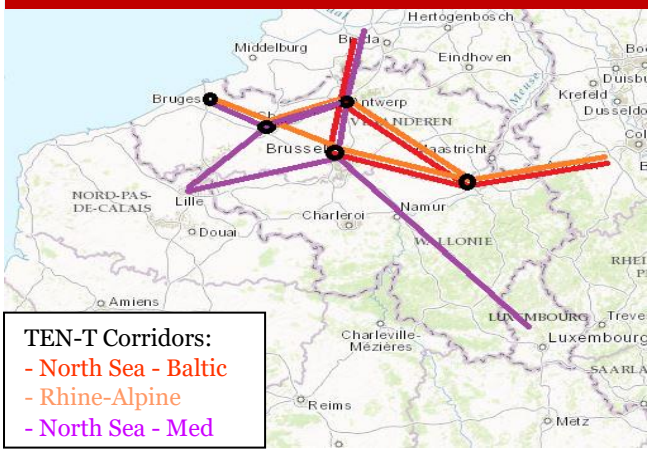
Difference between estimated and final cost. The initial investments in ERTMS were characterized by a high unit cost and significant **cost overruns**, due to the novelty of the technology. While in more recent investments, **limited differences** between estimated and final cost are encountered, probably also in relation to the **efficient and transparent procurement procedures** along with **high competition in the construction market**, which sometimes lead to cost savings. On the other hand, in case of new lines, **procedures for land acquisition** are very **complex** and frequent conflict with citizens opposing projects may increase the investment cost.

Summary Indicators

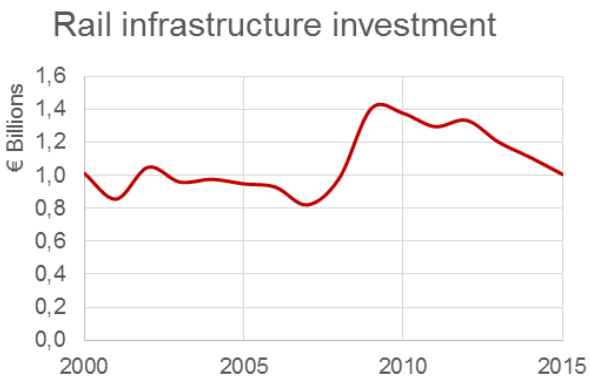
Country Network Length	**3,602 km**
- Of which HSR	209 km
- Of which electrified	n/a
- Of which double track or more	n/a
- Of which TEN-T	1,814 km

Investment in rail infastructure over the 2000 – 2015 period	**17.3 B€**
% of mountain	4.2%
Population density (ppl/km²)	371.8

Country Map



Investments in rail infrastructure



Between 2007 and 2009 the Belgian infrastructure spending increased nearly by 40% after which it started to slowly revert back to the average of around 1 B€ per annum.

Over the period from 2016 until 2020 the Belgian Ministry of Transport intends to invest 4.3 B€ (of which 3.9 B€ is state budget) into the development of the network. The focus thereby lies on building on capacity, punctuality, and safety. The main type of works will include maintenance as well as renewals.

Key Findings

Overview

Belgium is characterised by a **modern** and **efficient railway system**. Geographical conditions require it to be **interoperable** with those of neighbouring countries, to ensure the efficiency of its port system as well as connectivity among close urban areas of the different countries (i.e. Netherlands, France, and Germany among others). As a result, the compliance with technical requirements for EU interoperability represents a priority in the development of the railway infrastructure. Belgium is one of the early adopters of the **ERTMS** and is among the first three Member States to have completed the TEN-T high-speed rail core network.

Difference between estimated and final cost

For **electrification and signalling works** the average cost within the country is around **200 k€/km**, in line with the EU average. A significantly higher unit cost is observed for the first projects concerning the deployment ERTMS, which, additionally, resulted in significant cost overruns once implemented, due to the novelty of the technology implemented. Oppositely, most **recent projects** present overall a **limited difference between estimated and final cost**.

Indeed, Belgium has one of the most **advanced public procurement processes** being among the pioneers for e-procurement and a very low level of corruption. The price only to MEAT (most economically advantageous tender) criteria ratio lies at 28%-to-72%. Parts of the benefits of the high use of e-procurement that show in Belgium are an increased level of companies participating to the tenders. In addition, the participation of foreign bidders in the tenders is moderately high with 5% of contracts won by foreign bidders. Therefore, the competition is higher and in some cases, this leads to cost savings from the originally estimated prices. This compensates the **additional cost** that may result from the procedures for **land acquisition**, which are often very complex and frequently involve conflict with citizens who oppose the projects.

Bulgaria

Summary Description

Due to the current characteristics of the railway system – poor quality level and limited integration in the EU network -, in the next years rail infrastructure investments in Bulgaria will focus on the **modernisation** of existing lines to comply with EU standards and **new lines to complete the TEN-T network.** The unit cost of similar investments carried out in the past results to be in line with the EU average.

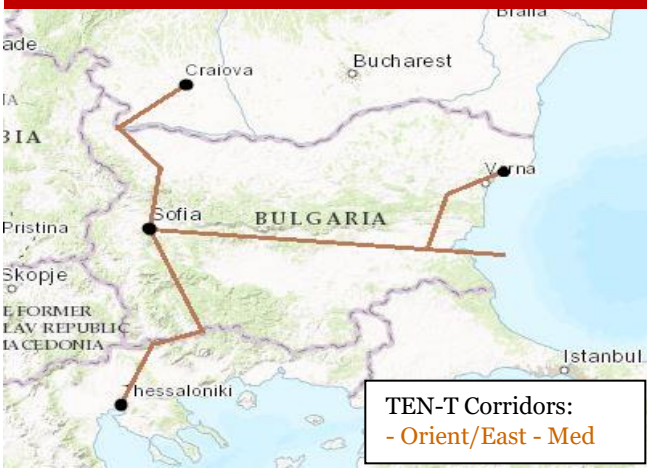
Difference between estimated and final cost. A limited difference between estimated and final cost is encountered. This is related to different factor having an opposite impact on final investment cost. Specifically:

- Awarding **criteria focused on price** lead to **frequent cost savings** because of price wars among bidders;
- The limited efficiency of the procurement process and the low competition in the market may result in an increase of the estimated costs.

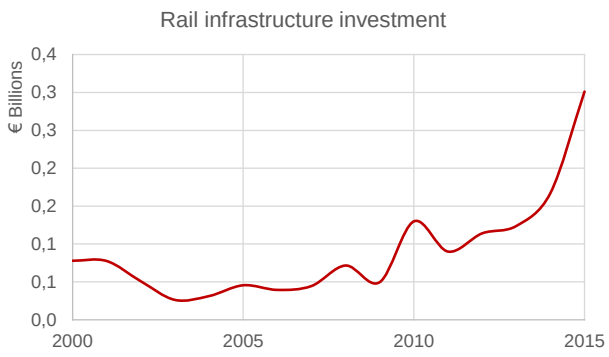
Summary Indicators

Country Network Length	**4,029 km**
- Of which HSR	0 km
- Of which electrified	2,868 km
- Of which double track or more	989 km
- Of which TEN-T	987 km
Investment in rail infastructure over the 2000 – 2015 period	**1.4 B€**
% of mountain	53.3%
Population density (ppl/km²)	66.2

Country Map



Investments in rail infrastructure



Particularly in the last five years, the infrastructure spending on rail has been growing rapidly in Bulgaria.

The main objectives for the period 2014-2030 are to improve the technical parameters of the railway infrastructure and thereby removing significant bottlenecks. To this aim 1.5 B€ from 2014 to 2020 and 2.6 B€ from 2021 to 2030 will be invested into mainly upgrading, rehabilitating and maintaining existing railway lines. This funding excludes national financing and consists of only other sources, such as EU funds.

Key Findings

Overview

The main investment focuses in Bulgaria over the next years are aimed at tackling the main problems of Bulgarian railway system such as:

- the far **below EU average condition of infrastructure** which leads to limitations in Bulgarian passenger and freight transport activity,
- **rail connections** which are **disconnected** from other transport infrastructure such as IWW and maritime ports,
- the **insufficient integration** of the national network in the **European network** which hinders the implementation of interoperability systems.

Most specific projects are therefore planned around **modernisation works of existing lines** (including the installation of ERTMS and other EU compliance works) and **new lines for the completion of the TEN-T network** (e.g. 296 km Plovdiv – Burgas which is expected to be designed by 2020 and constructed thereafter).

The cost of the investments carried out over the 2000-2015 period is substantially in line with the EU average, as regards the rehabilitation and upgrading of existing railway lines.

Difference between estimated and final cost.

Over the 2000-2015 period, a **limited difference between estimated and final cost** of rail investments is encountered. This is related to the opposite impact of different factors.

On one hand, the **limited transparency** of the procurement process has a **negative effect on the final cost** per se, as the procurement process is inefficient and costs more money, while on the other hand indirectly companies are often discouraged from applying because the contracts are generally awarded to the same companies.

Additionally, there is a very small amount of foreign participation in the tenders as most of the public tenders are not, or only rarely and untimely, published in the English language leading to the proportion of tenders won by foreign firms to be only at around 1%. The **lower level of competition** thus drives up prices and increase final infrastructure costs.

On the contrary, this effect is partially offset by **procurement criteria focusing predominantly on price**. In 2016, the price only criteria outweighed the European recommended MEAT criteria 64%-to-36%. Nevertheless, in light of the ex-ante conditionalities of the 2014-2020 programming period the country has created an improvement plan, which is focusing mainly on preventing fraud and corruption and increasing green procurement and the participation from SMEs through the implementation of an e-procurement system and agencies to perform investigate the process.

Croatia

Summary Description

Croatia is one the EU country with the **highest proportions of single tracks** on the network, wherefore many of future projects focus on **doubling existing lines**.

The unit cost for the construction of new conventional lines in the country is in line with the EU average, equalling 4.1 M€/km.

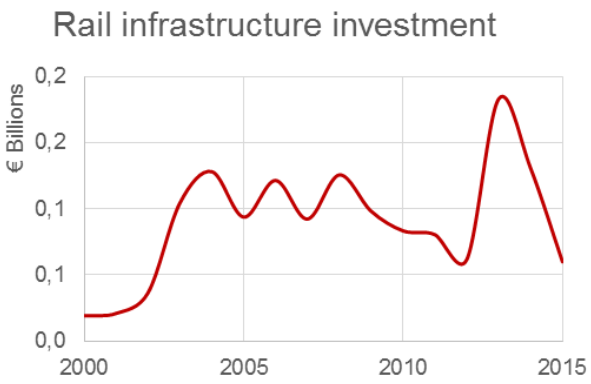
Difference between estimated and final cost. Different factors impact on the switching from estimated to final investment cost. Specifically, regarding the procurement phase, the frequent use of the **price-only criteria** may lead to a **reduction of the cost** (often falling short of the estimates), compensating potential cost increase related to the **length of the procurement process**. In case of new railway lines, the implementation phase can also be affected by **complex land acquisition procedures**, increasing the time and cost of projects.

Summary Indicators

Country Network Length	**2,605 km**
- Of which HSR	0 km
- Of which electrified	970 km
- Of which double track or more	254 km
- Of which TEN-T	307 km
Investment in rail infastructure over the 2000 – 2015 period	**1.4 B€**
% of mountain	n/a
Population density (ppl/km²)	74.4

Country Map

Investments in rail infrastructure



The infrastructure spending in Croatia over different years alters strongly but the overall trend is clearly upwards.

In the period 2014-2020 1 B€ of infrastructure investments in rail are planned. These investments are mainly focused on the Mediterranean corridor; more specifically the section between Rijeka and the Hungarian border. The focus of the investments will be on building new lines, rehabilitating old ones and performing the maintenance of those.

Key Findings

Overview

Croatia's railway infrastructure manager has been the country's **biggest beneficiary of EU funds since 2008**. As the country has one of the highest proportions of **single-track railways** and is coherently among the bottom three scoring Member States for completion of conventional railway network and railway infrastructure quality, investments have been predominantly and are currently focusing on the **construction of second tracks and upgrading of existing infrastructure.**

The unit cost of the investment carried out over the last years for the construction of conventional lines is in line with the EU average, equalling 4.1 M€/km. There are several factors that have an impact on this cost, some of which typically increase and some of which typically decrease the final project costs.

Difference between estimated and planned cost

Procurement processes in Croatia have a particularly large influence on the rail infrastructure development cost. The **awarding criteria** constitute a particularity compared to the other Member States, because Croatia has the highest ratio between price-only to MEAT criteria with 91%-to-9%. Therefore, the final costs are often lower than the estimated costs, as the bidders might undercut the estimate to win the contract.

On the other hand, the several **complaints** received by the procuring agencies under the Ministry of Transport impact **the length of the tendering process**, which can significantly delay the execution of projects or even drive up costs. However, it has to be noted that over the last three years, an overall improvement of the procurement process has been observed (i.e. the ratio between price-only to MEAT criteria decreased by 4% as well as the tenders participated by a single bidder).

In addition, the regulatory environment has a considerable impact on the final cost for two reasons. On one hand, the **environmental protection laws** can often drive up the cost of infrastructure depending on its routing, while on the other hand **also complex procedures for the purchase of land** on which the infrastructure is built can increase the time and cost of projects.

Market drivers such as the construction market dynamics have a moderate effect on the cost. **Low interests from bidders for small-scale projects** can often drive up the cost of those. On the contrary, the construction market dynamics in general including competition have a positive effect and reduce the overall cost of the projects.

Czech Republic

Summary Description

The Czech Republic rail infrastructure plays a fundamental role in the movement of goods entering and leaving the country and its quality level is in line with the EU average. Nonetheless, significant investments are needed to **upgrade** and **electrify existing lines**. Difference between estimated and final cost. Particular drivers that can influence the final cost of rail investments in Czech Republic including:

- The use of **procurement criteria** that are heavily focused on price, leading to frequent cost saving;
- Different **market factors** (e.g. construction market competition, appetite of the market, etc.) which have a strongly **diverting influence**, but lead to generally lower costs than those resulting from the planning process.

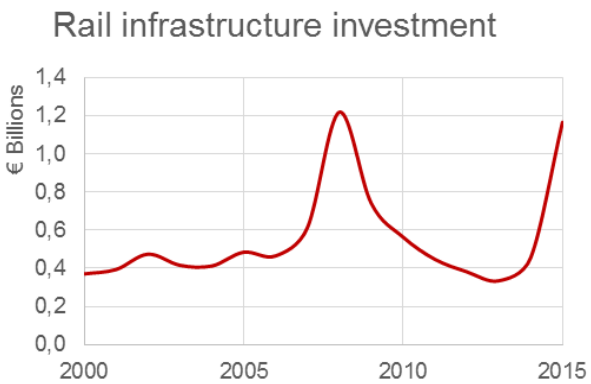
Summary Indicators

Country Network Length	**9,463 km**
- Of which HSR	0 km
- Of which electrified	3,217 km
- Of which double track or more	1,965 km
- Of which TEN-T	1,897 km
Investment in rail infastructure over the 2000 – 2015 period	**8.9 B€**
% of mountain	32.3%
Population density (ppl/km²)	136.6

Country Map

TEN-T Corridors:
- Baltic - Adriatic - Orient/East - Med - Rhine - Danube

Investments in rail infrastructure



Between 2007 and 2008, the Czech Republic was experiencing a strong uptake on rail infrastructure spending that has been strongly reduced by the crisis. Over the last few years the spending started to increase rapidly again. Over the period from 2014 until 2030, the main investment focus lies on creating more competitive railway transport by upgrading and rehabilitating of existing lines. Thereby, the principle aim is the compliance with the White paper on transport and the TEN-T vision. Four B€ are already committed to this purpose through EU and national funding. Furthermore, pilot projects of alternative financing methods will be incorporated to increase investment.

Key Findings

Overview

The Czech Republic's railway network is characterised by being the densest in terms of length of network divided by area of the country. Provided that the country is landlocked, railways play a much more significant role as a mass export and import mode of transport than for other countries and coherently a large and important part of TEN-T corridors passes through the country. Although the quality of the rail network is nearly in line with the average of the EU and above the large majority of Cohesion Countries, the proportion of electrified and double track railways are still relatively low. Therefore, the **future investments** that are largely financed by EU funds focus on the **upgrading and electrification of existing lines** to tackle those issues.

The **signalling and electrification costs**, equalling 170 k€/km on average, at the **lower end** of the spectrum of the Member States. Whereas, the unit cost of **rehabilitation works** of conventional lines equals on average 6.68 M€/km, **slightly above** the European average.

Impact of external factors

Particularly, in the years after accession in the EU, the cost of railway infrastructure in Czech Republic were impacted by the necessity to **adapt to the EU laws and Directives** on rail infrastructure, which **increased cost of rail projects**. Nonetheless, this effect has decreased over time.

Difference between estimated and final cost

Overall, **limited differences** are encountered between estimated and final cost, with frequent cost savings. These are primarily attributable to the large use of the **lowest-price criteria** in the awarding of procurement procedures (the ratio of price-only criteria to MEAT criteria is 82%-to-18%).

On the other hand, in some cases the **competition dynamics** in the construction market lead to **extraordinary price increases** and price dumping in turn.

Overall, the market factors are very complex and therefore vary strongly from project to project, which means that it is important to assess those in detail before drawing a conclusion for a particular project.

Denmark

Summary Description

The rail transport does not have a strong history in Denmark, where a pivot role has been historically played by the maritime transport. As a result, the rail infrastructure is not characterised by high quality level (compared to other non-Cohesion countries) and the main future investments focus lies on the **electrification** of the network as well as the **completion of the first high-speed rail** and the construction of others.

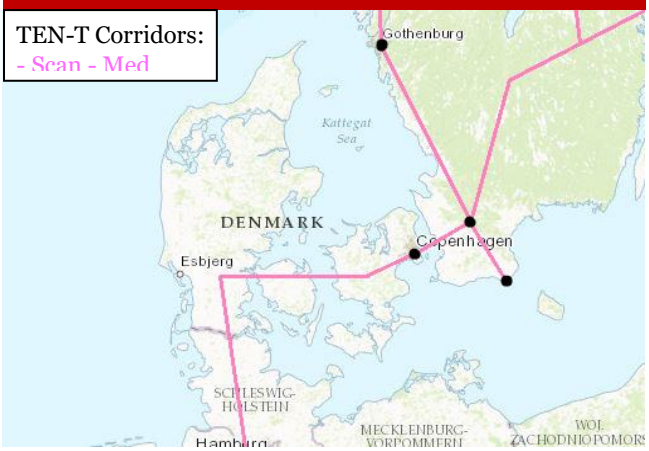
Difference between estimated and final cost. External factors do not have a strong impact on the difference between estimated and final cost. **Advanced procurement processes**, involving many companies including SMEs lead to high **competition** and final costs are often lower than in the tender documents.

Summary Indicators

Country Network Length	**2,131 km**
- Of which HSR	0 km
- Of which electrified	620 km
- Of which double track or more	927 km
- Of which TEN-T	538 km

Investment in rail infastructure over the 2000 – 2015 period	**9.2 B€**
% of mountain	0%
Population density (ppl/km²)	132.4

Country Map



Investments in rail infrastructure

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In the last few years (from around 2010 onwards) the Danish rail investments have been more than doubled through the uptake of high-speed rail construction.

In order to create a more sustainable future, the Danish Parliament decided to use the proceeds from the country's oil operation to finance the electrification of the main railway lines and the development of the high-speed rail network. The largest planned investments are the electrification of the Fredericia-Aalborg line for ca. 0.7 B€ and the construction of the high-speed rail line between Odense and Middelfart for ca. 0.6 B€.

Key Findings

Overview

Denmark, like the rest of the Nordic States, does not have a strong railway history, also because heavy shipments to different parts of the country are nearly always also possible by maritime transport. As a consequence, the railway network is relatively small compared to for example Belgium, France and the Netherlands, and still far from completion of its planned TEN-T conventional and high-speed corridors. In fact, the quality of the infrastructure is fairly poor when compared with most other non-cohesion countries and the first high-speed rail is currently still under construction. In the near future, the predominant investments will therefore focus the **electrification** of the network as well as the **completion of the first high-speed rail** and the **construction** of others.

Difference between estimated and final cost

In Denmark, the **awarding criteria** of the procurement process often lead to costs being lower than the estimated investments. For instance, the ratio between the price only to MEAT criteria is very low (26%-to-74%), which opposed to some countries where the criteria are favouring price, reduces unforeseen improvement works.

The country has one of the most **advanced procurement systems** with **short decision times** compared to other Member States, as well as high levels of transparency and access/participation from companies (including SMEs). For example, the tenders for which only a single bid is received is thus reduced to 12% of all awarded contracts. The **high level of participation** and thus competition between the companies allows for reduction of costs.

The same effect can be observed in the construction competition market dynamics, which due to high competition often result in cost savings and bidders undercutting the cost of the before the tender estimated costs.

Estonia

Summary Description

As those of the other Baltic Republics, Estonian railway system is characterised by section with Russian and European gauge. Coherently, the two main rail investment focuses of the country are its **connection with Russia** (St. Petersburg and Moscow) as well as **Rail Baltica** (the railway line to connect the Baltic countries with the EU via Poland).
Difference between estimated and final cost. Country specific cost drivers that can influence on these investment cost include:

- **Awarding criteria** focus on price which often leads to **lower final project cost** than in the estimates;
- **Low competition** amongst construction companies, which may **drive up final costs**;
- **Procurement of small projects** leading to low interest from the domestic and international market and thus **increasing costs**.

Summary Indicators

Country Network Length	**1,016 km**
- Of which HSR	0 km
- Of which electrified	132 km
- Of which double track or more	n/a
- Of which TEN-T	424 km
Investment in rail infastructure over the 2000 – 2015 period	**0.4 B€**
% of mountain	0%
Population density (ppl/km²)	30.3

Country Map

Investments in rail infrastructure

Estonia has some of the lowest levels of railway spending in the EU with a small peak in 2011. The investments focus predominantly on the Rail Baltic line that will connect the country with the rest of the Baltic countries as well as with Eastern Central and Western Europe. The construction is expected to begin in 2018 and finish in 2025. The currently available financial contributions as of April 2017 from CEF funds and the national authorities amount to 229 M€ for the Estonian line section.

Key Findings

Overview

The rail network of **Estonia** is the **third smallest in Europe** after Luxembourg and Slovenia, but has the largest density in terms of kilometres of rail per million inhabitants. Only around **10%** of the network is **double-track line** and around **8.7%** were **electrified** as of 2014. As the other Baltic Republic, the railway infrastructure includes sections with **Russian and European track gauges**. Coherently, the investments efforts of the country are split into two. On one hand, the country is planning to improve railway connections with Russia (St. Petersburg and Moscow) and on the other hand the biggest investment is targeted on **Rail Baltica**, the major project to connect the country to the rest of Eastern Europe as well as the Central and Western part of the continent.

Difference between estimated and final cost

In Estonia, the **market factors** play a great role for the final cost of railway infrastructure projects. Due to **low national competition** and **low interest** from the foreign market, the projects often end up in **cost overruns**. This is because bidders will expect a higher return for the often relatively small railway projects procured in the country.

On the other hand, **awarding criteria** in the procurement process are historically focused very strongly on price, with a ratio of 81%-to-19% between price only and MEAT criteria in 2014. In the two years afterwards, these have been drastically reduced for the better to 65%-to-35%, which is nonetheless very high. In some cases this leads to cost savings as bidders will attempt to undercut their fellow bidders. Competition is expected to be further encouraged by increased visibility and transparency of the procurement process ensured by the **early adoption of e-procurement**.

Finland

Summary Description

The quality of the Finnish railway infrastructure is currently very high for European standards wherefore future investments focus on **long-distance** and **cross border projects**, as well as new lines to improve domestic connectivity particularly from and to Helsinki.

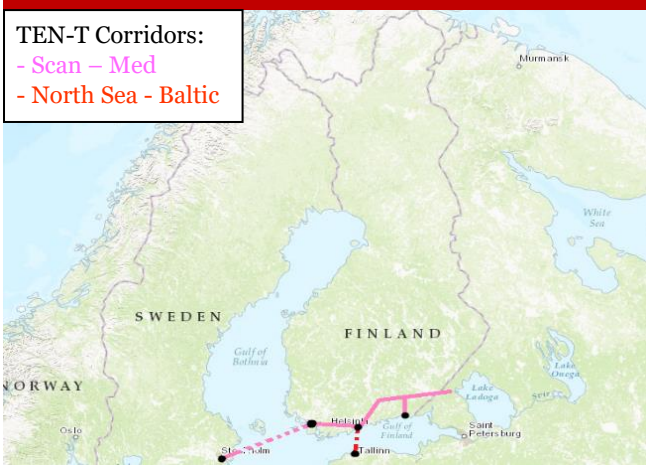
Impact of external factors. The cost of railway infrastructure increases in case **structures** for persons with **reduced mobility** or **tunnels** are included in the project, as in this case **independent experts** need to control the measures implemented.

Difference between estimated and final cost. The procurement process is very **advanced** and **cost efficient**. **High levels of transparency** facilitate competition and provide potential for cost savings.

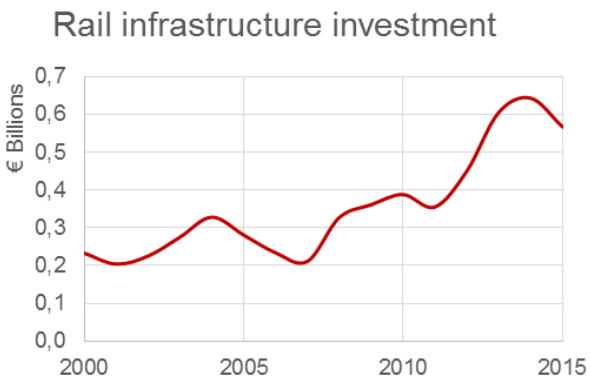
Summary Indicators

Country Network Length	**5,926 km**
- Of which HSR	0 km
- Of which electrified	3,270 km
- Of which double track or more	682 km
- Of which TEN-T	505 km
Investment in rail infastructure over the 2000 – 2015 period	**5.7 B€**
% of mountain	50.8%
Population density (ppl/km²)	18

Country Map



Investments in rail infrastructure



From around 2007, the railway investments have been strongly increasing in Finland.

Between 2015 and 2022 the Finnish transport strategy outlines to invest 3.5 B€ into the development of the railway network. Key investments focus on developing the long-distance rail network, but also the local public rail transport in the region of its capital Helsinki. Part of the strategy is to make use of smart technologies and upgrade the signalling system to match ERTMS standards.

Key Findings

Overview

Finland has the **second highest quality of railway infrastructure** among all Member States, only second to France, but is still far from the envisioned coverage of conventional rail as planned for the TEN-T corridors. The country is currently investing into rail infrastructures to improve domestic connectivity, but also strategically planning international connections, particularly with the rest of Europe as well as with Asia through plans to increase traffic with Russia and China. The expansion of the country's long-distance network is one of the key investment areas of which the majority is made up by the improvement of the Seinäjoki–Oulu line (ca. 860 M€), the construction of the Helsinki–Riihimäki line (350 M€), and the construction of the Luumäki–Imatra line (380 M€), for all of which the works have already started and are currently ongoing.

Impact of external factors

The cost of a rail infrastructure increases in case the **structures** for the persons with reduced mobility and tunnels are included in the projects. Indeed, in this case, the cost of the measures is amplified by **independent safety assessors** that need to be employed instead of the infrastructure manager conducting these types of controls.

Difference between estimated and final cost

The procurement process in Finland is relatively advanced and characterised by very low levels of corruption and a good value for money. The progress of e-procurement is relatively high and mandatory for all large-scale procurement processes, such as railway infrastructure. Therefore, the **transparency** of the process is strongly enhanced and fostering **competition** to reduce prices. In terms of the awarding criteria, the price only and MEAT criteria are valued nearly evenly with a ratio of 46%-to-54%.

France

Summary Description

French railway system stands out for having the **highest quality level** in the EU and for including the largest high-speed rail network in the EU.
Impact of external factors. A large part of this network has financed with the use of **PPP**, involving high cost for the planning and contractual phase. As a result, the unit cost of the base infrastructure for high-speed railways is rather higher than the EU average, equalling 9.81 M€/km.

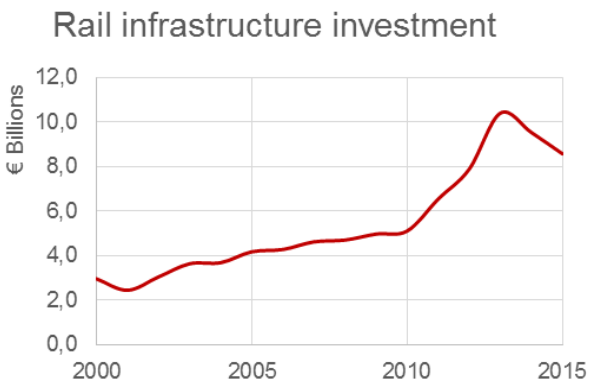
Difference between estimated and final cost. The procurement is centred on MEAT criteria, which is predominantly used to awards services and works. As a result, limited differences between estimated and final costs are expected as well as a high reliability and quality of the contractor.

Summary Indicators

Country Network Length	**29,979 km**
- Of which HSR	2,036 km
- Of which electrified	16,015 km
- Of which double track or more	n/a
- Of which TEN-T	7,794 km
Investment in rail infastructure over the 2000 – 2015 period	**86.5 B€**
% of mountain	22.3%
Population density (ppl/km²)	105.3

Country Map

Investments in rail infrastructure



Through the completion of the construction of the first high-speed lines, the investment has been relatively low in France within the first ten years of the new millennium. From 2010 onwards, the construction of new high-speed lines has significantly raised spending levels again.
The French government planned in 2016 to increase the connectivity of different regions of the country by adding 2,000 kilometres of high-speed railway tracks by 2020. Furthermore, after the merger between the infrastructure managers SNCF and RFF, the company planned from 2015 until 2025 to spend 3.5 B€ annually on upgrading the network of existing conventional

Key Findings

Overview

France as the Member State with the largest area also stands out by having the s**econd largest high-speed rail infrastructure in Europe**. In addition, the country's network **quality** is considered the best among all Member States. Over the next years, planned investments include a further **extension of the high-speed rail network** and **upgrades of the existing conventional network**, which is of comparatively low quality compared to the modern high-speed infrastructure in the country.

Impact of external factors

The cost for the development of the **base infrastructure** of the French high-speed railways result **slightly higher than the EU average**, equalling on average 9.81 M€/km. This is related to the **frequent use of PPP to finance the investments**. Since the possibility of using PPP for railway infrastructure projects was introduced in 2006, this contract scheme has been used to finance several high-speed rail projects, including the Tours-Bordeaux HS, the Nimes-Montepellier, and the Perpignan Figueras HS lines. The establishment of PPPs usually requires higher planning cost and time than the traditional procurement process, due to the effort required for the contract management, which are reflected in the infrastructure unit cost.

Difference between estimated and final cost

Due to the size of the country, both in terms of area and population, **public procurement in France is the largest in the EU**. The procurement process as a consequence of recent efforts in reducing the costs has become very **efficient** and **advanced**. It is characterised by **strong competition** because public buyers are restricted to specific procedures that open up the process to more potential suppliers. The government strong push for the development of e-procurement will further contribute to these factors, although it is to note that the current status of the electronic system still has a lot of potential to grow. Another distinctive feature are the **low weight of price only criteria** and in turn high emphasis on MEAT criteria (4%-to-96%), which can lead to contract values more aligned with estimated ones, compared to other countries, yet ensuring higher benefits in terms of quality and reliability of the contractors.

Germany

Summary Description

Germany has the **largest railway system** in the EU Country, which also qualified as the fifth best infrastructure network in terms of quality.

Future investments focus on the expansion of the high-speed rail network and the upgrading of existing lines that have become old.

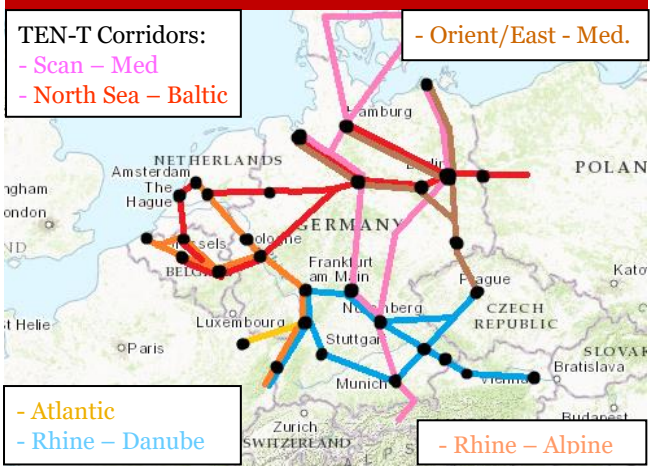
Impact of external factors. The unit cost of rail infrastructure investments may reflect specific features of the country, such as a higher unit cost in case the project is carried out in the northern area, due to the specific geotechnical characteristics, or the high population density.

Difference between estimated and final cost. Due to the advanced of the planning and procurement process, limited differences are expected between estimated and final cost.

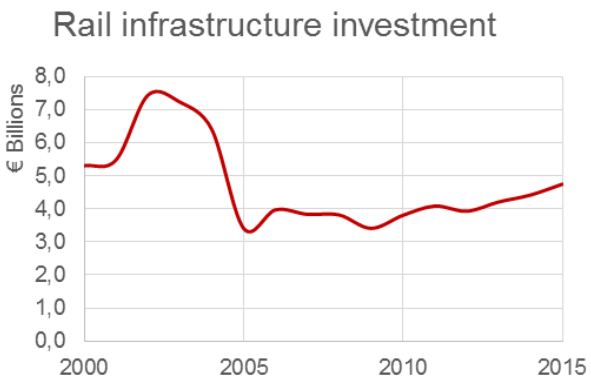
Summary Indicators

Country Network Length	**33,380 km**
- Of which HSR	1,475 km
- Of which electrified	20,095 km
- Of which double track or more	18,331 km
- Of which TEN-T	10,393 km
Investment in rail infastructure over the 2000 – 2015 period	**75.5 B€**
% of mountain	14.7%
Population density (ppl/km²)	228.6

Country Map



Investments in rail infrastructure



In the early 2000s, the construction of high-speed rail lines has led to a spike of German rail investment. From 2010 onwards, the investments have had a relatively mediocre, but stable level. In the period from 2014-2030 an investment of 42.5 B€ is planned for the construction of new lines and upgrading extisting lines. Additionally, 88 B€ are planned to be invested into the rehabilitation and maintenance of the existing network.

The investments aim to maintain the large network in good shape and to remove bottlenecks.

Key Findings

Overview

With around 33,000 kilometres of railway lines, **Germany** is the country with **largest railway network in the EU**. Furthermore, the country has the third densest network in the EU measured by length of line per area and the fifth highest quality of the rail infrastructure. Future investments focus particularly on **expanding** the, compared to the size of the conventional infrastructure small, **high-speed network** and **upgrading existing infrastructure** which is fairly old in many cases. This is particularly important from an EU perspective, because provided the country central location the corridors passing through Germany are highly important for the overall connectivity within Europe.

Impact of external factors

Due to the **high density of the country's population**, railway projects for lines with similar features often **cost more** than in other countries. Civil engineering buildings such as interfaces with other infrastructure (e.g. railway or highway over- and underpasses) are more frequent and therefore drive up the cost.

Another country specific external cost factor particularly in Northern Germany is constituted by **frequent moorlands**. This leads to a significant **increase of costs related to earthworks**, because large amounts of sand are needed to stabilise the ground and the project time can increase significantly.

Difference between estimated and final cost

For the infrastructure planning process, the Deutsche Bahn (IM) uses an infrastructure-planning tool working with aggregated price lists and a so-called "5D" planning software factoring in detailed engineering plan data, time-cost factors, and regional price levels to create cost estimates. Therefore, the **estimates** tend to be more **detailed** than in many other Member States. Nonetheless, **cost overruns** still occur frequently as the project cost is often increased by **unforeseeable external cost drivers** (e.g. archaeological findings etc.).

The **procurement process** in Germany is highly focused on **economic efficiency**. The large administrative capacity and low level of corruption lead to fast and transparent procurement procedures. Nonetheless, a significant percentage of tenders with just one bidder are encountered (17% in 2016). The e-procurement is at a largely advanced level with mandatory publication of the tender documents and a comparatively high uptake rate of the procedures.

The dynamics of the **construction market**, which is **relatively competitive**, facilitate the selection of the most-convenient offer, but, in the past, many railway projects have been subject to large cost overruns due to anticompetitive violations.

Greece

Summary Description

The **financial crisis** impacted negatively on the development of the rail infrastructure in Greece, due to the **lack of the financial resources** available and the **delays** in the planning and implementation of infrastructure project. As a result, Greece has the third lowest quality of railway infrastructure in the EU.

Impact of external factors. The unit cost of the **baseline infrastructure** for conventional and high-speed lines are **slightly lower** than the EU average. Nonetheless, the **orography** of the country often requires the construction of **tunnels** and **structures,** which increase the construction cost.

Difference between estimated and final cost. After the financial crisis, the final cost of investment of rail infrastructure has been affected by different factors. The **restrictions** on **capital movements** complicated the organization of the **supply chain**. Similarly, the characteristics of the **procurement process** result in **final cost exceeding estimated one.**

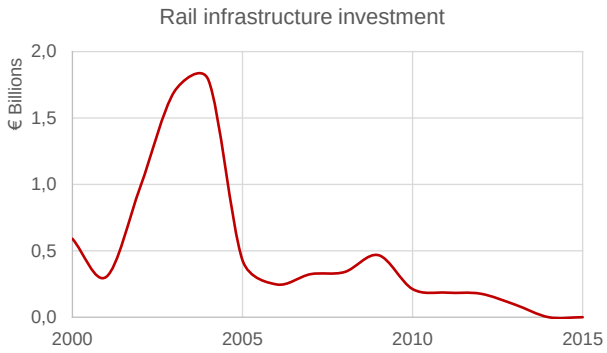
Summary Indicators

Country Network Length	**2,240 km**
- Of which HSR	0 km
- Of which electrified	520 km
- Of which double track or more	524 km
- Of which TEN-T	1,065 km
Investment in rail infastructure over the 2000 – 2015 period	**7.8 B€**
% of mountain	77.9%
Population density (ppl/km²)	81.9

Country Map

TEN-T Corridors:
- Orient/East - Med

Investments in rail infrastructure



Through the crisis in Greece, the investments in railway infrastructure have completely decreased to nearly zero.
Over the 2014-2020 approximately 3 B€ from Cohesion Fund and ERDF were provided to Greece for the development of the transport and energy infrastructure.

Key Findings

Overview

Greece has a very important strategic position for the European economy, as it constitutes a major exchange point between Europe and Asia due to its unique access to Asia by both land through Turkey and sea through the Suez channel. Nonetheless, the country's rail network has the **third lowest quality of railway infrastructure** and the lowest density of railway infrastructure per both area and inhabitants among all Member States. Therefore, the development of the country's network is crucial to for the European economy as a whole.

The future investments are expected to contribute to increase port connectivity by constructing new lines between ports and other infrastructure hubs and upgrading the existing lines to European standards.

However, the **financial crisis** has impacted on the financial resources available for investments, contributing particularly strong towards the **infrastructure deficit**, because the proportion of Greece's GDP spend on infrastructure has decreased from 3.7% in 2006 to 1.1% in 2015 creating an annual deficit of around 5.7 B€. The lack of resources resulted in the majority of the infrastructure projects under development being delayed. At the same time, **delays** occurred in the **planning**, **funding**, and **contracting phase** of the projects.

Impact of external factors

For projects carried out before the financial crisis and projects financed by the CEF from 2014 onwards, the average **unit cost** for the construction of **conventional lines** without major structures is with an average of 3.58 M€/km **slightly below** the European average. For the construction of **high-speed lines**, this value lies at 7.64 and is **slightly below** the EU average. Nonetheless, given the **orography** of the country, **overall construction cost** are frequently higher due to the presence of **tunnels** and **structures**.

Difference between estimated and final cost

Different external factors affect the cost of railway infrastructure in Greece. Before 2008, cost increases occurred because of the significant cost of **land acquisition**, in case of new lines, specifically in urban areas.

After the financial crisis, **restrictions on capital movements** lead to **complicated supply chains**, which further drive the infrastructure cost.

Procurement plays a relevant role in determining the final cost of the investments as well. As a result of the crisis, the structure has been improved by a rapid adoption of e-procurement procedures and simplified processes, but it is still far from European standards and therefore, does not meet all from the EU enforced standards, yet. In combination with the **awarding criteria** that are mainly focusing on price only (93%-to-7% MEAT criteria), this leads to **frequent cost overruns** compared to originally estimated project cost, as additional works are often required.

Hungary

Summary Description

Hungary has the fifth densest network within the EU, but the **quality of the network** is **relatively low** compared to the EU average. Therefore, future investments are aimed at **improving the quality** of the network by **upgrading existing lines**, **completing the TEN-T network** and achieving **EU interoperability** also by installing the **ERTMS** system.

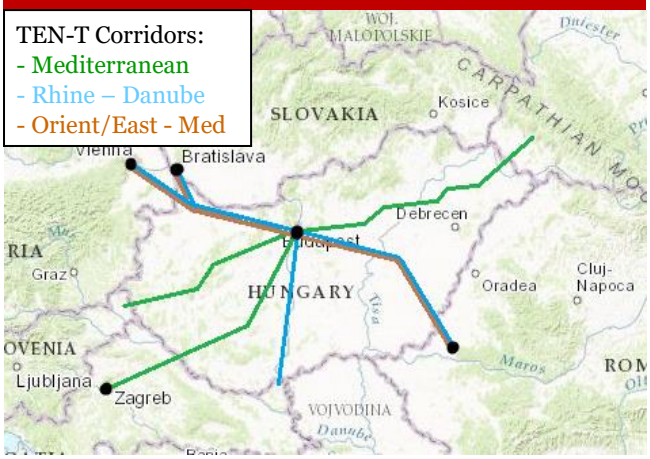
Difference between estimated and final cost. Country specific cost-drivers include:

- **Underspecified tender documents** often lead to **higher final prices** than estimated;
- **Limited know-how in the workforce requires importing labour and materials with significant costs.**

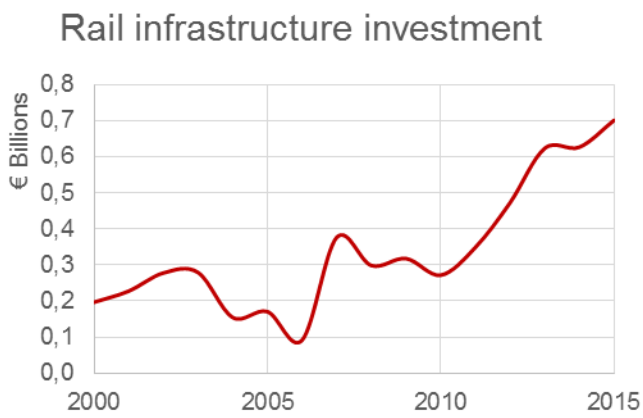
Summary Indicators

Country Network Length	**7,749 km**
- Of which HSR	0 km
- Of which electrified	3,090 km
- Of which double track or more	1,226 km
- Of which TEN-T	1,947 km
Investment in rail infastructure over the 2000 – 2015 period	**5.4 B€**
% of mountain	4.7%
Population density (ppl/km²)	105.8

Country Map



Investments in rail infrastructure



Hungary has been benefitting from being one of the frequent beneficiaries of EU funds from around 2010 onwards, since when the annual investment in rail more than doubled.

Hungary's total investments under the operational programme for 2014-2020 are 3.91 B€. The projects envisioned for investment target the modernisation of 280 kilometres of lines and thereby optimising the travelling times. Another investment focus lies on the development of the ERTMS system for which 956 kilometres of rail are supposed to be equipped with GSM-R by 2020.

Key Findings

Overview

Hungary has the fifth densest network within the EU, but the **quality of the network** is **relatively low** compared to the EU average. Furthermore, the TEN-T conventional and high-speed networks are still less than 10% developed, wherefore the future investments are targeted at **improving the quality** by upgrading existing lines, completing the network and achieving EU interoperability also by installing the ERTMS system.

Difference between estimated and final cost

Hungary's **public procurement system** presents several issues as regards the tendering of rail infrastructure projects. **Tender documents** are often **underspecified** for the works that need to be done, which will often lead to **additional works** that need to be undertaken, thus leading to cost overruns. Furthermore, Hungary has one of the **least developed e-procurement** systems in respect to the other EU Member States and there is a **low appetite from the market** because of relatively small projects being procured. In fact, in Hungary 36% of all contracts awarded receive only a single bid. This lack of competition leads to an increase of prices compared to the initially estimated costs.

On the other hand, the **criteria** used to award tenders **limit the cost increase**. Specifically, approximately 72% of the public tenders are awarded based on the price-only criteria, leading construction companies to compete on financial offers exclusively.

In the implementation of the projects, the construction market dynamics and **limited technical skills** for the execution of infrastructure projects drive costs, because often **services and materials need to be costly imported from other countries**. Unstable prices and dependency on the foreign markets therefore often lead to cost overruns.

Ireland

Summary Description

Although the Irish railway sections of the TEN-T network are almost completed, the overall quality system is characterised by a **low quality level**.
In Ireland, most of the planned works focus on the connections between **large agglomerations** and meeting the **EU safety and quality standards**, as well as to connect airports to the rail network for easy tourist access.
Difference between estimated and final cost. Factors impacting on the cost of rail infrastructure investment include:

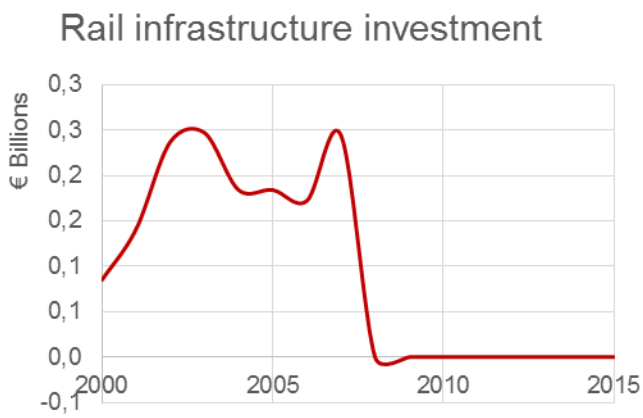
- **Complex land acquisition procedures increase cost** of railway infrastructure
- Despite the good procurement processes, there is **relatively low participation** of domestic companies, and **low competition in the construction market**, which result in **tender prices higher than estimated**.

Summary Indicators

Country Network Length	**1,458 km**
- Of which HSR	0 km
- Of which electrified	n/a
- Of which double track or more	44 km
- Of which TEN-T	371 km
Investment in rail infastructure over the 2000 – 2015 period	**1.5 B€**
% of mountain	10.6%
Population density (ppl/km²)	67.9

Country Map

Investments in rail infrastructure



After 2007, the Irish investments in rail infrastructure nearly ceseaed entirely.

In a report published by Irish Rail, the country's strategy is outlined to focus investments over the next years on connecting major cities, such as Dublin to Cork, Belfast, Galway, Limerick, and Waterford. Furthermore, the country plans to improve the access to additional infrastructure, such as airports to improve tourist access.

Key Findings

Overview

The Irish rail infrastructure network is already covering **92 %** of the country's envisioned **TEN-T conventional network**. Nonetheless, the network has a **lower quality than the EU average**. Additionally, the country has by far the **lowest proportion of electrified rail** tracks being less than 5%. Due to the country's geographical location and the fact that it is sea locked, the interoperability with other railway systems is not a priority in the development of the rail infrastructure network. Additionally, no high-speed rail is planned in the near future, wherefore most of the planned works focus on the connections between large agglomerations and meeting the EU safety and quality standards.

Impact of external factors

From a regulatory standpoint, after the formation of the Commission for Rail Regulation in 2005 as a response to the Directive 2004/49/EC, technical standards have been implemented which have significantly increased the cost of compliance in the past.

Difference between estimated and final cost

Ireland's procurement system is relatively advanced. As one of the **e-procurement pioneers** and one of the highest uptake rates of such, as well as for a strong framework and strong capacity of the procurement bodies, the country has a **transparent and efficient procurement system**. The price only to MEAT criteria rate of 16%-to-84% favours strongly the long-term economic effects of railway projects. The country has one of the highest percentages of contracts won by foreign firms (11%). On the other hand, this is potentially also an indicator of the relatively **low domestic competition**.

In case of construction of new lines, estimated cost may increase due to complicated procedures for the land acquisition further drive costs.

Italy

Summary Description

Italy has one the largest high-speed and overall railway network in the EU. Nonetheless, the system is characterised by a medium quality level, lower than other non-Cohesion countries.

Specific works planned are the completion of several tunnels, upgrading of the signalling systems on large sections to ERTMS ETCS Level 2, and doubling existing single-track lines mainly in the southern part of the country.

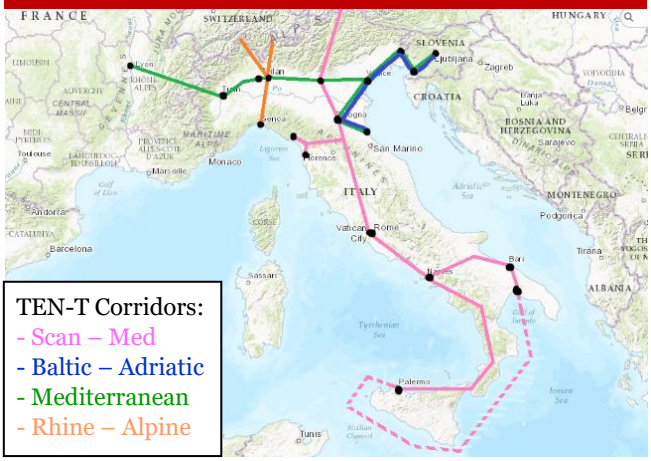
Impact of external factors. **Diverse topographical factors** and **varying population density** across the country can make the **planning process more difficult** and result in variation of the cost of infrastructure projects carried out in different areas of the country.

Difference between estimated and final cost. Difference between estimated and final cost may occur due to the **relatively inefficient procurement process.** Oppositely, the presence of **highly skilled workforce** within the country contributes to lower final cost.

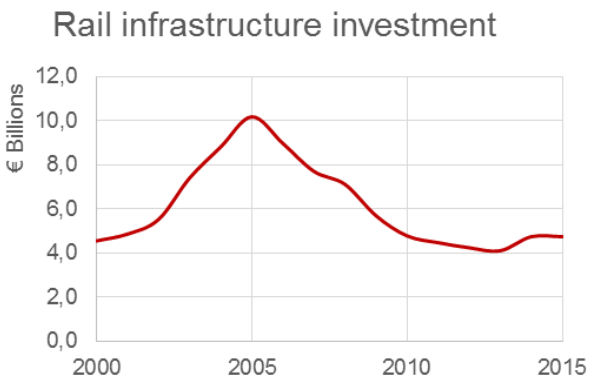
Summary Indicators

Country Network Length	**17,106 km**
- Of which HSR	923 km
- Of which electrified	12,218 km
- Of which double track or more	7,763 km
- Of which TEN-T	5,670 km
Investment in rail infastructure	
over the 2000 – 2015 period	**97.9 B€**
% of mountain	60.1%
Population density (ppl/km²)	201

Country Map



Investments in rail infrastructure



The start of construction of the Italian high-speed rail network in the early 2000s lead to a bump in spending. From 2010, the investment has been fairly stable.

Between 2015 and 2020 the Italian infrastructure manager RFI plans to spend 17 B€ to improve its network. The financed works concern mainly the expansion of the high-speed rail network, the completion of the TEN-T network (e.g. Brenner Base Tunnel), and upgrading of the existing lines by installing better links to existing infrastructure and using the latest technologies to improve the service, such as the installation of ERTMS.

Key Findings

Overview

Italy has the fourth biggest railway network in the EU and the **fourth largest high-speed rail** infrastructure. Furthermore, the proportion of electrified lines is at around 70%, which is also a very good value in the EU. Nonetheless, despite being among the countries with the largest rail and high-speed rail infrastructure, the country's overall network has a relatively low quality compared to most other non-cohesion countries, wherefore the future investments focus on **improvement works**, as well as the **expansion of the high-speed** and **TEN-T network**. Specific works planned are the completion of tunnels (e.g. Brenner Base and Terzo Valico dei Giovi), upgrading of the signalling systems on large sections to ERTMS ETCS Level 2, and doubling existing single-track lines mainly in the southern part of the country.

The unit cost of **conventional rail base infrastructure** is with on average 3.44 M€/km **in line with other Member States**. Furthermore, the same value for **high-speed** is **slightly lower** with on average 6.95 M€/km than for most Member States with high-speed rail.

Impact of external factors

A country specific **environmental factor** is the diverse **geographical factors** around the country. For instance, in the North of Italy are mountainous regions and a high density of urban areas, while in the South the country the population is less dense and the topology less complex. This can lead to significant cost differences of infrastructure within the same country and increases the difficulty to plan.

Difference between estimated and final cost

Public procurement procedures in Italy may result in **final costs higher than estimated**. Indeed, the average days to decision are with 193 amongst the highest in Europe. Further, about one third of the public tenders are participated by only one bidder.

Oppositely, the characteristics of the **construction market**, which is relatively **advanced** and contains a **very skilled workforce** and large expertise of railway experts (which is often sought from other countries that have large infrastructure projects) contribute to **lower the investment final cost.**

Latvia

Summary Description

Latvia's future investments mainly focus on the grand project **Rail Baltica** that is connecting Estonia, Latvia and Lithuania with each other and the rest of the EU, as well as electrification works of the main lines.

Difference between estimated and final cost. Country specific drivers impacting on rail infrastructure final cost are constituted by the following factors:

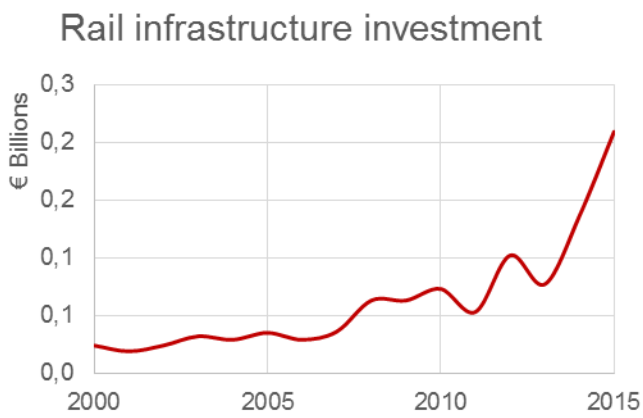
- **limited technical skills** available in the country, requiring **costly sourcing of expertise** from abroad;
- **cost estimates** are carried out as **lump sum,** reducing the planning accuracy;
- **cost overruns** can be attributed to the **procurement process** and **low competition in the construction market.**

Summary Indicators

Country Network Length	**1,860 km**
- Of which HSR	0 km
- Of which electrified	251 km
- Of which double track or more	367 km
- Of which TEN-T	590 km
Investment in rail infastructure over the 2000 – 2015 period	**1.0 B€**
% of mountain	0%
Population density (ppl/km²)	31.8

Country Map

Investments in rail infrastructure



Latvia like the other Baltic Member States has relatively low spending overall. From 2010 onwards nonetheless, the initiation of Rail Baltica can be observed in increased spending.

From 2014 to 2020 and 2021 to 2030, 670 M€ and 2 B€ investments are planned respectively. The objectives are to provide more capacity of the rail infrastructure, as well as to uphold high traffic safety standards. The envisioned works consist mainly of the electrification of main railway lines to increase competitiveness and sustainability, attract additional cargoes, and ensure compatibility with EU transportation policy and long-term objectives.

Key Findings

Overview

Latvia's rail network is amongst the **smallest** within the EU and its quality is slightly below the European average, less than 15% of the network is electrified and only a small proportion of the lines are double tracks. Furthermore, Latvia is the only country within the EU, which has not yet completed any section of the envisioned TEN-T conventional or high-speed network. Therefore, the future investments mainly focus on the grand project **Rail Baltica** that is connecting Estonia, Latvia and Lithuania with each other and the rest of the EU, as well as **electrification works** of the main lines.

Difference between estimated and final cost

In Latvia, market factors are highly relevant for railway projects. **Limited technical skills** available in the country lead to a need to import labour, which can drive up the cost of infrastructures. Overall, **construction costs** in the past **varied greatly** across the years increasing before the economic crisis in 2008, and decreasing afterwards. A price increase is expected in the near future due to the increase in demand for projects.

A particularity of the country is that the **cost estimates** during the different stages are all carried out as a **lump sum** unlike in other countries where they are carried out through a detailed cost breakdown. This can lead to l**imitations** when assessing the **accuracy of the planning.**

In Latvia, the **awarding criteria** are focused predominantly on **price only.** The ratio between price only and MEAT criteria is 67%-to-33%. The criteria have historically both led to **cost overruns** and **cost savings** depending on the projects. (A potential consequence of a focus on price only as identified in other countries can be that additional works are required that were not included in the bids that won the tender based on price.) Another issue is that Latvia has one of the **highest rates of single bids** received with 31% of all awarded contracts receiving only one bid. This is an indicator of **low competition**, which can further drive up the cost of railway projects. Advancements in the e-procurement system, which contains mandatory notifications about new tenders help, but are not widely in use yet and thus have only a limited effect.

Lithuania

Summary Description

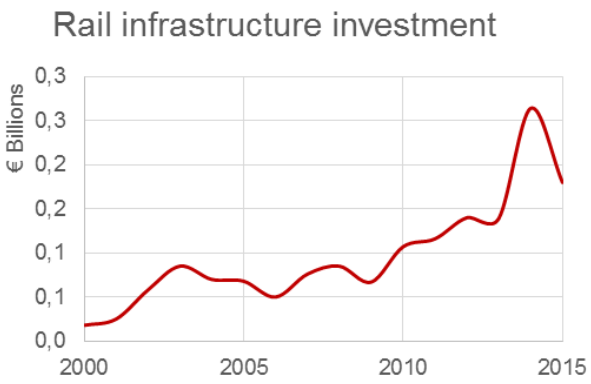
Due to Lithuania's previous annexation to the Soviet Union, most railway tracks still have the **Russian gauge**. Nonetheless, because of its now EU centric economic orientation the main focus of rail infrastructure investments lies on the **development of railway lines** with **standard EU gauge**.
Impact of external factors. The introduction of **EU interoperability standards** result in an increased cost of railway infrastructure. However, this effect has bene reducing over time.
Difference between estimated and final cost. The final cost of railway infrastructure investments is affected by the **procurement process**, with **awarding criteria** focussed on the **lowest-price**, and by a **low competition** in the market and **little interest for the procured projects**, which, oppositely **drive up costs**.

Summary Indicators

Country Network Length	**1,911 km**
- Of which HSR	0 km
- Of which electrified	122 km
- Of which double track or more	452 km
- Of which TEN-T	852 km
Investment in rail infastructure over the 2000 – 2015 period	**1.6 B€**
% of mountain	0%
Population density (ppl/km²)	46.4

Country Map

Investments in rail infrastructure



Lithuania's infrastructure spending on railway is fairly small, but has been steadily increasing since 2010.
In the period from 2014 to 2020 the country plans to spend around 500 M€ in rail infrastrcture investments. These projects are focused mainly on the integration in the TEN-T network, by upgrading existing lines and building missing links. Specifically, interventions will be aimed to the renewal and upgrading of the Lithuanian section of the Rail Baltica project.

Key Findings

Overview

Similarly to those of the other Baltic countries, the Lithuanian rail infrastructure is characterised by the existence of railway with **different gauges**, namely the Russian (1520 mm) and the standard gauge (1435 mm). The former is encountered in the majority of the line (93%); however, the main focussed on the investments is towards the development of railways line with standard gauge.

Impact of external factors

The introduction of **EU interoperability standards** impacted on the price of railway infrastructure in the period 2000 - 2008, as they are more costly to comply with than the country's previous standards. Nonetheless, the influence of these requirements has decreased with time, due to the development of the market and the experience gained.

Difference between estimated and final cost

The impact of the **procurement system** is still relevant on the cost railway infrastructure. Indeed the large majority of procurement procedures (approximately 91%) are awarded based on the **lowest price criteria**. These compensate the potential cost increase related to the **relatively low appetite** from the **domestic** and **international market**. Nonetheless, Lithuania has one of the most used **e-procurement process** with approximately 90% of the total procurement being taken up electronically. This is greatly **improving transparency** and **fostering competition**, thereby creating the potential to reduce prices.

Luxembourg

Summary Description

In Luxembourg, future investments are focused on specific works that concern the upgrading of existing lines according to EU standards and the creation of new lines that will enlarge the country's network.
Impact of external factors. Difficulties to **purchase land** as well as land prices constitute **significant cost drivers,** in the case of new railway lines.

Difference between estimated and final cost. Limited difference between estimated and final cost result from:

- **Competition in the construction market favouring cost savings;**
- A **simplified procurement system,** that allows for **cost savings and time efficient** awarding of tenders.

Summary Indicators

Country Network Length	**275 km**
- Of which HSR	0 km
- Of which electrified	262 km
- Of which double track or more	154 km
- Of which TEN-T	64 km
Investment in rail infastructure over the 2000 – 2015 period	**2.1 B€**
% of mountain	4.4%
Population density (ppl/km²)	220.3

Country Map

Investments in rail infrastructure

Since 2000 there is a clear upwards trend in the spending on railway infrastructure, which is expected to continue.

For the period from 2014 to 2030, the government of Luxembourg plans to invest 3.8 B€ with the aim of increasing the capacity of the network and remove bottlenecks.
Specific works that are envisioned concern the upgrading of existing lines according to EU standards and the creation of new lines that will enlarge the country's network.

Key Findings

Overview

Due to its limited geographical extension, Luxembourg is the EU country with the **shortest rail infrastructure network**, which, however, is characterised by a **good quality level**.

Impact of external factors

The construction cost of **new railway lines** is significantly impacted by the costs and procedures related to **land acquisition**.

Difference between estimated and final cost

The influence of the construction market in Luxembourg has changed from the period before the financial crisis to the current period after the crisis. Before the crisis, the **construction dynamics** led to an **increase of final costs** respective to the estimated costs due to **low competition** as there was little interest from the domestic and the international market for the projects procured. After the crisis, due to the negative effects on the economy the change in the **construction competition dynamics** has led to **cost savings** respective to the estimated amounts as bidders undercut the estimated prices

After the financial crisis, also the **procurement process** had a stronger influence on the final railway infrastructure cost. This is due to the **length** and **awarding criteria** of the procurement process. Provided the small size of the country, the procurement process is relatively simplified and centralised with a one-stop-shop for all procurement queries. As a consequence, the process is fast and efficient. Additionally, the awarding criteria are focused mainly on price with a ratio of 79% price only criteria to 21% MEAT criteria. Overall, the procurement process leads to lower prices than the initial estimates, particularly since after the financial crisis.

Netherlands

Summary Descriptioncmq

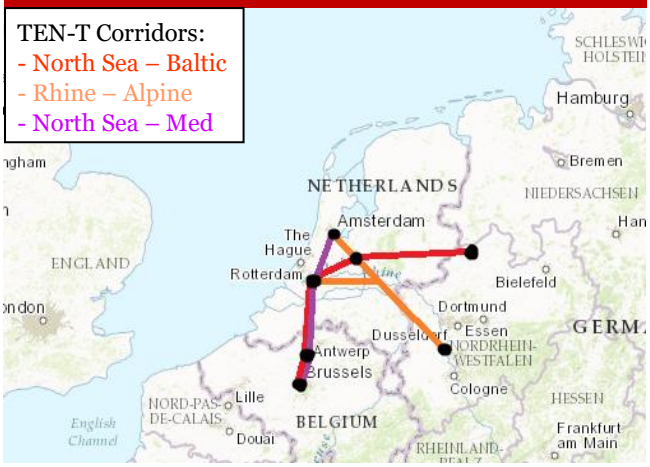
As one of the **most developed rail networks** in the EU, future interventions in the Netherlands focus on investments in projects related to the **deployment of signalling and electrification systems**.

Difference between estimated and final cost. While high unit investment cost and significant difference between estimated and final cost were encountered in the **first investments** carried out in the country related to the deployment of **ERTMS** due to the novelty of the technology, in most recent projects the **advanced planning system** enables to develop accurate estimates.

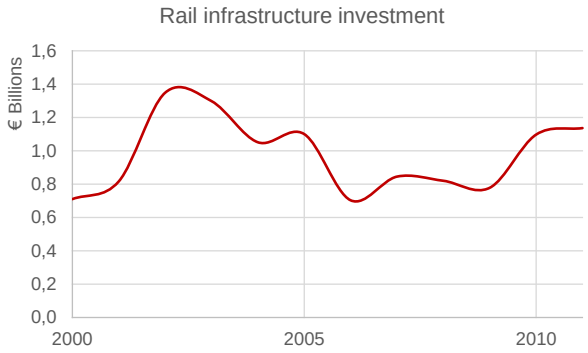
Summary Indicators

Country Network Length	**3,016 km**
- Of which HSR	120 km
- Of which electrified	2,107 km
- Of which double track or more	n/a
- Of which TEN-T	1,122 km
Investment in rail infastructure over the 2000 – 2015 period	**11.7 B€**
% of mountain	0%
Population density (ppl/km²)	502.9

Country Map



Investments in rail infrastructure



The trend of rail investments in the Netherlands alternates increases and slightly decreases, never falling below 0.6 B€/year.
Over the period from 2014 to 2030 the Dutch Ministry of Transport plans to invest 800 M€ per year on railway infrastructure (excluding maintenance). The investments focus mainly on upgrading of existing lines according to the new signalling standards of the EU.

Key Findings

Overview

The Netherlands stands out for the **high quality** of its infrastructure system (e.g. its port infrastructure is considered the best at global level), including the rail infrastructure. Over the period 2000 – 2015, no major projects concerning the development of the rail infrastructure have been co-funded by ESIFs. EU funds invested in this field were received from the TEN-T and the CEF programmes and were invested in projects related to the **deployment of signalling and/or electrification system**. These interventions will also one of the priority of the future investments.

Difference between estimated and final cost

The Netherlands has been investing in the deployment of **ERTMS** since 2007. When the first investment projects were implemented, the **planning process**, which is based on the cost of previous projects, did not enable to estimate accurately the cost related the deployment of this **new system**. The estimated unit cost was significantly higher than the EU average, while the final cost was in line with the average unit cost for similar project.

In the following years, the Netherlands has acquired expertise in the field of ERTMS and its **planning process** can **reliably estimate** cost for this kind of investments.

Poland

Summary Description

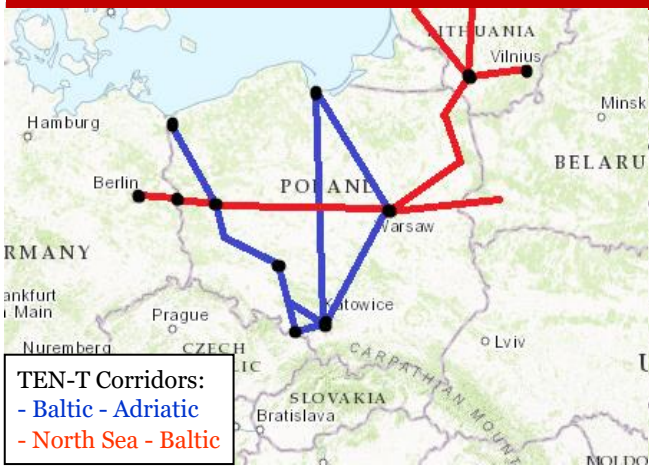
Poland has one of the largest railway infrastructure in Europe, which, however, is characterised by a low quality level. Polish future investments are mainly focused on upgrading and rehabilitation works, aimed to improve passenger travel and reduce travel time, by completing the TEN-T network and upgrading the standards to be compliant with the EU TSI.
Difference between estimated and final cost. Factors impacting on the shifting from estimated to final cost include:

- **Limited skills** and **weak domestic supply chains** often lead to more **expensive imported elements** for the infrastructure.
- A **strong focus on price only** criteria leads to frequent **price competition among bidders that often result in cost savings**.

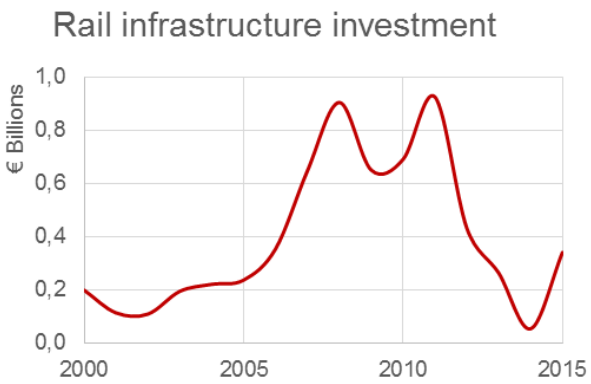
Summary Indicators

Country Network Length	**18,429 km**
- Of which HSR	224 km
- Of which electrified	11,786
- Of which doubel track	8,618
- Of which TEN-T	3,654 km
Investment in rail infastructure over the 2000 – 2015 period	**6.3 B€**
% of mountain	5.2%
Population density (ppl/km²)	124.1

Country Map



Investments in rail infrastructure



Over the past years, the infrastructure spending in Poland has had two peaks in 2009 and 2011 and a significant drop in 2014.
Future investments in the Polish infrastructure systems will be mainly focused on upgrading and rehabilitation works, aimed to improve passenger travel and reduce travel time, by completing the TEN-T network and upgrading the standards to be TSI compliant.
For the period from 2014 to 2020, 16 B€ of funding have been approved. While, for the 2020 – 2030 period further funding needs of 42 B€ are identified, but no funding has been agreed on yet.

Key Findings

Overview

Poland has the **third railway infrastructure in Europe** in terms of total length, which, however, is characterised by a **low quality level**. The investments carried out from 2000 to 2015 contributed to **the modernization and rationalisation** of the infrastructure.

Difference between estimated and final cost

Over the last years, an increasing amount of funds has been allocated to the rail sector, leading the development of the market, which now represent an **attractive opportunities** for construction companies. As a result, the market is overall **open to competition**, except for projects related to the **deployment of ERTMS**. For these projects, the unit cost encountered in Poland result indeed slightly higher than the EU average.

Different factors impact on the shifting from estimated to final cost. Difficulties may be encountered in the **planning process**, specifically as regards the exact definition of the scope of the project, which lead to potential **cost overruns**.

However, until recently, these were avoided due to the **awarding criteria** used in the procurement process. Until 2014, **83% of the public procedures** were awarded based on the **lowest-price criteria**. The situation has substantially changed in the last years after the implementation of the **EU Directive 2014/24 on public procurement**. In 2016, only 16% of the contracts were awarded considering exclusively the financial offer.

Portugal

Summary Description

Portugal railway system includes mainly sections with **Iberian gauge**, since it needed to be interoperable with the Spanish one.

The main future infrastructure investments in Portugal are focused on **electrification** of the existing infrastructure as well as on the deployment of the **signalling system**.

Difference between estimated and final cost. Difference between estimated and final cost may occur due to the limited competition on the market, which did not increase after the financial crisis as many construction companies went bankruptcy, and the slow **procurement process.**

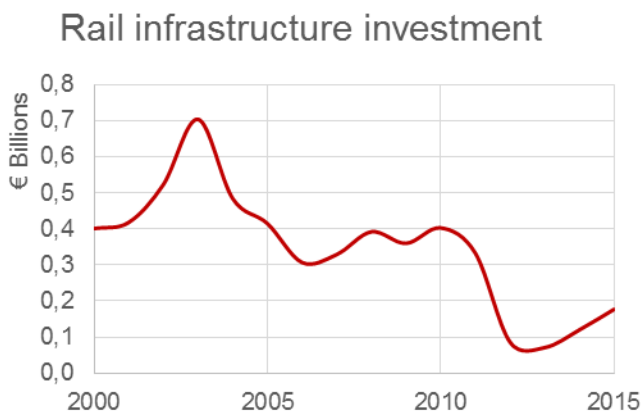
Nonetheless, Portugal is the country with the highest number of projects funded over the 2000-2015 period presenting final cost in line with estimated cost.

Summary Indicators

Country Network Length	**2,533 km**
- Of which HSR	0 km
- Of which electrified	1,657 km
- Of which double track or more	611 km
- Of which TEN-T:	1,607 km
Investment in rail infastructure over the 2000 – 2015 period	**5.5 B€**
% of mountain	39.1%
Population density (ppl/km²)	112.3

Country Map

Investments in rail infrastructure



In 2003 Portugal experienced a new high of its railway infrastructure investment level, which has since then been strongly decreasing to a minimum in 2012. In the current programming period, the investments have been starting to grow again.

For the 2014-2020 period, investments in the railway infrastructure will amount to approximately 2.8 B €. Priority will be given to electrification of the existing infrastructure as well as the deployment of the signalling system. Additionally, interventions to modernise and upgrade the infrastructure will be undertaken.

Key Findings

Overview

The development of the railway infrastructure in Portugal is related to the geographical positioning of the country. Spain is the only bordering country and interoperability has been sought with its railway system. As a result, the majority of the railway lines has **Iberian gauge**.

The EU funds supported the **modernization** of the railway system, which quality is now in line with EU average.

Difference between estimated and final cost

The cost of rail investment in the country was affected by different factors. Particularly the **construction market dynamics** have a large correlation with the costs. In the market is relatively **little competition**, which often drives up the cost of projects. Additionally, due to the rather small construction industry compared to bigger countries, many **materials** need to be **imported** through complicated supply chains, as the country is located far from production centres. Differently from other countries, these dynamics did not change after 2008, as the economic crisis resulted in the **bankruptcy of many construction and design companies**.

Another cost factor is represented by the decentralised procurement system, which leaded to relatively **slow** and difficult to control **procurement procedures**, reducing the time planned for construction, and thus increasing the prices.

Furthermore, because of the **financial crisis** a widespread phenomenon was that **construction and design companies** involved in the planning and tendering process declared **insolvency** during the procurement phase, thus further increasing the length of the process. Nonetheless, recent improvements have been made to the procurement system, which **reduced the length of the decision process** (i.e. from 94 days in 2014 to 87 days in 2016). Additionally, measured for the period from 2000 until 2016 Portugal was the Member State with the most accurate cost estimates, considering the proximity of final costs to the estimated cost.

Romania

Summary Description

The Romanian railway system is characterised by a low quality level and a state of disrepair and only 5% of Romania's TEN-T network has been completed. Thus, the priority of the investments in the next years will be on the **modernisation** and **completion of TEN-T corridors**.

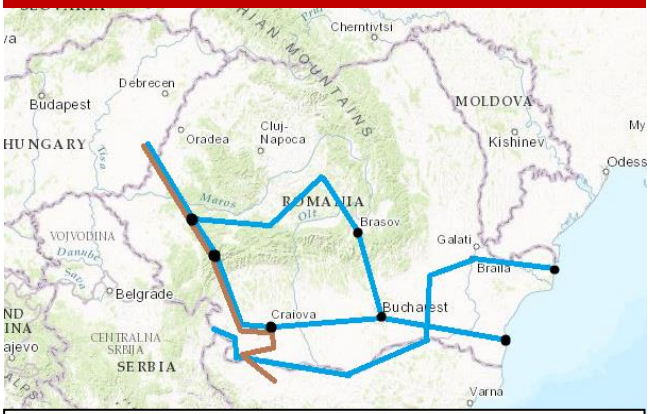
Impact of external factors. In the years after the accession in the EU, the cost of the infrastructure increased due to the necessity to comply with EU standards. To fulfil these higher requirements, **material and skilled labour often need to be costly imported.**

Difference between investment and final cost. Different factors related to the **procurement process** impact on the shifting from estimated to final cost. **Public procurement is very complex** and the length of the procedures is impacted by the high number of **contestations** received.

Summary Indicators

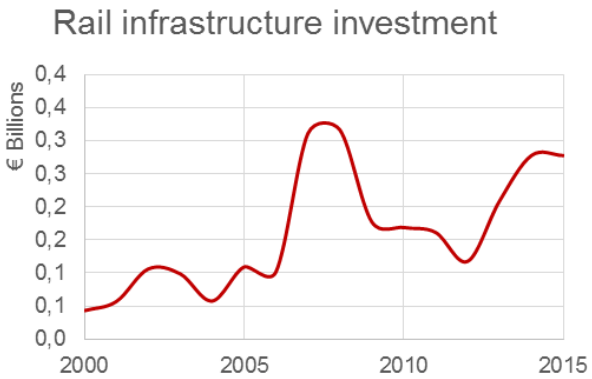
Country Network Length	**10,766 km**
- Of which HSR	0 km
- Of which electrified	4,030
- Of which double track or more	2,917 km
- Of which TEN-T:	2,237 km
Investment in rail infastructure over the 2000 – 2015 period	**2.6 B€**
% of mountain	37.9%
Population density (ppl/km²)	86.1

Country Map



TEN-T Corridors: - Orient/East – Med - Rhine - Danube

Investments in rail infrastructure



Romania has strongly increased spending after 2006, which however was slowed down after 2008 through the crisis until 2012. After that, investments in the rail infrastructure started increasing again.

The National General Transport Master Plan foresees investments equalling 14.4 B€ over the 2014 – 2030 period. Funds will be destined for maintenance and rehabilitation of the main railway lines. No new major infrastructure projects are included.

Key Findings

Overview

The Romanian railway system, comprising over 10,000 kilometres of railway lines, is in an advanced state of **disrepair** due to the lack of maintenance. As a consequence, Romania results to be the EU country with the lowest quality railway infrastructure and only 5% of the TEN-T network in the country has been completed. Thus, the priority of the investments in the next years will be on the **modernisation** and **development** of the TEN-T network.

Impact of external factors

Since Romania joined the EU, priority has been given to rehabilitation and modernization interventions to EU standards, as well. The accession to the EU and the necessity to comply with **interoperability standards** impacts on the cost of railways investments carried out before 2008. In particular, for example **technical specifications** regarding the seismic concrete class used during construction increase the material cost. Additionally, in order to fulfil the high requirements for the inter-European interoperability materials and services needed to be costly sourced from non-domestic sources. Nonetheless, the impact of this factor has decreased over years.

Difference between estimated and final cost

As regards the difference between estimated and final costs, **cost overruns** are not frequent as 96% of the public procedures are awarded based on the **lowest price criteria**. Nonetheless, the cost of procurement is impacted by the **length of the process**, which, in turn, is affected by the **high number of contestations** received, which slow down the process.

Overall, the necessity to **increase** the **administrative capacity** of the **implementing body** and, subsequently, improve the procurement process has been included among the ex-ante conditionalities for the 2014- 2020 programming period.

Slovakia

Summary Description

The quality level of the Slovakian rail infrastructure is overall in line with EU average, while the passenger service lags behind compared to more developed countries. Thus, the **improvement of the passenger service** will represent the focus of the investments foreseen in the next years.

Difference between estimated and final cost. A significant difference between estimated and final cost is encountered due to a number of different factors including:

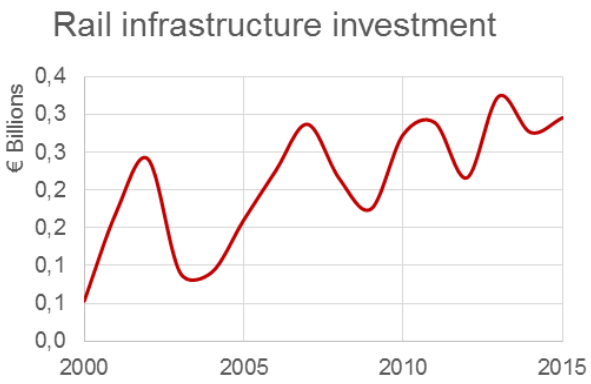
- Complicated procedures for **land acquisition** that **significantly increase the cost**;
- **Length** of the **procurement process** and **few potential bidders** negatively impact on the tendered cost;
- **Low competition** and **low level of available skills** resulting in expensive services from abroad need to be **imported**.

Summary Indicators

Country Network Length	**3,626 km**
- Of which HSR	0 km
- Of which electrified	1,587 km
- Of which double track or more	1,017 km
- Of which TEN-T:	845 km
Investment in rail infastructure over the 2000 – 2015 period	**3.4 B€**
% of mountain	62%
Population density (ppl/km²)	110.6

Country Map

Investments in rail infrastructure



Slovakia has a very strong cyclical rail spending behaviour, which however is constantly increasing since the early 2000s.

The future investments between 2020 and 2030 target passenger trains and the improvement of the passenger service.

To this aim, it is planned primarily to upgrade existing lines and passenger trains.

The exact investment value is not yet planned by the Ministry of Transport.

Key Findings

Overview

The Slovakian railway infrastructure has been developed over last 160 years and currently includes over 3,600 kilometres of railways lines. The quality of the infrastructure is overall in line with the EU average; nonetheless, this does not apply to all categories of services. Specifically, regarding the technical development, the passenger service lags behind compared to more developed countries. Thus, the **improvement of the passenger service** will represent the focus of the investments foreseen in the next years.

The support provided by the EU funds since Slovakia joined the EU has been focused on the **modernisation** and **improvement** of the existing railway lines as well.

Difference between estimated and final cost

The analysis of the difference between estimated and final cost of EU co-funded projects highlighted a **significant difference** among them. A number of factors contribute to this result.

Firstly, a relevant role is attributed to the **construction market competition**, characterised by a **low number of players** competing in a relatively small market. Contributing to this issue are **complex processes** to enter a rail project into the tender due to the specific regulations.

Oppositely, the **planning process** of rail infrastructure projects leads to **cost overestimation**, as estimate is based on the average costs of previous projects carried out in the previous five years.

Additionally, the procurement process is believed to have a significant impact on the cost of railways infrastructure. On the one hand, projects are usually awarded based on the **lowest price criteria** (used in 85% of the procedures) leading to cost decrease. On the other hand, the significant **length of the process** (on average 163 days) results in final costs higher than estimated ones as well as the low number of participants in the tenders. Additionally, the country's workforce is **missing skilled labour** to carry out the projects, wherefore materials and services often need to be costly imported.

Slovenia

Summary Description

In Slovenia, the majority of ongoing and planned investments in the rail sector focus on the enhancement of the railways lines and deployment of ERTMS.

Difference between estimated and final cost. The impact of factors affecting the final cost of rail infrastructure investments changed with the financial crisis.

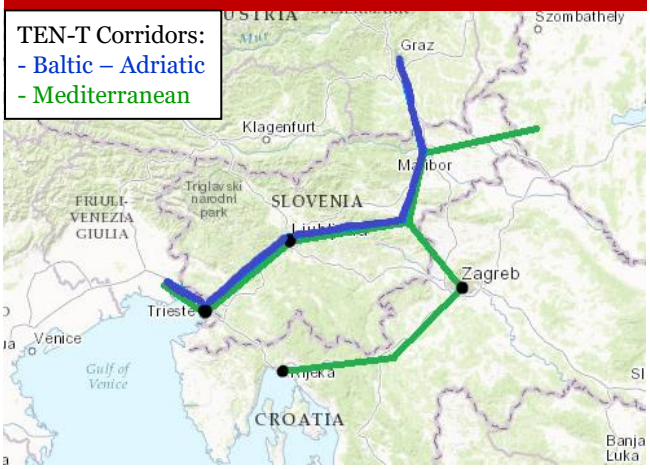
While, **before the crisis, low construction competition** has led to frequent **cost overruns,** while **after the crisis the opposite was the case**.

Similarly, the **procurement process**, which historically led to cost overruns, after the crisis and recent and ongoing improvements foster **cost savings**.

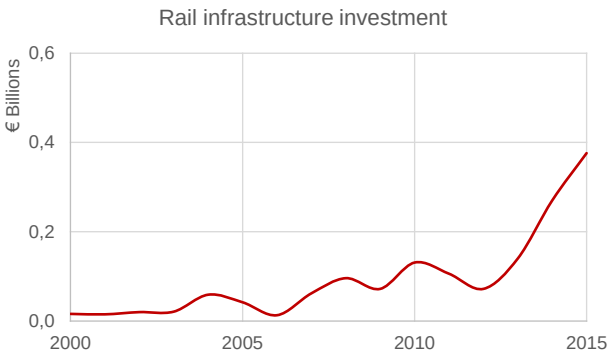
Summary Indicators

Country Network Length	**1,209 km**
- Of which HSR	0 km
- Of which electrified	500 km
- Of which double track or more	330 km
- Of which TEN-T:	888 km
Investment in rail infastructure over the 2000 – 2015 period	**1.5 B€**
% of mountain	78%
Population density (ppl/km²)	102.4

Country Map



Investments in rail infrastructure



Slovenia has a very low spending on rail infrastructure. Nonetheless, since 2012 the spending has been strongly increasing year over year to around four times the 2012 level in 2015.

In the periods from 2017 to 2020 and from 2020 to 2030, the planned investments of the country are 1.3 B€ and 2.3 B€ respectively. Those focus mainly on the upgrading and electrification of regional lines and the installation of ERTMS level 2 on main lines. Additionally they include the construction of a second track on the Ljubljana-Seserice line and the Divaca – Koper line and upgrading of the rail section Ljublique – Divaca.

Key Findings

Overview

Compared to those of the other EU countries, the Slovenia railway system is less developed in terms of total length and quality. While the former is connected to the limited geographical extension of the country, the latter is related to the necessity of **modernising** the existing network.

Coherently, the majority of the investments in the rail sector regard **enhancement of the railways lines** and **deployment** of **ERTMS**.

Difference between estimated and final cost

As for the deployment of **ERTMS**, the unit cost results to be line with the EU average if more recent projects are considered (i.e. implemented after 2005). Whereas the unit cost of **older projects** is significantly higher than the EU average (i.e. approximately 1.3 M€/km), probably due to **technological issues** and the **limited technical capacity**, which need to be more costly sourced either domestically or even imported from abroad.

Another factor affecting rail infrastructure cost before 2008 was the **construction market competition**, which increased prices as **few companies** participated to the tenders and low interest of the domestic and international market was caused by the predominant procurement of small projects. Nonetheless, these effects **reversed** after the financial crisis, which led to **more competition** due to a generally smaller market and fewer procured projects. The differences between estimated and final cost was influenced by these dynamics as well. Additionally, it is affected by the **procurement process**, which is historically predominantly driven by **price only criteria**. The ratio between price only criteria and MEAT criteria of 78%-to-22% is far above the EU average and has led to many **cost overruns before the crisis**, while after the crisis an **ongoing improvement of the procurement system** has led predominantly to **cost savings** when final prices are compared to initial estimates.

Spain

Summary Description

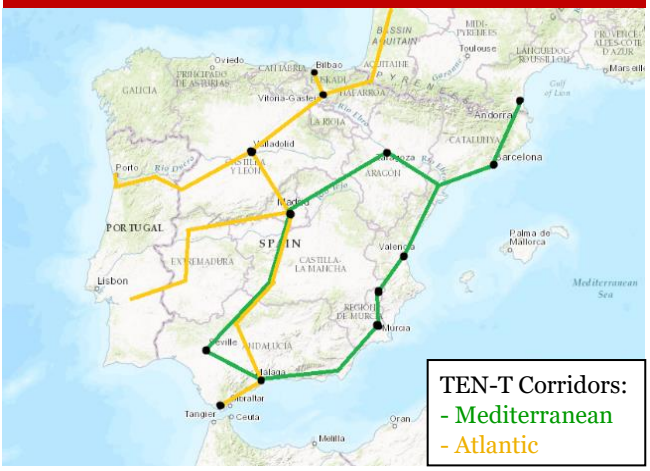
Despite being the country with Europe's largest high-speed rail expansion, Spain is only at 35% of completion of the planned TEN-T high-speed rail core network. Thus, the **development of the high-speed network** is the focus of future rail investments.

Difference between estimated and final cost. To avoid cost overruns and improve the cost-efficiency of rail investments, the Spanish government published a **regulation** to set out **planning requirements to define the cost** of railway infrastructure projects. Specifically, the document introduced specific requirements to foster the use of **planning best practices** and **prevent cost overruns.**

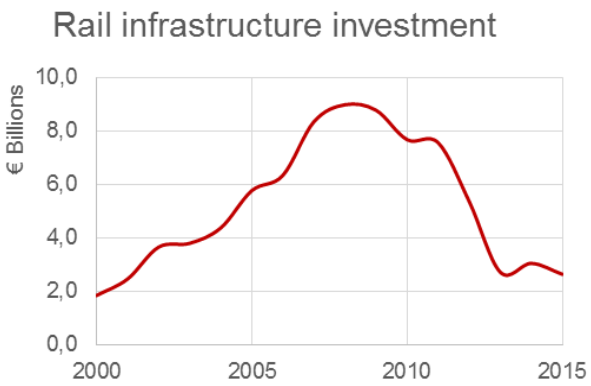
Summary Indicators

Country Network Length	**15,875 km**
- Of which HSR	2,871 km
- Of which electrified	10,138 km
- Of which double track or more	5,958 km
- Of which TEN-T	7,519 km
Investment in rail infastructure over the 2000 – 2015 period	**83.3 B€**
% of mountain	55.7%
Population density (ppl/km²)	92.5

Country Map



Investments in rail infrastructure



Over the 2000-2010 period, Spain has been constructing Europe's largest high-speed rail network, which is reflected in large spending amounts until 2011. After the completion of the major sections of this network, the spending dropped to levels nearly as low as before 2000. The Spanish government is planning to expand further the high-speed rail network in the coming period. A particular objective is to increase the availability of high-speed service so that 90% of Spanish citizens are within a 30-kilometre radius of high-speed access. Specific projects are the completion of the line Seville to Malaga. Within the period 2017-2020 the Spanish infrastructure manager plans to spend 1.16 B€ on improvement works.

Key Findings

Overview

Spain has the **largest high-speed rail infrastructure** among all Member States. Furthermore, Spain has the railway infrastructure with the fourth highest quality of all Member States, as well as the fourth highest degree of completion of the TEN-T conventional rail core network. Despite the large high-speed rail expansion, the country is only at 35% of completion of the planned TEN-T high-speed rail core network, which means that the future rail investments are strongly focused on **high-speed**.

The EU funding played a relevant role in the development of the Spanish high-speed railway network, supporting i.e. the deployment of the Madrid-Levante, Madrid-Barcelona- French border, Atlantic axis, Madrid- Valladolid high-speed railway lines. The average unit cost for the deployment of the **base infrastructure** of **high-speed railway** in Spain results is **in line with the EU average**, being comprised between 7 and 11 M€/km, with higher cost referring to older projects (started before 2000).

Difference between estimated and final cost

After several cost overruns and considering the difficult economic situation, the Spanish government introduced specific **infrastructure construction** and **design rules** in 2010, in order to increase the **cost efficiency** of the investments in the rail sector. The interventions follow the strategy of **construction in phases**, whereby it allows for a sequential increase of the capacity because of traffic evolution (progressive rail installations). This means, for example, that where possible a single track should be completed and operated before the second track will be constructed in order to start generating revenues from the investments earlier and thus cut costs.

Additionally, **planning requirements** have been introduced which set out that the distances between infrastructure elements and the elements as their amount need to be set during the planning process, after which they cannot be changed unless they go through a rigorous approval process. This measure aims to **increase planning best practices** to prevent **cost overruns**. Furthermore, projects are obliged to follow the course of the **cheapest structures**, meaning that if for example two bridges or a longer line can prevent the need to build a more costly tunnel the **cheapest** and **most economically feasible option** shall be taken, as long as it is in line with environmental impact statement.

Sweden

Summary Description

Sweden has an extensive railway network, characterised by an average quality level.

Future investments are mainly targeting the deployment of ERTMS on the main lines and the initial development of a high-speed rail network.

Difference between estimated and final cost. Different factors contribute to final cost higher than estimated on, including:

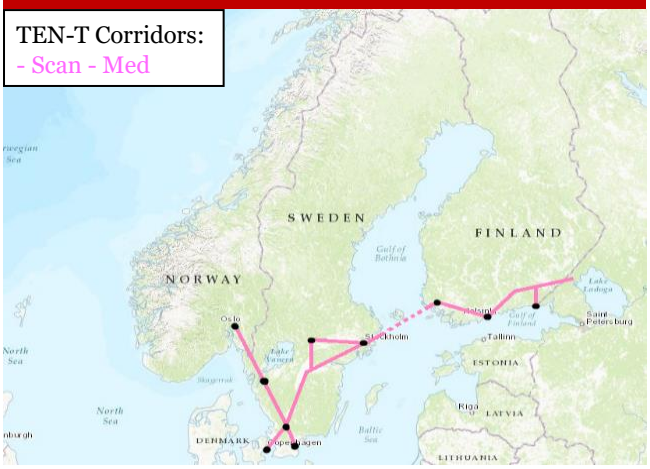
- Construction dynamics and **bargaining power of suppliers strongly increase costs**;
- **Limited skills domestically available**.

Nonetheless, the majority of public procedures are awarded on the lowest-price criteria. As a result, limited cost overruns actually occur.

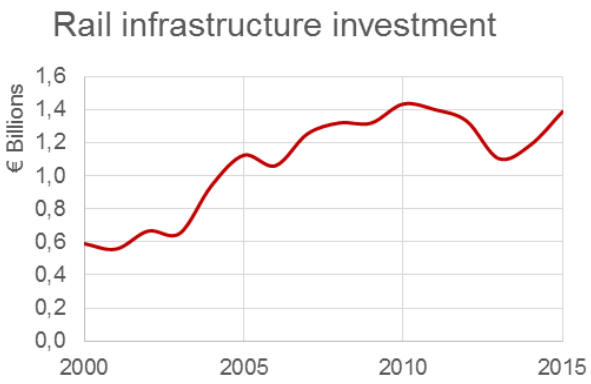
Summary Indicators

Country Network Length	**9,684 km**
- Of which HSR	0 km
- Of which electrified	8,077 km
- Of which double track or more	1,955 km
- Of which TEN-T	1,423 km
Investment in rail infastructure over the 2000 – 2015 period	**17.3 B€**
% of mountain	50.6%
Population density (ppl/km²)	24.1

Country Map



Investments in rail infrastructure



The Swedish rail infrastructure spending is characterised by a strong upwards trend since 2003 onwards. Nonetheless, spending levels are relatively low compared to other countries with similar income levels and network lengths.

The 2015 – 2024 national transport plan foresees investments for ca. 52 B€ destined to all transport modes. Approximately 17% of them will be invested in rail infrastructure operation, maintenance, and reinvestments. The main initiatives foreseen include interventions for the deployment of ERTMS, interventions on the Gothenburg-Borås route and on the Eastern Link.

Key Findings

Overview

With nearly 10,000 km of railway lines, Sweden is among the EU countries with the ten largest railway infrastructures. Nonetheless, the majority of the system consists of **single-track railway** line and it characterised by an **average quality level**. Sweden has not started deploying high-speed railway lines. The planning phase for this new infrastructure is currently ongoing and the railway lines are expected to be completed by 2035.

Difference between estimated and final cost

Different factors impact on the final cost of rail infrastructure investments.

Firstly, the railway infrastructure cost is strongly driven by **market factors**. Construction market dynamics are characterised by **few large players** able to carry out the respective works and therefore having large bargaining power.

Additionally, **limited skills** to carry out the specific works lead to higher costs.

As regards the **awarding criteria**, 53% of public contracts are awarded based on the lowest price criteria. The combination of all of these factors is deemed the cause for **final costs** being **higher** than originally estimated in the tender documents. Nonetheless, a limited number of cost overruns are encountered and recent and ongoing innovation initiatives are supposed to benefit **optimised procedures** and **lower costs** in the future.

United Kingdom

Summary Description

The UK conventional railway system has been developed since the XVI century. Future investments are aimed to develop high-speed rail, specifically by the construction of the second **high-speed line** of the country.

Difference between estimated and final cost. In the case of complex infrastructure projects, **final cost** is **higher** than estimated due to the use of **target cost,** which incentives bidders to raise the price during the procuring phase. On the other hand, **tender values** are believed to be **underestimated.**

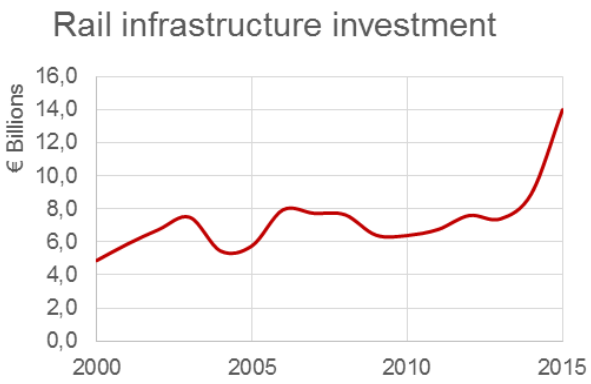
Since 2013, the infrastructure manager launched a specific initiative aimed to **avoid cost overruns** and improve the awarding mechanism.

Summary Indicators

Country Network Length	**16,241 km**
- Of which HSR	113 km
- Of which electrified	5,440 km
- Of which double track or more	12,085 km
- Of which TEN-T	1,951 km
Investment in rail infastructure over the 2000 – 2015 period	**117.0 B€**
% of mountain	25.5%
Population density (ppl/km²)	268.6

Country Map

Investments in rail infrastructure



In recent years, the United Kingdom has undertaken the strongest railway infrastructure investments in all of Europe. This can particularly be attributed to the construction of the country's first high-speed railway lines. As the construction of H2 is still ongoing, the spending is currently still rising.

The funds made available in the 2019 – 2024 period are focussed on the operations, maintenance and renewal of the existing railway infrastructure. Over this period, 47.9 B£ (ca. 55 B€) are expected to be spent, of which 34.7 B£ provided via grant.

Key Findings

Overview

The United Kingdom is the Member State with the most complete national network of conventional railway infrastructure, which was developed through the long industrial history. Currently, the country is **upgrading the quality** of the infrastructure, which is in contrast to the size of the network relatively low compared to the standards of the most advanced railway Member States, such as Spain, France, or Germany.

Particularly also the **development of high-speed rail** is a significant strategic objective which is currently pursued by the construction of the second high-speed line of the country between London and Birmingham.

Difference between estimated and final cost

Cost reimbursement for complex rail infrastructure projects in the UK is often connected to a **target cost**. Thus, bidders and contractors share potential benefit of the cost saving and contribute to possible cost overruns. As a result, bidders try to **increase the target cost** during the **procurement process**. On the other hand, the price of the tender is often believed to be too low. This scheme is not applied in the case of smaller projects, which are usually lump sum, as contracts based on target cost require more effort as regards contract management.

Since 2013, Network Rail has launched a specific initiative aiming to reduce cost overruns and change awarding criteria, placing greater importance in selecting experienced and skilled contractors.