POLICY PAPER

Connecting Europe with a Rail Renaissance

Eight measures to revive the European rail system

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Brief summary

Rail is already one of the cleanest transport modes. A renaissance of a truly European rail network could not only make a major contribution to achieving the European Union's climate targets but could also make Europeans feel and live European integration in daily life. Yet, decades of political focus on road and air travel as well as nationalist thinking have led to a patchwork of national rail systems, which are sometimes in very poor shape. Cross-border rail transport is the sore spot of the European transport system.

In order to turn rail into the backbone of Europe's future transport system, the EU should create a dense network of rail services across Europe, revise transport taxes and infrastructure charges to create the right price signals, and make rail travel more convenient for passengers. This would improve domestic and international rail services and incentivise a modal shift away from road and air travel. A revival of long-distance international day and night trains could become a flagship project of the EU, and become a symbol of a renaissance of rail.

This policy paper presents eight measures to start off the European rail renaissance:

- #1: Start a European investment initiative for strengthening rail infrastructure and closing missing links
- #2: Make more efficient use of existing infrastructure
- #3: Support the launch of international services
- #4: Improve coordination and planning of international services
- #5: Make transport taxes fair
- #6: Make infrastructure charges fair
- #7: Allow for one-stop booking platforms
- #8: Guarantee passenger rights along the entire travel chain

Imprint

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Executive summary

Rail is already one of the cleanest transport modes. A renaissance of a truly European rail network could not only make a major contribution to achieving the European Union's climate targets but could also make Europeans feel and live European integration in daily life. **The European Year of Rail 2021 is an important political opportunity to start off a 'rail renaissance'.** The time is ripe as Europeans increasingly turn to rail as a climate-friendly mode of travel, 24 European Union (EU) member states have declared they will strengthen international rail, and the European Commission is pursuing its European Green Deal.

Earlier, in its 2011 White Paper, the European Commission envisaged that by 2050 half of (medium-distance) passenger transport should via rail – but the EU is still very far from this target. Decades of political focus on road and air travel as well as nationalist thinking have led to a patchwork of national rail systems, which are sometimes in very poor shape. Cross-border rail transport is the sore spot of the European transport system.

The **main obstacles** currently facing international passenger rail transport are:

INFRASTRUCTURE: Total rail network length has decreased by around 20% since 1960, when it was at its height. Only half of track kilometres are electrified, and many have been poorly maintained. In 2018, the European Commission found that **out of 365 cross-border rail links that had once existed, 149 (41%) were non-operational**, and only few high-speed links exist, connecting only Germany, Netherlands, Belgium, France and Spain. The main reason is that insufficient funding, both from EU and its member states, is made available for rail. There has been a particular lack of interest in building or restoring cross-border links. Additionally, **existing infrastructure is not efficiently used** because infrastructure managers do not coordinate well across borders.

SERVICES: Even where infrastructure is in place, train services may still not be good enough, for example: poor-quality infrastructure may mean that trains operate only at low speed; services may not be frequent enough; or several changes of trains with poorly managed connections may mean that overall journey time is very long. **Even European capitals are not well connected.** For example, from Berlin there are currently no direct connections to Brussels, Paris or Copenhagen, and **most night trains have been discontinued.** A European Commission report found that **of 202 operational cross-border rail links, only 57 were fully exploited** in 2017. The main reasons are: it is often difficult to make the business case for cross-border rail services, and there is a lack of interest on the part of incumbent rail operators, infrastructure managers and governments.

PRICE: Rail currently has a competitive disadvantage against road and air transport because **EU member states do not apply taxes consistently across transport modes.** Aviation and road transport are exempt from various taxes, creating unfair starting conditions for rail and giving the wrong price signals to consumers. For example, airlines do not pay any taxes on kerosene, receive 85% of EU Emissions Trading System (ETS) allowances free of charge, and pay no Value Added Tax (VAT) on intra-EU flights. Rail pays infrastructure access charges on each track kilometre but member states charge only on roughly 3% of the road network for infrastructure use.

CONVENIENCE: In contrast to the aviation sector, the rail sector has not managed to make international travel easy and convenient for passengers. There is currently **no publicly accessible platform that shows all existing train connections in Europe,** nor is it possible to **compare prices and book international rail tickets at 'one stop shops' online.** This is because rail operators are not obliged to share all relevant data. To make it even more complicated, on international rail journeys

with multiple legs, **passengers bear the risk if a train connection is missed**. EU rail passenger rights currently do not guarantee that passengers enjoy rights for the entire travel chain, if multiple operators are involved.

In order to turn rail into the backbone of the future European mobility system, the EU and its member states should aim to:

Create a dense network of day and night rail services across Europe: Develop and better manage infrastructure and a coordinated, clock-wise timetable across Europe ('Europatakt') for fast frequent services between cities with more than 250,000 inhabitants, with connections to regional services. Day trains can easily cover distances of up to 1,000km, and night services up to 2,000km – depending on whether high-speed or regular infrastructure is available. Night trains must be an essential element of Europe's future mobility because they offer an alternative to many intra-EU flights and can cover larger distances than day trains.

Get the price right: Rail (and local public transport) as the most sustainable choice needs to be consistently cheaper than flying or driving.

Make rail travel convenient for passengers: Connections need to be convenient and well managed and tickets easy to buy that cover the entire travel chain, preferably also including other modes for the first and last mile. Passengers should have access to all relevant information before and during the journey and should be should be assisted by rail companies when there are delays or cancellations.

The table below shows the eight measures that are key to achieving these goals and for starting the EU rail renaissance:

Goal	Measure	How?
Boost infrastructure capacity	#1: Start a European investment initiative for strengthening rail infrastructure and closing missing links	Use EU transport budget and recovery funding for closing cross-border links, and for short term capacity improvements
	#2: Make more efficient use of existing infrastructure	Entrust the European Railway Agency (ERA) with traffic control Roll out European signalling system on cross-border routes and core corridors Investigate further options to increase capacity in the short run
Create a truly European rail service	#3: Support the launch of international services (day and night)	Entrust ERA with demand forecast and corridor coordination Build EU rolling stock pool Provide start-up funding for new international lines
	#4: Improve coordination and planning of international services	Entrust ERA with capacity allocation on international corridors
Get the price right	#5: Make transport taxes fair	Introduce a kerosene tax Full auctioning of ETS allowances for aviation VAT on flight tickets
	#6: Make infrastructure charges fair	Reduce track access charges to direct costs only Comprehensive road infrastructure charges
Make rail travel convenient	#7: Allow for one-stop booking platforms	Oblige rail operators to share static and dynamic data
	#8: Guarantee passenger rights along the entire travel chain	Make through ticketing mandatory

Table 1: measures that are key to achieving these goals and for starting the EU rail renaissance

1 Introduction

1.1   The transport sector's contribution to the European Green Deal

The European Union (EU) aims to be climate-neutral by 2050. This means reducing greenhouse gas (GHG) emissions to net zero. The transport sector is a particularly hard nut to crack: in contrast to other sectors, GHG emissions in the transport sector are still on the rise (at least until the Covid-19 crisis hit the EU), totalling 1,097 $MtCO_2$ (million metric tonnes of carbon dioxide) in 2018.[1] The European Commission aims for a 90% reduction in transport GHG emissions by 2050 compared to 1990 levels, with remaining emissions being compensated through sinks and carbon removal technologies. Yet, to get in line with the 1.5°C limit, transport emissions might even need to be completely phased out well before 2050.

Europe's current transport system imposes very high costs on society. A study published by the European Commission in 2019 estimates that carbon pollution, air pollution, congestion, accident costs, resource use, and habitat loss together create €987 billion of external costs per year.[2] Only a marginal share of these costs are paid for by users, the rest is borne by society as a whole.

Efforts to make transport modes more efficient or to change the type of fuel for cars or planes will not be enough. Energy efficiency improvements are usually outweighed by growing transport volumes or, in the case of cars, by the growing size and weight of vehicles (rebound effects). With current policies, the European Commission projects that passenger transport will grow by 35% and freight transport by 53% (2015-2050).[3] Switching all private cars or airplanes to electricity, hydrogen or synthetic fuels will require enormous amounts of electricity that go far beyond current and projected production in Europe.

In short: today's policies will not bring the EU to the emissions reductions needed. The EU needs to urgently take a more transformative approach to the transport sector. The in-depth study accompanying the EU's long-term strategy *A Clean Planet for All* showed that for a 1.5°C compatible future, transport energy demand needs to drop by around 50%. This can be achieved only if overall transport demand is reduced, if the transport system becomes more efficient and if transport is shifted to cleaner modes.[4] The European Green Deal recognises the need to shift transport to rail and to increase rail capacity, and has announced a new Strategy on Smart and Sustainable Mobility. Yet, concrete measures need to be taken soon to accelerate the much-needed transformation.

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[1] European Environment Agency (2019). Greenhouse gas emissions from transport in Europe. https://www.eea.europa.eu/data-and-maps/indicators/transport-emissions-of-greenhouse-gases/transport-emissions-of-greenhouse-gases-12 (accessed 04 November 2020)

[2] Additionally, infrastructure costs amount to €267 billion a year. Total revenues from taxes and charges are only €385 billion. European Commission (2019). Handbook on the external costs of transport. Version 2019. https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf (accessed 04 November 2020)

[3] European Commission (2018). In-Depth Analysis in support of the Commission Communication COM(2018)773 A Clean Planet for All. https://ec.europa.eu/clima/sites/clima/files/docs/pages/com_2018_733_analysis_in_support_en_0.pdf (accessed 04 November 2020)

[4] Ibid.

1.2   A rail renaissance for a low-carbon future

Shifting transport to rail could be a game changer for reducing GHG emissions in the EU. Intra-European flights on distances less than 1,000km are estimated to cause 28 $MtCO_2$ every year ().[5] This is without counting the non-CO_2 climate impacts of aviation, which are two to four times higher than the mere CO_2 emissions. In theory, these distances could be covered by rail. Twelve of the 20 busiest European air routes cover distances less than 700km (see Annex).[6] Rail is already one of the most energy-efficient modes of transport, with high levels of electrification and therefore low CO_2 emissions compared to other transport modes.[7] Travelling by plane from Paris to Berlin causes at least six times the CO_2 emissions of a train journey.[8]
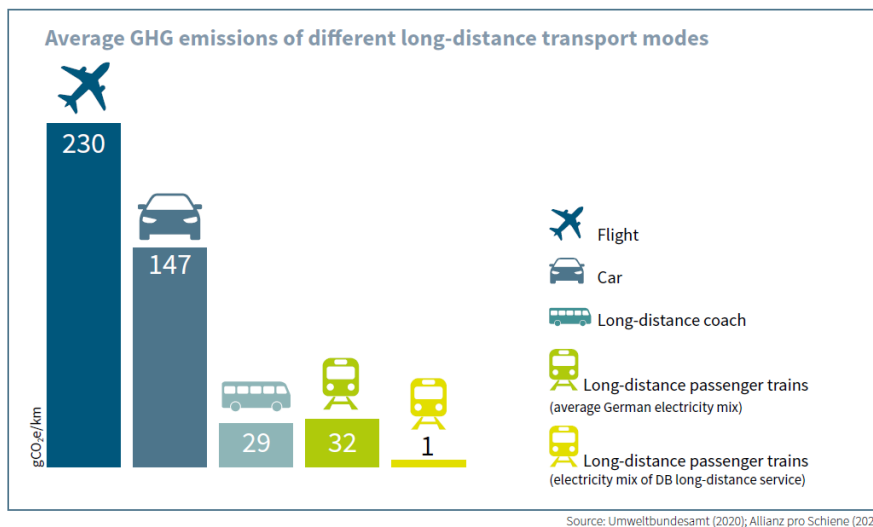

Figure 1: Average GHG emissions of different long-distance transport modes in Germany[9]

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[5] Total intra-EU flight emissions are 62 $MtCO_2$. Transport&Environment (2020). Air2Rail Reducing CO2 from intra-European aviation by a modal shift from air to rail.
https://www.transportenvironment.org/sites/te/files/publications/2020_03_Air2Rail_Koios_strategy_rev.pdf (accessed 04 November 2020)

[6] European Railway Agency (2020). Fostering the railway sector through the European Green Deal.
https://www.era.europa.eu/sites/default/files/events-news/docs/fostering_railway_sector_through_european_green_deal_en.pdf (accessed 04 November 2020)

[7] The average CO2 emissions per person-kilometre depend on the electricity mix of the respective Member State.

[8] Anna Deparnay-Grunenberg (2020). Mit dem Nachtzug durch Europa. https://anna.deparnay-grunenberg.eu/wp-content/uploads/2020/07/Flyer_Mit_dem_Nachtzug_quer_durch_Europa.pdf (accessed 04 November 2020) based on data from atmosfair, using an RFI factor of 2.

[9] Umweltbundesamt (2020). Vergleich der durchschnittlichen Emissionen verschiedener Verkehrsträger. https://www.umweltbundesamt.de/bild/vergleich-der-durchschnittlichen-emissionen-0; Allianz pro Schiene; Allianz pro Schiene (2020). Treibhausgasemissionen. https://www.allianz-pro-schiene.de/wp-content/uploads/2020/01/200108_treibhausgas-emissionen.pdf (accessed 04 November 2020). RFI factor of 2 for flights; comparing passenger-km (i.e. taking into account average occupancy rates of each mode) .

1.3   A rail renaissance for connecting Europe

Rail played an important role in nation building in the 19th century. The dense rail network built from the 1840s in many European countries was used for structuring and consolidating the territory. Seventy percent of the network that we use today in Europe had been built by 1900.[10]

The rail system was one of the first systems for which European rules were established – long before the foundation of the EU. As early as 1872, European governments and railway organisations gathered to discuss timetables for international trains.[11] In 1920, rail operators agreed on the basic characteristics of a rail ticket and on revenue sharing for cross-border stretches. Until the Second World War, night trains were the preferred mode of travel within Europe. In the 1970s, many European cities were still connected through direct day and night train services, and the Trans Europ Express network expanded from Spain to Austria, and from Denmark to southern Italy, before it was abandoned in 1995. Since the early 1990s, rail operators have increasingly focused on shorter point-to-point connections in their respective countries, with more frequent services. Yet, this came at the expense of coordination across borders with respect to timetables and profit/loss sharing.

Figure 2: Trans-Europ Express Network in 1974 winter[12]

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[10] Marti-Henneberg (2013). European integration and national models for railway networks (1840–2010). Journal of Transport Geography, Volume 26, January 2013, pp. 126-138.

[11] Forum Train Europe (2020). History. http://www.forumtraineurope.eu/fr/organisation/forum-train-europe/history/ (accessed 04 November 2020)

[12] Matsukaze, CC BY-SA 3.0 <http://creativecommons.org/licenses/by-sa/3.0/>, via Wikimedia Commons (accessed 04 November 2020)

Today, rail has lost this community-building role and also does not reflect the status of European integration: existing cross-border tracks are not used to full potential or, especially in poorer regions, are in a bad state of repair. A considerable number of cross-border rail links have even been dismantled. Railway systems have developed over decades independently from each other, and EU member states, infrastructure managers and rail operators persist in thinking only in national boundaries. As a result, travelling across several EU member states has become an adventure for passengers.

The European Railway Agency (ERA) found that between the 50 most populated urban areas at distances of less than 1,000km from each other 20 connections take longer than five hours – sometimes even up to 13 hours. Among these routes are Madrid-Lisbon, only 625km apart but requiring a rail journey of nine hours and 45 minutes (9h45), or Bucharest-Sofia, where the 350km distance requires a nine-hour journey. With better rail infrastructure, these travelling times could be reduced significantly. This shows a high potential for modal shift away from aviation, but also for bringing European metropolitan areas closer together.

Link	Time/distance	Estimated passengers/year 2019
Paris – Milan	7h20 / 850 km	1.75 million
Madrid-Lisbon	9h45 / 625 km	1.5 million
Copenhagen – Stockholm	5h15 / 650 km	1.5 million
Berlin – Vienna	8h30 / 680 km	1 million
Amsterdam – Berlin	6h05 / 650 km	850,000
Munich – Milan	7h10 / 500 km	510,000
Vienna – Milan	10h / 850 km	510,000
Amsterdam – Hamburg	5h15 / 460 km	455,000
Munich – Budapest	6h50 / 650 km	375,000
Warsaw – Budapest	10h / 850km	365,000
Berlin – Budapest	11h30 / 875 km	330,000
Hamburg– Stockholm	10h40 / 980 km	220,000
Sofia - Athens	11h50 / 795 km	220,000
Berlin – Warsaw	5h45 / 575 km	200,000
Milan – Budapest	13h / 970 km	200,000
Stuttgart – Milan	7h / 500 km	165,000
Budapest – Bucharest	14h40 / 840 km	125,000
Bucharest - Sofia	9h / 350 km	110,000
Marseille – Milan	7h15 / 520 km	No data

Table 2: City connections with high modal shift potential[13]

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[13] Source: Data from European Railway Agency (2020). Fostering the railway sector through the European Green Deal. https://www.era.europa.eu/sites/default/files/events-news/docs/fostering_railway_sector_through_european_green_deal_en.pdf (accessed 04 November 2020)

A renaissance of rail could not only make a major contribution to achieving the EU's climate targets but would have two major co-benefits. First, a truly European rail network could make Europeans feel and live European integration in daily life. Second, connecting the European periphery and less favoured regions would integrate people who currently feel abandoned by the EU.

1.4 The European Year of Rail 2021 is a window of opportunity

In its 2011 White Paper on Transport, the European Commission already envisaged that by 2050 more than 50% of road freight transport could shift to rail, and that most (medium-distance) passenger transport could be via rail.[14] The results of policy efforts of the last decade are, however, relatively modest: the share of rail in freight transport is still at only 18.7%[15] and for passenger transport remains at only 7.9%[16] (latest available data from 2018); the planned development of rail infrastructure is delayed, especially on cross-border sections; and rail operators still fail to cooperate across borders, making international travels very cumbersome for passengers. The main reason is that the EU and its member states have failed to follow-up on the 2011 White Paper with concrete policy measures that would speed-up construction and refurbishment of infrastructure, create a level playing field for rail compared to road and air, and oblige rail and infrastructure operators to cooperate across borders.

The EU has announced 2021 as the European Year of Rail. This is a key opportunity which comes at just the right moment. First, climate change has moved to the forefront of public debate. Two-thirds of Europeans would support a ban on short-haul flights and measures to reduce road traffic.[17] Second, the European Commission has indicated its intention to give more prominence to rail: the European Green Deal highlights the need for cleaner transport alternatives, and for a shift of road freight transport to rail. By late 2020 the Commission plans to publish a new sustainable mobility strategy. Third, 24 member states signed a declaration in June 2020 to support the development of international passenger rail transport.[18] Finally, the German EU Council Presidency has proposed a concept for a Trans Europ Express 2.0 and has announced plans to discuss a booking system for international rail journeys.[19]

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[14] European Commission (2011). White Paper Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system. https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52011DC0144&from=EN (accessed 04 November 2020)

[15] Eurostat (2020). Freight transport statistics - modal split. https://ec.europa.eu/eurostat/statistics-explained/index.php/Freight_transport_statistics_-_modal_split#Modal_split_in_the_EU (accessed 04 November 2020)

[16] Eurostat (2020). Modal split of passenger transport. https://ec.europa.eu/eurostat/databrowser/view/tran_hv_psmod/default/table?lang=en (accessed 04 November 2020)

[17] EIB (2020). The EIB Climate Survey 2019-2020. https://www.eib.org/attachments/thematic/the_eib_climate_survey_2019_2020_en.pdf (accessed 04 November 2020)

[18] Political statement for coalition of the willing on development international rail passenger transport. 04 June 2020. https://www.permanentrepresentations.nl/documents/publications/2020/06/04/political-statement-for-coalition-of-the-willing-development-international-rail-passenger-transport (accessed 04 November 2020)

[19] BMVI (2020). TEE2.0. International high-speed and overnight rail services to promote climate change mitigation. https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile (accessed 04 November 2020)

This is the right moment to initiate the much-needed policy changes to kick off a European rail renaissance.

2 Eight measures to start the rail renaissance

Rail can only become a backbone of Europe's future mobility if the EU creates a fast, reliable and convenient system with high capacities that leaves behind the purely national thinking – in other words, a rail system with a European spirit. The aim should be to:

Create a dense network of rail services across Europe: Develop infrastructure and a coordinated, clockwise timetable across Europe ('Europatakt') for fast, frequent services between cities with more than 250,000 inhabitants, with connections to regional services. Day trains can easily cover distances of up to 1,000km,[20] and one-night services up to 2,000km[21]– depending on whether high-speed or regular infrastructure is available.

Get the price right: Rail (and local public transport) as the most sustainable choice needs to be consistently cheaper than flying or driving.

Make rail travel convenient for passengers: Connections need to be convenient and well managed and tickets easy to buy that cover the entire travel chain, preferably also including other modes for the first and last mile. Passengers should have access to all relevant information before and during their journeys and should be assisted by rail companies when there are delays or cancellations.

The following eight measures are key for starting the EU rail renaissance.

2.1   BOOST INFRASTRUCTURE CAPACITY

Rail infrastructure is the foundation of a strong railway system, as it determines where, and how many, trains can operate and how fast they can travel. The capacity of the network is determined by the length of tracks (i.e. how many track kilometres are in place), the quality of tracks (single or multiple tracks, high speed or conventional, electrified or not), and how efficiently the infrastructure can be used, which is a question of technology and management.

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[20] European Court of Auditors (2018). A European high-speed rail network: not a reality but an ineffective patchwork. https://www.eca.europa.eu/Lists/ECADocuments/SR18_19/SR_HIGH_SPEED_RAIL_EN.pdf; European Railway Agency (2020). Fostering the railway sector through the European Green Deal. https://www.era.europa.eu/sites/default/files/events-news/docs/fostering_railway_sector_through_european_green_deal_en.pdf (accessed 04 November 2020)

[21] UIC (2013). UIC-Study Night Trains 2.0 - New opportunities by HSR? UIC-Study Night Trains 2.0 - New opportunities by HSR?

2.1.1   Measure #1: Start a European investment initiative for strengthening rail infrastructure and closing missing links

The **total length** of the railway network was 221,000km in 2016, of which only 8,400 of track kilometres were high-speed tracks (HSTs).[22] The total network length decreased by around 20% between 1960, when it was at its height, and 2016.[23]
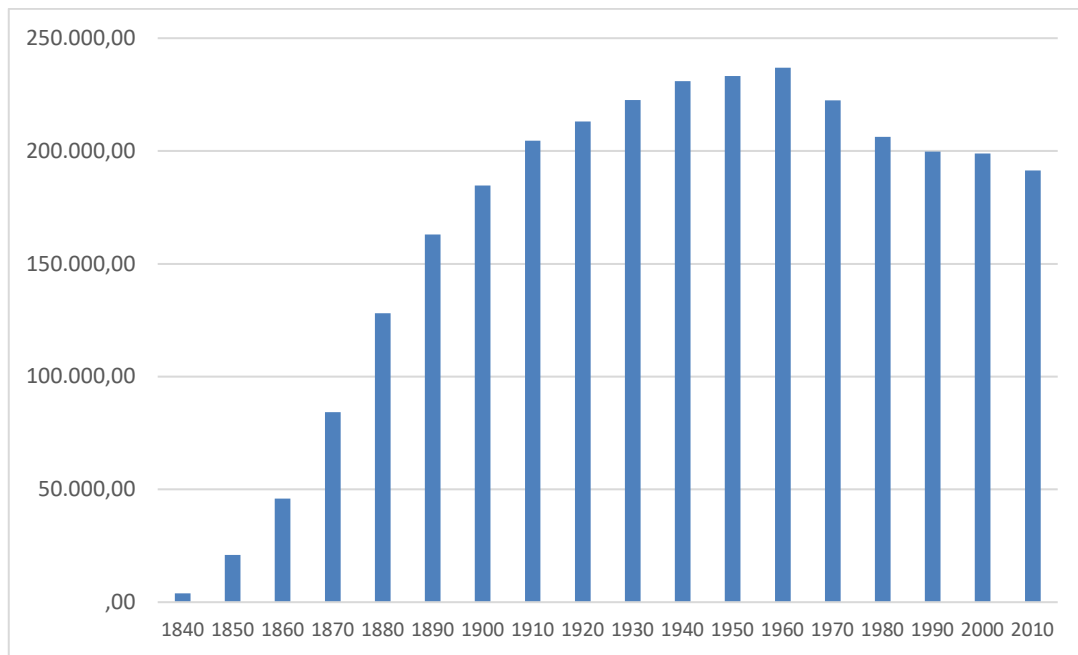

Figure 3: Total length of railway tracks in Europe (1840 to 2010)[24]

Between 2011 and 2016, the largest increases in track length were recorded in Lithuania, Germany and the Netherlands.[25] The largest losses of rail track kilometres (2011-2016) were in Greece, Portugal, France and Poland. France illustrates this latter development: Figure 4 shows operational railway lines in 1910-30, compared to 2008-2014.

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[22] Incl. Norway, see European Commission (2019). Staff Working Document accompanying the Sixth report on monitoring development of the rail market. https://ec.europa.eu/transport/sites/transport/files/6th_rmms_report.pdf (accessed 04 November 2020)

[23] Marti-Henneberg (2013). European integration and national models for railway networks (1840–2010). Journal of Transport Geography, Volume 26, January 2013, pp. 126-138.

[24] Marti-Henneberg (2013). European integration and national models for railway networks (1840–2010). Journal of Transport Geography, Volume 26, January 2013, pp. 126-138 (accessed 04 November 2020)

[25] European Commission (2019). Staff Working Document accompanying the Sixth report on monitoring development of the rail market. https://ec.europa.eu/transport/sites/transport/files/6th_rmms_report.pdf (accessed 04 November 2020)
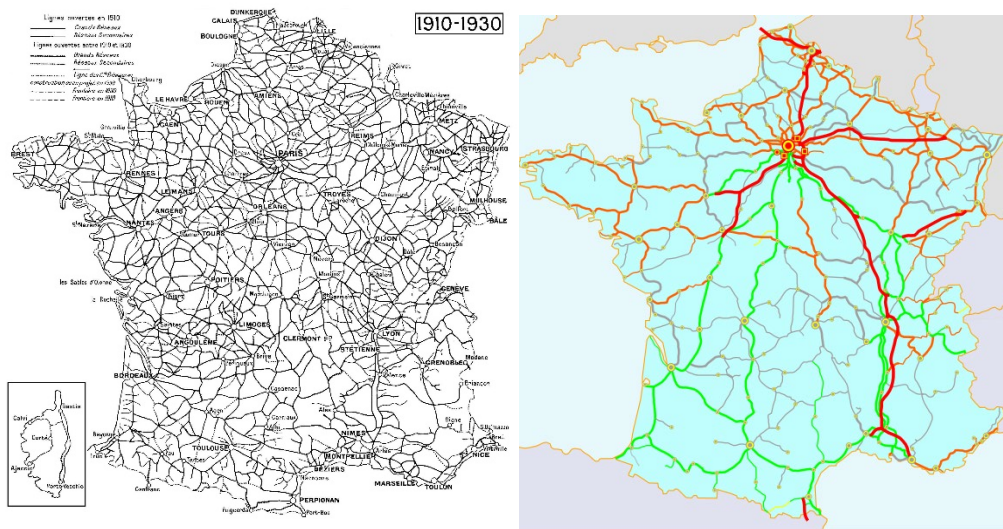
Figure 4: French railway network 1910-1930 versus 2016[26]

The **type and quality of rail infrastructure** varies considerably across member states. Only France, Germany, Spain, Italy and Benelux have high-speed lines operating at >250km/h. In eastern member states, there are almost no tracks for >200km/h and conventional rail lines urgently require upgrading.[27] But also within countries, e.g. Germany or France, there are big differences.

For example, in the EU only an average of 54% of tracks is electrified.[28] While the core network already has a high degree of electrification, regional lines have not. **Electrification** allows trains to operate on renewable electricity instead of polluting diesel. It reduces the carbon footprint of rail, improves air quality and allows for a more efficient utilisation of tracks. Electricity-run trains can accelerate faster than diesel trains, permitting trains to operate in shorter intervals on the same tracks.[29] The patchwork of electrified and non-electrified tracks means that even on electrified stretches trains

[26] Map 1910-1930: Daniel Maurice, http://mes.gares.free.fr/divers/carte_france.htm; Map 2016: © Benja-min Smith / Wiki-media Commons, https://commons.wikimedia.org/wiki/File:French_railway_network.svg (accessed 04 November 2020)

[27] European Court of Auditors (2018).Towards a successful transport sector in the EU: challenges to be addressed. https://www.eca.europa.eu/Lists/ECADocuments/LR_TRANSPORT/LR_TRANSPORT_EN.pdf (accessed 04 November 2020)

[28] Allianz pro Schiene (2020). Elektromobilität: Die Mobilität von morgen schon heute auf der Schiene. https://www.allianz-pro-schiene.de/themen/umwelt/elektromobilitaet/ (accessed 04 November 2020)

[29] Deutsche Umwelthilfe (2020). Lückenschluss. https://www.duh.de/fileadmin/user_upload/download/Projektinfor-mation/Verkehr/Elektromobilitaet/HG_Papier_Lueckenschluss_Stand_19022020_final.pdf (accessed 04 November 2020)

High speed versus conventional tracks

In the EU, trains that can operate at 250km/h or above (on upgraded conventional lines, above 200 km/h) are considered 'high speed' – in contrast to 'conventional lines'. Generally, infrastructure costs are higher for lines achieving higher speeds. Constructing 1km of new high-speed rail infrastructure is almost twice as costly as conventional rail, as it requires heavier superstructures with large radius bends, a more resistant catenary and a more advanced signalling system than conventional rail infrastructure (DG Regio 2018). One kilometre of HS tracks costs €25 million, but costs can easily reach €145 million, e.g. if crossing mountain regions or urban areas.

A European Court of Auditors (ECA, 2018) analysis indicates that high-speed trains rarely operate at full speed, and usually only at an average speed of 45% of the line's designed speed, because of frequent interim stops, or a mix of freight and passenger traffic, or slow and fast traffic. While high-speed lines are important to create alternatives to flying, the cost effectiveness of and the need for high-speed lines thus needs to be carefully evaluated on a case-by-case basis. Another option might be to reduce the mix of traffic where demand justifies it.

often operate with diesel. Luxembourg has the highest degree of electrification, at 95%.[30] In Germany, only 61% of the railway network is electrified and only 27 of the 57 the border crossings into neighbouring countries.[31] Thirteen German border crossings with the Czech Republic and eight with Poland, two to Austria, three to France, three to the Netherlands and one to Denmark have yet not been electrified.[32]

A functioning railway network also requires **maintenance** of tracks. On average infrastructure managers spend €100,000 per main track-kilometre per year, with large variations across countries.[33] Many member states have accumulated enormous maintenance backlogs due to a lack of public funding over the last few decades. Germany, for instance, has accumulated a backlog of €44.5 billion.[34]

Border crossings are a particularly weak element of the European rail network. There are only a handful of cross-border high-speed tracks connecting UK, Netherlands, Belgium and France, and one connecting France with Spain. Also conventional tracks are often in poor shape. On many cross-border sections infrastructure has partly been dismantled or is of poor quality – meaning trains can only operate at very slow speed. For instance, on the route connecting Düsseldorf-Rotterdam, the section between Dülken

and Kaldenkirchen (Germany) just before the Dutch border is only single track, meaning that trains cannot operate in both directions at the same time. In 2018, the European Commission found that

[30] Last data available for 2016. European Commission (?). Electrified railway lines. https://ec.europa.eu/transport/facts-fundings/scoreboard/compare/energy-union-innovation/share-electrified-railway_en (accessed 04 November 2020)

[31] Deutsche Umwelthilfe (2020). Lückenschluss. https://www.duh.de/fileadmin/user_upload/download/Projektinformation/Verkehr/Elektromobilitaet/HG_Papier_Lueckenschluss_Stand_19022020_final.pdf (accessed 04 November 2020)

[32] RailTech (2020). Electrification of cross-border tracks urgent for Germany. 29 June 2020. https://www.railtech.com/infrastructure/2020/06/29/electrification-of-cross-border-tracks-urgent-for-germany/ (accessed 04 November 2020)

[33] PRIME (2020). 2018 PRIME Benchmarking report. https://webgate.ec.europa.eu/multisite/primeinfrastructure/sites/primeinfrastructure/files/prime_external_report_200610.pdf (accessed 04 November 2020)

[34] Railjournal (2029). Huge Rail Infrastructure Replacement Backlog Revealed in Germany. 12 November 2019. https://www.railjournal.com/infrastructure/huge-rail-infrastructure-replacement-backlog-revealed-in-germany/ (accessed 04 November 2020)

out of 365 cross-border links that had once existed, 149 (41%) were non-operational.[35] Another 46 links were used for freight only. While not all of these 'unexploited' links are still needed, the study identified at least 48 cross-border links with significant passenger rail potential. It should also be noted that some additional links that have never existed are desperately needed.

Apart from cross-border links there are domestic lines that create significant added value to the European network. For instance, a much straighter, preferably high-speed, line from Dortmund to Kassel, and from Kassel to Eisenach, would help a lot to better connect the German Bundesländer North-Rhine Westfalia to Thuringia and Sachsen, and also the Netherlands with south Poland and the Czech Republic.

In 1996 the European Union had already decided to establish a **Trans-European Transport Network (TEN-T)**, a Europe-wide network of railway lines, roads, inland waterways, maritime shipping routes, ports, airports and railroad terminals (Decision No 1692/96/EC). The aim of the EU's TEN-T plan is to close infrastructure gaps, remove bottlenecks and technical barriers. A core network, based on nine key corridors, is to be completed by 2030 and a comprehensive network by 2050. For rail, the TEN-T plan covers both conventional and high-speed infrastructure, and includes the upgrade of various border crossings.

However, the implementation of the TEN-T core network is seriously delayed. In particular, cross-border gaps in the European railway network are only very slowly closing; for example, the links Madrid-Lisbon (currently taking 9h45 for 625 km), Bordeaux-San Sebastian, or Berlin-Prague-Vienna.

Why is cross-border infrastructure still in such poor shape?

First, rail network development is **massively underfunded and not a priority in transport spending.** The completion of the TEN-T core network (all modes) alone is expected to cost **€500 billion by 2030** (€1.5 trillion for the 2050 comprehensive network). But the Connecting Europe Facility (CEF), the main funding instrument for TEN-T, had only

EU funding for transport

Connecting Europe Facility (CEF): provides finance for the implementation of the TEN-T (Trans-European Transport Network), based on a previously agreed list of projects. The CEF regularly issues calls, focusing on infrastructure, digitalisation, innovation and alternative fuels. Co-finance rates reach up to 40% for cross-border rail projects.

EU Cohesion Policy funding: provides finance for all types of transport projects, based on Member States' Operational Programmes. Co-finance rates are between 50% and 85%, depending on the financial strength of the region. Funding is channelled through the European Regional Development Fund (ERDF) and the Cohesion Fund (CF).

European Fund for Strategic Investments (EFSI): is an EU budget guarantee given to the European Investment Bank (EIB) allowing the EIB to give loans to higher-risk projects. The EFSI is demand driven, meaning that in theory all types of transport projects can apply for funding.

Recovery and Resilience Facility: provides financial support (grants and loans) for public investment and reforms, in response to the Covid-19 crisis. It aims to create European flagships. 'The promotion of future-proof clean technologies to accelerate the use of sustainable, accessible and smart transport [..] and extension of public transport' is one of the seven focus areas.

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[35] European Commission (2018). Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders. https://op.europa.eu/en/publication-detail/-/publication/e68ec381-62f7-11e8-ab9c-01aa75ed71a1/language-en (accessed 04 November 2020)

a humble rail budget of €21.6 billion for the period 2014-2020. An additional €12.2 billion of EU co-hesion funding was dedicated to TEN-T railway projects, and €6bn to other rail projects. **EU co-fi-nance rates under CEF reach up to 40% only**, and on average only 11% comes from EU funding. This means that most of the funding needs to come from member states. Some member states do not have sufficient resources to cover the remaining costs.

Second, **national priorities are not aligned with EU priorities**. National governments have the ultimate say on infrastructure projects, as they provide most of the funds (at least in the old member states), and are responsible for planning. Many EU member states do not see a priority in TEN-T, and especially not in cross-border sections, as international services currently account for only 5% of demand. They also still tend to favour road over rail infrastructure. As a result, the rail network is developing more as **a patchwork of networks governed by national interests**. The CEF, over which the European Commission has more control, dedicated 70% of its funds to rail but only 26% of cohesion funding was used for rail in the period 2014-2020. Under the cohesion funds, there are no rules, for example, on the share of transport budget that should be spent on rail or on cross-border projects.

Third, **available funding is not well spent**. The EU has not clearly prioritised which segments of the TEN-T plan to address first. The lists of priority projects annexed to the TEN-T Guidelines and CEF Regulation are too long to guarantee funding. The European Court of Auditors (ECA) found in 2018 that the EU was lacking a realistic long-term plan for infrastructure investments and that EU co-funding for high-speed rail lines was used inefficiently – and not for cross-border sections. Many needs assessments were of low quality and had not given consideration to alternative, less costly options (e.g. upgrading conventional lines). Nine of the 14 audited high-speed lines did not have enough passenger potential, based on an analysis of the catchment area.[36] A 2020 ECA study found that large cross-border projects co-funded by the EU were delayed by an average of 11 years, recorded a cost-increase of 47% compared to initial estimates, and were not based on sound cost-benefit analyses. The ECA judged that the European Commission had only limited legal tools at hand to supervise implementation of these mega-projects but it did not make sufficient use of these existing tools.[37]

Fifth, TEN-T alone is not the complete solution. Most of the identified cross-border **missing links are outside the scope of the TEN-T** core or comprehensive network plan (TEN-T covers only 33 links). These links are often essential for the regional rail network and could have a significant Euro-pean benefit, bringing border regions closer together and reducing regional disparities. Yet they re-ceive little EU funding.

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[36] European Court of Auditors (2018). Special report n° 19/2018: A European high-speed rail network: not a reality but an ineffective patchwork. https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=46398 (accessed 04 November 2020)

[37] European Court of Auditors (2020). Special Report 10/2020: EU transport infrastructures: more speed needed in megaproject implementation to deliver network effects on time.
https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=53699 (accessed 04 November 2020)

Recommendation

The EU should launch a targeted **investment initiative** on improving rail infrastructure, based on the following principles:

- Use EU transport budget **only for sustainable transport infrastructure in line with the EU's climate and energy targets**, and ensure that sufficient budget is available for rail.

- Set **strategic priorities** for new infrastructure projects, and earmark EU funding for cross-border sections with high impact and on targeted local infrastructure measures such as passing loops for existing lines to separate fast and slow traffic; ensure also that non-TEN-T missing links can receive funding.

- Increase the **co-finance rate** for cross-border rail projects (in member states worst hit by economic crisis) from the current 40% to 60%.

- Conduct sound **cost-benefit analyses** for EU co-funded projects, carefully analysing whether smaller interventions (e.g. upgrading, construction of bypasses or electrification) would be more efficient and sustainable than new high-speed lines and megaprojects.

The EU should use the **Recovery and Resilience Facility** for closing urgent cross-border infrastructure gaps and for reviving a European rail network of day and night trains.

The EU should convene an **EU Rail Finance summit in early 2021** to ensure that the Operational Programmes (cohesion funding) and national Recovery and Resilience Plans advance a European rail network, and ensure coherence of funding priorities on cross-border projects.

2.1.2   Measure #2: Make more efficient use of infrastructure: management and harmonisation

Building new railway infrastructure is expensive. It is therefore all the more important to **make efficient use of tracks**. Capacity of tracks can be improved through a more coordinated traffic control and management, and better and harmonised signalling systems.

Currently, the European network is only a patchwork of national systems. Each member state has its own infrastructure manager that allocates tracks to train operators – but usually with a primarily national perspective. Especially on cross-border sections, this lack of integration results in traffic not being predictable and in inefficient use of infrastructure. Infrastructure managers do not efficiently cooperate, in the case of traffic disruptions for example, because they are focused on their respective national networks.[38] This situation could be improved if, for example, the European Railway Agency (ERA) would help national infrastructure managers to coordinate, and work as a **European traffic**

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[38] European Commission (2013). Staff Working Document accompanying proposal for a Directive on a Single European Railway Area. SWD(2013) 12 final. https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=SWD:2013:0013:FIN:EN:PDF (accessed 04 November 2020)

control authority. The ERA could then instruct national traffic management centres to work together in a defined standard approach and find alternative routes in times of need.

There are currently also dozens of different **signalling systems** in Europe, with each country implementing its own national system. Usually this means that on cross-border lines only those trains equipped with the various signalling systems of the relevant countries can operate. As a response, the EU has established the **European Rail Traffic Management System (ERTMS)**, a programme aiming to replace these different signalling systems with a unified system. In theory, ERTMS would allow trains to operate on cross-border lines without interruption. To this end, both the tracks (trackside module) and the trains (on board module) need to be equipped with ERTMS technology.

The European Commission and the European Railway Agency praise that ERTMS could also increase track capacity by up to 30% because it allows reducing the safety distance between trains.[39] A 2019 business case analysis of ERTMS was not able to confirm such capacity gains in general. The capacity depends on many factors of which the signalling system is only one.[40] The **main benefits of ERTMS are improved interoperability, safety and reliability** - and it is an enabler for future digitalisation such as automatic driving.[41]

Yet the transition to ERTMS is not running smoothly. The EU has set the target to equip the entire core network with ERTMS by 2030, but **in 2020 only around 12% (6,120 km) was in operation**.[42] Only 3,600 vehicles are so far equipped with ERTMS – the target for 2030 is 27,500 to 38,500. Out of the 5,000 new vehicles registered between 2015-2020 only 900 were fitted with ERTMS as Member States made vast use of available exemptions.[43]

The main reason for the slow roll-out are high equipment costs, but also the transition phase and lack of individual business case for infrastructure managers where the national signalling system is already functioning well or is relatively new. In Germany, for example, the national system already allows for trains to run up to 300km/h and will only reach the end of its lifecycle by 2030.[44] The benefit of ERTMS is long term, and more for society or the rail sectors as a whole, but not for infrastructure managers or rail operators.

Against its original idea, **ERTMS is not yet a uniform standard** as different generations of ERTMS are not compatible with each other and member states have introduced ERTMS systems that are tailored to their national needs. **There is currently no single vehicle that could operate on all existing ERTMS lines**. A train fitted for ERTMS in one country may lose admission to another country. For example, Bombardier Traxx used by Nederlandse Spoorwegen (NS) on highspeed line in the Netherlands, originally fit for use in Germany and Austria, is no longer fit due to installation of ERTMS

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[39] European Railway Agency (2020). Fostering the railway sector through the European Green Deal. https://www.era.eu-ropa.eu/sites/default/files/events-news/docs/fostering_railway_sector_through_european_green_deal_en.pdf (accessed 04 November 2020)

[40] Ineco and Ernst&Young (2019). ERTMS business case on the 9 core network corridors – Second Release. https://op.eu-ropa.eu/en/publication-detail/-/publication/a5c88a67-994f-11e9-9d01-01aa75ed71a1 (accessed 04 November 2020)

[41] Ibid.

[42] Matthias Ruete (2020). ERTMS - First Work Plan of the European Coordinator. https://ec.europa.eu/transport/sites/transport/files/work_plan_ertms_2020.pdf (accessed 04 November 2020)

[43] Ibid.

[44] European Court of Auditors (2017). Special report no 13/2017: A single European rail traffic management system: will the political choice ever become reality? https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=41794 (accessed 04 November 2020)

version that is non-conform in Germany and Austria. The slow roll-out of (non-uniform) ERTMS currently means that operators need to fit their trains with double systems, or have a limited deployment area. In the worst case, the deployment area gets cut into pieces, by ERTMS-fitted lines that trains without ERTMS onboard units cannot traverse.

Finally, it also seems that the European Commission underestimated the costs of ERTMS roll-out. The European Court of Auditors estimates that the **capital investment for ERTMS deployment on the entire TEN-T core network could be €80 billion**[45] and the costs for onboard retrofitting of the entire fleet an additional €11 billion. EU funding can cover only a limited share of these overall costs. Between 2007 and 2020, €3.9 billion was allocated from the EU budget to ERTMS roll-out projects – this is less than 5% of the total deployment costs for the overall network. The ECA also criticised the EU for not effectively targeting cross-border sections and core network corridors, and onboard units for international traffic. [46]

Instead of moving completely to ERTMS, trains could be equipped with more than one conventional signalling system. Such trains do exist and can be built if need be. It should also be considered that a fair share of trains remain within one country, a significant number operate in two countries, and only few trains will need to operate in more countries. **The deployment of ERTMS is most useful and most urgent on cross-border sections and the core corridors of the European network**.

If ERTMS is to help international rail, the European Commission needs to guarantee the stability of the ERTMS specifications and ensure that different ERTMS versions become compatible with each other. Funding for the rollout of ERTMS should then target cross-border sections or core network corridors, and, for onboard equipment, operators that service international connections.[47]

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[45] Ibid. Costs for trackside equipment and installation can range between 100,000 and 350,000 EUR/ km depending on whether the entire line needs to be renovated. But the overall costs for infrastructure managers could well reach 1.44 million EUR/km if also considering design, testing, authorisation, project management, telecommunication investments, training of staff etc. In addition, ERTMS equipment for locomotives can range between 375,000 and 1 million EUR.

[46] Ibid.

[47] Ibid.

> ## Recommendations
>
> The EU and its member states should authorise the European Railway Agency (ERA) to become a **European traffic control authority** to supervise and monitor international rail traffic. The ERA could also facilitate cross-border path allocation for international trains.
>
> The EU and its member states could also agree that a certain percentage of **slot capacity in each national network should be reserved for, or given preference to ,international services.**
>
> The EU should **stabilise ERTMS specifications** and eliminate incompatibilities between different ERTMS systems.
>
> The EU and its member states should cooperate to synchronise ERTMS deployment on cross-border sections and core corridors. **EU funding should** target ERTMS rollout on **cross-border sections or core network corridors** (track-side equipment) and **international services** (on-board equipment).
>
> The European Commission should further **investigate** to what extent ERTMS can increase capacity, and assess **which other options are available to increase capacities in the short term** (e.g. corridor coordination, bypasses, strengthening nodes etc).

2.2 CREATE A TRULY EUROPEAN RAIL SERVICE

Europe is far from offering a dense network of fast train services between major metropolitan areas. A European Commission report found that **of 202 operational cross-border rail links, only 57 were fully exploited** in 2017.[48]

Even where infrastructure is in place, this is no guarantee for adequate rail services and not even all European capitals are connected. For example, from Berlin there are currently no direct connections to Brussels, Paris or Copenhagen. Especially for regional transport, there are often no viable train services at all. For example, to travel the 200km from Frankfurt to Luxembourg, the fastest rail connection takes 4h9 with two changes.

There are a **few** examples of **direct high-speed services across European borders**, with acceptable service levels, for instance on the routes Paris-Brussels, Montpellier-Barcelona, Frankfurt-Brussels, Frankfurt-Paris, Paris-London or Paris-Amsterdam. However, journey times are still far from optimal due to sub-optimal infrastructure, frequency is not as high as could be, prices are high (these latter two due to monopolies) and compulsory reservations on some lines make use inflexible.

In September 2020 German Transport Minister Scheuer proposed a revival of the **Trans Europ Express.** His proposal for a TEE 2.0 envisages eight day train lines and eight night train lines, each

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[48] European Commission (2018). Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders. https://op.europa.eu/en/publication-detail/-/publication/e68ec381-62f7-11e8-ab9c-01aa75ed71a1/language-en (accessed 04 November 2020)

crossing at least three European member states.[49] This vision is an important first step towards a better European rail network, although it lacks connections to south-eastern Europe and the Iberian Peninsula, and only envisages one daily pair of trains on each line. Yet the vision could be easily implemented and expanded in the very near future – if the right support measures are provided.
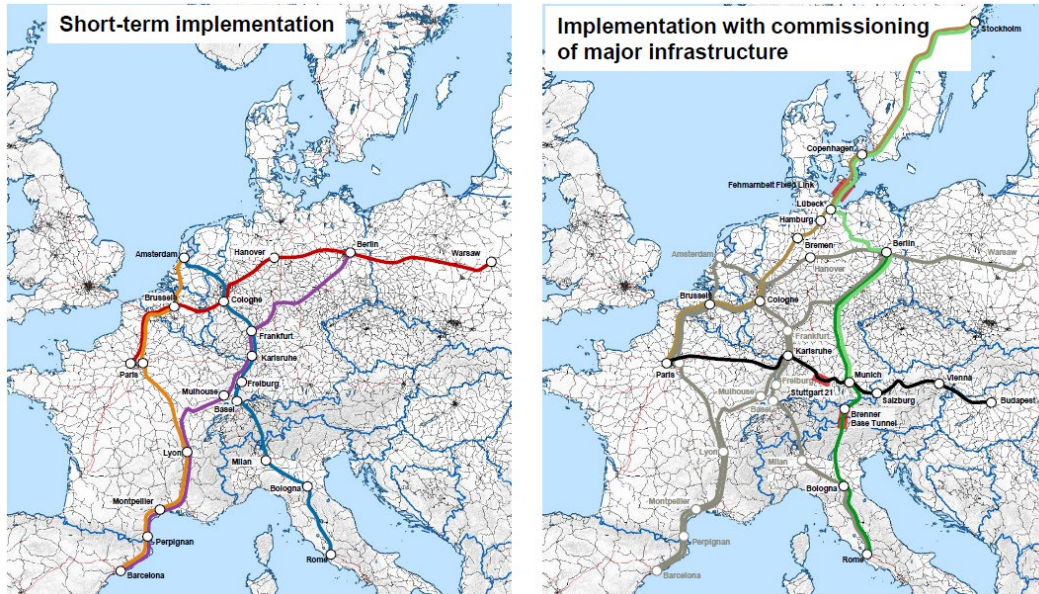

Figure 5: Proposal for a Trans Europ Express 2.0[50]

2.2.1   Measure #3: Support the launch of direct international services

Operating trains across borders means that staff need to receive special training on the different safety systems, train drivers need to speak the languages of all countries the train passes because there is no common language, and sometimes the locomotive needs to be changed at the border because each country uses a different signalling system, as on the Berlin-Amsterdam route.

This is the result of centuries of national thinking. In the EU, **over 11,000 different national rules apply to rail transport**,[51] over 20 different signalling and speed control systems are in place, three different track gauge systems are in use, and at least six different voltage systems. The European Union has adopted four Railway Packages that aim at harmonising these rules and systems. The 4th Railway Package of the EU, adopted in 2016, aims to eliminate some of the major administrative hurdles but implementation will take several years. In the meantime, the lack of harmonisation often makes it economically unattractive to start a new cross-border service.

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[49] BMVI (2020). TEE2.0. International high-speed and overnight rail services to promote climate change mitigation. https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile (accessed 04 November 2020)

[50] BMVI (2020). TEE2.0. International high-speed and overnight rail services to promote climate change mitiga-tion. https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile (accessed 04 November 2020)

[51] European Commission (2013). European Rail: Challenges Ahead.The Fourth Rail Package.Press Release 30 January 2013. https://ec.europa.eu/commission/presscorner/detail/en/MEMO_13_45 (accessed 04 November 2020)

Some new entrant rail operators have shown interest in starting cross-border services on potentially economically viable routes, but report several obstacles.

First, there is a **lack of rolling stock** for international connections.[52] The stock of second-hand interoperable material is limited, especially for night trains, because of years of underinvestment – incumbent rail operators have not ordered new fleets. Even where second-hand material is available, incumbents are generally reluctant to sell it. New entrants usually do not have sufficient funds to order an entire new fleet themselves, and the rail industry is reluctant to take orders of only few units. Leasing companies do not enter the cross-border market because the interoperable rolling stock currently needs to be tailored to the specific track section: if an operator goes bankrupt, the rolling stock cannot easily be leased out for other network sections.

Second, new entrants also face difficulties when trying to sell tickets for their services. They usually **do not get access to the established sales channels** of the incumbents.[53] People usually refer to the known names (Deutsche Bahn, SNCF, etc) when looking for rail tickets and are not even aware of the existence of alternative options.

Third, new entrants claim that **access to track infrastructure** is difficult.[54] Rail operators need to apply for track capacity slots if they want to run a new train service, and new entrants report that incumbents are usually prioritised. For cross-border services, it is even more complicated because rail operators need to negotiate with infrastructure managers on both sides of the border. In some EU member states, infrastructure managers charge high mark-ups (see section 2.3.2) on track usage.

The resulting lack of a business case points to a clear market failure, which governments should correct. To improve the economic attractiveness of launching international rail services, governments could provide **Public Service Obligations (PSOs) or other start-up funding**.

Most member states provide PSOs for domestic long-distance connections, where the service cannot be run commercially by the market or where the government wants to ensure a certain service level or train frequency. A PSO therefore removes the barriers to the operation of a train service. These give rail operators a guaranteed compensation for several years. There are no dedicated PSOs for international services but member states sometimes provide PSOs for the section crossing their territory (e.g. Berlin-Praha-Brno-Wien/Bratislava-Budapest, Praha-Plzeň-München, Warszawa-Ostrava-Wien, Praha-Ostrava-Košice, Amsterdam-Berlin). In exceptional cases, a government may also decide to grant PSOs for connections to important cities in neighbouring countries. But **PSOs for international services remain the exception**.[55] PSOs could be helpful for international links that are less promising from an (initial) demand perspective, but that are still useful as a link in the network. For other links, on which rising demand is forecast, start-up funding could be considered. For

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[52] ALLRAIL (2020). Fair access to Rolling Stock – Green Deal Priorities. https://www.allrail.eu/policy/ (accessed 04 November 2020)

[53] ALLRAIL (2020). Open RailData &Through Ticketing – Green Deal Priorities. https://www.allrail.eu/policy/ (accessed 04 November 2020)

[54] ALLRAIL (2020). Fair access to track infrastructure – Green Deal Priorities. https://www.allrail.eu/policy/ (accessed 04 November 2020)

[55] CER (2017). Public Service Rail Transport in the European Union: an Overview. https://www.cer.be/sites/default/files/publication/CER_PSO_Brochure.pdf (accessed 04 November 2020)

instance, track access charges on desired international corridors (or segments thereof) could be reduced to direct costs levels, or even to zero. The lost income for infrastructure managers could then be covered through the general budget of the member state, or even EU funds.

Governments could also consider buying a fleet for defined international corridors and then lease the vehicles to rail operators. For regional and some national operations, rolling stock is sometimes owned and leased out by the regional/national government (awarding authority) or a government-owned company. In a 2020 night train report, the Swedish transport agency Trafikverket proposed the establishment of a similar model for a planned international night train to Brussels.[56]

Recommendations

The **European Railway Agency (ERA) should be significantly strengthened** to assist EU member states with

- identifying routes with high European value or with extraordinary interregional importance;

- identifying which support instruments would be needed, and coordinating such support instruments; it could also explore whether the EU itself could provide this support directly (PSOs, seed funding).

The EU and member state governments should also help overcome the lack of rolling stock. They could either establish a publicly managed pool for **interoperable rolling stock**, or provide finance or guarantees for purchasing or leasing interoperable rolling stock material.

The EU should initiate legislation to ensure that new entrants have **access to inherited ticket sales channels** (incumbent websites, ticket machines and ticket desks).

2.2.2   Measure #4: Improve coordination and planning of international services

Even where there is a potential business case for international connections, this potential is often not exploited. The rail market is still dominated by the large **incumbents**, mostly formerly state-owned rail operators. They **tend to focus almost exclusively on the domestic market**, as international rail travel is currently a niche market only (international rail makes up only 5% of the market) and requires time-intensive and costly coordination with more than one infrastructure manager, other rail carriers, etc. New entrants, in turn, face a high commercial risk because international connections require higher investments and because they do not have access to well-known sales channels, usually the incumbents' websites (see above).

Rail operators also tend to focus on optimising train speeds but then **fail to coordinate timetables** for cross-border connection, leading to long waiting times at a station for connecting trains – simply because international connections are not a priority. For example on a journey from Cologne to London, a 1.5h stop is required in Brussels to board the Eurostar. Crossing France usually requires a

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[56] Trafikverket (2020). Night train service to the European continent. https://www.trafikverket.se/conten-tassets/0037cd33ea7d4f6c824395c9927b09e2/summary-of-the-final-report-night-trains-to-the-european-continent.pdf (accessed 04 November 2020)

change of train in Paris, arriving at one train station and departing from another on the other side of the city.

Rail operators and infrastructure managers tend to focus on optimising the national market, and prioritise national and regional trains on congested sections (e.g. around metropolitan areas).[57] International trains thus often need to wait or **run at lower speed**, not exploiting their full potential.

Currently rail operators need to apply for track slots at the different national infrastructure managers, and might be allocated slots that do not combine with each other. This does not only make it unattractive to plan international connections, it also reduces efficiency. The Dutch Council for the Environment and Infrastructure (RLI) found that on the London-Amsterdam route, 16 minutes could be saved if only the five involved infrastructure managers would cooperate more closely.[58]

The travel time from Berlin to Amsterdam, for example, could be reduced from the current 6.5h to just 5h if congestion could be reduced, for example by constructing bypasses and improving traffic management.

> ### Recommendation
>
> The EU should entrust the European Rail Agency (ERA) with forecasting **demand, assessing the level of required services** (destination, frequency, speed) **and allocating capacities**. The ERA could identify interesting routes that are not yet fully exploited and make this information available to train operators. It could also determine which sections of the desired network services would be commercially viable and where PSOs would be needed to guarantee a service.

2.3   GET THE PRICE RIGHT

Next to availability and travel time, **ticket prices** and convenience influence people's choice of transport mode. Many people believe that rail tickets are more expensive than plane tickets in Europe, and often this is the case. This is the result of airlines' aggressive marketing strategies offering extremely low fares for some tickets, and also a lack of transparency about the full costs of an air ticket (luggage, credit card charges, etc) during the booking process. On some very frequented routes, where rail is already a fast alternative, airlines offer consistently cheaper tickets (e.g. London-Paris, Düsseldorf-Paris, London-Brussels). Yet, airlines sell only a very small share of all plane tickets at those low fares. Most business trips, which make up a major share of passengers, are booked last minute at a much higher price. Several studies show that in many cases the train ticket is already cheaper.[59]

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[57] European Commission (2013). Staff Working Document SWD(2013) 12 final.

[58] Dutch Council for the Environment and Infrastructure (2020). Changing Tracks Towards better international passenger transport by train. https://en.rli.nl/publications/2020/advice/improving-international-passenger-rail (accessed 04 November 2020)

[59] UIC (2015). European Air-Rail-Bus Price Comparison. UIC investigated ticket prices for the busiest air routes in Europe, with competitive rail travel times. UIC found that in 82% of cases, rail was cheaper than air travel and that passengers could save an average 37% of costs if opting for train

In other words, **there is no clear and consistent price signal in favour of rail travel**. Given the clear environmental advantage of rail, train tickets should be significantly cheaper than airline tickets. Why is this not the case?

Rail currently has a competitive disadvantage against road and air transport because external costs are not equally internalised across transport modes. Energy taxes, infrastructure charges, value added tax, carbon pricing and the reduction of subsidies are important tools to internalise costs that are otherwise borne by third parties or society as a whole (air pollution, climate change, noise, accidents, etc). However, EU member states do not apply taxes consistently across transport modes.

2.3.1   Measure #5: Make transport taxes fair

Aviation and road transport are exempt from various taxes, creating unfair starting conditions for rail and giving the wrong price signals to consumers. Improving rail without increasing road and air transport prices is likely to increase overall transport demand instead of shifting transport. To reduce GHG emissions from the transport sector, the EU needs to work both on more pull factors (improving rail transport) and more push factors (increase aviation and road taxes).

Kerosene taxes: The Energy Taxation Directive sets minimum tax rates for different fuels and uses, also for aviation. Yet all member states have made use of an exemption for aviation. This means that airlines do not pay taxes at all for the fuel they use. It is estimated that these exemptions represent an annual tax revenue loss of at least €27 billion.[60] Taxing kerosene is a key instrument for reducing aviation emissions.

EU Emissions Trading System: The EU ETS was originally designed to cover flights from, to and within the European Economic Area (EEA). Following international pressure and negotiations within the International Civil Aviation Organisation (ICAO), the scope of the ETS was reduced to cover only flights within the EEA ('stop the clock' agreement). This means that currently only around 40% of total EU aviation emissions are covered. But even for flights within the EEA, airlines currently receive 85% of their allowances for free. Electric rail, in contrast, has to buy all ETS allowances. The ETS Directive is to be revised in the coming years, and the 'stop the clock' agreement on ETS exemptions for international flights expires in December 2023.

Value added tax: National VAT rates vary from country to country but cross-border flight tickets are exempt from VAT in the entire EU. For rail tickets, each member state defines the VAT on the journey stretch on its territory. Some member states have exempted rail from VAT, some (like Germany) apply a reduced rate. Greece and Croatia charge their full rates (24 and 25%). This distorts competition between rail and aviation on cross-border connections, and sets wrong price incentives: the exemption of cross-border aviation creates artificial demand for the most emission-intensive transport mode, aviation. If the EU28 would decide to introduce VAT of 19% on *all* tickets, this would create a tax income of €39.9 billion per year (and in Germany €6.3 billion per year).[61]

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[60] European Commission (2019). Taxes in the Field of Aviation and their impact. https://op.europa.eu/en/publication-detail/-/publication/0b1c6cdd-88d3-11e9-9369-01aa75ed71a1 (accessed 04 November 2020)

[61] Ibid.

> **Recommendations**
>
> When revising the **Energy Taxation Directive** in 2021, the EU should agree on an **EU-wide kerosene tax** starting at least at the minimum tax rate of 33 ct/litre. Until the EU-wide kerosene tax is introduced, a coalition of willing EU member states should introduce bilateral kerosene taxation agreements covering flights between them as well as on domestic flights.
>
> When revising the **EU ETS**, the EU should introduce **full auctioning of ETS allowances for aviation** and extend the scope again to include international flights. The EU should also set a floor price for ETS allowances and include non-CO2 impacts of aviation.
>
> The EU should reform the EU VAT Directive with the aim of putting mandatory **VAT on all flights** departing from European airports.

2.3.2 Measure #6: Make infrastructure charges fair

Rail pays **infrastructure access charges** on each track kilometre but member states charge only on roughly 3% of the road network for infrastructure use. The track access rates for rail vary between member states, with particularly high rates in Austria and Germany. Directive 2001/14/EC sets out that track access charges should generally only reflect direct costs (wear and tear costs) but Germany, for instance, makes use of an exemption and charges full costs for passenger trains (i.e. including infrastructure maintenance costs).[62] The German track access charges are thus five times as high as the mere direct costs would be.[63] This results in very high access charges for train operators, accounting for around a third of total operation costs.

High track access charges may result in infrastructure capacity (paid with public money at a high price) not being fully exploited. If track access charges were reduced to direct costs only, this would make it easier for operators to launch new services, and make better use of the network. Ultimately, the greater frequency of trains could even increase the infrastructure managers' income.

Nevertheless, it must be taken into account that rail infrastructure requires maintenance and that track access charges are designed to cover part of these costs. If track access charges are reduced, funding might need to come from other sources (e.g. the general budget) if greater train frequency does not make up for lost income.

The Covid-19 crisis, which has strongly impacted the rail sector, has brought about some positive developments. In September 2020 the EU adopted a regulation that gives member states the option of reducing track access charges below direct cost levels or even waive them completely during the

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[62] For freight transport, the German government had already halved track access charges as of 1 July 2020; the lost revenues are covered through the general budget.

[63] CERRE (2018). Track Access Charges – Case Study Germany. https://cerre.org/sites/cerre/files/180509_CERRE_TrackAccessCharges_CaseStudy_Germany_Final.pdf (accessed 04 November 2020)

Covid-19 crisis. France and Austria have already decided to make use of these flexibilities.[64] Yet the regulation does not include an obligation to reduce track access charges.

High track access charges create an uneven playing field between rail and road transport. Cars and buses pay only on selected routes for road use, and road charging is usually time-based instead of distance based. The revision of the EU Eurovignette Directive is currently in Trialogue negotiations. There are calls to phase out time-based charging systems, to differentiate charging by CO_2 emissions, and to extend systems to all major roads.

> ## Recommendation
>
> In the short term, member states should make use of the flexibilities in EU regulation and **reduce track access charges at least to direct cost levels**. Alternative funding mechanisms need to be explored to ensure that sufficient resources remain available for infrastructure maintenance.
>
> In the medium term, the '**polluter pays' principle** should apply to all transport modes, and infrastructure charges should be raised based on equal principle across modes. The EU should decide to raise distance-based charges on road use, on all major roads.

2.4   MAKE RAIL TRAVEL CONVENIENT

When people choose their means of travel, they want to be able to easily find connections, and compare prices between operators and across modes. When they embark on the journey, they want to be sure to arrive at their final destination without any hassles. For instance, they want to know whether they arrive on time and on what platform, and in case of disruptions, they want to be booked on an alternative train.

When taking a flight, this is already common sense. It is very easy for passengers to look for flight connections worldwide, **compare ticket prices and book tickets that guarantee passengers arrive at their final destination.** If rail is to become a real alternative to aviation, searching and booking needs to be at least as easy.

The EU has so far preferred to leave it to the sector itself to find a solution. But sector-led initiatives have failed to address these problems. It seems contradictory that with increasing digitalisation it has become ever-more difficult to search and book rail tickets, or to find the platform number, especially if more than one train operator is involved.

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[64] Austria for freight and commercially operated passenger trains. Railjournal (2020). Austria waives track access charges as passenger subsidy ends (05 October 2020). https://www.railjournal.com/passenger/main-line/austria-waives-track-access-charges-as-passenger-subsidy-ends/ (accessed 04 November 2020)

France waives charges in 2020 and reduces them to half price in 2021: Railfreight (2020). Europe waivers on track access charges abolition (01 September 2020). https://www.railfreight.com/railfreight/2020/09/01/europe-waivers-on-access-charges-abolition/ (accessed 04 November 2020)

2.4.1   Measure #7: Make data sharing mandatory to allow for one-stop booking platforms

There are different ways that passengers can search for and buy rail tickets: (1) via a rail operator's website or app, (2) at a rail operator's ticket counter, (3) at a third-party ticket vendor (e.g. Trainline, Omio), (4) at a (offline) travel agency. Yet, there is currently **no publicly accessible platform that shows all existing train connections in Europe**, nor is it possible to **compare prices and book international rail tickets at 'one stop' online**. Hence, a customer cannot even easily find out which train connections would potentially be available nor the expected price for the envisaged journey. Instead, passengers usually need to buy several tickets for one journey, navigating through a jungle of different websites in different languages. Why?

European law obliges transport operators **to share only some basic data**, such as static travel and traffic data, with other rail carriers or independent ticket vendors (1926/2017 Delegated Regulation of the Intelligent Transport Systems (ITS) Directive). The regulation does not cover fare data, and also leaves it open to member states to require dynamic travel and traffic data (e.g. information on platform numbers and changes, accurate seat plans, real-time delays and cancellations, predicted arrival time). These data are critical for a seamless journey and for passengers to be able to find alternative connections in case of disruptions.[65]

Some member states move beyond that regulation while others implement only the absolute minimum resulting in legal fragmentation across the EU. In Germany, for instance, Deutsche Bahn (DB) data on timetables and planned disruptions is open to ticket vendors, but not data on real-time platforms, real-time delays and cancellations, or next-day information on delays and cancellation (which is required for claiming compensation). The UK offers a positive example where static and dynamic service and fare data are shared with interested partners.

In addition to the lack of data sharing, each rail operator has built its own website for selling its tickets but often **without interfaces** that would allow for connecting to other operators' systems. Unfortunately, the trend is going in the wrong direction. In January 2020, SNCF stopped connecting its booking system with other train companies, and so did Eurostar. This means that SNCF tickets can no longer be booked on the DB website. Rail operators might also make **'during travel' information** accessible at least partially to consumers via their own apps. However, there are usually no interfaces between the systems, making it impossible for travellers to predict delays, search for re-routing, etc when using more than one carrier during their journey.[66]

The ticket counters of the major rail operator (e.g. DB) at the train station might have access to some tickets of other rail operators but personnel might not be trained to look for the cheapest or best connections. In some countries there are simply no 'in person' counters at rail stations. Sweden, for example, has switched almost completely to online booking.

Independent ticket vendors - online vendors like Trainline or Omio, or competent offline travel agencies - are emerging that specialise on this international market. However, Trainline can only sell tickets that the rail operators give them access to, and they only show connections on their website

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[65] Finger et al (2019). Towards EU-Wide Multimodal Ticketing and Payment Systems. https://fsr.eui.eu/towards-eu-wide-multimodal-ticketing-and-payment-systems/ (accessed 04 November 2020)

[66] European Commission (2019). Remaining challenges for EU-wide integrated ticketing and payment systems. https://op.europa.eu/en/publication-detail/-/publication/af05b3eb-df43-11e9-9c4e-01aa75ed71a1 (accessed 04 November 2020)

for which they can sell a ticket. Currently Trainline needs to enter into bilateral commercial agree-ments with every single railway operator (Trainline concluded 160 agreements so far).[67] Incumbent rail carriers are usually obliged to give basic access to ticket data due to competition law, but not to all relevant data. For example, they might only agree to provide access to standard fare (tickets) but not to reduced fares (offers, corporate fares, vouchers) or rail cards. This makes it difficult or impos-sible for independent ticket vendors to assemble their own products.

Recommendation

The EU should create the legal foundations for integrated **EU-wide ticketing and payment systems**. Consumers need to finally be able to book rail tickets for any connection in the EU via 'one-stop shops'. Such platforms should also cover multimodal journeys involving different modes of transport and operators.

To this end, the EU should **make access to dynamic data mandatory**, including fare data. Rail operators should share these essential data with other operators and ticket vendors in open Application Programming Interfaces (APIs), which should be in machine-readable format. Vendors should be able to define their own products and business models.

2.4.2   Measure #8: Passenger protection along the entire journey

A negative side-effect of buying several individual tickets from different rail operators for a multi-leg journey is that the **passengers bear the risk if a train connection is missed**. Since there are only a few direct international train connections between major European cities, this is a relevant concern for passengers.

A multi-leg journey with a single ticket contract and respective passenger rights for the entire travel chain is called a **'through ticket'**. Such tickets guarantee re-routing, assistance or compensation in case of travel disruption. Train carriers currently only offer such through tickets if they have reached a bilateral commercial agreement with the other carriers involved in the journey. They are not obliged by law to reach such agreements or to sell through tickets. The trend is also going in the wrong direction. Until 2019 it was possible to book a single through ticket from Berlin to London, with stopovers in Cologne and Brussels. Since Eurostar ended cooperation, passengers need to book three individual tickets with three different contracts – and with no right to rerouting if one of the connections is missed. Rail operators thereby bypass obligations relating to compensation, re-routing and assistance.

Trainline reports that for 99% of the tickets they sell such agreements do not exist.[68] They can thus offer only multiple ticket contracts to their customers – who bear the risk of missing connections.

The 2007 EU Rail Passenger Rights Regulation, which sets out some basic rights for rail passengers, is currently under review. The 2007 Regulation does not guarantee through tickets and 64% of trains are not covered by the Regulation because member states have made broad use of exemptions for regional services. The preliminary agreement on the revision reached by the Transport Committee

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[67] Expert interview
[68] Expert interview

of the European Parliament and the Council of Transport Ministers at the beginning of October 2020 is not promising in this respect: operators would only be obliged to sell through tickets covering all legs of journeys on routes operated by themselves or their wholly owned subsidiaries – but not for legs operated by other operators.[69] For example, on a trip from Lyon through Paris to Brussels, which involves both SNCF and Thalys, trains would not be covered, as SNCF owns only 70% of Thalys.

> **Recommendation**
>
> The EU should make it mandatory for rail companies to sell **through tickets**. Sold connections must be guaranteed to the final destination, with no exceptions for regional trains or force majeure.

3   Reviving night trains in Europe

Night trains can easily cover distances of up to 2,000km and are thus a key alternative for many intra-European flights. Night trains once made up a dense network of connections across all of Europe, including both domestic and international services.[70] But over the last few decades, most lines have been abandoned, especially in western Europe. Most night train services in France and Spain ceased in 2013. In 2014, the German DB still operated 17 night train lines (both domestic and international)[71] but closed down all lines in 2016. In the eastern EU member states, the density of night train services has decreased in recent years but is still greater than in western, northern and southern Europe. In Europe east of the EU, the night train network is still comparatively well established.
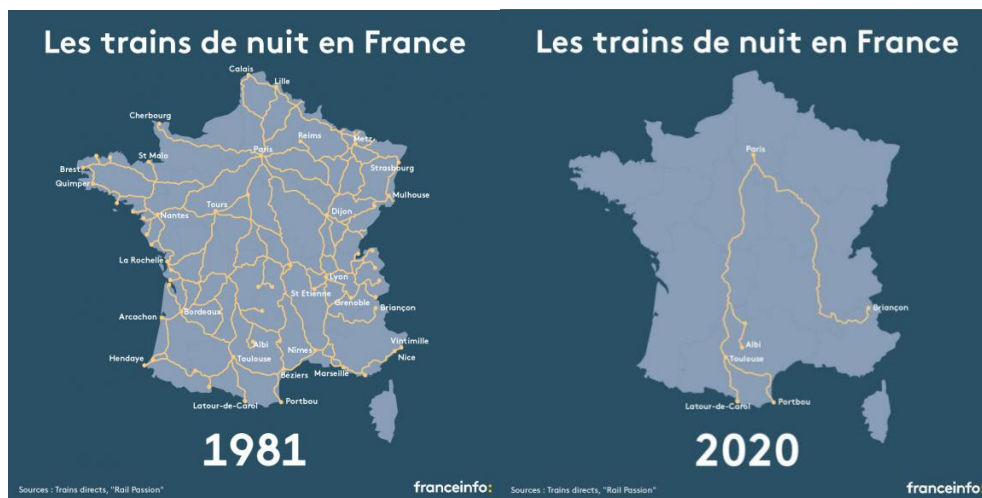

Figure 6: Night train connection in France 1981 vs 2020

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[69] Railway Gazette (2020). Passenger groups raise concerns about EU passenger rights recast. 2 October 2020. https://www.railwaygazette.com/policy/passenger-groups-raise-concerns-about-eu-passenger-rights-recast/57490.article (accessed 04 November 2020)

[70] Steer Davies Gleave supported by TRASPOL - Politecnico di Milano (2017). Research for TRAN Committee – Passenger night trains in Europe: the end of the line?. https://www.europarl.europa.eu/Reg-Data/etudes/STUD/2017/601977/IPOL_STU(2017)601977_EN.pdf (accessed 04 November 2020)

[71] Probst&Consorten (2014). Aktuelle Situation und Handlungsansätze zur Weiterentwicklung des Nachtreisezugverkehrs in Deutschland. http://www.nachtzug-retten.de/wp-content/uploads/2016/05/Studie-Nachtreisezugverkehr.compressed.pdf (accessed 04 November 2020)

The number of night trains has declined because of the increasing competition of low-cost airlines and coach services, the growing number of high-speed day services, and the general and partly growing difficulties that cross-border services are facing (interoperability, capacity management, track access charges and high taxes compared to other transport modes, booking, etc). Additionally, there are some specific difficulties related to night train services, as follows.

First, rolling stock is normally only used during night time, which means a **usage of about 12/24 hours versus 18/24 for day trains.** Since trains run overnight in both directions, the operator will need two compositions for a daily return service, whereas on short daytime journeys, one could make at least one return per day with one composition. In Russia, Ukraine and Belarus, double usage wagons are common, as trains cover longer distances.

Second, sleeping accommodation (couchette and sleeping compartments) means a **reduced number of passengers per carriage**.

Third, a **higher number of staff per passenger** is usually required. On day-time high-speed trains one service staff per 100-200 passengers is required, depending on the train's capacity. On night trains, in contrast, the ratio would typically be about 1 employee to 35 passengers, 1:70 for luxury accommodation, and 1:60 to 1:300 for couchettes. Also, staff work overnight require extra payments.

Fourth, night trains require **extra costs for cleaning, changing sheets**, etc.

Fifth, night trains typically cover longer distances than day trains, thus accumulating more kilometres of **track access charges**. While in some countries, reduced track access charges apply for night hours (e.g. 22:00 to 06:00), high mark-ups are often charged for the morning hours when night trains arrive at their destinations.

In sum, rolling material and staff on night trains on average serve fewer travellers than day trains, and night trains create extra costs which day trains do not need to cover.[72] Yet, the revenue generated by night trains is not usually higher than for a day service between two capitals. This is because customers have a rather fixed-price mindset for a trip between two European capitals, which is also driven by aviation. They are thus often not willing to pay a higher price for a night train connection.

One additional difficulty is the **availability of rolling stock.** Due to decades of underinvestment, the remaining rolling stock requires refurbishment. Sometimes this is only because it is old, sometimes because regulations change. For example, Austrian Federal Railways (ÖBB) ordered a new fleet to comply with new Italian fire regulations from March 2021 onwards. Purchasing new fleets is very costly because orders are usually limited to a small number of trains.

Yet there is some momentum behind the idea of reviving night trains. ÖBB took over some of the Deutsche Bahn night trains and is expanding its night train network. It has recently started a new connection to Brussels, it is starting Amsterdam-Vienna in December 2020, and plans on Amsterdam-Zürich in December 2021. Sweden wants to relaunch daily connections between Stockholm and Hamburg and Malmö and Brussels by summer 2022.[73] France announced it will restore two national connections by 2022. There are also new private operators (e.g. Alpen-Sylt-Nachtexpress or

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[72] Steer Davies Gleave supported by TRASPOL - Politecnico di Milano (2017). Research
for TRAN Committee – Passenger night trains in Europe: the end of the line?. https://www.europarl.europa.eu/RegData/etudes/STUD/2017/601977/IPOL_STU(2017)601977_EN.pdf (accessed 04 November 2020)

[73] Trafikverket (2020). Night train service to the European continent. https://www.trafikverket.se/contentassets/0037cd33ea7d4f6c824395c9927b09e2/summary-of-the-final-report-night-trains-to-the-european-continent.pdf (accessed 04 November 2020)

RegioJet for a new private night train between Czechia and Poland) that offer new night trains, which seem to be profitable even without state support.

Night trains must be an essential element of Europe's future mobility because they offer an alternative to many intra-EU flights and can cover larger distances than day trains. A one-night train can cover up to 2,000km, and even two-night trains (as in Russia) could be an option in the future. The EU and member state governments should foster and accelerate the already promising developments, and help operators to relaunch new night train connections across Europe.

Recommendations on night trains

Night trains should become an EU flagship project and a symbol for the rail renaissance. For reviving night trains, the most effective measures would be the following:

- Reduction of track access charges to at least direct cost levels, if not less.
- Fair taxation across transport modes, especially introduction of a kerosene tax.
- Start-up subsidy for new connections.
- Help to make rolling stock available.
- Improve searching and booking of tickets.

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4 Conclusions

The EU transport system stands at a crossroads. Over the past decades, transport GHG emissions have continued rising and current policy measures do not promise a major turnaround. Following the 'business-as-usual' pathway is thus not an option, as it would undermine the EU's target of reaching climate neutrality by 2050 at the latest. Instead, the EU needs to completely transform mobility, and rail has a major role to play in this change. Rail is already a low-carbon mode of travel, and offers great potential to bring Europe closer together.

The 2021 European Year of Rail, coming at a moment when the EU is starting its recovery programmes, and at the start of implementation of the European Green Deal, offers a window of opportunity for bringing the European rail system up to speed. The right decisions need to be taken now in terms of public spending but also in terms of regulations, so as to avoid further lock-ins into high-carbon transport modes.

In order to turn rail into the backbone of Europe's future transport system, the EU should create a dense network of rail services across Europe, revise transport taxes and infrastructure charges to create the right price signals, and make rail travel more convenient for passengers. This would improve domestic and international rail services and incentivise a modal shift away from road and air travel. A revival of long-distance international day and night trains could become a flagship project of the EU, and become a symbol of a renaissance of rail.

The following eight measures are necessary for triggering the rail renaissance in Europe:

Goal	Measure	How?
Boost infrastructure capacity	#1: Start a European investment initiative for strengthening rail infrastructure and closing missing links	Use EU transport budget and recovery funding for closing cross-border links, and for short term capacity improvements
	#2: Make more efficient use of existing infrastructure	Entrust the European Railway Agency (ERA) with traffic control Roll out European signalling system on cross-border routes and core corridors Investigate further options to increase capacity in the short run
Create a truly European rail service	#3: Support the launch of international services (day and night)	Entrust ERA with demand forecast and corridor coordination Build EU rolling stock pool Provide start-up funding for new international lines
	#4: Improve coordination and planning of international services	Entrust ERA with capacity allocation on international corridors
Get the price right	#5: Make transport taxes fair	Introduce a kerosene tax Full auctioning of ETS allowances for aviation VAT on flight tickets
	#6: Make infrastructure charges fair	Reduce track access charges to direct costs only Comprehensive road infrastructure charges
Make rail travel convenient	#7: Allow for one-stop booking platforms	Oblige rail operators to share static and dynamic data
	#8: Guarantee passenger rights along the entire travel chain	Make through ticketing mandatory

Table 3: Necessary measures for triggering the rail renaissance in Europe

Germanwatch

Following the motto of *Observing. Analysing. Acting.* Germanwatch has been actively promoting global equity and livelihood preservation since 1991. We focus on the politics and economics of the Global North and their worldwide consequences. The situation of marginalised people in the Global South is the starting point for our work. Together with our members and supporters, and with other actors in civil society, we strive to serve as a strong lobbying force for sustainable development. We aim to achieve our goals by advocating for the prevention of dangerous climate change and its negative impacts, for guaranteeing food security, and for corporate compliance with human rights standards.

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