

Long-distance cross-border passenger rail services

Final report

Study Contract

MOVE/2020/OP/0013

Written by Steer and KCW
October – *2021*

steer

kcw

EUROPEAN COMMISSION

Directorate-General for Mobility and Transport
Directorate C - Land
Unit C3 – Single European Rail Area

Contact: Maurizio Castelletti (Head of Unit), Nino Zambara (Policy Officer)

E-mail: *maurizio.castelletti@ec.europa.eu*
nino.zambara@ec.europa.eu

European Commission

B-1049 Brussels

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steer kcw

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Final Report
October 2021

Long-distance cross-border rail passenger services

Prepared by:

Steer
28-32 Upper Ground
London SE1 9PD
United Kingdom

+44 20 7910 5000
www.steergroup.com

Prepared for:

European Commission
Directorate-General for Mobility and Transport
Directorate C Land
Unit C3 Single European Rail Area

Client ref: MOVE/2020/OP/0013
Our ref: 23897101

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Credits

Annex divider photograph: Tony Walmsley

Glossary

This glossary provides details of terms which have a specific meaning in European legislation, have been assigned a specific meaning for the purposes of this report, or are examples of particular technologies relevant to this report.

Term	Meaning in this report	Origin
Agreement on Journey Continuation (AJC)	"Agreement concerning Journey Continuation in respect of International Passenger Traffic by Rail (AJC)", a 2017 agreement in which railway undertakings commit themselves to take action to support international passengers in the event of disruption to their journeys as a consequence of delay or cancellation.	The International Rail Transport Committee (CIT)
Application Programming Interface (API)	A software intermediary that allows communications between two applications.	
Assistance	Assistance provided in the event of delays, missed connections and cancellations.	Regulation (EU) 2021/782, Article 20
Broken connection	A situation where the delay or cancellation of one or more services, or of the departure of a service before the scheduled departure time, reduces the interval between arriving and departing services below the minimum connecting time. Note that a broken connection does not necessarily mean that a passenger fails to connect between the services.	Study team, see paragraph 5.23
Compensation	Compensation in the event of delays, missed connections and cancellations.	Regulation (EU) 2021/782, Article 19
Competent authority	Any public authority or group of public authorities of a Member State or Member States which has the power to intervene in public passenger transport in a given geographical area or any body vested with such authority.	Regulation (EC) 1370/2007, Article 2
Competent local authority	Any competent authority whose geographical area of competence is not national.	Regulation (EC) 1370/2007, Article 2
Connecting Europe Facility (CEF)	A key EU funding instrument to promote growth, jobs and competitiveness through targeted infrastructure investment at European level.	https://ec.europa.eu/inea/en/connecting-europe-facility
Couchette	A bed on a train which, during the day, is folded against the wall or used as seats.	
Cross-border train	A train service crossing national borders between EU Member States or between a Member State and a third country, where the principal purpose of the service is to carry passengers between stations located in different Member States or third countries.	Agreed for this study, see Table 3.1
End-to-end fare	A "non-interavailable" fare, not valid on all trains or combinations of trains. These fares allow passengers to choose a specific railway undertaking or service in exchange for a lower fare.	Study team, see paragraphs 5.47 to 5.49

Term	Meaning in this report	Origin
End-to-end ticket	A ticket or tickets for successive railway services operated by one or more railway undertakings. An end-to-end ticket may represent an end-to-end fare or a station-to-station fare. An end-to-end ticket which is a single transport contract and is between a railway undertaking and a passenger is also a through-ticket. Note that stakeholders reported as referring to an end-to-end ticket may not be aware of this definition.	Study team, see paragraph N.15
EU-27	The 27 Member States of the European Union since 1 February 2020.	https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Glossary:EU_enlargements
European Railway Traffic Management System (ERTMS)	The European standard for the Automatic Train Protection (ATP) and command and control systems. It creates an interoperable railway system in Europe that is more efficient and safer. It contributes to making rail operation between the Member States much easier and is an essential element of the Single European Railway Area.	https://ec.europa.eu/transport/modes/rail/ertms_en
European Train Control System (ETCS)	The signalling and control component of the European Rail Traffic Management System (ERTMS). ETCS is a replacement for legacy train protection systems and designed to replace the many incompatible safety systems currently used by European railways. ETCS has also been adopted outside Europe.	
Fair, reasonable and non-discriminatory (FRAND)	An approach to licensing intended to create a level playing field enabling all interested parties to make use of intellectual property.	
FAIRTIQ	A system, in use throughout Switzerland, in which passenger fares are calculated by tracking the movement of their mobile phone and matching it to journeys on public transport.	https://fairtiq.com/en-ch/
Fictive network	A hypothetical future night train network, connecting the European Union, Norway, Switzerland and the United Kingdom, based on realistic assumptions.	Study Technical Specifications, Task 3.2.1.2
General rule	Public service obligations (PSOs) which aim at establishing maximum tariffs for all passengers or for certain categories of passenger may also be the subject of general rules. [], the competent authority shall compensate the public service operators for the net financial effect, positive or negative, on costs incurred and revenues generated in complying with the tariff obligations established through general rules in a way that prevents overcompensation.	Regulation (EC) 1370/2007, Article 3(2)

Term	Meaning in this report	Origin
Generalised journey time (GJT)	A concept developed in the railway industry in Great Britain since the 1970s to represent the overall timetable related service quality of a train service. GJT includes station-to-station journey time, including any time involved in interchange; a frequency penalty, reflecting the inconvenience of not being able to travel at the desired time; and a penalty for each change of train during the journey.	
High-speed line	A line specially built to allow traffic to travel at speeds generally equal to or greater than 250 km/h on its main segments; it may include connecting segments where speeds are reduced to take account of local conditions.	Commission Implementing Regulation (EU) 2015/1100, Article 2
High-speed services	Rail passenger services provided by high-speed rolling stock, including tilting trains, that travel at least 200 km/h for at least part of the service; the use of high-speed infrastructure is not always necessary.	Commission Implementing Regulation (EU) 2015/1100, Article 2
Infrastructure manager	Any body or firm responsible in particular for establishing, managing and maintaining railway infrastructure, including traffic management and control-command and signalling; the functions of the infrastructure manager on a network or part of a network may be allocated to different bodies or firms.	Directive 2012/34/EU, Article 3
Integrated ticketing	The purchase of a single ticket that allows passengers to travel using different modes of transport provided by one or more operators. or Combining all transport methods in one single ticket.	Integrated Ticketing on long-distance passenger transport services, for European Parliament TRAN Committee
Interavailable ticket	A ticket valid on all trains or combinations of trains of two or more railway undertakings between two stations or zones or within a defined area. These tickets allow passengers a wider choice of railway undertakings, but at the same price, whichever train is actually used.	Study team
Long-distance rail passenger service	A rail passenger service which is not an urban and suburban or a regional service. This excludes (as defined below): • urban and suburban services, whose principal purpose is to meet the transport needs of an urban centre or conurbation, including a cross- border conurbation, together with transport needs between such a centre or conurbation and surrounding areas; or • regional services, whose principal purpose is to meet the transport needs of a region, including a cross-border region.	Regulation (EU) 2021/782, Article 3
MaaS	Mobility-as-a-Service, the integration of various forms of transport services into a single mobility service accessible on demand.	https://maas-alliance.eu/homepage/what-is-maas/
Mark-up	An infrastructure charge over and above the cost that is directly incurred as a result of operating the train service. Note that mark-ups are not normally identified in charges.	Directive 2012/34/EU, Article 32

Term	Meaning in this report	Origin
Market segments	When levying mark-ups, distinct market segments should be defined by the infrastructure manager where the costs of providing the transport services, their market prices or their requirements for service quality differ considerably. Annex VI to the Directive includes a list of pairs of market segments to be considered by infrastructure managers.	Directive 2012/34/EU
Minimum Access Package	A minimum set of services to be provided by infrastructure managers to railway undertakings in a non-discriminatory manner.	Directive 2012/34/EU, Annex II
Missed connection	A situation where a passenger misses one or more services in the course of a rail journey, sold in the form of a through-ticket, as a result of the delay or cancellation of one or more previous services, or of the departure of a service before the scheduled departure time. Note that stakeholders reported as referring to a missed connection may not be aware of this definition.	Regulation (EU) 2021/782, Article 3
National Access Point (NAP)	A single point of access for users to at least the static travel and traffic data and historic traffic data of different transport modes, including data updates, [], provided by the transport authorities, transport operators, infrastructure managers or transport on demand service providers within the territory of a given Member State.	Regulation (EU) 2017/1926, Article 3
New ticketing technologies	New and future forms of ticketing including, but not limited to, FAIRTIQ, MaaS, QR codes, Pay As You Go and smartcards.	
Night train	Any train consisting partly or wholly of night train rolling stock.	Agreed for this study, see Table 3.1
Night train rolling stock	Rail vehicles dedicated to, or reconfigured for, overnight travel.	Agreed for this study, see Table 3.1
NUTS	Nomenclature of Territorial Units for Statistics.	
Open Sales and Distribution Model (OSDM)	A standard interface between railway undertakings offering tickets for sale and other parties wishing to sell them, jointly managed by UIC, railway companies and ticket vendors. OSDM is expected to be rolled out during 2021.	
Overnight service	Any train, not consisting partly or wholly of night train rolling stock, which is in operation from before 02:00 to after 02:59.	Agreed for this study, see Table 3.1
Passenger Demand Forecasting Handbook (PDFH)	A document developed and managed by the rail industry in Great Britain, which summarises over twenty years of research on rail demand forecasting, providing guidance on aspects such as the effects of service quality, fares and external factors on rail demand.	https://www.raildeliverygroup.com/pdfc/about-the-pdfh.html
Pay As You Go (PAYG)	A system, in use in London, by which passengers can pay for any public transport journey on demand by touching a smartcard or any contactless, credit card, debit card or other device on a reader.	https://tfl.gov.uk/fares/how-to-pay-and-where-to-buy-tickets-and-oyster/pay-as-you-go

Term	Meaning in this report	Origin
Public Service Contract (PSC)	One or more legally binding acts confirming the agreement between a competent authority and a public service operator to entrust to that public service operator the management and operation of public passenger transport services subject to public service obligations; depending on the law of the Member State, the contract may also consist of a decision adopted by the competent authority: • taking the form of an individual legislative or regulatory act, or • containing conditions under which the competent authority itself provides the services or entrusts the provision of such services to an internal operator.	Regulation (EC) 1370/2007, Article 3
Public Service Obligation (PSO)	A requirement defined or determined by a competent authority in order to ensure public passenger transport services in the general interest that an operator, if it were considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions without reward.	Regulation (EC) 1370/2007, Article 3
QR code	A two-dimensional pattern of black squares arranged in a square grid on a white background, displayed on paper or on the screen of a mobile device, which can be read and interpreted to provide information, including ticketing information.	
Rail Freight Corridor (RFC)	All designated railway lines, including railway ferry lines, on the territory of or between Member States, and, where appropriate, European third countries, linking two or more terminals, along a principal route and, where appropriate, diversionary routes and sections connecting them, including the railway infrastructure and its equipment and relevant rail services in accordance with Article 5 of Directive 2001/14/EC.	Regulation (EU) 913/2010, Article 2(2)
Rail Passenger Corridor (RPC)	A proposal for passenger corridors with functions similar to those of Rail Freight Corridors.	
Railway undertaking	Any public or private undertaking licensed according to this Directive, the principal business of which is to provide services for the transport of goods and/or passengers by rail with a requirement that the undertaking ensure traction; this also includes undertakings which provide traction only.	Directive 2012/34/EU, Article 3
Regional service	Transport services whose principal purpose is to meet the transport needs of a region, including a cross-border region.	Directive 2012/34/EU, Article 3
Reimbursement	Reimbursement in the event of delays, missed connections and cancellations.	Regulation (EU) 2021/782, Article 18
Re-routing	Re-routing in the event of delays, missed connections and cancellations.	Regulation (EU) 2021/782, Article 18
Season ticket (or travel pass)	A ticket for an unlimited number of journeys which provides the authorised holder with rail travel on a particular route or network during a specified period.	Regulation (EU) 2021/782, Article 3
Single commercial transaction	Purchase of two or more tickets in a single transaction between a passenger and another party.	Regulation (EU) 2021/782, Article 12

Term	Meaning in this report	Origin
Sleeping car	A railway vehicle with beds for passengers to sleep in.	
Smartcard	A credit card-sized card with an embedded integrated circuit (IC) chip, with metal contacts and/or contactless connection to a reading device. Smart cards can provide personal identification, authentication, data storage and application processing, including ticketing.	
Station-to-station fare	An interavailable fare, valid on all trains or combinations of trains. These fares allow passengers a wider choice of trains, but no option to seek a railway undertaking offering lower fares.	Study team,
Structure gauge	The minimum height and width of platforms, tunnels, bridges and other structures to provide clearance around a train. Structure gauges vary by network and sometimes also by route. Trains, and hence the structure gauge, are often larger in Scandinavia and smallest in Great Britain.	
Takt	A regular interval timetable, but also the philosophy of planning a future Takt timetable in consultation with stakeholders and then putting in place the infrastructure and rolling stock required to operate it reliably.	
Technical Specifications for Interoperability (TSIs)	Technical and operational standards which must be met by each subsystem or part of subsystem in order to meet the essential requirements and ensure the interoperability of the railway system of the European Union.	Directive (EU) 2016/797
Ticket	Valid evidence, regardless of its form, of the conclusion of a transport contract. Note that stakeholders reported as referring to a ticket may not be aware of this definition.	Regulation (EU) 2021/782, Article 3
Through-ticket	A ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings. A through-ticket must represent a transport contract and must therefore be issued by a railway undertaking. Note that stakeholders reported as referring to a through-ticket may not be aware of this definition.	Directive (EU) 2016/2370, Article 1
Track gauge	The spacing of the rails on a railway track, measured between the inner faces of the load-bearing rails. There are four track gauges on the mainline networks in the study area: • 1435 mm, the standard gauge; • 1520 mm, the Russian gauge, in Estonia, Finland, Latvia and Lithuania; • 1600 mm, the Irish gauge, in Ireland and Northern Ireland; and • 1668 mm, the Iberian gauge, in Spain and Portugal.	
Train diagram	The complete activity of a locomotive, train or train crew from the start to the end of the working day. “Closed” diagrams complete an even number of journeys over a relevant period, such as a day or a week, so that resources end that period at their starting point.	See paragraph L.77

Term	Meaning in this report	Origin
Train pair	Two trains travelling in opposite directions, normally between the same two stations and calling at the same intermediate stations.	
Train path	A single end-to-end journey offered to railway undertakings by an infrastructure manager.	See paragraph L.77
Transmodel	An abstract model of common public transport concepts and data structures that can be used to build many different kinds of public transport information system, including timetabling, fares, operational management, real time data, journey planning.	http://www.transmodel-cen.eu
Transport contract	A contract of rail carriage for reward or free of charge between a railway undertaking and a passenger for the provision of one or more transport services. Note that only a railway undertaking can be a passenger's counterparty to a transport contract.	Regulation (EU) 2021/782, Article 3
Urban and suburban services	Transport services whose principal purpose is to meet the transport needs of an urban centre or conurbation, including a cross- border conurbation, together with transport needs between such a centre or conurbation and surrounding areas.	Directive 2012/34/EU, Article 3

Source: European legislation, desk research, Steer and KCW analysis.

Executive Summary

Overview

The European Green Deal includes a commitment for Europe to be the first climate-neutral continent by 2050. In December 2020, the Commission published its Sustainable and Smart Mobility Strategy, which identified a need for decisive action to shift more activity towards more sustainable transport modes, notably increasing the number of passengers travelling by rail. The European Parliament has asked the Commission to assess how cross-border night train services can be promoted.

The Commission has therefore commissioned this study to provide further insights into long-distance cross-border rail services, obstacles to the establishment, operation and greater use of rail services, and potential actions to remove these obstacles.

Long-distance cross-border rail since 2001

The total number of long-distance cross-border rail services in the study area, the EU, Norway, Switzerland and the United Kingdom, appears to have changed little since 2001, with around 4,500 train pairs per week, but within this total there have been two major changes:

- There was a pronounced shift from night trains (down 65%) to high-speed trains (up 95%), which may have made some journeys too brief by day for a dedicated night train to remain viable.
- The number of routes served has declined, with a focus on more frequent services on core routes, which have less splitting and joining of trains to serve two or more destinations.

Cross-border travel within the study area by public transport immediately before the COVID-19 pandemic was mainly by air, with rail and coach only carrying around 10% of public transport passengers each. Only 6-7% of total passenger journeys and passenger-kilometres involve crossing one or more borders. Only a proportion of these cross-border rail passenger journeys are on long-distance services, and only a small proportion of those on long-distance cross-border services are on night trains.

The data available suggests that the rate of growth of long-distance cross-border passenger numbers may be slowing, from around 2.1% per annum from 2005 to 2010 to a forecast 1.6% per annum for the period 2020 to 2030.

Since 2001, railway undertakings have adopted several new commercial models. Many of them face competitive pressures to reduce costs, and some have adopted elements of the approaches used by low-cost airlines. However, there appears to be only limited scope to introduce low-cost rail services, particularly given the importance of en-route infrastructure charges in the costs of rail operations, especially on high-speed lines.

Long-distance cross-border rail market potential

The study has been carried out during the COVID-19 pandemic, which has affected both services and demand since early 2020, and may result in lasting changes in demand, particularly for cross-border business travel. Nonetheless, during 2021:

- National railways, competent transport authorities and commercial operators have put forward proposals for new commercial and PSO cross-border night trains on several routes, although not all of the routes announced during 2021 have yet begun operations.

- Member States have put forward proposals for new cross-border day trains including, in May 2021, a "TEE 2.0" network of long-distance cross-border services and coordination of Europe's rail services as a "Europatakt" regular interval timetable.

Where possible, these emerging proposals have been taken into account in this study.

Meanwhile, passenger attitudes to rail and to other modes continue to evolve, and some governments have introduced initiatives to ban or restrict short domestic flights.

For **long-distance cross-border night trains**, little information is available on existing passenger numbers, revenue or profitability, but good information exists on cross-border air connections on which rail could, in principle, successfully compete. We found 8 existing proposals for new night train services, all of which parallel dense air flows. We identified a further 16-17 potential origin-destination pairs where there might be sufficient demand to support a night train, and assumed that they could be combined into a fictive network of 11 routes. These 11 additional routes could require 170-250 couchette and sleeping cars and cost €90-135 million per annum to operate, but we estimate that they might attract a further 2-5 million passengers per year to rail. If operated daily, they would restore one-fifth of the volume of night trains lost since 2001.

We are aware that more potential routes for night trains may emerge if demand grows, for example due to changing passenger attitudes. However, the introduction of a larger number of new night train services might prove to be difficult without either additional capacity, or reallocation of existing capacity, in many city centre stations, as discussed below. In this situation, the obstacle of **commercial, economic, social and environmental viability** may be superseded by an obstacle of **infrastructure capacity and capacity allocation**.

For **long-distance cross-border day trains**, it is more difficult to estimate what additional services might be viable, partly because of the lack of passenger data, and partly because proposals for new services have emerged and been withdrawn as the study has progressed. We estimated that 27 new long-distance cross-border train pairs might attract an additional 1 million cross-border passengers. Depending on whether these were additional to existing services, rather than existing services joined together to create cross-border routes, they could require up to 400-500 vehicles, mainly in 7-10 car high-speed train sets, and cost up to €0.5 billion per annum to operate.

The **financial viability** of these services will vary. Over any distance, sleeping accommodation on night trains appears to cost more to provide than seats on aircraft, coaches and other trains. Over short distances, seats in conventional-speed trains operating by day or night can cost less to provide than some air services. There is insufficient data on passenger demand to estimate which new services could generate sufficient net passenger revenue to cover their costs and which would require PSO support.

Higher prices for carbon-based fuels, or higher taxes on them at the global, European or national level, would negatively impact the costs of other modes. Conversely, rail can be subsidised in recognition of its potential environmental benefits relative to other modes, considering its high level of electrification. We note that changes to taxation or subsidy of different fuels and different transport modes are being considered as policy measures at the European level and in many states.

Obstacles to long-distance cross-border rail

While there is uncertainty in the scope for, and cost and viability of, long-distance cross-border rail services, there was broad consensus among the stakeholders we contacted on the range of obstacles to their expansion.

Infrastructure charges vary widely, and in many cases are much higher than "the cost that is directly incurred as a result of operating the train service". The legislative framework only permits charging more than this cost where it does not "exclude the use of infrastructure by market segments which can pay" it. However, many stakeholders said that services which could be operated commercially are excluded by charges which are more than they can pay. At present, infrastructure managers are permitted to set higher charges for cross-border services than for domestic services. High charges act as a barrier to entry and can leave expensive infrastructure capacity unused. Lower infrastructure charges would not necessarily result in lower fares, but could attract new entrants and price competition, at least where regulatory bodies did not decide that they would compromise the economic equilibrium of one or more PSO services.

Infrastructure capacity depends on the configuration of the network, the speed and stopping pattern of each rail service, whether they need to operate at regular intervals, how they are timetabled around each other, and whether there is a need to provide connections between them. Changes planned by 2030 may increase rail connections, speeds or capacity, but this does not mean that suitable capacity will be available for any particular proposed long-distance cross-border service. Constraints at many city centre stations may limit the scope to operate additional long-distance cross-border trains, and particularly night trains which typically arrive in the morning commuter peak. In addition, night trains, or individual stops on night train routes, may also cease to be viable where new links and high-speed lines offer such short journey times by day that there is too little remaining demand for travel overnight. In some cases, infrastructure capacity may be available at one to two years' notice, but in others, capacity enhancements may take a decade or more. Where capacity is constrained, domestic PSO services are often prioritised ahead of long-distance cross-border services.

Rolling stock will also be needed to operate additional cross-border services, and lack of suitable rolling stock is an obstacle to introducing them. For night trains, around 1,500 couchette and sleeping cars exist, but second hand stock may be in poor condition or otherwise unattractive to passengers, and few new vehicles have recently been ordered. It can be difficult to raise finance to buy more new rolling stock to provide services in a new market. In contrast, airlines and coach operators can use leased aircraft or coaches to test new routes for short periods and, if these are not successful, return them or try elsewhere.

Ticketing systems are necessary for passengers to research travel, to buy tickets and to make reservations, and to provide evidence to railway undertakings that passengers are entitled to travel on their services. Railway undertakings and ticket vendors cannot always sell end-to-end long-distance cross-border journeys to passengers, or enable them to book successive railway services operated by one or several railway undertakings. In some cases, a passenger can buy a single ticket valid on any combination of trains, by any mix of railway undertakings, between any two stations. In other cases, booking successive railway services operated by railway undertakings in the same group requires two transactions. This is partly a reflection of the tension between integration and competition. Ticket vendors can often sell two or more fares as a single transaction, but only railway undertakings and competent transport authorities can

create fares for connecting services, where there is sufficient market demand to do so, and where permitted by competition authorities.

In principle, a long-distance cross-border journey on the services of two or more operators can be offered for a market-priced end-to-end fare which is less than the sum of their separate fares. In practice, the end-to-end fare is sometimes more than the cheapest combination of separate fares. In addition, most long-distance cross-border markets may be too small for it to be worth one or more operators setting and sharing a special end-to-end fare.

Passenger rights in relation to successive railway services operated by one or more railway undertakings are technically complex. The new rail passenger rights Regulation (EU) 2021/782 creates requirements to offer through-tickets, and rights for passengers who hold them, but some stakeholders have noted that through-tickets can be more expensive than a combination of tickets offered at special fares, making them less attractive to passengers.

In 2018, less than 80% of EU27 long-distance and high-speed passenger services were operated and arrived less than five minutes late. Passengers making journeys requiring changes of train are often concerned at what will happen if, for whatever reason, they fail to make the connection onto one or more of the trains on which they intended, or are booked, to travel. Railway systems often do not allow railway undertakings to identify passengers holding tickets for connecting journeys, or to hold connections for passengers whose train is delayed. Delaying departures can disrupt services, and result in missed or broken connections for other passengers.

It is legally and technically complex to link separate tickets including season tickets, smartcards, Pay As You Go (PAYG) and other new technologies into a single contract, and then to assign liability for missed connections. Even if one party were made liable, many trains and stations have no passenger-facing staff, and many passengers must use their own initiative to deal with a missed connection.

Passengers may base their expectations on their perception of air travel, but all airports have passenger-facing staff who can provide assistance, all airlines have the name of every passenger and know whether they and their baggage are on board but not all airlines offer connections as a single transaction, ticket, contract and fare.

There has been extensive investment in railway infrastructure and rolling stock to reduce journey times, but the benefits may be lost for connecting passengers who, for whatever reason, fail to complete a connection and reach their destination later than expected and, in some cases, after additional expense and inconvenience. Railway undertakings cannot realistically operate a service in which no trains ever arrive late. However, the stress and risk of changing trains could be reduced by giving passengers clearer information on minimum connecting times within and between stations, and wider provision for passengers to specify longer connecting times.

Unless the punctuality and reliability of rail services reaches much higher levels, the most effective way to improve passengers' experience of, and confidence in, connections may be clearer information on minimum connecting times within and between stations, and wider functionality in journey planners and ticketing and reservation systems for passengers to specify longer connecting times.

PSOs for cross-border services which are not or could not be delivered commercially could in principle specify the entire service on a consistent basis, with railway undertakings receiving

support for a PSO package service, with cross-subsidy between profitable and unprofitable seasons, days, times of day and station calls, but there are significant barriers to doing so. Many existing PSOs have been awarded directly, but from December 2023 they will have to be tendered competitively by competent authorities. Many competent authorities are constrained by the powers granted to them in national, regional and local legislation, and are often subject to democratic control of where and how they spend their resources. Competent authorities wishing to specify a PSO for a cross-border service may need to deal with local consultation and administrative processes operating in different timescales, in different locations, in two or more languages. Competent authorities may not provide PSO support on sections of route served by commercial services, or near or across borders. Some competent authorities favour gross cost contracts and others favour net cost contracts, in some cases explicitly combining loss-making services with profitable ones which cross-subsidise them. This creates a need for agreed processes to allocate costs and revenues to particular services, competent authorities or railway undertakings.

Technical, operational and safety obstacles to cross-border operations remain. Differences in electrification systems can be dealt with by multi-system locomotives and trains, but there is a limit to the number of different systems that can be accommodated within a locomotive or fixed-formation train set. Differences in track and structure gauge can be managed with stock with gauge-changing equipment and smaller dimensions, and standard gauge high-speed lines are extending into Spain, with the Iberian gauge, and the Baltic states, with the Russian gauge. Many other technical differences are being addressed through Technical Specifications for Interoperability (TSIs), but in some cases existing assets, systems and procedures can only be made compliant when they become due for renewal. However, the European Train Control System (ETCS), intended to be a single common system, in the short term can act as an additional system which is required for only a short part of a journey. A trend to fixed-formation trains, with a wide variety of incompatible coupling and other systems, and different technical requirements on each network, can make it increasingly difficult for a single train to be split into portions to different destinations.

European railway policy has emphasised a level playing field for access and charges based on costs directly incurred, but in practice permits prioritisation and different infrastructure charges for different market segments, even if they impose the same costs. Increasing congestion undermines the vision of new entrants requesting capacity and starting services in the timetable 12-18 months later. The timetable operated at points where the network is congested or constrained is often planned many years in advance, particularly where investment to address congestion has been justified by a commitment to specific PSO services. Many networks, including the largest, in Germany, are moving to regular interval, clockface or “Takt” timetables, in which a future timetable is designed by consensus and then the infrastructure and trains needed to operate it are built. The “Takt” approach of centralised long-term planning can, depending on the levels of capacity utilisation which are planned, make it difficult to make major changes or to accommodate new entry at short notice.

Potential measures to remove obstacles

The table below lists current practice or potential measures to address these obstacles.

Obstacle	Practice or potential measure	
Infrastructure charges	Ensure that infrastructure charges are set at the cost directly incurred	IC1
	Fix charges for a relevant period, with increases phased	IC2
	Compensate railway undertakings which cannot operate services due to works or closures	IC3
	Analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services	IC4
	Wider reform of infrastructure charging with the objective of meeting economy-wide climate neutrality	IC5
Capacity and capacity allocation	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables	CA1
	Ensure further implementation of the European Train Control System (ETCS)	CA2
	Explicitly permit capacity allocation to be based on social or environmental value	CA3
	Offer more framework agreements for long-distance cross-border services	CA4
	Complete and refine the international Timetabling Process (TTR)	CA5
	Develop hubs for long-distance cross-border trains	CA6
	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality	CA7
Rolling stock	Require that unused stock be offered for auction	RS1
	Public sector guarantees to limit risks to leasing companies	RS2
	Ensure non-discrimination in rolling stock leasing prices	RS3
	Consider wider EU and/or EIB co-financing of cross-border rolling stock	RS4
Ticketing and rights for connecting passengers	Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)	TP1
	Define and publish minimum connecting times within and between stations	TP2
	Offer passengers the option to request longer connecting times	TP3
	Use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible	TP4
	Record and publish delays and their attribution to causes and parties	TP5
	Revise Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom	TP6
	Reform the regulatory framework for passenger rights for all modes	TP7
Creating cross-border PSOs	Use PSOs for long-distance cross-border services to improve financeability	PS1
	Ensure that long-distance cross-border PSO services are specified in full	PS2
	Provide start-up funding support for new long-distance cross-border services	PS3
Data collection, reporting and monitoring	Extend reporting requirements, for example to RMMS	DA1
	Create an open industry database of ticket sales	DA2
Other proposals	Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality	OP1

Source: Steer. For further details see Chapter 6.

1 Introduction

Background

1.1 The **European Green Deal** includes a commitment for Europe to be the first climate-neutral continent by 2050. In December 2020, the Commission published its Sustainable and Smart Mobility Strategy, which identified a need for decisive action to shift more activity towards more sustainable transport modes, notably increasing the number of passengers travelling by rail[1]. The European Parliament has asked the Commission to assess how cross-border night train services can be promoted.

1.2 The Commission requires a wide-ranging but rapid study of possible improvements to cross-border rail services, obstacles to the establishment, operation and greater use of rail services, and proposals to remove them.

1.3 In 2017, Steer prepared a study on night trains at the request of the European Parliament[2]. The current study is intended to go one step further and to propose concrete initiatives to address key obstacles to long-distance cross-border passenger rail services, including night trains, within the study area of the EU, Norway, Switzerland and the United Kingdom.

1.4 Long-distance cross-border services face several challenges:

- International passenger services were liberalised in December 2009, but few new international services have appeared.
- The provision of night trains has declined, notably in 2016, when Deutsche Bahn (DB) closed its City Night Line network of domestic and cross-border night trains.
- The fourth railway package is now coming into effect, liberalising domestic rail services. The effects may be limited, but no mechanisms have been put in place to constrain domestic liberalisation to ensure that capacity remains available for cross-border services, either by day or by night. There is a risk that increasing congestion, and prioritisation of domestic services, make it difficult to introduce new cross-border services.
- Despite the technical pillar of the fourth railway package, technical, operational and administrative barriers to cross-border operation persist.
- The COVID-19 pandemic means that future services and demand are uncertain, at least in the short to medium term. The Commission envisages a study horizon to 2030.

1.5 Nonetheless, during 2021 many proposals have been put forward for new long-distance cross-border trains, some of which we discuss in this report.

[1] Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Sustainable and Smart Mobility Strategy – putting European transport on track for the future, {SWD(2020) 331 final} (2020)

[2] **https://www.europarl.europa.eu/thinktank/en/document.html?reference=IPOL_STU(2017)601977**

Study objectives and requirements

1.6 The objective of the study is to assess the main obstacles for the further development of long-distance cross-border and night train services in Europe, to devise measures to overcome these obstacles and to carry out a preliminary assessment of them.

1.7 The key study requirements are to:

- identify the indicative scope for increasing the network of cross-border day and night trains in the study area;
- estimate the indicative costs, passenger numbers, revenues and possible support or subsidy requirements of such a network;
- identify ways of improving ticketing for all rail passengers, with the vision of a clear price, a single transaction, and passenger rights related to missed connections, for any station-to-station journey within the study area;
- identify obstacles to achieving these objectives, devise measures to remove these obstacles, and carry out a preliminary assessment of the most promising measures; and
- present the results to a one-day study conference.

1.8 The findings of this study will be used to inform the Commission's forthcoming action plan, due later in 2021, to boost long-distance and cross-border passenger rail services.

Structure of this report

1.9 The Commission's Technical Specification set out a list of tasks:

- description and analysis of long-distance cross-border passenger services, including cross-border night train services and their commercial and operational aspects;
- identification and analysis of obstacles hampering future development of cross-border services including cross-border night train services;
- identification of measures to remove obstacles;
- preliminary assessment of the most promising measures; and
- organisation and management of a conference on the results of the study.

1.10 This report sets out the findings from Tasks 3.1 to 3.4 and provides further detail on our approach to Task 3.5. The Technical Specifications requested that the main text of this report should not exceed around 75 pages. To enable a concise and free-flowing structure, the main report does not rigidly follow the sequence of Tasks and sub-Tasks, but Annex A describes where each Task and sub-Task is dealt with in the report and other Annexes.

1.11 The remainder of this report is structured as follows:

- Chapter 2 provides an overview of the study approach.
- Chapter 3 describes our review of the long-distance cross-border rail passenger market.
- Chapter 4 describes our assessment of the market potential.
- Chapter 5 identifies obstacles.
- Chapter 6 identifies and examines potential measures to address the obstacles.
- Chapter 7 presents our preliminary conclusions and the steps to complete the study.

2 Overview of the study approach

Introduction

2.1 This chapter provides an overview of our approach to the study, developed to respond to the scope and requirements set out in the Tender Specification for the call for tender reference MOVE/2020/OP/0013. The study began on 15 December 2020 and the requirements and proposal were reviewed with the Commission's Steering Group at a Kick-Off Meeting on 15 January 2021. The study is to be completed in nine months, by September 2021.

Overview of the study approach

2.2 The study process is illustrated Figure 2.1 and the key tasks are summarised below.

2.3 Tasks 1 and 2 were added at our initiative, to review data made available to the study team or already publicly available, and to refine the approach to the study presented in the Inception Report and Interim Report. We also developed a plan for stakeholder engagement, described in Annex B, to provide input to subsequent Tasks.

2.4 Task 3.1 includes the description and analysis of long-distance cross-border passenger services, including cross-border night train services. We gathered data on changes in supply and demand since 2001, stimulus measures, and case studies on the reasons for the change. Annex G identifies potential additional long-distance cross-border routes.

2.5 Task 3.2 is the analysis of six groups of obstacles to the future development of cross-border services, including cross-border night train services, which have been identified by the Commission. This was informed by desk research and stakeholder engagement reported in Annexes K to P.

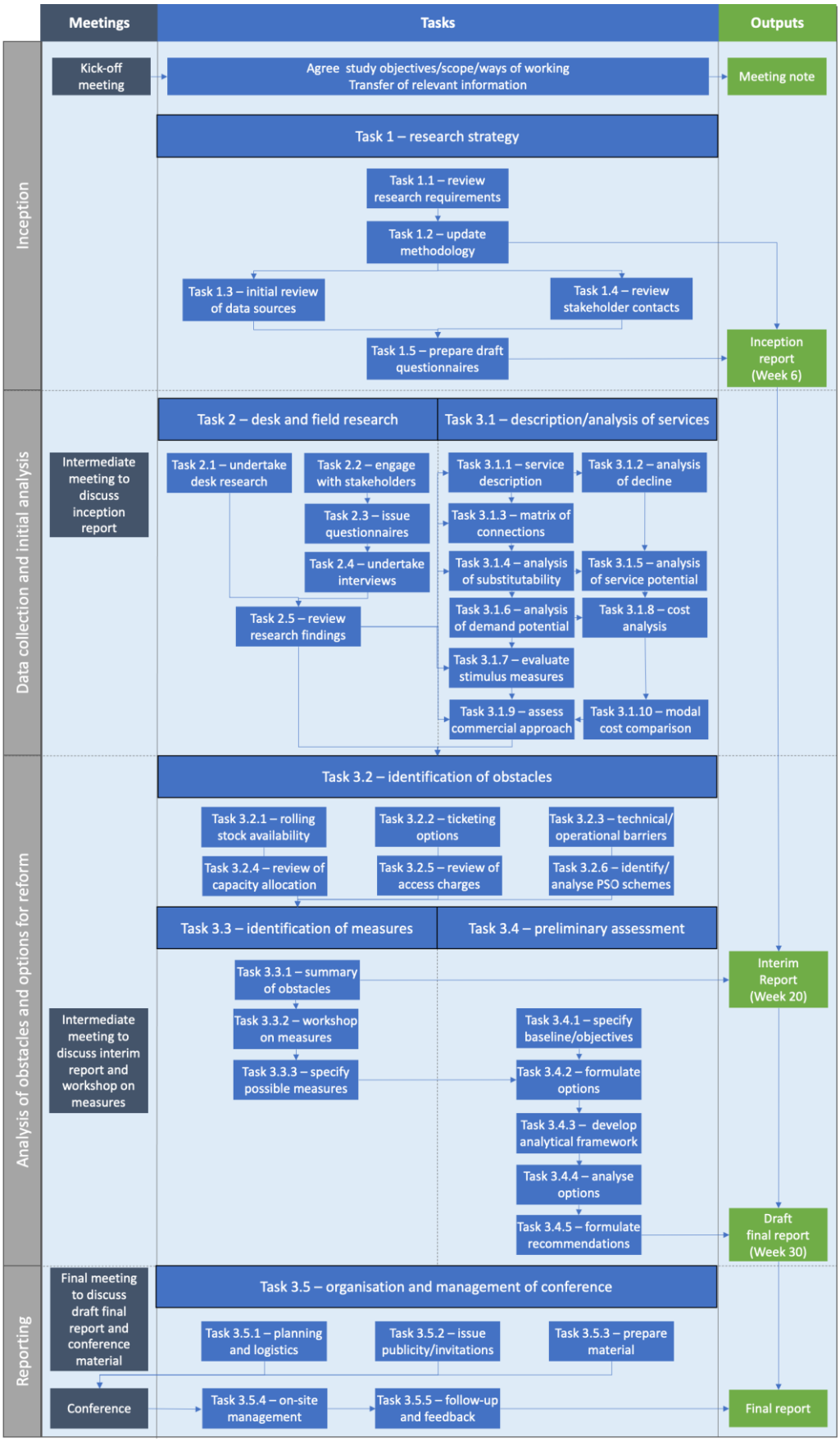
2.6 Task 3.3 is the identification of measures to remove obstacles, informed by desk research, stakeholder engagement and a workshop with the Commission.

2.7 Task 3.4 is a preliminary assessment of the most promising measures, which will help to inform any future impact assessment undertaken in accordance with the Better Regulation Guidelines. Our proposed approach is described in Annex Q.

2.8 Task 3.5 is the organisation and management of a conference on the results of the study, as described in Annex R.

2.9 In Annex A we list the Tasks in the Technical Specification and cross-reference them to where they are addressed in the main text and the Annexes of this report.

Figure 2.1: Overview of approach



3 The cross-border rail passenger market

Introduction

3.1 Cross-border travel by rail has faced increasing competition from low-cost airlines and, from 2011, liberalised cross-border coach services. It now carries fewer than one in ten cross-border collective transport passengers within the study area of the EU, Norway, Switzerland and the United Kingdom.

3.2 In 2010, the Commission's third railway package introduced open access rights for international rail passenger services including cabotage, the carriage of domestic passengers in one state by an operator from another state. Operators may pick up and set down passengers at any station on an international route, including at stations located in the same Member State. Despite this, market entry to provide cross-border rail services has been limited.

3.3 In 2016, Deutsche Bahn closed its City Night Line network of domestic and cross-border night trains. The European Parliament subsequently commissioned a study on night trains, carried out by Steer, and has now asked the Commission to assess how cross-border train services can be promoted to increase the number of passengers travelling by rail. In response to this request, the Commission commissioned this study.

3.4 Table 3.1 lists several definitions, relevant to cross-border services, that we agreed with the Commission. These terms are also included in the glossary at the front of this report.

Table 3.1: Study definitions agreed with the Commission

Term	Possible definition	Comments
Cross-border train	A train service crossing national borders between EU Member States or between a Member State and a third country, where the principal purpose of the service is to carry passengers between stations located in different Member States or third countries.	The definitions refer to the "principal purpose" of the train. The purpose of a train cannot be determined unless it is publicly stated by a competent authority or railway undertaking.
Long-distance train	A rail passenger service which is not an urban and suburban or a regional service. This excludes: • urban and suburban services, whose principal purpose is to meet the transport needs of an urban centre or conurbation, including a cross- border conurbation, together with transport needs between such a centre or conurbation and surrounding areas; or • regional services, whose principal purpose is to meet the transport needs of a region, including a cross-border region.	
Night train	Any train consisting partly or wholly of night train rolling stock.	Definition was devised in the 2017 European Parliament study.
Night train rolling stock	Rail vehicles dedicated to, or reconfigured for, overnight travel.	Based on the definition above.
Overnight service	Any train, not consisting partly or wholly of night train rolling stock, which is in operation from before 02:00 to after 02:59.	

Source: European Commission, European legislation.

3.5 In the remainder of this chapter, we set out our findings on the long-distance cross-border passenger market within the study area of the EU, Norway, Switzerland and the United Kingdom, summarising in turn our work on:

- long-distance cross-border services from 2001 to 2019 (Annex C);
- long-distance cross-border demand from 2001 to 2019 (Annex D);
- the creation of a matrix of cross-border rail, air and coach connections (Annex E); and
- the commercial approaches of railway undertakings (Annex F).

Long-distance cross-border services since 2001

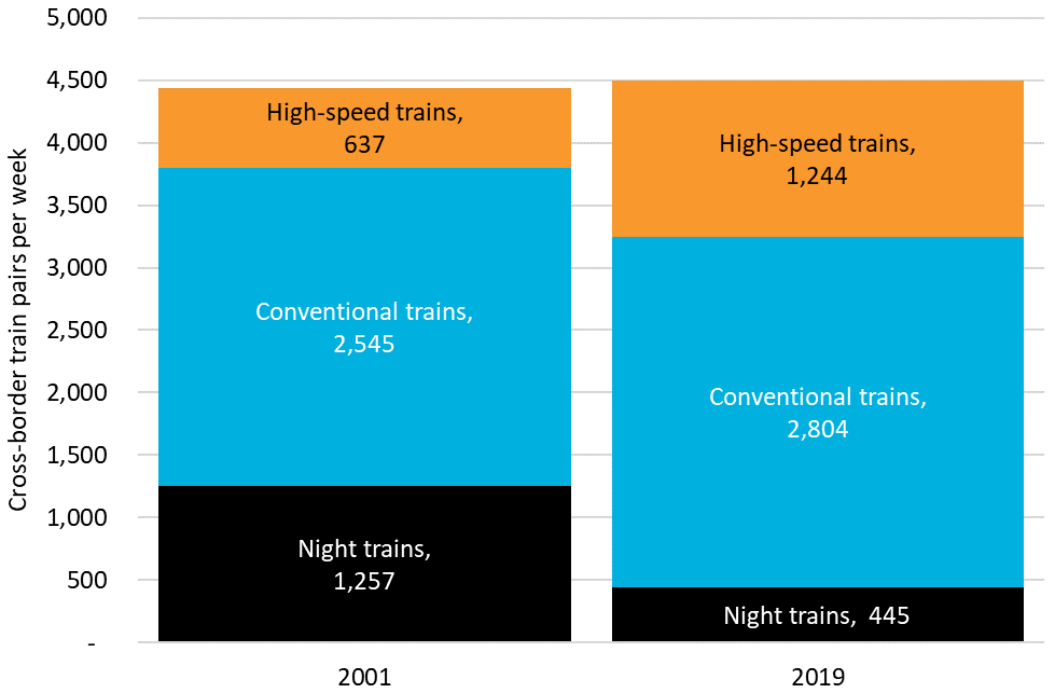
3.6 We sought to examine the changes to long-distance cross-border services, as defined in Table 3.1, between the timetables in operation in 2001 and 2019, the timetable year before the COVID-19 pandemic. We provide a detailed timeline of changes over this period in Annex C. However, it is difficult to summarise the enormous number of small changes to the routing, destinations and frequency of individual trains over this period, particularly where historic infrastructure has been replaced or superseded by new routes and border crossings, including high-speed lines.

Long-distance cross-border train pairs per week, 2001 and 2019

3.7 Figure 3.1 summarises the cumulative changes in the number of long-distance cross-border pairs of trains, one in each direction, per week in 2001 and 2019, after excluding train pairs which only operated infrequently. The apparent change, excluding infrequent services, is a

small increase in total weekly long-distance cross-border train pairs from 4,481 in 2001 to 4,516 in 2019.

Figure 3.1: Long-distance cross-border trains pairs per week, 2001 and 2019



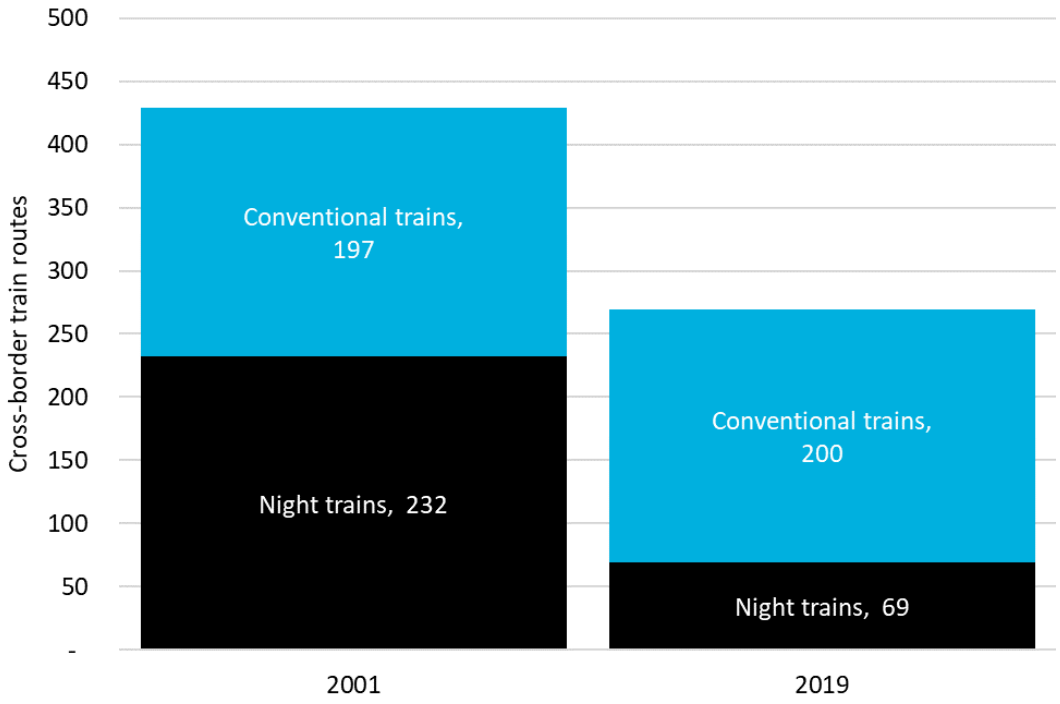
Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.
Note: chart excludes night trains operating less than once a week, day trains operating fewer than five times a week, and any trains operating for less than six weeks a year.
Note: chart also excludes a small number of overnight services, operating between 02:00 and 02:59, not consisting partly or wholly of night train rolling stock.

3.8 However, within this total there was a pronounced shift from night trains (down 65%) to high-speed trains (up 95%). The growth in numbers of high-speed trains and the decline in night trains is consistent with the hypothesis that these effects are causally linked, but any apparent correspondence between relative changes in the level of each type of service should be treated with caution.

Long-distance cross-border origin-destination pairs served, 2001 and 2019

3.9 Figure 3.2 groups the individual trains shown in Figure 3.1 to identify the number of distinct origin-destination pairs between which they operated in 2001 and 2019.

Figure 3.2: Long-distance cross-border origin-destination pairs served, 2001 and 2019



Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.

3.10 In contrast to the apparent slight growth in the total number of trains shown in Figure 3.1, Figure 3.2 shows that there has been an overall decline in the number of routes served, combining:

- 70% fewer night train routes, down from 232 to 69; and
- 2% more day train routes, including high-speed trains, up from 197 to 200.

3.11 Figure 3.2 appears to show a small increase in day train routes, but in some cases long routes have been split into shorter ones, resulting in more routes which cross at least one border but not more border crossings. In 2001, some additional destinations were served directly by attaching universally operable "RIC" through carriages to "carrier trains" for the main part of the journey. Use of attachment to serve additional destinations has since declined, for several reasons.

3.12 First, there is a trend to fixed-formation trains that cannot be extended or shortened by attaching or detaching individual vehicles. High-speed rail services are almost always operated with fixed-formation train sets, as are many day train services operating at conventional speeds. However, night trains are less commonly operated as fixed formations, and CER pointed out that they do not require dedicated locomotives, which can be shared with freight services operating during the day.

3.13 Second, there are additional costs, complexities and delays associated with attaching and detaching, which can be substantial relative to the often limited additional revenue from the through passengers.

3.14 Third, increasing use of the infrastructure may make it more difficult to accommodate such operations. We discuss congested infrastructure and capacity allocation in Annex L.

Cross-border connections between regions, 2001 and 2019

3.15 We examined connections provided between 104 Nomenclature of Territorial Units for Statistics (NUTS) Level 1 regions in the study area, shown in Figure 3.3 below.

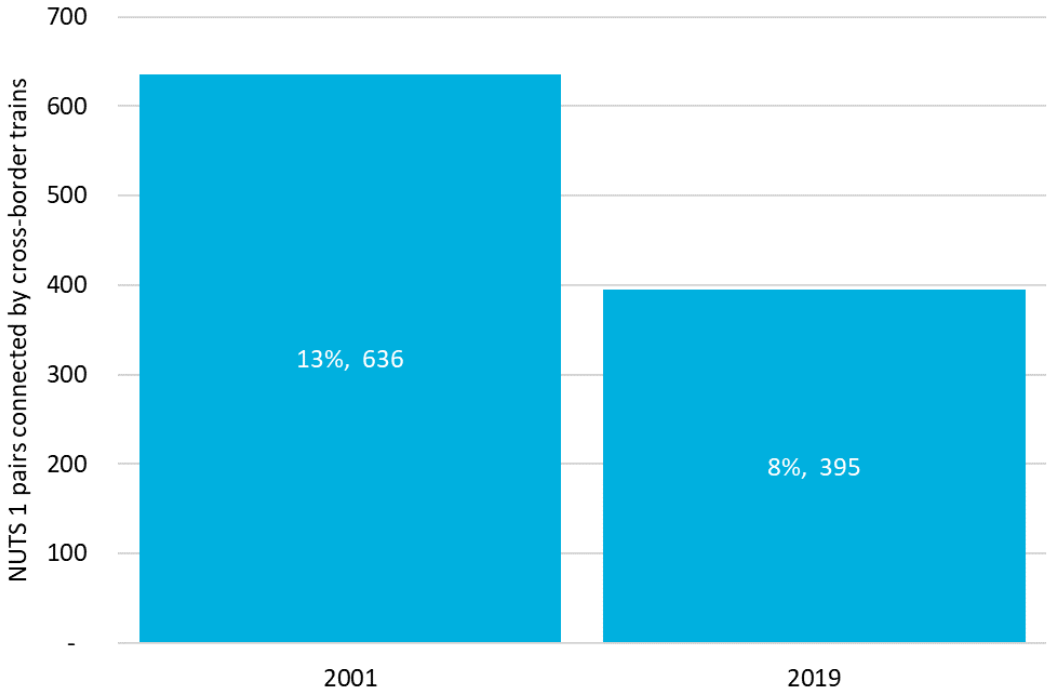
Figure 3.3: NUTS 1 regions



Source: Eurostat.
Note: study area includes only the EU, Norway, Switzerland and the United Kingdom.

3.16 In principle, cross-border travel is possible between 4,976 different pairs of NUTS 1 regions. Figure 3.4 compares the number of pairs of NUTS 1 regions connected by direct long-distance cross-border trains in 2001 and 2019.

Figure 3.4: Pairs of NUTS 1 regions linked by long-distance cross-border rail, 2001 and 2019



Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.

3.17 The proportion of NUTS 1 regions which are connected has declined from around 13% to 8%, a reduction of 38%. We also identified that:

- 474 NUTS 1 zone pairs had fewer direct services per week in 2019 than in 2001.
- 183 NUTS 1 zone pairs had more direct services per week in 2019 than in 2001.

The decline in night trains

3.18 Except in rare cases, such as infrastructure failure, the immediate cause of any change in rail services is a managerial decision by a railway undertaking or PSO competent authority. The cumulative effect of such individual decisions is less likely to reflect a long-term plan than repeated adjustment to events, often driven by short-term pressures including the availability of resources such as rolling stock, train crew and funding. We examined evidence for the underlying causes of the changes identified in ten detailed case studies in Annex C. From these we identified several apparent causes for the decline in long-distance cross-border night train services, related to infrastructure changes, infrastructure charges, rolling stock, rail reform in Europe, commercial pressure or management focus, high-speed lines, and passenger numbers and viability, which we describe next.

3.19 **Infrastructure changes** in Spain, France and, to a lesser extent, Italy, in the form of the opening of high-speed lines, appear to have been a major driver of the decline of night trains. High-speed lines are expensive but, once built, it may be cheaper to carry passengers across borders on high-speed trains than on night trains, as we discuss in Chapter 4. Conversely, in Bulgaria, Poland, Lithuania and Turkey, infrastructure has been upgraded, but resulted either in no long-distance cross-border passenger trains or no improvement to the existing service. In Greece, Latvia, Lithuania, Estonia, Poland, Romania, Serbia and Turkey, poor infrastructure condition, or disruptive maintenance, renewal and enhancement, appears to have contributed to a cycle of decline of long-distance train services. In Hungary, Latvia, Poland, Romania, Serbia

and Spain, gaps in the electrified network can require the retention of diesel locomotives for a limited number of passenger trains, resulting in disproportionate extra costs and longer journey times.

3.20 Different track gauges may be a declining barrier to cross-border services, with standard gauge lines open between France and Spain and planned between Poland and Lithuania, Latvia and Estonia (Rail Baltica II). However, trains that change gauge en route must be specially designed or adapted for rapid re-gauging, requiring agreement by railway undertakings, infrastructure managers and competent authorities on the technology to be used and how the additional costs should be covered. Between Poland and Lithuania, for example, the Lithuanian competent authorities did not wish to contribute to the additional costs of modifying stock to change gauge, so only a single Polish train was equipped to operate the service, which in consequence could only operate three times each way per week (see paragraph C.156).

3.21 **Infrastructure charges**, which in many cases exceed the cost that is directly incurred as a result of operating the train service, have made many services appear financially unviable. This appears to contravene the requirement, in Article 32 of Directive 2012/34/EU, that the level of charges shall not "exclude the use of infrastructure by market segments which can pay at least the cost that is directly incurred as a result of operating the railway service, plus a rate of return which the market can bear."

3.22 **Rolling stock** has not been bought in sufficient quantities to replace the ageing fleets used for cross-border night trains. We identified 1,467 dedicated night train rolling stock vehicles, as defined in Table 3.1, but only 91 new vehicles delivered in the EU-27 over the period 2001 to 2017, an average of fewer than six vehicles per year, which would take over 250 years to replace the whole fleet. Withdrawal of life-expired or un-refurbished vehicles may explain many of the night train closures between 2001 and 2019. In many countries, there has been a loss of carrier trains, formed of RIC conventional rolling stock, which allow portions of night trains to be added, at low cost, to other trains. In Denmark, France, Germany and Spain, conversion of day trains to fixed-formation trains has reduced the scope for night trains to share locomotives with day trains.

3.23 **Rail reform in Europe** since 1993 has ended the situation where services could be extended across borders on the basis of bilateral agreements between vertically integrated incumbents, sharing costs without mandatory regimes for infrastructure charges and PSO support. Cross-border rail services now involve at least three, but more usually five or more, players:

- at least one, but often two or more, railway undertakings;
- at least two infrastructure managers; and
- at least one competent authority, if PSO support is provided.

3.24 In Annex G, we illustrate the number of infrastructure managers involved in proposed new night train services, and as many as four additional parties may become involved for each additional network used. In Annex O, we describe the complexities of PSO support for cross-border services. In Annex C, we illustrate in case studies the difficulties when multiple actors cannot agree on service concepts or the infrastructure measures needed to realise them. One stakeholder, the Netherlands Ministerie Infrastructuur en Waterstaat's (I&W), noted that the launch of the Drielandentrein serving a cross-border region in Belgium, Germany and the Netherlands would require the involvement of three national governments and three regulatory bodies.

3.25 **Commercial pressure** may mean that commercially minded railway managers focus on services with the best financial performance or which are simplest to manage. Simplifying operations may have contributed to the trend to more cross-border day trains operating on fewer routes, mirroring the simplification of the airlines' long-haul networks. In contrast, specifying services under a PSO means that they must continue to be provided whatever their financial performance or complexity to manage.

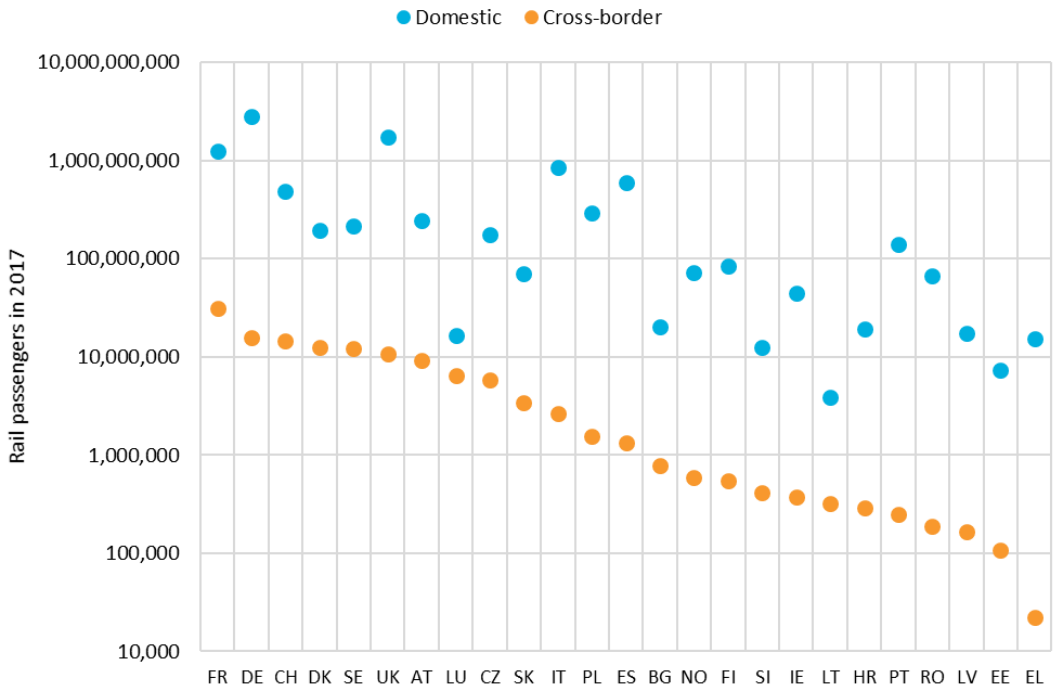
3.26 **Many dedicated high-speed lines** are not or cannot be used by night trains, for reasons including steep gradients, maximum permitted axle weights, incompatible signalling, and safety rules. This means that they cannot be used to extend the distances over which night trains could operate within an indicative journey time of 8-16 hours.

3.27 **Passenger numbers and viability** are difficult to determine in the absence of consistent and regular reporting, which we discuss next, and revenues and costs, which we discuss in Chapter 4. However, ÖBB Nightjet's active decisions to retain and expand a network of night trains contrasts with a self-reinforcing cycle of decline in supply, quality, usage and revenue on other night train routes.

Cross-border demand since 2001

3.28 Figure 3.5, based on Eurostat data, and subject to limitations which we detail in Annex D, shows an estimate of the number of rail passengers making domestic journeys or crossing the border of each state in the EU, Switzerland, Norway and the United Kingdom during 2017.

Figure 3.5: Domestic and cross-border rail journeys by state, 2017



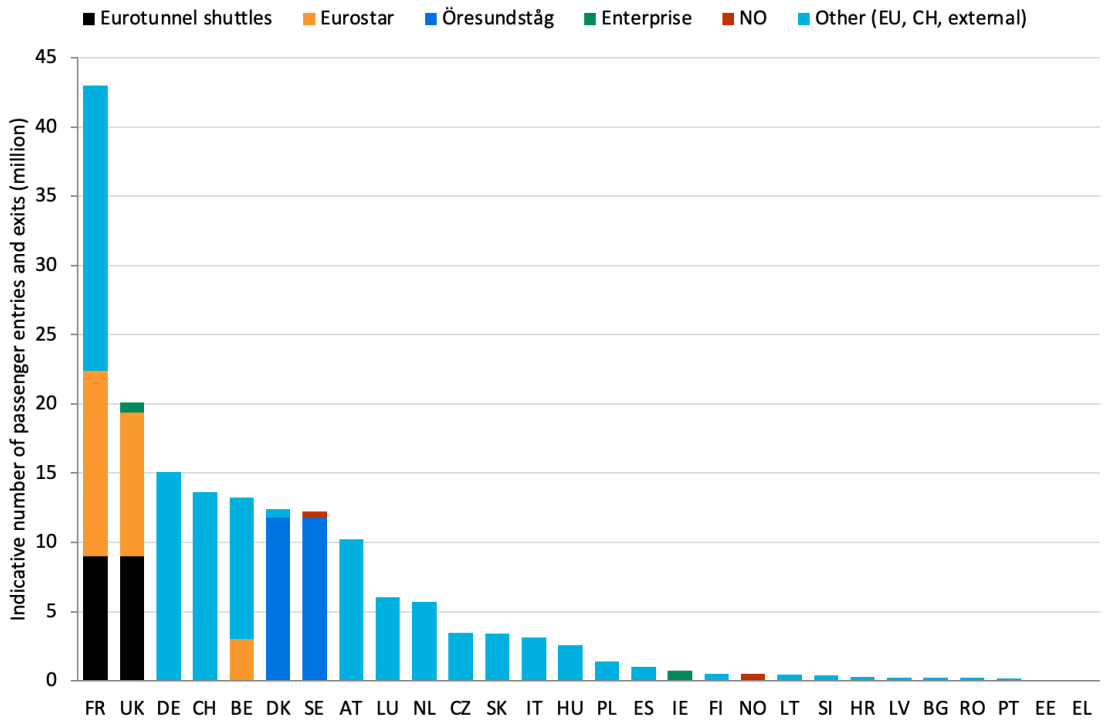
Source: Eurostat, Steer analysis. Cross-border journeys within the study area are counted at least twice.

3.29 Except for in Luxembourg, cross-border rail passenger numbers are normally less than one-tenth, and sometimes less than one-hundredth, of domestic rail passenger numbers. Of

around 10 billion rail journeys in total in 2017, around 65 million[3] involved crossing a border, whether on short-distance or long-distance services, and only a small proportion of long-distance cross-border journeys are made on night trains. However, these cross-border journeys constitute only around 6-7% of total passenger journeys and passenger-kilometres.

3.30 Figure 3.6 reproduces an analysis of the end points of cross-border journeys from our 2016 study on rail security, based on Eurostat data for 2014[4].

Figure 3.6: Cross-border rail passenger entries and exits by state, 2014



Source: Eurostat and Steer analysis
Note: passengers between EU Member States, Switzerland and Norway are counted twice.
Note: Enterprise is the brand name of services between Dublin in Ireland and Belfast in the UK.

3.31 Eurostat data suggest that, in 2014, around 78 million passengers crossed borders between EU Member States, 14 million crossed between EU Member States and Switzerland or Norway, and 4 million crossed between EU Member States and other states. Of these, approximately:

- 10 million used (black) Eurotunnel shuttle services with either trucks, coaches or private vehicles.
- 10 million used (orange) Eurostar services. All of them crossed the English Channel between France and the UK, and we understand that around 3 million of them also crossed the Franco-Belgian border en route to Brussels. Some Eurostar services now continue to Amsterdam in the Netherlands.

[3] Excluding travel on Eurotunnel shuttles between France and the United Kingdom, which are included for information in black at the bottom left corner of Figure 3.6.

[4] 'Study on options for the security of European high-speed and international rail services', Steer for the European Commission, December 2016, contains further analysis of cross-border travel and services.

- 12 million, or 15%, used services across the Oresund between Denmark and Sweden, the majority on the bi-regional Øresundståg network connecting Sjælland and Skåne.
- 22 million of the remaining passengers crossed between France and other states, including Belgium (other than on Eurostar), Luxembourg, Germany, Switzerland, Italy and Spain.

3.32 Taken together, these observations indicate that, of cross-border passengers by rail in 2014:

- Around 55% were entering or leaving France.
- Around 15% were entering or leaving Sweden.

3.33 We also note that at least 32 million crossings, or 40% of the total, used new infrastructure developed specifically to enable rail travel between neighbouring Member States[5]. Construction of further international links, which is only likely to occur where there is high expected demand, seems likely to result in further growth in the number of passengers crossing borders.

3.34 As additional context:

- One suburban line may carry 100 million passenger journeys a year, over short distances[6].
- The estimated 65 million cross-border rail passengers per year in 2017 correspond to 1.25 million per week on over 4,500 weekly long-distance train pairs or 9,000 weekly long-distance trains, plus infrequent services (see Figure 3.1), plus short-distance trains. This implies that, averaged over long- and short-distance, day and night, and conventional and high-speed, each train is carrying fewer than 150 passengers as it crosses a border, and some trains are carrying many fewer.

3.35 Coach services across European borders are poorly documented but, in 2014, ten mainly small Member States reported around 10 million cross-border coach trips, suggesting that the total for the study area may be comparable with the 65 million cross-border rail journeys[7]. Airlines, in contrast, offered around 650 million international airline seats within the study area during 2019, or around ten airline seats for every rail passenger. Taken together, these data suggest that rail services may carry around 10% of passengers crossing borders within the study area, with a similar portion being carried by coach and the overwhelming majority being carried by air.

3.36 We sought more detailed and reliable data on cross-border rail travel but have identified little of value for the study. We set out in Annex D how data on passenger journeys are rarely captured, kept and made public:

- Passengers making an end-to-end journey may not seek, or be offered, a single ticket identifying their origin and destination. If they complete a journey using more than one

[5] 20 million through the Channel Tunnel opened in 1994, and 12 million on the Oresund link opened in 2000.

[6] In Paris, RATP report that nearly 1.2 million passengers use Réseau Express Régional (RER) Line A every day, equivalent to around 400 million passengers every year.

[7] Comprehensive Study on Passenger Transport by Coach in Europe, Steer for the European Commission, April 2016, Table 5.9 and paragraph 5.104.

ticket, or use a travel pass or season ticket, no evidence of their origin and destination is retained.

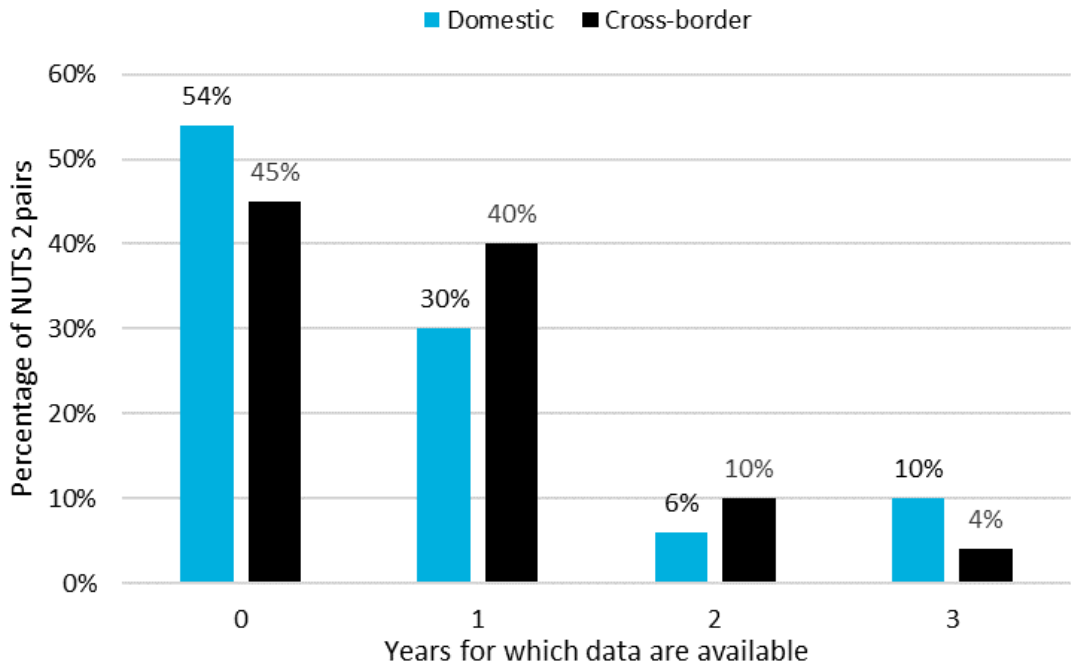
- Railway undertakings and competent authorities may issue billions of tickets but may not have systems to retain all the sales data. Revenue data is often rapidly consolidated for management and accounting purposes, but other details of the tickets may be lost.
- Railway undertakings and competent authorities rarely disclose details of passenger numbers or revenue, which are often treated as commercially confidential. Only one of the stakeholders we contacted provided detailed information on passenger numbers[8].

3.37 We concluded that the best, and most consistent, source of data on cross-border passenger numbers was a dataset of journeys between NUTS 2 level zones published by Eurostat, with the following limitations:

- The information is published only every five years, currently for 2005, 2010 and 2015.
- It is based on point-to-point ticket sales, not the ultimate origins and destinations of passengers using multiple tickets or rail passes.
- It includes only incumbent operators and excludes open access commercial services.

3.38 Figure 3.7 shows the proportion of NUTS 2 zone pairs for which data were available for no, one, two or three years. At least some estimate of demand is available for 54% of NUTS 2 pairs, but evidence of trends in demand is only available for 14% of cross-border NUTS 2 pairs. This is a poor basis either to analyse the past or to project into the future.

Figure 3.7: Availability of NUTS 2 level ticket sales data for domestic and cross-border flows



Source: Eurostat, Steer analysis.

[8] Exceptionally, Trafikverket provided detailed passenger statistics and ticket revenue for the night trains to the north of Sweden and Narvik.

3.39 We searched the Eurostat data for information on specific NUTS 2 zone pairs relevant to the case studies in Annex C and to support the analysis of market potential described in Chapter 4. We typically only found data for one in ten NUTS 2 zone pairs searched. We concluded that too little data was available to examine passenger numbers by NUTS 2 zone pair or by rail corridor.

3.40 We also examined the implied growth rates for each NUTS 2 zone pair for which data existed for more than one year, but concluded that the wide range of changes reported might reflect changes in definitions rather than actual changes in demand. We also examined the reported changes in total ticket sales and compared them with the EU-28 growth rates for passenger rail demand from the EU Reference Scenario 2016. While this process is not statistically robust, Table 3.2 shows that it produces results consistent with a trend decline in the rate of growth in demand, from around 2.1% over the period 2005 to 2010 to a forecast of around 1.6% over the period from 2020 to 2030 in the EU Reference Scenario prepared before the onset of the COVID-19 pandemic.

Table 3.2: Cross-border demand growth rates from 2005, 2010 and 2015 to 2019 and 2030

Period	Years	Source	Compound average annual growth rate
2005-2010	5	Steer analysis of Eurostat data	2.1%
2010-2015	5		1.8%
2015-2019	4		1.8%
2019-2020	1	EU Reference Scenario	1.7%
2020-2030	10		1.6%

Source: Eurostat, EU Reference Scenario, Steer analysis.

3.41 While individual railway undertakings and competent authorities, and those planning new services or infrastructure, may collect extensive data on passengers in the markets they would or could serve, we concluded that there is currently no usable and reliable source of cross-border rail journeys within the study area.

The matrix of connections by rail, air and coach in 2019

3.42 While little data on rail passenger demand is available, it is possible to assemble data on the services provided by rail and competing modes. We created an Excel database combining matrices of data on rail, air and coach services, as described in Annex E. The database uses the same zoning system, 2021 NUTS 2 zones, as Eurostat's collation of rail ticket data for 2005, 2010 and 2015 described above.

3.43 **Rail** connections were drawn from a High-Speed Rail study for the Commission, carried out by EBP, who extracted in-vehicle rail journey times for a rail journey between each pair of metropolitan areas. This measure underestimates the duration of any journey requiring one or more connections, but was the only one extracted by EBP. We mapped metropolitan areas to NUTS 2 zones to create a matrix of in-vehicle rail journey times at NUTS 2 level. Note that this data does not identify the rail routes or infrastructure offering the lowest journey times or whether the rail services were direct.

3.44 **Air** connections were derived from OAG Traffic Analyser data for calendar year 2019 on the number of flights, seating capacity and flying time for flights between EU, Norwegian, Swiss and United Kingdom airports. We used the IATA system of airport codes to identify airports to cities and hence to NUTS 2 zones. We added 150 minutes to the weighted average flight time

as a proxy for the typical time required to travel from the origin to the departure airport and check in, pass through security, board and taxi, and to deplane, claim baggage and travel from the arrival airport to the final destination.

3.45 **Coach** timetables are not systematically collated or saved, so there was no means of reconstructing the coach connections available in 2019. We estimated the potential coach journey time between any two NUTS 2 zones as 1.5 times the drive time, based on historic averages, between the coordinates identified by EBP as the locations of the railway stations in the metropolitan areas we had associated with each NUTS 2 zone.

The commercial approaches of railway undertakings

3.46 We examined the scope for railway undertakings to apply techniques used in aviation to develop lost-cost services. Table 3.3 below shows an indicative RAG (Red-Amber-Green) assessment of whether these techniques are transferrable to rail.

Table 3.3: Approaches used by low-cost airlines

Approach	Comments	RAG		
		🔴	🟡	🟢
Use cheaper terminal infrastructure	• Low-cost airlines can seek airports and terminals with lower charges and minimise fees for airbridges and other services. • Rail infrastructure charges are dominated by en-route charges, which cannot readily be avoided.	🔴		
Large, standardised fleet	• Low-cost airlines may have over 100 identical aircraft. • Rail rolling stock has become less standardised, and is often designed for a specific market, with local needs taking precedence over interoperability.		🟡	
Faster turnarounds	• Low-cost airlines may turn round in less than 30 minutes. • Urban and suburban trains often have no catering or toilets and are cleaned en route, allowing rapid turnaround after each journey. • Long-distance day trains must allow enough time for cleaning and rubbish removal, replenishing catering supplies, and reliability. • Night trains have no opportunity to reduce turnaround times.	🔴		
Longer operating hours	• Low-cost airlines can average eight short flights over a working day of up to 18 hours, several hours of which are spent on the ground. • Day trains have longer journey times, making it hard to schedule them to fill a long day efficiently, as very early departures and late arrivals may not be attractive, but they can continue as overnight services. • Night trains can operate long hours, but gradually become day trains.		🟡	
Less busy airports	• Low-cost airlines use less busy airports, minimising delay. • Cross-border trains are likely to need to serve congested city centre stations to be attractive to passengers. • Many cities have no suitable alternative stations.	🔴		
Single class of accommodation	• Low-cost airlines offer a single (and basic) class with bookable extras. • Day trains have been introduced with single-class stock with bookable extras, which can also be used overnight as seated accommodation. • Night trains often have multiple classes of high-quality accommodation to attract passengers in a competitive market.		🟡	
High load factor	• Low-cost airlines often achieve end-to-end load factors of 80-90%. • Trains may be harder to fill consistently over the whole route.	🔴		

Approach	Comments	RAG		
		🔴	🟡	🟢
Zero-based business model	• Airline start-ups design their services "bottom-up" to develop an efficient operation and business model. • New entrant rail operators have the same opportunity to work "bottom-up".		🟡	
Lower pay	• Airline start-ups typically recruit staff on terms and conditions with lower pay and/or greater flexibility. • New entrant rail operators have the same opportunity to design staff terms and conditions, depending on the national labour market.		🟡	
Modular base structure with all vehicles and crew at a single base each night	• Low-cost airlines operate from small bases to which each aircraft returns every 24 hours. • Day trains can operate with staff and service facilities at a single fixed base from which one or two round trips are possible every 24 hours, with no need to use remote facilities and all staff at home every night. • Night trains cannot return to base every 24 hours and staff must be away overnight.		🟡	
Flexibility to make frequent service changes	• Some low-cost airlines have a policy of frequent review, closing the worst-performing routes and bases and trying new routes and bases elsewhere. Pilots can fly almost any route without special training. • For railway undertakings, in contrast, capacity for regular train paths must be applied for a year or more ahead, and suitable maintenance and service facilities must also be found. Drivers must be trained on the routes they will use, including diversionary routes.	🔴		

Source: Steer analysis.

3.47 Airlines have used a wide range of techniques to reduce costs and increase load factors, enabling a rapid fall in the real cost of flying since they emerged in the 1990s. Legacy airline carriers have been forced to adopt many elements of the low-cost model to retain market share and compete, although some passengers remain willing to pay more for a higher quality service, including features such as access to airport lounges. Liberalisation has led to the emergence of a small number of airline networks, meaning that, for many airport-to-airport journeys, passengers are offered a choice of one or more direct and several indirect flights.

3.48 Rail liberalisation has not led to the emergence of competing network carriers, and the overwhelming majority of station-to-station journeys are served by only one operator, typically a state-owned incumbent or a PSO contractor. Pressure to reduce costs still exists from other modes, for commercial rail services, and from competitive tendering, for PSO services. However, the nature of the rail industry makes it harder to introduce low-cost services, for several reasons:

- A relatively high proportion of railway undertakings costs are en-route infrastructure charges, particularly on high-speed lines, as we discuss in Annex J.
- Day trains often make multiple stops, at which passengers board and alight, making it harder to keep a train full or to ensure that groups of passengers boarding during the journey can be seated together. Many long-distance cross-border trains may derive most of their revenue from domestic passengers rather than from those crossing a border, who may be few in number or on short-distance journeys.
- On railways, delays occur mainly en route, and railway undertakings must allow recovery time at the end of each journey to ensure punctual departure on the next journey.

Aircraft en route cannot be slowed or stopped, but trains en route can be delayed by the services of other passenger or freight railway undertakings.
- Rail has to date not realised economies of scale with a large, standardised fleet.
- Rail offers little scope to relocate trains and crew regularly to chase seasonal demand or to explore new markets.

Summary of the market

3.49 The number of long-distance cross-border rail services, around 4,500 train pairs per week, appears to have changed little between 2001 and 2019. Within this total, however, there have been two major changes:

- There was a pronounced shift from night trains (down 65%) to high-speed trains (up 95%).
- The number of routes served has declined, with a focus on more frequent services on core routes, which have less splitting and joining of trains to serve two or more destinations.

3.50 Cross-border travel within the study area by public transport is mainly by air, with rail and coach each carrying only around 10% of public transport passengers. Only around 0.65% of rail passenger journeys cross a border, although these amount to 5% of total passenger-kilometres. Only a proportion of cross-border rail passenger journeys are on long-distance services, and only a small proportion of those on long-distance cross-border services are on night trains.

3.51 Little detailed data is available on passengers travelling on individual trains, routes, corridors or border crossings. With minor exceptions, the stakeholders we contacted were unable or unwilling to provide either passenger data or financial information such as revenues, costs and profitability.

3.52 The limited passenger data available suggests that the rate of growth of passenger numbers may be slowing, from around 2.1% per annum from 2005 to 2010 to the 1.6% per annum for the period 2020 to 2030 in the EU Reference Scenario 2016.

3.53 Railway undertakings have adopted several commercial models, described in Annex F. Many face competitive pressures to reduce costs, and some have adopted some elements of the approaches used by low-cost airlines. However, there appears to be only limited scope to introduce low-cost rail services, particularly given the importance of en-route infrastructure charges in the costs of rail operations.

4 Market potential

Introduction

4.1 In this Chapter we set out our assessments of:

- the potential for night train services to be a valid substitute for other modes (Annex G);
- the potential to increase rail connections, capacity or speeds by 2030 (Annex G);
- the potential additional passengers on long-distance cross-border trains (Annex G);
- the potential for measures to stimulate the market (Annex H);
- the main cost drivers of rail, aviation and long-distance coaches (Annex I); and
- the costs of additional rail services (Annex J).

Potential for new night train services

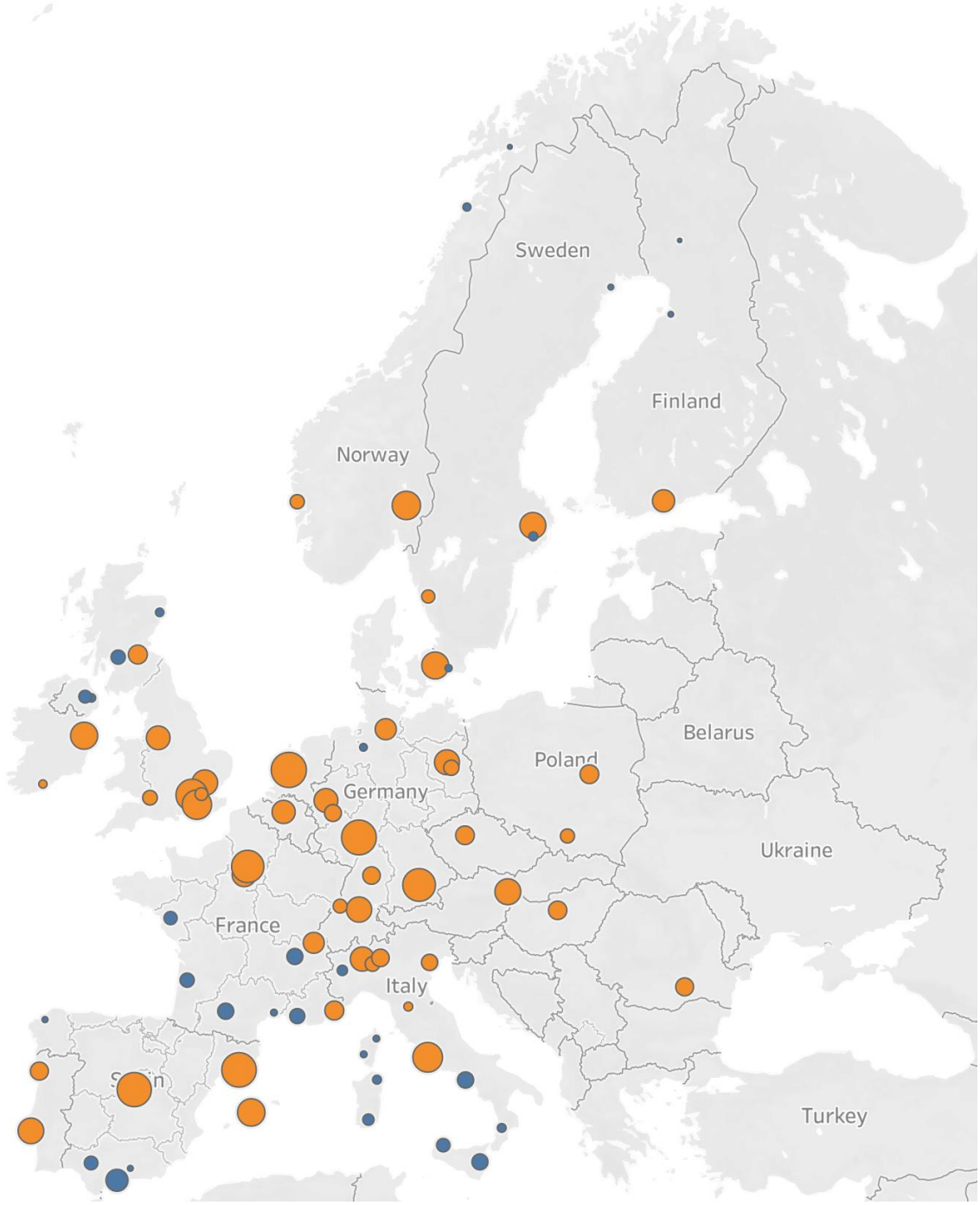
4.2 The largest and growing night train network is that of Austria's national rail operator, ÖBB, which operates night trains under the Nightjet brand. Many Nightjet routes operate under PSOs in Austria, Switzerland, Hungary and Poland, but others are former City Night Line routes closed by DB in December 2016, which ÖBB has taken an active decision to operate on a commercial basis, or have been opened more recently. This means that many Nightjet routes are the product of a recent and active decision that they should be retained or opened. We noted that the majority of the routes are over great circle distances of 500-800 kilometres and terminate in cities or conurbations with airports connected by more than 500,000 airline seats per year.

4.3 Figure 4.1 below shows the results of a search for other airports within the study area, distinguishing airports with at least one cross-border (orange) route or one domestic (blue) route over great circle distances of 500-1000 kilometres and connected with over 500,000 seats in 2019. We reviewed recent proposals for new night train routes (listed in Annex G, Table G.1) and found that all the destinations of the proposed services are at cities shown on the map below.

4.4 We also examined all cross-border airline routes over a great circle distance of 500-1000 kilometres on which more than 500,000 seats were offered in 2019[9]. We found 96 such airport-to-airport routes within the study area connecting 91 city pairs, which included most existing Nightjet routes and all 8 new night trains routes proposed by existing and new operators.

[9] Other studies of potential rail services have also examined on existing air markets. See, for example Étude de developpement de nouvelles lignes de trains d'equilibre du territoire (TET), Direction générale des infrastructures, des transports et de la mer, Décembre 2020 (2021)

Figure 4.1: Airports 500-1000 kilometres apart connected by over 500,000 airline seats

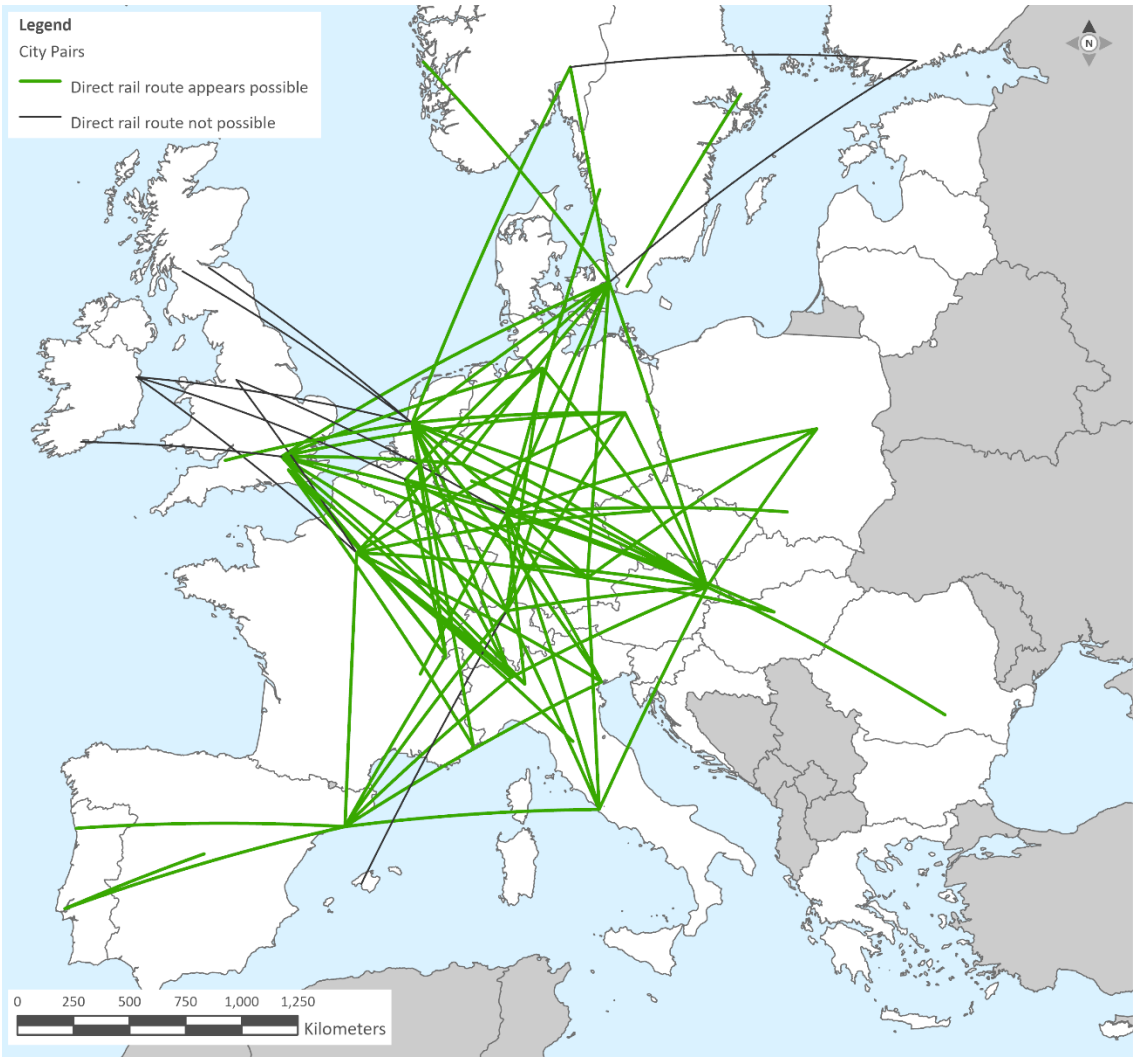


Source: OAG data for 2019, Steer analysis.
Note: see paragraph 4.3 for explanation of orange and blue airports.
Note: the area of the circles represents the number of seats offered in 2019 to other airports within the study area.

4.5 Figure 4.2 shows the 91 city pairs connected by cross-border airline routes meeting the length and seating capacity criteria:

- Green lines show city pairs between which a direct rail route appears to be possible.
- Black lines show city pairs between which a direct rail route appears not to be possible.

Figure 4.2: Airports 500-1000 kilometres apart connected by over 500,000 cross-border airline seats



Source: OAG data for 2019, Steer analysis.
Note: see paragraph 4.5 for explanation of green and black lines.

4.6 For the latter, we assumed that:

- Direct rail routes would not be possible to and from Cork, Dublin and Palma de Mallorca, all of which are on islands.
- Direct rail routes would probably not be practicable to and from Glasgow, Edinburgh, Manchester. These would require rolling stock suited to both the Channel Tunnel and the restricted loading gauge in Great Britain, and would enter and leave the Schengen area in the middle of the night and hence need border facilities before departure or on arrival.
- Direct rail routes would probably not be practicable to and from Helsinki, from where rail connections to Copenhagen and Oslo would need to travel via St Petersburg, in the Russian Federation, and Hamburg, and would require a change of track gauge.

4.7 From the remaining city pairs shown by green lines we identified the 8 proposed night train routes and a further 16-17 potential origin-destination pairs, which we estimated could be combined into 11 routes, from which we developed a “fictive network” as a basis to develop our estimates of rolling stock requirements and operating costs.

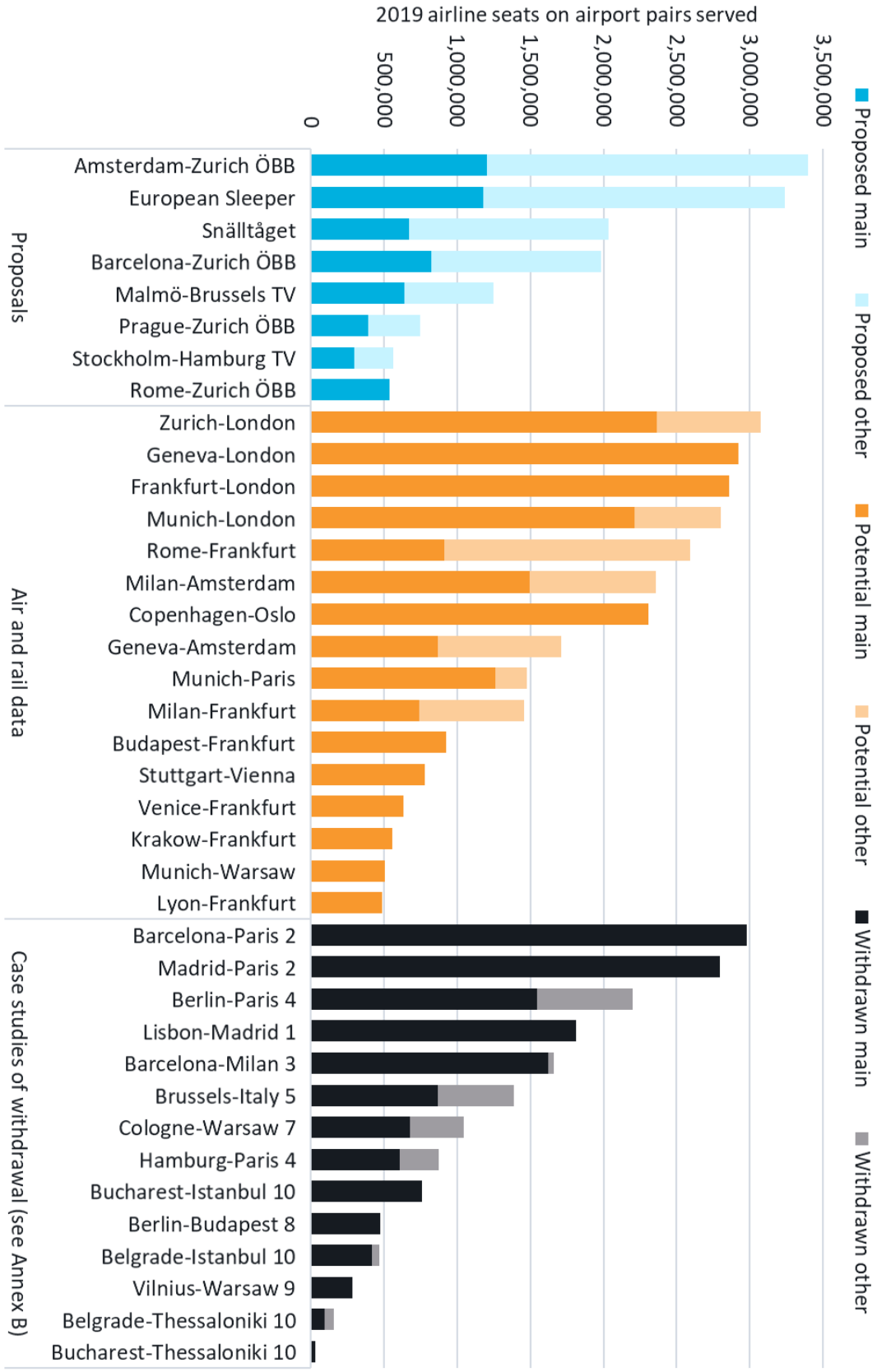
4.8 Figure 4.3 summarises the number of scheduled airline seats in 2019 between airports on:

- proposed routes;
- potential routes identified from our analysis of air and rail data; and
- withdrawn routes examined in the case studies in Annex C.

4.9 In each case we identify the densest single city-to-city flow, which might involve more than one airport at each city, and the total including more minor flows. For example, the route at the top of the figure, ÖBB's proposed Amsterdam to Zurich service, could compete with around 1.2 million airline seats between Amsterdam and Zurich and a further 2.2 million seats between Dusseldorf and Zurich (1.1 million), Amsterdam and Basel (0.5 million), Cologne/Bonn and Zurich (0.4 million) and Dusseldorf and Basel (0.1 million).

4.10 Our analysis is described further in Annex G.

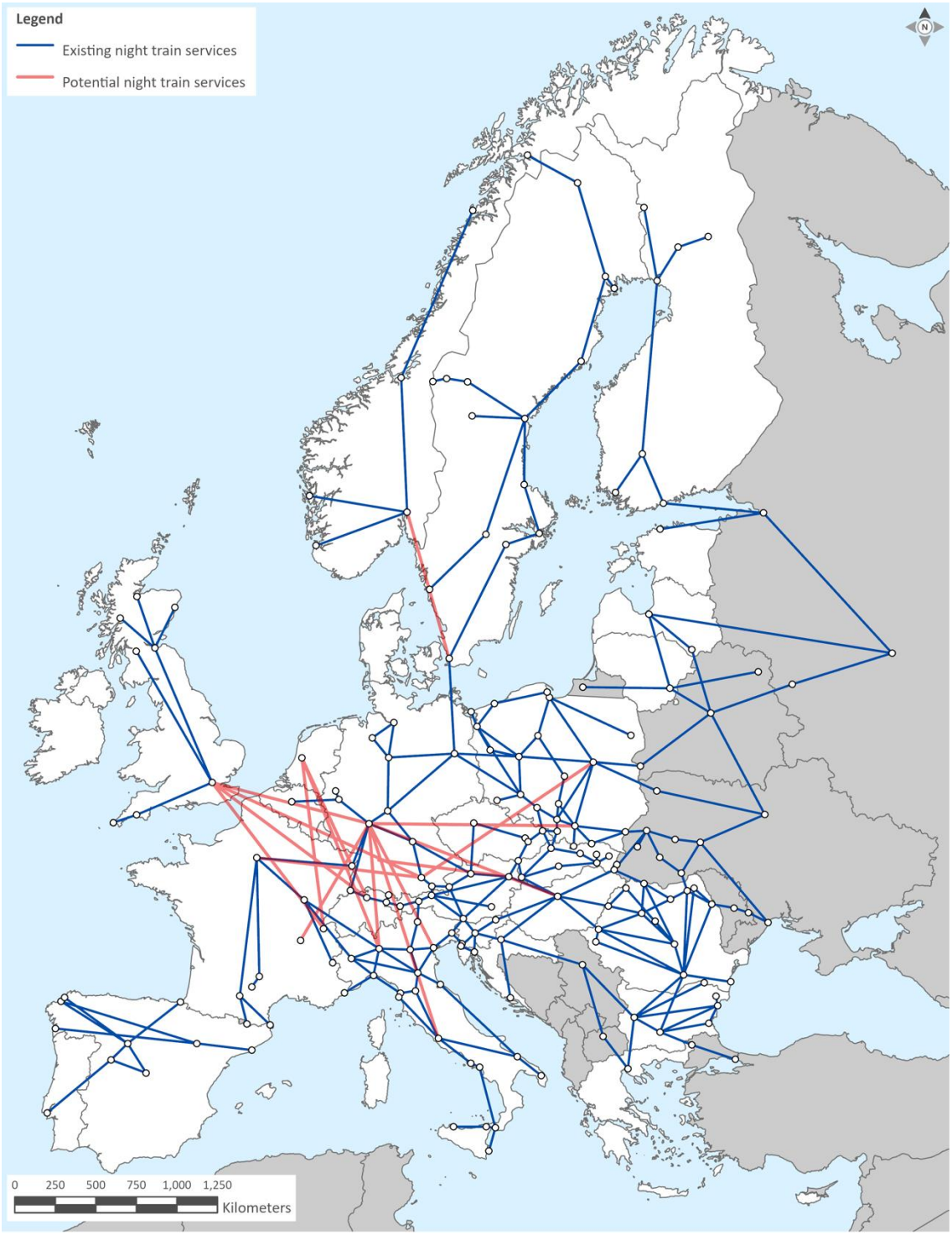
Figure 4.3: Overview of proposed, potential and withdrawn night train routes



Source: OAG, Evaluation of high-speed rail in Europe, Steer analysis.

4.11 Figure 4.4 below shows, in diagrammatic form, existing night train routes operating during 2019 with at least one end in the study area, and the potential new night train services listed in Figure 4.3.

Figure 4.4: Overview of existing and potential night train routes



Source: OAG, Evaluation of high-speed rail in Europe, Steer analysis.

4.12 The figure illustrates how many of the potential routes serve a small number of major cities which are also airline hubs:

- Frankfurt is on seven of the routes, to Budapest, Krakow, London, Lyon, Milan, Rome and Venice.
- London is on four of the routes, to Frankfurt, Geneva, Munich and Zurich.
- Amsterdam is on two or three of the routes, to Milan, Geneva and, potentially, Zurich.

4.13 Some of the potential new routes might be viable, whether operated commercially or on the basis of a PSO, but detailed operational and market studies would be required to investigate. The viability of the routes would depend on at least three critical factors:

- the future levels of airline (and coach) services and fares;
- the scope to subsidise routes with economic, social or environmental benefits; and
- the obstacles which we discuss further in Chapter 5.

4.14 We are aware that more potential routes for night trains may emerge if demand grows, whether due to changing passenger attitudes and preferences or other factors. However, the existence of seven potential routes serving Frankfurt alone highlights how the introduction of a larger number of new night train services might prove to be difficult without either additional capacity, or reallocation of existing capacity, in many city centre stations which have already been identified as constrained or congested. We discuss this issue further in Annex L and list stations identified as constraints in Table L.8.

Potential for new day services

4.15 Our analysis of the potential for new night trains, described above, focused on their need to connect points too far apart to offer a short journey time by day but far enough apart to allow at least 6-8 hours' sleep during the journey. No such constraint applies to new day trains, which can make intermediate stops to serve shorter-distance markets. Except where they run non-stop over long-distance on high-speed lines, the viability of new cross-border services may depend more on the incremental costs of linking existing domestic trains than the potential revenue from long-distance cross-border passengers.

4.16 For illustrative purposes we estimated that 27 additional long-distance cross-border day train pairs might add around 1 million additional cross-border passengers per year.

4.17 We also noted that infrastructure expected to be opened by 2030 would not have been authorised or funded without consideration of what services would operate on it, which in some cases would also include new cross-border services[10]. In practice, adequate services would only be certain to be introduced in practice if they were specified in a PSO.

Potential to increase rail connections, speeds or capacity

4.18 The study of High Speed Rail for the Commission, carried out by EBP, identified the potential reductions in rail journey times between metropolitan areas resulting from new connections and increased speeds planned between 2020 and 2030.

[10] High-speed lines from Belgium to France and the Netherlands, the Channel Tunnel from France to the United Kingdom, the Perpignan-Figueres link from France to Spain, and the Oresund link between Denmark and Sweden, were all planned and built specifically to operate new cross-border services, whether specified in a PSO or operated commercially. This is also the case for the Fehmarn Belt link from Denmark to Germany, and Rail Baltica from Estonia to Latvia, Lithuania and Poland.

4.19 For night trains, we identified the impact of new connections and higher speeds on the 24 proposed and potential additional routes. Only 9 of the 24 routes would be affected, and the potential reduction in journey times was not generally sufficient to make it likely to be practicable to extend night trains to a further destination. We also noted that doing so might result in already short overnight journeys becoming too short to be served by a night train. For example, in 2019, Copenhagen and Hamburg were linked by 270,000 airline seats. In June 2021, Snälltåget opened a night train route connecting the two cities in 6-7 hours which, while short, may attract at least some passengers from air[11]. From 2029, the Fehmarn Belt crossing may reduce day train journey times from around 4½ hours to as little as 2½ hours, which would end the viability of night trains, and possibly flights, between the two cities.

4.20 Improvements to the network in the form of new connections or higher speeds will not prevent continuation of existing cross-border services, and may allow new ones to be added. Planned increases in capacity are often required to operate additional services for which they have been designed, and may not result in additional train paths suitable for efficient, reliable and attractive long-distance cross-border services. Many stakeholders reported practical issues of obtaining infrastructure capacity to offer new services, particularly in the morning peak in stations in cities including Amsterdam, Berlin, Cologne, Copenhagen, Frankfurt, Hamburg, London, Oslo, Stockholm and Zurich. We discuss the extent of infrastructure capacity as an obstacle in Chapter 5.

Potential additional passengers on long-distance cross-border trains

4.21 We noted in Chapter 3 that data on passenger numbers at EU level are limited and that few stakeholders provided data on passenger numbers on specific services.

4.22 For night trains, our desk research enabled us to estimate that each of the two daily train pairs operated by the subsidised Caledonian Sleeper may carry around 80,000 passengers per year, and each distinct route operated by the mainly commercial Nightjet network may carry around 200,000 passengers per year.

4.23 Table 4.1 uses this data to illustrate the order of magnitude of additional passengers which might be carried on night trains if all the proposed and potential routes were to open.

Table 4.1: Indicative passengers on additional night train routes, 2019 levels of demand

Routes	Origin-destination pairs	80,000 per route	200,000 per route
Proposed routes	8	0.64 million	1.6 million
Fictive network	17	1.36 million	3.4 million
Total	**25**	**2 million**	**5 million**
Total in 2030	**25**	**2.4 million**	**6 million**

Source: Steer analysis.

4.24 In addition to the current 65 million day and night cross-border rail journeys, this suggests a potential for 0.6-1.6 million additional night train passengers by 2024, rising to 2-5 million if all the potential routes opened. Growth at the rate projected in the EU Reference Scenario from 2019 to 2030 (Table 3.2) might result in a further 20% increase in passenger numbers.

[11] The first train left Stockholm Central station on June 27 at 16.22, stopping at Höje Taastrup at 22.45, Hamburg at 05.31, and arriving at Berlin Hauptbahnhof at 08.52.

4.25 For day trains, we assumed that each new cross-border train might result in an additional 50 passengers who had not previously used rail, so that each new train pair would carry 100 new passengers per day or 36,500 new passengers per year. This suggests that 27 new long-distance cross-border train pairs might add around 1 million passengers per year.

Potential measures to grow the long-distance cross-border market

4.26 In Annex H we describe how, while initial decisions on the track and structure gauge of different railways have created enduring operational incompatibilities, steps to create international standards began with the 1886 Berne Convention and have continued. Recent progress has been mixed, for several reasons.

4.27 Different standard, Iberian and Russian track gauges remain a barrier to cross-border operation, but can increasingly be addressed by gauge-changing stock. The standard gauge is being used on high-speed lines throughout Spain and into the Baltic states of Lithuania, Latvia and Estonia.

4.28 Different signalling systems are, in principle, being harmonised with the European Train Control System (ETCS)[12]. In the long term, ETCS is intended to be a single common system, but in the short term it is often an additional system required for a short part of a journey. In practice, stakeholders mentioned how ETCS has been implemented in different ways on different networks.

4.29 Different approaches to infrastructure charges (Annex K) and capacity allocation (Annex L) have in principle been harmonised through development of EU policy including the four railway packages. In practice, new entry to provide long-distance cross-border passenger services since the third railway package came into force in 2010 has been extremely limited. One stakeholder noted that some states appeared to have concluded that the third railway package liberalisation had failed, and that capacity should be devoted to a well-planned PSO network rather than waiting for open access services. Directive 2012/34/EU permits charges to differ for domestic and cross-border services, and allows domestic PSO services to be prioritised when infrastructure is congested.

4.30 Finally, a lack of end-to-end fares, and a range of different ticketing and sales systems, remain barriers to selling tickets for cross-border journeys. The emerging Open Sales and Distribution Model (OSDM), described in Annex N, seeks to address these issues, but will require close monitoring to assess its effectiveness in facilitating ticketing at a single point of sale and as single transaction, and the inclusion of non-incumbent railway undertakings and third-party vendors in ticket distribution.

The cost drivers of rail, air and long-distance coaches

4.31 We set out in Annex I our analysis of the costs of rail, air and coach services in Europe.

- For rail, we examined the range of costs from conventional 200 km/h day trains, which might also be used to operate overnight services with only seated accommodation, high-speed trains, and night trains providing high-quality sleeping accommodation.

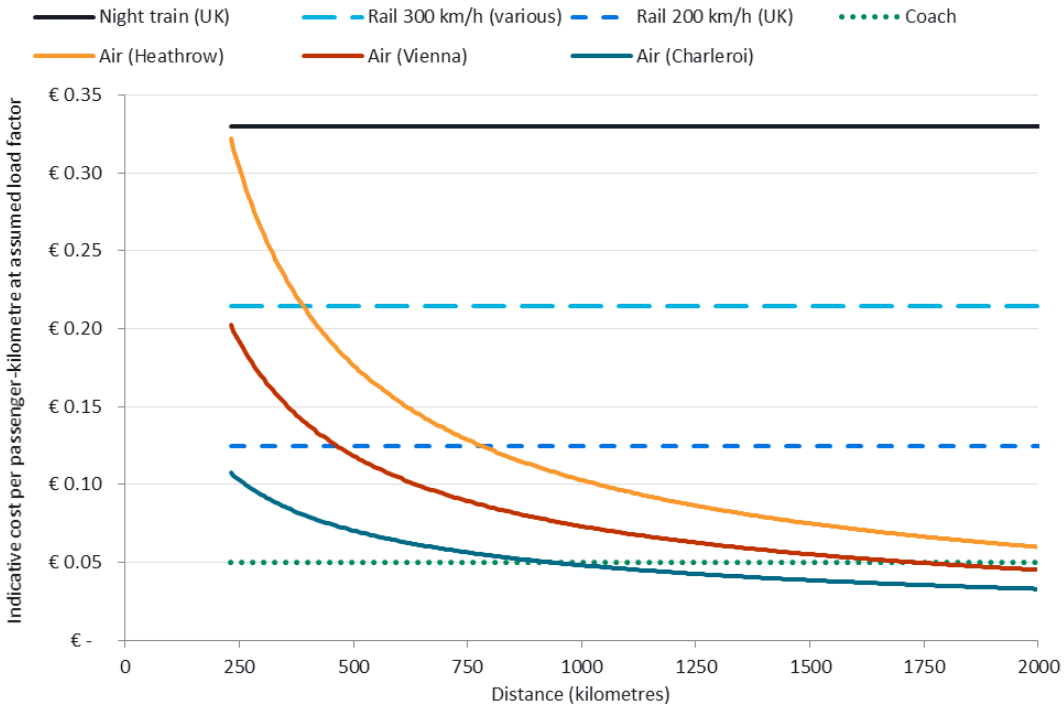
[12] At the study conference, a new entrant railway undertaking said that Eurostar has to deal with seven signalling systems (see paragraph R.47).

- For air, where costs on short flights can be dominated by airport charges, we examined the range of costs illustrated by the charges at Brussels Charleroi, Vienna, and London Heathrow.

4.32 Figure 4.5 compares the results at distances over 250 kilometres, using assumptions about load factors to estimate an average cost per passenger-kilometre for each type of service. We stress that the estimates are drawn from limited sources and may not be representative of all the variations in costs across the EU. We note in particular that:

- Infrastructure charges are included for air (airports and air navigation services), rail in the United Kingdom (Network Rail) and coach (vehicle taxes and road tolls), but not for 300 km/h rail on new infrastructure, which may combine very high capital costs with modern infrastructure technologies offering relatively low operating and maintenance costs.
- Rail and coach costs per passenger-kilometre fall with distance, but we estimate that the effect is small compared with the rapid decline in airline costs per passenger-kilometre with distance, which is due to the large element of fixed airport charges in airline costs.

Figure 4.5: Comparison of cost estimates by mode, 2018-2019 cost levels



Source: Steer illustrative analysis, see text.

4.33 In addition, rail costs per passenger-kilometre may change even within a single journey:

- Infrastructure charges may change as the train moves between networks.
- Train operating costs may change if the service splits and joins.
- Load factors may vary as passengers board and alight.

4.34 Nonetheless, the chart suggests that:

- Rail services cost more than coach services at any distance.
- Night trains with sleeping cars cost more than air at the distances at which they operate.

- Day trains only cost less than air at distances up to 200-400 kilometres, depending mainly on the level of airport charges at each end of the route.

The cost of new and/or improved services

4.35 To supplement the above analysis of rail costs based on desk research, we also prepared detailed cost estimates, described in Annex J, for three specific rail services:

- a high-speed Hamburg-Berlin-Munich service with a seven-car ICE 4 multiple-unit train;
- a conventional speed Berlin-Erfurt-Stuttgart service, locomotive-hauled with 10 cars; and
- a Berlin-Vienna night train with two seating, three couchette and two sleeping cars.

4.36 All three of the services examined operate without direct support from competent authorities or co-financing of vehicles by European funds. We estimate that the day trains, whether high-speed train or conventional long-distance, can probably be operated commercially. The high-speed train can probably generate considerably higher revenues than the conventional train, although in other states much of its operating surplus may be captured by the infrastructure manager in infrastructure charges. The night train, in contrast, appears unlikely to be able to recover all its costs from passenger revenues and likely to require support. In practice, it may benefit from using the maintenance facilities of the operator in Vienna at marginal cost.

4.37 These cost estimates are based on data for specific networks and routes and may not be relevant to other routes in other states. However, we note that:

- Infrastructure costs play a relatively minor role in night train costs in Germany, but this may be different in other states.
- Rolling stock is a major cost for night trains, as it requires relatively high space per passenger in sleeping and couchette cars, and can make only one loaded journey every 24 hours.
- The cost of service facilities varies, and railway undertakings which already have access to facilities may be able to use them for additional services at little or no additional cost.
- Train driver and crew costs, and the labour costs of other activities, vary between States and regions within them. Railway undertakings may seek to recruit staff and procure services in states or regions with lower costs.
- Fare revenue is key to achieving profitability. Open access operators designing services therefore focus on the number of potential customers and their willingness to pay.

Summary of market potential

4.38 Information on cross-border rail passenger numbers is poor, but good information is available on cross-border air services which could, in principle, be replaced by long-distance cross-border trains. For night trains, 8 existing proposals for new services all parallel dense air flows. We found a further 16-17 potential routes where there might be sufficient demand to support a night train. For day trains, it is much more difficult to estimate what additional long-distance cross-border services might be possible.

4.39 We examine in Annex G the potential of forecast changes to the rail network to 2030 to increase rail connections, speeds or capacity. We identified two themes:

- New links and high-speed lines offering shorter journey times by day might render some night train services, or some stops on them, no longer viable.
- Constraints at many city centre stations may limit the scope to operate additional night trains arriving in the morning commuter peak. In some cases, infrastructure capacity may

be available at one to two year's notice, but in other areas, it might not be available for a decade or more.

4.40 Initiatives to facilitate cross-border travel began in the nineteenth century and continue with harmonisation measures including a standard signalling system, ETCS, and regulatory harmonisation through the four railway packages. However, liberalisation of cross-border services in 2010 has resulted in little entry on long-distance cross-border routes. Legislation explicitly permits cross-border services to be charged more than domestic services, and allows domestic PSO services to be prioritised when infrastructure is congested. OSDM may make it easier to sell tickets for cross-border travel as a single transaction, but is not yet proven and will need to be monitored in practice.

4.41 Some additional long-distance cross-border trains might be commercially viable, but others are likely to require subsidy. Over any distance, we estimate that sleeping accommodation on night trains costs more than seats on aircraft, coaches and other trains. Over short distances, seats in conventional-speed trains operating by day or night can cost less to provide than air services from expensive airports.

4.42 Neither 2019 levels of demand, on which this analysis is based, nor the EU Reference Scenario reflect:

- changes in passenger behaviour, due to the COVID-19 pandemic or increasing concern for the environment; or
- changes in national policies and legislation, such as the vote of the French national assembly to ban domestic flights on routes that could be travelled via train in under two and a half hours, which is expected to close 6.3% of Air France and HOP! Flights, according to Insight IQ Flights data.

4.43 The backdrop for this study is the European Green Deal, which aims, inter alia, to shift transport to less polluting modes such as rail. The Technical Specifications did not require us to compare the carbon impacts of different modes of transport, and we have noted in previous studies that night train vehicles, which only make a single journey per day, almost certainly have more "embedded" carbon per passenger-kilometre than trains using other rolling stock[13]. However:

- Aircraft are currently powered almost exclusively by fossil fuel, and there have been only limited pilot projects of aircraft powered by biofuels or by batteries.
- Coaches continue to be powered by fossil fuels, although battery technology is being extended to a growing proportion of smaller road vehicles.
- Rail alone has the proven potential to be powered wholly by renewable energy.

4.44 Higher market prices for fossil fuels, or higher taxes on them at the global, European or national level, would increase the costs of other modes relative to rail. Conversely, rail can be subsidised in recognition of its potential environmental benefits relative to other modes. We note that changes to taxation or subsidy of different fuels and different transport modes are being considered as policy measures at the European level and in many states.

[13] Table 17, Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

4.45 Changes in passenger and public attitudes, government policies, and internalisation of external costs all have the potential to increase the shift from other modes to rail beyond that which would occur in the 2019 market in pre-COVID market conditions.

5 Identification of obstacles

Introduction

5.1 We sought and collated evidence of obstacles to the provision of long-distance cross-border services through our desk research and stakeholder interviews and questionnaire responses. The obstacles we identified can be categorised as:

- infrastructure charges;
- infrastructure capacity and capacity allocation;
- rolling stock;
- ticketing and rights for connecting passengers;
- creating cross-border PSOs; and
- other technical and operational barriers.

5.2 We next discuss these further, and end with a summary of the obstacles.

Infrastructure charges

5.3 Our detailed analysis of infrastructure charges is set out in Annex K. From the perspective of railway undertakings wishing to provide a cross-border service, there are two main issues:

- Charges can be high and unaffordable, despite the principle that they must not exclude market segments which can pay the cost directly incurred by operating the service.
- Charges can be subject to frequent and large changes, making business planning difficult.

5.4 Many stakeholders drew our attention to these points, and suggested that infrastructure managers should be required to prove that their charges complied with Article 32 of Directive 2012/34/EU. This requires that the level of charges shall not "exclude the use of infrastructure by market segments which can pay at least the cost that is directly incurred as a result of operating the railway service".

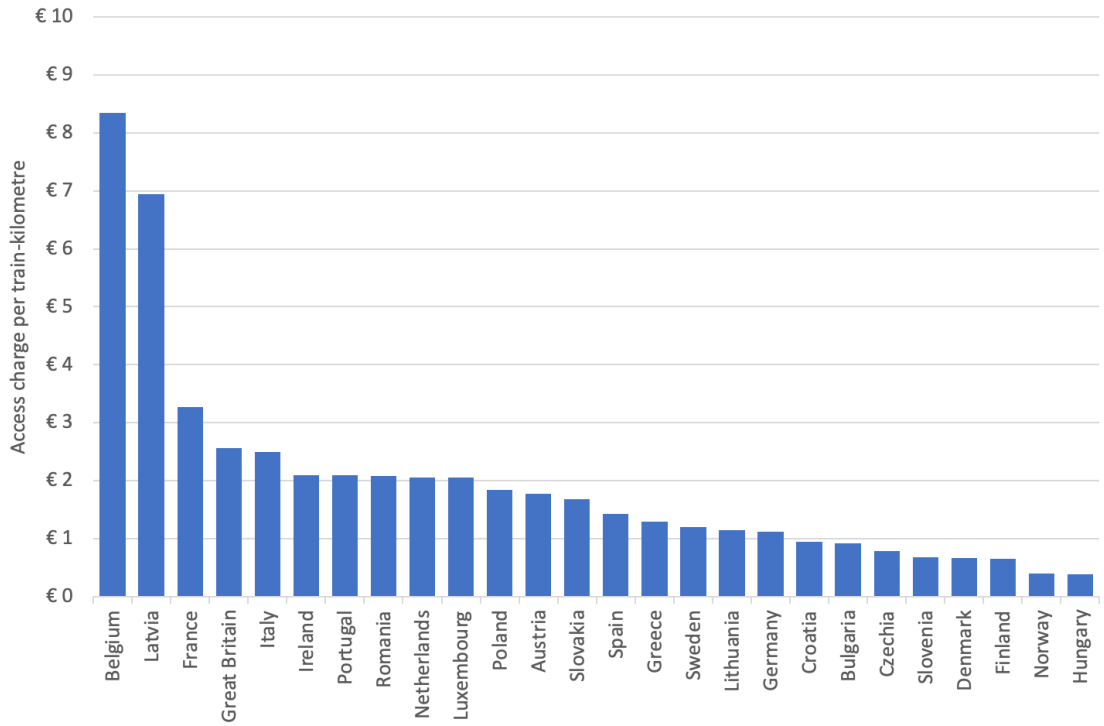
The infrastructure charges framework

5.5 The framework for access charges in the EU is Chapter IV of Directive 2012/34/EU, which sets out the principle that charges are "set at the cost that is directly incurred as a result of operating the train service". Commission Implementing Regulation (EU) 2015/909 set out a wide variety of different ways in which this cost could be calculated or estimated. In addition, from this base, charges:

- may be increased, through scarcity charges, noise charges and mark-ups (see glossary);
- may be reduced, to compensate for unpaid costs of competing modes;
- may be averaged, over services and time; and
- must be limited, to the amount which a "market segment" can bear.

5.6 Figure 5.1 shows data provided to RMMS on charges excluding mark-ups for passenger trains providing conventional long-distance services. Charges on high-speed lines are often different.

Figure 5.1: RMMS findings on infrastructure charges for conventional long-distance trains



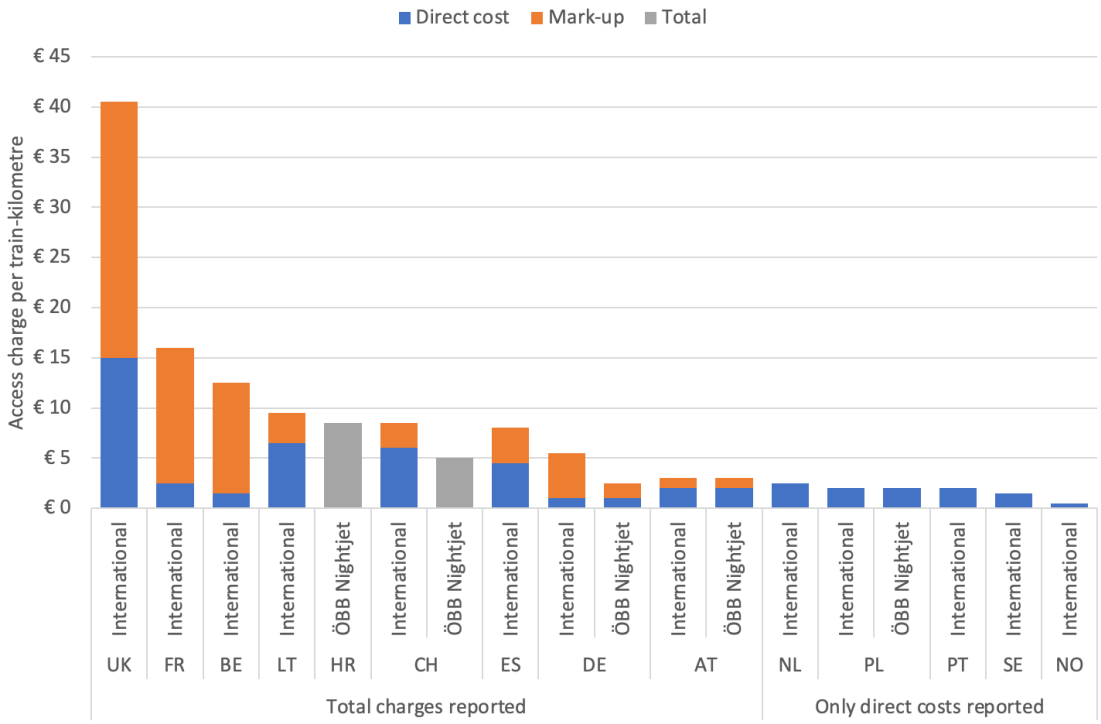
Source: RMMS, Steer analysis.

5.7 We conclude that a combination of the flexibility of the charges framework, and differences in how it is applied in the States, mean that charges vary widely with location, time, and the characteristics of each vehicle in the train. This also means that their impact on the cost base of train operators can also vary significantly.

The impact of mark-ups on costs

5.8 While some components of charges are referred to in the Directive as mark-ups, this does not mean that they are related to other charges or separately identified in the final charge. Figure 5.2 shows data collected by IRG-Rail on charges for cross-border passenger trains, including some ÖBB Nightjet night trains.

Figure 5.2: IRG-Rail findings on infrastructure charges for cross-border trains



Source: IRG-Rail, Steer analysis.

5.9 This suggests that mark-ups form a large proportion of final charges for cross-border trains in France, Belgium and Germany. It also suggests that charges for ÖBB Nightjet services are sometimes lower than for other cross-border trains.

5.10 In Annex J we summarise our estimates of the costs of high-speed and conventional day trains and night trains. We estimate that, for the services we studied, the effect of mark-ups on costs is greatest on high-speed lines. This suggests that reductions in access charges might increase the attractiveness of providing services on high-speed lines, where capacity exists, but might have less effect on conventional day trains and night trains.

The impact of charges on passenger numbers

5.11 At first sight, lower infrastructure charges and hence costs could result in lower passenger fares and hence more passenger demand. Charges on high-speed lines in Belgium or Spain of around €10 per train-kilometre are, for a train carrying 200 passengers, around €0.05 per passenger-kilometre, equivalent to €25 on a 500-kilometre journey. A reduction in charges of €1 per train-kilometre on a long-distance cross-border train illustratively carrying 200 passengers is a cost reduction of €0.005 per passenger-kilometre, equivalent to €2.50 on a 500-kilometre journey.

5.12 In practice, while lower charges and hence costs could in principle be passed on to passengers as lower fares, rail fares are not set by reference to costs:

- Fares on PSO services are often set or regulated by competent authorities in the context of their economic, social or environmental objectives.
- Fares on commercial services are often set by railway undertakings with the objective of maximising revenue using yield management, in which fares vary with class of travel, flexibility, time of booking, and the number of seats remaining on each service.

5.13 We have seen no evidence that past changes in infrastructure charges have led to changes in fares.

5.14 We conclude that lower infrastructure charges would, in many cases, only result in lower fares through the mechanism of new services being introduced and choosing to offer lower fares, whether these fares were specified and supported by competent authorities through PSOs or set by a new operator competing on price with an incumbent. Detailed studies would be required to estimate what rail services would, or could, become commercially viable with any given level and structure of access charges throughout the study area. Experience since the third railway package came into force in 2010 suggests that, even where services could be viable, it could take several years before railway undertakings identified an opportunity and decided to enter the market.

Infrastructure capacity and capacity allocation

5.15 Annex L sets out our detailed analysis of infrastructure capacity and capacity allocation.

How infrastructure capacity is allocated

5.16 The framework for infrastructure capacity allocation in the EU is Chapter IV of Directive 2012/34/EU, which provides for railway undertakings to request capacity at least 12-18 months in advance of the relevant timetable period. This is to enable the regulatory bodies concerned to assess the potential economic impact on existing public service contracts. Infrastructure managers' Network Statements describe when and how to apply for capacity, but not the processes by which a timetable is created. This typically involves interlinked databases including the relevant details of maintenance and engineering works, characteristics of infrastructure and rolling stock, rules on how the timings of trains are calculated, and the service specifications in Public Service Contracts PSCs.

5.17 In practice, railway timetables are typically based on the timetable of the preceding year, adjusted to deal with maintenance and renewal plans and changes in infrastructure and rolling stock. Major changes normally only occur when new infrastructure or rolling stock enables additional connectivity, speed or capacity, or when a fundamental redesign is needed to make better use of the available capacity. Congestion on many networks, and the benefits to the industry and passengers of stable and easy-to-understand timetables, have accelerated the trend towards clockface or "Takt" timetables (see glossary), particularly in urban and suburban areas.

5.18 In states using the Takt approach, consultation and planning for the clockface hourly timetable can begin up to 15 years in advance, after which infrastructure and rolling stock are built in time to deliver it. Stakeholders commented that this can make it difficult to introduce services at short notice, except by using pre-planned spare paths built into the Takt timetable.

Coordinating timetables across borders

5.19 Coordinating timetables across borders requires bi- or multilateral processes involving the infrastructure managers concerned. In 2014, RailNetEurope (RNE) and Forum Train Europe (FTE) joined forces to begin the Redesign of the International Timetabling Process (TTR), to be implemented by 2025, enabling capacity to be allocated for both short- and long-term needs. Pilot projects have found that TTR required extensive IT developments, costed at €675 million, to achieve a high degree of preplanning, automation and integration between legacy systems adapted for the purpose.

5.20 IRG-Rail has noted that there appeared to be widespread agreement among stakeholders that there is a need for revision of Directive 2012/34/EU. Other stakeholder comments focused on how the infrastructure managers set and use the priority rules which the Directive permits them to apply on congested and specialised infrastructure.

The impact on long-distance cross-border passenger trains

5.21 In Annex L we examine the case studies of the timetabling of proposed new night trains services. Snälltåget's new commercial service linking Stockholm, Copenhagen, Hamburg and Berlin has to be fitted between capacity constraints in all those cities, particularly in the AM commuter peaks, and on the network in Germany, which is already planning a Takt timetable for 2030. Trafikverket examined several possible PSO services from Sweden and tendered two routes, each of which would also pass through some of these cities[14]. Many stakeholders mentioned constraints at city centre stations, which we list in Annex G, noting where proposed long-distance cross-border night trains would need capacity. We also note how both city centre stations and long-distance lines have become effectively full in Great Britain after market entry, and how it can take more than a decade to build additional capacity. As the number of constraints rises, it can become impossible to find a commercially attractive train path through all of them.

Best practice for dealing with constraints

5.22 The Directive 2012/34/EU framework for capacity allocation provides mechanisms for declaring infrastructure congested, preparing a capacity analysis and capacity enhancement plan and, until the problem is resolved, applying scarcity charges and/or priority criteria. Scarcity charges are not an effective means of restricting existing PSO services, which are also often assigned a higher priority than new long-distance cross-border services.

5.23 Best practice includes long-term capacity planning, with the aim of retaining a reserve of capacity, but building spare capacity can be extremely expensive and difficult to justify without clear evidence that it is likely to be needed. Infrastructure upgrades to provide for planned PSO services may not result in capacity suitable for long-distance cross-border services.

Rolling stock

Existing night train rolling stock

5.24 Many night trains consist partly of cars with seats similar, or identical, to those used on day trains. In addition, across the study area of the EU, Norway, Switzerland and the United Kingdom, we identified nearly 1,500 vehicles dedicated to, or which can be reconfigured for, overnight travel, such as couchette cars and sleeping cars. However, some may not currently be operable or in a condition which would be accepted by passengers without refurbishment. Stakeholders indicated that lack of adequate rolling stock is a barrier to starting, extending or expanding new cross-border services.

[14] On 30 August 2021, Trafikverket announced that it had awarded the contract for a Stockholm-Hamburg services to SJ but that no bids had been received for a Malmö-Brussels service. We understand that the service to Hamburg will, like ÖBB's Nightjet services, terminate at Hamburg-Altona, rather than the constrained Hauptbahnhof.

The rolling stock needed for the fictive networks

5.25 In Chapter 4 we described our estimates of the scope for "fictive" networks of long-distance cross-border night trains (paragraph 4.2) and day trains (paragraph 4.15). For night trains, we identified 11 possible train services, 6 of which would involve splitting and joining to serve a total of 17 origin-destination pairs, which we estimated would require 22-32 7-car train sets, plus an allowance of 10% for spares. For day trains, we estimated that to attract an additional 1 million cross-border passengers a year might require 54 train sets, or 400-500 vehicles, mainly of high-speed stock, plus an allowance of 10% for spares. However, additional cross-border services might be created largely by combining existing journeys, or through higher utilisation of existing high-speed train fleets.

The costs of operating the fictive networks

5.26 Using the cost analysis developed in Annex J, we estimated that the fictive night train network could cost €90-135 million per annum to operate and a fictive day train network of 27 additional cross-border train pairs could cost €0.5 billion if it consisted of wholly new services, with additional rolling stock. These cost estimates exclude infrastructure charges which, according to our analysis in Annex M, often exceed the cost that is directly incurred as a result of operating the train service, and therefore include an element of profit to the infrastructure manager. With no reliable information on passenger demand, we have not attempted to estimate the net additional revenue which could be earned on the fictive networks, or whether the services would be commercially viable or require PSO support. Providing PSO support, as is happening through the procurement of a new night train service in Sweden, is the most certain way of ensuring that the new services envisaged will actually be introduced.

The availability of rolling stock

5.27 Purchases of new night train rolling stock since 2001 have been limited, with 75 vehicles ordered in 2015 for the Caledonian Sleeper in the United Kingdom, and 91 vehicles on order by ÖBB to expand its Nightjet services. Recent proposals for night train services may mean obtaining secondhand stock and refurbishing it. One new entrant railway undertaking told us that demand for new rolling stock is high, and that it was no longer possible to buy secondhand stock for day trains.

5.28 We have identified allegations that some railway undertakings are avoiding making unused stock available to potential competitors, including one court case (see Annex M, paragraph M.34). As new proposals emerge, it is not clear whether and when it will be necessary to order more new night train rolling stock. In Annex M we describe several potential measures to increase the availability of rolling stock.

Ticketing and rights for connecting passengers

5.29 In Annex N we set out our detailed analysis of ticketing and the rights for connecting passengers.

5.30 End-to-end passenger ticketing (see glossary) long predates the establishment of the European Community or Union. The International Union of Railways (UIC) has been involved in standardisation of processes since its inception in 1922, including the initial development of an international tariff, and arrangements for ticket sales based on it, which later becoming the Special Conditions for International Carriage (SCIC). However, SCIC has lost significance over the last decades as yield management and market prices have been implemented separately from international and national end-to-end fares (see glossary).

5.31 As a guide to what passengers may expect of the ticketing aspects of a journey, Table 5.1 lists the top three themes of simplicity, price and protection identified by both a 2019 study of integrated ticketing[15] and independently by a stakeholder.

Table 5.1: Expectations from ticketing

Theme	Remaining challenges for EU-wide integrated ticketing (2019)	The Man in Seat 61 (2021)
Protection	Ensured journey connections	In the event that a delay meant a missed connection, protection against having to buy new onward tickets at full on-the-day prices.
Simplicity	Ease of booking	The ability to make one transaction easily on one website with one headline price, rather than separate tickets booked on different websites.
Price	Lower prices and promotions	An attractive and competitive end-to-end price, rather than the sum of the fares for each train on the journey.

Source: stakeholders, Steer analysis, see Annex N for further details.

5.32 In practice, progress to meeting these expectations has been limited, for at least three reasons:

- Initiatives such as the National Access Points required by Regulation (EU) 2017/1926 do not expand either the range of parties who can sell tickets or the range of tickets they can offer.
- Agreements between railway undertakings to harmonise the prices or terms and conditions of tickets may be perceived as potentially anti-competitive and attract the attention of competition authorities.
- There are limited incentives for railway undertakings to offer tickets which they expect few passengers to buy.

5.33 There is broad agreement among stakeholders that it should be easy for passengers to compare and buy tickets, ideally as a single transaction, for travel between any two stations, and that passengers needing to connect between trains should be confident that the connection will be made or, if it is not, be provided with some or all of assistance, re-routing, reimbursement or compensation (see glossary). Ticket vendors also argued that they should be able to compete with railway undertakings to sell tickets, and to combine them at their own initiative, as a service to passengers.

5.34 There is less agreement on:

- whether passengers should be able to travel on all relevant services, or to select a railway undertaking or train based on price;
- how fares for long-distance journeys involving connections should be set; and
- how separate contracts for rail carriage can be linked to create rights related to connections, how such rights could be delivered, or by whom.

[15] Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report, 2019.

The new rail passenger rights Regulation (EU) 2021/782

5.35 On 29 April 2021 the European Parliament and the Council adopted the new rail passenger rights Regulation (EU) 2021/782. It applies from 7 June 2023 but must be the subject of a report by 7 June 2026, in which appropriate proposals for further change may be made.

5.36 Table 5.2 assesses the new Regulation against the passenger expectations listed in Table 5.1 and notes a number of limitations in the framework it creates.

Table 5.2: Potential benefits of ticketing and Regulation (EU) 2021/782

Potential benefit	Effect of Regulation (EU) 2021/782	Potential limitations
Ensured journey connections	• Rights related to missed connections. • In case passenger is not informed that the ticket is not a through-ticket, the passenger has to be treated as if the passenger had received a through-ticket (burden of proof lies with the railway undertaking) • RU can specify for which rail service the TT has been issued	• Limited to passengers with through-tickets, but passengers may not be aware of through-tickets or whether they have one. • The definition of a through-ticket does not require it to be valid only on one (or a limited number) of trains, or to include a statement that it will be valid on one (or a limited number) of trains (because tickets and reservations may be physically separate), and includes open tickets which in some cases may be valid for up to a month. It may be difficult for the industry to identify whether any passengers have experienced a missed connection.
	Clear allocation of liability for missed connections, delays and cancellations.	None
Ease of booking	Obligation to offer through-tickets. Free	• The obligation to offer through-tickets is limited to 'sole undertakings' (see glossary). • No limit on the prices relative to other tickets. • Need not include a seat reservation for one train, so does not guarantee a seat.
Lower prices and promotions	Outside the scope of the Regulation.	

Source: stakeholders, Steer analysis.

Ensured journey connections

5.37 The new Regulation grants rights related to connection to passengers with a through-ticket. The definition follows the definition in Directive (EU) 2012/34 and is defined as "a ticket or tickets representing [a contract of rail carriage for reward or free of charge between a railway undertaking and a passenger for the provision of one or more transport services] for successive railway services operated by one or more railway undertakings"[16]. Through-tickets

[16] As the definition of "through-ticket" has commercial implications going beyond the issue of passenger rights, it appears in the Directive establishing a single European railway area rather than in Regulation (EU) 2021/782.

must be a contract with a railway undertaking, rather than a ticket vendor, competent transport authority or other party.

5.38 The number of passengers benefiting from rights related to connections therefore depends on the number holding tickets meeting the definition of a through-ticket.

5.39 The new Regulation provides for passengers to be informed whether a ticket or tickets constitute a through-ticket. More specifically:

- Article 12 (2) requires that, in the case of journeys including one or more connections, passengers are informed prior to purchase whether a ticket or tickets constitute a through-ticket;
- Article 12 (5) provides that liabilities allocated to railway undertakings in the case of through-tickets do not apply when passengers have been informed (either through information on a ticket or provided by another means) that the tickets they have purchased represent separate contracts; and
- Article 12 (6) ensures that the burden of proof that a passenger was provided with relevant information lies with the railway undertaking.

5.40 Nevertheless, in practice passengers may not always be aware of the existence of through-tickets or the rights associated with them. Moreover, they may not be made aware that their rights are more limited where they purchase tickets as separate transactions without making staff aware of the full extent of their journey.

5.41 The proportion of EU27 long-distance and high-speed passenger services arriving less than five minutes late fell from 84.9% in 2015 to 78.7% in 2018[17]. Regulation on passenger rights cannot, in itself, make the trains run on time, but can provide rights for passengers who fail to complete their intended connection. However, at least some passengers may prefer to allow extra time for their intended connections, rather than to rely on passenger rights in the event that they do not complete them. Passengers can certainly ask for such connection times when booking, but not all railway services facilitate such requests. Regulation should enable passengers to make such requests when researching the booking and the price for their journey.

5.42 In the event of delays, missed connections and cancellations, the new Regulation contains the same rules on the liability of railway undertakings to provide assistance, re-routing, reimbursement and compensation as the currently applicable Regulation (EC) No 1371/2007. However, we note that any party made liable to deliver passenger rights might modify or remove the services they offer to minimise the costs to them of doing so. For example:

- They might specify longer minimum connecting times, with the effect that the journey times offered to passengers making connections would rise.
- They might charge much more for tickets sold as a single transport contract, to deter passengers from buying them. Over time, this could mean that such tickets became too expensive to be relevant to most passengers[18].

[17] Eurostat.

[18] We describe in Annex N how this has happened to fares in the global airline and British rail industries.

5.43 This means that passengers willing to risk booking a tight connection, or to obtain the cheapest fare, need to do so through separate transactions and transport contracts, and would have no passenger rights if they failed to make the connection.

5.44 The responses of both industry parties and passengers would depend on the details of what liability they bore. We discuss in Annex N other models for how liability could be assigned to parties including ticket vendors, railway undertakings and other parties, if and when the new Regulation were to be revised or amended.

Ease of booking

5.45 Ease of booking of rail travel may be facilitated by the emerging Open Sales and Distribution Model (OSDM), jointly managed by UIC, railway companies and ticket vendors, which is now expected to be rolled out by the end of 2021. OSDM is not a reference standard and is not compatible with Transmodel[19], but it creates a standard interface between railway undertakings offering tickets for sale and other parties wishing to sell them. Stakeholders were optimistic that the standard interface would make it easier for ticket vendors to link to railway undertakings' systems, but noted that all would depend on the willingness of railway undertakings to provide an OSDM interface and to make all their ticket products available through it. In addition, buying a ticket through OSDM does not, in itself, create a single transport contract with a railway undertaking which would constitute a through-ticket and hence entitle the passenger to rights related to connections.

5.46 However, neither the new Regulation nor the use of systems such as OSDM are intended to control the prices at which through-tickets are offered, as discussed above, or to guarantee that seats can be reserved on trains.

Lower prices and promotions

5.47 Many stakeholders suggested that railway undertakings should set end-to-end fares and promotions for connecting journeys, at market prices designed to be attractive compared with other modes.

5.48 End-to-end fares could be offered under a number of models, but any model raises two issues:

- The need for railway undertakings to agree to adopt common systems and processes to enable end-to-end fares to be set.
- The willingness of railway undertakings to set end-to-end fares for relatively few passengers between most pairs of stations.

5.49 We note, for example, that, while full-service airlines and airline alliances offer end-to-end fares within their own networks, the low-cost airlines operating within Europe do not set end-to-end fares and instead offer each flight as a separate transaction, contract, ticket and fare. We conclude that, even if the rail industry adopted models which enabled it to set lower end-to-end fares, it might rarely be commercially worthwhile to do so in practice.

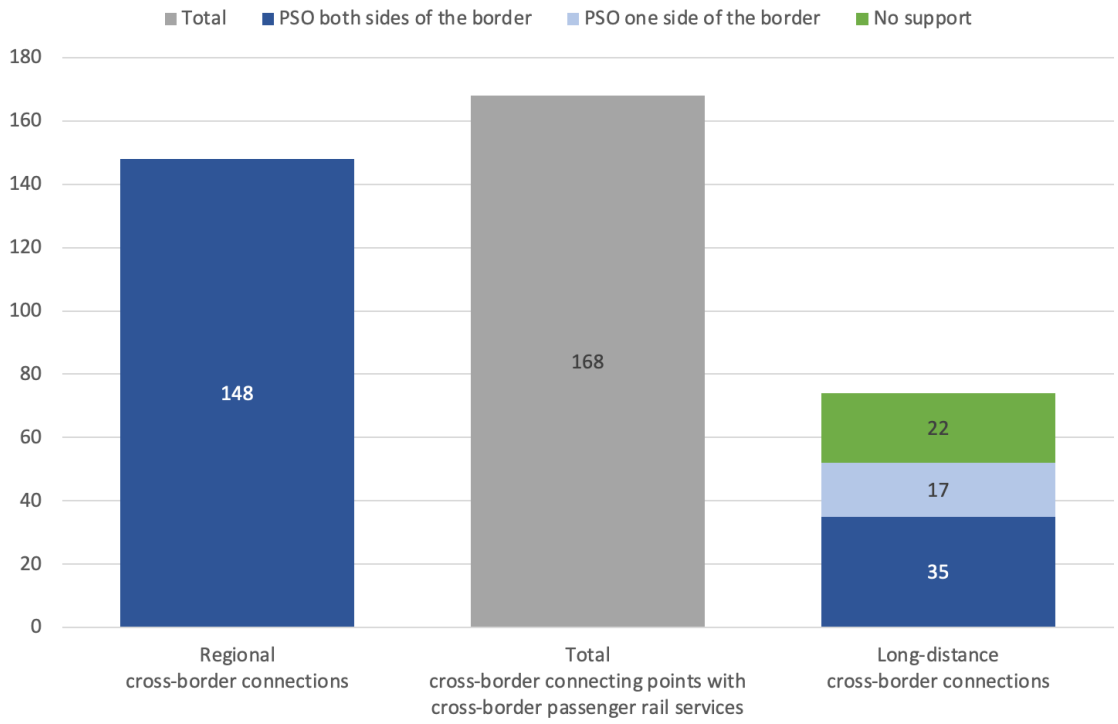
[19] Transmodel provides an abstract model of common public transport concepts and data structures that can be used to build many different kinds of public transport information system, including timetabling, fares, operational management, real time data, journey planning.

Creating cross-border PSOs

Cross-border rail PSO schemes within the study area

5.50 Figure 5.3 summarises our findings on the number of cross-border rail connections in the study area with regular passenger services.

Figure 5.3: Cross-border rail connections in the study area



Source: KCW analysis.

5.51 Of the 168 cross-border rail connecting points with regional and/or long-distance services:

- 148, or 88% (left), had regional passenger services, all of which were supported by PSO.
- 74, or 44% (right), had long-distance service.

5.52 Of the 74 long-distance services on the right:

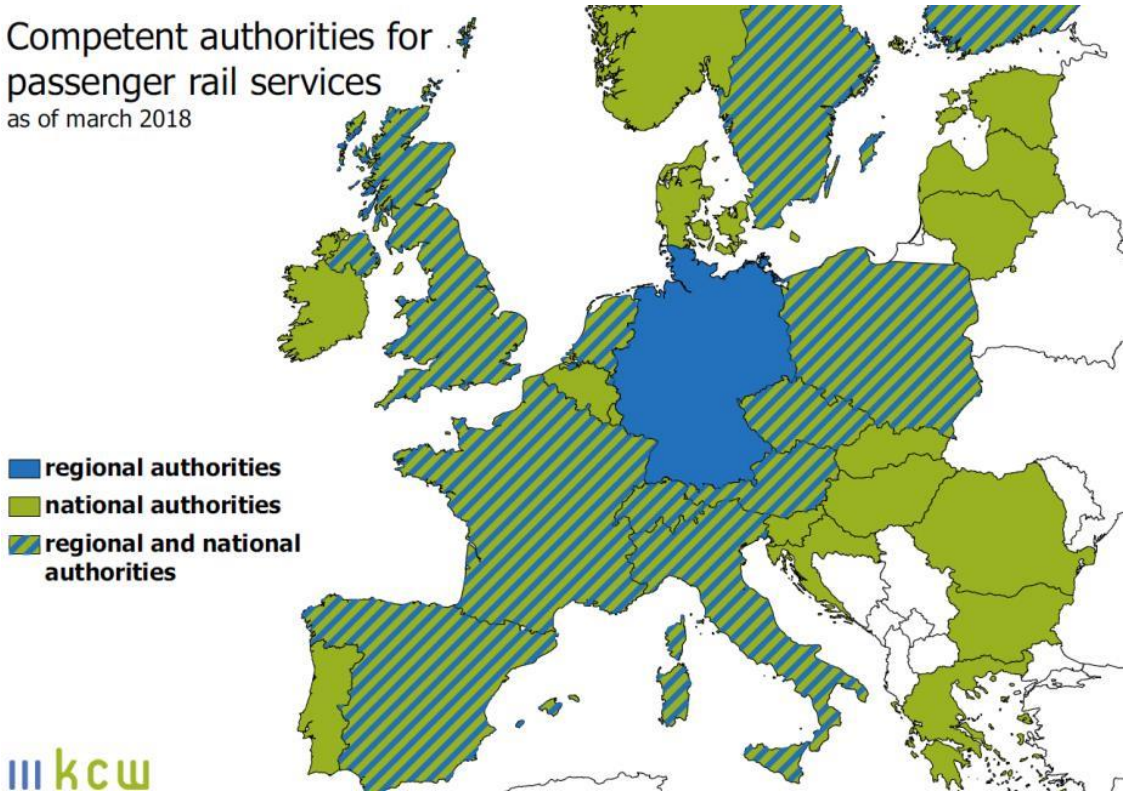
- 35, or 47% had PSOs on both sides of the border.
- 17, or 23%, had PSOs on one side of the border.
- 22, or 30%, were open access or commercial services with no support.

5.53 Thus, while commercial operation is the presumed default approach to rail services:

- No regional cross-border services were operated on this basis.
- Only 30% of long-distance cross-border services were operated on this basis.
- Of the 70% of long-distance cross-border services with PSO support, only two-thirds (47% of 70%) had a PSO on both sides of the border.

5.54 A major driver of the mix of support on both, one, or neither sides of the border is the lack of a PSO competent authority at national level in Germany, as illustrated in Figure 5.4.

Figure 5.4: Competent authorities for passenger rail services, 2018



Source: Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders, KCW for European Commission.

5.55 This means that long-distance cross-border PSO services linking Germany with any of the nine surrounding states[20] do not normally receive PSO support from a German competent authority.

5.56 Services can also be supported through a "general rule", provided for under Article 3(2) of Regulation 1370/2007 (see glossary), on financial compensation for PSOs which establish maximum tariffs for pupils, students, apprentices and persons with reduced mobility (PRMs). This means that a railway undertaking receives compensation for accepting PSO fares which would be below what it would otherwise charge. In principle, a competent authority could also pay a railway undertaking to make particular station calls, such as to enable children to make a short journey to or from school on an existing long-distance commercial service.

Long-distance cross-border services with PSO and open access

5.57 Many long-distance cross-border services only receive PSO support on part of their route, for reasons including that:

- PSO support is not offered because no authority has competence to do so, such as with long-distance services in Germany, as shown in Figure 5.4.
- PSO support is not offered on part of the route where the competent authority judges that services already operated commercially are sufficient.

[20] Denmark, Poland, Czechia, Austria, Switzerland, France, Luxembourg, Belgium and the Netherlands.

- PSO support is not offered on part of the route to avoid unfair competition to other services operated commercially.
- PSO support is not offered on part of the route between the last station in a state and the border.
- The railway undertaking has extended the service on an open access basis, whether across a border or not.

5.58 Any gap or discontinuity between PSOs, including if one expires and is not immediately renewed, leaves the risk that services could be withdrawn over the section of route affected.

5.59 As an example of the potential complexity, we identified a single service between Zurich and Budapest with route sections:

- in Switzerland supported by a long-distance concession;
- in Austria west of Salzburg supported by a PSO;
- in Austria east of Salzburg not supported by a PSO but compensated for accepting regional tickets; and
- in Hungary supported by a national PSO.

5.60 The Annex to Regulation (EC) 1370/2007 requires that "the accounts of the said public services must be separated" and this has been the subject of a judgement by the Court of Justice of the European Union (CJEU)[21]. However, it is rarely meaningful to allocate costs, revenues or the need for subsidy to the different sections of the route of a single train[22]. In addition, competent authorities often deliberately combine profitable and loss-making services in a single PSO to enable the former to cross-subsidise the latter.

5.61 If the PSC is competitively tendered, the support requested and paid will be determined by bidders. However, most of the long-distance cross-border PSO services we examined are operated by incumbents, in many cases under a direct award. Experience of competitive tendering in some States may remain limited until current PSCs have expired, which may take some years.

PSO schemes for domestic night trains

5.62 Many, but not all, domestic night train services have PSO support. Where they do, the PSO may cover all domestic services, including day trains, or a package including regional and long-distance services, with the effect that the level of support specific to the night trains cannot be identified. Only Sweden and the United Kingdom have PSCs specific to night train services.

PSO institutional, procedural, contractual and financial features

5.63 We identified wide variations between PSOs, including contract duration, the risks transferred to the contractor, the existence and complexity of any performance regime, the arrangements for rolling stock, and the extent to which profitable and loss-making services are combined in a

[21] Judgment of the Court (third chamber), in Case C-482/14, https://curia.europa.eu/juris/document/document.jsf?text=&docid=192205&pageindex=0&doclang=en&mode=req&dir=&occ=first&part=1, Recital 129

[22] Parties may agree in advance a methodology for allocating costs and/or revenues, such as the "net financial effect" approach set out in the Annex to Regulation (EC) 1370/2007. However, there may still be disagreements, followed by extensive negotiation, over whether a predefined methodology correctly reflects the financial effects on each party of any particular change in services.

single PSO to provide cross-subsidy. It might be difficult for competent authorities in two or more Member States to agree on a common approach or joint procurement, to a service specification setting out factors including between which stations a train should operate, the maximum journey time, at which stations it should call, how often it should operate, the times of the first and last services, the capacity to be provided, the range of onboard services, and the fares. As of 2021, the Ostsachsen II contract remains a unique example of a joint cross-border PSO specified and tendered by four regional competent authorities (two in Germany and two in Czechia), but other networks will be tendered in this way in the future.

PSO models to support cross-border night trains

5.64 Competent authorities may decide to impose a PSO to ensure public passenger transport services in the general interest and a range of models are available to enable this. Any elements of a night train service not specified in a PSO can be withdrawn at short notice as a commercial decision, irrespective of any social or environmental consequences, and may take a long time to replace through a PSO. At present, however, legislation in Germany effectively precludes the provision of PSO support to long-distance services, including long-distance cross-border services.

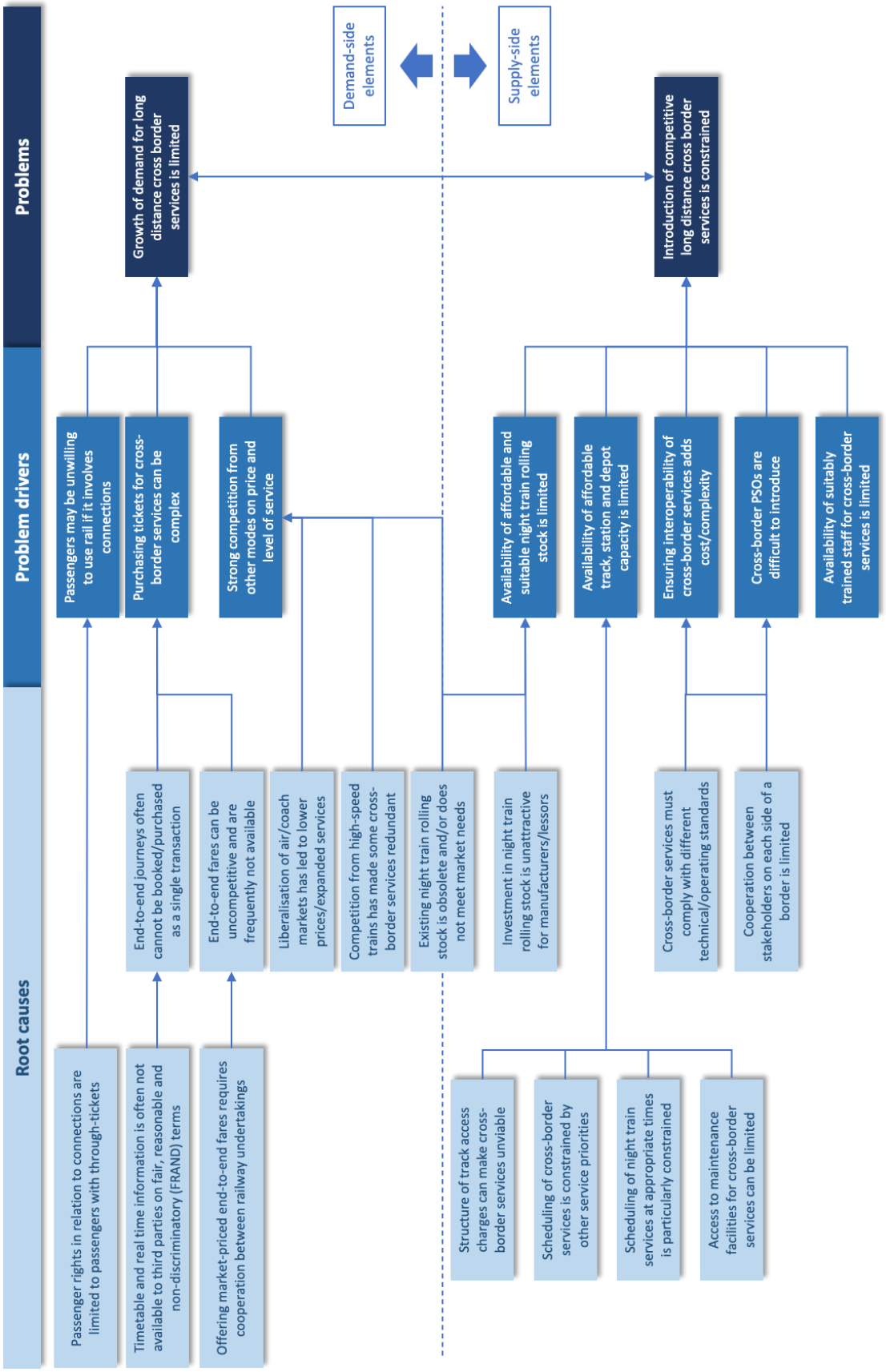
Other technical and operational obstacles

5.65 In Annex P, we summarise how studies since 2005 have identified a wide range of obstacles resulting from the different technologies, legislation and practices used in the railways in the study area. We reviewed IRG-Rail's 2020 assessment of the remaining and emerging obstacles and discussed initiatives in rail freight to collate emerging obstacles in an Interoperability Logbook. Stakeholders also pointed out that Europe's railways use a wide range of technical and operational systems and languages. In aviation, in contrast, common standards and a single language mean that trained aircrew can take off from, fly between, and land at, almost any airports in Europe or the world without extra training.

Definition of the problem

5.66 As a preliminary exercise, we developed a definition of the problem to inform further consideration of possible policy intervention, as shown in Figure 5.5. This draws on the discussion of obstacles described in the chapter, placing them within a structured framework following the approach required by the Better Regulation Guidelines. Note, however, that it is not intended to be definitive and would need to be reviewed, challenged and developed as part of any future formal impact assessment of policy options.

Figure 5.5: Problem definition



Source: Steer analysis.

5.67 In the final part of this chapter, we set out the core problems, problem drivers and root causes by way of a summary of the obstacles previously identified.

The core problems

5.68 Figure 5.5 identifies two core problems, the first relating to the demand for long-distance cross-border services and the second to their supply. Note, however, that:

- While we consider this distinction to be useful in describing the issues, demand and supply-side factors can interact and either reinforce or counterbalance one another.
- Some elements of the problem are specific to night trains, some to long-distance cross-border services, and some to cross-border services, but some are shared by all passenger rail services.

Limited growth in demand for long-distance cross-border rail services

5.69 Rail only carries a small proportion of long-distance cross-border public transport journeys within the study area, most of which are now carried by air. Air and coach services offer both competitive fares and a level of service quality that more frequently match the expectations of their respective markets. In addition, the expansion of high-speed train services has provided passengers with the option of faster travel by day, reducing demand for both conventional long-distance and night trains.

5.70 In the case of night trains, it is also difficult to offer journeys at times that are attractive to different passengers making different types of journey. Business travellers may require that a night train arrives in a relatively narrow time window: an 06:00 arrival may mean waiting for three hours before beginning the working day, and may severely reduce the advantage of a restful night on the train, while an 09:00 arrival may be too late to reach a meeting on time. Leisure passengers may have greater flexibility, and may be willing to accept a wider range of arrival and departure times. For long-distance cross-border services by day, it may be necessary to offer a number of departures, ideally at regular intervals and with standard and consistent connections.

Introduction of competitive long-distance cross-border services is constrained

5.71 The lack of cross-border interoperability significantly increases costs for railway undertakings, since they must typically make additional investment to meet the technical and operational requirements of each network on which they operate. This can mean operating a dedicated sub-fleet equipped for cross-border services, which reduces operational flexibility and increases operating costs. The operation of cross-border services also introduces other operational complexities relating to, inter alia, ticket sales and distribution, securing attractive and stable train paths on congested networks, and the recruitment, training and retention of suitably qualified staff.

Problem drivers and root causes

Complex ticketing arrangements for cross-border rail services

5.72 Railway undertakings rarely act in combination to offer a single cross-border product (whether valid on a single combination of trains or, more flexibly, on all trains or even all operators) for a single end-to-end fare. European railway legislation intended to encourage through-ticketing has been implemented but, as discussed in Annex N, the legal definition of through-tickets relates to the existence of a single contract between a passenger and a railway undertaking. This does not align either with stakeholders' understanding of the concept or the range of

benefits that passengers might expect to receive when buying a ticket. For example, passengers might make greater use of cross-border rail services if they could buy more tickets for an end-to-end fare and through a single transaction, neither of which necessarily implies a single contract.

5.73 Annex N includes a fuller discussion of the barriers to integrated and through-ticketing, which include the need for clearing and other mechanisms, to enable ticket vendors to offer a wider range of end-to-end fares, and to allocate liability for missed connections in a way that supports the objectives of legislation on passenger rights. Development and implementation of such mechanisms would require substantial, industry-wide investment and coordination across a wide range of stakeholders including railway undertakings and independent ticket vendors. These barriers are beginning to be addressed, both by industry-led initiatives such as the Open Sales and Distribution Model (OSDM) sponsored by UIC and by an S2R innovation programme, but the timescales for, and industry take-up of, such initiatives is unclear.

5.74 In addition, experience in rail and other transport modes[23] shows that, regardless of the technical and commercial solution to through-ticketing, it is important to ensure a level playing field between organisations if they are both:

- to cooperate to combine services to offer cross-border products; and
- to compete for passenger business.

5.75 For example, stakeholders told us that incumbent national railway undertakings' approach to integrated and through-ticketing can be designed to disadvantage new entrants, or to limit the ability of independent ticket vendors to offer attractive fare products to passengers[24].

Strong intra- and intermodal competition

5.76 The cost structures of coach, air and rail services are very different, and it can be difficult for railway undertakings to offer fares that are both competitive and commercially viable. This depends in part on national policies on taxation of, and subsidy to, different types of transport service, the treatment of environmental and other externalities arising from transport, and the level and structure of infrastructure charges. Figure 4.5 shows how:

- The operation of rail services costs more than the operation of coach services at any distance.
- Night trains with sleeping cars cost more to operate than air services at comparable distances.
- Day trains only cost less than air at distances up to 200-400 kilometres, depending mainly on the level of airport charges at each end of the route.

[23] See, for example, Executive Summary of the Evaluation, Regulation 80/2009 of the European Parliament and of the Council of 14 January 2009 on a Code of Conduct for computerised reservation systems, {SWD(2020) 9 final} (2020).

[24] Stakeholders mentioned incumbents not including other services in journey planners, incumbents not allowing new entrants or ticket vendors to sell their tickets, incumbents not allowing other parties access to all the tickets and functionality in their own sales system, and incumbents offering very low commission for sales of their tickets.

5.77 At the same time, the costs of travel do not fully reflect the associated externalities. The Fit-to-55 announcements of July 2021[25] will contribute to addressing this issue, depending on the extent and pace of their implementation. However, it is unclear how far this will affect the relative prices of air and rail in practice.

Limited availability of affordable and suitable night-train rolling stock

5.78 We identified around 1,500 vehicles dedicated to, or which can be reconfigured for, overnight travel, such as couchette and sleeping cars, although some night trains consist partly of cars with seats similar, or identical, to those used on day trains. Recent purchases of new night train rolling stock have been limited, with operators often relying on refurbished but increasingly obsolete vehicles. The lack of rolling stock that is both suitably configured and affordable makes it difficult for train operators to offer night train services that are attractive to passengers.

5.79 In the case of night train services, this problem driver is compounded by the specialised nature of night train rolling stock. Vehicles will only be available from lessors at attractive lease rates if they can readily be reused, which is typically not the case for night train rolling stock. In these circumstances, lessors will only include such stock in their catalogues if the potential revenue stream from its operation can be largely guaranteed, which is rarely possible for commercial operations. There is also limited appetite from manufacturers to develop new night train stock, which is typically ordered in much smaller quantities than stock used for urban, suburban, regional and long-distance day services.

5.80 Stakeholders also suggested that some railway undertakings avoid making unused rolling stock available to potential competitors, and in one case the resulting dispute has led to court action (see Annex M, paragraph M.34). One stakeholder also claimed that the REACH Regulation[26] prevents rolling stock operated by one railway undertaking from being used by another, whether it is sold, rented, or provided for free.

Limited availability of affordable infrastructure capacity

5.81 The flexibility of the framework for charging for access to railway infrastructure, and differences in how the framework is applied in different Member States, result in charges varying substantially with location, time, and vehicle characteristics. This, in turn, means that the impact of access charges on the cost base of train operators can also vary significantly.

5.82 The application of the framework for infrastructure capacity allocation is set out in Chapter IV of Directive 2012/34/EU, which requires railway undertakings to request capacity for each timetable period at least 12-18 months in advance. This can make it difficult to introduce new services, particularly where networks are constrained or congested. In practice, railway timetables are nearly always based on the timetable of the preceding year, with some

[25] As an intermediate step towards climate neutrality by 2050, the EU has raised its 2030 climate ambition, committing to cutting emissions by at least 55% by 2030. The Fit for 55 package is a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are in line with the climate goals agreed by the Council and the European Parliament.

[26] Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (2006).

adjustments to accommodate maintenance and renewal plans and changes in infrastructure and rolling stock. Major changes are relatively rare, since they typically involve changing the timings of a large number of trains operated by a range of passenger and freight operators and introduce substantial risk to service reliability, at least immediately following implementation.

5.83 In addition, congestion on many networks has accelerated the trend towards clockface or "Takt" timetables, particularly in urban and suburban areas. On national networks using the Takt approach, consultation and planning for the clockface hourly timetable can begin up to 15 years in advance, after which infrastructure and rolling stock are built to deliver it. Stakeholders commented that this can make it difficult to introduce services at short notice, except using pre-planned spare paths built into the Takt timetable. This is even more complex when timetables in more than one Member State must be considered.

5.84 We also note that issues related to capacity constraints, whether on sections of track or at junctions, stations, depots or other facilities, affect local and long-distance traffic, especially during peak hours. This means that developing a new timetable raises not only technical issues concerning the accommodation of different trains with different operating characteristics, but also commercial and financial issues affecting a range of PSO authorities, railway undertakings and infrastructure managers. Negotiating changes to PSO contracts to compensate railway undertakings for the impact of timetable changes can be difficult, particularly if it is to accommodate new services which may not be introduced as expected or may prove not to be viable.

Cost and complexity of ensuring interoperability of cross-border services

5.85 In addition to changes in track or structure gauge, different electrification or signalling systems in each network require direct services to operate with trains equipped to deal with multiple electrification, signalling and control systems. This leads to higher costs for the operator, which worsens the business case of a direct service.

5.86 The need for interoperability of the rolling stock adds further costs and complexity from the perspective of railway undertakings. Technical issues such as network-specific requirements for built-in fire extinguishing devices, selective door control, and handling of trains exceeding the platform length at some stations, may also prevent the efficient operation of rolling stock.

Scale of the problem

5.87 Annex E describes the limited quantitative information available on the number and type of long-distance cross-border journeys within the study area. We also considered the possible evolution of the problem, given the findings from the stakeholder survey and our wider research. The following tables describe the main factors we considered likely to influence the future development of long-distance cross-border services:

- In Table 5.3, we discuss a number of factors likely to have a substantial impact regardless of the extent and pace of recovery of the European rail industry from the COVID-19 pandemic.
- In Table 5.4, we consider how the pandemic may influence the impact of different factors, noting that the timescales for emerging from travel and other restrictions arising from COVID-19 are uncertain.

Table 5.3: Possible evolution of the problem

Topics	Key considerations, excluding COVID-19 implications
Policy	
Rail policy changes in Europe	• From 1993, rail policy ended the situation where services could be extended across borders on the basis of a bilateral agreement between vertically-integrated railways. • Since 2010, the third railway package's liberalisation of cross-border services has led to little entry into long-distance cross-border routes. • Currently, the fourth railway package is coming into effect. It liberalises domestic rail services, but no mechanisms are in place to constrain domestic liberalisation to ensure that capacity remains available for cross-border services. Increasing congestion on the rail network, combined with prioritisation of domestic services, may make it more difficult to introduce new cross-border services.
Infrastructure charges policy in Europe	• Charges may still be higher for cross-border than for domestic services, which can worsen the viability of cross-border services.
Passenger demand	
Rail demand	• Between 1995 and 2018, share of total intra-EU-27 passenger-kilometres remained at 6.9% for rail, rose from 5.3% to 9.6% for air, and fell from 87.8% to 83.5% for other modes. Passenger-kilometres grew by 1.2% per annum for rail and 3.9% pr annum for air. The EU Reference Scenario envisages a rail growth rate of 1.6% per annum from 2020 to 2030. • Expansion of the TEN-T network may result in further growth in the number of cross-border journeys. • However, the network is increasingly congested, particularly in a number of cities which would be key nodes on the future cross-border network.
Competition with air	• Airlines can offer travel over 500-800 kilometres for around half the cost of night trains (see Figure 4.5). • This competitive advantage of air may be reduced by policy interventions including energy taxation of aviation fuel.
Competition with long-distance coach	• Coaches can offer travel for half the cost of 200km/h rail and overnight trains, one quarter the cost of 300km/h trains, and one sixth the cost of night trains with high-quality accommodation (see Figure 4.5). • Coaches' future competitive advantage will depend on the practicalities and costs of decarbonising coach travel and the effects of road congestion.
Infrastructure development	
Development of high-speed lines	• Case studies (see Annex C) show that high-speed lines often result in night trains being withdrawn because the cities they connect can be reached quickly by day. • Several existing or proposed night train routes may have faster day rail journey times by 2030 as a result of improvements on the TEN-T identified in the high-speed rail study by EBP (see Annex G from G.99).
Consequences of infrastructure changes	• The introduction of infrastructure charging has increased the apparent cost of some services and contributed to their withdrawal (see Annex C).
Infrastructure access	
Capacity allocation	• An increasingly congested network may make it more difficult to find train paths for long-distance cross-border services (see Annex L).

Topics	Key considerations, excluding COVID-19 implications
Operational issues	
Rolling stock provision	• Existing fleets gradually become life-expired, in need of refurbishment, or no longer acceptable to passengers. • Little new night train rolling stock has been purchased (see paragraph 3.22).
Technical, operational and safety issues	• Standards are being harmonised in some areas, such as ETCS. • However, the lack of common standards for track and loading gauge, electrification and a range of other systems, the lack of a common railway operating language, and the need for drivers to learn the routes they drive, will continue to be barriers to cross-border operations.
Delivery of passenger rights of assistance	• The nature of the rail industry, with no passenger-facing staff on many trains and stations, will make it difficult for any industry party to provide face-to-face assistance, including re-routing, to passengers.
Ticketing and distribution	• Ticketing and distribution will continue to face the challenges of multiple technologies and the limited value to railway undertakings of developing special prices and products for journeys made only in relatively small numbers.
Business cases	
PSOs	• It can be difficult for multiple competent authorities to identify a need for a long-distance service and to specify a timetable for which capacity is available or can be created. • It can be difficult to justify a PSO service carrying passengers between stations already served by a commercial service. This can mean that only part of a cross-border service is supported by PSO.

Source: stakeholders, Steer analysis.

Table 5.4: Possible impact of Covid-19 on the problem

Topics	COVID-19 implications
Passenger demand	
Rail demand	• COVID-19 has led to less business and commuter travel. It is unclear if workers who can work from home will continue to do so, and what business travel will return and when. • It is not clear whether and how lower demand means that either PSO or commercial services are reduced, and what usable capacity will be released. • There may be a short-term increase in leisure travel by rail, particularly if cross-border air travel becomes difficult, but it is not clear how long this will last.
Competition with air	• COVID-19 restrictions have increased the cost and inconvenience of flying, especially across borders. • During the recovery from COVID-19, air services may remain less frequent and more expensive, but it is not clear how long this effect will last.
Competition with long-distance coach	• Coaches require little infrastructure investment and can readily be redeployed to new routes. • Coach can be more agile than rail in responding to changes in travel patterns in the future.

Topics	COVID-19 implications
Infrastructure development	
Development of high-speed lines	• COVID-19 has absorbed financial resources and may result in lower demand. • Further schemes to expand the high-speed network may be delayed or cancelled.
Infrastructure access	
Capacity allocation	• Reduced commuting, if sustained, may result in fewer services in urban areas, freeing capacity for other uses. • However, this depends on whether local competent authorities are willing to cut local services, and whether the freed capacity is useful for long-distance cross-border services.
Operational issues	
Rolling stock provision	• Diversion of funds to the COVID-19 response may make it harder to find funding for new or refurbished night train rolling stock.
Business cases	
PSOs	• Shortage of funds may lead to competent authorities scaling back PSOs. • It may be less controversial to cut cross-border services than domestic services.

Source: stakeholders, Steer analysis.

5.88 In the next chapter, we consider the objectives for any future policy intervention in light of the problem described and identify potential measures for addressing them.

6 Potential measures

Introduction

6.1 The Commission has noted that the network of European night trains has declined rapidly, as we demonstrated in Chapter 3 and Annex C. The Commission asked us to address passenger potential, operations and barriers of cross-border passenger rail services in general, with a special focus on night trains, as these two types of services complement and reinforce each other and face similar obstacles.

6.2 Our desk research and stakeholder interviews and questionnaire responses confirm that there are a wide range of obstacles to the development of long-distance cross-border rail services. In this chapter:

- We consider the objectives for future policy intervention in light of the problem definition set out in Chapter 5.
- We consider potential measures to address the different elements of the problem.

6.3 At this stage we did not seek to formulate or undertake a formal impact assessment of policy options.

Objectives

General policy objectives

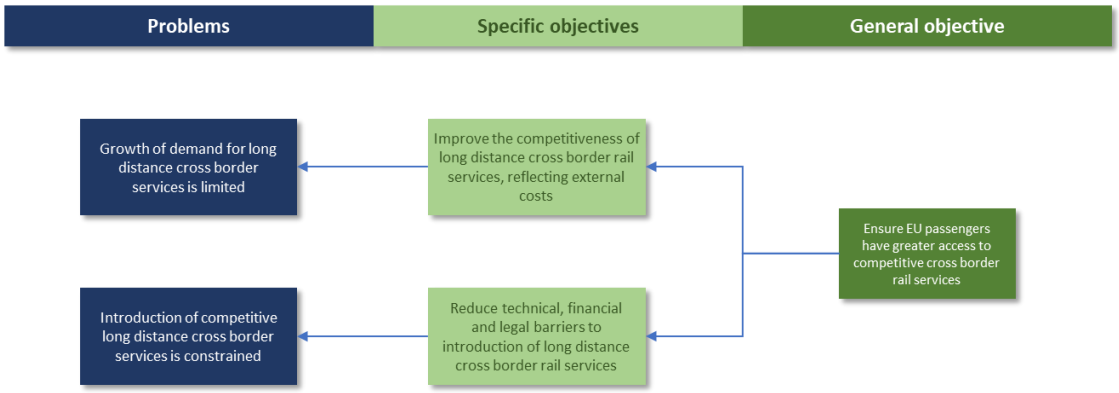
6.4 We suggest that the general objective of any possible future EU policy intervention should be **to ensure that EU passengers have greater access to competitive cross-border rail services**. In our view, this is consistent with the provisions of the TFEU relating to transport, the aims of the European Green Deal and the Sustainable and Smart Mobility Strategy, as it relates to rail transport, and the political priorities recently identified in the Fit to 55 package.

Specific objectives

6.5 We propose two specific objectives, each aligned with an element of the problem definition discussed in the previous chapter. These are shown in Figure 6.1 and can be summarised as follows:

- to improve the competitiveness of long-distance cross-border rail services, including through better reflection of external costs (including environmental costs) in the prices charged for different types of transport service; and
- to reduce the technical, financial and legal barriers to the introduction of long-distance cross-border rail services, thereby allowing the network of such services to expand.

Figure 6.1: Objectives for further policy intervention



Source: Steer analysis.

6.6 All the measures identified in this chapter can in principle support the delivery of these objectives, although none implemented in isolation would resolve the problem as defined. Policy intervention at the EU level, if justified, would need to be based on a package of complementary measures, with each measure focused on a different aspect of the problem. The formulation of such a package, which would need to be subject to a full impact assessment under the Better Regulation Guidelines, is beyond the scope of this study.

Potential measures

6.7 We identified measures to meet the objectives from:

- desk research into the development, introduction and operation of cross-border services;
- the stakeholder survey and interviews, which sought stakeholder views on how different obstacles might be overcome; and
- a Workshop with the Commission.

6.8 They are summarised here, and fuller details are provided in Annex Q.

Measures IC on infrastructure charges

6.9 In Annex K we discuss a number of obstacles to the operation of long-distance cross-border services. We identified the following measures to address them.

Measure IC1: ensure that infrastructure charges are set at the cost directly incurred

6.10 Directive 2012/34/EU is based on the principle that charges for services should reflect the direct cost they impose, but nevertheless permits wide divergence from it, in particular allowing charges to be raised to recover fixed costs. Many stakeholders argued that charges should be reduced, and one means of achieving this would be to restrict the ways in which additional charges may be levied. We note, however, that this could mean that more infrastructure managers would require direct subsidy. This would include many national networks and also the part of the Channel Tunnel within the EU.

Measure IC2: fix charges for a relevant period, with increases phased

6.11 Framework agreements between infrastructure managers and applicants specify the characteristics of the infrastructure capacity required by, and offered to, the applicant over a period of time exceeding one working timetable period. They can reduce the risk to new entry by ensuring that suitable infrastructure capacity will be available over an extended period.

However, the results of our desk research showed that charges can vary widely from year to year, making it difficult for applicants to prepare a long-term business plan. A proven approach in some states is for infrastructure managers or regulatory bodies to set charges for periods of five years or more, and to ensure that any major increases in charges are phased in over several years.

Measure IC3: compensate railway undertakings who cannot operate services due to works or closures

6.12 Compensation from infrastructure managers to railway undertakings, who cannot operate services as specified in their track access agreements due to track closures, would minimise the commercial risk of operating long-distance cross-border services, especially night trains. This compensation could be on the basis of lost revenue, or the additional costs associated with delays or using diversionary routes, or both. Great Britain's infrastructure manager has compensation regimes for both planned infrastructure works and unplanned disruption[27].

Measure IC4: analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services

6.13 Provisions of Annex VI of the Directive 2012/34/EU permit mark-ups in the charges system to differ between domestic and international services. The ability of cross-border services to bear mark-ups could be investigated more thoroughly before they were applied. Such investigation could be required by the legislation, or it might be encouraged through the issue of guidance.

Measure IC5: wider reform of infrastructure charging with the objective of meeting climate neutrality

6.14 Some stakeholders advocated a reform of Directive 2012/34/EU, although none offered a detailed analysis of the problems they have identified or the changes they proposed.

Measures CA on infrastructure capacity allocation

6.15 In Annex L, we discuss the issues associated with infrastructure capacity allocation. We identified the following measures to address them.

Measure CA1: where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables

6.16 The need for, and complexities of, capacity allocation on railways are driven by the fundamentals of railway technology: trains cannot pass each other on the same line, and each train already timetabled constrains the addition of further trains, which cannot pass through the same location at the same time. Some stakeholders argued that proven best practice is to plan a regular interval, clockface or "Takt" timetable designed for the efficient and reliable delivery of attractive services and connections, and then to provide infrastructure and rolling stock with the characteristics required to deliver them. However, others argued that one or

[27] These are schedules to the track access contract between each railway undertaking and infrastructure manager Network Rail. The Schedule 4 regime compensates railway undertakings for the financial impact of planned possessions, when they cannot access the network because of Network Rail's engineering work. The Schedule 8 regime compensates railway undertakings for unplanned service disruption, whether caused by Network Rail, other train operators, or outside the industry.

more adjacent Takt timetables on a cross-border route limit the intended right for applicants to request the capacity they require, and force them to choose from pre-planned paths, which may result in longer journey times or a lack of attractive connections.

6.17 In reality, an increasing number of urban and suburban networks, constrained long-distance routes, and even national networks, are being timetabled on a Takt basis. On 17 May 2021, the German Bundesministerium für Verkehr und digitale Infrastruktur (BMVI) published a proposal for a Europatakt, which would extend this approach across the European network[28]. Eurolink also published a proposal that cross-border services should be planned before domestic services[29]. The BMVI claims that Europatakt would "interlink the individual optimised clock-face timetables of the European countries to build up a coordinated network of international connections to reduce international journey times". While the vision is consistent with an objective of making long-distance cross-border passenger rail services more attractive to passengers, it is not clear whether it is the best way of doing so, or how it would affect the approach to addressing other obstacles including rolling stock, ticketing, connections and PSOs.

Measure CA2: ensure further implementation of the European Train Control System (ETCS)

6.18 A growing proportion of the study area's rail network, including cross-border corridors, is being controlled by ETCS. Subject to emerging differences in implementation on different networks, ETCS can offer a common interface between track and train, enable locomotives and crews to operate on more networks, and reduce or eliminate the need for changes at borders. In principle, ETCS can also increase the number of trains which can be operated at a given level of reliability, especially if combined with automatic train operation (ATO), as has already been implemented on constrained urban track. However, it is not yet clear what improvements ETCS can deliver in practice on specific routes carrying specific traffic, or at what point other constraints will emerge.

6.19 One measure which has been suggested is further promotion of ETCS, including through the Commission's grant support under the Connecting Europe Facility (CEF).

Measure CA3: explicitly permit capacity allocation to be based on social or environmental value

6.20 In Sweden and the United Kingdom, the allocation of constrained capacity has been guided by the principle of devising the most socially valuable timetable[30], and this concept could be extended or adapted to deliver the most environmentally valuable timetable. At city centre stations constrained in the morning peak, for example, it might be better to allocate capacity to operate a night train carrying long-distance passengers, instead of a day train carrying suburban passengers, many of whom would have in any case travelled by a sustainable transport solution, such as tram, bus, bicycle, or on an earlier or later train. We note that the

[28] First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)

[29] Towards a better international timetable in Europe, Jeroen Wesdorp and Thomas Moerman, Eurolink, 17 May 2021 (2021)

[30] If Takt is seen as a proactive approach to optimising timetables, this can in principle be seen as a reactive approach to doing so. In practice, the approaches tend to converge on planning a repeating "standard hour" timetable designed to maximise social value.

COVID-19 pandemic may lead to temporary or permanent changes to passengers' demand for, and ability to find alternatives to, both commuting and business travel.

Measure CA4: offer more framework agreements for long-distance cross-border services

6.21 Framework agreements for capacity exceeding one timetable period are provided for in Article 42 of Directive 2012/34/EU but appear to be used in only two Member States and a further two European third countries[31]. As previously noted, new entrants struggle to find financing for rolling stock acquisitions, because they cannot demonstrate to lenders that they have a business case to use the stock over a sustained period. Framework agreements for infrastructure capacity would increase the stability and financeability of their business plans.

Measure CA5: complete and refine the international Timetabling Process (TTR)

6.22 We noted above how TTR is intended to allow capacity to be allocated for both short- and long-term needs. Pilot projects have found that TTR requires extensive IT developments, but it remains the best approach yet devised, at least until further improvements emerge.

Measure CA6: develop hubs for long-distance cross-border trains

6.23 Some stakeholders advocated "hubs for night trains", but we have seen no clear statement of what they proposed. We note that Vienna's new main station was designed taking into account ÖBB's plans to operate an extensive Nightjet network, that the German Federal Transport Infrastructure Plan (FTIP) includes a number of hubs, and that cross-border trains serving Amsterdam are to be focused on Amsterdam-Zuid station. A hub concept might need to be linked to provision of suitable line and platform capacity at peak periods, and arrangements for ticketing and connections.

Measure CA7: wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality

6.24 We noted that some stakeholders advocated complete reform of Directive 2012/34/EU. One specific and more limited measure could be to review the flexibility allowed to prioritise domestic PSO services over cross-border services (Eurolink, for example, suggested the opposite priority), although it is not clear how a change in priority in theory would change timetabling processes in practice.

Measures RS on rolling stock

6.25 In Annex M we set out five potential measures to increase the availability of rolling stock, which we summarise briefly here.

Measure RS1: require that unused stock be offered for auction

6.26 New entrants often wish to test markets using secondhand rolling stock, which has already been authorised for use, rather than committing to investment in new rolling stock, which may still need to be authorised. There have been allegations that certain incumbents only sell redundant rolling stock to other incumbents, which blocks the market for secondhand stock. This measure would require owners of unused or redundant rolling stock to make them available to the market and to sell them through a transparent process. There might, however,

[31] RMMS 7 reported that "At June 2020, framework agreements were applied by the infrastructure managers of Austria, Italy, Norway and the United Kingdom. Framework agreements will be used in Spain to open the domestic high-speed rail market starting from the 2020-2021 timetable."

be practical difficulties in identifying stock which was unused, or in protecting it from deterioration.

Measure RS2: public sector guarantees to limit risks to leasing companies

6.27 New entrants currently struggle to find financiers for new rolling stock orders over around €200 million, due to their limited ability to demonstrate a robust business case. Public sector guarantees could be provided to reduce the risk to leasing companies of holding rolling stock needed for cross-border services.

Measure RS3: ensure non-discrimination in rolling stock leasing prices

6.28 New entrants currently pay higher leasing charges than incumbents, who can offer a corporate guarantee, or PSO contractors, where the PSO includes a usage guarantee. Standard and transparent prices would ensure that stock was available to all railway undertakings on equal terms.

Measure RS4: consider wider EU and/or EIB co-financing of cross-border rolling stock

6.29 Stakeholders identified a number of practical issues associated with making existing rolling stock suitable for cross-border operations. Examples include compatibility with signalling equipment and compliance with fire regulations and the provision of selective door opening required on some networks. EU co-funding could cover the additional costs of equipping rolling stock to meet the requirements for cross-border operation[32].

Measures TP on ticketing and rights for connecting passengers

6.30 In Annex N we discuss the issues associated with ticketing and rights for connecting passengers, in relation to which we identified the following potential measures.

Measure TP1: encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)

6.31 Stakeholders were optimistic that OSDM would make it easier for ticket vendors to sell passengers multiple tickets in a single transaction, although much will depend on the behaviour of railway undertakings. One measure would be to require railway undertakings to make all tickets available on OSDM according to fair, reasonable and non-discriminatory (FRAND) commercial principles. However, buying a ticket through OSDM does not, in itself, create a single transport contract with a railway undertaking which would constitute a through-ticket and hence entitle the passenger to certain rights.

Measure TP2: define and publish minimum connecting times within and between stations

6.32 In Annex N we contrast the lack of information on connecting times in some states with online information on connections, not only within but also between, stations in others.

6.33 The UIC MERITS database contains information on minimum connecting times within, but not between, stations. We discussed MERITS with UIC, who told us that the process of collating minimum connecting times had been made more complex by the separation of operations and infrastructure and, in some cases, the separate management of stations. Depending on the

[32] By May 2020, CEF transport funding had included over €800 million on actions with an ERTMS component.

state, minimum connecting times within stations could be reported to UIC, for inclusion in MERITS, by one or more of:

- the railway undertakings;
- the infrastructure manager; or
- the station managers.

6.34 We are also aware of examples of journey planning software suggesting connections within stations which, because of the layout of, or temporary changes to, the station concerned, could not in practice be made in the time available.

6.35 One potential measure, which one stakeholder suggested could be managed by the European Union Agency for Railways (ERA), would be to establish a central database of connecting times within and between stations, accessible online.

Measure TP3: offer passengers the option to request longer connecting times

6.36 Another measure would be to ensure that passengers had access to functionality to specify longer connecting times when searching for travel options. At present, where this functionality exists, it may be offered by railway undertakings but is not accessible by ticket vendors.

Measure TP4: use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible

6.37 Stakeholders referred to voluntary agreements to assist passengers, including the existing "Agreement on Journey Continuation" (AJC) between railway undertakings[33], and suggested that this could be extended and made mandatory. One advantage of the AJC, if it became a business-to-consumer (B2C) agreement, is that it would be a direct agreement between a railway undertaking and a passenger who had missed one of their services and could show that this was for reasons beyond their control. This could simplify or remove the need for mechanisms to allocate liability or to transfer reimbursements or compensation between parties.

Measure TP5: record and publish delays and their attribution to causes and parties

6.38 Regulation (EU) 2021/782 defines a missed connection as when "a passenger misses one or more services in the course of a rail journey, sold as a through-ticket, as a result of the delay or cancellation of one or more previous services, or of the departure of a service before the scheduled departure time". If this is to form the basis for contractual rights and obligations, it will be essential that the fact of a delay, or premature departure, and if necessary the cause and party responsible, can be recorded. Given that the Regulation has only recently been adopted, the ability of relevant systems across the European rail network to capture such information has not yet been tested and they more or may not prove adequate.

6.39 One measure that would help to ensure the adequacy of recorded data supporting requirements relating to missed connections would be to build on existing best practice in delay measurement and attribution, such as the performance regimes in Great Britain

[33] The contents of the agreement are not public, but we understand that it is an agreement to take action to support international passengers in the event of disruption to their journeys as a consequence of delay or cancellation, and its objective is to offer passengers the opportunity to continue their journeys to the final destination, without extra cost, as a commercial gesture.

(referred to in paragraph 6.12), to make sure that this information was consistently collected and available to interested parties[34].

Measure TP6: link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom

6.40 Regulation (EU) 2021/782 states that "through-tickets allow seamless journeys for passengers" but does not define "seamless journey" or what features of the legal form of a through-ticket mean that it would result in a seamless journey. One measure would be to define a series of specific outputs to be delivered to passengers, based on priorities such as ensuring connections and ease of booking. Additional priorities could be identified through consultation with passengers and passenger representative bodies, which might be similar to those listed in Table 5.1.

Measure TP7: reform the regulatory framework for passenger rights for all modes

6.41 Stakeholders told us that the framework set by Regulation (EU) 2021/782 is a compromise which may deliver only limited benefits. We identified possible gaps in the framework it establishes in relation to long-distance cross-border train services, including that:

- It establishes only limited obligations, such as that some rights only apply to passengers with a through-ticket, which in law can only exist if the passenger has a transport contract with a railway undertaking.
- It may be difficult to comply with some obligations, such as providing any service to passengers at an unstaffed station or on a driver-only train.
- There may be scope for abuse and fraud by passengers, such as by falsely claiming to have travelled on a train which was delayed, or to have intended to travel on a train which was cancelled.

6.42 An evaluation of the way the Regulation works in practice could lead to further reform. In any event, if the implementation of other measures intended to address ticketing issues had implications for passenger rights, some changes to the Regulation might be needed to ensure consistency with wider legislation and/or other initiatives.

Measures PS on cross-border PSOs

6.43 The issues associated with PSOs for cross-border services are discussed in Annex O. We identified the following measures to address them.

Measure PS1: use PSOs for long-distance cross-border services to improve financeability

6.44 Offering PSOs for long-distance cross-border services, such as the planned PSO from Sweden related to night trains, would address a number of issues:

- It would allow these services to be taken into account in planning networks of services and connections with other services, including setting fares and ticketing arrangements.
- It would make it easier for the European Investment Bank (EIB) to finance rolling stock acquisitions. However, the EIB traditionally only finances part of a rolling stock acquisition, and only up to a certain amount, so this would only be a partial solution.

[34] The European air transport industry also has long-established delay attribution mechanisms, using Central Office for Delay Analysis (CODA) codes developed by EUROCONTROL. However, the processes and systems for recording and classifying delays in aviation are very different from those in rail.

Measure PS2: ensure that long-distance cross-border PSO services are specified in full

6.45 The range of structures of cross-border PSOs is complex, as illustrated by Figure 5.3, but some PSOs only specify a service to the last station in a state rather than to the border. This appears to create an opportunity for railway undertakings to split the operation, leaving a gap at the border, if it is cheaper and operationally practicable to do so.

Measure PS3: provide start-up funding support for new long-distance cross-border services

6.46 Some stakeholders mentioned the scope for start-up funding for new cross-border services, which was anticipated in the study Technical Specifications and was intended for the extension of the ÖBB Nightjet service from Dusseldorf via Arnhem to Amsterdam[35]. Member States could use start-up funding to encourage new services to be trialled, even if they subsequently proved not to be viable, although we note that this means of provision of subsidy has been challenged[36]. An alternative would be targeted financial support available on a non-discriminatory basis to any railway undertaking introducing a new cross-border services, such as through a pilot with reduced infrastructure charges or subsidised fares.

Measures DA on data

6.47 This study has been constrained by the limited data in the public domain on many aspects of rail passenger markets, operations and costs. One issue we identified in earlier studies is that market liberalisation tends to lead to sources of information becoming fragmented, inconsistent and often commercially confidential. We note in Annex D how, in one extreme case of Eurostat data on passengers by speed of train over the period 2015-2019, all data except for Turkey is either zero or marked confidential.

6.48 It is an obstacle, to both entrepreneurs wishing to identify and exploit market opportunities and competent authorities wishing to ensure public passenger transport services in the general interest, if the information needed to plan services is not readily available. The following measures are designed to help establish greater transparency of relevant data.

Measure DA1: extend reporting requirements, for example to RMMS

6.49 Reporting requirements to RMMS could be expanded, perhaps on a phased basis and in consultation with the Member States, to include more information, focusing on the needs of competent authorities and potential market entrants.

Measure DA2: create an open industry database of ticket sales

6.50 The airline industry has long-established sources of data, such as the OAG data from which we extracted data on airline seats, flights and journey times by airport pair. Great Britain's rail industry has a database of station-to-station sales by period, Latest Earnings Networked Nationally Overnight (LENNON), accessible, with confidentiality safeguards, to railway undertakings and competent authorities wishing to plan services. If and when there is increasing commonality in sales and ticketing systems across the EU, one measure would be to collate the information in a database accessible on clearly-defined terms.

[35] NightJet expands to Amsterdam and Brussels, Railway Gazette International, 11 October 2019 (2019)

[36] Dutch state sued for subsidising NS Vienna-Amsterdam night train, Railtech, 5 May 2021 (2021)

Measures OP on other proposals

Measure OP1: Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality

6.51 Several stakeholders argued that differences in the taxation of air and rail modes do not result in a level playing field between them, and that there would be less need to promote long-distance cross-border rail services if taxation of the modes was reformed. This could be done through the Delivering the European Green Deal (DEGD) package[37].

Summary of potential measures

6.52 Table 6.1 below summarises the measures identified through our research, consultation and analysis and reviewed at the Interim Workshop and subsequent discussions. It also identifies:

- Were the measures proven in action, or only planned, or at the pilot stage?
- Were the measures proposed by stakeholders, either in response to specific questions or at their own initiative, or devised by Steer and KCW through research and analysis?

Table 6.1: Summary of potential measures to remove obstacles

Obstacle	Potential measure		Emerging practice		Measure proposed	
			Proven	Planned or pilot	Stakeholders	Steer/KCW
Infrastructure charges	IC1	Ensure that infrastructure charges are set at the cost directly incurred	●		●	●
	IC2	Fix charges for a relevant period, with increases phased	●			●
	IC3	Compensate railway undertakings which cannot operate services due to works or closures	●			●
	IC4	Analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services				●
	IC5	Wider reform of infrastructure charging with the objective of meeting climate neutrality			●	●
Capacity and capacity allocation	CA1	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables	●			
	CA2	Ensure further implementation of the European Train Control System (ETCS)	●			
	CA3	Explicitly permit capacity allocation to be based on social or environmental value	●			
	CA4	Offer more framework agreements for long-distance cross-border services	●			●

[37] As an intermediate step towards climate neutrality by 2050, the EU has raised its 2030 climate ambition, committing to cutting emissions by at least 55% by 2030. The Fit for 55 package is a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are in line with the climate goals agreed by the Council and the European Parliament.

Obstacle	Potential measure		Emerging practice		Measure proposed	
			Proven	Planned or pilot	Stakeholders	Steer/KCW
	CA5	Complete and refine the international Timetabling Process (TTR)		●		
	CA6	Develop hubs for long-distance cross-border trains			●	
	CA7	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality			●	●
Rolling stock	RS1	Require that unused stock be offered for auction			●	
	RS2	Public sector guarantees to limit risks to leasing companies			●	●
	RS3	Ensure non-discrimination in rolling stock leasing prices				●
	RS4	Consider wider EU and/or EIB co-financing of cross-border rolling stock				●
Ticketing and rights for connecting passengers	TP1	Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)		●		
	TP2	Define and publish minimum connecting times within and between stations	●			
	TP3	Offer passengers the option to request longer connecting times	●		●	
	TP4	Use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible	●		●	
	TP5	Record and publish delays and their attribution to causes and parties	●			
	TP6	Link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom			●	
	TP7	Reform the regulatory framework for passenger rights for all modes			●	●
Creating cross-border PSOs	PS1	Use PSOs for long-distance cross-border services to improve financeability	●			●
	PS2	Ensure that long-distance cross-border PSO services are specified in full	●			
	PS3	Provide start-up funding support for new long-distance cross-border services			●	
Data collection, reporting and monitoring	DA1	Extend reporting requirements, for example to RMMS				●
	DA2	Create an open industry database of ticket sales				●
Other proposals	OP1	Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality			●	

Source: desk research, stakeholders, Steer analysis.

Preliminary assessment of potential measures

6.53 The potential measures listed above vary considerably in terms of their potential to address the problem drivers identified, the level and allocation of benefits they deliver, their practicality and cost of implementation, and the type of intervention they imply. Hence, they give rise to a range of potential outcomes for passengers, administrations and industry.

6.54 We defined a number of criteria against which to assess each measure, as shown in Table 6.2 below.

Table 6.2: Indicators for high-level assessment of measures

Indicators	Description
Legal/policy feasibility	Whether a potential measure is implementable under existing EU legislation or requires a change in EU legislation. Some potential measures may also be ruled out by previous Commission policy choices or mandates by EU institutions.
Efficiency and Effectiveness	It may be possible to show that some measures would achieve a worse cost-benefit outcome than others.
Linkages	It may be possible to link a measure to: • the action plan of Member State Platform on international passenger rail[38] and/or • the sector statement of the industry[39].
Technical feasibility	The implementation of a potential measure may or may not be feasible and/or implementation might not be possible, given constraints or practical considerations.
Timing	The time to implement a potential measure and potential definition of milestones will vary between measures.

Source: Steer adaptation of Better Regulation screening criteria.

6.55 These provide the basis for a high-level assessment, as shown in Table 6.3 (supported by the key in Table 6.4), of which Annex Q provides further details.

[38] Report on the Platform on International Rail Passenger Transport (IRP), 29 March 2021 (2021)

[39] Sector Stakeholder Statement on International Rail Passenger Services, by representatives of railway undertakings (CER/ALLRAIL/UIC/CIT) and infrastructure managers (EIM/CER/UIC), railway suppliers (UNIFE), passenger and consumers' organizations (EPF/BEUC), travel companies (EU Travel Tech/ECTAA) and distributors (EU Travel Tech/ALLRAIL), 30 March 2021 (2021)

Table 6.3: Preliminary assessment of measures against indicators

Potential measure		Legal/policy feasibility		Efficiency and Effectiveness		Linkages		Technical feasibility		Timing (years)
		Directive	Regulation	Costs	Benefits	Platform	Statement	Pilot study	Feasibility	
Infrastructure charges										
IC1	Ensure that infrastructure charges are set at the cost directly incurred	🔴	🔴	🔴🔴🔴	🟢🟢🟢	🟢	-	🔴	🟢	<5
IC2	Fix charges for a relevant period, with increases phased	🔴	🔴	🔴🔴	🟢🟢	🟢	-	🟢	🟢	<5
IC3	Compensate railway undertakings which cannot operate services due to works or closures	🔴	-	🔴🔴	🟢🟢	🟢	-	🟢	🟢	<5
IC4	Analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services	?	?	🔴	🟢	🟢	-	🟢	🟢	<5
IC5	Wider reform of infrastructure charging with the objective of meeting climate neutrality	🔴	🔴	?	?	🟢	-	🔴	🟢	<5
Infrastructure capacity allocation										
CA1	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables	🔴	-	?	?	🟢	🟢	🟢	🟢	0-15
CA2	Ensure further implementation of the European Train Control System (ETCS)	-	-	-	-	-	🟢	🟢	🟢	0-15
CA3	Explicitly permit capacity allocation to be based on social or environmental value	🔴	-	🔴	?	🟢	-	🟢	🟢	<5
CA4	Offer more framework agreements for long-distance cross-border services	🔴	-	🔴	?	-	-	🟢	🟢	<5
CA5	Complete and refine the international Timetabling Process (TTR)	-	-	?	?	🟢	🟢	🟡	🟢	0-5
CA6	Develop hubs for long-distance cross-border trains	-	-	?	?	🟢	-	🟢	🟢	<5
CA7	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality	🔴	-	?	?	🟢	-	🔴	🟢	<5
Rolling stock										
RS1	Require that unused stock be offered for auction	🔴	-	?	🟢🟢	🟢	-	🟡	🟢	<5
RS2	Public sector guarantees to limit risks to leasing companies	-	-	🔴	🟢	🟢	-	🟡	🟢	<5
RS3	Ensure non-discrimination in rolling stock leasing prices	-	-	🔴🔴	🟢🟢	🟢	-	🟡	🟢	<5
RS4	Consider wider EU and/or EIB co-financing of cross-border rolling stock	-	-	🔴🔴	🟢	🟢	🟢	🟡	🟢	<5

Potential measure		Legal/policy feasibility		Efficiency and Effectiveness		Linkages		Technical feasibility		Timing (years)
		Directive	Regulation	Costs	Benefits	Platform	Statement	Pilot study	Feasibility	
Ticketing and rights for connecting passengers										
TP1	Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)	-	🔴	?	?	🟢	🟢	🟡	🟢	0-5
TP2	Define and publish minimum connecting times within and between stations	-	🔴	?	?	🟢	🟢	🟡		<5
TP3	Offer passengers the option to request longer connecting times	-	🔴	?	?	🟢	🟢	🟡	🟢	<5
TP4	Use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible	-	🔴	🔴	?	-	🟢	🟡	🟢	<5
TP5	Record and publish delays and their attribution to causes and parties	🔴	-	🔴🔴	?	-	🟢	🟡	🟢	5-10
TP6	Link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom	-	🔴	🔴	?	-	🟢	🔴	🟢	<5
TP7	Reform the regulatory framework for passenger rights for all modes	-	🔴	?	?	-	🟢	🔴	🟢	5-10
Cross-border PSOs										
PS1	Use PSOs for long-distance cross-border services to improve financeability	-	🔴	🔴	?	🟢	-	🟢	🟢	<5
PS2	Ensure that long-distance cross-border PSO services are specified in full	-	-	?	?	-	-	🟡	🟢	0-10
PS3	Provide start-up funding support for new long-distance cross-border services	-	-	?	?	🟢	-	🟡	🟢	<5
Data										
DA1	Extend reporting requirements, for example to RMMS	-	🔴	🔴	🟢	-	-	🟡	?	<5
DA2	Create an open industry database of ticket sales	?	?	🔴🔴	?	-	-	🟡	?	5-10
Other proposals										
OP1	Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality	🔴	🔴	🔴🔴🔴	🟢🟢🟢	-	🟢	🔴	?	<5

Source: Steer analysis, see Table 6.4 below for key.

Table 6.4: Preliminary assessment of measures: key to summary table

Issue	Symbol and meaning	
Directive	?	Not known whether a change to a Directive would be needed
	-	No change to a Directive needed
	🔴	Change to a Directive needed
Regulation	?	Not known whether a change to a Regulation would be needed
	-	No change to a Regulation needed
	🔴	Change to a Regulation needed
Costs	?	Costs not estimated
	-	No net costs
	🔴	Low costs
	🔴🔴	Medium costs
	🔴🔴🔴	High costs
Benefits	?	Benefits not estimated
	-	No net benefits
	🟢	Low benefits
	🟢🟢	Medium benefits
	🟢🟢🟢	High benefits
Platform	-	No identified link to the Member State Platform on international passenger rail
	🟢	Identified link to the Member State Platform on international passenger rail
Statement	-	No identified link to the sector statement of the industry
	🟢	Identified link to the sector statement of the industry
Pilot study	🟢	Pilot study not necessary as the measure is already in place
	🟡	Pilot study possible, and in some cases under way or imminent
	🔴	Pilot study not possible, because the measure would need to be introduced EU-wide at once
Feasibility	?	Not clear whether the measure would be feasible
	🟢	Measure is in place, or has been trialled, or appears prima facie feasible
Timing (years)	0-5	Could start immediately but would take up to five years for effects to be felt
	0-10	Could start immediately but would take up to ten years for effects to be felt
	0-15	Could start immediately but would take up to fifteen years for effects to be felt
	<5	Not in hand, but could be introduced within five years
	5-10	Not in hand, but could be introduced in five to ten years

Source: Steer analysis.

7 Preliminary conclusions

Introduction

7.1 In this chapter we set out our preliminary conclusions.

Information on cross-border travel is limited

7.2 Information on the number of passengers making cross-border journeys by rail, or using long-distance cross-border trains, is limited. Railway undertakings, and coach operators, have information on their own ticket sales and passengers, but this is rarely shared.

New long-distance cross-border services are being introduced

7.3 There are a number of mechanisms by which (potential) new long-distance cross-border services are emerging, as summarised in Table 7.1.

Table 7.1: New long-distance cross-border rail services

Basis	Initiator(s)	Examples	Reference
Unilateral	New entrant	European Sleeper, Amsterdam to Prague	G.55
	Existing non-incumbent	Snälltåget, Stockholm to Berlin	G.58
	Existing incumbent	ÖBB, Amsterdam to Zurich	G.54
		ÖBB, Barcelona to Zurich	G.60
		ÖBB, Prague to Zurich	G.62
		ÖBB, Rome to Zurich	G.64
	PSO competent authority [40]	Trafikverket, Malmö to Brussels	G.61
		Trafikverket, Stockholm to Hamburg	G.63
	Ministry of Transport	France, TET (study)	G.140
Multilateral	Existing incumbents	DB/ÖBB/SBB/SNCF, Vienna/Berlin-Brussels/Paris	G.32
	Ministers of Transport	TEE 2.0	G.134
		Eurolink (study)	L.81
		Lithuania/Latvia/Estonia, Rail Baltica	G.138

Source: Steer analysis.

7.4 These various initiatives relate to specific services, potential networks, and cross-border infrastructure, and are at different stages of development. There are overlaps and duplication between them, and some may not result in additional or improved services. Nonetheless, the range of initiators and initiatives suggests that stakeholders, including ministries of transport,

[40] On 30 August 2021, Trafikverket announced that it had awarded the contract for a Stockholm-Hamburg services to SJ but that no bids had been received for a Malmö-Brussels service.

specialist agencies and competent authorities, incumbents, and established and new independent operators, continue to seek opportunities to expand and introduce long-distance cross-border services.

Obstacles to new services remain

7.5 Despite this range of initiatives, our desk research, and the comments of stakeholders through interviews and questionnaire responses, confirmed that a wide range of obstacles to long-distance cross-border services remain. These range from technical issues that may be resolved in the near future, such as the replacement of national rules by Technical Specifications for Interoperability (TSIs), or wider opportunities to sell tickets through a single transaction, to enduring differences between the railways of Europe, including differences in track and structure gauge and in working languages. Our analysis of these obstacles and preliminary view of the problem to be addressed through any further policy intervention indicate that they include both demand-side and supply-side factors, which interact to constrain the growth of cross-border rail services relative to the services provided by other modes, in particular air and coach transport.

7.1 We noted how data on cross-border travel is currently limited. In addition, data on travel and trends to 2019 may be of limited relevance if the COVID-19 pandemic leads to permanent changes in patterns of travel including, as some have suggested, reductions in commuting and business travel.

7.2 It is possible that falls in demand resulting from the pandemic mean that there is sufficient capacity for any new long-distance cross-border services, whether commercial or PSO, to be operated with attractive, efficient and reliable timetables. However, there is at least the risk that insufficient capacity is available to operate all the potential new services, creating a need for prioritisation, pending the provision of additional capacity.

7.3 Without robust forecasts of future passenger demand for travel, it is beyond the scope of this study to predict whether, where and when additional rail infrastructure capacity will be needed to support cross-border services. However, if many increases in capacity are required, and are not included in existing programmes, such as those documented by the recent study of high-speed rail in Europe by EBP[41], then the lead times to plan and build further capacity may be a constraint.

Potential measures to address these obstacles

7.4 These obstacles should be addressed within the overall policy framework set by the European Green Deal and the transport policy designed to help deliver it. We have identified the importance of rail's lack of competitiveness, which suggests the need for an integrated policy response including measures addressing specific barriers to the introduction of cross-border rail services. We note that measures focused on rail transport, if implemented in isolation and without regard to the wider strategy, may prove ineffective.

7.5 We also note that we cannot make recommendations on any of the measures, as this would pre-empt a full impact assessment in which measures would be grouped into options and subject to thorough quantitative and qualitative analysis, in line with the requirements of the

[41] Evaluation of high-speed rail in Europe, Comprehensive literature review and potential of section upgrades for improving EU-connectivity, EBP for European Commission, Final Report (Draft), 27.11.2020 (2020)

Better Regulation Guidelines, an exercise that is beyond the scope of this study. To inform any impact assessment that the Commission may wish to undertake in the future, we have nevertheless considered:

- the extent to which the different measures identified in Chapter 6 meet the specific objectives shown in Figure 6.1; and
- the implications of adopting different measures, in terms of the policy instruments that would need to be used, which in turn may influence priorities and timescales for action.

7.6 Table 7.2 indicates the objectives that the measures would help to meet.

Table 7.2: Potential measures - meeting objectives

Potential measure		Boost the competitiveness of long-distance cross-border services	Reduce the technical, financial and legal barriers to the introduction of long-distance cross-border rail services
Infrastructure charges			
IC1	Ensure that infrastructure charges are set at the cost directly incurred	●	●
IC2	Fix charges for a relevant period, with increases phased		●
IC3	Compensate railway undertakings which cannot operate services due to works or closures	●	●
IC4	Analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services	●	●
IC5	Wider reform of infrastructure charging with the objective of meeting climate neutrality	●	●
Infrastructure capacity allocation			
CA1	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables		●
CA2	Ensure further implementation of the European Train Control System (ETCS)	●	●
CA3	Explicitly permit capacity allocation to be based on social or environmental value	●	●
CA4	Offer more framework agreements for long-distance cross-border services	●	●
CA5	Complete and refine the international Timetabling Process (TTR)	●	●
CA6	Develop hubs for long-distance cross-border trains	●	●
CA7	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality	●	●
Rolling stock			
RS1	Require that unused stock be offered for auction	●	●
RS2	Public sector guarantees to limit risks to leasing companies	●	●
RS3	Ensure non-discrimination in rolling stock leasing prices	●	●
RS4	Consider wider EU and/or EIB co-financing of cross-border rolling stock	●	●

Potential measure		Boost the competitiveness of long-distance cross-border services	Reduce the technical, financial and legal barriers to the introduction of long-distance cross-border rail services
Ticketing and rights for connecting passengers			
TP1	Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)	●	●
TP2	Define and publish minimum connecting times within and between stations		●
TP3	Offer passengers the option to request longer connecting times		●
TP4	Use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible		●
TP5	Record and publish delays and their attribution to causes and parties		●
TP6	Link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom		●
TP7	Reform the regulatory framework for passenger rights for all modes	●	●
Cross-border PSOs			
PS1	Use PSOs for long-distance cross-border services to improve financeability		●
PS2	Ensure that long-distance cross-border PSO services are specified in full		●
PS3	Provide start-up funding support for new long-distance cross-border services		●
Data			
DA1	Extend reporting requirements, for example to RMMS	●	●
DA2	Create an open industry database of ticket sales	●	●
Other proposals			
OP1	Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality	●	

Source: Steer analysis.

7.7 Almost all the measures would help to reduce one or more barriers to the introduction of long-distance cross-border services. The extent to which they would contribute to establishing a more level playing field on which such services could compete is more difficult to determine, although any that would help to ensure greater transparency of key data or processes could improve their competitiveness relative to other modes. As we previously noted, boosting competitiveness with respect to other modes would require action across the transport sector, possibly in the form of OP1 reforming transport taxation, as considered in the Fit for 55 package.

7.8 Nevertheless, the table suggests that a suitable combination of measures could achieve a balanced response to address many of the obstacles discussed in Chapter 5. How the

measures were combined in practice would depend on a consideration of their likely timescales for implementation and priorities for strengthening the development of the cross-border rail network.

7.9 Table 7.3 indicates the level of intervention potentially required to implement each measure.

Table 7.3: Potential measures – required level of policy intervention

Potential measure		Action already being taken	Could be facilitated through greater stakeholder discussion/exchange of good practice	Could be facilitated through EU level guidance or other non-legislative intervention	Could only be fully achieved through change to EU railway legislation	Would require change to broader framework of transport legislation
Infrastructure charges						
IC1	Ensure that infrastructure charges are set at the cost directly incurred			●	●	
IC2	Fix charges for a relevant period, with increases phased		●	●	●	
IC3	Compensate railway undertakings which cannot operate services due to works or closures				●	
IC4	Analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services		●	●		
IC5	Wider reform of infrastructure charging with the objective of meeting climate neutrality				●	
Infrastructure capacity allocation						
CA1	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables	●	●	●		
CA2	Ensure further implementation of the European Train Control System (ETCS)	●	●			
CA3	Explicitly permit capacity allocation to be based on social or environmental value			●	●	
CA4	Offer more framework agreements for long-distance cross-border services		●	●		
CA5	Complete and refine the international Timetabling Process (TTR)	●	●			
CA6	Develop hubs for long-distance cross-border trains	●	●			
CA7	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality				●	
Rolling stock						
RS1	Require that unused stock be offered for auction				●	
RS2	Public sector guarantees to limit risks to leasing companies				●	
RS3	Ensure non-discrimination in rolling stock leasing prices				●	
RS4	Consider wider EU and/or EIB co-financing of cross-border rolling stock			●	●	

Potential measure		Action already being taken	Could be facilitated through greater stakeholder discussion/exchange of good practice	Could be facilitated through EU level guidance or other non-legislative intervention	Could only be fully achieved through change to EU railway legislation	Would require change to broader framework of transport legislation
Ticketing and rights for connecting passengers						
TP1	Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)	●	●	●		
TP2	Define and publish minimum connecting times within and between stations		●	●		
TP3	Offer passengers the option to request longer connecting times		●	●		
TP4	Extend use of the provisions of the Agreement on Journey Continuation (AJC) to ensure that the industry assists and re-routes passengers as much as possible		●	●	●	
TP5	Record and publish delays and their attribution to causes and parties		●		●	
TP6	Link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom				●	
TP7	Reform the regulatory framework for passenger rights for all modes				●	?
Cross-border PSOs						
PS1	Use PSOs for long-distance cross-border services to improve financeability	●	●	●		
PS2	Ensure that long-distance cross-border PSO services are specified in full		●	●		
PS3	Provide start-up funding support for new long-distance cross-border services	●	●			
Data						
DA1	Extend reporting requirements, for example to RMMS				●	
DA2	Create an open industry database of ticket sales				●	
Other proposals						
OP1	Wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality				●	●

Source: Steer analysis.

7.10 We note that:

- Considerable activity is already underway, particularly in the area of capacity allocation but also in ticketing, through technologies such as FAIRTIQ and OSDM, and the development of cross-border PSOs. As previously highlighted, measure CA1, planning

infrastructure to deliver regular interval (clockface or Takt) timetables, is being implemented by a number of states in the study area. In addition, measures such as TP1, encouraging fair, reasonable and non-discriminatory use of OSDM could be delivered through the UIC-led initiative established to develop and implement the model.

- Progress can be made in a number of areas without recourse to a change in, or introduction of new, legislation, either by encouraging wider industry discussion and exchange of best practice or through issuing EU-level guidance. For example, limiting infrastructure charges to direct costs, measure IC1, and fixing charges for an extended period and introducing increases in a phased way, measure IC2, are fully consistent with existing legislation and could be introduced more widely by learning from established practice in states such as France.
- At the same time, the removal of key barriers in a number of areas, such as the pricing of infrastructure, provision of rolling stock and availability of industry data, would be likely to require changes in legislation to correct for commercial decision-making that does not take account of the potential environmental and other benefits of modal shift in favour of rail, including through the development of a more competitive network of long-distance cross-border rail services. We have suggested that measures such as IC3, compensating railway undertakings for disruption due to infrastructure works, and RS1, requiring that unused stock be offered for auction, merit further investigation. Both would probably require legislation to implement them effectively.
- Measure OP1, the wider reform of transport taxation and carbon pricing to reflect the external costs and benefits of different choices of transport mode, such as through the Fit for 55 package, could have a substantial effect on the development of long-distance cross-border services, but could be one of the most difficult of all the measures considered to implement.

7.11 Hence, in our view, any set of measures selected from those identified in this study is likely to require different types of intervention, introduced in different phases, if the problem is to be fully addressed.

7.12 This could begin with initiatives to accelerate or extend the geographical scope of initiatives already being taken forward by the industry, such as the development of a pan-European Takt timetable and OSDM, and extended in time to include focused legislative change to address specific barriers in the availability and pricing of infrastructure capacity and rolling stock.

7.13 However, any measures adopted would need to be subject to more thorough investigation within the framework of the Better Regulation Guidelines.

Annexes



steer kcw

A Index of Tasks in the Technical Specification

Introduction

A.1 The table below indicates where each Task and sub-Task in the Technical Specification is referred to in this report and Annexes.

Table A.1: Discussion of Tasks and sub-Tasks

Task of sub-Task		Paragraphs	
		Report	Annex
3.1.1	Quantitative and qualitative description of the cross-border services between 2001 and 2019: supply	3.6 - 3.17	C.22 - C.76
3.1.1	Quantitative and qualitative description of the cross-border services between 2001 and 2019: demand	3.28 - 3.41	D
3.1.2	Identify extent and causes of decline	3.18 - 3.27	C.77 - C.229
3.1.3	Develop a matrix of connections by rail, air and coach	3.42 - 3.45	E
3.1.4	Assess whether night train services would be a valid substitute for other modes	4.2 - 4.17	G.31 - G.98
3.1.5	Assess the potential of the rail network to increase connections, capacity or speeds by 2030	4.18 - 4.20	G.99 - G.131
3.1.6	Estimate potential cross-border passengers and sensitivity tests for 2030 and recovery from COVID-19	4.21 - 4.25	G.144 - G.154
3.1.7	Measures used to stimulate cross-border services	4.26 - 4.30	H
3.1.8	Costs for cross-border night and long-distance trains	4.35 - 4.37	I.3 - I.19
			J
3.1.9	Commercial approach of railway undertakings	3.46 - 3.48	F
3.1.10	Compare rail cost drivers with air and coach	4.31 - 4.34	I
3.2.1.1	Identify existing night train rolling stock	5.24	M.2 - M.38
3.2.1.2	Estimate fleet size for potential fictive network	5.25	M.39 -M.44
3.2.1.3	Estimate costs of potential fictive network	5.26	M.45 - M.56
3.2.1.4	Identify measures to make rolling stock available	5.27	M.57 - M.66
3.2.2.1	Identify framework for cross-border services to use National Access Points (NAPs)		N.48 - N.51
3.2.2.2	Assess offer of through-ticketing in 2020		N.32 - N.46
3.2.2.3	Assess progress in through-ticketing		N.32 - N.46
3.2.2.4	Assess impacts of FSM and S2R		N.52 - N.59
3.2.2.5	Assess effect of through-tickets on passenger numbers		N.76 - N.84
3.2.2.6	Assess effect of through-tickets on railway undertaking costs		N.85 - N.86
3.2.2.7	Identify framework for liability for passenger rights on journeys with connections or sold by ticket vendors	5.30 - 5.42	N.87 - N.122
3.2.2.8	Identify revenue clearing models for through-ticketing	5.30 - 5.42	N.123 - N.151
3.2.2.9	Monitoring report for Directive 2012/34 Article 13a		N.25 - N.30

Task of sub-Task		Paragraphs	
		Report	Annex
3.2.2.10	Identify measures to accelerate through-ticketing		N.123 - N.151
3.2.3.1	Identify barriers to cross-border night trains	5.65	P.3 - P.19
3.2.3.2	Assess measures required with the Commission		P.20 - P.26
3.2.4.1	Describe national rules for capacity allocation	5.16 - 5.18	L.7 - L.36
3.2.4.2	Describe international timetable coordination	5.19 - 5.20	L.37 - L.43
3.2.4.3	Assess the impact on cross-border passenger services	5.21	L.44 - L.67
3.2.4.4	Identify measures to improve capacity allocation	5.22 - 5.23	L.68 - L.108
3.2.5.1	Describe access charges and mark-ups	5.5 - 5.7	K.4 - K.27
3.2.5.2	Assess the impact of mark-ups on long-distance trains	5.8 - 5.10	K.28 - K.34
3.2.5.3	Assess impact of mark-ups on fares and demand	5.11 - 5.13	K.35 - K.47
3.2.6.1	Identify cross-border services with PSO	5.50 - 5.54	O.8 - O.25
3.2.6.2	Identify cross-border services with partial PSO	5.57 - 5.61	O.26 - O.38
3.2.6.3	Identify PSOs for domestic night trains	5.62	O.39 - O.51
3.2.6.4	Describe institutional arrangements for PSOs	5.63	O.52 - O.91
3.2.6.5	Devise PSOs for cross-border night trains	5.64	O.92 - O.99

Source: Technical Specification, Steer analysis.

B Approach to stakeholder engagement

Introduction

B.1 This Annex presents an overview and analysis of the stakeholder engagement activities conducted by Steer and KCW in the course of the evaluation of the study.

Scope of the engagement with stakeholders

B.2 The engagement with stakeholders was designed with the following scope:

- Geographic scope: we targeted the EU Member States with railways and 3 non-EU states, Norway, Switzerland and the United Kingdom.
- Technical scope: we focused on enabling the growth of long-distance cross-border passenger rail services including night trains.

B.3 Note that the stakeholder engagement undertaken during this study was not part of a formal consultation process.

Objectives of the engagement with stakeholders

B.4 To gain an understanding of the issues that may arise in the study and input into the European Commission's Action Plan, in agreement with the European Commission and guided by the study's Technical Specifications, we defined a programme of field research designed to:

- ensure a process which provided the opportunity for stakeholders to provide information and data that contributed to the findings of the study;
- collect stakeholder views on the outcomes, results and impacts of the long-distance cross-border passenger rail market;
- collect data from stakeholders to ensure cross-referencing of information and address any information gaps identified;
- discuss issues arising with the application of legislation relating to long-distance cross-border services and any possible shortcomings, redundancies, overlaps, inefficiencies or inconsistencies; and
- collect stakeholder views on whether long-distance cross-border passenger rail is still fit for purpose and any suggested good practices or amendments.

B.5 This Annex discusses in turn:

- the methodology used for the targeted stakeholder engagement;
- the level of engagement achieved;
- the overview of stakeholder engagement results; and
- the questionnaire questions.

B.6 Note that the detailed findings from the stakeholder engagement and our analysis has been incorporated directly within the relevant sections of the Report.

Methodology of stakeholder engagement

Choice of engagement methods

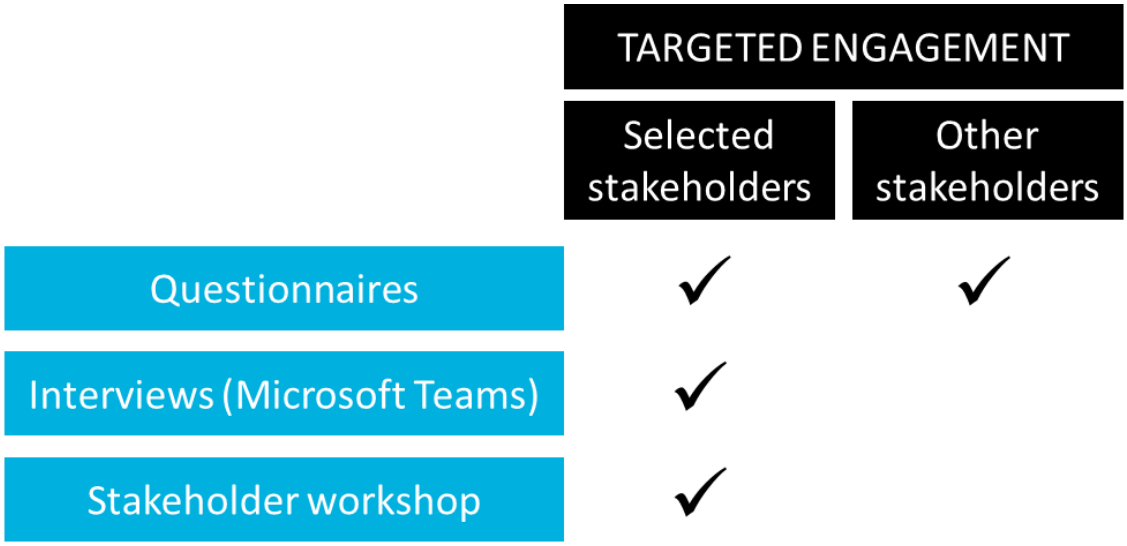
B.7 For the engagement process to be as effective as possible, we used different channels to engage with stakeholders, as shown in the table below.

Table B.1: Stakeholder methods, approach and target audience

Method	Approach	Target audience and purpose
Pilot interviews	Microsoft Teams meetings	Two key stakeholders to help refine the methodology of the work programme.
Targeted interviews by Steer and KCW	Microsoft Teams meetings with at least 26 participants	Key industry stakeholders', PSO's and passenger representatives' views and provision of data and documents.
Targeted questionnaires to industry	Issuing of questionnaires for each key stakeholder group	

B.8 The figure below shows how we engaged with each group of stakeholders identified to maximise the benefits of the field research for the study.

Figure B.1: Stakeholder engagement strategy



B.9 We grouped stakeholders as shown in the table below.

Table B.2: Stakeholder groupings

Group code	Organisation types
IM	Infrastructure Managers
IRU	Incumbent Railway Undertakings
MSS	Member States and Studies
NERU	New Entrant Railway Undertakings
PAX	Passenger Representative Bodies
PSO	PSO Competent Authorities
RBE	Regulatory Bodies and Timetabling
RS	Rolling Stock-related
TAT	Travel Agents and Ticketing

Source: Steer analysis.

B.10 Certain stakeholders were invited to complete a targeted questionnaire and to attend an interview via Microsoft Teams, where possible after receipt of their completed questionnaire:

- We examined questionnaire responses as soon as they were received.
- Selected stakeholders were then invited to interview by Steer or KCW, allowing the project teams to focus the interview on points of most relevance to the stakeholder concerned, based on their responses to the questionnaire.
- If the interview took place before the questionnaire was submitted, our team focused the discussion on key issues with regards to the European Commission's study.

B.11 "Other stakeholders" were invited to complete a targeted questionnaire:

- We examined questionnaire responses as soon as they were received.
- In some instances, we invited other stakeholders to interview, where they expressed willingness to be interviewed, and we considered their contribution likely to be useful to the study.

Selection of stakeholders

B.12 Through previous work for the European Commission and other clients, we have established contacts with a wide range of stakeholders in the groups listed in the table overleaf:

- Steer's rail, air and coach studies have established extensive contacts with infrastructure managers, operators and operator associations, Ministries, competent authorities and regulators, passenger representatives (including those representing passengers with reduced mobility) and industry commentators.
- KCW has already identified and contacted all competent authorities relevant to cross-border services as part of its study on missing cross-border links[42].

B.13 We reviewed the lists of stakeholders as a precursor to engagement:

- We removed some stakeholders who did not respond to past research or provide useful information.
- We sought to identify and add stakeholders not included in the table overleaf, including in areas where we have not carried out recent detailed research, such as in parts of the industry supply chain for issues such as ticketing (Task 3.2.2).
- We added any additional stakeholders suggested by the Commission.
- We added additional stakeholders suggested by some of the stakeholders we engaged with, or who reached out to us directly asking to take part. We thus engaged with more stakeholders than planned.

[42] Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders, KCW for European Commission, March 2018.

Table B.3: Stakeholder research

Task	Description (summarised by Steer)	Infrastructure managers	Operators: incumbents	Operators: new entrants	Competent authorities	Ministries	Regulatory bodies & ERA	Passenger representatives	Commentators & press
3.1	**Market and demand studies**								
3.1.1	Describe services 2001-2019	●	●	●					
3.1.2	Identify extent and causes of decline	●	●	●				●	●
3.1.3	Identify rail, air and coach connections 2019								
3.1.4	Scope for more night trains								
3.1.5	Scope for increasing connections, capacity, speed								
3.1.6	Estimate potential passengers								
3.1.7	Measures to stimulate cross-border services	●	●	●	●	●	●	●	●
3.1	**Operating cost analysis**								
3.1.8	Costs of cross-border services		●	●	●	●			
3.1.9	Commercial approach of railway undertakings		●	●	●	●			
3.1.10	Costs compared with air and coach								
3.2.1	**Rolling stock supply and costs**								
3.2.1.1	Identify night train rolling stock		●	●			●	●	●
3.2.1.2	Estimate fleet size for fictive night network								
3.2.1.3	Costs of fictive day and night networks								
3.2.1.4	Measures to make rolling stock available		●	●	●		●		●
3.2.2	**Ticketing**		●	●	●	●	●	●	●
3.2.3	**Technical barriers**	●	●	●	●	●	●		
3.2.4	**Capacity allocation**	●					●		
3.2.5	**Mark-ups to charges**	●							
3.2.6	**Cross-border PSOs**	●	●	●	●	●			
3.3	**Identification of measures to remove obstacles**								
3.4	**Preliminary impact assessment**								
3.5	**Conference on the results of the study**								

Communication with stakeholders

B.14 One member of the project team managed the stakeholder communication under the supervision of the Project Manager. They managed all communications from Steer with stakeholders and completed a log daily, or at least every other day, to track the progress of the engagement with each of the 226 stakeholders contacted. This log enabled the team, *inter alia*, to keep track of questionnaires sent and received, and interviews requested, agreed,

scheduled and completed. This log was reviewed each week, with follow-up emails made to progress the interview programme as required.

B.15 We used a dedicated email address, **longdistance.crossborder@steergroup.com**, to communicate with stakeholders. Several team members have access to this email address.

B.16 We contacted stakeholders with an introductory email, explaining the objectives and timeline of the study, and a targeted questionnaire, which varied by stakeholder group. A copy of our Letter of Introduction from the European Commission was also included.

B.17 This initial email was sent to the organisation's mailbox or to our contact at the organisation (through previous work by Steer and KCW, or from the Commission). In several cases, our study was forwarded on to the appropriate person at the organisation. Where our email "bounced", usually because the individual contact no longer worked for the organisation, we identified alternative contact details for the organisation through desk research.

B.18 Stakeholders were initially given two weeks to provide their answers; more time was offered to stakeholders when requested. A final follow-up email was sent on 21 April 2021 to all stakeholders who had not yet responded with a completed questionnaire.

Timeline of the engagement with stakeholders

B.19 The table below summarises the stakeholder engagement timeline following the initial two pilot questionnaires and interviews sent on 4 March 2021.

Table B.4: Stakeholder engagement timeline

	March 2021				April 2021				May 2021			
Piloting (interviews)												
Questionnaires distributed												
Questionnaires received												
Interviews												
Analysis of questionnaires and interviews												

Source: Steer and KCW.

B.20 On 4 March we ran a brief pilot of two questionnaires and interviews. On 17 and 18 March 2021, we distributed the bulk (167) of the questionnaires, all with an initial due date of 1 April, which was extended for stakeholders who asked for more time.

B.21 On 7 to 9 April, we emailed most (59) of the remaining questionnaires to stakeholders, with a due date of 21 April.

B.22 On 9 and 12 April, we sent reminder emails to the first batch of stakeholders.

B.23 On 21 April, we sent a final email to all stakeholders who had not yet responded with their completed questionnaires. We granted some extensions on a case-by-case basis.

B.24 In parallel, we asked some stakeholders for an interview at the same time as sending them a questionnaire.

B.25 We held the first interview on 9 March, and continued to arrange interviews until submission of our Interim Report on 1 June[43].

B.26 We aimed to be flexible with stakeholders and to agree to conduct an interview before receiving a questionnaire, if this was more convenient.

B.27 Stakeholders were also invited to the online study conference held on 1 September 2021. Further details can be found in Annex R.

Confidentiality

B.28 To ensure that we respected the confidentiality of responses, we invited all stakeholders to highlight in yellow in their questionnaire any issues which they wished to remain confidential. Any information marked confidential will be used to inform the study, but will be anonymised in a way that it cannot be directly or indirectly attributed to a specific stakeholder.

Engagement methods

Questionnaires

B.29 The targeted stakeholder questionnaires covered the scope required by the Commission's Technical Specification and were designed to obtain detailed and precise views from the industry, as well as data and policy views. Each questionnaire consisted of a large number of questions which covered a wide range of topics within each evaluation question. The questions were proposed in the Inception Report and agreed by the Commission.

B.30 The full list of questions is included later in this Annex.

B.31 We encouraged stakeholders to contact us regarding any questions on the questionnaire.

Interviews

B.32 We completed 24 interviews, each of 60-75 minutes, with selected stakeholders, in Dutch, English, French or German, normally reflecting the preference of the stakeholder.

B.33 We shared example of interview notes among the interviewers to achieve a consistent structure and content.

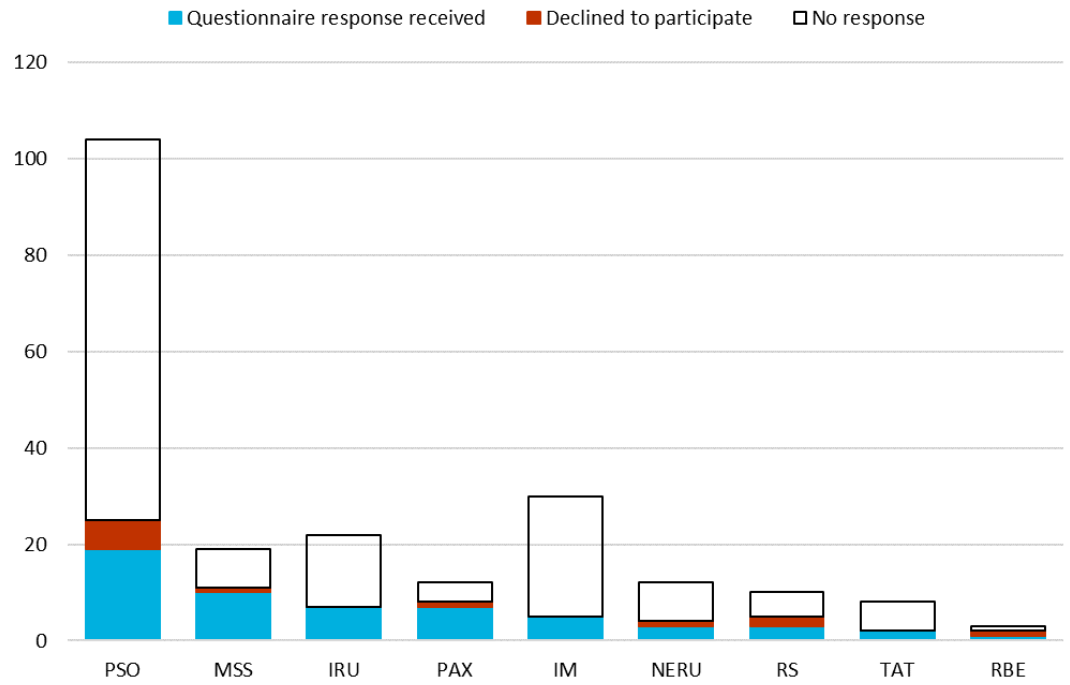
Level of engagement

Targeted stakeholder engagement achieved

B.34 The figure below provides an overview of the number of questionnaire responses received from stakeholders for this study. In total we received 57 responses, which are discussed in more detail in the corresponding sections below.

[43] During June we also completed interviews with UIC and EIM.

Figure B.2: Number of questionnaires received



Note: for key see paragraph B.9.

B.35 We received responses from all groups, with the greatest response rate by volume from the PSOs (19) and the lowest response rate by volume from the RBEs (1). Response rate by percentage was highest for the PAXs (7 of 12, 58%) and lowest for IMs (5 of 30, 17%).

B.36 The table below lists the organisations that returned a completed questionnaire. The Finnish Ministry of Transport and Telecommunications declined to respond: because of their geographical location, they have no intra-EU international rail passenger traffic.

B.37 Other EU members responded to the PSO-targeted questionnaires.

Table B.5: Stakeholder engagement by group

Key			
Questionnaire response received	No questionnaire response	Declined to participate	Interviewed
●	●	●	●

Organisation		Status	
		Questionnaire received	Interview
MSS Member States and Studies			
AT	BMK (Federal Ministry for Climate Protection, Environment, Energy, Mobility, Innovation and Technology	●	●
BE	FOD Mobiliteit en Vervoer	●	
FR	Direction Générale des Infrastructures, Transports et de la Mer (DGITM)	●	●

Organisation		Status	
		Questionnaire received	Interview
EE	Ministry of Economic Affairs and Communications	●	
LT	Ministry of Transport and Communications	●	
NL	Ministry of Infrastructure and Water Management	●	●
RO	Ministry of Transport, Romania	●	
SI	Ministry of Infrastructure, Slovenia	●	
AT	SCHIG	●	●
FI	Ministry of Transport and Telecommunications	●	
BE	DG Mobilité Durable et Ferroviaire	●	
DE	Bundesministerium fur Verkehr, Bau und Wohnungswesen	●	
EL	Ministry of Infrastructure, Transport and Networks	●	
FR	Ministry of Ecology, Sustainable Development, Transport and Housing	●	
IT	Ministero dei Trasporti	●	
LU	Ministry of Mobility and Public Works	●	
LU	Department for Transport	●	
UK	Transport Scotland	●	
RBE Regulatory bodies and timetabling			
EU	European Union Agency for Railways (ERA)	●	●
EU	IRG-Rail	●	
CH	SMA	●	
IM Infrastructure Managers			
FI	FTIA	●	
HU	MÁV-START	●	
PL	PKP Polskie Linie Kolejowe SA	●	
UK	HS1	●	●
EU	EIM Rail	●	●
BE	Infrabel	●	●
BG	Bulgarian Railway Company	●	
CH	Switzerland Federal Office of Transport (FOT)	●	●
CZ	Czech Railway Infrastructure Administration	●	
DE	DB Netz	●	
DK	Banedanmark	●	
EE	Eesti Raudtee	●	
EL	OSE	●	
ES	Railway Infrastructure Authority (ADIF)	●	
FR	RFF	●	
FR/UK	Getlink (formerly Eurotunnel)	●	●

Organisation		Status	
		Questionnaire received	Interview
HR	HZ Infrastruktura	●	
IE	Irish Rail	●	
IT	Rete Ferroviaria Italiana	●	
LT	Lithuanian Railways / Lietuvos geležinkeliai	●	
LU	Societé Nationale des Chemins de Fer Luxembourgeois	●	
LV	Latvian Railway / LDz	●	
NL	ProRail	●	●
NO	Jernbaneverket	●	
PT	Rede Ferroviária Nacional, REFER E.P.	●	
RO	CFR Infrastructura	●	
SI	Public Agency of the Republic of Slovenia for Railway Transport	●	
SK	Zeleznice Slovenskej Republiky	●	
UK	Network Rail	●	
IRU Incumbent Railway Undertakings			
AT	ÖBB	●	
ES	Renfe	●	
FR	SNCF	●	
IT	Trenitalia	●	
NO	Vy, Norwegian State Railways	●	
SE	SJ AB	●	
CH	SBB	●	●
DE	DB	●	●
EU	CER	●	●
CZ	Czech Railways / České dráhy	●	
DK	Danske Statsbaner	●	
EU	Railteam BV	●	
FI	VR	●	
HR	Croatian Railways, HZPP	●	
NL	Nederlandse Spoorwegen (NS)	●	
PL	PKP Intercity, Poland	●	
PT	Comboios de Portugal (CP)	●	
SI	Slovenske Zeleznice	●	
SK	Železničná spoločnosť Slovensko, a.s. (ŽSSK)	●	
RO	CFR Călători	●	
UK	National Express	●	
UK	Stagecoach	●	

Organisation		Status	
		Questionnaire received	Interview
NERU New Entrant Railway Undertakings			
EU	ALLRAIL	●	●
FR	Eurostar	●	●
SE	Snälltåget	●	●
BE	Thalys	●	
CZ	RegioJet[44]	●	●
CZ	Leo Express	●	
DE	RDC Deutschland / Bahn-Touristik-Express	●	●
DE	FlixTrain	●	●
EU	European Sleeper	●	
FR	Thello	●	
HU	Continental Railway Solution	●	●
IT	Nuovo Trasporto Viaggiatori (NTV)	●	
TAT Travel Agents and Ticketing			
EU	European Travel Agents' and Tour Operators' Associations (ECTAA) / EU Travel Tech (EUTT)	●	●
UK	The Man in Seat 61	●	
UK	Trainline[45]	●	●
BE	SNCB	●	
CH	Swiss	●	
ES	Amadeus	●	
NL	Sqills	●	
UK	Silver Rail	●	
RS Rolling stock manufacturers and supply chain, leasing companies and rolling stock finance			
ES	Patentes Talgo	●	
EU	European Investment Bank (EIB)	●	●
UK	Beacon Rail	●	●
BE	UNIFE	●	
CH	Eurofima	●	
CH	Rail Working Group	●	
CH	Stadler	●	
DE	Alpha Trains Europa GmbH	●	
DE	Siemens	●	
FR	Alstom/Bombardier	●	

[44] An interview with RegioJet was arranged but subsequently postponed until 19 July.

[45] EUTT completed on Trainline's behalf.

Organisation		Status	
		Questionnaire received	Interview
PAX Passenger bodies			
BE	BEUC (European Consumer Organisation)	●	
DE	PRO-BAHN	●	
EU	Back-on-track, Back-on-track Belgium	●	●
EU	European Disability Forum (EDF)	●	
FR	Fédération nationale des associations d'usagers des transports (FNAUT)	●	
FR	Oui au Train de nuit	●	●
IT	Assoutenti UTP Italy	●	
EU	European Passenger Federation (EPF)	●	●
EU	European Blind Union	●	
EU	European Union for the Deaf	●	
EU	Inclusion Europe	●	
UK	European Rail Campaign	●	
Other			
CH	EBP[46]	Not sent	●
PSOs			
BE	FOD Mobiliteit en Vervoer	●	
CH	Switzerland Federal Office of Transport (BAV)	●	●
CZ	Department of Transport and Road Management	●	
CZ	Ministry of Transport Czechia	●	
DE	Zweckverband Verkehrsverbund Oberlausitz-Niederschlesien (ZVON)	●	●
DK	Danish Civil Aviation and Railway Authority	●	
DK	Ministry of Transport Denmark	●	
HU	Jihomorávsky kraj	●	
IE	National Transport Authority, Ireland	●	
IT	Regione Autonoma	●	
LV	Ministry of Transport Latvia	●	
NL	Noord Brabant	●	
NL	Provincie Limburg	●	
NO	Ministry of Transport Norway	●	
PO	Urząd Marszałkowski Województwa	●	
SE	Swedish Transport Administration / Trafikverket	●	●
SE	Swedish Transport Agency / Transportstyrelsen	●	
SK	Ministry of Transport Slovak Republic	●	

[46] EBP were consultants for the Commission on the Evaluation of high-speed rail in Europe

Organisation		Status	
		Questionnaire received	Interview
UK	Department for Infrastructure, Northern Ireland	●	
PSO competent authorities at national level			
BG	Railway Administration Executive Agency (RAEA)	●	
CH	UVEK Finanzierung (BAV)	●	
DE	Federal Ministry of Transport and Digital Infrastructure / BMVI	●	●
EE	Majandus- ja Kommunikatsiooniministeerium, Teede- ja raudteeosakond, Raudteetalitus (MKM, Ministry of Economic Affairs and Communications)	●	
ES	Ministerio de Transportes, Movilidad y Agenda Urbana (MITMA) (formerly Ministerio de Fomento)	●	
FR	Ministere de la Transition ecologique et solidaire	●	
HR	Ministry of Maritime Affairs, Transport and Infrastructure, Croatia	●	
LI	Amt für Bau und Infrastruktur (ABI) / Office for Construction and Infrastructure	●	
LT	Lietuvos Respublikos susisiekimo ministerija (Ministry of Transport and Communications)	●	
LU	Ministère du Développement durable et des infrastructures - Département des transports	●	
NO	Ministry of Transport and Communications	●	
PL	Ministry of Infrastructure and Construction (Ministerstwo Infrastruktury i Budownictwa)	●	
PL	Ministry of Infrastructure and Development (Ministerstwo Infrastruktury i Rozwoju)	●	
PT	Ministry of Planning and Infrastructure (Ministro do Planeamento e Infraestruturas)	●	
SE	Ministry of Enterprise and Innovation	●	
SI	Ministrstvo za infrastrukturo (Ministry of Infrastructure)	●	
SK	Ministerstvo dopravy a výstavby Slovenskej republiky	●	
NO	Norwegian National Rail Administration/Jernbaneverket	●	
UK	Department for Transport	●	
PSO competent authorities at regional level			
AT	OÖ Verkehrsverbund-Organisations GmbH Nfg. & Co KG (OÖVV)	●	
AT	Salzburger Verkehrsverbund GmbH	●	
AT	Verkehrsverbund Ost-Region (VOR) GmbH	●	
AT	Verkehrsverbund Tirol GesmbH (VVT)	●	
AT	Amt der Vorarlberger Landesregierung (VVOR)	●	
AT	Amt der Steiermärkischen Landesregierung (STMK)	●	
AT	Amt der Kärntner Landesregierung	●	

Organisation		Status	
		Questionnaire received	Interview
AT	Steirische Verkehrsverbund GmbH (VST)	●	
CH	Canton de Vaud, Service de la mobilité	●	
CH	Kanton Aargau, Departement Bau, Verkehr und Umwelt, Abteilung Verkehr	●	
CH	Bau- und Verkehrsdepartement des Kantons Basel-Stadt	●	
CH	Kanton Graubünden, Amt für Energie und Verkehr	●	
CH	Kanton Schaffhausen, Koordinierungsstelle öffentlicher Verkehr	●	
CH	Kanton Solothurn, Amt für Verkehr und Tiefbau, Öffentlicher Verkehr	●	
CH	Kanton St. Gallen, Amt für öffentlichen Verkehr	●	
CH	Kanton Thurgau, Abteilung Öffentlicher Verkehr/Tourismus	●	
CH	Kanton Wallis, Departement für Mobilität, Raumentwicklung und Umwelt, Dienststelle für Mobilität, Sektion Verkehr	●	
CH	Kanton Zürich, Volkswirtschaftsdirektion, Amt für verkehr	●	
CH	République et Canton de Neuchâtel, Service des Transports	●	
CH	République et Canton du Jura, Service du développement territorial, Section de la mobilité et des transports	●	
CZ	Jihočeský Koordinátor Dopravy Jikord s.r.o.	●	
CZ	Královéhradecký kraj, odbor dopravy a silničního hospodářství, oddělení dopravní obslužnosti	●	
CZ	Liberecký kraj, Odbor dopravy, Oddělení dopravní obslužnosti	●	
CZ	Moravskoslezský kraj, Odbor dopravy a chytrého regionu, Oddělení dopravy	●	
CZ	Olomoucký kraj, Oddělení veřejná doprava	●	
CZ	Pardubický kraj, Odbor dopravy a silničního hospodářství (ODSH), Oddělení dopravy	●	
CZ	Plzenský kraj, Odbor dopravy a silničního hospodářství, Oddělení dopravně správních agend	●	
CZ	Ústecký kraj, Odbor dopravy a silničního hospodářství, Oddělení dopravní obslužnosti kraje	●	
CZ	Zlínský kraj, Odbor dopravy a silničního hospodářství, Oddělení veřejné dopravy	●	
DE	Bayerische Eisenbahngesellschaft mbH (BEG)	●	
DE	Nahverkehrsgesellschaft Baden-Württemberg mbH (NVBW)	●	
DE	Zweckverband Schienenpersonennahverkehr Rheinland-Pfalz Süd (SPNV Sud)	●	

Organisation		Status	
		Questionnaire received	Interview
DE	VBB Verkehrsverbund Berlin-Brandenburg GmbH, Planung und Fahrgastinformation (VBB)	●	
DE	Zweckverband Personennahverkehr Saarland (VGS)	●	
DE	Verkehrsgesellschaft Mecklenburg-Vorpommern mbH (VMV)	●	
DE	Zweckverband Verkehrsverbund Oberelbe (VVO) GmbH (Z-VOE)	●	
DE	Zweckverband Nahverkehr Rheinland (ZV NVR)	●	
DE	Verkehrsverbund Rhein-Ruhr AöR (VRR)	●	
DE	Verkehrsverbund Mittelsachsen GmbH (VMS)	●	
DE	Nahverkehr Westfalen-Lippe (NWL)	●	
DE	Landesnahverkehrsgesellschaft Niedersachsen mbH (LNVG)	●	
DE	Zweckverband Schienenpersonennahverkehr Rheinland-Pfalz Nord (SPNV Nord)	●	
FR	Région Nouvelle-Aquitaine	●	
FR	Région Bourgogne-Franche-Comté	●	
FR	Région Grand Est	●	
FR	Région Hauts-de-France	●	
IT	Regione Liguria	●	
NL	Provincie Zeeland	●	
NL	Provincie Gelderland	●	
NL	Provincie Overijssel	●	
NL	Provincie Drenthe	●	
PL	Urząd Marszałkowski Województwa Dolnośląskiego, Wydział Transportu, Dział Transportu Kolejowego	●	
PL	Urząd Marszałkowski Województwa Malopolska, Departament Transportu i Komunikacji	●	
PL	Urząd Marszałkowski Województwa Opole, Departament Infrastruktury i Gospodarki	●	
PL	Urząd Marszałkowski Województwa Podkarpackiego, Departament Dróg i Publicznego Transportu Zbiorowego	●	
PL	Urząd Marszałkowski Województwa Podlaskiego, Departament Infrastruktury i Transportu	●	
PL	Urząd Marszałkowski Województwa Śląskiego, Wydział Komunikacji i Transportu, Referat organizacji transportu publicznego	●	
PL	Urząd Marszałkowski Województwa Zachodniopomorskiego, Wydział Infrastruktury i Transportu	●	
SE	Regionala kollektivtrafikmyndigheten i Norrbotten	●	

Organisation		Status	
		Questionnaire received	Interview
SE	Skånetrafiken	●	

Written contributions

B.38 Several stakeholders provided supplementary documents, in support of their response to the questionnaire, which we also reviewed.

Table B.6: Written contributions received through stakeholder engagement

Organisation	Stakeholder group	Title of Paper	Length
SCHIG	MSS	A decision tree on how to implement new international (very) long-distance trains, 23/02/2021	34 slides
Eurostar	NERU	International High-Speed Rail – Unlocking the Potential: Eurostar proposal to review charging principles for international rail passenger services, February 2021	10 pages
ALLRAIL	NERU	Appendix to questionnaire answers	31 pages
Oui au Train de nuit	PAX	10 Actions pour impulser La Renaissance des Trains de Nuit en Europe, April 2021	71 pages

Overview of stakeholder engagement results

B.39 In this section, we report on the questionnaire responses and interviews.

B.40 The questionnaires were designed to obtain data and open responses, so that facts and opinions could be extracted. Each stakeholder in a group was sent the same set of questions, so that their views could be easily compared and contrasted. The stakeholder responses were highly qualitative and it was not possible to carry out any numerical or statistical analysis.

B.41 Findings from the stakeholder engagement and our analysis have been incorporated directly within the relevant sections of the Report.

Response quality

B.42 A large proportion of the responses (46 of 57) were received by the deadline of 21 April and were reviewed before our Interim Report. Subsequent responses were taken into account in our Draft Final Report. Responses received varied from not very detailed, and with missing sections, to very well detailed, and providing valuable but mainly qualitative information for the study.

B.43 Nearly all responses were supplied in good English but some were completed in other languages, which we translated using machine translation. A few stakeholders submitted additional written responses alongside their questionnaire responses, as summarised above.

B.44 Interviews were useful for investigating gaps in the qualitative data and gave stakeholders the opportunity to raise specific points of importance. Many stakeholders encouraged us to contact them if we had any questions about the information they provided.

B.45 However, the response rate of some key industry participants remained limited, particularly for stakeholder groups Regulatory Bodies and Timetabling (RBE), Infrastructure Managers (IM), Incumbent Railway Undertakings (IRU), New Entrant Railway Undertakings (NERU),

Travel Agents and Ticketing (TAT) and PSO Competent Authorities (PSO). Even where stakeholders responded to the questionnaire, the level of detail varied between stakeholders and between questions. The data may not represent a balanced view across those stakeholder groups.

B.46 In addition, requests for the provision of data were of limited value, as most stakeholders did not share quantitative information. This may be because data was not available, because of confidentiality issues, or because stakeholders did not have the resources to compile the data within the time available.

B.47 It is important to note that we have generally taken the stakeholder views at face value. We did not attempt to verify the accuracy of the information they provided, except in cases where we were already aware of any contradictions.

Questionnaire questions

B.48 This section summarises the questionnaire questions and how they link back to the tasks within the Technical Specifications.

Task 3.1.1: Describe services 2001-2019

Quantitative and qualitative (where needed to clarify the quantitative description) description of the cross-border (night and long-distance trains) services in the geographical area described in section 2.1, between 2001 and 2019, both in terms of ridership and supply.

- *Where data for cross-border day-time services cannot be found or reconstructed, proxy indicators may be used (for example percentage of cross-border travel compared to the total number of rail passengers in Europe);*
- *For night train services a higher level of detail is requested covering both supply and ridership.*

Supply

B.49 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.7: Questions related to Task 3.1.1 on supply

Proposal	Question
Questions for all relevant interviewees	
3.54	Do you collect data on any of “cross-border train”, “long-distance train”, “night train”, “night train rolling stock”, “long-distance cross-border (high-speed) passenger services” or “cross-border night train services”? What definitions do you use?
3.54	Please provide any timetables you have for cross-border day or night trains from 2001 to 2019, by types of accommodation occupied.

Demand (ridership)

B.50 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.8: Questions related to Task 3.1.1 on demand

Proposal	Question
Questions for all relevant interviewees	
3.57	Please provide any information or references you have on passenger numbers for cross-border day or night trains from 2001 to 2019, by individual service or route, including all the types of accommodation offered on them.
3.57, 3.130	What proportion of passengers using cross-border day and night trains are connecting? What proportion of those connections are to or from frequent or local services on which reservation is not possible?
None	Do passengers ever change between night trains in the middle of the night? If not, during what period of the night does no passenger interchange take place?

Task 3.1.2: Identify extent and causes of decline

Analyse to which extent the decline in night train services has been substituted by other rail services such as (cross-border) high-speed services and why (e.g. was the offer rationalised or did demand fall). Analyse the explanatory factors identified by passenger representative bodies (notably in terms of price, quality, comfort, safety, traveling times).

If demand figures are not available, this analysis may be based on the analysis of the offer of cross-border night train services.

B.51 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.9: Questions related to Task 3.1.2

Proposal	Question
Questions for questionnaire and interviews	
3.19, 3.65	What has driven changes in cross-border day and night services since 2001? What has led to increases, reductions or closures? Will these factors continue to apply in the future? If not, what has changed? What factors are now seen as important in reviewing and planning cross-border services? Please give specific examples.
3.19, 3.65	Has the introduction of faster services, or high-speed lines, been a factor in changes to night train services? Has the viability of trains been a factor in changes to night train services? Please give specific examples.
3.19, 3.66	Where cross-border night trains have been cut back, have they been replaced by day services? To what extent did night train passengers switch to conventional or high-speed rail services by day, or change to other modes? Please give specific examples.
3.65	What are attractive time windows for journeys … … how early are passengers prepared to start day train and night train journeys? … how late are passenger prepared to end day train and night train journeys? Please give specific examples.

Task 3.1.3: Identify rail, air and coach connections 2019

Develop a matrix representing timetable 2019 connections by rail, air and coach between states covered by this study.

B.52 This task required only questions related to specific data sources.

Task 3.1.4: Scope for more night trains

Use the above-mentioned matrix, and based on simple criteria for distances, travel times and frequencies per origin-destination pair as well as the 2020 timetable, to assess whether night train services would be a valid substitute for other modes.

B.53 This task required only questions related to specific data sources.

Task 3.1.5: Scope for increasing connections, capacity, speed

Assess the (future) potential of the rail network to increase connections, capacity or speeds in the light of existing investments. The Consultant can base this analysis on the study on high-speed rail commissioned by the Directorate General for Mobility and Transport which will provide a map of the planned rail network for 2030.

B.54 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.10: Questions related to Task 3.1.5

Proposal	Question
Questions for questionnaire and interviews	
3.79	What constraints to operating cross-border day or night trains exist? Are there specific capacity constraints on links, at junctions, at stations, and other locations? Please provide examples of which you are aware.
3.79	Please identify any planned or proposed service changes which will add new constraints.
3.79	What proposals exist to remove these constraints? When will this happen, and how much will it cost?
Specific questions for interviewees	
	Are there barriers to operating services where there is a change of track or structure gauge?
	Are there barriers to travelling from Poland to the network of the Russian gauge?
	Are there barriers to travelling from France to the network of the Iberian gauge?
	Are there barriers to using the Channel Tunnel?
	Are there barriers to using High Speed 1 in Great Britain?
	Are there barriers to using the Network Rail network in Great Britain?

Task 3.1.6: Estimate potential passengers

Provide an estimate, based on tasks 3.1.1 – 3.1.4 and on literature study, of the number of potential passengers for the night and long-distance train relations identified in task 3.1.4 (level 2020). Provide a basic sensitivity analysis for 2030, using the result of task 3.1.5, initiatives foreseen in the framework of the European Green Deal and, if relevant at the time of writing the report, any measures taken to recover from the corona-outbreak.

B.55 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.11: Questions related to Task 3.1.6

Proposal	Question
Questions for questionnaire and interviews	
3.88	How do you think the European Green Deal will affect future demand and services, and hence availability of infrastructure capacity and rolling stock? What will this mean for cross-border day and night trains? Are there plans to implement the Green Deal / achieve the Green Deal objectives?
3.88	How do you think COVID-19 will affect future demand and services, and hence availability of infrastructure capacity and rolling stock? What will this mean for cross-border day and night trains?
Questions for all relevant interviewees	
3.83	What models do you use for predicting demand and revenue for cross-border day and night trains? Please provide details.
3.83	What models do you have of how passengers choose from a range of different connections at different times? Do these models distinguish between daytime direct trains, daytime connections involving interchange, and night trains?
3.83	How successful or accurate have they proved to be in practice?

Task 3.1.7: Measures to stimulate cross-border services

Identify any other measures, either at European, (multi-)national or at industry level, which were meant to stimulate cross-border (night and long-distance) train services or domestic night train services, including their level of success and failure.

B.56 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.12: Questions related to Task 3.1.7

Proposal	Question
Questions for questionnaire and interviews	
3.21, 3.91	What measures have been taken to stimulate cross-border services, whether by day or night, since 2001? What was the outcome and why?
3.21, 3.91	What measures would most help to develop cross-border services, by day or by night? Do cross-border services require high quality hubs with capacity to operate a range of services and connections? Please provide examples.
3.21, 3.91	Who would need to take these measures? Please provided further details.

Task 3.1.8: Costs of cross-border services

Detail (for the situation at present or close to at present), the production costs for cross-border (night and long-distance train) services (including the main cost drivers), their level of income and their profitability (including the required volume of passengers ensuring financial break-even). In view of the tasks described in section 3.2, the production costs related to the availability of rolling stock, as well the level of income and compensation related to the execution of a Public Service Contract (if any), should be described in detail.

B.57 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.13: Questions related to Task 3.1.8

Proposal	Question
Questions for questionnaire and interviews	
3.22, 3.95	What data are you able to share on the operating costs of cross-border day and night services? Please provide whatever is available.
3.103	Under what circumstances can cross-border services be operated without PSCs? Are you aware of any examples of existing or proposed cross-border services which might affect the economic equilibrium of PSCs? Please provide examples.

Task 3.1.9: Commercial approach of railway undertakings

Assess the commercial approach of railway undertakings to the provision of services in these market segments (night and long-distance cross-border trains), in particular by incumbent operators and new-entrant, and the possibility to develop low-cost services as done in aviation.

B.58 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.14: Questions related to Task 3.1.9

Proposal	Question
Questions for all relevant interviewees	
3.104	What business models are in use for the operation of cross-border day and night services? Please provide examples.
3.104	What are their relative advantages and disadvantages?
3.104	How attractive are cross-border services compared with serving the domestic market in terms of costs and revenues?
3.104	Are fares on new services constrained by fares on existing services … … where existing services have low fares specified through a PSC? … where one uses kilometric (distance-based) fares and the other uses market fares?
3.104	To what extent are lower fares possible and sustainable?
3.104	Approximately what average loading (passengers per train) is needed to make a long-distance cross-border train commercially viable … … for a day train operating at high speed (over 200 km/h) or at conventional speed? … for a night train?
3.104	Which practices are transferable from aviation, such as seasonal variations in the offer, frequent timetable and route changes, higher load factors and shorter turnarounds?

Task 3.1.10: Costs compared with air and coach

Compare the main cost drivers identified in task 3.1.8 with those for aviation and long-distance coaches. For aviation and coach services, the consultant can use a literature study.

B.59 This task required only questions related to specific data sources.

Task 3.2.1: Rolling stock supply and costs

Task 3.2.1.1: Identify night train rolling stock

Evaluate the existing number of rolling stock dedicated to night train services. Assess whether there is a real shortage of suitable rolling stock, or if rolling stock is artificially kept from the market. If the former applies, the consultant should identify what are the current technical or commercial limitations of the existing rolling stock. If the latter applies, a quantitative analysis is to be performed and remedy measures are to be proposed.

B.60 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.15: Questions related to Task 3.2.1.1

Proposal	Question
Questions for questionnaire and interviews	
3.111	Please identify any rolling stock suitable for night trains which you own or control, or of which you are aware, and any relevant technical details.
3.112	Is the stock serviceable? Does it comply with current standards? Does it meet current passenger needs?
3.23	What issues arise obtaining night train rolling stock for domestic or cross-border trains? How much does it cost? How long does it take to have stock in service?
3.23	Have you withdrawn night train or long-distance rolling stock from use? If so, has it been retained for later use, sold, or scrapped? What has been the level of interest in buying stock, and in what volumes? Please provide examples.
3.23	Can night train rolling stock from one location be used elsewhere? Please provide examples or where this can and cannot be done.
	What initiatives have manufacturers and leasing companies taken to facilitate the development of long-distance cross-border train services with high-speed, conventional day stock, or night stock? Please provide examples.

Task 3.2.1.2: Estimate fleet size for fictive night network

Estimate how much rolling stock and of what type would be needed to:

a) set up a night train network connecting the EU + the United Kingdom, Norway and Switzerland. The consultant may use a fictive, yet based on realistic assumptions, scenario to devise such a network;
b) set up a network of long-distance rail passenger services in the EU + the United Kingdom, Norway and Switzerland. Again, the consultant may use a fictive, yet based on realistic assumptions, scenario to devise such a network;

NB: for both networks the consultant is requested to use the matrix developed in task 3.1 and to make a basic distinction between existing cross-border services (timetable 2020) and fictive services constructed for the scope of this study.

B.61 This task required only questions related to specific data sources.

Task 3.2.1.3: Costs of fictive day and night networks

Estimate the costs to set up and operate the fictive network developed in task 3.2.1.2.

B.62 This task required only questions related to specific data sources.

Task 3.2.1.4: Measures to make rolling stock available

Identify suitable measures to increase the availability of rolling stock for:

a) cross-border long-distance (high-speed) passenger services;
b) cross-border night train services;

The consultant is requested to cover in his analysis both new-build rolling stock, secondhand rolling stock and reconstructed/modernised rolling stock.

B.63 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.16: Questions related to Task 3.2.1.4

Proposal	Question
Questions for questionnaire and interviews	
3.119	What would be the minimum viable size for an order of new cross-border day or night stock (in vehicles or trains)? How large does an order have to be before unit prices cease to fall?
3.23	Are you aware of allegations or evidence of rolling stock suitable for night trains being artificially kept from the market? Please provide details.
3.24	How could the availability of rolling stock be improved? What has worked and failed? Please give examples.
3.120	Can cross-border day or night train rolling stock be transferred elsewhere or sold? Please provide examples.
3.120	Can financial instruments such as green bonds facilitate the provision of rolling stock for cross-border services?
3.120	Could government or EU intervention help? How?

Task 3.2.2: Ticketing

Task 3.2.2.1: Framework for information sharing

Identify the most coherent framework to ensure that cross-border rail services share their information data through the National Access Points (in compliance with Commission Delegated Regulation (EU) 2017/1926, supplementing Directive 2010/40/EU with regard to the provision of EU-wide multimodal travel information services).

B.64 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.17: Questions related to Task 3.2.2.1

Proposal	Question
Questions for all relevant interviewees	
Commission Delegated Regulation (EU) 2017/1926 requires that … "Each Member State shall set up a national access point. The national access point shall constitute a single point of access for users to at least the static travel and traffic data and historic traffic data of different transport modes, including data updates, as set out in the Annex, provided by the transport authorities, transport operators, infrastructure managers or transport on demand service providers within the territory of a given Member State." "Transport authorities, transport operators, infrastructure managers or transport on demand service providers shall provide the static travel and traffic data and historic traffic data listed in point 1 of the Annex, of the different transport modes"	
3.126	Are you familiar with the National Access Points? Please describe your understanding of them?
3.126	What are your views on the National Access Points? What are the barriers to their wider use?
3.126	Is data uploaded in a comprehensive, accurate and timely way? Please give examples. How could the data be more comprehensive, accurate and timely?
3.126	Is data accessed easily and exploited effectively? Please give examples. How could better use be made of the data?
3.126	How should railway undertakings providing cross-border services share information data through the National Access Points? What steps need to be taken to make this happen?

Task 3.2.2.2: Assess offer of rail through-tickets

Assess quantitatively and qualitatively the offer of rail through-tickets in Europe including the analysis of sales channels used and revenue sharing mechanisms, for both domestic and for cross-border travel for the 2020 timetable.

B.65 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.18: Questions related to Task 3.2.2.2

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.130	Please provide any information you have on the proportion of rail tickets sold by different channels. If possible, include any information specific to cross-border journeys or through-tickets.
3.130	Please list any organisations you are aware of who provide through-tickets for rail travel.
3.130	Please estimate how many through-tickets they offer and the proportion of passengers using them rather than buying separate tickets.

Task 3.2.2.3: Assess progress in through-ticketing

Assess (qualitatively) the development in the offer of through-tickets in the last decade and explain the reasons for that development.

B.66 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.19: Questions related to Task 3.2.2.3

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.25, 3.134	What is your vision for through-ticketing? What progress has been made towards it in the last decade, and why? What are the barriers?

Task 3.2.2.4: Assess FSM and S2R

Assess the developments envisaged by FSM (Full Service Model) and S2R (Shift2Rail Joint Undertaking) and their impacts on the rail ticketing market.

B.67 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.20: Questions related to Task 3.2.2.4

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.25, 3.135	What are the effects of the Full Service Model (FSM) and Shift2Rail (S2R) on rail ticketing? What are their effects on through-ticketing?
3.25, 3.135	How could the process be better or accelerated?

Task 3.2.2.5: Assess effect of through-ticketing on passengers

Assess what would be the effect on passenger numbers if through-tickets would be easily available for all train travel in Europe by default (i.e. one ticket for any rail trip online ("one-click") and at desk counters).

B.68 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.21: Questions related to Task 3.2.2.5

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as “a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings”. Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.141	What benefits would you expect there to be from buying through-tickets? Why?
3.141	Please identify any disadvantages to offering through-tickets. Are there circumstances under which passengers want to avoid them?
3.141	Do passengers connecting to or from night trains seek or expect tight connections from or to day trains? Would they expect through-tickets?
None	If through-tickets were easily available for all train travel in Europe by default, what would be the effect on demand? What would be the effect on demand for long-distance cross-border day trains? What would be the effect on demand for long-distance cross-border night trains?
None	How would passengers with through-tickets be offered choices of continuation, re-routing or reimbursement in the event of delays, missed connections and cancellations? How would this work in practice? Are there any barriers to offering, delivering and enforcing such a right? What benefits would passenger receive in practice? Please provide examples.

Task 3.2.2.6: Assess effect of through-ticketing on railways

Assess what would be the economic impact on railway undertakings if they would be obliged to generally offer and accept through-tickets, including offering the associated passenger rights (notably for re-routing and compensation.

B.69 The Commission has clarified that "one-click" ticketing has not been defined, although we use the term "single transaction". We focused on "through-tickets", for which a definition is available. The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.22: Questions related to Task 3.2.2.6

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings"[47]. Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.142	What effect would it have on railway undertakings? Would there be increased costs? Why?
3.142	Through-ticketing could be linked to elements of rail passenger rights legislation related to choice of reimbursement, re-routing or connections, as specified in Regulation 1371/2007 or the proposed recast.
3.142	How would this work?
3.142	What practical issue would it have for railway undertakings? How would they minimise the net cost of compliance?
3.142	Could this result in any unintended consequences (such as making through-tickets more expensive, or increasing minimum connecting times)?
3.142	A travel agent is defined as "any intermediary acting on behalf of a passenger for the conclusion of transport contracts"[48]. How would railway undertakings stop travel agents selling through-tickets for connections which might not be met?
None	How would passengers with through-tickets be offered choices of continuation, re-routing or reimbursement in the event of delays, missed connections and cancellations? How would this work in practice? Are there any barriers to offering, delivering and enforcing such a right? How would railways (including railway undertakings and other parties) act in practice? Please provide examples.

[47] Regulation (EU) 2021/782 subsequently defined 'transport contract' as "a contract of rail carriage for reward or free of charge between a railway undertaking and a passenger for the provision of one or more transport services". This means that a through-ticket can only exist where the passenger's contract is with a railway undertaking and not, for example, with a PSO competent authority or intermediate body.

[48] This definition is provided in Article 3(h) of Regulation (EU) 181/2011 concerning the rights of passengers in bus and coach transport. We found no definition in legislation specific to rail.

Task 3.2.2.7: Framework for liability scheme

As regards journey disruptions and the associated passenger rights (including re-routing and compensation), identify what liability scheme should be applied among railway undertakings performing different rail legs under one through-ticket; Identify what liability scheme should be applied in cases of journey disruptions between ticket vendors (who bundled tickets of different railway undertakings, possibly with an insufficient connection time) and the railway undertakings performing the journey under one through-ticket.

B.70 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.23: Questions related to Task 3.2.2.7

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.142	Through-ticketing could be linked to elements of rail passenger rights legislation related to choice of reimbursement, re-routing or connections, as specified in Regulation 1371/2007 or the proposed recast.
3.142	If this were to happen, how should liability be apportioned between the various parties, such as railway undertakings acting as carriers or substitute carriers, infrastructure managers, station managers, tour operators and ticket vendors? Please identify any specific issues which might arise.
3.142	If this were to happen, how would liability be proved in practice? Please identify any specific issues which might arise?
3.142	What would be the costs for each of these parties?
3.142	Do you have any comments on the practicability of making certain parties liable? Why?

Task 3.2.2.8: Identify models for through-ticketing

Identify suitable models to offer general through-ticketing in the Union, including any clearing house (directly between railway undertakings, via third-party platforms, via centralised public channels, etc.) and existing best practices.

B.71 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.24: Questions related to Task 3.2.2.8

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
3.146	How could through-ticketing be provided throughout the EU, such as through existing systems, a railway clearing house, third party platforms, or centralised public channels?
3.146	Would fundamental changes be required, such as … … a unique identifier for every ticket issued? … passenger details being recorded on every ticket? … changes in ticketing technology to support these or other changes?
3.146	How long would these approaches take, and how much would they cost? Who should pay the costs? Could the costs be recovered from through passengers?
3.146	What do you see as the advantages and disadvantages of doing so?
3.146	If introduced, would through-tickets be used … … by passengers on multi-leg domestic journeys? … by passengers on multi-leg cross-border journeys? Please provide examples.
3.147	What do you consider best practice in through-ticketing? Would it be relevant to long-distance cross-border trains?

Task 3.2.2.9: Monitoring report Directive 2012/34 Article 13a

Develop a separate deliverable which acts as a monitoring report as requested in Article 13a of Directive 2012/34/EU as amended by Directive (EU) 2016/2370.

B.72 Directive 2012/34/EU, as amended by Directive (EU) 2016/2370, sets out the requirement shown in the box below.

Common information and through-ticketing schemes

1. Without prejudice to Regulation (EC) No 1371/2007 of the European Parliament and of the Council and Directive 2010/40/EU of the European Parliament and of the Council, Member States may require railway undertakings operating domestic passenger services to participate in a common information and integrated ticketing scheme for the supply of tickets, through-tickets and reservations or give the power to competent authorities to establish such a scheme. If such a scheme is established, Member States shall ensure that it does not create market distortion or discriminate between railway undertakings and that it is managed by a public or private legal entity or an association of all railway undertakings operating passenger services.
2. The Commission shall monitor rail market developments concerning the introduction and use of common information and through-ticketing systems and shall assess the need for action at Union level, taking into account market initiatives. It shall in particular consider non-discriminatory access for rail passengers to data necessary to plan journeys and book tickets. By 31 December 2022, it shall present a report to the European Parliament and the Council on the availability of such common information and through-ticketing systems, to be accompanied, if appropriate, by legislative proposals.

B.73 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.25: Questions related to Task 3.2.2.9 (Monitoring report for Directive 2012/34 Article 13a)

Proposal	Question
Questions for questionnaire and interviews	
Table 3.8	Please provide any estimates of the number of passenger journeys by mode, subdivided by urban, suburban, regional, national and international.
Table 3.8	Please provide an estimated matrix of connections between such journeys (such as local bus to regional train, long-distance bus to local tram, or international train to urban train).
Table 3.8	Please provide, if available, revenue by mode or other means of disaggregation.
Table 3.8	Please provide a list of authorities with competence in relation to transport.
Table 3.8	Please provide the authorities' geographical area of responsibility.
Table 3.8	Please provide a list of all through-ticketing schemes in operation within your Member State, or to neighbouring states, identifying the competent authorities involved and the data on passenger journeys, connections and revenue (listed above) associated with the through-ticketing scheme.
Table 3.8	Please provide the results of any passenger satisfaction studies related to through-ticketing.
Table 3.8	What are your views on progress, and barriers to further progress, on use of common information and through-ticketing systems, and any need for action at Union level, taking into account market initiatives? Please provide examples.
Table 3.8	Is non-discriminatory access for rail passengers to data necessary to plan journeys and book tickets enforced, for example by the National Enforcement Bodies? Are statistics and reports available on monitoring, complaints, dispute resolution, enforcement and sanctions? Please provide any data available.
Table 3.8	What are your views on the provision of non-discriminatory access for rail passengers to data necessary to plan journeys and book tickets? Please provide examples.

Task 3.2.2.10: Legal measures to accelerate through-ticketing

Identify (legal) measures to accelerate the offering of train through-tickets in Europe. Any proposed measure should take into due account and be aligned with the recommendations presented in the report published by the Directorate General for Mobility and Transport in 2019 on Remaining challenges for EU-wide integrated ticketing and payment systems.

B.74 The Commission has clarified that "one-click" ticketing has not been defined and we focused on "through-tickets", for which a definition is available. The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.26: Questions related to Task 3.2.2.10

Proposal	Question
Questions for questionnaire and interviews	
Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings". Would you suggest any changes to exclude or include other tickets or authorities to travel?	
In 2019 the Directorate General for Mobility and Transport published a report on "Remaining challenges for EU-wide integrated ticketing and payment systems".	
3.25	Could through-ticketing be accelerated by legal measures? What would be required? How long would this take?
3.154	What difficulties might arise? Who would bear the costs? Might some operators withdraw rather than comply?

Task 3.2.3: Technical barriers

3.2.3.1: Identify technical/operational/safety barriers

Identify and describe any technical/operational/safety-related barriers which hamper the operation of cross-border (night train) services, including basic requirements such as access to service facilities and neutrality of traffic management; estimate the related costs.

B.75 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.27: Questions related to Task 3.2.3.1

Proposal	Question
Questions for questionnaire and interviews	
3.155	What technical/operational/safety-related barriers hamper the operation of cross-border night train services? Are these barriers already dealt with by any kind of entity / group? Please give examples.
3.155	Is access to service facilities a barrier? Please give examples.
3.155	Is neutrality of traffic management (as distinct from capacity allocation) a barrier? Please give examples.
3.155	Do you have any estimates of the costs of these barriers? Which barriers are most costly? Please give examples.
Table 3.9	Could any new cross-border night trains be at anything other than standard gauge throughout? Please explain your views.
Table 3.9	Must cross-border night trains be locomotive-hauled, or could multiple unit stock be used? Does this affect the need to change crews at borders? Please provide examples.
Table 3.9	Please identify any other barriers to operating and using cross-border night trains.
Table 3.9	How could these barriers be removed? What parties would need to do so? Over what timescale could this take effect?
Table 3.9	Please provide any estimates you have of the technical costs of removing these barriers.
3.157	Please identify any measures the Commission could take to reduce barriers to the operation and use of cross-border night trains.

3.2.3.2: Assess additional measures with Commission

Assess in cooperation with the Directorate General for Mobility and Transport whether additional measures, other than ongoing initiatives, would be required to lift these barriers.

B.76 This task does not require external research.

Task 3.2.4: Infrastructure capacity allocation

Task 3.2.4.1: Describe rules for infrastructure capacity allocation

Describe, national legislation/rules for infrastructure capacity allocation.

B.77 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.28: Questions related to Task 3.2.4.1

Proposal	Question
Questions for questionnaire and interviews	
3.184	How is infrastructure capacity allocated on your network? How far in advance would it be necessary to apply? What factors would determine this timescale?
3.184	Has the introduction of the third and fourth railway packages led to proposals for new services which would create new constraints? If so, where and from when?
3.184	Are you aware of charges which reflects the scarcity of capacity of the identifiable section of the infrastructure during periods of congestion under Directive 2012/34 Article 31(4)? Where, when and at what level do they apply? What trains would pay them?
3.184	Have you declared any infrastructure to be congested under Directive 2012/34 Article 47(1)? When do you expect the constraint to be relieved? Are you aware of any constraints to the operation of night trains, including station capacity in the morning peak? Are you aware of any constraints to the operation of cross-border trains?
3.184	Are you aware of the use of priority criteria to allocate capacity under Directive 2012/34 Article 47(3)? Where, when and how to they apply?
None	How far in advance would an applicant need to request a pair of overnight paths, one in each direction, leaving after 18:00 and arriving before 10:00 every night?
None	How far in advance would an applicant need to request paths for two round trips of up to four hours each way between 06:00 and 22:00 every day?
Questions for all relevant interviewees	
None	Is there a trend to regular interval “Takt” timetables on your network? How will moves to regular interval “Takt” timetables affect the processes and the lead times to secure capacity for new services? What impact will “Takt” timetables have on existing or future cross-border day and night trains? Please give examples.

Task 3.2.4.2: Describe rules for international timetable coordination

Describe the practical implementation of international timetable coordination by IMs.

B.78 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.29: Questions related to Task 3.2.4.2

Proposal	Question
Questions for questionnaire and interviews	
3.166	How is timetabling coordinated with neighbouring infrastructure managers? How far in advance would it be necessary to apply? What factors would determine this timescale?
3.166	How far in advance would an applicant need to request a pair of overnight paths, one in each direction, leaving after 18:00 and arriving before 10:00 every night?
3.166	How far in advance would an applicant need to request paths for two round trips of up to four hours each way between 06:00 and 22:00 every day?
Questions for all relevant interviewees	
None	Is there a trend to regular interval “Takt” timetables on your network? How will moves to regular interval “Takt” timetables affect the processes and the lead times to secure capacity for new services? Please give examples.

Task 3.2.4.3: Assess impact on the timetabling of cross-border services

Assess the impact of the above-mentioned rules/legislation on the timetabling of cross-border passenger services, with special attention to cross-border night trains. Analyse instructive examples of cross-border trains featuring in the 2020 timetable, if any.

B.79 This task will require only questions related to specific data sources.

Task 3.2.4.4: Identify measures or best practices to improve capacity allocation

Identify, any measures or best practices to improve infrastructure capacity allocation for cross-border services. Any issues related to capacity constraints, including for stations, should be taken into account.

B.80 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.30: Questions related to Task 3.2.4.4

Proposal	Question
Questions for questionnaire and interviews	
3.168, 3.170	What would you consider best practices in railway capacity allocation … … to create efficient and reliable paths for cross-border passenger services? … to make such paths available as soon as operators require them? Please provide examples.
3.168, 3.170	What specific issues arise in relation to specific capacity constraints including sections of line, junctions and stations? How are these best dealt with? Please provide examples.
3.168, 3.170	How important are issues not related to the main infrastructure, such as access to depots, stabling points, refuelling and toilet emptying facilities? Please provide examples.

Task 3.2.5: Access charges and mark-ups

Task 3.2.5.1 description of typical access charges

Describe typical track access charges per train kilometre for the EU-27 plus the United Kingdom, Switzerland and Norway, including the application, if any, of mark-ups for cross-border passenger services. The consultant may base its work on existing publications (e.g. IRG-Rail publications).

B.81 This task requires only questions related to specific data sources.

Task 3.2.5.2: Assess the impact of mark-ups on operating costs

Assess, in conjunction with the work performed under task 3.1, the impact of mark-ups on the operating costs of long-distance passenger services, including night train and cross-border services.

B.82 This task required only questions related to specific data sources.

Task 3.2.5.3: Assess the impact of mark-ups on passenger numbers

Assess by making use of elasticities (and by taken into account any findings of task 3.1.2), the impact on passenger numbers if ticket prices would fall in the absence of mark-ups. The consultant is requested to devise a fictive, yet based on realistic assumptions checked with railway undertakings, relation between the absence of mark-ups and the ticket price.

B.83 The table below sets out general and specific research questions, referenced to paragraphs in our proposal.

Table B.31: Questions related to Task 3.2.5.3

Proposal	Question
Questions for questionnaire and interviews	
3.182	Are you aware of any examples of reductions in access charges resulting in reductions in passenger fares? Are you aware of any examples of reductions in access charges resulting in additional train services? Please provide examples.
3.182	Do you have any evidence of the elasticity of long-distance passenger rail demand to passenger fares? Please provide examples.

C Cross-border rail services since 2001

Introduction

C.1 The Commission envisaged that this study would be informed by:

- a description of supply and demand, ideally both quantitative and qualitative, of cross-border services in the study area between 2001 and 2019; and
- an analysis of the extent to which the decline in night train services has been substituted by other rail services such as (cross-border) high-speed services and why.

C.2 This Annex describes our analysis associated with these tasks. In the remainder of this Annex we describe in turn:

- our approach;
- main findings;
- other findings;
- conclusions on supply;
- case studies on the causes of decline; and
- conclusions on the causes of decline.

Our approach

Data sources

C.3 Steer and KCW's collective experience from recent studies of cross-border links, night trains, and rail security is that past timetables are both difficult to find and labour-intensive to analyse. We reviewed the available data sources and past timetables and confirmed that:

- Until around 2015, some incumbent national railway undertakings published electronic timetables for domestic and some cross-border services on CDs or as downloads, but these are no longer available except through occasional internet sales or auctions.
- Since around 2010, current timetables have been increasingly available on the internet, but past timetables are not archived or made available.

C.4 We therefore proposed to base our analysis on printed versions of the European Rail Timetable, published by Thomas Cook Group until 2013 and since then by ex-Thomas Cook staff, searching printed versions by hand for the supply of services.

C.5 Our recent experience from the night trains study for the European Parliament was that it takes several person-days to identify all night trains in the study area[49]. Complexities include:

- trains operating only on certain days of the week, or on certain holidays, or seasonally;
- trains splitting and joining into different portions;
- changes in destinations by day of week, or season, or over time;

[49] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

- minor changes to timings, train numbers or train classifications; and
- imbalances in services, with more trains in service in one direction that the other.

C.6 Identifying all cross-border trains complying with an agreed definition of cross-border services to be included would require a major work programme, which would need either to record all these details or to introduce simplifications which would omit them. We concluded that the resources required to count and catalogue all such trains from 2001 to 2019, even if timetable data for the whole period could be assembled, would be disproportionate to the additional information gained.

C.7 We therefore agreed with the Commission to limit the quantitative analysis of the timetable offer to 2001 and 2019, with comparison of the two years to identify the overall changes during this period. We agreed not to attempt to calculate train-kilometres, which can be problematic where more than one route is used, and can be meaningless for trains which split and join portions.

C.8 Our principal sources of timetable data were the Summer editions of the European Rail Timetable 2001 and 2019. These were supplemented as necessary by individual operator timetables and other sources of data, all of which are listed in the study bibliography.

Definitions

C.9 The table below shows several definitions agreed with the Commission.

Table C.1: Study definitions agreed with the Commission

Term	Possible definition	Comments
Cross-border train	A train service crossing national borders between EU Member States or between a Member State and a third country, where the principal purpose of the service is to carry passengers between stations located in different Member States or third countries.	The definitions refer to the "principal purpose" of the train. The purpose of a trains cannot be determined unless it is publicly stated by a competent authority or railway undertaking.
Long-distance train	A train service beyond: • urban or suburban services, whose principal purpose is to meet the transport needs of an urban centre or conurbation, including a cross-border conurbation, together with transport needs between such a centre or conurbation and surrounding areas; or • regional services, whose principal purpose is to meet the transport needs of a region, including a cross-border region".	
Night train	Any train consisting partly or wholly of night train rolling stock.	Definition was devised in the 2017 European Parliament study.
Night train rolling stock	Rail vehicles dedicated to, or reconfigured for, overnight travel.	Based on the definition above.
Overnight service	Any train, not consisting partly or wholly of night train rolling stock, which is in operation from before 02:00 to after 02:59.	

Source: European Commission, European legislation.

C.10 We used these to distinguish four types of direct, long-distance cross-border train:

- Night trains, consisting wholly or partly of night train rolling stock.
- Overnight services, operating between 02:00 and 02:59, not consisting partly or wholly of night train rolling stock.
- Daytime conventional speed trains.
- Daytime high-speed trains.

C.11 Following discussions with the Commission, we agreed to record direct, long-distance cross-border services over the entirety of their routes, regardless of the number of states passed through. This enabled us to compare how intermediate origin-destination pairs were served in 2001 and 2019, rather than just considering the start and end points of services. More specifically:

- We recorded long-distance cross-border night trains operating one or more times a week.
- We recorded long-distance cross-border day trains operating five or more times a week.
- We noted trains which were seasonal.

Trains included

C.12 We identified long-distance trains from the train category indicated in the timetables and/or existing knowledge of the organisation of passenger train services in each state. The tables below show the codes of trains which we included as:

- cross-border night trains;
- cross-border conventional long-distance trains; or
- cross-border high-speed trains.

Table C.2: Categorisation of trains: cross-border night trains

Code	Brand	Operator(s)
Night trains with couchette and/or sleeping car accommodation		
CNL	City Night Line	DB, partnering with ÖBB and SBB
D	D-Zug	Multiple railway undertakings
EN	EuroNight	Multiple railway undertakings
Estr	Estrella	Renfe
HOT	Trenhotel	Renfe/CP
NAT	Nattåg	SJ
NJ	NightJet	ÖBB and partners
Pa	Passažrskyj (slower long-distance train)	RŽD-FPK/BČ/Latvijas Ekspresis/LG/UZ
RGJ	RegioJet	RegioJet
Sk	Skoryj (fast train)	RŽD-FPK/BČ/GoRail/Latvijas Ekspresis/LG/UZ

Source: KCW analysis.

Table C.3: Categorisation of trains: cross-border conventional long-distance trains

Code	Brand	Operator(s)
Conventional speed long-distance trains operating using non-tilting stock at up to 200 km/h		
AEx	ArrivaExpress	Arriva Česka Republika
Arco	Arco	Renfe
B	Brzi vlak/voz	HŽ, ŽS, SV, SŽ
CE	Celta	CP, partnering with Renfe
CEN	Fast train	FART/SSIF in Centovalli
D	D-Zug (express train)	Multiple railway undertakings
E	Eilzug (fast train)	ÖBB
EC	EuroCity	Multiple railway undertakings
EP	Enterprise	Iarnród Éireann, partnering with NIR
Ex	Express	ČD, ZSSK, ÖBB or FS
IC	InterCity	Multiple railway undertakings
IR	InterRegio	DB, SBB or CFRC
LE	Leo Express	Leo Express
ÖT	Øresundståg	Öresundståget
R	Rychlík (fast train)	ČD or ZSSK
RE	RegioExpress	SBB, partnering with TreNord (in Swiss Fernverkehrskonzession)
RGJ	RegioJet	RegioJet
RJ	RailJet	ÖBB, partnering with ČD, DB and ZSSK
Sk	Skoryj (fast train)	RŽD-FPK/UZ/BČ/Latvijas Ekspresis/LG
TLG	Talgo	Renfe, partnering with SNCF
TLK	Twoje Linie Kolejowe	PKP Intercity

Source: KCW analysis.

Table C.4: Categorisation of trains: cross-border high-speed trains

Code	Brand	Operator(s)
High-speed trains using 200 km/h tilt-equipped stock or other stock with higher design speed		
AE	Allegro	Karelia Trains (joint venture of VR / RZD-FPK)
AVE	Alta Velocidad Española	Renfe in partnership with SNCF
EST	Eurostar	Eurostar
ICE	InterCityExpress	DB, partnering with DSB, NS International, ÖBB, SBB and SNCF
IZY	IZY	Thalys
RJX	Railjet Express	ÖBB, in partnership with DB and MÁV-START
Sn	Snabbtåg	SJ (in 2001, as X or X2000)
TGV	Train à Grande Vitesse/InOui	SNCF, partnering with CFL, DB, Renfe and SNCB/NMBS
THA	Thalys	Thalys

Source: KCW analysis.

Data collection

C.13 The table below shows the data collected for each individual train service.

Table C.5: Data collection on cross-border trains

Data	Further details
Train number	Any official or unofficial prefix letter
Type of long-distance service	High-speed train, with arrival no later than 01:59 and departure no earlier than 03:00
	Other day train, with arrival no later than 01:59 and departure no earlier than 03:00
	Night trains, consisting wholly or partly of night train rolling stock (couchettes and/or sleeping cars)
	Overnight train, with seated accommodation only (in service between 02:00 and 02:59)
Frequency	Train pairs per week
Origin	State
	Town or city
	NUTS 1 zone
	Departure time from principal origin town or city
Intermediate calls	NUTS 1 zones in which the train had scheduled station calls
Destination	State
	Town or city
	NUTS 1 zone
	Arrival time in principal destination town or city
Additional information	Seasonality
	Days of operation
	Operation as portions attached to other services as “through carriages”

Source: KCW analysis.

C.14 We examined the timetables in one direction only and assumed that trains operated symmetrically, so that a train from A to B had a corresponding return service B to A. We are aware that this was not always the case on some routes, but considered the simplification reasonable, as it halved the total analysis required with only minor loss of detail.

C.15 We took the planned published timetable as authoritative, but noted as a comment any known changes arising from long-term track repair work or other operational issues. In both 2001 and 2019 we were aware of a small number of services advertised as “direct” which in practice involved a change of train and/or bus replacement services: we noted the fact but recorded the service as shown in the published timetable.

C.16 Standard practice in mainland Europe is the assignment of a separate train number to each section of a train conveying portions to multiple destinations. We recorded each portion as if it were a separate service over the entire route, with information about the common sections of route provided in additional comments. We avoided double-counting such trains in calculating which origin and destination zones were linked.

C.17 As agreed with the Commission, we excluded from the analysis trains with service frequencies below a reasonable threshold:

- We did not record high-speed and other long-distance day train services with a frequency of less than five train pairs per week.
- We did not record night trains and overnight services with a frequency of less than one train pair per week.
- We included seasonal services operating for more than six weeks a year but not those operating for fewer than six weeks in the year, which we noted separately.

C.18 We made several exceptions to these thresholds in the circumstances where:

- There were minor variations to arrival or departure times, but the overall effect was that a service was available at least as frequently as its respective threshold value.
- Extensions to services operated less frequently than the respective threshold value. For example, where weekly extensions of a day train service operating seven times per week over its core route, these could be recorded as six times per week from A to B plus once per week from A via B to C.

Geographical scope

C.19 We included all long-distance cross-border trains connecting the states listed below.

Table C.6: Geographical scope

Connections between	Further details	NUTS zones excluded	NUTS zones added
EU-27 excluding NUTS 1 zones with no railways	Cyprus (whole Member State)	CY0	
	Greece (islands including Crete)	EL4	
	Finland (Åland islands)	FI2	
	France (overseas Departments)	FRY	
	Malta (whole Member State)	MT0	
	Portugal (Azores)	PT2	
	Portugal (Madeira)	PT3	
	Spain (Canary islands)	ES7	
Also in study area	United Kingdom	All except UKI, UKJ, UKN	
	Liechtenstein		
	Norway		
	Switzerland		
Other neighbouring states	Albania		AL0
	Belarus		BY0
	Bosnia and Herzegovina		BH0
	Kazakhstan		KA0
	Kosovo		KO0
	Moldova		MO0
	Montenegro		ME0
	North Macedonia		MK0
	Russian Federation, Kaliningrad		RUK
	Russian Federation, excluding Kaliningrad		RU0
	Serbia		RS1, RS2
	Turkey within Europe		TR1, TR2
	Ukraine		UI0

Source: KCW analysis.

C.20 We used the Eurostat NUTS 1 zones for 2021, with the following changes:

- Within the EU-27, we excluded zones with no railways.
- Within the United Kingdom, we included only zones from which cross-border services operate, and for which cross-border passengers are reported: UKI (London), UKJ (South East) and UKN (Northern Ireland).
- Outside the NUTS 2021 zoning system, to enable consistent coding, we created one notional additional zone for each state.

C.21 This resulted in a total of 104 NUTS 1 or notional zones, of which 4,976 O-D pairs fall within the scope of the study.

Main findings on the supply of long-distance cross-border services

Timeline

C.22 The tables below provide a timeline of the most significant changes over the period 2001 to 2019, including some changes during 2020 and 2021.

Table C.7: Timeline: 2001-2005

Change	Events
New routes and service enhancements	Expansion of DB City Night Line (CNL) services: • New routes such as Copenhagen-Basel • Delivery of 42 new sleeping cars
	Reinstatement of services to/from Bosnia and Hercegovina and Serbia
Closed routes and service reductions	Closure of all international night train services using SNCB/NMBS or NS rolling stock: • Belgium-southern France • Belgium-Italy • Netherlands-southern France
	Closure of direct day train Brussels-Luxembourg-Basel-Milan
	Closure of day train Paris-Vienna cut back to Paris-Munich
	Closure of night train between Poland and Baltic states
	Closure of all direct long-distance services Poland-Slovakia and Poland-Romania
Infrastructure changes	Opening of HSL in Belgium, HSL 2 Leuven-Liège
	Opening of HSL in Germany, Cologne-Frankfurt
	Opening of HSL in Italy, Rome-Naples
Other developments	Ryanair opens first base in continental Europe at Brussels South Charleroi Airport. Passenger numbers grow from 7 million to 27 million.
	Wizz Air launched as low-cost airline serving central and eastern Europe
	Established low-cost airlines grow rapidly
	Accession of Cyprus, Czechia, Estonia, Latvia, Lithuania, Hungary, Malta, Poland, Slovakia and Slovenia to the EU
	Renewal of Finnish incumbent VR domestic night train fleet. VR later orders 50 double-deck sleeping cars.

Source: KCW analysis.

Table C.8: Timeline: 2006-2010

Change	Events
New routes and service enhancements	Expansion or relaunch of DB CNL services to/from Amsterdam and Copenhagen.
	Regular interval daytime timetables launched on main routes between: • Austria-Czechia • Austria-Hungary • Czechia-Slovakia-Hungary
Closed routes and service reductions	Cut back of night train Paris-Vienna cut back to Strasbourg-Vienna. Closure of remaining Strasbourg-Vienna service.
	Closure of last remaining regular night trains to/from Brussels, as DB re-routes all CNL services to avoid Belgium
	Closure of all Switzerland-Italy night train services. Withdrawal of all SBB night train rolling stock.
	Closure of night trains Berlin-Warsaw/Krakow
	Introduction by ÖBB of 230 km/h Railjet trains. Subsequently, fewer through carriages Austria-Hungary-Serbia/Romania.
Infrastructure changes	Opening of HSL in France, part of LGV Est Européen Paris-Vendenheim(-Strasbourg)
	Opening of HSL in Belgium, HSL 3 Liège-Aachen
	Opening of HSL in Italy, Milan-Bologna-Florence in two stages
	Opening of HSL in France/Spain, Figueres-Perpignan
Other developments	Trend to concentrate long-distance cross-border services on one route per border: • Poland-Germany • Poland-Czechia • France-Germany • France-Italy
	Cost-saving programme at DB City Night Line (CNL)
	Declining quality of international services to/from Italy by Trenitalia: • Winding up of Cisalpino joint venture with SBB • DB and ÖBB begin to operate Brenner EuroCity service in open access mode in Italy
	Accession of Bulgaria and Romania to the EU
	Low-cost airlines continue to grow rapidly
	2010 eruption of Eyjafjallajökull volcano gives short-term boost to rail
	Global financial crisis marks beginning of austerity. Railways worst affected in Greece, Portugal and Spain.
	Launch of DB “London Spezial” through-tickets between Germany and London
	2010: third railway package comes into effect. Cross-border passenger train services are liberalised.

Source: KCW analysis.

Table C.9: Timeline 2011-2015

Change	Events
New routes and service enhancements	Launch of RegioJet's cross-border route Prague-Košice, later with couchettes at night
	Launch of Leo Express daily Prague-Košice train pair. Service operates as a seated-only overnight service in one direction.
	Reinstatement by Thello of Marseille-Nice-Milan day trains
Closed routes and service reductions	Closure of all services to/from Greece (2011-2014)
	Closure of all services between central Europe and Italy via Slovenia
	Closure of all long-distance services Serbia-Romania
	Closure of all DB CNL night trains to/from Denmark, France and the Netherlands
	Closure of remaining domestic DB CNL routes Munich-Berlin and Munich-Hamburg
	Closure of night train Geneva-Irun
	Closure of all Elipsos night trains Madrid-Paris and Barcelona-Paris, -Milan, -Zurich
	Closure by Thello of night train Paris-Rome
	Closure of night train Germany/Netherlands-Warsaw
	Steady decline of services between France and Portugal via Hendaye/Irun
	Croatia excludes most international services from PSOs. Closure of 32 services, including the Sarajevo-Budapest day train.
	Suspension "temporarily" of last long-distance service between Poland and Lithuania. The service was never reinstated.
	Reduced frequency and withdrawal of sleeping cars from Berlin-Malmö services
Infrastructure changes	Opening of HSL in Spain, Barcelona-Figueres
	Opening of HSL in Italy, Turin-Milan in two stages
	Opening of "Danube Bridge II" between Romania and Bulgaria
	Opening of Rail Baltica I dual gauge track project in Lithuania
Other developments	Russian RZD ends through carriages to western Europe, cuts routes and frequencies
	Night train services in main season badly affected by construction work, poorly coordinated with sales and information, in Bulgaria, Denmark, France and Turkey
	Trenitalia ends "Artesia" cooperation with SNCF: • SNCF operates daytime France-Italy trains • Trenitalia, as Thello, operates Paris-Venice night train
	Trenitalia ends cooperation on long-distance trains to Slovenia, Croatia and Hungary. Withdrawal of these services.
	RegioJet attempts and fails to become DB's partner on Hamburg-Berlin-Prague route
	Launch of SNCF OUIGO "low-cost" high-speed domestic services paralleling TGV.
	Launch by new entrant Astra Trans Carpatic of night train services in Romania
	Caledonian Sleeper night-train only franchise created and won by Serco
	Continuation of austerity in Greece, Portugal and Spain
	Accession of Croatia to the EU
	Political reorientation of Ukraine with new train services to EU countries
	Berlin-Malmö night train taken over in Sweden by new entrant Veolia/Transdev

Source: KCW analysis.

Table C.10: Timeline 2016-2021

Change	Events
New routes and service enhancements	Launch of ÖBB NightJet, including former CNL Zurich-Berlin/Hamburg route. Slow but steady expansion since, including launch of Vienna-Brussels route.
	Launch of RegioJet summer Prague-Rijeka night train with only two months' planning
	Launch by Leo Express services: commercial Prague-Krakow and PSO Prague-Wroclaw
	Launch by Thalys of Izy "low-cost" services Paris-Brussels
	Reinstatement of night train Berlin-Budapest/Vienna via Poland in 2018
Closed routes and service reductions	Closure of City Night Line network in December 2016
	Closure of almost all remaining French night trains, already reduced to couchettes: • Paris-Hendaye/Irun • Luxembourg-Nice • Luxembourg-Portbou • Strasbourg-Portbou French government tendering of these services at short notice attracts no bids.
	Night train Paris-Portbou funded by region, but runs only at weekends and in holidays
	Closure of all direct day trains Brussels-Luxembourg-Strasbourg-Switzerland
	Temporary withdrawal of night train Berlin-Prague-Budapest/Vienna in 2017. This means loss of direct services Berlin-Vienna for first time in more than 57 years.
	Further decline of night train services in south eastern Europe: • withdrawal of Belgrade-Sofia • seasonal operation of Bucharest-Istanbul • seasonal operation of Ljubljana-Zagreb-Belgrade with couchettes only • seasonal connections only to North Macedonia
	Seasonal only daytime long-distance trains Sofia-Bucharest and Sofia-Belgrade
	Closure of Budapest-Craiova-Sofia night trains on Danube Bridge II after only two years
Infrastructure changes	Opening of HSL in France completes LGV Est Européen Paris-Vendenheim(-Strasbourg)
	Opening of HSL in Germany Halle/Leipzig-Nuremberg(-Munich)
Other developments	Interrail includes one return trip in the holder's country of residence, boosting sales.
	DB and ÖBB switch to timetable-based ticket sales only. Tickets for future dates are not sold until any engineering works on those dates are announced. Late/incorrect timetable data prevent ticket sales.
	Withdrawal of SNCF from EPA-HERMES European seat reservation system
	Launch by Eurostar of bespoke ticket and reservation system. Withdrawal of DB "London Spezial" through-tickets between Germany and London.
	Withdrawal of the last international train ferry route in Europe between Sassnitz in Germany and Trelleborg in Sweden.
	New rolling stock introduced on Caledonian Sleeper services
	ÖBB orders 231 vehicles for 33 push-pull night train sets to meet fire regulations in Italy and expansion plans. Couchettes replaced by MiniSuites (see Figure M.47)
	SNCF begins to convert existing TGV services to OUIGO operation. These former TGV services disappear from many online timetables and rail ticket booking websites.
	2020-2021 various announcements of new or reinstated services by 2024 by incumbents DB/ÖBB/SBB/SNCF and European Sleeper, RegioJet and Trafikverket PSO.

Source: KCW analysis.

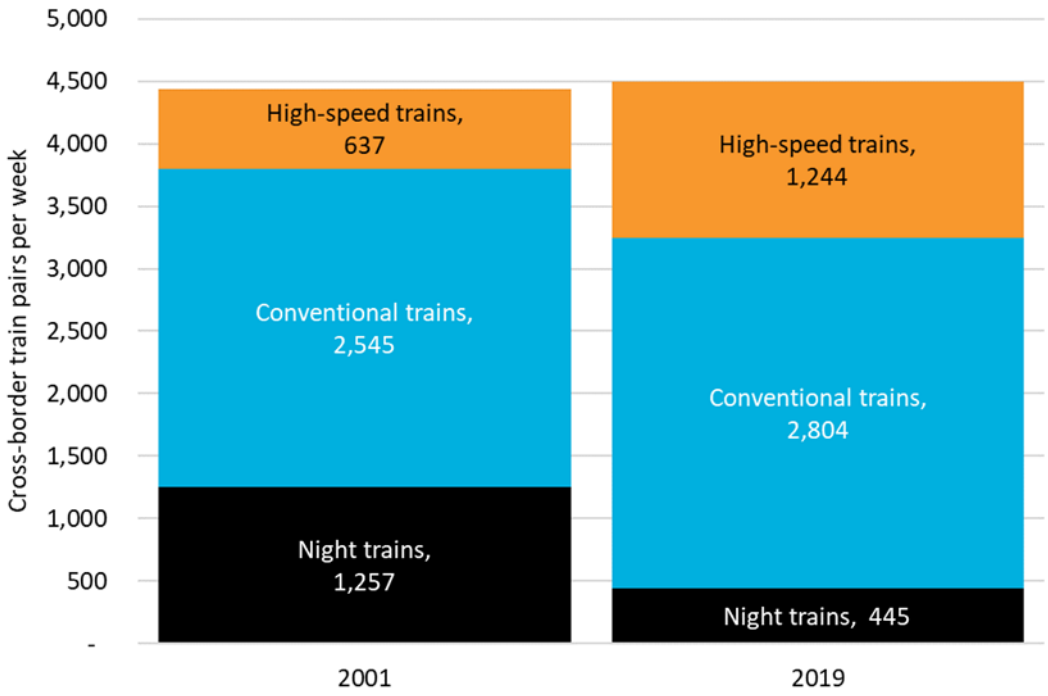
C.23 Further details of many of these changes are discussed later in this Annex. In Annex G, we also review the new services which have been proposed during 2020 and 2021.

C.24 We next summarise the overall changes in long-distance cross-border train services between 2001 and 2019.

Long-distance cross-border train pairs per week

C.25 The figure below compares the number of long-distance cross-border train pairs per week in 2001 and 2019, after excluding train pairs less frequent than the thresholds described in paragraph C.17.

Figure C.1: Long-distance cross-border train pairs per week, 2001 and 2019



Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.
Note: chart excludes a small number of overnight services, operating between 02:00 and 02:59, not consisting partly or wholly of night train rolling stock.

C.26 The apparent result, excluding infrequent services, is a small increase in total weekly long-distance cross-border trains from 4,481 in 2001 to 4,516 in 2019. However, within this total there was a pronounced shift from night trains to high-speed trains:

- The number of night trains with dedicated rolling stock fell from 1,257 to 445, -65%, or by almost two-thirds.
- The number of high-speed daytime trains rose from 637 to 1,244, +95%, or almost double.
- The number of conventional daytime trains rose from 2,545 to 2,804, +10%.

C.27 The number of high-speed services appears to have been driven by several factors:

- Night trains have been replaced by high-speed services on selected corridors.
- Frequencies have been increased on core routes.
- Conventional day rolling stock (operating with codes such as D, IC and EC) has been replaced with bespoke trains (operating with codes such as ICE, RJX and SC) which we have classified as high-speed. However, the use of high-speed capable stock has not

necessarily led to significant journey time reductions, especially where new or upgraded infrastructure accounts for only a small proportion of a route[50].

C.28 The detailed data also show that, between 2001 and 2019, there was a significant reduction in the use of through carriages to serve multiple destinations.

C.29 The overall growth in numbers of high-speed trains and the decline in night trains is consistent with the hypothesis that these are cause and effect, but should be treated with caution. Decisions either to introduce high-speed services or to withdraw night trains may have been made at different times and for unrelated reasons, as we explore in the case studies later in this Annex from paragraph C.77.

C.30 The number of conventional train numbers is sensitive to whether individual services have a train number which is classified as regional or long-distance:

- There has been a decline in "long-distance" services on routes such as Luxembourg-Trier-Koblenz (Luxembourg to Germany) and Dresden to Wroclaw (Germany to Poland) which have now been classified as regional.
- There has been an increase in "long-distance" services on routes such as Copenhagen to Gothenburg, where Øresundståg services now extend beyond neighbouring regions of Sjælland (Denmark) and Skåne (Sweden) to the Swedish city of Gothenburg in Västra Götaland, over 350 kilometres from Copenhagen.

C.31 To illustrate some of the changes which occurred between 2001 and 2019, and the practical issues of categorising changes to services, we discuss briefly below the examples of three cross-border corridors in the study area:

- the border crossings between France and Spain;
- the Oresund between Denmark and Sweden; and
- the English Channel between France and the United Kingdom.

Example: the border crossings between France and Spain

C.32 Historically, train operations over the Franco-Spanish border crossings at Hendaye/Irun and Cerbère/Portbou were subject to an international treaty. This was interpreted as requiring trains from Spain to Cerbère and Hendaye to return from France without passengers, and similarly for those from France to Portbou and Irun to return to Spain without passengers. This arrangement ended in April 2018 for Hendaye/Irun and February 2019 for Cerbère/Portbou respectively. Nonetheless, we reported all these cross-border services as train pairs permitted to carry passengers in both directions.

C.33 In addition, the Paris-La Tour de Carol-Enveitg night train service formerly continued around 4 kilometres on standard gauge (1435 millimetre) tracks to Puigcerdà in Spain. As of February 2020, before services were affected by the COVID-19 pandemic (pre-Corona), good connections were available between the night trains in La Tour de Carol-Enveitg and regional

[50] The European Court of Auditors identified that lines designed for 350 km/h operation and stock designed for 300 km/h operation might still only result in average train speeds of 120-130 km/h (Annex V, Speed yield analysis, Special Report - A European high-speed rail network: not a reality but an ineffective patchwork, European Court of Auditors (2018)). In contrast, on Great Britain's historic 200 km/h East Coast Main Line operated by 200 km/h stock, non-stop 303-kilometre London-York services achieve average speeds of over 160 km/h.

trains to Barcelona in Spain. Thus, while the Paris-La Tour de Carol-Enveitg night train does not now cross a border, we exceptionally recorded it as providing a cross-border service.

Example: services across the Oresund

C.34 The Øresundståg service, which is the densest cross-border service in the study area, illustrates the complexity of how services can change over time in response to changing patterns of travel, PSO requirements, and commercial opportunities.

C.35 Services began in 2000, just before the 2001 timetable, with a focus on urban and suburban services in and between Copenhagen and Malmö and the surrounding areas including the Swedish country of Skåne. Subsequently, some Øresundståg services were extended to Gothenburg, the next major city and a commercially attractive destination[51]. This led, for a period, to the withdrawal of services operated by Swedish national incumbent operator SJ. As of 2021, Øresundståg operates the most frequent services between Malmö and Gothenburg, although SJ also operates less frequent but faster services calling at fewer intermediate stations.

C.36 In addition, punctuality of trains arriving from Sweden has been poor, affecting services through Copenhagen to Helsingør, and around two-thirds of passengers on the services are Swedish, many of the commuting into Copenhagen from Malmö. In 2017 it was announced that the services would be separated from 2021[52]:

- Sweden's Skånetrafiken will specify the majority of the services, including cross-border services as far as Østerport, just north of central Copenhagen.
- Denmark will specify domestic services between Copenhagen and Helsingør.

C.37 These changes over the period 2000-2021 illustrate the potential difficulty of interpreting them as "an increase in long-distance cross-border services".

Example: services across the English Channel

C.38 Similar issues arise for the Channel Tunnel, the second busiest cross-border route in the study area[53]. The night boat train between Paris and London was withdrawn in 1980, but it was not until 1994 that a rail link was completed through the Channel Tunnel, with a journey time of 3¼ hours, and not until 2007 that a high-speed line opened to London, with a journey time of 2¼ hours.

C.39 As with the Øresundståg, it is an extreme simplification to summarise the changes in cross-Channel services between the 1980s and the current timetable as "replacement of a night train with high-speed day trains".

[51] Commercially-viable extensions to PSO services may be either specified by the relevant competent authority or carried out on an open access at the initiative of the railway undertaking. See Annex O for further details.

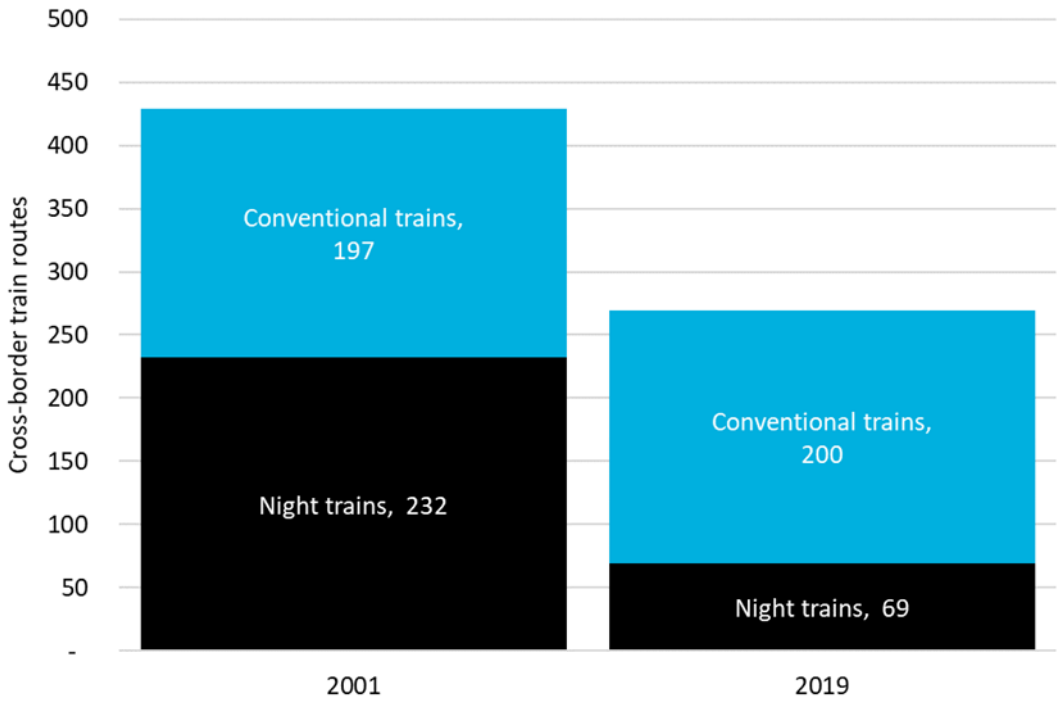
[52] Cross-Øresund services to be split, Railway Gazette International, 18 December 2017 (2017).

[53] The Channel Tunnel carries passengers not only on Eurostar high-speed trains but also on Eurotunnel's le Shuttle services.

Long-distance cross-border routes served

C.40 The figure below compares the number of distinct services recorded in 2001 and 2019.

Figure C.2: Long-distance cross-border routes served, 2001 and 2019



Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.

C.41 In contrast to the apparent slight growth in the total number of trains shown in the preceding figure, this shows that the has been an overall decline in the number of routes served:

- The number of routes served by night trains fell from 232 to 69, or 70%.
- The number of routes served by day trains, including high-speed trains, rose from 197 to 200, or by around 2%.

The figure appears to show a small increase in day train routes, but in some cases long routes have been split into shorter ones, resulting in more routes which cross a border but not more border crossings. This change reflects the greater variety of direct services offered in 2001, commonly but not exclusively in the form of universally operable "RIC"[54] through carriages attached to "carrier trains" for the trunk leg. There may be several reasons for the removal of such changes.

C.42 First, there is a trend to fixed-formation trains for which attaching and detaching are not possible. High-rail services are almost invariably served with fixed-formation train sets, as are many day train services operating at conventional speeds. However, night trains are less commonly operated as fixed formations, and CER pointed out that they do not require dedicated locomotives, which can be shared with freight services operating during the day.

[54] "Regolamento Internazionale delle Carrozze", an agreement on the use railway passenger coaches between European railways.

C.43 Second, there are additional costs, complexities and risk of delays associated with attaching and detaching. As an example, our 2017 study for the European Parliament identified how two three-portion trains were split and re-joined into four trains en route[55].

"*Some of these services involve splitting and joining. One night train leaves Warsaw at 21:12 with portions for Prague in the Czech Republic, Vienna in Austria, and Budapest in Hungary. Another night train leaves Krakow at 22:02 with portions for the same three destinations. These six portions are marshalled en route to form four trains. The first reaches Prague from Warsaw at 06:33. The second reaches Vienna from both Krakow and Warsaw at 06:55. The third reaches Prague from Krakow at 07:22. The fourth reaches Budapest from both Krakow and Warsaw at 08:37. The six portions collectively bear seven train numbers (402, EN402, 407, EN407, 442, 444 and 477) and two names (Chopin and Silesia). Couchette accommodation on the portions to Prague is only provided at certain times of year. An equivalent service operates in the reverse direction.*"

C.44 These additional costs may be high relative to the additional revenue from attracting more through passengers.

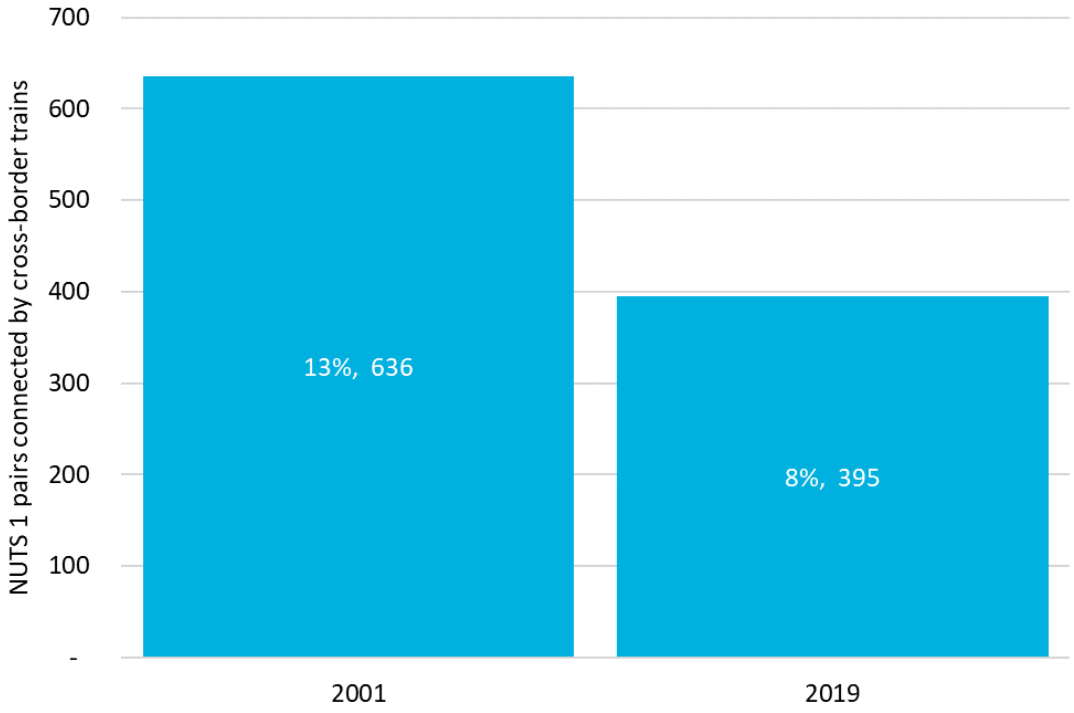
C.45 Third, increasing use of the infrastructure may make it more difficult to accommodate such operations. We discuss the issue of congested infrastructure and capacity allocation in Annex L.

Regions connected

C.46 The figure below compares the number of pairs of the 4,976 NUTS 1 connected by trains in 2001 and 2019.

[55] Annex J: Case study: PKP Intercity Night (Poland), Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

Figure C.3: NUTS 1 regions connected by rail, 2001 and 2019



Source: European Rail Timetable 2001 and 2019, KCW and Steer analysis.

C.47 The figure suggests that there has been a decline in the number of connections from around 13% to 8% of NUTS 1 zone pairs, or a reduction of 38%. We also identified that:

- 474 NUTS 1 zone pairs had fewer direct services per week in 2019 than in 2001.
- 183 NUTS 1 zone pairs had more direct services per week in 2019 than in 2001.

Other findings on the supply of long-distance cross-border services

C.48 We set out below some additional findings in relation to:

- seasonal services;
- services between France and Spain; and
- neighbouring states with no long-distance cross-border services.

Seasonal services

C.49 As noted above, we examined evidence of seasonal services, in particular to serve either the winter ski season or the main summer holidays.

C.50 Spring and summer seasonal services operating for between 8 and 26 weeks per year accounted for 9% of the total in 2001, falling to 5% in 2019. We found no trains operating only in the six weeks of the typical European summer school holidays.

C.51 Winter seasonal services chartered by package holiday providers are not listed in published timetables, and it is no longer possible to identify what was offered in 2001, but the table below lists the winter-only routes we identified as operating during 2019.

Table C.1: Winter-only routes, 2019

Origin	Destination	Train type	Frequency	Operator
Hamburg (DE)	Bludenz (AT) Schwarzach St. Veit (AT)	Night train	1/week for 8 weeks	Euro Express
London (UK)	Bourg St Maurice (FR)	High-speed overnight	1/week	Thalys
		High-speed	1/week	Thalys
Amsterdam (NL)	Bourg St Maurice (FR)	High-speed	1/week	Thalys
Brussels (BE)	Bourg St Maurice (FR)	High-speed	1/week	Thalys
Munich (DE)	Innsbruck (AT)	High-speed	Weekend extensions to selected services	DB

Source: KCW analysis.

C.52 Our understanding is that this represents a significant reduction in the number of winter seasonal services operated in 2001.

Neighbouring states with no long-distance cross-border services

C.53 The table below summarises the situation on the 15 border sections with no long-distance cross-border rail services in 2019.

Table C.2: Neighbouring states with no long-distance cross-border rail services, 2019

Neighbouring states	Regional cross-border trains in 2019	Good service?	Comments on service in 2019
With some services, between EU Member States and Liechtenstein			
Liechtenstein Switzerland	✓	✓	Regular regional rail services appropriate to the size of Liechtenstein and the poor location of Schaan-Vaduz station.
Liechtenstein Austria	✓	✓	
With some services, between EU Member States			
Estonia Latvia	✓	✗	Very limited regional rail service requiring change of train at border with poor connections in 2019.
Poland Lithuania	✓	✗	Very limited weekend-only standard gauge regional rail service between Białystok (Poland) and Kaunas (Lithuania) in 2019.
Poland Slovakia	✓	✗	Limited regional services, mostly seasonal only.
Italy Slovenia	✓	✗	Limited regional rail service, but a Venice-Ljubljana-Vienna long-distance train is under discussion for introduction in 2021.
With no services, between EU Member States			
Finland Sweden	✗		Land border is remote and gauges differ. Reactivation of very limited regional cross-border service is planned for June 2021.
Finland Norway	✗		No rail connection.
With no services, between EU Member States and other third countries			
Croatia Bosnia-Herzegovina	✗		Political disagreements and requirement for Croatian services to be commercial. Decline, then all services ended December 2016.
Greece Turkey	✗		Service withdrawn with suspension of all cross-border rail services to/from Greece in March 2011.
Poland Kaliningrad	✗		Service withdrawn, and shortage of suitable standard-gauge rolling stock in Kaliningrad.
Romania Serbia	✗		Last long-distance route withdrawn in December 2011. Remaining regional services suspended in 2017.
Bulgaria Macedonia	✗		No rail connection.
Croatia Montenegro	✗		No rail connection.
Greece Albania	✗		No rail connection.

Source: KCW analysis.
Note: state pairs are listed in the order in which they are discussed below.

C.54 Six of these border sections have at least some alternative regional rail services (✓) but the remainder do not (✗).

C.55 On two cross-border sections on Liechtenstein's borders, regional trains provided an adequate level of service in 2019. However, plans for an upgrade to a high-frequency "S-Bahn" system were rejected by public referendum in 2020.

C.56 Of four other cross-border sections with at least some services:

- Three (Poland to Lithuania, discussed below as case study 9, Estonia to Latvia, and Poland Slovakia) have services that are seasonal, weekend-only and/or require a change of train at or near the border, leaving long-distance buses to cater for cross-border public transport demand.
- One (Italy to Slovenia) experienced a complete lack of passenger train services for over three years from December 2011. From January 2015, local cross-border services were partially reinstated, but with a gap remaining in the Italian rail network between Villa Opicina and Trieste. The EU Interreg project CROSSMOBY[56] subsequently provided seed funding for two daily regional train pairs between Trieste in Italy and Ljubljana in Slovenia from September 2018. A long-distance service, from Trieste in Italy via Ljubljana in Slovenia to Vienna in Austria may follow from June 2021.

C.57 Of the nine border sections with no passenger train services at all, almost all are on the periphery of the EU and/or are borders with third countries:

- Two involve a change of gauge or the use of neglected tracks of a different gauge to the rest of the national network.
- Four have no physical rail connection.

C.58 Of the three remaining border sections:

- Croatia to Bosnia-Herzegovina and Greece to Turkey are peripherally located and subject to ongoing political tensions.
- The lack of Romania to Serbia services is a significant gap in the European passenger train network, particularly given the current poor service at Serbia's other rail border crossings. However, demand for travel between the two countries may be limited.

Conclusions on the supply of long-distance cross-border services

C.59 Our analysis excludes train services not meeting the frequency thresholds described in paragraph C.17.

C.60 It shows that the patterns of operation of cross-border trains are complex. As noted in the introduction to this Annex, and in the discussion of how we treated cross-border services between France and Spain and across the Oresund and the English Channel, simplification is necessary to identify high-level trends.

C.61 In addition, comparison of services for 2001 and 2019 may conceal intermediate changes for different reasons and with different apparent effects, as shown by the example of Oresund in paragraphs C.34 to C.37.

[56] CROSSMOBY is supported by the Italy-Slovenia Cooperation Programme of the European Regional Development Fund (ERDF).

C.62 Despite these complexities and the necessary simplifications to deal with them, the high level data reveal several clear changes between 2001 and 2019, which we discuss next.

Findings

C.63 First, the total number of long-distance cross-border train pairs over the period has remained broadly stable between 2001 and 2019, suggesting that these has been no structural decline in the total number of long-distance cross-border services.

C.64 Second, within this total, there has been a structural reduction in night trains (down 65%) and increase in high-speed trains (up 95%, although use of high-speed rolling stock on short sections of high-speed lines may not result in high average speeds). There are also around 10% more day trains operating at conventional speeds.

C.65 Third, the number of end-to-end routes served has fallen between 2001 and 2019, particularly for night train routes, down 69% from 261 to 80. Contributing factors appear to include a reduction in portion working, and trains which serve different destinations on different days, although we note that for 2021 ÖBB Nightjet has planned a service with three portions, to Hamburg and to Amsterdam daily and to Brussels three times a week.

C.66 Fourth, and in consequence, the number of NUTS 1 zones with at least the minimum threshold frequency of service has declined, from around 13% to 8% of the total.

C.67 Fifth, while limited information is available on seasonal services, whether scheduled or chartered, the number offered appears to have declined between 2001 and 2019, and now focuses on penetration of Alpine ski areas with long road journey times from the nearest airports.

C.68 Taken together, these data point to a significant reduction in the diversity of destinations served, but also a concentration of long-distance cross-border services on a declining number of core international routes, albeit more frequently.

Possible explanations

C.69 These observations are consistent with various hypotheses, which we discuss below.

C.70 There is a trend to simplify rail services, with a reduction in features such as locomotive haulage, portion working, and timetables which vary by the day of the week or time of year.

C.71 Simplification of services is also encouraged by congestion of rail infrastructure, where it occurs. Congestion strengthens the benefits of removing features which absorb capacity and may increase journey times, such as:

- use of train paths only on some days of the week or seasons of the year;
- stops at borders to change traction;
- longer stops at stations to split and join trains; and
- operation of services over longer distances, which can contribute to unreliability unless sufficient recovery time is allowed in timetables.

C.72 It is inefficient to provide infrastructure and rolling stock which are used only for infrequent or seasonal services. We discuss below how railway undertaking management may conclude that it is more efficient to focus resources on dense core services rather than thin peripheral ones.

C.73 Simplification of services is also facilitated by demand management, the increasing use of compulsory reservation and yield management. These make it possible to shape demand to

match services, reducing the need for the latter to provide additional capacity at peak times of the day, week or year.

C.74 Over Europe as a whole, the trend appears to be towards standard formation trains and a standard repeating pattern timetable throughout the year, with minor reductions or modifications of services at weekends and other periods of lower demand[57]. We discuss in Annex L the contrast between infrastructure managers with spare capacity available for open access services at relatively short notice and those designing their infrastructure and rolling stock fleet to operate an intensive standard regular interval, clockface or "Takt" timetable planned many years in advance.

C.75 Night trains may be a partial exception to the pressures for simplification and standardisation. While changes in traction, and splitting and joining, continue to add operational costs, they may have little or no commercial penalty, as minimising journey time is often not necessary and can even be counterproductive. However, to be attractive to passengers, night trains may need to arrive in major city centre stations during the morning peak, when the available infrastructure is at its busiest. Whatever the causes, there has been a reduction in the number of direct connections, and this has resulted in a need both:

- to change trains, with the associated scope for a missed connection; and
- in the absence of a through-ticketing agreement, to buy two tickets, often with a higher fare than could have been offered on the direct train.

C.76 We discuss some of these obstacles further in other Annexes, and in particular the issues of rolling stock (Annex M), ticketing and connections (Annex N) and infrastructure capacity allocation (Annex L).

[57] Similar changes over time have been seen in long-haul air services, where airlines have withdrawn less-than-daily services in favour of a standard daily schedule. This simplifies operations, means that the same arrival and departure slots at congested airports can be used for the same services each day, and offers passenger the attraction of a more frequent service. However, the existence of three major global alliances means that airlines can continue to offer daily services to former destinations through their alliance partners or through "interline agreements" with non-aligned airlines. In rail, which lacks such extensive through-ticketing arrangements, it is much harder for a railway undertaking to specify a fare, or offer a through-ticket, to stations it does not serve itself. We discuss this further in Annex N.

Case studies on the causes of decline

C.77 To supplement the timetable analysis described above, we also carried out ten more detailed case studies of where long-distance cross-border services had declined or been withdrawn, selected from across the study area and with a range of characteristics. The table below lists the case studies we agreed with the Commission.

Table C.3: Case studies of causes of decline

Case study	Main markets connected	
1	Portugal	Spain/France
2	Spain	France
3	Spain	Switzerland/Italy
4	Northern Germany	Belgium/France
5	Italy	Luxembourg/Belgium
6	Sweden	Germany
7	Western Germany	Poland/Russia
8	Northern Germany	Austria/Slovakia/Hungary
9	Poland	Lithuania
10	Central/Southern Europe	Greece/Turkey

C.78 In addition to factual research, we contacted passenger representatives Back-on-Track and the European Passengers' Federation (EPF) for a customer-focused assessment of the quality of the services available in the absence of night trains.

C.79 Note that the immediate cause of any change to the planned rail timetable is almost invariably a decision by either:

- the management of a railway undertaking; or
- a public authority changing its instructions to the railway, which in recent years is usually through a formal Public Service Obligation (PSO).

C.80 Exactly how such decisions are made, and the factors taken into account at the time, are rarely documented or made publicly available. Nonetheless we attempted to identify the principal drivers of decisions made to reduce or close night train services.

Case study 1: Portugal and Spain/France

C.81 Portugal and Spain share the 1668 millimetre "Iberian" gauge, so that night trains from them cannot continue into France or elsewhere on the 1435 millimetre standard gauge network without gauge-changing stock.

Table C.4: Night trains between Portugal and Spain/France

Routes		PSO in 2019	Days run 2001	Service last operated	Alternative services?	Reasons for withdrawal
PT	Lisbon	✗	7	2020	Poor	• Initial temporary suspension due to COVID-19. • Focus in Spain on high-speed rail.
ES	Madrid	✗				
PT	Lisbon	✗	7	2020	None	
ES	San Sebastian	✗				
FR	Hendaye	✗				

Source: KCW analysis.

C.82 Since 1995, there has been no direct Lisbon-Madrid daytime service. The only other alternative connection, for a motorway distance of 625 kilometres, has a journey time of at least 12½ hours, involves two or three changes of train, and has no through-ticketing. None of the routes between Portugal and Spain is continuously electrified, leading to a requirement for several changes of locomotive en route.

C.83 From 2008 onwards, Portugal was heavily affected by the global financial crisis. In 2010, Portuguese incumbent operator CP withdrew its own Iberian gauge night train rolling stock, which dated from the 1970s, and has since relied on Renfe (the Spanish incumbent operator) to provide stock for both routes. Renfe has steadily reduced its cross-border and domestic night train routes, often preceding the opening of standard gauge high-speed lines. For some time, Renfe has been mothballing, disposing of, or converting Talgo night train rolling stock for daytime use[58].

C.84 In 2012, the Portuguese infrastructure manager closed the Torre das Vargens-Marvão Beirã section of the shortest rail route between Lisbon and Madrid. Since then, both night train routes have run combined as one train between Lisbon and Medina del Campo in Spain. This reduced operating costs, but led to a late arrival and early departure of the Lisbon-Hendaye train at the eastern end, breaking onward connections to/from Paris.

C.85 In 2012 it was reported that on average around 400 passengers per day used the trains (or 100 in each route in each direction) and that heavy financial losses were incurred:

- To/from Madrid, the "Lusitania" incurred €7.6 million costs for €1.6 million revenue.
- To/from northern Spain and Hendaye, the "Sud Express" incurred €9.3 million costs for €4.2 million revenue[59]. German ticketing agency Bahnagentur Schöneberg reported that it was frequently sold out in summer before the COVID-19 pandemic, but was often only available to book a few weeks in advance.

[58] https://www.railjournal.com/rolling-stock/renfe-awards-contract-to-convert-night-trains-into-hs-day-trains/ (accessed 8.4.2021)

[59] https://www.publico.pt/2012/09/28/economia/noticia/sud-expresso-e-lusitania-expresso-passam-a-comboio-unico-a-partir-de-4-de-outubro-1564987 (accessed 8.4.2021)

C.86 These data suggest that commercial operation of these trains all year round is financially unsustainable, either requiring cross-subsidy from profitable commercial routes, or leading to the accumulation of debt by the incumbent operators. Despite this, we note that Renfe reported a surplus of over €431,000 for the Sud Express in 2014[60].

C.87 Passenger representatives Back-on-Track reported that the services were adequate in 2001, but merely partially adequate in 2019, by when the rolling stock was "old and run-down", making sleep difficult, and it had become difficult to book the trains online. In addition, connections in Irun/Hendaye to/from Paris had been broken far too often in the past decade. If there were no night train, through journeys would be "next to impossible" and involve at least one night in a hotel.

Outlook

C.88 Renfe announced in 2021 that it saw no future in the night train market[61], referring instead to high-speed rail. However, there is no high-speed line between Lisbon and the Spanish border and, on the Spanish side, the initial sections of the Badajoz-Madrid high-speed line are not planned to open before 2023. In early 2021, it was reported that, to avoid the country being effectively cut off from the rest of Europe by rail, Portugal is exploring the reinstatement of the Sud Express, by acquiring or reactivating Iberian gauge rolling stock in combination with a PSO[62]. The forthcoming completion of electrification of the route between Vilar Formoso (PT) and Salamanca (ES) should reduce costs and journey times[63].

Case study 2: Spain and France

C.89 This route represents a clear case of high-speed rail replacing commercially-operated night train services, following the inauguration of high-speed lines:

- in 2010, from Perpignan in France to Figueres in Spain; and
- in 2013, from Figueres to Barcelona.

[60] **https://www.congreso.es/public_oficiales/L10/CONG/BOCG/D/BOCG-10-D-407.PDF#page=135** (accessed 8.4.2021)

[61] **https://expresso.pt/politica/2021-03-30-Governo-quer-comboio-noturno-com-Espanha-mas-pede-colaboracao-da-Renfe-604db3a9** (accessed 8.4.2021)

[62] **https://expresso.pt/sociedade/2021-04-02-Portugal-pode-vir-a-reativar-sozinho-o-comboio-centenario-Sud-Express-d3d5a430** (accessed 8.4.2021)

[63] **https://www.railjournal.com/regions/europe/adif-to-complete-electrification-of-spain-portugal-link/** (accessed 8.4.2021)

Table C.5: Night trains between Spain and France

Routes		PSO in 2013	Days run 2001	Service last operated	Alternative services?	Reasons for withdrawal
ES	Madrid	✗	7	2013	Partially adequate	• Opening of high-speed lines (Perpignan (FR)-Figueres (ES)-Barcelona (ES)
FR	Paris	✗				

Source: KCW analysis.

C.90 Before their complete withdrawal in 2013, services on the route were reduced in frequency to five times per week in winter. In addition, tickets were often only made available for booking a few weeks in advance.

C.91 The entire Madrid-Barcelona-Paris route is now standard gauge track and, other than a section in France between Montpellier and Perpignan, on high-speed infrastructure. Renfe's gauge-convertible Talgo VI rolling stock, formerly used on this and the Barcelona-Paris night train route, is currently in storage.

C.92 We rate the replacement high-speed services between Paris and Madrid as only partially adequate, for the following reasons:

- There are no direct services: change is required in Lyon, Toulouse or Barcelona.
- The journey time is 10 hours.
- The earliest arrival in Madrid is 17:10 in summer and 19:50 in winter.
- There is no through fare and no through-ticketing. While other ticket vendors can sell tickets in a single transaction, since SNCF left the HERMES European Reservation System in 2018, the national railways do not sell the domestic tickets of the other operator:
  - Spain's Renfe can only sell tickets in one transaction if the change is made in Spain.
  - France's SNCF can only sell tickets in one transaction if the change is made in France.

C.93 The direct TGV trains between Paris and Barcelona also offer basic onboard facilities and as few as two train pairs per day, while the journey time of 6½ hours means a late earliest arrival time.

C.94 Passenger representatives reported that the night train service in 2001 was adequate, but that alternative services in 2019 were inadequate on the grounds of frequency, lack of direct services, late earliest arrivals, high fares and a lack of ticketing integration with SNCF's low-cost domestic service OUIGO. They suggested that sufficient demand exists for a night train in parallel with the high-speed daytime offer, and criticised the lack of political support for these night trains. Back-on-Track suggested that the withdrawal was a commercial decision of the operators to "remove a competing service to the newly established high-speed service".

Outlook

C.95 Proposals have been put forward in France to reinstate several domestic night trains, and some cross-border services were also considered[64]. These were routes from Paris to:

- Barcelona;
- Madrid;
- Rome via Florence;
- Malmö via Brussels, Hamburg and Copenhagen; and
- Vienna/Berlin.

C.96 The study also suggested that some rolling stock might be funded through the European Green Deal.

C.97 In Spain, as noted above, Renfe currently sees no future in the night train market.

Case study 3: Spain and Switzerland/Italy

C.98 As with the services between Spain and France described above, the imminent completion in 2013 of the Figueres to Barcelona high-speed line led to the complete withdrawal of these night train routes in 2012. Renfe's gauge-convertible Talgo VI night train rolling stock, used on these night train routes, is currently in storage.

Table C.6: Night trains between Spain and Switzerland/Italy

Routes		PSO in 2012	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
ES	Barcelona	✗	3-7	2012	Poor	• Opening of high-speed lines (Perpignan (FR)-Figueres (ES)-Barcelona (ES)
FR		✗				
CH	Zurich	✗				
ES	Barcelona	✗	3-7	2012	Poor	
FR		✗				
IT	Milan	✗				

Source: KCW analysis.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.

C.99 However, unlike the routes between Spain and Paris, there are major gaps in the high-speed infrastructure. Each route now has only one alternative daytime journey opportunity in each direction per day, with two changes of train, and taking around 11 hours, only partly due to a lack of high-speed infrastructure. The earliest possible arrival time in Barcelona is 19:30.

C.100 There are no through fares and through-ticketing is not available. Independent retailers can sell tickets in one transaction, but may offer unrealistic transfers such as Lyon Exupéry to Lyon Part Dieu in 20 minutes.

[64] Étude de developpement de nouvelles lignes de trains d'equilibre du territoire (TET), Direction générale des infrastructures, des transports et de la mer, Décembre 2020 (2021)

C.101 Timetables are poorly coordinated, and long waits and/or inter-station transfers are required in Lyon: adjustment to timetables could create more and better connections there.

C.102 Passenger representatives Back-on-Track reported that the night train service in 2001 was inadequate due to the low service frequency in winter. Alternative services in 2019 were ranked as inadequate on the grounds of journey time, frequency, a lack of direct services, late earliest arrivals and a lack of end-to-end ticketing. The view was expressed that, in the absence of political intervention, the withdrawal of these routes was a commercial decision designed to divert passengers to high-speed services, while in reality the poor alternatives have driven passengers to fly. It was stated that there is sufficient suppressed demand for night trains on these routes.

Outlook

C.103 SBB's expansion plans for the period from December 2024 feature the reinstatement of the Zurich to Barcelona night train route from December 2024. However, this depends on the finance available under the Swiss Climate Fund and, in the view of SBB, the cooperation of railway undertakings in France and Spain[65].

Case study 4: Northern Germany and Belgium/France

C.104 From 2002, DB's City Night Line (CNL) night train service began a major service improvement offensive, including an order for 42 Siemens Comfortline sleeping cars[66].

Table C.7: Night trains between Northern Germany and Belgium/France

Routes		PSO in 2014	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
DE	Berlin	✗	7	2008 via Brussels, 2014 via Mannheim	Partially adequate	• Re-routing away from Belgium owing to track access charges. • Substantial annual deficit, operating costs in France. • Management decision to close night train business.
BE	Brussels	✗				
FR	Paris	✗				
DE	Hamburg	✗	3	2008 via Brussels, 2014 via Mannheim	Partially adequate	
BE	Brussels	✗				
FR	Paris	✗				

Source: KCW analysis.

C.105 However, with effect from December 2008, a major cost reduction plan was launched. This involved a reduction in service frequency to three or four train pairs per week in winter on many core routes, although this practice was subsequently abandoned two years later. At the

[65] https://company.sbb.ch/en/media/media-relations/press-releases/detail.html/2020/9/1509-1; https://www.deutschebahn.com/resource/blob/5762318/313b4a27407cd6c61163f7d3cf993db0/Joint-Statement-Nachtzuege-data.pdf (both accessed 12.4.2021)

[66] This was the last order in western Europe for internationally interoperable night train vehicles until the most recent NightJet rolling stock orders in Austria.

same time, the Berlin to Paris night train was re-routed to avoid Belgium, owing to Infrabel's high track access charges[67] (see also Figure K.39) and the lack of a supporting PSO. This left Belgium with no regular year-round night train services and led to the suspension of the Paris to Hamburg portion for two years until December 2010.

C.106 DB's CNL routes through Belgium were also subject to unique operational challenges in the form of steep gradients in Liège (BE) and Aachen (DE), requiring "banking" locomotives to push westbound trains under conditions of poor adhesion. The opening of the HSL 2 high-speed line in Belgium led, in late 2002, to the ending of the locomotive-hauled Ostend (BE)-Brussels-Cologne (DE) InterCity route. This meant that the costs of traction and crew for the "banking" service in Aachen had to be covered by the single daily CNL train pair alone.

C.107 In 2014, CNL night trains between both Berlin and Hamburg and Paris were suspended. DB did not cite falling demand as a factor in the decision, despite the fact that the declining quality of CNL services (rolling stock defects, disruption due to track works, booking difficulties) from around 2012 had been criticised. In 2015, at a hearing in the Bundestag, Ulrich Homburg, board member of Personenverkehr, DB Mobility Logistics AG, stated that "demand is stable […] our trains are well booked"[10], and German ticketing agency Bahnagentur Schöneberg reported that these trains were often sold out. DB cited increasing operating costs per kilometre (track access charges, traction and personnel) in France 70% higher than in Germany (see also Figure K.39), contributing to an annual deficit of €6 million[68]. In addition, SNCF may have sought to recover from DB all the costs of locomotives retained entirely from CNL operations. Until the opening of the first phase of the LGV Est in 2007, these costs would have been shared among dozens of daily long-distance train services.

C.108 The end of 2016, two years later, saw the complete closure of the CNL network. Among the reasons cited by DB were increasing costs and an ageing fleet, although at this time the Siemens Comfortline sleeping cars, ordered in 2002 and built between 2003 and 2005, were among the youngest in Europe.

C.109 Passenger representatives Back-on-Track reported that the night train services in 2001 were adequate and that demand was high before their withdrawal, and blamed DB for ending the services.

Services in 2019

C.110 In 2019, a weekly sleeper train operated by Russian Railways RZD remained available for journeys between Paris and Berlin. This train, formed of modern rolling stock but crewed mainly by Russian-speaking staff, was bookable on the RZD website and at SNCF and DB ticket offices and agents. RZD used little or no yield management, leading to high fares, comparable with last-minute travel on ÖBB's NightJet. In addition, daytime journey opportunities taking 8¼ hours were available roughly every two hours: these required at least one change of train, but through fares, priced by DB, were available.

C.111 From Brussels to Berlin one change of train was required, with through-ticketing available as long as DB trains were used for the entire journey of 6¾ hours.

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[67] DB Personenverkehr on social media, no longer available.

[68] **https://www.bundestag.de/resource/blob/356570/41abb5806e2323cd23b10d51ef5583b3/026_sitzung_protokoll-data.pdf** (accessed 14.04.2021)

C.112 Between Paris and Hamburg, in 2019 only day trains were available, running approximately every two hours and requiring at least one change of train. Through-ticketing was not available for the fastest route (journey time 8¼ hours) via Brussels and Cologne, as Thalys does not cooperate with DB. However, through fares priced by DB were available for journeys via the slightly slower route via Mannheim.

C.113 From Brussels to Hamburg, a 6½-7 hour journey, one or two changes of train were required, with through-ticketing available as long as DB trains were used throughout.

C.114 2019 alternatives to the night train were rated as inadequate by passenger representatives: the RZD night train was too infrequent and too expensive, while day journeys of up to 9 hours took too long. On day services with up to three changes, including one of 8 minutes in Karlsruhe ("far too short"), the risk of missed connections was high. The lack of bicycle transport on alternative TGV, ICE and Thalys services was criticised, as was the lack of end-to-to end ticketing via Brussels.

Outlook

C.115 From December 2023, following the delivery of new rolling stock to allow service expansion, ÖBB plans to introduce Nightjet routes from Paris and Brussels running combined between an unspecified point in western Germany and Berlin[69]. The partial separation of the routes should enable more attractive arrival and departure times in Brussels than the single service operated until 2008.

C.116 In April 2021, two independent operators announced plans for night trains between Brussels and Berlin from 2022[70]. One, European Sleeper, proposed a route via Amsterdam at the Brussels end and extending to Dresden and Prague and the Berlin end. The German TEE 2.0 proposal also envisages direct day and night trains from Paris, via Brussels, to both Berlin and Hamburg[71].

Case study 5: Italy and Luxembourg/Belgium

C.117 Until 2004, when the last remaining direct daytime service was withdrawn, five incumbent operators were involved in the operation of the Brussels-Switzerland-Italy route.

69 **https://www.deutschebahn.com/resource/blob/5762316/1dcd4361da294c6087ceae5547869061/Infografik-Nachtzuege-data.pdf** (accessed 12.4.2021)

70 **https://www.railjournal.com/news/another-new-brussels-berlin-night-train-announced/** (accessed 14.4.2021)

71 **https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile** (pages 10 and 18; accessed 14.4.2021)

Table C.8: Night trains between Italy and Luxembourg/Belgium

Routes		PSO in 2002	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
IT	Venice		7	2002	Partially adequate	• Track access charges. • Life-expired rolling stock. • Low-cost airlines. • Direct day trains BE-CH suspended on completion of high-speed line LGV Est Paris (FR)-Strasbourg (FR).
	Florence				None	
	Milan				Partially adequate	
CH						
FR						
LU	Luxembourg					
BE	Brussels					

Source: KCW analysis.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.
Note: subsidy by PSO was first standardised by Regulation 1370/2007 and only applies to EU Member States.

C.118 In December 2002, the night train on this route, which also carried cars to/from the Motorail terminal in Denderleeuw in Belgium five times per week, was withdrawn. We understand that reasons for the loss of these non-PSO trains include:

- the age of the rolling stock;
- the opening of Ryanair's base at Charleroi Brussels South Airport in 2001[72];
- track access charges in Belgium and France; and
- declining average speeds on the Brussels-Luxembourg section.

C.119 A further factor may have been the management focus of the Cisalpino joint venture (50% SBB and 50% Trenitalia) on its core market between Switzerland and northern Italy, predominantly using dedicated tilting rolling stock.

C.120 From 2003 to 2009, a reasonable alternative with end-to-end ticketing was available in the form of the newly-introduced DB ICE service between Brussels and Cologne, partly on new high-speed infrastructure, connecting into the Amsterdam (NL)-Dortmund (DE)-Cologne-Milan night train.

C.121 Since 2016, alternative journey opportunities between Brussels and Milan have involved at least three changes of train, taking at least 11 hours, without end-to-end ticketing. In summer 2019, for example, one option was to travel with Thalys to Paris, transfer (by metro/RER) across Paris, and use the Thello night train to Milan/Venice, requiring three separate tickets.

C.122 In 2016, the remaining Brussels-Luxembourg-Strasbourg-Switzerland direct daytime trains were withdrawn, after many years of decline including deceleration in Belgium, poor quality rolling stock, and cutting the route back to Basel in Switzerland. They were replaced by two

[72] https://corporate.ryanair.com/about-us/history-of-ryanair (accessed 24.04.2021)

daily high-speed train pairs on the Brussels-Strasbourg section only, using the much longer route via the LGV Nord and the newly inaugurated final section of the LGV Est in France.

C.123 The four incumbent railway undertakings, SNCB/NMBS, CFL, SNCF and SBB, could not agree on an upgrade plan for the winding Belgian section (TEN North Sea-Mediterranean Corridor) or a concept for the medium-term continuation of direct services over the whole route. This situation was exacerbated by timetabling conflicts, and the introduction of ETCS in Luxembourg, for which SNCF had no suitably-equipped locomotives[73]. SNCF has never equipped its conventional locomotive-hauled trains for operation on French high-speed lines. Use of the French section of LGV between Lucy, south of Metz, and Strasbourg would reduce journey times compared with the winding classic line via Saverne. Further significant time savings on the entire Metz-Basel section would be possible with 200 km/h rolling stock, as opposed to the 160 km/h stock later deployed by SNCB/NMBS, as it would allow full integration into the "TER 200" timetable between Strasbourg and Basel.

C.124 Passenger representatives reported that the night train service in 2001 was adequate. Its withdrawal in 2016 was linked to:

- the introduction of infrastructure charging regimes in the EU, especially in France, "which had the highest TAC in Europe for passenger trains";
- investment diverted from new rolling stock to high-speed lines; and
- the launch of low-cost air routes from Brussels South Charleroi Airport in 2001.

C.125 Replacement services in 2019 were described as wholly inadequate: the "least bad replacement was to go to Paris, change stations by RER and metro in full rush hour and take Paris Bercy-Venice train. No through-tickets, to Paris was by expensive Thalys."

Outlook

C.126 We identified no plans for reinstatement of direct night or day trains on the Brussels-Luxembourg-Strasbourg-Basel(-Italy) axis. We also note that the 130 km/h Belgian section of the TEN North Sea-Mediterranean Corridor awaits upgrading.

Case study 6: Sweden and Germany

C.127 For many years, direct trains between Germany and Malmö ran via the train ferry between Sassnitz in Germany and Trelleborg in Sweden, reaching a peak of up to four train pairs per day in the early 1990s. By 2000, the service had been reduced to a daily night train, operated by DB in cooperation with the Swedish incumbent SJ.

[73] https://web.archive.org/web/20160401222546/https://www.b-europe.com/travel/practical/alerts (accessed 14.4.2021)

Table C.9: Night trains between Sweden and Germany

Routes		PSO in 2019	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
SE	Malmö	✗	7	3 in summer, 2019	Partially adequate	• Commercially viable in summer only. • Reduction in train ferry service.
DE	Berlin	✗				

Source: KCW analysis.

C.128 In late 2000, the private company Georg Verkehrsorganisation GmbH (GVG) made history as the first private operator of long-distance passenger trains in Germany, taking over the operation of the trains on the German side, following DB's decision to suspend the route. From 2003 trains ran daily in summer only.

C.129 In 2012, Transdev subsidiary Snälltåget took over the operation of the trains in Sweden, with services reduced to three train pairs per week in summer only, with couchette cars only and using a single train set.

C.130 From 2014, only one train ferry remained available, meaning that an overnight crossing was possible in one direction only. In the other direction, the trains had to use early evening or early morning sailings, leading to unattractively early departure or late arrival times in one direction.

C.131 In 2015 it was reported that the seasonal service just broke even, and that planned infrastructure changes by the German infrastructure manager DB Netz would prohibit the use of Scandinavian rolling stock built to a larger loading gauge[74].

C.132 In 2019, owing to the restricted days of operation and lack of sleeping cars, which resulted in less capacity and higher fares, this night train service was rated as inadequate. Alternative daytime train services took 7¾ hours, required two changes of train, and in high summer were frequently fully booked on the Hamburg-Copenhagen section, where an inadequate service of four daily train pairs of three-carriage trains was provided. End-to-end ticketing was available.

C.133 Passenger representatives rated the service in 2001 as adequate and had no further comments.

Outlook

C.134 In June 2021, Snälltåget reintroduced night trains between Malmö and Berlin via the Oresund link and Denmark, with through carriages to/from Stockholm attached to existing Malmö-Stockholm open access services. Snälltåget's acquisition of couchette car rolling stock from DB

[74] **https://www.spiegel.de/wirtschaft/unternehmen/nachtzug-berlin-malmoe-rolf-georg-betreibt-privaten-fernzug-a-1034516.html** (accessed 11.04.2021)

has enabled the creation of a second train set, in turn enabling daily operation in the summer season[75].

C.135 In addition:

- The Swedish national competent authority Trafikverket has explored the option of PSOs, to which commercial operator Snälltåget is opposed, for Stockholm-Hamburg and/or Malmö-Cologne(-Brussels) night train routes from as early as 2022[76], as described in paragraphs G.61 and G.63[77].
- The German TEE 2.0 proposal envisages both direct daytime and night trains between Stockholm, Malmö, Copenhagen and Berlin[78].

C.136 We note that the proposal to introduce PSO, and hence potentially subsidised, services partly paralleling an existing commercial service raises questions over what constitutes fair competition.

Case study 7: Western Germany and Poland/Russia

C.137 Until late 2013, the daily night train between the major rail hubs of Cologne and Warsaw also conveyed "through carriages" of life-expired 140 km/h gauge-convertible stock to/from Minsk in Belarus and Moscow in the Russian Federation.

Table C.10: Night trains between Western Germany and Poland/Russia

Routes		PSO in 2013/6	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
DE	Cologne	✗	7	2016	Partially adequate	• Loss of City Night Line (CNL) carrier trains to enable operation at marginal cost.
PL	Warsaw	✗				
DE	Cologne	✗	7	2013	Poor	• Strategy change at RZD from "through carriages" to independent open access services to fewer destinations.
PL		✗				
BY	Minsk					
RU	Moscow					

Source: KCW analysis.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.
Note: subsidy by PSO was first standardised by Regulation 1370/2007 and only applies to EU Member States.

[75] https://www.railwaygazette.com/passenger/sn%C3%A4llt%C3%A5get-targets-2021-expansion/56781.article (accessed 11.04.2021)

[76] https://www.trafikverket.se/contentassets/0037cd33ea7d4f6c824395c9927b09e2/summary-of-the-final-report-night-trains-to-the-european-continent.pdf (accessed 14.4.2021)

[77] On 30 August 2021, Trafikverket announced that it had awarded the contract for a Stockholm-Hamburg services to SJ but that no bids had been received for a Malmö-Brussels service.

[78] https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile (pages 10 and 18; accessed 14.4.2021)

C.138 Between Cologne and Berlin, both Warsaw and Moscow trains were last operated as a portion of the CNL route Amsterdam (NL)-Cologne-Berlin-Prague (CZ), saving operating costs, most notably track access charges, on this section, but also preventing arrival in Warsaw before 11:00.

C.139 From 2013, the practice of "through carriages" to/from western Europe ended, under the new strategy of RZD Russian Railways to operate its own complete "open access" trains between Russia and Berlin (DE), Paris (FR) and Nice (FR). This was primarily in order to have more control over their scheduling through western Europe, but also involved serving fewer destinations at lower frequencies. This required new 200 km/h gauge-convertible sleeping cars: 200 were delivered by Siemens to RZD from 2012 onwards.

C.140 In the 2014 timetable, costs were cut further by attaching the Cologne-Warsaw carriages to the first daytime EuroCity train of the day from Berlin to Warsaw, deferring arrival in Warsaw by a further 80 minutes. The return service was similarly attached to the last EuroCity train of the day as far as Berlin. From the end of 2016, when the CNL network was shut down, there was no longer a technically compatible carrier train on the trunk leg Berlin-Cologne.

C.141 In 2019, it was possible to travel between Cologne and Warsaw by alternative day trains, with one change in Berlin. There were up to three journey opportunities per day, taking around 11¾ hours, and through-ticketing was available through DB sales channels.

C.142 In 2019, it was possible to travel between Cologne and Moscow twice a week by changing in Berlin onto the RZD Strizh night train, for which a separate ticket was required. From Cologne, however, there was no day connection to Warsaw arriving early enough to connect with the thrice-weekly Warsaw-Moscow night train. Western Germany was connected directly to Russia only by a weekly RZD train calling at Frankfurt (DE) at around 01:00, which did not serve Cologne or the surrounding populous state of North Rhine-Westphalia.

C.143 Passenger representatives rated the service in 2001 as adequate and had no further comments.

Outlook

C.144 There are no concrete plans for the reinstatement of direct night trains on either route. The German TEE 2.0 proposal foresees both direct daytime and night trains between Cologne and Warsaw[79].

Case study 8: Northern Germany and Austria/Slovakia/Hungary

C.145 This case study differs from the others in that a daily, year-round night train service is still available, despite several changes of route over the years.

[79] **https://www.bmvi.de/SharedDocs/EN/Documents/K/innovative-rail-transport-overnight-21-09-2020.pdf?__blob=publicationFile** (pages 10 and 18; accessed 14.4.2021)

Table C.11: Night trains between Northern Germany and Austria/Slovakia/Hungary

Routes		PSO in 2017	PSO in 2021	Service 2001	Gap in service	Alternative services?	Reasons for withdrawal
DE	Berlin	✗	✗	7	2017/8		• Operating costs in Germany, especially track access charges.
PL			✓				
CZ		✓	Part				
AT	Vienna	✗	✗				
DE	Berlin	✗	✗	7	2017/8		• Operating costs in Germany, especially track access charges. • Short-term need for cost savings at the Hungarian incumbent MÁV-START.
PL			✓				
CZ		✓	Part				
SK	Bratislava	✓	✓				
HU	Budapest	✓	✓				

Source: KCW analysis.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.
Note: subsidy by PSO was first standardised by Regulation 1370/2007 and only applies to EU Member States.

C.146 In 2001, the Berlin-Vienna night train ran via Passau and Leipzig in Germany, and also conveyed through couchette cars beyond Vienna to Budapest, albeit with a late arrival and early departure.

C.147 In 2008, this route was discontinued, apparently due to a combination of high track access charges and lack of PSO on the 720 route-kilometres within Germany. It was replaced by the Berlin-Prague (CZ)-Bratislava (SK)-Budapest (HU) night train "Metropol", which used the path of the former Františkovy Lazně (CZ)-Budapest (HU) train east of Prague. We understand that the Metropol had, since its inception, been PSO-supported between Budapest and the Czech/German border, leaving only 275 route-kilometres in Germany with no support. In addition to its function as a night train, the Metropol served as a late evening/early morning day train connection between Berlin and Prague. Vienna was served by a portion of the train attached/detached in Břeclav in Czechia.

C.148 In August 2017, Hungarian incumbent railway undertaking MÁV-START announced a cost-saving programme for its long-distance cross-border services, including the merger or truncation of selected night train routes, such as the withdrawal of direct carriages to Bar (ME) and Varna (BG) in summer. This included cutting back the Metropol from Berlin to operate only south of Prague[80], where the remaining 610 route-kilometres in Hungary, Slovakia and Czechia were still covered by PSOs. The information available suggests that MÁV-START was commercially responsible for the train in Germany, with no cost- or revenue-sharing with DB. This is consistent with MÁV-START's statement that the Metropol would be cut back to

[80] https://www.mavcsoport.hu/mav-start/menetrendvaltastol-csokken-utasellato-kapacitasa (accessed 12.04.2021)

Budapest-Prague "… due to significantly increased transport costs in Germany"[81]. An additional reason may have been MÁV-START's long-term shortage of serviceable night train rolling stock, which since 2014 had meant the use of hired couchette cars from the leasing company Wagon Service Travel in Slovakia. The August 2017 announcement meant that incumbents ÖBB, ZSSK and ČD were unable to organise a replacement service before the timetable change in December 2017. As a consequence, there was no direct train service at all between the capitals of Germany and Austria for a year.

C.149 In December 2018, daily night trains on the Berlin-Vienna/Budapest route were reinstated. Arrival and departure times at the end points are very similar to those of the former service, but the route taken between Břeclav and Berlin via Bohumín (CZ), Opole (PL), Wrocław (PL) and Frankfurt (Oder) (DE) was very different. This brought two key advantages:

- Only 90 route-kilometres were in Germany, minimising the distance on the section of route with the highest, full cost-recovery infrastructure charges.
- Cost-sharing with other night trains was maximised: the train is coupled to the Budapest/Vienna-Warsaw services south of Bohumín (CZ), and the Przemysl (PL)-Berlin service west of Opole or Wrocław (PL).

C.150 Published information suggests that the carriages to and from Budapest are conveyed by the PSO-supported Budapest-Prague night train between Budapest and Břeclav[82,83]. We were informed by stakeholders that the entire route within Poland is covered by PSO. In 2020, MÁV-START bought 22 used sleeping cars from Wagon Service Travel for around €8 million, which suggests that it sees a future in cross-border night train services[84]. The Berlin-Vienna portion will be extended to Graz in Austria from June 2022, when it will be operated under the Austrian long-distance PSO between Břeclav and Graz.

C.151 For 2001, passenger representatives rated the Berlin-Vienna train adequate, while the Berlin-Budapest train was described as inadequate. Both services were ranked as adequate in 2019.

Case study 9: Poland and Lithuania

C.152 In 2004, Poland and the Baltic states joined the EU, but Belarus did not. Poland uses the 1435 millimetre European standard track gauge but Lithuania, Latvia, Estonia and Belarus (and Finland) use the 1520 millimetre Russian gauge.

[81] **https://www.mavcsoport.hu/mav-start/belfoldi-utazas-nemzetkozi-utazas/uj-kedvezmenyek-erkeznek-uj-vasuti-menetrenddel** (accessed 12.04.2021)

[82] Čiastková zmluva pre rok 2021, Ministerstvo dopravy a výstavby SR, Slovakia

[83] Smlouva o veřejných službách 2020-2029, Příloha č. 1. Provozní koncepce, Ministerstvo dopravy ČR, Czechia

[84] **https://www.mavcsoport.hu/mav-start/ev-vegeig-huszonket-legkondicionalt-fekvohelyes-es-halokocsi-erkezik** (accessed 12.04.2021)

Table C.12: Night trains between Poland and Lithuania

Routes		PSO in 2005	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
PL	Warsaw		4	2005	Poor	• Night train: need to replace gauge-convertible rolling stock. • Night train: seasonal demand. • Day long-distance train: "suspended" due to track works and never restored.
BY	On one route					
LT	Vilnius					

Source: KCW analysis. Note that routes exist via Belarus and direct, as discussed below.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.
Note: subsidy by PSO was first standardised by Regulation 1370/2007 and only applies to EU Member States.

C.153 In 1991, following the independence of the Baltic states from the Soviet Union, the rail service to/from Poland comprised:

- several daily services between Białystok (PL) and Hrodna (BY), with at least one daily direct train between Warsaw and Vilnius via this route; and
- a daily service from Warsaw via Białystok (PL), Šeštokai (LT), Kaunas, Vilnius, and Riga (LV) to Tallinn (EE).

Route via Belarus

C.154 Until 2000, the daily services between Białystok in Poland and Hrodna in Belarus used a route which was shorter and faster than that via Šeštokai, with re-gauging in Kuźnica Białostocka in Poland. In 2000, however, trains on this route were discontinued as a result of new transit visa requirements for citizens of pre-EU-accession countries crossing Belarus. The affected trains included the Berlin-Vilnius-Saint Petersburg night train, for which the Lithuanian and Russian incumbents LG and RZD had purchased new rolling stock in 1994.

Route via Šeštokai

C.155 The historic Warsaw-Tallinn service required passengers to change trains, with a guaranteed connection, at the limit of standard gauge track in Šeštokai. By the end of the 1990s it was cut back to Warsaw-Vilnius, due to:

- growing competition from road transport; and
- the continued focus of the incumbent railway undertakings in the Baltic states on their core business of (mostly east-west) rail freight.

C.156 However, from 2000 a direct night train ran every other day between Warsaw and Vilnius. An impending transit visa requirement to cross Belarus was regarded by the Polish incumbent PKP as an opportunity to improve services via Šeštokai, specifically by removing the need to change trains there. A bespoke rapid re-gauging system known as SUW2000 was developed in Poland and subsequently installed in Mockava (LT) between the Poland/Lithuania border and

Šeštokai[85]. The direct train used one set of existing rolling stock, re-equipped with SUW2000-compatible wheelsets, intended as an economic way to prove the technology.

C.157 In May 2005 the service ended, apparently due in part to low demand outside the summer season[86], which may explain the alleged unwillingness of the then Lithuanian incumbent railway undertaking LG to support investment in SUW2000 rolling stock[87] to replace the single adapted train set, which was near the end of its serviceable life.

C.158 Until September 2013, a daytime service remained in place between Warsaw and Šeštokai, with passengers changing trains there to travel to and from Vilnius. The journey originally took around 9½ hours to cover the 550-kilometre route, but from December 2010 a further change of trains in Kaunas in Lithuania was required, extending the journey time to 10 hours. In September 2013, the train was "temporarily suspended", with no replacement bus service between Suwałki in Poland and Kaunas in Lithuania. This suspension was in connection with the installation of a standard gauge track, either alongside or interlaced with the Russian gauge track, between Šeštokai and Kaunas, a project costing €380 million and sometimes known as Rail Baltica I.

C.159 On reopening in October 2015, the "upgraded" Białystok-Kaunas line remained sinuous and mostly single track, non-electrified and with a maximum speed of 120 km/h[88]. We understand that the line is not signalled over its entire length, severely constraining capacity.

C.160 In June 2016, an inadequate regional cross-border service was launched, running on Fridays to Mondays only, and this remained the only alternative service available in 2019.

C.161 In 2021, the regional cross-border Białystok to Kaunas service was expected to run daily, but with such poor timings that journeys from Warsaw to Vilnius would either not be possible in one day or involve an arrival after midnight[89].

C.162 As of April 2021, some 5½ years after reopening, long-distance cross-border passenger train services via Šeštokai have yet to resume. This may be because of issues with the diesel locomotives required to haul the train, including their availability and authorisation of Polish locomotives for Lithuania and vice versa. One Polish train set was sufficient when the train terminated in Šeštokai, with a short turnaround time there, but two would be required for a daily train pair between Warsaw and Kaunas with attractive timings. Despite the lengthy period for the planning and execution of the infrastructure work, it appears that an operational concept could not be developed to the satisfaction of the incumbent railway

[85] The technology is also used in Mostys'ka II in Ukraine.

[86] **https://kurier-kolejowy.pl/aktualnosci/29716/pociagi-do-kowna-nie-jada-z-powodu-braku-taboru.html** (accessed 16.04.2021)

[87] **http://www.sejm.gov.pl/sejm7.nsf/InterpelacjaTresc.xsp?key=201AC3D8** (accessed 16.04.2021)

[88] **https://www.railwaygazette.com/infrastructure/first-section-of-rail-baltica-inaugurated/41522.article** (accessed 12.04.2021)

[89] **https://www.seat61.com/trains-and-routes/warsaw-to-vilnius-by-train.htm** (accessed 16.04.2021)

undertakings, PKP Intercity and LTG Link, and competent authorities in both countries, by the end of 2015[90].

C.163 To conclude, the current service provision is worse than that offered before the construction of Rail Baltica I.

Outlook

C.164 Following the signing of a letter of intent by PKP Intercity and LTG Link in 2020[91], a Warsaw-Vilnius service may be reinstated after the COVID-19 pandemic. This is likely to be in the form of a daytime connection involving a change of train in Kaunas but with through-ticketing. As of May 2021, the selection of rolling stock was still to be finalised[92].

C.165 Looking further ahead, an indicative service concept for the standard gauge line Rail Baltica II, opening in 2026 at the earliest, shows "high-speed" services from Warsaw to Vilnius and from Warsaw via Riga to Tallinn, and night trains between Berlin/Vienna and Vilnius via Warsaw[93].

Case study 10: Central/Southern Europe and Greece/Turkey

C.166 By the middle of the first decade of the twenty-first century, the railways of the former Yugoslavia were on the road to recovery, with efforts to restore and create new international services starting to bear fruit. At that time, the network was still extensive and attractive enough to ward off competition from international bus and coach routes.

[90] **https://kurier-kolejowy.pl/aktualnosci/29716/pociagi-do-kowna-nie-jada-z-powodu-braku-taboru.html** (accessed 16.04.2021)

[91] **https://www.rynek-kolejowy.pl/mobile/pociag-warszawa--wilno-od-polowy-2021-roku--98671.html** (accessed 16.04.2021)

[92] **https://www.rynek-kolejowy.pl/wiadomosci/pociag-warszawa--wilno-jeden-bilet-dogodna-przesiadka-w-kownie-102299.html** (accessed 11.05.2021)

[93] **https://www.railbaltica.org/operational-plan-provides-new-insights-on-rail-baltica-international-regional-and-cargo-train-movement-in-2026-2056/** (accessed 12.04.2021)

Table C.13: Night trains between Central/Southern Europe and Greece/Turkey

Routes		PSO	Service 2001	Service last operated	Alternative services?	Reasons for withdrawal
RS	Belgrade		7	2017 (all year) (2019, 7 in summer)	None	• Vicious circle of falling quality and demand. • Long journey times, delays, poor quality rolling stock, closure of central station in Belgrade, construction works in Greece.
MK	Skopje					
EL	Thessaloniki	?				
RS	Belgrade		7	2012	None	• Vicious circle of falling quality and demand. • Long journey times, delays, border controls, closure of city centre stations, construction works in Bulgaria and Turkey.
BG	Sofia	?				
TR	Istanbul					
RO	Bucharest	?	7	2014 (all year) (2019, 1 in summer)	None	• Vicious circle of falling quality and demand. • Long journey times, poor quality rolling stock.
EL	Thessaloniki	?				
RO	Bucharest	?	7	2016 (all year) (2019, 7 in summer)	None	• Vicious circle of falling quality and demand. • Long journey times, delays, poor quality rolling stock, border controls, construction works in Bulgaria and Turkey.
TR	Istanbul				None	

Source: KCW analysis.
Note: grey boxed represent states which are passed through but which contribute few or no night train passengers.
Note: subsidy by PSO was first standardised by Regulation 1370/2007 and only applies to EU Member States.
Note: question marks indicate that we have not identified whether PSOs exist in Bulgaria, Greece and Romania.

C.167 With the financial crisis of 2008, the situation then deteriorated, leading to service cuts and the almost complete suspension of infrastructure and rolling stock maintenance in Bulgaria, Greece and Serbia.

C.168 In February 2011, matters came to a head when Greece unilaterally suspended all cross-border passenger train services until May 2014 as part of its austerity measures, with services remaining much reduced in scope since then.

C.169 In both the Baltic region and south-east Europe there appears to be a pattern of lack of both resources and proactive management:

- Where infrastructure has been neglected, timetables are not regularly updated to reflect the situation, resulting in severe delays and missed connections, in the sense of both passenger interchange and through carriages reaching their next carrier train.
- Where infrastructure work is underway, routes have been left partially or completely suspended, typically without adequate alternative rail or bus services, for many years.
- Where infrastructure works have been partially or fully completed, passenger services have not been improved. The condition of Serbian RIC rolling stock is such that it is no longer permitted to operate in several neighbouring countries.

C.170 The situation has reached the point that, for overland journeys between western Europe and Greece, travel agents and websites such as Seat61.com advocate travelling by ferry from Italy.

Belgrade-Skopje-Thessaloniki

C.171 In 2009, the direct daytime train Olympus was discontinued.

C.172 Between 2011 and 2014, the night train Hellas, running overnight between Serbia and North Macedonia, was interrupted by the suspension of all international services to/from Greece. In 2015, this was followed by the European refugee crisis.

C.173 In 2017, sleeping cars were withdrawn, presumably requiring overhaul. Since May 2017, between Gevgelija in North Macedonia and Thessaloniki in Greece, the train has been replaced by a TrainOSE bus, but in 2018 this bus did not operate until the summer.

C.174 Since 2018, both the train and the bus have run in summer only, seemingly reliant on income from Interrail holders and other tourists. These developments leave North Macedonia with no year-round international passenger train services.

C.175 Finally, in 2018, the closure of Belgrade's centrally located terminal station has significantly reduced the convenience and visibility of rail as a viable mode of transport.

C.176 In 2019, there was no alternative rail service outside the summer season.

Outlook

C.177 Infrastructure upgrade programmes for the Belgrade-Niš-Preševo line in Serbia may worsen the situation in the short-term before improving it, while rolling stock investment appears to be focused on regional rail vehicles only suitable for domestic use. Train services are expected to resume on the Gevgeilija to Thessaloniki section on completion of rebuilding works. However, a service level at least as good as before the financial crisis period appears unlikely without the procurement of additional interoperable rolling stock.

Belgrade-Sofia-Istanbul

C.178 Until 2012, daily daytime and night trains connected Belgrade and Sofia. The daytime train pair conveyed through carriages that continued overnight to/from Istanbul.

C.179 Since at least 2000, only one night train pair has ever been provided on the Sofia-Istanbul Sirkeci (central station for European Istanbul) route, and all passengers are required to disembark in the middle of night at the Turkish border station of Kapikule to show or buy visas. In addition:

- In 2012, this train terminated at Kapikule, with bus replacement services to Istanbul.
- Since 2013, it has terminated at Halkali in the distant outskirts of Istanbul, replaced by bus to/from central Istanbul.
- From late 2019, regional Marmaray trains have replaced this bus.

C.180 From December 2012 to December 2015 there was no Belgrade-Sofia day train, forcing intending passengers to spend the day in Sofia.

C.181 In 2014, further construction works disrupted the train within Bulgaria.

C.182 In December 2015 the night train was withdrawn and the day train reintroduced, but reports suggest that the Sofia-Istanbul night train did not wait for the day train to arrive from Belgrade in the event of delays.

C.183 Since 2017 the direct Belgrade-Sofia day train has run in summer only, possibly due to increased costs associated with the allocation of diesel locomotives to the freight subsidiary of the restructured Serbian incumbent railway undertaking ŽS. In consequence, passengers are required to take three separate regional trains in winter, with extended journey times.

C.184 In 2018, the closure of Belgrade's centrally located terminal station led to these trains moving to the suburban station of Topčider, breaking connections to/from Croatia and Hungary.

C.185 In 2019, there was a poor alternative rail service outside the summer season, requiring three changes of train.

Outlook

C.186 Despite the completion of many infrastructure upgrades in both the Istanbul area and on the line between Plovdiv in Bulgaria and the Bulgaria/Turkey border[94], there appear to be no plans for service enhancements or to serve the city centres at each end. Infrastructure upgrade programmes in Serbia for the Belgrade-Niš-Dimitrovgrad line, including electrification of the latter section, should (after further disruption) improve the situation in the medium- to long-term.

Bucharest-Thessaloniki

C.187 In 2001 there were two daily year-round journey opportunities in each direction between Bucharest and Thessaloniki, with either the Bucharest-Sofia or Sofia-Thessaloniki leg being overnight.

C.188 In 2014, the Bucharest-Sofia night train ended, after conveying only through cars to/from Ukraine and Russia, which could not easily be booked in western Europe.

C.189 In May 2014, following the resumption of international rail traffic to/from Greece, a daytime Sofia-Thessaloniki train pair was reintroduced, but since May 2017, this has been permanently replaced by bus between General Todorov in Bulgaria and Strimon in Greece, apparently because its original Greek carrier train (between Alexandroupolis and Thessaloniki) has been converted to bespoke, non-RIC rolling stock.

C.190 Since 2017, the direct Bucharest-Sofia day train has run seasonally. Lightweight Diesel Multiple Unit (DMU) rolling stock is deployed in Romania in winter, providing sufficient capacity and attracting lower track access charges, but requiring passengers to change train in Ruse in Bulgaria. Also since 2017, the direct day train conveys through couchette and seated cars to/from Thessaloniki once a week in summer, but at all other times an overnight stay is required in Sofia. There were therefore no adequate alternative rail service in winter and autumn 2019.

Outlook

C.191 We have identified no planned service improvements.

Bucharest-Istanbul

C.192 Through carriages between Bucharest and Istanbul were traditionally attached to the Sofia-Istanbul night train between Dimitrovgrad in Bulgaria and Istanbul all year round.

C.193 Since 2012, however, the route has been significantly affected by engineering works in Turkey and Bulgaria described above (paragraph C.186).

[94] **https://www.railwaygazette.com/europe/bulgaria-completes-upgrading-of-routes-to-the-border/42546.article**; **https://www.railwaygazette.com/infrastructure/svilengrad-turkey-upgrading-completed/38037.article** (accessed 14.04.2021)

C.194 In 2015, provision of sleeping cars ended.

C.195 Since 2017, the through service, conveying only couchette cars, has only run in summer. In winter, the Romanian incumbent CFR Călători uses lightweight DMU rolling stock, which is cheaper to operate but cannot convey the through carriages on the Bucharest-Ruse section.

C.196 In winter and autumn 2019, there was no adequate alternative rail service, as shown below.

Table C.14: Night train service from Istanbul to Bucharest in winter and autumn 2019

Time		Mode	From	To
21:30	22:30	Replacement bus	Istanbul Sirkeci	Istanbul Halkali
22:30	22:40	Wait at Istanbul Halkali		
22:40	02:37	Night train	Istanbul Halkali	Kapikule (Turkish border)
02:37	03:15	Border controls on platform		
03:15	04:15	Night train	Kapikule (Bulgarian border)	Dimitrovgrad (Bulgaria)
04:15	05:55	Wait at Dimitrovgrad		
05:55	10:25	Day train	Dimitrovgrad	Gorna Orjahovitsa
10:25	12:55	Wait at Gorna Orjahovitsa		
12:55	15:15	Day train	Gorna Orjahovitsa	Ruse
15:55	16:10	Wait at Ruse		
16:10	18:54	Day train	Ruse (Bulgaria)	Bucharest (Romania)

Source: KCW analysis of westbound (Istanbul to Bucharest) journeys.

C.197 The journey involves a rail replacement bus, an interrupted night train journey, three day trains, and a cumulative wait of over three hours at five stations. The summer through carriages follow the same timetable, attached to the day trains. There appears to be significant scope for improvement.

C.198 Passenger representatives Back-on-Track reported that services in the Balkan region have been inadequate for many years. Reasons under the control of the railway include low speeds, delays, the poor condition of rolling stock, constant disruption to services for infrastructure works, and a lack of online booking options. The loss of rail demand has been exacerbated by competition from bus and coach services and low-cost airlines. Frequently missed connections in Sofia can add 24 hours to journey times.

C.199 A specific problem appears to be the lack of air conditioning on the sections for which diesel locomotives are still required: from Niš to Dimitrovgrad and from Ruse to Bucharest. The loss of through carriages between Bucharest and Budapest was criticised, as were long waiting times in stations during the transfer of through carriages, often with no air conditioning, working toilets or lights.

Outlook

C.200 Despite the completion of many infrastructure upgrades in both the Istanbul area and on the line between Plovdiv (BG) and the Bulgaria/Turkey border (paragraph C.186), there appear to be no plans for service improvements.

Conclusions on the causes of decline

C.201 We summarise below our conclusions from the case studies on the causes of decline, dealing in turn with:

- infrastructure-related factors;
- rolling stock-related factors;
- rail reform in Europe;
- commercial pressure or management focus;
- high-speed lines; and
- passenger numbers and viability.

Infrastructure-related factors

C.202 In Spain, France and, to a lesser extent, Italy, opening of high-speed lines has been an issue. This appears to be driven by a management view that high-speed and night trains cannibalise each other, rather than being mutually reinforcing. In all the case studies, journey times by high-speed services replacing night trains exceed 6½ hours, and alternative services were judged to be inadequate or only partially adequate on the routes examined.

C.203 In Greece, Hungary, Latvia, Lithuania, Estonia, Poland, Romania, Serbia and Turkey, badly-neglected infrastructure and/or disruptive maintenance/renewal/enhancement has been an issue. Medium- to long-term disruption is likely to lead to intending passengers seeking alternatives and permanently changing travel behaviour.

C.204 In Bulgaria, Latvia, Poland and Turkey, upgraded infrastructure has been left with either no long-distance cross-border passenger trains or no improvements relative to the service before the upgrade.

C.205 In Latvia, Poland, Romania, Serbia and Spain, gaps in the electrified network can require the retention of diesel locomotives for a limited number of passenger trains, at disproportionate extra cost, and extending journey times for passengers. The same issues have arisen in Hungary and Romania.

C.206 In Belgium, France and Germany, a combination of high track access charges (see Annex K) and lack of direct compensation via PSO has been an issue. We note that vertically integrated incumbent railways are unable to challenge their owners' policies of full cost-recovery charging regimes and/or the exclusion of long-distance services from PSOs. This can lead to at least two distinct effects:

- Lower track access charges for lighter, non-interoperable rolling stock lead to the loss of through carriages and/or the need to change trains at the border, as in Romania.
- More widely, the existence of track access charges, which may exceed the actual direct costs to the infrastructure manager (see Annex K) appears to have created a near-universal issue of closer scrutiny of the financial performance of individual services.

C.207 Between France and Spain, and Poland and Lithuania, differences in track gauge may be declining as a barrier to cross-border services, due to the opening of standard gauge lines, and the prospect of Rail Baltica II. However, services that change gauge en route must be specially designed or adapted for rapid re-gauging, requiring the agreement of all parties involved.

Rolling stock-related factors

C.208 The table below summarises new rolling stock delivered for use on cross-border night trains.

Table C.15: New rolling stock for cross-border night trains in Europe, 2001 to 2017

Year of order or delivery	State	Railway undertaking	Vehicles
2003	Poland	PKP InterCity	3
2004	Germany	DB	42
2006	Czechia	ČD	12
2009	Romania	CFR Călători	9
2012	Bulgaria	BDZ	30
2012	Russian Federation	RZD	200
2017	Ukraine	UZ	2
Total			**298**
Total EU			**96**

Source: KCW analysis.
Note: dates may be either year of order or year of delivery.

C.209 Too little dedicated rolling stock has been purchased to replace ageing fleets used for cross-border night trains. Only 91 new vehicles were delivered in the EU-27 over the period 2001 to 2017, an average of fewer than six vehicles per year. At this rate, it would take over 250 years to replace the whole fleet.

C.210 In Belgium, France (sleeping cars only), the Netherlands, Portugal and Switzerland, the life-expired or overhaul-requiring vehicles of the incumbent operators were withdrawn from traffic between 2001 and 2019. This explains many of the route losses in this period, including between Italy and Luxembourg/Belgium (case study 5). Germany was alone in western Europe in ordering significant numbers of vehicles (case study 4).

C.211 In Bulgaria and Greece (but also Serbia and Macedonia) rolling stock was badly neglected following years of austerity. Unreliable rolling stock, partly caused by deferred maintenance, has also been an issue in Hungary.

C.212 In Luxembourg and the Netherlands, there has been an issue of the prohibitively high costs of equipping locomotives with ETCS.

C.213 In Bulgaria, Poland and Romania, there has been a loss of suitable carrier trains formed of RIC conventional rolling stock. The economics of night trains can be improved by attaching services to other night trains or (largely domestic) late evening or early morning day trains. If these services are cut, or converted to operation by technically incompatible bespoke train types, night trains must cover the full costs of track access and driving staff.

C.214 In Denmark, France, Germany, Spain (and Serbia), there has been an issue of the cost of retaining locomotives for night train services only, following conversion of daytime services to bespoke rolling stock types. Where costs can no longer be shared between several trains per day, the railway undertaking supplying the locomotive will seek full cost recovery, including overhauls (costing hundreds of thousands of euros), from the night trains.

C.215 In France, Italy, Spain and Switzerland, the quality and comfort of high-speed rolling stock may not be adequate for journeys taking longer than six hours. This contributes to their assessment as inadequate as an alternative to night trains.

Rail reform in Europe

C.216 Before 1993, when Directive 91/440/EEC began the process of separation of railway infrastructure and operations, services could be extended across borders on the basis of bilateral agreements between vertically integrated incumbents sharing costs[95]. This did not require explicit regimes for infrastructure allocation and charges and formal specifications for PSO support.

C.217 Now, cross-border rail services require the involvement of at least three, but more usually five or more players:

- at least one, but often two or more, railway undertakings;
- at least two infrastructure managers; and
- at least two competent authorities if PSO support is provided.

C.218 The number of parties involves typically increases by between one and four for each additional country passed through. The Netherlands Ministerie Infrastructuur en Waterstaat's (I&W) mentioned the example of how operation of the cross-border Drielandentrein in Belgium, Germany and the Netherlands requires the involvement of three national governments and three regulatory bodies.

C.219 The separation of infrastructure and operations, and the formalisation of relationships between them, generates additional complexity, interfaces and transactions. The case studies on Italy and Luxembourg/Belgium (case study 5) and Poland and Lithuania (case study 9) illustrate the difficulties that arise when multiple actors cannot agree on service concepts and/or the infrastructure measures needed to realise them.

Commercial pressure or management focus

C.220 In France, Germany, Spain and (until recently) Switzerland, night trains may be neglected or ended because of a mix of commercial pressure and/or a lack of railway undertaking management interest in services not covered by PSO. Governments can choose to specify socially and/or economically beneficial services in the form of PSOs, give instructions, guidance or targets to incumbent railways which they own or control, or simply leave decisions to management. Where decisions are delegated to management, commercially oriented railway undertakings or departments within them (such as DB Fernverkehr, SNCF Grandes Lignes and Renfe Larga Distancia) may focus on services with the best revenue/cost performance or which are simplest to manage. This is consistent with the earlier finding that the number of long-distance cross-border day trains (and long-haul air services) has grown, but that they operate on fewer routes.

C.221 Germany is unique in Europe in explicitly requiring revenue-maximisation of its incumbent while allowing the market to determine which long-distance services should be provided. When DB management closed the CNL night train network in 2016, a debate in the Bundestag

[95] One arrangement was to have a broad match between vehicle-kilometres operated from state A in state B and vehicle-kilometres operated from state B in state A.

concluded that the government should not intervene[96,97]. This policy disincentivises any cross-subsidy within DB Fernverkehr to night trains. The situation is similar in Spain, following the near elimination of PSOs for Larga Distancia routes. In Switzerland, in contrast, the system of bundling profitable and non-profitable routes into long-distance PSO-like "concessions" achieves the politically desired network at zero net subsidy[98].

C.222 Common themes in the western European case studies are operating costs, in particular track access charges, and rolling stock issues, combined with a lack of long-distance PSOs in France, Germany and Spain.

High-speed lines

C.223 One finding stands out, that night trains do not run on dedicated high-speed lines, and high-speed infrastructure is not being used to expand the range of night train services within the indicative night train journey time range of 8-16 hours. This is despite the fact that many high-speed journeys replacing night trains take significantly longer than four hours, operate at low frequencies, and lack direct services and onboard facilities such as hot food or bicycle transport. The fastest daytime substitute services in the case studies take 6½ hours. In many cases, the situation is exacerbated by a lack of through fares or end-to-end ticketing for routes formerly served by direct night trains. Of the 21 individual routes examined:

- 11 replacement services were rated as inadequate; and
- 10 replacement services were rated as only partially adequate.

C.224 The withdrawal of night train routes (and conventional long-distance day trains) has led to a reduction of international rail connectivity between cities other than the largest capitals including, for example:

- in Belgium, Namur;
- in France, Nancy and Strasbourg;
- in Italy, Turin;
- Luxembourg; and
- in Spain, Burgos and San Sebastian.

Passenger numbers and viability

C.225 We set out in Annex D how data on passengers on individual night train routes are not available. In practice, between many pairs of NUTS zones in different states, the number of point-to-point airline seats is many times the number of zone-to-zone rail passengers.

C.226 This makes it difficult to assess whether demand is falling, or the extent to which this is caused by poor quality, but it is clear that services in southeast Europe, in the final case study, do not meet modern standards. The declining quality of DB night trains in the final years of CNL, and

[96] Deutscher Bundestag, Stenografischer Bericht, 183. Sitzung, Berlin, Thursday 7 July 2016 (2016).

[97] It is not clear how the recent announcement by the transport ministry of "TEE 2.0" routes (see paragraph G.5), to be operated without a procurement process, is consistent with this policy.

[98] In Great Britain, some PSO services ("franchises") are profitable and others are loss-making, but all have specific service specifications. Transport Scotland's Caledonian Sleeper franchise is dedicated to night trains, and management cannot be distracted by, or focus on, other services.

complaints about the condition of Renfe's low-floor Talgo rolling stock (case studies 1 to 3) are likely to have led to poor experiences and less repeat business.

Success factors

C.227 Services between Northern Germany and Austria/Slovakia/Hungary (case study 8) are unique in the reinstatement of a service that had been cut. This suggests these success factors:

- minimising route-kilometres in the Member State with the highest costs (track access, locomotive hire, drivers and conductors);
- cost-sharing with other night trains on common sections of route;
- management (and political) belief in the product (in Austria)[99];
- indirect financial support through ÖBB's PSO-supported night train routes; and
- indirect financial support via PSO for the carrier train in Hungary and Slovakia.

C.228 The reintroduced night train in case study 8 is also thought to have enabled the reinstatement of a Berlin (DE)-Przemysl (PL) night train, consistent with PKP Intercity's requirement for carrier services to reduce the costs of non-PSO night train operations (case study 7).

C.229 We also note that all daily, year-round cross-border night train services are provided by incumbents or their daughter companies, with one exception, the RegioJet Prague (CZ)-Košice (SK) route, in operation since 2015. However, RegioJet's strategy from the outset has been to develop a portfolio of open access and PSO services, with the latter providing a secure basis to secure loans for investment in the former, as well as contributing to economies of scale and helping to cover overhead costs.

[99] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017) also identified that ÖBB was helped by the favourable geography of Austria, the lack of direct air services between Vienna and many night train destinations, the newly-built Vienna Hauptbahnhof, and a high affinity for rail.

D Long-distance cross-border rail demand since 2001

Introduction

D.1 The Technical Specification for this study required us to prepare a quantitative and qualitative (where needed to clarify the quantitative description) description of ridership of cross-border (night and long-distance trains) services in the EU, the United Kingdom, Norway and Switzerland between 2001 and 2019. The aim was that this would serve two purposes.

D.2 First, analysing the past: we were asked to analyse the extent to which the decline in night train services has been substituted by other rail services such as (cross-border) high-speed services and why, such as whether falling demand drove falling supply, or vice versa. This was to include an analysis of the explanatory factors identified by passenger representative bodies, such as price, quality, comfort, safety and journey times.

D.3 Second, projecting into the future: we were asked to combine this demand data with assumptions on the future rail network to estimate the number of potential passengers for night and long-distance train services identified for 2020, with a sensitivity analysis for 2030, taking into account the European Green Deal and, if relevant at the time of writing the report, any measures taken to recover from the coronavirus outbreak.

The use of demand and ridership data

D.4 Forecasting demand for passenger services, including cross-border rail services, ideally includes:

- a time series of past passenger demand at a disaggregate level;
- models of the factors which drive demand, which may include factors such as population, economic growth and household income;
- models of how passengers choose between different modes and travel options, which may include factors such as price, journey time, and the need to interchange; and
- predictions of the factors which drive demand and choice between modes and travel options.

D.5 In practice, only limited time series data is available on past passenger demand, as we discuss below. We first note the inherent limitations of passenger demand data based on ticket sales.

The limitations of ticket sales data

D.6 In principle, all rail passengers buy a ticket for their journey, and the railway undertakings who ultimately sell these tickets can use them to create a database of actual passenger journeys. In practice, the data generated, retained and made public suffer from several deficiencies relevant to any use of data on long-distance cross-border rail travel.

Ticket sales do not reveal passenger origins and destinations

D.7 First, ticket sales do not always reveal passengers' true origins and destinations.

D.8 Passengers may not buy end-to-end tickets: even where it is possible to buy a ticket between origin and destination stations in different states, passengers may not do so, because they wish to break their journey, because some parts of it are already covered by a season ticket, pass or discount, because it is cheaper or more flexible to buy separate tickets, or because they are unaware of, or see no benefit from, the option of buying a single end-to-end ticket. Where passengers travel on season tickets or multimodal tickets, aggregate passenger journeys and passenger-kilometres are often estimate from assumptions about the number and length of journeys made and the mode(s) used.

Ticket sales may not identify which train or trains passengers use

D.9 Second, ticket sales may not distinguish on which trains passengers travel, whether they use through trains or interchange en route, or even whether they travel on day trains, night trains, or overnight services using day train stock.

D.10 Even where tickets are linked to specific trains or types of train, ticket sales data are typically consolidated by railway undertakings to include only the revenue data required for management and accounting purposes, with detailed information on ticket origins and destinations discarded. In particular, data on tickets valid only a specific train may be impossible to interpret unless the relevant timetable data is also retained by the railway undertaking or infrastructure manager.

Ticket sales may not be collated into a usable database

D.11 Third, even where end-to-end tickets are available, ticket vendors or operators may not collate or report the details of what has been sold. One extreme example is Eurostar services through the Channel Tunnel between France and Great Britain. After the Oresund crossing between Denmark and Sweden, this is the second busiest cross-border rail route in Europe and, we estimate, carries one in seven of all cross-border rail passengers in the study area[100]. While the data report trips in various NUTS 2 zones on the continent, all the trip ends in Great Britain are reported as Inner London or Kent, irrespective of where passengers begin or end their journey.

D.12 High Speed 1, an infrastructure manager, told us that there is no national database in France or elsewhere of ticket sales or, as a result, of passenger volumes and revenue, in the form of an origin-destination matrix. In contrast, Great Britain maintains a database of station-to-station sales by period (Latest Earnings Networked Nationally Overnight (LENNON)) and has an industry-standard model for forecasting demand (MOIRA).

Ticket sales data may be confidential and withheld

D.13 Fourth, data published or reported to industry statistical bodies or to Eurostat may be deliberately limited, to preserve information considered by railway undertakings, or competent authorities specifying PSO services, as commercially confidential. Both Eurostat and the Commission's Rail Market Monitoring (RMMS), the definitive industry reports at the EU level, report that much data is confidential. In one extreme case, Eurostat data on

[100] This refers to passengers on Eurostar cross-border rail services. The Channel Tunnel also carries approximately the same number of passengers on vehicle-carrying shuttle trains.

passengers by speed of train over the period 2015-2019, all data except for Turkey is either zero or marked confidential[101].

Ticket sales data may reveal passenger numbers but not passenger-kilometres or revenue

D.14 Fifth, data on passenger numbers are generally less useful than data on passenger-kilometres, which can also be used to estimate potential revenue. For example, total passenger numbers reported on night trains are of little value without clarity on how many passengers included are travelling short distances in seated accommodation on "day" tickets in the evening or early morning.

D.15 We were aware of these challenges and therefore planned to supplement our analysis of published sources with a questionnaire to operators with the aim of obtaining as much information, and at as granular a level as possible, as can be obtained, as we discuss next.

Data from published sources

D.16 We noted above how international rail usage data published in national and European statistics can be incomplete and/or insufficiently disaggregate to assign to individual services or routes.

Eurostat data at NUTS 2 level

D.17 Eurostat publishes a limited dataset at the NUTS 2 level[102], subject to the following caveats:

- The information is published only every five years, currently for 2005, 2010 and 2015.
- It is based on point-to-point ticket sales which, as explained above, may not represent the ultimate origins and destinations of passengers using multiple tickets or rail passes.
- It is reported only by incumbent operators and excludes open access commercial services.

D.18 In summary, the data present an incomplete and often misleading picture, and must be treated with caution.

D.19 We downloaded and examined the Eurostat dataset which, as noted above, omits data which has been marked confidential. We also noted that the supporting documentation comments, inter alia, that "the use of tonnes or passengers entails a high risk of double counting, particularly in international transport".

D.20 In our initial examination we rapidly found data which appear inconsistent with definitive sources[103]. However, it is not be possible to validate or correct the Eurostat data, except if we observe that it contradicts data points from more reliable sources with which we are already

[101] Online data code RAIL_PA_SPEED at https://ec.europa.eu/eurostat/databrowser/view/rail_pa_speed/default/map?lang=en

[102] tran_r_rapa.xlxs. This dataset contains around 60,000 records, although many of them are empty or marked confidential, and most relate to domestic flows between NUTS 2 zones in the same state.

[103] For example, the Eurostat data reports over 15 million rail passengers between Paris and London in 2015, approximately double the number reported by Eurostar, Eurotunnel and in other sources. One possibility is that each passenger had been reported by the Member States at both ends of the Eurostar journey. This inconsistency is easy to identify because Eurostar passenger numbers are well-documented elsewhere, but this is not the case for less prominent flows.

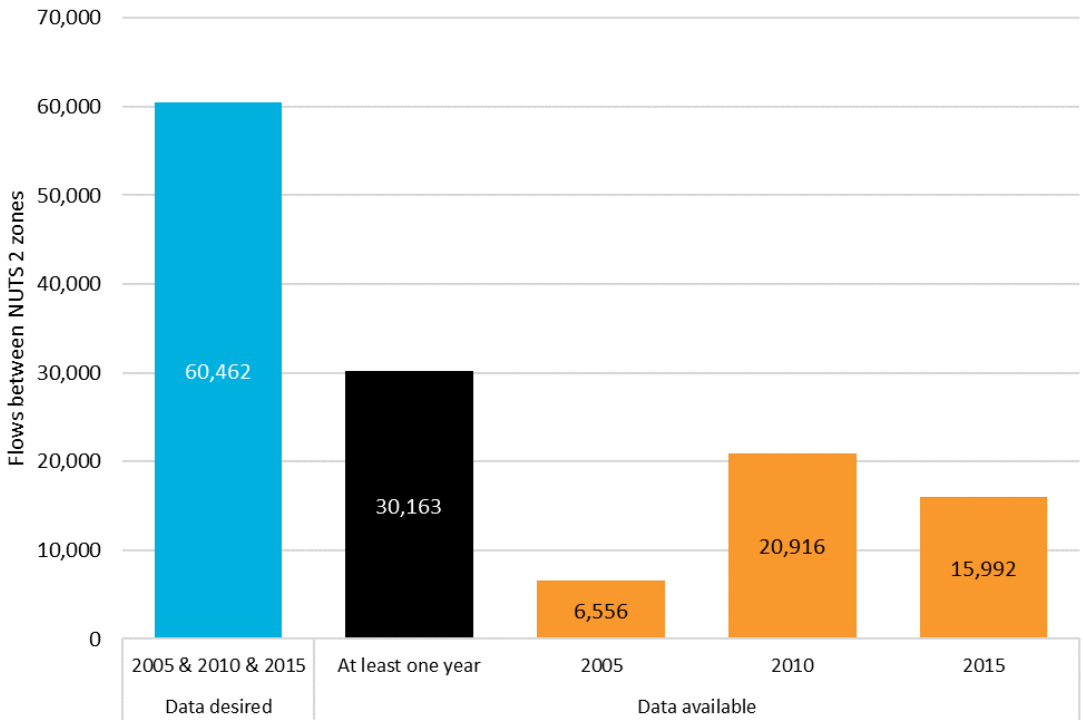
familiar. Nonetheless, we concluded that, despite its limitations, it is likely to be the only relatively comprehensive source of origin-destination data on passenger demand.

D.21 This means that data on passenger demand can only be disaggregated at the NUTS 2 level provided by Eurostat. We therefore extracted the Eurostat data:

- using the NUTS 2021 zoning system[104];
- for the EU-24 with mainland railways (excluding Ireland), plus Norway, Switzerland and Great Britain; and
- including both cross-border and, initially at least, domestic flows.

D.22 The NUTS 2 zoning creates a total of 60,462 potential cross-border and domestic zone-to-zone flows[105], but in practice data is only available for a small portion of them, as shown in the figure below.

Figure D.4: Available ticket sales data at NUTS 2 level in Eurostat, 2005-2015



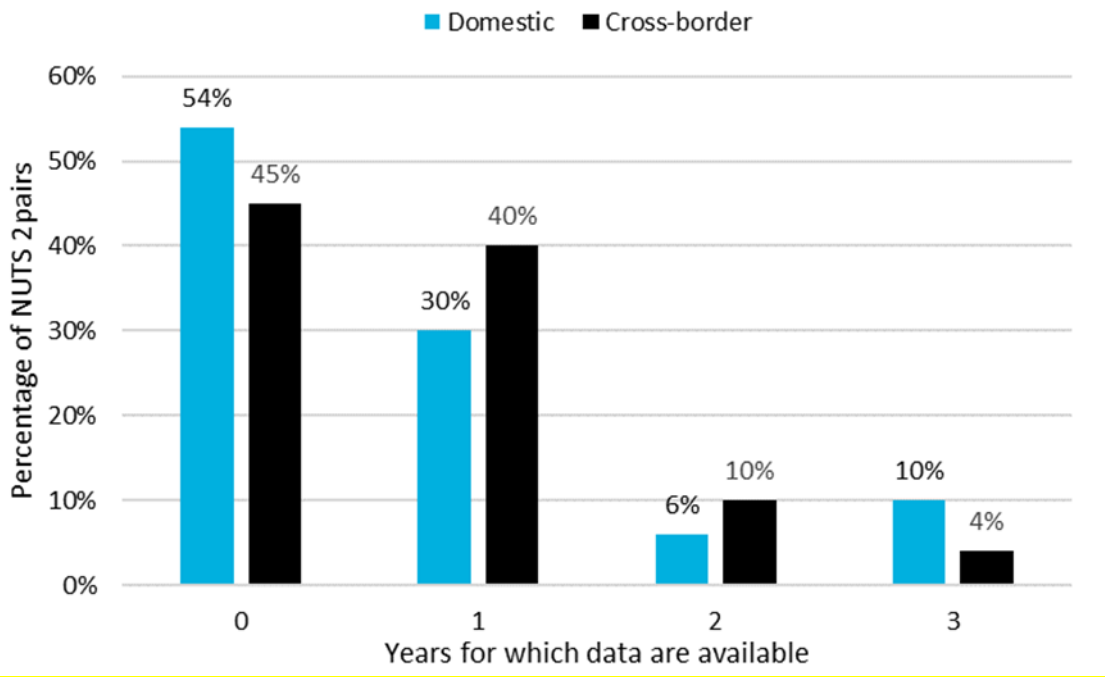
Source: Eurostat, Steer analysis.

D.23 The figure below shows the proportion of zone pairs for which data were available for no, one, two or three years.

[104] Version 1.4 of 25 September 2020, for use from 1 January 2021. This differs only slightly from the 2016 zoning, but the Eurostat dataset appears to have been based on the very different zoning from 2013.

[105] Rail travel would not be practicable between all these NUTS 2 zones, some of which are on islands with no rail network or no rail connection to other networks.

Figure D.5: Available ticket sales data at NUTS 2 level, domestic and cross-border, years



Source: Eurostat, Steer analysis.

D.24 The matrix holds data for at least one year for 55% of cross-border NUTS 2 pairs, compared with only 46% of domestic NUTS 2 pairs. However, for 40% of cross-border NUTS 2 pairs, data was only available for one year, with only:

- data for two years for 10% of cross-border NUTS 2 pairs; and
- data for three years for 4% of cross-border NUTS 2 pairs.

D.25 This means that at least some estimate of demand is available for 54% of NUTS 2 pairs, but evidence of trends in demand is only available for 14% of cross-border NUTS 2 pairs. This is a poor basis either to analyse the past or to project into the future.

D.26 The study Technical Specifications suggested that where data could not be found or reconstructed, proxy indicators could be used such as the proportion of total travel which is cross-border. However, while Eurostat and other data suggest that around 0.65% of all rail passenger journeys, and 5% of passenger-kilometres, are cross-border, this statistic provides no further evidence on either which borders they cross, or the crossing points, or their ultimate origins and destinations.

Evidence of demand to support a dedicated end-to-end rail service

D.27 We also considered the potential of each zone-to-zone flow to support any form of dedicated rail service. Of the 30,163 flows for which Eurostat had at least one year of data, only 3,494 had reported passenger numbers of more than 50,000 per annum, equivalent to around 70 passengers per day each way, which would require only a two-vehicle train but be sufficient to support 2-3 daily non-stop coach services. This compares with an average train load of at least 100 passengers on every train operator in Great Britain except on the subsidised regional

services of Wales, Scotland and the North of England[106]. We concluded that flows of less than 50,000 passengers per year were unlikely to be sufficient to support any dedicated long-distance cross-border rail service.

Data from stakeholders

D.28 The table below illustrates the data it would be desirable to collect and formed the basis for our questionnaire to operators on demand and, ideally, revenue, data.

Table D.1: Data collection: desirable demand data

Data requested	Minimum	Preferred	Desirable	Ideal
2001-2019 passengers	🔴	🟡	🟢	🟢
2001-2019 passengers by sleeping, couchette, seat	🔴	🟡	🟢	🟢
2001-2019 passengers by exact travel class (such as whether ensuite)		🟡	🟢	🟢
2001-2019 passenger-kilometres by exact travel class			🟢	🟢
2001-2019 passenger matrix by exact travel class by origin-destination				🟢

D.29 However, our experience from studies of night trains, rail security and for RMMS 6 is that disaggregate ridership data for long-distance services are considered by operators to be commercially sensitive and therefore rarely made available to third parties, as we noted above.

D.30 We asked infrastructure managers and railway undertakings for any data on passenger demand, at any level of disaggregation, which they were able and willing to make available to use. Only Trafikverket provided detailed passenger statistics and ticket revenue, for the night trains to the north of Sweden and Narvik.

Forecasting data to 2019 and 2030

D.31 The Technical Specifications envisaged that we would develop an understanding of both demand and supply in 2020. The COVID-19 pandemic has made both 2020 and 2021 atypical years, so we agreed with the Commission to focus on data for 2019. To assess future potential for long-distance cross-border services we therefore needed forecasts to 2019 and 2030.

D.32 We investigated the extent to which it was possible to use the limited data for a maximum of three years to develop forecasts.

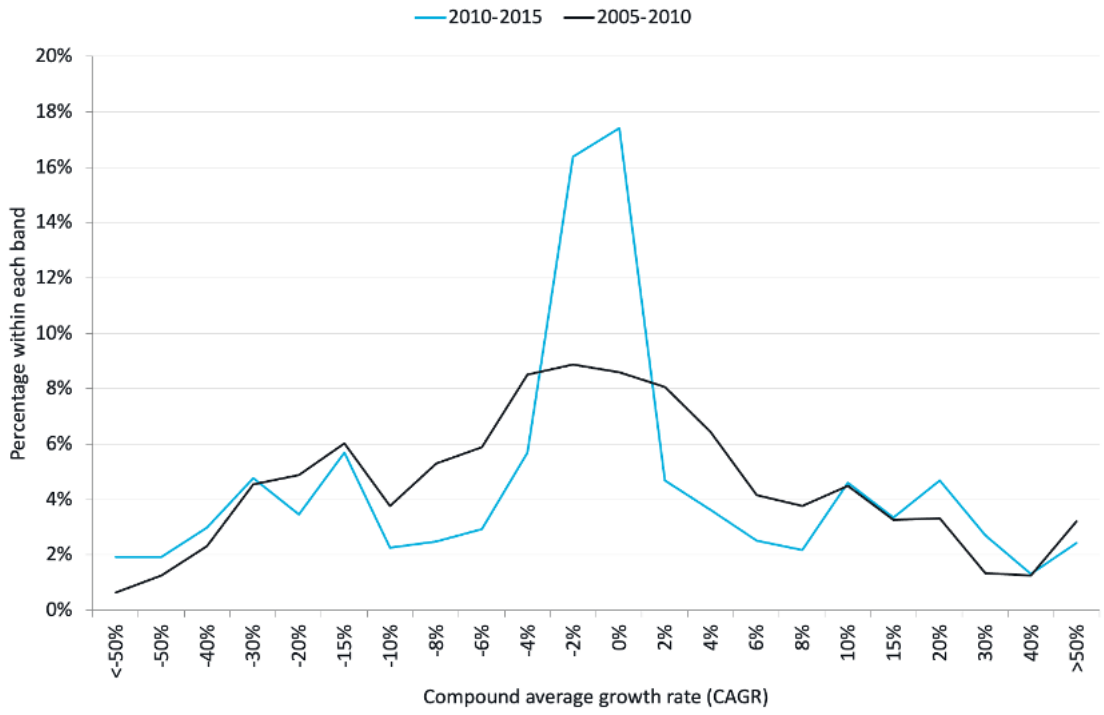
Evidence of growth before 2019

D.33 We noted above how the Eurostat demand data at NUTS 2 level only provided an estimate of demand for 54% of NUTS 2 pairs, and scope to estimate trends in demand for only 14% of cross-border NUTS 2 pairs.

D.34 We investigated the implied distribution of compound average growth rates (CAGR) by NUTS 2 pair for the 5-year periods 2005-2010 and 2010-2015. The figures below show these distributions.

[106] Table 37, passenger-kilometres per train-kilometre, from Office of Rail and Road data for 2015/16, Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

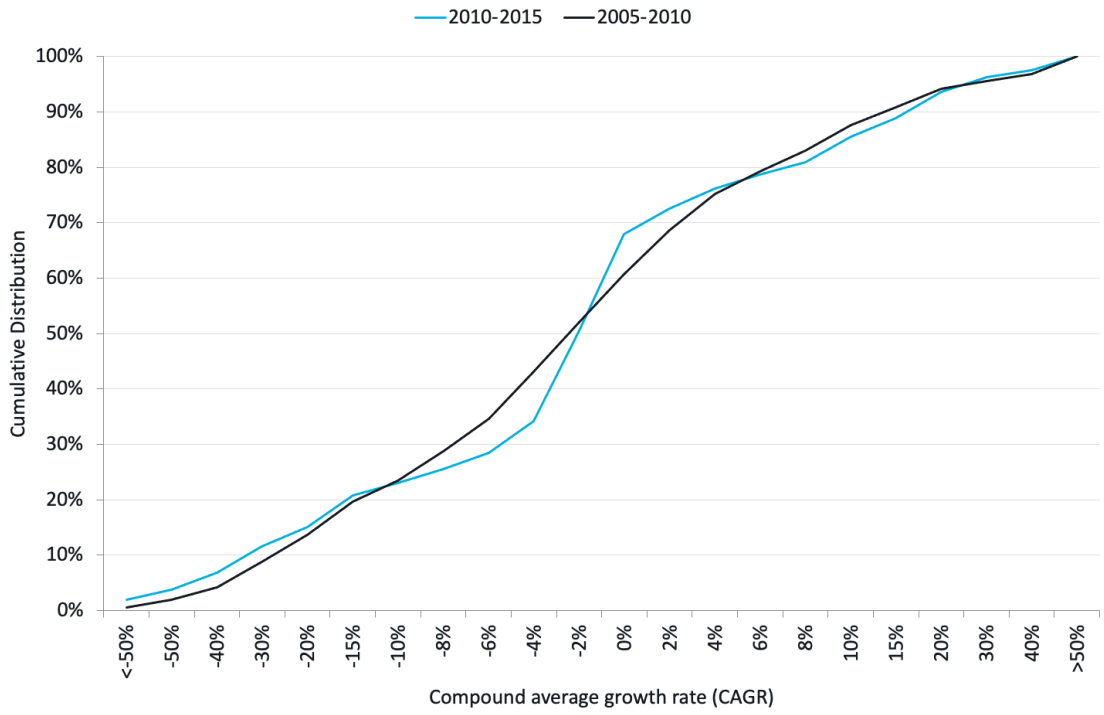
Figure D.6: Implied demand growth rates, 2005-2010 and 2010-2015



Source: Eurostat, Steer analysis.

D.35 The figure above shows the wide range of compound average growth rates for the NUTS 2 pairs where two or more data points are available. The extremes of the range include CAGRs of less than -50%, equivalent to a fall by a factor of 32 or more in five years, and more than +50%, equivalent to growth by factor of 7 or more in five years.

Figure D.7: Implied demand growth rates, 2005-2010 and 2010-2015, cumulative



Source: Eurostat, Steer analysis.

D.36 The figure above shows that only around 40% of NUTS 2 pairs have implied compound average growth in the more credible range of ±4% CAGR.

D.37 One possible explanation is that railway undertakings have allocated passengers to NUTS 2 ones using different approaches in different years. This means that any apparent growth rate may result from changes in the allocation method rather than changes in passenger demand[107].

D.38 Averaged across all flows, the compound average growth rates were broadly credible rates of:

- 2.1% for 2005-2010; and
- 1.8% for 2010-2015.

Approach to forecasting 2019 and 2030 demand

D.39 We estimated 2019 demand by applying the annual growth rates above and continuing with the growth rate of 1.8% from 2015 to 2019.

D.40 We estimated 2030 demand using EU-28 growth rates from the EU Reference Scenario 2016[108].

D.41 The table below summarises the growth rates used.

[107] Steer saw evidence of different analysis being used in different years while analysing the Member States' data returns for RMMS.

[108] Rail passenger transport activity in billion passenger-kilometres, from https://ec.europa.eu/energy/data-analysis/energy-modelling/eu-reference-scenario-2016_en

Table D.2: Growth rates used to estimate 2019 and 2030 demand from 2005, 2010 and 2015 demand

Period	Years	Source	Compound average growth rate
2005-2010	5	Steer analysis of Eurostat data	2.1%
2010-2015	5		1.8%
2015-2019	4		1.8%
2019-2020	1	EU Reference Scenario	1.7%
2020-2030	10		1.6%

Source: Eurostat, EU Reference Scenario, Steer analysis.

D.42 We note that, despite the different sources used, the overall result is a trend decline in assumed growth rate, from 2.1% from 2005 to 2010 to 1.6% from 2020 to 2030.

D.43 As noted above, the analysis is based entirely on passenger numbers. Changes in average trip length, or average revenue per passenger-kilometre, cannot be identified without consistent data on revenues or passenger-kilometres, ideally at the same level of disaggregation.

Conclusions

D.44 Data based on ticket sales can at best identify the origins and destinations of individual tickets, where these are defined. Where passengers, for whatever reason, use more than one ticket to make the same journey, the industry may have no means of identifying their initial origin and final destination.

D.45 In practice, only limited data is available on passenger journeys at the European level. Eurostat has partial data for 2005, 2010 and 2015 at NUTS 2 level, but there is no realistic prospect of using this to identify the number of passengers using each cross-border connection, their ultimate origins and destinations at NUTS 2 level, and whether they have travelled on direct or connecting services, all of which are necessary to assess the scope for new long-distance cross-border services.

D.46 Where data exists for two or more years, the pattern is not one of steady but small growth or decline. Our experience is that this may mean that passengers have been allocated to NUTS 2 zones using a different approach each year. This means that reported changes between 2005, 2010 and 2015 at NUTS 2 level are not a reliable basis to estimate subsequent or future growth.

D.47 Growth in the total passenger numbers reported in Eurostat is more credible and, when compared with the EU Reference Scenario, is consistent with a gradual decline in the average rate of growth from 2005 to 2030.

E Long-distance cross-border services in 2019

Introduction

E.1 The Technical Specifications required us to develop a matrix representing timetable 2019 connections by rail, air and coach between states covered by this study, and to use as a basis the matrix being developed in the framework of the study on high-speed rail[109], which had been commissioned by the Directorate General for Mobility and Transport in the first half of 2020.

E.2 Our proposed approach to each of the three modes is summarised in the table below.

Table E.1: Sources of data on rail demand in 2019 and rail, air and coach timetables

Mode	Proposed source	Geographical basis	Comments
Rail demand	Eurostat	NUTS 2 zones (130)	See Annex D
Rail	High Speed Rail study	Metropolitan areas (238)	Data include in-vehicle times but not interchange times.
Air	2019 OAG data by airport pair on flights, seats and actual flight times	Airports	Flight time is a small part of journey time between origin and destination, which also includes time in surface access and at airports.
Coach		Coach stops and terminals	Historic timetables are not collated, so 2019 timetables could not be recreated.

Source: Steer.

E.3 A key issue was the need to collate the data on a common geographical basis. As we describe below, the most appropriate approach was to use the NUTS 2 zoning already adopted for rail, but this meant that:

- For air, there was a need to identify, from airline service data, which airport or airports, if any, were most relevant to travel between two NUTS 2 zones.
- For coach, there is no repository of timetable data and it is no longer possible to identify what services operated in 2019. 2019 and 2020 services are atypical because of the service reductions made during the COVID-19 pandemic. We therefore estimated potential coach journey times between the metropolitan areas used in the High Speed Rail study.

[109] Evaluation of high-speed rail in Europe, Comprehensive literature review and potential of section upgrades for improving EU-connectivity, EBP for European Commission, Final Report (Draft), 27.11.2020 (2020)

Rail

E.4 We spoke to EBP, the authors of the High Speed Rail study, who had extracted rail journey times between stations which a Google API identified as providing the optimal access/egress points for a rail journey between each pair of metropolitan areas. Note that, in metropolitan areas served by multiple stations, the selected station might vary. EBP confirmed that the rail journey times extracted were in-vehicle times and did not include interchange times, which they pointed out might vary by time of day and from timetable to timetable.

Mapping metropolitan areas to NUTS 2 zones

E.5 We agreed with the Commission that, to maximise its usefulness, the matrix representing timetable connections should use the same zoning system, 2021 NUTS 2 zones, as the demand data from Eurostat's collation of rail ticket data for 2005, 2010 and 2015, described in greater detail in Annex D.

E.6 It was therefore necessary to identify which metropolitan areas should be taken as most representative of each NUTS 2 zone. The table below summarises our approach.

Table E.2: Rail levels of service: associating 238 metropolitan areas with 130 NUTS 2 zones

Number of metropolitan areas in NUTS 2 zone	Approach	Implication
0	Associate NUTS 2 zone with the nearest metropolitan area in the same state, using road distance from the largest settlement in the NUTS 2 zone to nearby metropolitan areas.	See text below (paragraph E.7).
1	Associate NUTS 2 zone with the metropolitan area.	Assumes that the rail journey time for the Metropolitan area is representative of the rail journey time for most travel.
2 or more	Associate NUTS 2 zone with the metropolitan area within it which has the largest population.	Rail travel times from smaller Metropolitan areas may not be representative, especially in large NUTS 2 zones.

Source: Steer analysis.

E.7 Where the NUTS 2 zone contained no metropolitan areas, we associated it with the NUTS 2 zone with the nearest metropolitan area within the same state. We identified the nearest metropolitan area using the distance by road between the largest settlement in the NUTS 2 zone and nearby metropolitan regions in the same state. We were aware that this approach would overlook large and potentially well-connected stations within the NUTS 2 zone, but we had no source of rail journey time to and from these stations consistent with the approach adopted by EBP.

E.8 Where the NUTS 2 zones contained two or more metropolitan areas, we associated it with the one with the largest population. We note that, in some cases, a smaller metropolitan area might generate a larger proportion of long-distance travel, such as where inbound leisure travel focused on areas with leisure destinations and hotels, rather than metropolitan areas with high population.

Air

E.9 We used OAG[110] Traffic Analyser to extract data for calendar year 2019 on the number of flights, seating capacity and flying time for flights between EU, Norwegian, Swiss and United Kingdom airports.

Mapping airports to NUTS 2 zones

E.10 Many airports are outside the city they serve and hence also in a different NUTS 2 zone. We used the IATA system of airport codes to identify airports to the cities and hence to NUTS 2 zones.

E.11 One example is Paris, where the PAR airport code includes CDG (Charles de Gaulle), ORY (Paris Orly) and LBG (Paris–Le Bourget Airport).

E.12 A second, and extreme example is London, where the LON airport code represents seven airports in six NUTS 2 zones:

- London has five NUTS 2 zones: three contain Biggin Hill, London City and Heathrow.
- The East of England has three NUTS 2 zones: two contain Luton, Southend and Stansted.
- The South East has four NUTS 2 zones: one contains Gatwick.

E.13 We assumed that all these airports were associated with the metropolitan areas of Paris and London respectively.

E.14 We checked several examples and concluded that the use of the IATA code appeared to reflect the likely origin and destination of the largest concentration of passengers using the airport.

Estimated air generalised journey time

E.15 OAG Traffic Analyser reports average actual flight times between each airport pair. We calculated the weighted average flight time of flights between all airports we had associated with the same NUTS 2 zones.

E.16 We added 150 minutes to the weighted average flight time as a proxy for the typical time required to travel from the origin to the departure airport and check in, pass through security, board and taxi, and to deplane, claim baggage and travel from the arrival airport to the final destination. We did not make any additional adjustments to take into account the need for passport controls on flights between the Common Travel Area (CTA, Ireland and the United Kingdom) and the Schengen Area (the remainder of the study area).

Airline load factors and estimated passenger numbers

E.17 We also combined the OAG Traffic Analyser data on airline seat numbers by airport pair with assumptions on airline load factors to estimate the number of airline passenger carried between each airport pair. We used this data to estimate air passenger demand for use:

- in Task 3.1.2 (Annex C), to examine the causes of decline in night train services;
- in Task 3.1.4 (Annex G), to assess the scope for long-distance cross-border services; and
- in Task 3.1.10 (Annex I), to convert between airline costs per seat and per passenger.

[110] OAG is a brand name used by the OAG Aviation Group.

Coach

E.18 In the absence of any means of recreating the 2019 coach timetables, we estimated coach levels of service by estimating the journey time by a coach service between each pair of NUTS 2 zones.

Road journey time data

E.19 For each NUTS 2 zone pair, we used Google API to extract drive times, based on historic averages, between the coordinates identified by EBP as the locations of the railway stations in the metropolitan areas we had associated with the NUTS 2 zones. We made no attempt to assess how driving times might vary by time of day and week.

Coach journey time data

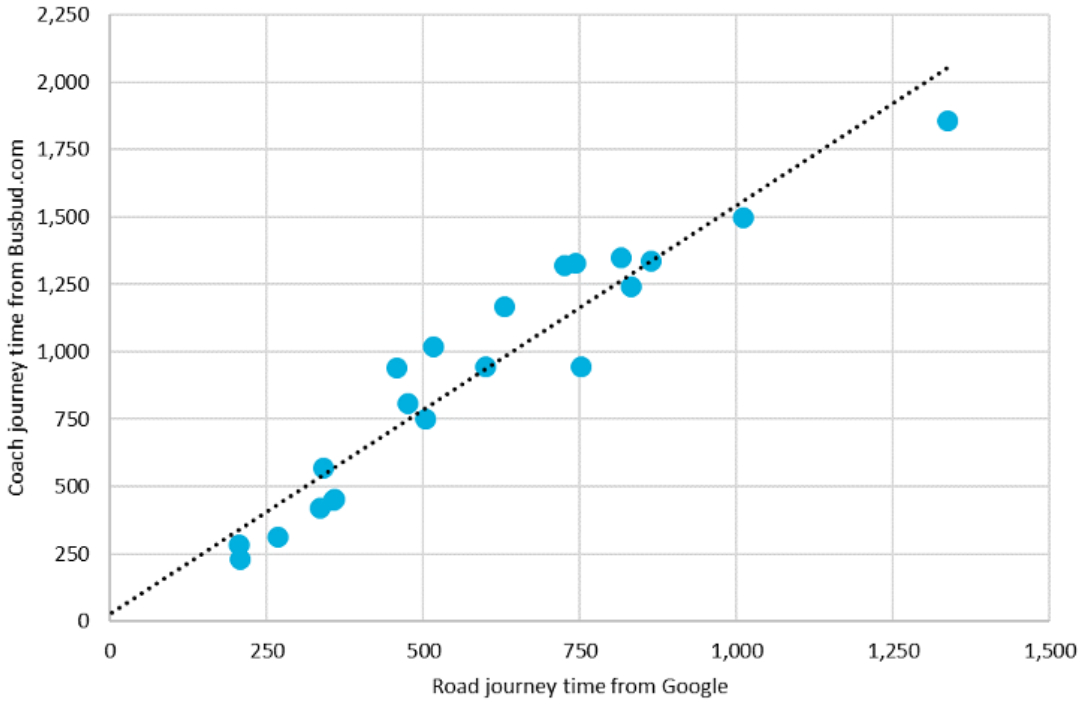
E.20 We used the Busbud.com, a large bus and coach travel booking website, to identify journey times by coach for a sample of journeys, within the study area, on journeys from 200 to nearly 1,400 kilometres[111]. Few cross-border services were operating, presumably as a result of the restrictions associated with the COVID-19 pandemic. We made 53 searches, of which only 22 returned a schedule, one of which we discarded as implausible. We cross-checked some of these times to other websites and confirmed that they were broadly consistent.

Study area coach journey time estimation

E.21 We carried out a regression of the coach journeys times from Busbud.com against the drive times extracted from the Google API for each of the 21 journeys. Linear regression resulted in a slope close to 1.5 and an intercept close to zero, as shown below.

[111] The search was carried out on 7 April 2021 for travel on 9 April 2021.

Figure E.8: Estimation of potential coach journey times from road journey times



Source: Google, Busbud.com, Steer analysis.

E.22 We therefore assumed that the potential coach journey time between any pair of metropolitan areas, and hence any pair of NUTS 2 zones, was 1.5 times the extracted average drive time. In practice, it would be simple to assume a different slope and intercept, or to insert actual scheduled times, if it was considered that this would result in a material increase in accuracy.

Coach frequency

E.23 Note that we found no source of coach services or frequency in 2019 or even any evidence of which metropolitan areas were advertised as connected by direct or indirect coach services in 2019. The matrix of estimates of potential coach journey time between NUTS 2 zones therefore overestimates the level of service which would have been available during 2019.

Summary

E.24 The resulting matrices are stored in an Excel spreadsheet, based on 2021 NUTS 2 zoning.

E.25 Note the following limitations to the data.

E.26 Rail journey times are limited to in-vehicle time and included no details of the number of interchanges or connecting times. Note that interchange times might vary by time of day and from timetable to timetable.

E.27 Air flight times are based on detailed data on average flight time by airport pair. However, in the absence of detailed surface access models, we added a standard additional time of 150 minutes to the flight time to represent the additional time spend travelling from origin to destination.

E.28 Coach services and journey times are not available for 2019 and the current services may be highly atypical because of the COVID-19 pandemic. The coach data is therefore based on an estimate of the journey time between each NUTS 2 zone pair if they were connected by a direct coach service.

F The commercial approaches of railway undertakings

Introduction

F.1 The Commission required us to assess the commercial approach of railway undertakings to the provision of services in long-distance cross-border and night trains markets, in particular by incumbent operators and new entrants, and the possibility of developed low-cost services as used in aviation.

F.2 This Annex focuses on models for commercial services, as distinct from models for Public Service Obligation (PSO) services, which we discuss in Annex O. The key distinction is that PSO services require the railway undertaking to provide services specified by a competent authority, whereas commercial services are designed by, and provided at the discretion of, the railway undertaking, subject to guidance or instructions given by its shareholders.

F.3 In this Annex we describe:

- models with a comprehensive service offer;
- niche models, other than low cost;
- existing low-cost rail operators;
- theoretical low-cost models; and
- the relative attractiveness of cross-border and domestic markets.

Models with a comprehensive service offer

F.4 Incumbent railway undertakings, the vast majority of which are, or were formerly, state-owned, typically:

- operate an extensive network of frequent long-distance services;
- have access to a wide range of resources, such as rolling stock, staff, information and booking systems, workshops, planning and management capacity; and
- have expensive experience of the markets in which they operate.

F.5 Where there is no, or only weak, competition from either other railway undertakings or other modes, incumbent operators of long-distance services may not have maximised the efficiency of their services, but they do benefit from economies of scale, and synergies between services, including the ability to provide passengers with connecting services within their own network.

F.6 The incentives on incumbents to develop new services, or to improve loss-making services, are often limited, particularly where to do so requires additional expenditure. The behaviour of incumbent railway undertakings with a comprehensive service offer therefore often depends on the approach of their shareholders to allowing borrowing to develop and test new services.

Niche models, other than low cost

F.7 A new entrant commercial railway undertaking may be a start-up business, or may be an existing PSO contractor which has the skills and local knowledge to enter the commercial

market. Several new entrants combine a mix of PSO contracts and commercial services: current examples include RegioJet, based in Czechia, and MTR's operations in Sweden.

F.8 New entrant railway undertakings are typically small, and adopt one of several niche models, including:

- classic day trains;
- night trains;
- premium services;
- event and charter services; and
- low-cost services, which we discuss separately below.

F.9 We discuss next the range of niches in which new entrants have been able to operate.

Classic day trains

F.10 New entrants offering classic day train services often begin small, in some cases with a single train set. This normally limits them, initially at least, to operating on a single line, sometimes seasonally or on only some days of the week. Where possible, they try to focus services on gaps in existing services or when demand is highest.

F.11 Given the generally large networks of relatively frequent services operated by incumbent railway undertakings, it can be difficult for new entrants to find a workable business model. The two principal reasons are that:

- Unlike an incumbent, they cannot offer passengers onward connections to other points, and can only attract passengers travelling between the stations on their route they serve.
- It is rarely possible to obtain capacity to operate at a frequency comparable to the incumbent. Even if this capacity can be obtained, it is a potentially high-risk strategy to increase total capacity rapidly, with the risk that the sudden increase in capacity cannot be filled.

F.12 In practice, new entrants have devised business models to address these obstacles. We next describe three different approaches.

Classic new entry in Great Britain

F.13 We describe in Annex N how Great Britain's chosen model of fares and ticketing includes the availability of through fares, between any two stations, which are interavailable and accepted by all operators. In this model, a new entrant need not provide connections to carry passengers connecting onto other services, and need not even set any fares, because it can if it wishes rely on its share of the ticket revenue from passengers who use its services for all or part of their journey.

F.14 However, the approach of the regulatory body, the Office of Rail and Road (ORR), to the protection of the economic equilibrium of PSO services means that new entrants cannot normally compete directly with PSO operators in their main markets. The niche adopted by the new entrants to date has therefore been to focus on direct connections to London which are not provided by PSO operators. The current examples, all on the East Coast Main Line, are:

- Hull Trains services to/from Hull, joining the main line at Doncaster.
- Grand Central services to/from Bradford, also joining the main line at Doncaster.
- Grand Central services to/from Sunderland, joining the main line at Northallerton.

F.15 The entrants provide sufficient direct services from Hull, Bradford and Sunderland to gain a high share of passengers travelling between them and London, but do not need to compete on frequency with the PSO operator on the main line. Both entered the market with secondhand stock but, with its business model established, from December 2019 Hull Trains upgraded to new stock similar to that used by the incumbent.

Classic new entry elsewhere

F.16 Other than in Great Britain, new entrants do not normally have the opportunity to earn a share of fares paid for connecting journeys, which makes it harder to identify viable niches in which to operate. Examples of the main approaches include:

- Leo Express targeted routes with relatively low service frequency, where a new entrant can earn a relatively large share of the market, particularly by targeting large gaps in the service of the incumbent.
- Hamburg-Köln-Express (HKX, subsequently FlixTrain) targeted routes with a perceived low service quality.

F.17 In each case, a key part of the commercial proposition has been offering lower fares than those of the incumbent.

High-speed new entry in Italy

F.18 An exception to the approach of entry on a relatively small scale was used in Italy, where considerable spare capacity was available on the main north-south high-speed line and its east-west continuation along the Po valley. New entrant Nuovo Trasporto Viaggiatori (NTV), founded in 2006, used an initial investment of €967 million to enter operations in 2012 with a fleet of 25 high-speed trains, providing frequencies comparable to those of incumbent Trenitalia between the main cities on the line.

F.19 While NTV has now been successfully operating its Italo services for several years, we note that this was a relatively high-risk strategy, particularly because of the need to buy a complete fleet of high-speed trains, rather than to lease a small number of secondhand vehicles.

Night trains

F.20 A second potential niche is the operation of night trains. Snälltåget has operated seasonal night train services in Sweden and between Sweden and Germany and, as we describe in Annex G, in early 2021 other operators announced proposals to introduce night train services. Our analysis of the operating costs of various services in Annexes I and J highlights several issues associated with operating a night train service:

- The costs of night train rolling stock[112] are higher than those of ordinary seated stock, which can also be used to provide overnight services.
- The costs of night train crew are higher, for reasons such as the need to carry a second driver to comply with safety rules, and the minimum supervisory staff required for safety when passengers are sleeping.

[112] We define this to mean "rail vehicles dedicated to, or reconfigured for, overnight travel". In practice, the principal types of night train rolling stock are couchette (Liegewagen) and sleeping car (Schlafwagen), although other types of accommodation have been used.

- The product range is often more complex than a choice between First Class and Second Class, requiring specialised and more expensive sales systems to describe the various products.
- The cost of high-quality services is higher, including the need to provide bedlinen and breakfast.

F.21 In practice, night trains can typically charge fares similar to day fares for overnight travel in seated accommodation, and successively higher fares for spaces in couchettes, sleeping compartments, and sleeping compartments with en-suite facilities.

F.22 Night trains can only operate where they offer passengers sufficient time to sleep, making it difficult to attract passengers at intermediate stations served in the middle of the night. They ideally offer a minimum journey times of 7-8 hours, between cities connected by a high passenger flow, with no or limited fast day services, and limited or indirect air connections. This means that night trains are a relatively small niche compared with day trains, and the typical new entrant offers at most a single train pair each night.

Premium services

F.23 In principle, a niche may exist of offering premium services, with a single class of high standard accommodation. This approach was tried by Deutsche Bundesbahn Intercity trains from 1971 to 1979 and Deutsche Bahn Metropolitan services from 1999 to 2001 but, in both cases, passenger demand proved too low to support a sustainable business[113]. In the case of the Deutsche Bahn Metropolitan service, one issue may have been that any passengers requiring connections had to complete their journey on standard services, which did not offer the same quality and onto which no through fares were available. Many potential passengers may instead have chosen to use the standard intercity and connecting services, on which through fares were available.

F.24 We discussed this niche with stakeholders, but concluded that it seems unlikely to be a viable niche in long-distance cross-border rail transport.

Event and charter services

F.25 Finally, a small niche exists for companies which specialise in providing rail charters for events and pilgrimages. However, these services are provided on demand at the request of, and paid for by, businesses or groups, rather than being publicised and sold direct to the public.

F.26 We conclude that, while a niche for such services may continue to exist, it is not of direct relevance to the provision of long-distance cross-border collective transport services by rail.

Existing low-cost rail operators

F.27 The Commission asked us to examine whether the introduction and expansion of low-cost airlines could be adapted to rail in the form of low-cost rail services.

[113] Premium-only airline services have had limited success. After services on the most conspicuous example, Concorde, ended in 2003, several operators tried to introduce premium-only transatlantic services, but these could not offer the frequency or connections of the established ("legacy") carriers. From 2009, British Airways introduced a daily service between New York and London City airport, operated by a 32-seat A318 with a special Club World London City seat, reusing Concorde's flight numbers BA001 and BA002. This service was withdrawn in 2020.

F.28 In the past, high-speed services were typically provided as premium services, with higher fares than other long-distance rail services. However, several low-cost rail operators have since emerged, ostensibly to compete with these high-speed services, but often as a sub-brand of incumbent operators.

F.29 Incumbent operators do not normally publish separate accounts for low-cost subsidiaries, but our analysis suggests that high fixed costs, in particular rolling stock and the high infrastructure charges on high-speed lines, mean that most of these services may be loss-making or marginal. The rationale for their introduction appears to have been less to generate profits than to expand into untapped markets to consolidate the incumbents' positions ahead of the fourth railway package.

F.30 We briefly describe three low-cost rail operators:

- Italo (Italy) from 2006;
- OUIGO (France) from 2013; and
- Avlo (Spain) from 2019.

Italo (Italy) from 2006

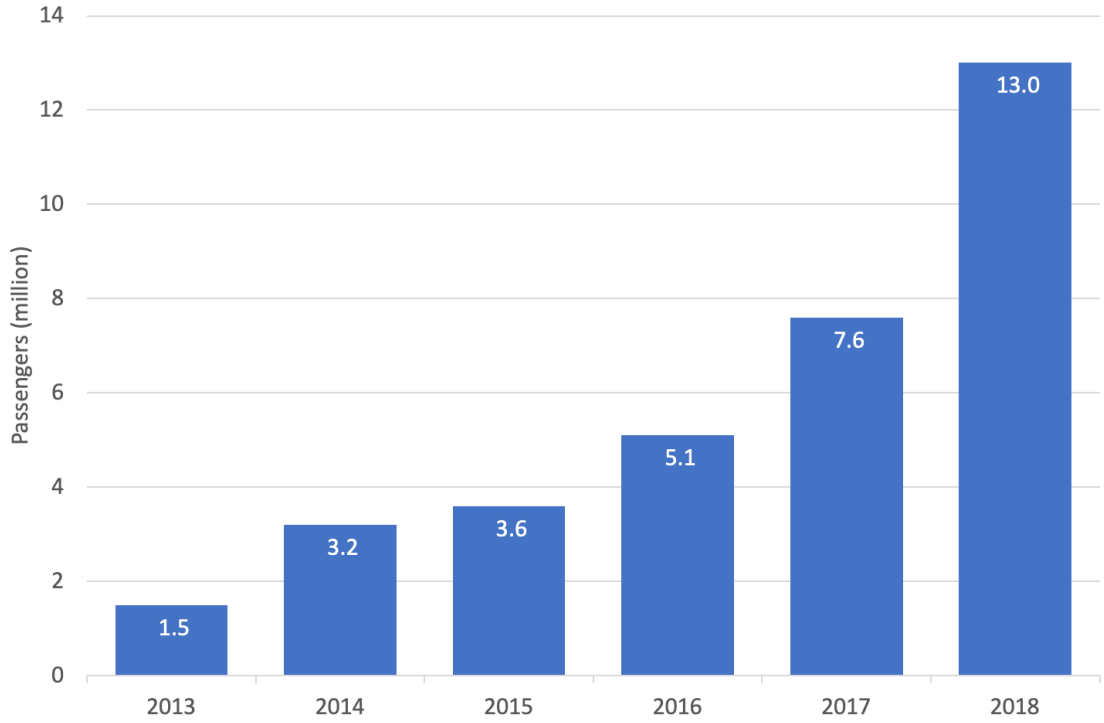
F.31 New entrant Nuovo Trasporto Viaggiatori (NTV), which was founded in 2006 and began operations in 2012, was the first open access operator in Europe to provide an intensive service, competing with incumbent high-speed operator Trenitalia under the Italo brand.

F.32 While Italo is not strictly a low-cost operator, it was not profitable until track access charges were reduced by the Italian regulator, following substantial pressures from Italo. Low-cost high-speed operation may not be profitable at the levels of infrastructure charges currently charged on some high-speed lines, which we discuss in Annex K.

OUIGO (France) from 2013

F.33 OUIGO began operations in April 2013 as a sub-brand of the classic SNCF high-speed services, which were subsequently rebranded InOui. The business had grown to 13 million passengers in 2018, as shown below.

Figure F.9: OUIGO passengers, 2013-2018



Source: Les Echos[114].

F.34 OUIGO's business model was based on several features of low-cost airlines, which we also discuss further below:

- OUIGO uses TGV Duplex double-deck trains with no buffet car or First Class. Total capacity is up to 1,200 passengers, 20% more than on normal TGV Duplex trains.
- OUIGO used stations outside the main city centres, such as Marne-la-Vallée, at which station charges are significantly lower, instead of Paris Gare de Lyon. This policy has subsequently been changed, with a move to city centre stations, apparently to gain a higher market share.
- OUIGO has online-only ticket sales, to minimise retail costs, and luggage restrictions.

F.35 OUIGO offers low fares, such as €19 one-way between Paris Gare de Lyon and Lyon Part Dieu, departing at 18:30 and arriving at 20:26. Our analysis suggests that such fares are unlikely to be strictly profitable at current levels of costs.

F.36 On 10 May 2021, SNCF began five daily OUIGO services between Madrid and Barcelona.

Avlo (Spain) from 2019

F.37 In 2019, ADIF, Spain's infrastructure manager, openly tendered three packages of train paths to operate high-speed services on three corridors from Madrid to Barcelona, Sevilla/Málaga and Valencia/Alicante. Three operators were successful:

- Renfe won the largest package.

[114] https://www.lesechos.fr/industrie-services/tourisme-transport/la-sncf-celebre-les-5-ans-de-ouigo-piece-maitresse-du-renouveau-du-tgv-138523

- ILSA-Trenitalia won the medium package.
- SNCF won the smallest package. SNCF claimed that they would bring the OUIGO model to Spain, where they would plan to offer low fare/low-cost high-speed services.

F.38 Renfe had been working on a low-cost high-speed business model, known as Avlo, which was finalised and announced in 2020. The principles of Avlo are similar to those of OUIGO:

- Avlo has no First Class, a vending machine instead of a buffet car, and all sales are online.
- Avlo trains to offer 20% more seats than existing trains.
- Avlo will have low fares, starting as low as €5 to capture market share before the other two competitors.

F.39 Renfe plans to run Avlo services in parallel with normal AVE services, and its business plan says that Avlo will generate 20% of revenues within ten years from their introduction.

F.40 Avlo's service introduction was delayed by the COVID-19 pandemic, but its first trains ran on 23 June 2021.

Theoretical low-cost models

F.41 The table below summarises some of the techniques used to create low-cost airlines and our indicative RAG (Red-Amber-Green) assessment of whether they are transferrable to rail.

Table F.1: Approaches used by low-cost airlines

Approach	Comments	RAG		
		🔴	🟡	🟢
Use cheaper terminal infrastructure	• Low-cost airlines can seek airports and terminals with lower charges and minimise fees for airbridges and other services. • Rail infrastructure charges are dominated by en-route charges, which cannot readily be avoided.	🔴		
Large, standardised fleet	• Low-cost airlines may have over 100 identical aircraft. • Rail rolling stock has become less standardised, and is often designed for a specific market, with local needs taking precedence over interoperability.		🟡	
Faster turnarounds	• Low-cost airlines may turn round in less than 30 minutes. • Urban and suburban trains often have no catering or toilets and are cleaned en route, allowing rapid turnaround after each journey. • Long-distance day trains must allow enough time for cleaning and rubbish removal, replenishing catering supplies, and reliability. • Night trains have no opportunity to reduce turnaround times.	🔴		
Longer operating hours	• Low-cost airlines can average eight short flights over a working day of up to 18 hours, several hours of which are spent on the ground. • Day trains have longer journey times, making it hard to schedule them to fill a long day efficiently, as very early departures and late arrivals may not be attractive, but they can continue as overnight services. • Night trains can operate long hours, but gradually become day trains.		🟡	
Less busy airports	• Low-cost airlines use less busy airports, minimising delay. • Cross-border trains are likely to need to serve congested city centre stations to be attractive to passengers. • Many cities have no suitable alternative stations.	🔴		

Approach	Comments	RAG		
		●	●	●
Single class of accommodation	• Low-cost airlines offer a single (and basic) class with bookable extras. • Day trains have been introduced with single-class stock with bookable extras, which can also be used overnight as seated accommodation. • Night trains often have multiple classes of high-quality accommodation to attract passengers in a competitive market.		●	
High load factor	• Low-cost airlines often achieve end-to-end load factors of 80-90%. • Trains may be harder to fill consistently over the whole route.	●		
Zero-based business model	• Airline start-ups design their services "bottom-up" to develop an efficient operation and business model. • New entrant rail operators have the same opportunity to work "bottom-up".		●	
Lower pay	• Airline start-ups typically recruit staff on terms and conditions with lower pay and/or greater flexibility. • New entrant rail operators have the same opportunity to design staff terms and conditions, depending on the national labour market.		●	
Modular base structure with all vehicles and crew at a single base each night	• Low-cost airlines operate from small bases to which each aircraft returns every 24 hours. • Day trains can operate with staff and service facilities at a single fixed base from which one or two round trips are possible every 24 hours, with no need to use remote facilities and all staff at home every night. • Night trains cannot return to base every 24 hours and staff must be away overnight.		●	
Flexibility to make frequent service changes	• Some low-cost airlines have a policy of frequent review, closing the worst-performing routes and bases and trying new routes and bases elsewhere. Pilots can fly almost any route without special training. • For railway undertakings, in contrast, capacity for regular train paths must be applied for a year or more ahead, and suitable maintenance and service facilities must also be found. Drivers must be trained on the routes they will use, including diversionary routes.	●		

Source: Steer analysis.

F.42 We discuss these elements in turn below.

Cheaper terminal infrastructure

F.43 We describe in Annex I how, on short flights, airport charges can be the largest single element of airline costs, and compare the costs of Brussels Charleroi, Vienna and London Heathrow. Low-cost airlines can seek airports and terminals with lower charges and minimise fees for airbridges and other services.

F.44 For railway undertakings, it is possible to save station access charges by using less expensive stations[115], but railway infrastructure charges are normally dominated by en-route charges, which cannot readily be avoided[116]. In addition, while some passengers will find a low-cost station convenient, others will be willing to pay more for the accessibility of, and connections

[115] For instance, a long-distance train is charged €49.99 per call at Berlin Hauptbahnhof but only €11.96 at Berlin Ostkreuz. Source: Station price list of DB Station&Service AG 2021.

[116] Depending on the type of path used, a long-distance train between Berlin and Frankfurt is charged from €1,500 to €4,400. Source: Track access charges tool, DB Netz AG 2021.

to and from, a larger or more central station. We noted in paragraph F.34 that OUIGO has moved to city centre stations.

Large, standardised fleet

F.45 Low-cost airlines may use a large, standardised fleet, with 100 or identical aircraft, to avoid complexity and to save unit and maintenance costs. While in principle this strategy could be adopted in rail, we note that:

- Large homogenous fleets can only be justified where they will serve either large homogeneous markets or multiple small and similar markets[117].
- Only incumbent railway undertakings normally operate on sufficient scale to use a large fleet. The largest niche operator described above, NTV, began with only 25 train sets.
- Only incumbent railway undertakings normally have the size and financial capacity to procure large fleets.

Faster turnarounds

F.46 Low-cost airlines may reduce the turnaround times to less than 30 minutes at uncongested airports where this is achievable. Except at airports where runway capacity is constrained, aircraft can depart slightly late without affecting their journey time, and any cumulative delay by the end of the working day can be recovered overnight.

F.47 Day trains, on the other hand, must often allow sufficient time for ensure reliability and for activity such as toilet emptying and replenishment of water. A train missing its timetabled departure time is likely to be delayed further en route, so to ensure punctual departure it is normally necessary to provide recovery time at the end of every journey, rather than once at the end of the day.

F.48 Night trains have little or no scope to improve efficiency by reducing turnaround times, as they complete a round trip only every two days.

Longer operating hours

F.49 Low-cost airlines generally use their aircraft more intensively than the legacy carriers. One pattern involves each aircraft being operated by two crews each day, operating an early and a late shift[118].

F.50 For French low-cost rail operator OUIGO, the average daily operation time of each train set in 2016 was 13 hours, double that of the operating time of the standard TGV trains[119]. This increased utilisation has been achieved by carrying out maintenance work overnight. However, other railway undertakings already use their rolling stock intensively, with maintenance overnight or at weekends, and may have little scope for more intensive working.

[117] One recent example was the procurement of a fleet of 1140 vehicles, in 115 trains (60 eight-car and 55 twelve-car), for the cross-London Thameslink suburban line operated under a PSO.

[118] Some leisure and charter carriers have operated a third shift overnight, for example on a long route between western Europe and Greece or Turkey, although this can mean that it is not always possible for delays incurred on one day to be recovered overnight.

[119] La SNCF va quintupler son offre de TGV low cost, Lionel Steinman, Les Echos, 23 March 2017 **https://www.lesechos.fr/2017/03/la-sncf-va-quintupler-son-offre-de-tgv-low-cost-169747**.

F.51 It is difficult to extend the working hours of night trains, although in some cases their route can be extended to serve additional points at the ends of their route, within an overall window from around 16:00 to 10:00.

Less busy airports

F.52 The use of less busy airports may be an option for airlines in order to minimise delays and reduce costs.

F.53 Railway undertakings face different issues. Delays arise mainly during the journey, rather than at the ends of the route, and a railway undertaking will only be offered capacity if it is expected that it will be able to operate a reliable and punctual service. The difficulty arises when no more services can be handled at constraints, such as at major stations during peak hours. Long-distance trains need sufficient time for the passengers to board and leave the trains, and passengers on night trains may expect the opportunity to board and go to bed before departure and "lie in" on arrival. This may make it necessary to use less busy stations, but this is unlikely to result in either time savings or material cost reductions[120].

Single class of accommodation

F.54 Low-cost airlines offer a single (and basic) class of accommodation.

F.55 Two day train services still in operation and apparently commercially viable use single-class stock with bookable extras[121]. However, the financial viability of this approach may be specific to particular markets. In Germany, for instance, single-class low-cost railway services now face strong competition from low-cost airlines, long-distance coaches and DB Intercity night trains. Stakeholders told us that rail passengers in some markets are reluctant to accept a lower standard of accommodation, and prefer to pay extra for the levels of comfort provided by the incumbent[122].

F.56 For night trains, other than trains consisting only of seating accommodation, most operators provide a range of types of accommodation, at a wide range of prices, so as to be able to attract different target groups.

F.57 Related to the provision of a single class of accommodation is the option to introduce a higher seating density, with less space, and hence less cost, per passenger. Some railway undertakings have used the same strategy, and not only in the low-cost sector, where passengers are willing to accept the loss of space. For instance, Deutsche Bahn has reduced

[120] It was reported in May 2021 that, from 2030, all international trains calling in Amsterdam will serve Amsterdam-Zuid instead of Amsterdam-Central, to free platforms for domestic trains. Vanaf 2030 internationale trein centraal bij maken dienstregeling, Treinreiziger.nl, 21 May 2021 (2021)

[121] Izy and OUIGO, see discussion from paragraph F.30.

[122] Australia has only two main airlines in its domestic market. Relatively new entrant domestic airline Virgin Australia typically provides a more basic service, at lower fares, than incumbent QANTAS. Most passengers are familiar with the level of service on both airlines, and many do not buy solely on price. The outcome is that QANTAS can persuade a large proportion of passengers to pay its higher fares and Virgin Australia can only persuade a smaller proportion of passengers to accept its lower quality.

the space available for each passenger by 23%[123], although the change has been the subject of many passenger complaints[124]. This approach is not practicable for night trains.

High load factor

F.58 Low-cost airlines often achieve end-to-end load factors of 80-90%. Extensive yield management is used to ensure that almost all seats are sold, even if this means starting with very low fares for those booking far ahead.

F.59 For rail travel, attitudes to yield management vary widely:

- In states such as France, Sweden and the United Kingdom, yield management is widely accepted in rail and other modes, permitting railway undertakings to make many tickets train-specific or even to have reservation-only trains.
- In states such as Germany, in contrast, there is a culture of a fixed price. Yield management was introduced in 2003, but was not popular, and led to the reintroduction of open tickets.

F.60 Whatever the approach to yield management, trains making stops en route can be hard to fill consistently over the whole route, as passengers board and alight at each stop. This is not an issue for airlines.

Zero-based business model

F.61 Airline start-ups design their business around a specific service proposal, according to a zero-based business model.

F.62 New entrant rail operators in competitive markets, especially for PSO regional railway services and open access services, often adopt this business model, and thus save costs for unnecessary overheads and inefficient business processes. Incumbent operators, in contrast, typically have a range of legacy assets and working arrangements which can be difficult to replace.

Lower pay

F.63 Airline start-ups typically offer lower pay than legacy airlines, in some cases also in association with more flexible working conditions.

F.64 New entrant rail operators in principle have the same opportunity, but the scope to offer lower pay may depend on both national legislation[125] and the specific conditions of the labour market:

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[123] From 1.21 square metres (ICE 1) to 0.93 square metres (ICE 4) per Second Class seat.

[124] See the discussions on **www.ice-treff.de**, for instance.

[125] A 2013 study found that Member States have different policies and legislation on protecting employment, wages and working conditions of employees. In Austria the Ministry of Transport stated that competitive tendering could not be introduced while ÖBB's staff costs were 20% higher than those of its competitors. In Italy, in contrast, the Competition Authority ruled that compulsory adoption of the National Contract for the winner of a tender represents a barrier to entry, implicitly encouraging entry by "low-cost" operators. Further Action at European Level Regarding Market Opening for Domestic Passenger Transport by Rail and Ensuring Non-Discriminatory Access to Rail Infrastructure and Services, Steer for European Commission (2013)

- In Germany, there is a shortage of train drivers, and many railway undertakings are forced to train new staff before the start of operations.
- In Great Britain, where the railway undertaking and its staff are transferred to a new owner at the end of a PSO contract, driver pay has risen. This is partly because railway undertakings facing short-term driver shortages find that recruiting and training new drivers is slow compared with attracting them from competitors by offering them higher salaries.

Modular base structure

F.65 Low-cost airlines avoid basing all or most of their operations at an often-congested hub airport, and instead operate from small bases to which each aircraft returns every 24 hours.

F.66 In rail, day trains could in principle operate from small, fixed bases from which one or two round trips are possible every 24 hours. In practice, many trains often spend the night away from their base of depot, to provide a late outbound and early inbound service. Night trains, in contrast, cannot return to base every 24 hours, and must as a minimum arrange staff accommodation and cleaning and catering contractors at the far end of each route.

Frequent service changes

F.67 Some low-cost airlines have a policy of frequent review, closing the worst-performing routes and bases and testing new routes and bases elsewhere[126]. Pilots can fly almost any route in Europe, or anywhere in the world, without special training. This means that services can be changed readily between seasons, with the effect that capacity can be relocated throughout the year to follow demand.

F.68 For railway undertakings, in contrast, capacity must be applied for a year or more ahead, and suitable maintenance and service facilities must also be found. Drivers must speak a specific language and be trained on the routes they will use, including diversionary routes. While routes can be operated seasonally, there is less scope to move to wholly different routes, and none to shift operations across Europe[127]. In addition, state-owned operators are often expected by their shareholders to provide a minimum level of service, effectively cross-subsidising low season from high season.

The relative attractiveness of cross-border and domestic markets

F.69 Our desk research and discussions with stakeholders suggests that there is rarely a fundamental difficulty with operating a cross-border service, but the attractiveness of doing so will depend on details of the particular market. We identified several cases where a short extension across a border appears to be highly commercially attractive:

- The Alpen-Sylt-Express terminates in Salzburg in Austria, from which there are connections to many other Austrian cities.
- Many services in Germany continue to Basel.

[126] Buses and coaches can also be redeployed rapidly on different routes, allowing routes to be introduced on an experimental basis. Railway undertakings which also operate coach services, such as Flix and RegioJet, can use coach services to test the demand for rail routes, and can interview their coach passengers to obtain further information on the characteristics of the market.

[127] During the COVID-19 pandemic, airlines have been able to operate completely new flights at very short notice to return passengers in the few days before travel restrictions come into force.

- Many services from France continue to Brussels or Barcelona.
- Many services from Vienna continue to Bratislava.

F.70 The key issue is less likely to be demand and revenue than the cost of the many technical and operational barriers, which we discuss in Annex P.

Conclusion

Competing network carriers

F.71 In the European and global airline industries, liberalisation has led to the emergence of a small number of airline networks, meaning that, for many airport-to-airport journeys, passengers are offered a choice of one or more direct and several indirect flights.

F.72 Rail liberalisation has not led to the emergence of competing network carriers, and the overwhelming majority of station-to-station journeys are served by only one operator, typically a state-owned incumbent or a PSO contractor. The largest long-distance market in which two railway undertakings compete head-to-head is the high-speed network in Italy, where new entrant Italo competes with incumbent Trenitalia. Two new entrants, RegioJet and Leo Express, also compete with incumbents on cross-border services between Czechia and neighbouring states. FlixTrain is also expanding and expects to operate seven routes in Germany and Sweden by the end of 2021.

Niches

F.73 The overwhelming majority of new entrant operators begin relatively small, often with secondhand rolling stock, in a small niche.

F.74 Finding a commercially viable niche for day train operations is problematic, because a new entrant will have neither the network size nor the service frequency of an incumbent. Strategies have included targeting routes with low frequency or quality, but the most sustainable approaches, by RegioJet and Leo Express in Czechia, MTR Express in Sweden, and Hull Trains and Grand Central in the United Kingdom, involve becoming large enough to offer a sufficiently frequent service to attract passengers travelling at key times.

F.75 Finding a commercially viable niche for night train operations may be simpler, because a market can be served with one journey each day (or even one journey every second day) requiring only two (or one) trains. Snälltåget has operated seasonal night trains and is now expanding, and other operators have proposals to enter the market, but it is not yet clear how successful they will be.

F.76 Several of the recent proposed new night trains will be cross-border services. New entry to operate cross-border services is not fundamentally different, but requires careful consideration of the additional costs and benefits of crossing a border.

Low-cost services

F.77 Low-cost airlines have used a wide range of techniques to reduce costs and increase load factors, enabling a rapid fall in the real cost of flying since they emerged in the 1990s. Legacy airline carriers have been forced to adopt many elements of the low-cost model to retain market share and compete, although a proportion of passengers remain willing to pay more for a higher quality service, including features such as access to airport lounges.

F.78 The nature of the rail industry makes it harder to introduce low-cost services, for several reasons:

- While aircraft can achieve high end-to-end load factors, day trains often make multiple stops, at which passengers board and alight, making it harder to keep a train full.
- A relatively high proportion of railway undertakings costs are en-route infrastructure charges, particularly on high-speed lines, as we discuss in Annexes I and J.
- On railways, delays occur mainly en route, and railway undertakings must allow recovery time during and at the end of each journey to ensure punctual departure on the next journey.
- Rail offers few opportunities to realise economies of scale with a large, standardised fleet.
- Rail offers little scope to relocate trains and crew regularly to chase seasonal demand or explore new markets.

G The scope for more long-distance cross-border services

Introduction

G.1 The Commission required us to:

- assess whether night train services would be a valid substitute for other modes;
- assess the (future) potential of the rail network to increase connections, capacity or speeds in the light of existing investments; and
- provide an estimate of the number of potential passengers for the night and long-distance train relations identified above, and a basic sensitivity analysis for 2030, taking into account initiatives foreseen in the framework of the European Green Deal and, if relevant, measures taken to recover from the COVID-19 pandemic.

G.2 In Annexes C and D we identified the limited data available on the numbers of long-distance cross-border rail passengers in 2019. In Annex E we collated information on rail, air and coach connections and timetables which existed in 2019 or might exist in the absence of the COVID-19 pandemic.

G.3 In the context of the European Green Deal, and the limited data on rail and coach passengers, we have therefore based our approach on the much more comprehensive data available on the number of air connections within Europe, and specifically the number of flights and seats offered between each pair of airports in 2019.

G.4 In this Annex:

- We discuss the current network of night trains and the evidence of where they can compete with air services.
- We identify possible new night train routes, including potential calling points and the scope to attract passengers from air services.
- We identify the potential effects of future rail network connectivity, speed and capacity, which we discuss further in Annex L dealing with obstacles.
- We estimate the scope for additional passenger numbers in the short term and by 2030.

G.5 On 17 May 2021, two weeks before the completion of our Interim Report, several ministers of transport published a letter of intent to introduce new long-distance cross-border night and high-speed day trains (a new Trans Europ Express, "TEE 2.0")[128] and a proposal for EU-wide regular interval services ("Europatakt")[129].

[128] Letter of intent, International high-speed and overnight rail services (TEE 2.0), various ministers of transport, 17 May 2021 (2021)

[129] First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)

G.6 On 20 May 2021, three days later, the French government published a report on the development of new "TET" lines[130], which also included proposals for new long-distance cross-border services.

G.7 These proposals have been considered, but not fully taken into account, in this or other Annexes. However, the continued emergence of new proposals makes it difficult to define a base service level against which to investigate the scope for further long-distance cross-border trains or to identify the needs for infrastructure capacity or rolling stock.

The current network of night trains

G.8 The figure shows a map of the night trains operated in Europe in January 2020, before the COVID-19 pandemic led to major restrictions in travel and transport services.

Figure G.10: Night trains in Europe, January 2020



Source: rosnix.net, not verified by Steer.

[130] Étude de developpement de nouvelles lignes de trains d'equilibre du territoire (TET), Direction générale des infrastructures, des transports et de la mer, Décembre 2020 (2021)

G.9 The map shows that there are a relatively large number of night train routes in eastern Europe, where there are few dedicated high-speed lines. In contrast there are fewer night trains in western Europe, particularly in the corridor through Spain, France, Belgium and the Netherlands, with a branch to London in the United Kingdom, which have recently developed networks of high-speed lines on which day trains operate at speeds of 300 km/h or more.

G.10 Note that the map should not be considered to show a 'network', for at least two reasons.

G.11 First, passengers are unlikely to make connections between night trains, because these would involve either breaking a journey in the middle of the night or waiting all day. In practice, night trains passing through the same station, or running in the same corridor, may do so several hours apart to provide attractive timings between the main cities they connect.

G.12 Second, night trains which pass through the same station may not be operated by railway undertakings which offer, or could offer, a through-ticket for a connecting journey.

ÖBB's growing Nightjet network

G.13 To assess whether night train services would be a valid substitute for other modes, we focused on the largest and growing night train network, that of Austria's national rail operator, ÖBB, which operates night trains under the Nightjet brand. Many Nightjet routes operate without subsidy, or were added to the Nightjet network after the closure of DB's City Night Line in December 2016, or have been opened since[131]. This means that many routes are the product of a recent and active decision that they should be added or opened.

G.14 The figure below shows Nightjet's core east-west routes through Austria, and extensions into other states, including former City Night Line routes into and through Germany and the new Nightjet routes to Brussels and Amsterdam.

[131] There is no subsidy on the routes: between Vienna and Amsterdam, where the intended start-up subsidy was prevented, Brussels, and Hamburg; in Germany between Basel Bad and Hamburg and Berlin; and in Germany between Munich and Salzburg on routes to and from Venice, Milan and Rome.

Figure G.11: The ÖBB Nightjet network



Source: ÖBB Nightjet (April 2021).

G.15 Many Nightjet trains split and join to serve multiple destinations. We discuss in Annex L how, in the 2021 timetable, from Vienna:

- The 19:23 departure splits to serve Milan and Rome.
- The 20:13 departure splits to serve Amsterdam, Brussels and Hamburg.
- The 21:27 departure splits to serve Venice and Zurich.
- The 22:10 departure splits to serve Berlin and Warsaw.

G.16 Most Nightjet routes end at points not connected by direct day trains, and only two routes have more than two direct day trains each way per day: from Zurich there are five direct day trains to Vienna and four to Hamburg. The average journey time on day trains is normally at least 7-8 hours.

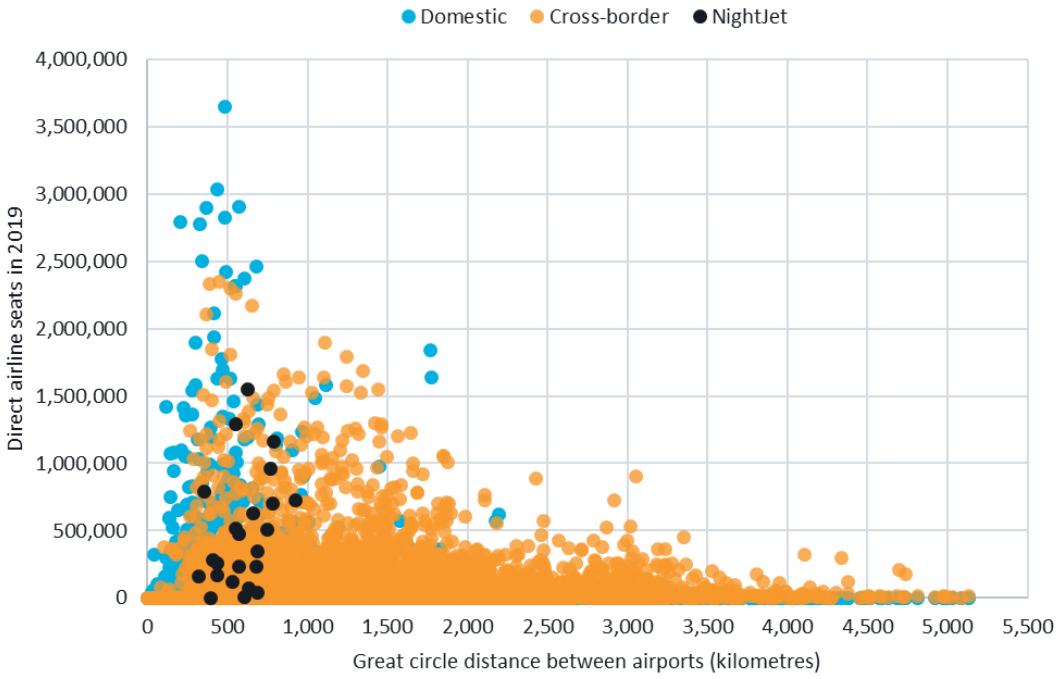
G.17 Nearly all Nightjet routes end at cities with airports, but most also serve intermediate cities with few or no direct flights to other points on the route.

The current network of air services

G.18 One potential benefit of an expanded range of long-distance cross-border rail services is the ability of rail to attract passengers from other modes of transport as well as increased rail connectivity.

G.19 The figure below compares the number of airline seats operated on scheduled domestic and cross-border services within Europe during 2019 with the shortest (great circle) distance between the airports. Airline capacity provided generally falls with distance, and all the routes with more than 2 million seats in 2019 are shorter than 750 kilometres.

Figure G.12: Airline seats and distance between airports in study area, 2019



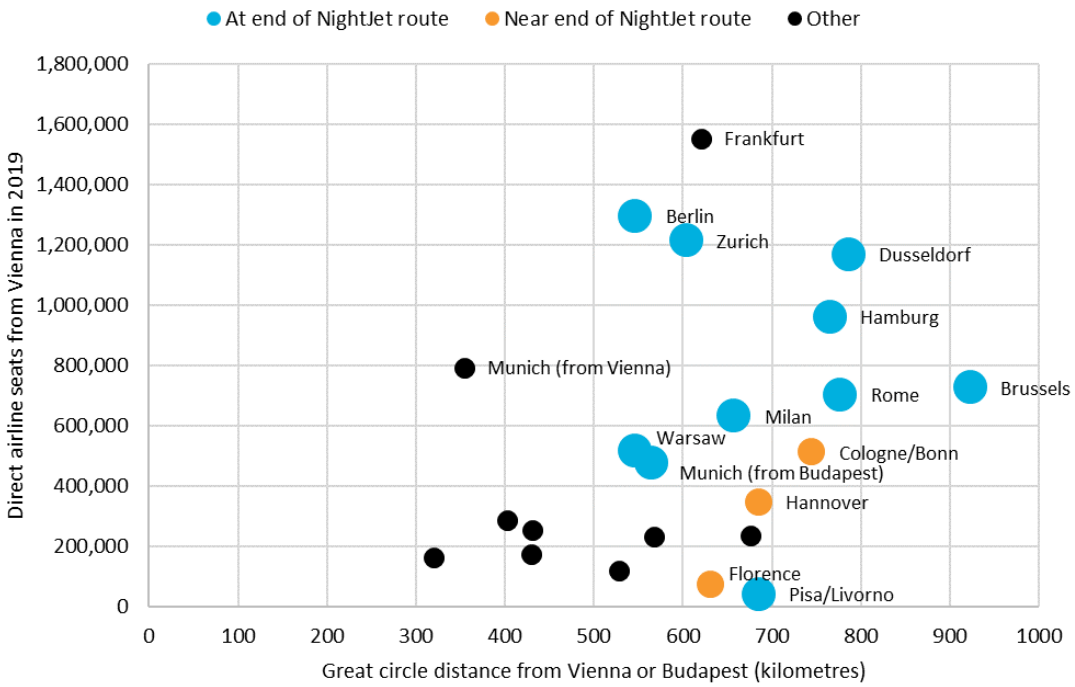
Source: OAG, Steer analysis.

G.20 We note that the number of airline seats exceeds the number of passengers, and that some passengers on each flight may be connecting to another flight, particularly at hub airports. We note, however, that the proportion of connecting passengers is typically highest on domestic routes, which tend to be short, and is likely to be lower on cross-border routes.

G.21 The figure above also highlights (green) airline routes between cities also connected by Nightjet in 2019. These are operated over great circle distances from around 325 kilometres, between Vienna and Krakow, to around 925 kilometres, between Vienna and Brussels.

G.22 The figure below focuses on these airline routes served by Nightjet.

Figure G.13: Airline seats and distance between Nightjet route end points, 2019



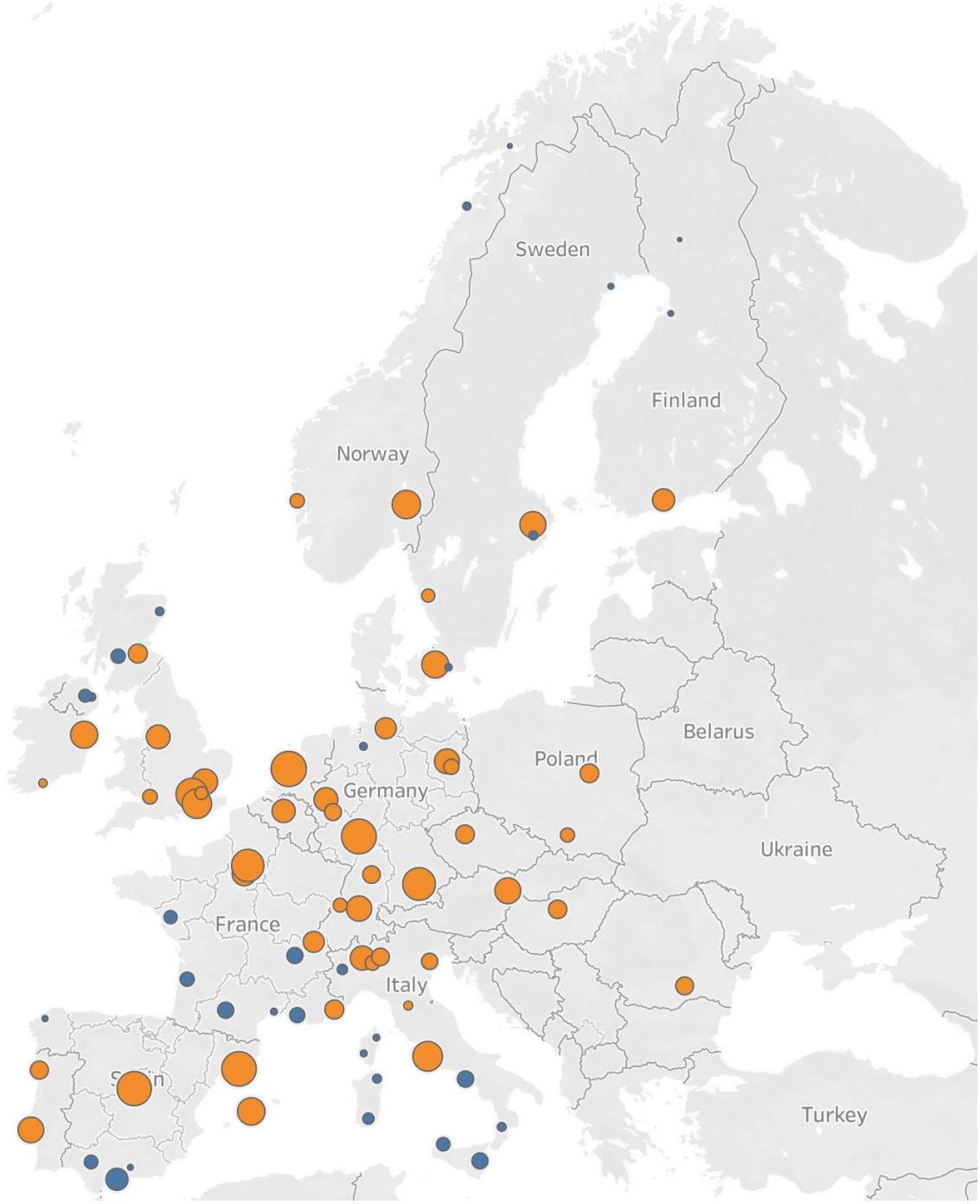
Source: OAG, Steer analysis.
Notes: distances are from Vienna except for the route to Munich from Budapest.

G.23 Most of the overnight routes are over great circle distances of 500-800 kilometres. The shortest, from to Vienna to Krakow, has a great circle distance of only 325 kilometres and was served by fewer than 200,000 airline seats, but continues to Warsaw, enabling Nightjet to carry passengers between Vienna and both cities.

G.24 All the routes terminate at destinations connected by more than 500,000 airline seats, with the exception of the portion of the Rome route which serves Florence, Pisa and Livorno, which operates twice a week in the summer months. Several call at other destinations before the final stop: Hannover is the last stop before Hamburg, and Bonn and Cologne are the last stops before Dusseldorf.

G.25 The map below shows the results of a search for other airports within the study area, distinguishing airports with at least one cross-border (orange) route or one domestic (blue) route over great circle distances of 500-1000 kilometres and with over 500,000 seats in 2019.

Figure G.14: Airports 500-1000 kilometres apart connected by over 500,000 airline seats



Source: OAG, Steer preliminary analysis.
The area of the circles represents the number of seats offered in 2019 to other airports within the study area.

G.26 Examination of the map raises several points.

G.27 First, some cities, while well-connected by air, may be difficult to serve with night trains:

- Helsinki's shortest connection to the rest of the study area is via the Russian Federation.
- Dublin, Cork and Palma de Mallorca are on islands with independent rail networks.
- Spain and Portugal have a broad track gauge, except on new high-speed lines.
- Norway and Sweden have a larger structure gauge than most of the network and, other than on existing and planned high-speed lines, Great Britain has a smaller one: rolling stock crossing between networks must fit within the smallest gauge.
- Other barriers may include technical differences in signalling and electrification systems and operational ones include train crew route competence and language capability.

G.28 We discuss these and other obstacles to the introduction of night trains in other Annexes.

G.29 Second, the scope for night trains will depend not only on great circle distances by air but also journey times by rail including any interchanges. High-speed lines might in principle enable long-distance cross-border night or day trains to serve some longer routes and still be attractive compared with not only coach but also air services. However, and as noted above, and in Annex C, new infrastructure offering higher speeds and reduced journey times is not being used by conventional night trains, and no high-speed night train rolling stock exists[132].

G.30 Third, as with the current Nightjet network, it may be possible to serve two or more cities at each end of the route, combining the markets for travel between them into a single night train service. However, it may be commercially desirable for the most important destinations:

- to be at the ends of the route, so that as many passengers as possible can board and go to bed before departure or "lie in" after arrival; and/or
- to have departures after the end of the working day and arrivals before the start of the working day, so as to be attractive to business travellers.

Possible night trains routes

G.31 We next discuss emerging proposals for new night train routes, and then our analysis of the potential for further new routes.

The proposals for new routes

G.32 From our desk research we identified a range of recent proposals for new night train routes, at various dates and various levels of detail, as summarised in the table below. In practice, some of the studies did not provide details of the proposed route or calling points:

- In 2019, Kennisinstituut voor Mobiliteitsbeleid (KiM) examined connecting Amsterdam with nine cities on the continent, plus others in Great Britain, but with only limited analysis.
- In 2020, four national railways, DB, ÖBB, SBB and SNCF announced proposals for a route between "Vienna/Berlin-Brussels/Paris"[133]. We note that Berlin-Paris via Brussels appears in the TEE 2.0 proposals released in September 2020 as route EN 21/22, with timings similar to those of Deutsche Bahn's pre-2008 service.
- In 2021, Moonlight Express announced a proposed route between Brussels and Berlin, but did not provide further details.

[132] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

[133] Night trains to European cities make a comeback, SNCF, 21 December 2020 (2020)

Table G.1: Proposals for new night train routes and airports served at cities at each end of the route

Date	Source	Airports served	Mid-point	Airports served	Start date
2019 June	KiM[134]	Amsterdam		Copenhagen	
				Lyon	
				Milan	
				Munich	
				Prague	
				Turin	
				Vienna	
				Warsaw	
				Zurich	
2020 April	Trafikverket [135]	Oslo Gothenburg Copenhagen		Hamburg Frankfurt	
		Stockholm Gothenburg Copenhagen		Hamburg Berlin	
		Stockholm Copenhagen		Hamburg Cologne Brussels	
		Copenhagen		Cologne Frankfurt Basel	
		Copenhagen	Hamburg	Cologne	2023
2020 June	Snälltåget[136]	Stockholm Copenhagen		Hamburg Berlin	2021
2020 September	ÖBB[137] SBB[138]	Zurich Basel	Frankfurt	Cologne Amsterdam	2021
		Zurich Basel	Frankfurt	Leipzig Dresden Prague	2023
		Zurich Geneva Lyon		Barcelona	2024
		Zurich	Milan	Bologna Rome	
2020 December	DB, ÖBB, SBB, SNCF[139]	Vienna Berlin		Brussels Paris	2023
2021 April	European Sleeper	Brussels Amsterdam	Hannover	Berlin Leipzig Prague	2022
2021 April	Moonlight Express[140]	Brussels		Berlin	2022
		Brussels		Barcelona	Plans

Source: Steer desk research.
Note: routes through Copenhagen could also serve Malmö and routes through Cologne could also serve Dusseldorf.
Note: on 16 June 2021, Moonlight Express announced that it would merge with European Sleeper[141].

[134] Slapend onderweg, Potentieel van de internationale nachttrein van en naar Nederland, Kennisinstituut voor Mobiliteitsbeleid (KiM), (2019)

[135] Underlagsrapport till Nattågstrafik till Europa, Kapacitet för nattåg till kontinenten, 2020:114, Trafikverket (2020)

[136] Increased cross-border night train services between Sweden and Germany in 2021 – but summer 2020 is cancelled, Press Release, Snälltåget, 16.06.2020 (2020)

[137] ÖBB Nightjet, presentation in Copenhagen, 15.09.2020 (2020)

[138] Nightjet network Switzerland 2024: CFF and ÖBB want to further develop the night train offer in Europe, Press release, 09.15.2020 (2020)

G.33 Nonetheless, we note that all the destinations of the proposed services are at cities shown on the map above as having cross-border air routes over great circle distances of 500-1000 kilometres and with over 500,000 seats in 2019.

G.34 We also noted that, in some cases, the proposed route would serve a major city nears its mid-point, but that it was not clear whether any material demand could be attracted from this city. This is because it would normally be unattractive to join or leave a night train in the middle of the night, especially if each end of the route could be reached by a shorter day train journey.

G.35 One example is the proposals by Trafikverket, which after the 2020 study selected two routes not on the list. Trafikverket and the Danish transport ministry sought tenders to operate them under a PSO from August 2022 for up to six years. The chosen PSO routes are between:

- Stockholm and Padborg, with an intended final destination of Hamburg; and
- Malmö, Copenhagen and Padborg, with an intended final destination of Brussels.

G.36 The second route appears likely to pass through Hamburg in the middle of the night, and we assume that passengers would be unlikely to find the night trains attractive for travel between Hamburg and any of Malmö, Copenhagen and Brussels[142].

The potential for further routes

G.37 The study Technical Specifications required us to use simple criteria for distances, travel times and frequencies per origin-destination pair as well as the 2020 timetable, to assess whether night train services would be a valid substitute for other modes.

G.38 We began by attempting to identify routes on which there is sufficient end-to-end passenger demand to support a night train running for several hours without intermediate calling points. We stress that this is not an attempt to assess whether such night trains could be operated commercially or would require subsidy.

G.39 Drawing on the above analysis, we assembled a long list of potential night trains routes in the study area drawing on:

- existing proposals for night train routes;
- further routes identified from analysis of air traffic routes and rail journey times; and
- the case studies described in Annex C.

G.40 We chose as our criterion cross-border airline routes over a great circle distance of 500-1000 kilometres on which more than 500,000 seats were offered in 2019. We identified a total of 96 airport-to-airport routes within the study area, connecting 91 city pairs, including many already served by night trains. The table below lists these routes, grouped into city pairs, and sorted in descending order of number of seats.

[139] Towards a better future, Joint Statement to expand Night Train services in Europe, DB/ÖBB/SBB/SNCF, 8 December 2020 (2020)

[140] Belgian company Moonlight Express turns travelling upside down, Press release, Moonlight Express, 6 April 2021 (2021)

[141] Railway Gazette, 16 June 2021.

[142] On 30 August 2021, Trafikverket announced that it had awarded the contract for a Stockholm-Hamburg services to SJ but that no bids had been received for a Malmö-Brussels service.

Table G.2: City pairs connected by more than 500,000 airline seats per year, 2019

City A			City B			Great Circle Distance (kilometres)	Flights	Seats
State	City	Code	State	City	Code			
Spain	Barcelona	BCN	France	Paris	CDG	858	8,595	1,609,785
					ORY	826	7,010	1,367,240
Denmark	Copenhagen	CPH	Norway	Oslo	OSL	515	12,577	2,306,309
Sweden	Stockholm	ARN	Denmark	Copenhagen	MMX	546	12,496	2,261,222
Denmark	Copenhagen	CPH	UK	London	LHR	977	7,361	1,267,775
					LGW	983	5,236	927,288
UK	London	LHR	Switzerland	Zurich	ZRH	785	9,238	1,549,026
		LCY				758	5,942	637,982
UK	London	LHR	Germany	Frankfurt	FRA	653	12,455	2,173,638
Portugal	Lisbon	LIS	Spain	Madrid	MAD	512	11,911	1,814,713
Spain	Barcelona	BCN	Italy	Rome	FCO	847	8,935	1,667,023
Germany	Munich	MUC	UK	London	LHR	940	10,476	1,642,912
Germany	Frankfurt	FRA	Austria	Vienna	VIE	620	8,745	1,554,661
Switzerland	Geneva	GVA	UK	London	LHR	752	10,030	1,492,758
Germany	Berlin	TXL	Switzerland	Zurich	ZRH	660	9,657	1,488,017
UK	London	LHR	Germany	Berlin	TXL	945	6,233	955,459
		STN			SXF	906	2,677	505,953
Netherlands	Amsterdam	AMS	Ireland	Dublin	DUB	748	9,162	1,437,579
Netherlands	Amsterdam	AMS	Denmark	Copenhagen	CPH	632	8,604	1,394,826
France	Paris	CDG	Italy	Milan	MXP	597	8,470	1,336,251
Switzerland	Zurich	ZRH	Austria	Vienna	VIE	604	7,808	1,314,254
Germany	Berlin	TXL	Austria	Vienna	VIE	546	8,197	1,296,336
Italy	Milan	LIN	UK	London	LHR	978	4,590	709,156
		BGY			STN	977	2,952	557,928
France	Paris	CDG	Germany	Munich	MUC	681	8,064	1,263,410
Netherlands	Amsterdam	AMS	Germany	Munich	MUC	663	8,477	1,229,586
Spain	Barcelona	BCN	Portugal	Lisbon	LIS	991	6,966	1,206,272
Netherlands	Amsterdam	AMS	Switzerland	Zurich	ZRH	602	7,544	1,202,282
Spain	Barcelona	BCN	Italy	Milan	MXP	719	6,314	1,172,152
Germany	Dusseldorf	DUS	Austria	Vienna	VIE	787	7,198	1,168,646
Denmark	Copenhagen	CPH	Finland	Helsinki	HEL	890	6,799	1,163,475
Netherlands	Amsterdam	AMS	Austria	Vienna	VIE	959	7,036	1,138,526
Netherlands	Amsterdam	AMS	Italy	Milan	MXP	797	6,806	1,091,018
France	Paris	CDG	Germany	Berlin	TXL	850	5,700	1,055,952
Germany	Dusseldorf	DUS	UK	London	LHR	501	6,721	1,018,956
Germany	Hamburg	HAM	Switzerland	Zurich	ZRH	692	5,871	1,006,924
Switzerland	Geneva	GVA	UK	London	LGW	713	5,663	969,310
Germany	Hamburg	HAM	Austria	Vienna	VIE	766	5,742	961,746

City A			City B			Great Circle Distance (kilometres)	Flights	Seats
State	City	Code	State	City	Code			
France	Paris	CDG	Italy	Venice	VCE	835	6,064	938,010
Denmark	Copenhagen	CPH	Germany	Frankfurt	FRA	679	5,416	937,206
Hungary	Budapest	BUD	Germany	Frankfurt	FRA	832	5,052	927,388
Italy	Rome	FCO	Germany	Frankfurt	FRA	954	5,356	915,455
Italy	Rome	FCO	Germany	Munich	MUC	727	5,227	896,898
Netherlands	Amsterdam	AMS	Czechia	Prague	PRG	703	5,563	892,942
Netherlands	Amsterdam	AMS	Norway	Oslo	OSL	958	6,068	891,464
France	Paris	CDG	Ireland	Dublin	DUB	784	5,858	886,383
France	Paris	CDG	Czechia	Prague	PRG	851	4,665	874,534
Belgium	Brussels	BRU	Switzerland	Geneva	GVA	531	5,440	870,322
Netherlands	Amsterdam	AMS	Switzerland	Geneva	GVA	681	6,002	842,566
Netherlands	Amsterdam	AMS	Germany	Berlin	TXL	578	5,188	829,510
Spain	Barcelona	BCN	Switzerland	Zurich	ZRH	855	4,034	824,798
Spain	Barcelona	BCN	Portugal	Porto	OPO	895	4,580	808,448
Spain	Barcelona	BCN	Switzerland	Geneva	GVA	637	4,572	805,990
France	Paris	CDG	UK	Manchester	MAN	587	5,948	803,228
Germany	Hamburg	HAM	UK	London	LHR	744	5,240	786,024
Romania	Bucharest	OTP	Austria	Vienna	VIE	829	5,097	783,664
Germany	Stuttgart	STR	Austria	Vienna	VIE	546	5,420	778,674
Netherlands	Amsterdam	AMS	UK	Edinburgh	EDI	665	4,530	755,876
UK	London	LGW	Italy	Milan	MXP	896	4,414	728,456
Belgium	Brussels	BRU	Austria	Vienna	VIE	924	4,547	727,440
Denmark	Copenhagen	CPH	Switzerland	Zurich	ZRH	950	3,898	713,778
UK	London	LGW	France	Nice	NCE	998	4,402	711,636
Italy	Rome	FCO	Austria	Vienna	VIE	777	3,862	703,754
Denmark	Copenhagen	CPH	Germany	Munich	MUC	809	4,993	702,705
Norway	Oslo	OSL	Finland	Helsinki	HEL	761	4,782	701,549
Germany	Frankfurt	FRA	Poland	Warsaw	WAW	895	5,037	679,263
Germany	Frankfurt	FRA	UK	Manchester	MAN	832	3,915	656,481
Belgium	Brussels	BRU	Denmark	Copenhagen	CPH	753	4,453	641,490
Italy	Milan	MXP	Austria	Vienna	VIE	657	4,128	633,554
Germany	Frankfurt	FRA	Italy	Venice	VCE	575	3,724	631,847
Norway	Bergen	BGO	Denmark	Copenhagen	CPH	678	4,144	628,152
Belgium	Brussels	BRU	Germany	Munich	MUC	595	4,646	625,278
France	Paris	CDG	Germany	Hamburg	HAM	727	4,129	609,047
Spain	Barcelona	BCN	Italy	Venice	VCE	951	3,119	597,435
Denmark	Copenhagen	CPH	Austria	Vienna	VIE	877	3,529	588,780
Switzerland	Zurich	ZRH	Spain	Palma	PMI	993	3,125	588,128
Germany	Frankfurt	FRA	Sweden	Gothenburg	GOT	882	3,562	576,835

City A			City B			Great Circle Distance (kilometres)	Flights	Seats
State	City	Code	State	City	Code			
France	Paris	CDG	Italy	Milan	LIN	644	3,836	576,664
Germany	Frankfurt	FRA	Italy	Milan	LIN	512	4,408	575,296
Germany	Frankfurt	FRA	Poland	Krakow	KRK	800	3,612	560,072
Netherlands	Amsterdam	AMS	France	Nice	NCE	977	3,822	551,270
Belgium	Brussels	BRU	Italy	Milan	MXP	665	3,717	549,192
Italy	Florence	FLR	France	Paris	CDG	879	4,099	544,217
Netherlands	Amsterdam	AMS	Switzerland	Basel	BSL	558	4,284	537,948
Belgium	Brussels	BRU	Ireland	Dublin	DUB	782	2,923	536,471
Italy	Rome	FCO	Switzerland	Zurich	ZRH	692	3,547	536,368
Poland	Warsaw	WAW	Austria	Vienna	VIE	547	4,550	517,328
Germany	Cologne	CGN	Austria	Vienna	VIE	745	3,470	513,148
Netherlands	Amsterdam	AMS	UK	Bristol	BRS	521	4,118	509,140
Germany	Munich	MUC	Poland	Warsaw	WAW	776	4,298	505,028
UK	London	LHR	Ireland	Cork	ORK	554	2,908	504,056
Denmark	Copenhagen	CPH	Germany	Dusseldorf	DUS	618	4,299	503,146
Netherlands	Amsterdam	AMS	UK	Glasgow	GLA	716	3,058	491,298
France	Lyon	LYS	Germany	Frankfurt	FRA	544	3,168	485,358
Netherlands	Amsterdam	AMS	Italy	Venice	VCE	937	3,012	478,788
Hungary	Budapest	BUD	Germany	Munich	MUC	565	3,244	477,352

Source: OAG data for 2019, Steer analysis.

G.41 We examined these city pairs and:

- We excluded those that are already connected by night train routes.
- We ignored routes which would need only minor extensions to existing night train routes, on the assumption that such extensions could be added by the current operator.
- Where relevant, we also considered where each end of the route could attract passengers from more than one airport pair, either by connecting cities served by two or more airports or by calling at more than one point at each end of the route.

Case study routes

G.42 In Annex C we included case studies of routes from which night trains had been withdrawn. We examined the data on airline seat numbers for these routes to identify whether and how the proposed or potential routes differed from them, such as by having much larger numbers of airline seats. In practice, we found that there was no evidence that a large number of airlines seats meant that a night train would not be withdrawn. This suggests that a dense airline flow does not guarantee that a night train service would be viable.

Possible night trains routes: calling points and competing airports

G.43 The figure overleaf summarises the number of scheduled airline seats in 2019 between airports on:

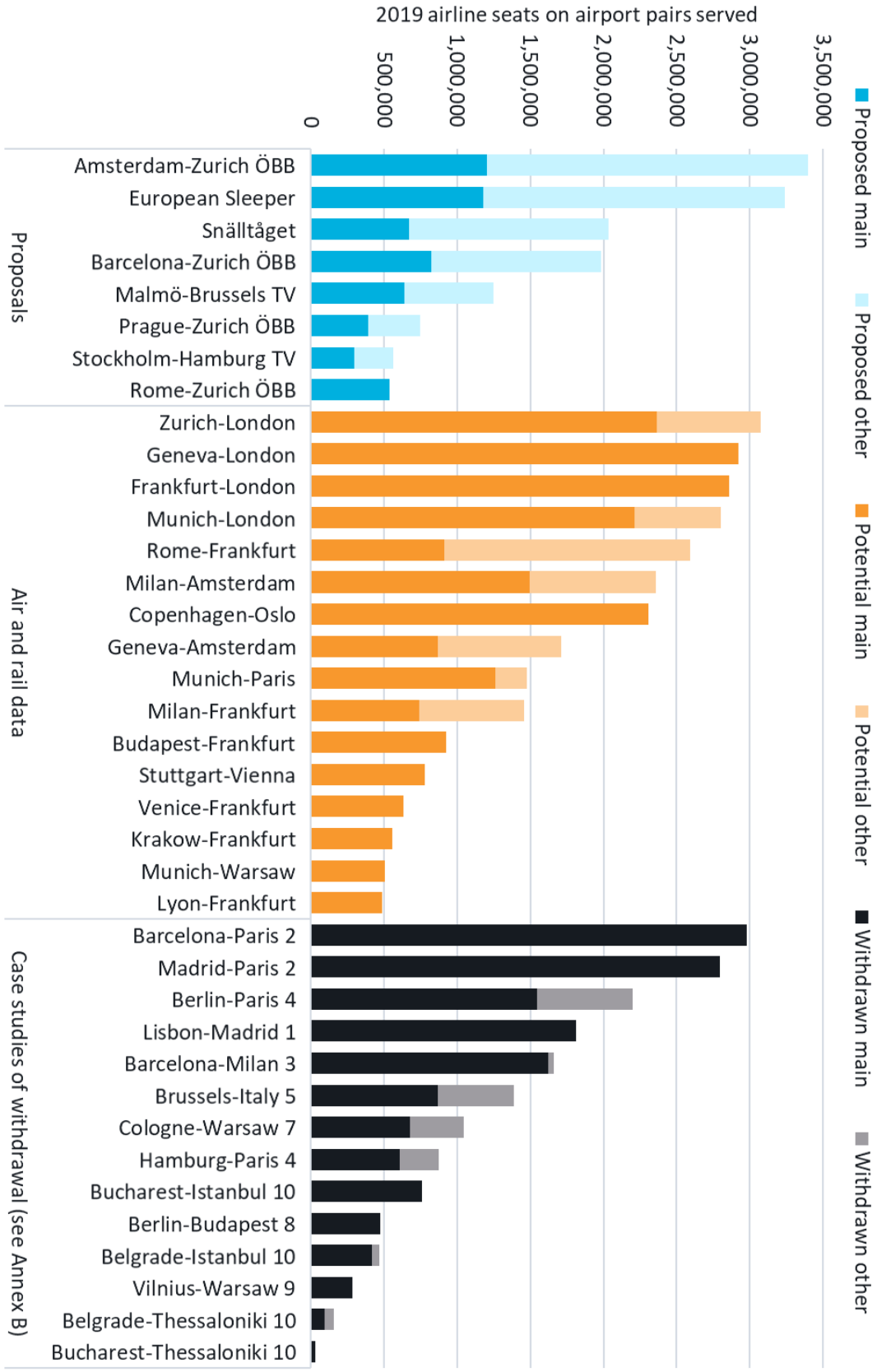
- proposed routes;
- potential routes identified from our analysis of air and rail data; and
- withdrawn routes examined in the case studies in Annex C.

G.44 In each case we identify the densest single city-to-city flow, which might involve more than one airport at each city, and the total including more minor flows. For example, the route at the top of the figure, ÖBB's proposed Amsterdam to Zurich service, could compete with around 1.2 million airline seats between Amsterdam and Zurich and a further 2.2 million seats between Dusseldorf and Zurich (1.1 million), Amsterdam and Basel (0.5 million), Cologne/Bonn and Zurich (0.4 million) and Dusseldorf and Basel (0.1 million).

G.45 The table following the figure lists the principal airports before and after the mid-point of the route, with which we assumed that the night train would compete. As noted above, we ignored airports serving cities which seemed likely to be served in the middle of the night and/or to be sufficiently close to both ends of the route for day trains to offer feasible journey times.

G.46 The table also includes the fastest end-to-end rail journey time available midweek during May 2021. These journey times may be longer than those provided in 2019, before the COVID-19 pandemic, but do include connecting times rather than only in-vehicle times.

Figure G.15: Overview of proposed, potential and withdrawn night train routes



Source: OAG, Evaluation of high-speed rail in Europe, Steer analysis.

Table G.3: Assumed routes of existing proposals, Steer analysis of air and rail data, and case study night trains

Routes		Airport-served cities at each end of the route		
Proposals	Amsterdam-Zurich	Amsterdam	08:22	Basel/Mulhouse/Freiburg Zurich
	European Sleeper	Brussels Amsterdam	10:52	Berlin Dresden Prague (Warsaw)
	Snälltåget	Berlin Hamburg	12:58	Copenhagen Malmö Stockholm
	Barcelona-Zurich	Barcelona	11:41	Lyon Geneva Zurich
	Malmö-Brussels	Malmö Copenhagen	13:22	Dusseldorf Cologne Brussels
	Prague-Zurich	Prague Dresden Leipzig/Halle	10:40	Basel/Mulhouse/Freiburg Zurich
	Stockholm-Hamburg	Stockholm Malmö Copenhagen	10:41	Hamburg
	Rome-Zurich	Rome Bologna	07:37	Zurich
Air and rail data	Zurich-London	Zurich Basel/Mulhouse/Freiburg	09:25	London
	Geneva-London	Geneva	06:29	London
	Frankfurt-London	Frankfurt	07:33	London
	Munich-London	Munich Stuttgart	10:28	London
	Rome-Frankfurt	Frankfurt Munich	12:18	Bologna Rome
	Milan-Amsterdam	Milan Bergamo	11:39	Brussels Amsterdam
	Copenhagen-Oslo	Copenhagen Malmö	07:34	Oslo
	Geneva-Amsterdam	Geneva	10:09	Brussels Amsterdam
	Munich-Paris	Munich Stuttgart	05:33	Paris
	Milan-Frankfurt	Milan Bergamo	08:16	Frankfurt
	Budapest-Frankfurt	Budapest	09:58	Frankfurt
	Stuttgart-Vienna	Stuttgart	06:29	Vienna
	Venice-Frankfurt	Venice	10:31	Frankfurt
	Krakow-Frankfurt	Krakow	10:30	Frankfurt
	Munich-Warsaw	Munich	10:44	Warsaw
	Lyon-Frankfurt	Lyon	06:55	Frankfurt
Case studies of withdrawal (See Annex C)	Barcelona-Paris	Barcelona	06:39	Paris
	Madrid-Paris	Madrid	11:53	Paris
	Berlin-Paris	Berlin	08:18	Paris
	Lisbon-Madrid	Lisbon	09:00	Madrid
	Barcelona-Milan	Barcelona	11:45	Genova Bergamo Milan
	Brussels-Italy	Brussels Luxembourg	19:56	Bergamo Milan Bologna Florence
	Cologne-Warsaw	Cologne Dusseldorf Frankfurt	10:46	Warsaw
	Hamburg-Paris	Hamburg	08:52	Brussels Paris
	Bucharest-Istanbul	Bucharest		Istanbul
	Berlin-Budapest	Berlin	08:01	Bratislava Budapest
	Belgrade-Istanbul	Belgrade		Istanbul
	Vilnius-Warsaw	Vilnius		Warsaw
	Belgrade-Thessaloniki	Belgrade		Thessaloniki
	Bucharest-Thessaloniki	Bucharest		Thessaloniki

Source: Steer analysis and assumptions on routes and potential station calls.
Note that some cities have several airports.
Note that for cells shaded grey, neither DB nor Trainline returned a journey time.
Note that a potential European Sleeper portion to Warsaw is not confirmed: see text for details.

G.47 Comparison of the number of airline seats offered on each route reveals several points.

G.48 First, none of the eight proposed new night train routes competes with fewer than 500,000 airline seats, the threshold we assumed in our analysis. This does not mean that night train services would not be commercially, economically, socially or environmentally justified at lower flows. Nonetheless, all the proposed routes connect cities also connected by large numbers of airline seats.

G.49 Second, we identified sixteen further potential night train routes competing with at least this number of airline seats. Seven of these potential routes compete with more than 2 million airline seats, and five of them compete with more than 2 million airline seats between a single city pair:

- London and Zurich, Geneva, Frankfurt and Munich; and
- Copenhagen and Oslo.

G.50 We note that inclusion of these routes would bring Norway and the United Kingdom into the European night train network.

G.51 Third, while the identification of potential routes based on the simple criteria of airlines seats, great circle distance and rail journey time is encouraging, the case studies suggest that meeting these criteria alone is not sufficient. In particular, there are no daily night train services between Paris and Barcelona, Madrid and Berlin, all of which were connected by more than 2 million airline seats in 2019. We outline in Annex C how, in the case of the two densest routes, this appeared to be a clear case of high-speed rail replacing commercially-operated night train services.

G.52 We discuss each of these routes in turn below, in descending order of total airline seats.

Existing proposals

G.53 We describe first the routes which have been proposed by existing operators ÖBB and Snälltåget, new entrant European Sleeper, and transport authority Trafikverket.

Proposed ÖBB route Amsterdam to Zurich from December 2021

G.54 ÖBB has announced a route from Amsterdam to Zurich, which could parallel airline seats between Amsterdam, Dusseldorf and Cologne at the north end and Basel and Zurich at the south end. As noted above, it would parallel a total of around 3.4 million aircraft seats, the largest number of any of the routes we identified.

Proposed European Sleeper route Amsterdam to Prague from 2022

G.55 European Sleeper's proposed route would link Brussels and Amsterdam in the west with Berlin, Dresden and Prague in the east on routes currently without night trains. The densest airline flow, between Amsterdam and Berlin, offered around 1.2 million seats in 2019, but Amsterdam to Prague is also a dense route and we estimated that the route parallels a total of around 3.2 million seats. European Sleeper proposes to operate the route commercially.

G.56 On 30 April 2021, Het Laatste Nieuws reported[143] that European Sleeper was seeking changes to the route:

[143] Nieuwe nachttrein met startplaats in Oostende moet ook naar Warschau sporen, Het Laatste Nieuws, 30 April 2021 (2021)

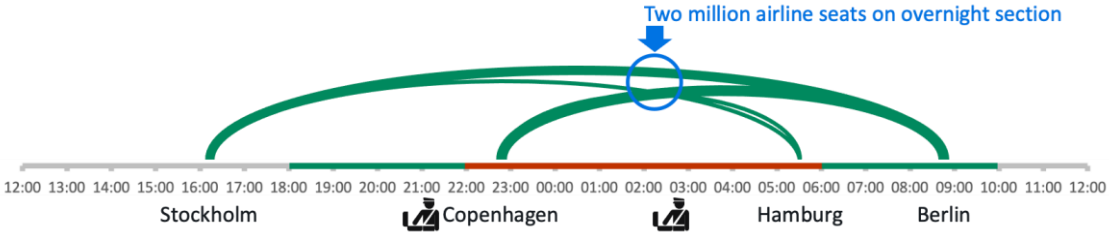
- A western extension to Ostend, with calls at Bruges, Ghent, Brussels South, Brussels Central and Antwerp in Belgium.
- An eastern portion detaching at Berlin to serve Warsaw.

G.57 As of 28 May 2021, European Sleeper's website did not refer to these proposals. We assume that they are unconfirmed and we did not include them in our analysis, but the addition of a portion to Warsaw would add new connections to the route.

New Snälltåget route Stockholm to Berlin from June 2021

G.58 Snälltåget has operated a seasonal route from Malmö to Berlin by ferry, but its new rail-only route operates overland via Denmark, serving the Copenhagen area with a suburban stop in Høje Taastrup[144]. The figure below shows the timings between Stockholm and Berlin and illustrates the number of airline seats on each route in 2019.

Figure G.16: Airline seats paralleling the new Snälltåget night train route



Source: Snälltåget, OAG, Steer analysis.
Note: width of green lines is proportional to the number of airline seats in 2019.

G.59 The densest parallel airline route is from Stockholm to Berlin, which offered around 0.7 million seats in 2019, but we estimated that the route parallels a total of over 2 million seats. The journey by day train currently takes almost 13 hours, although the Fehmarn Belt crossing, opening in 2029, should offer a 2-hour time saving. Snälltåget has the advantage that it is already established in, and understands well, some of the markets served, and intends to operate the route commercially.

Proposed ÖBB route from Barcelona to Zurich from 2024

G.60 ÖBB has put forward proposals to reintroduce the route from Barcelona to Zurich which we examined in case study 3 in Annex C. The densest parallel airline route is from Barcelona to Zurich, which offered around 0.8 million seats in 2019, but a night train could also serve Geneva and Lyon at the northern end, paralleling over 2 million seats in total.

Proposed Trafikverket route Malmö to Brussels from 2022 for up to six years

G.61 Trafikverket has tendered a PSO route from Malmö and Copenhagen to Brussels, a route with 0.6 million airline seats, which we assumed might at the southern end also serve Dusseldorf, with 0.5 million seats, and Cologne with 0.1 million seats. The journey by day train currently takes over 13 hours, although the Fehmarn Belt crossing, opening in 2029, should offer a 2-

[144] The first train left Stockholm Central station on June 27 at 16.22, stopping at Höje Taastrup at 22.45, Hamburg at 05.31, and arriving at Berlin Hauptbahnhof at 08.52.

hour time saving. Trafikverket's analysis concluded that longer routes would generally require more subsidy[145].

Proposed ÖBB route Prague to Zurich in 2023, if possible

G.62 ÖBB proposes to introduce a new route in 2023 which would parallel the existing route via Frankfurt to Berlin before taking a new route via Leipzig and then turning south to Dresden and Prague. The end cities are connected by almost 0.4 million airline seats, with thinner routes between other points, offering a total of around 0.7 million seats. ÖBB has not stated the extent to which this route would share operations and costs with the existing route to Berlin.

Proposed Trafikverket route Stockholm to Hamburg from 2022 for up to six years

G.63 Trafikverket has tendered a PSO route from Stockholm, via Malmö and Copenhagen, to Hamburg. Hamburg is served by around 0.3 million airline seats from each of Stockholm and Copenhagen. The Fehmarn Belt crossing, opening in 2029, should offer a 2-hour time saving 2029 which may weaken the case for an overnight service between Copenhagen and Hamburg[146].

Proposed ÖBB route from Rome to Zurich

G.64 ÖBB has put forward proposals to introduce a route from Rome to Zurich but we did not identify when operations might begin. The parallel airline route offers 0.5 million seats per year.

Potential new routes

G.65 We describe next the potential routes identified in our own analysis, beginning with airline routes over great circle distances of 500-1000 kilometres and with over 500,000 seats in 2019 and, where possible, combining them or adding calling points to serve a larger market.

Potential route Zurich to London

G.66 From the London area airports, there are around 2.4 million airline seats to Zurich and a further 0.7 million to Basel, which could be served en route. This is the densest potential route we identified from analysis of airline seat data. The current fastest journey time is around 9½ hours, using both high-speed lines and the Channel Tunnel.

Potential route Geneva to London

G.67 In 2019, Geneva had flights from five London area airports, with a total of around 2.9 million seats, although we note that at least some may be seasonal services for the winter sports market. This is the densest single city-to-city route we identified from analysis of airline seat data. The fastest journey time, on high-speed line throughout, is only around 6½ hours, but we assume below (paragraph G.87) that it would be possible to serve Geneva by extending the route from Zurich.

[145] On 30 August 2021, Trafikverket announced that no bids had been received for a Malmö-Brussels service.

[146] On 30 August 2021, Trafikverket announced that it had awarded the contract for a Stockholm-Hamburg services to SJ.

Potential route Frankfurt to London

G.68 In 2019, Frankfurt had flights from three London area airports, with a total of nearly 2.9 million seats. The fastest journey time is currently around 7½ hours, but the in-train time is only just over five hours. Nonetheless, a service with no intermediate stops could in principle operate at reduced speed, or allow additional time before departure and after arrival, to ensure that passengers had adequate time to sleep.

Potential route Munich to London

G.69 In 2019, Munich had flights from four London area airports, with a total of over 2.2 million seats although we note that at least some may be seasonal services for the winter sports market. We assumed that a route to Munich could also stop at Stuttgart, served from two London area airports with around 0.6 million seats. The fastest journey time between London and Munich is around 10½ hours.

Potential route Rome to Frankfurt

G.70 There are around 0.9 million airline seats between Rome and Frankfurt, but we assumed that a night train could also call at Munich and Bologna, taking the total number to around 2.6 million airline seats. While paralleling existing Nightjet routes, this route does not duplicate any city pairs currently connected.

Potential route Milan to Amsterdam

G.71 There are around 1.5 million airline seats between Amsterdam and Milan's airports, Linate and Malpensa, and total of 2.4 million if Brussels was also included as a stop. As with the Rome to Frankfurt route, this parallels, but does not duplicate, existing routes.

Potential route Copenhagen to Oslo

G.72 A north-south route from Copenhagen and Malmö to Oslo parallels 2.3 million aircraft seats, but we note that it would be unlikely to be possible to serve Gothenburg, in the middle of the route. This is the only route we identified that would serve Norway, although we note that Trafikverket investigated a longer route from Frankfurt to Oslo.

Potential route Geneva to Amsterdam

G.73 We identified a potential route from Amsterdam and Brussels to Geneva, served by around 1.7 million airline seats which were split equally between Amsterdam and Brussels. We note, however, that this route closely parallels ÖBB's proposed Amsterdam to Zurich route and could in principle be served by a portion diverging at Basel, which might also serve Bern.

Potential route Munich to Paris

G.74 We identified a route from Munich and Stuttgart to Paris, paralleled by 1.5 million airline seats, although we note that the fastest existing rail journey time is less than 6 hours.

Potential route Milan to Frankfurt

G.75 Milan to Frankfurt is barely 500 kilometres by great circle route, but day trains currently take over eight hours, which suggests that they would be suitable for a night train. There are 1.3 million airline seats between the cities and a further 0.1 million between Frankfurt and Bergamo.

Potential route Budapest to Frankfurt

G.76 There are 0.9 million airline seats between Frankfurt and Budapest, which appears to make it a potential candidate route. It may be that the existing Dusseldorf to Vienna route via Frankfurt already carries some passengers to and from Budapest and that only limited additional passengers could be attracted by a new night train in the corridor. However, timings on the current route mean early departures from, and late arrivals in, Budapest. A route ending at Frankfurt might allow an extension to Budapest with reasonable timings.

Potential route Stuttgart to Vienna

G.77 There are 0.8 million airline seats a year between Stuttgart and Vienna, where the day journey time is around 6½ hours. ÖBB Nightjet does not currently serve Stuttgart, although a proposed new route between Augsburg and Mannheim would pass through Stuttgart and might be able to serve it effectively, depending on the timing.

Potential routes Frankfurt to Venice, Krakow and Lyon, and Munich to Warsaw

G.78 We identified four further routes served by over 0.5 million airline seats in 2019: three from Frankfurt and one from Munich. All the points served are on the existing, or proposed, ÖBB Nightjet network. They might parallel existing routes, but might require different timings to be viable. We also note that Trafikverket estimated that a route between Malmö and Cologne, with a similar-sized market, would require subsidy of around €6 million per year.

Case study routes which have declined or been closed

G.79 We also include for comparison the routes examined as case studies in Annex C. In many cases, no night trains now operate. We identified several reasons but note that:

- In the case of the two densest routes, Madrid and Barcelona to Paris, this appeared to be a clear case of high-speed rail replacing commercially-operated night train services. However, passenger representatives reported that the high-speed day trains were inadequate on the grounds of frequency, lack of direct services, late earliest arrivals, high fares and a lack of ticketing integration with SNCF's low-cost domestic service OUIGO (see Annex C, case study 2).
- Of the routes examined in case study 10, only the route between Bucharest and Istanbul is paralleled by more than 0.5 million aircraft seats. It seems likely that all these routes would require subsidy.

Summary of proposed and potential night train routes

G.80 The table below summarises the proposed and potential night trains which we assume could potentially be brought into operation in the absence of any obstacles. It also identifies:

- the proposed start date, where this has been identified;
- the likely track gauge of the rolling stock (we note that Barcelona-Zurich services could also use gauge-changing stock);
- whether the route seems likely to use high-speed lines;
- whether the route would need to use the Channel Tunnel, Oresund Link or the Fehmarn Link, expected to open in 2029; and
- our estimate of the number of infrastructure managers which might be involved, depending on the route or routes used.

Table G.4: Summary of proposed and potential routes, stock required, and networks used

Routes		Earliest start date, if stated	Track gauge	Route uses high-speed line	Route uses Channel Tunnel	Route uses Oresund Link	Route could use Fehmarn Belt	Infrastructure managers
Proposals	Amsterdam-Zurich	2021, December	Standard					3-5
	European Sleeper	2022	Standard					4
	Snälltåget	2021, June	Standard			●	●	3
	Barcelona-Zurich	2024, December	Standard	●				3
	Malmö-Brussels	2022, August	Standard			●	●	5
	Prague-Zurich	2023, if possible	Standard					3
	Stockholm-Hamburg	2022, August	Standard			●	●	3
	Rome-Zurich		Standard					2-3
Air and rail data	Zurich-London		Standard	●	●			4-6
	Geneva-London		Standard	●	●			4
	Frankfurt-London		Standard	●	●			4-5
	Munich-London		Standard	●	●			4-5
	Rome-Frankfurt		Standard					3
	Milan-Amsterdam		Standard					4-6
	Copenhagen-Oslo		Standard			●		3
	Geneva-Amsterdam		Standard					3-4
	Munich-Paris		Standard					2-3
	Milan-Frankfurt		Standard					3
	Budapest-Frankfurt		Standard					3
	Stuttgart-Vienna		Standard					2
	Venice-Frankfurt		Standard					3
	Krakow-Frankfurt		Standard					2-4
	Munich-Warsaw		Standard					2-4
	Lyon-Frankfurt		Standard					2

Source: Steer analysis and assumptions on route used and potential station calls.
Note: Barcelona-Zurich services could also use gauge-changing stock and the Iberian gauge network in Spain.

G.81 Of a total of 24 routes, several would have to use high-speed lines for at least part of their journey, including the route to Barcelona and all four routes to London. The routes to London would also require rolling stock meeting the safety requirements of the Channel Tunnel.

G.82 All cross-border routes would require the involvement of at least two infrastructure managers, but some of them might involve as many as six. In the case studies in Annex C, we note how night trains may pass through a network without making any stops which are attractive to passengers. An infrastructure manager may need to keep a line open overnight for a single night train service which provides no benefits to the local population.

G.83 We discuss briefly below some of the potential obstacles to introducing these services. Obstacles are discussed in greater detail in Annexes K to P.

The fictive night train network

G.84 The Commission required us to identify the rolling stock requirements, and costs, of a future fictive network, implicitly additional to existing services and proposals.

G.85 The table below sets out our estimate of the possible fictive network, including how some services could be operated as combined routes.

Table G.5: Fictive night train network by 2030

Route	Origin	Destination
London-Geneva/Zurich	London	Geneva
	London	Zurich
London-Munich/Frankfurt	London	Munich
	London	Frankfurt
Frankfurt-Venice/Rome	Frankfurt	Venice
	Frankfurt	Rome
Milan-Frankfurt/Amsterdam	Milan	Amsterdam
	Milan	Frankfurt
Copenhagen-Oslo	Copenhagen	Oslo
Amsterdam-Zurich/Geneva	Amsterdam	Geneva
	Amsterdam	Zurich
Paris-Munich	Paris	Munich
Budapest/Vienna Stuttgart/Frankfurt	Budapest	Frankfurt
	Vienna	Stuttgart
Krakow-Frankfurt	Krakow	Frankfurt
Munich-Warsaw	Munich	Warsaw
Lyon-Frankfurt	Lyon	Frankfurt

Source: Steer analysis.

G.86 We ignored the eight routes we identified as existing proposals, although we note that:

- Not all these routes are fully committed.
- Some of the routes may not yet have sourced suitable rolling stock, which might lead to delays in their introduction.

G.87 We included the 16 potential routes identified in our analysis, but provisionally assumed that in practice these could be combined into 11 main routes with some splitting and joining and one additional origin-destination pair:

- Routes from London would need to pass through the Channel Tunnel which has additional security and safety requirements. We assumed that the four routes would be operated as two pairs of half trains, to Geneva and Zurich and to Munich and Frankfurt.
- We assumed that routes from Frankfurt to Venice and Rome could be combined.

- We assumed that the routes from Milan from Frankfurt and Amsterdam could be combined.
- We assumed that a route from Amsterdam to Geneva, like a route from London to Geneva, could also serve Zurich, although this would depend on routing and timings.
- We assumed that the routes from Budapest to Frankfurt and Vienna to Stuttgart could be combined, with an overnight section between Vienna and Stuttgart.

G.88 Taken together, this suggests the potential for a fictive network of 17 routes, combined into a minimum of 11 trains, over and above existing proposals, which might be in operation by 2030.

G.89 We stress that this analysis is sensitive to at least three critical factors:

- the continuing emergence of new rail services proposals, such as the TEE 2.0 and TET proposals, which we discuss below;
- the future levels of airline services and fares;
- the scope to subsidise routes with economic, social or environmental benefits; and
- the operational feasibility of additional routes, given constraints on the infrastructure, which we discuss further in Annex L.

G.90 A railway undertaking or competent authority developing a proposal for a new night train service would typically also carry out detailed market research. This would include collation of available data on issues such as:

- affinities between the cities, such as a common language or migrant communities;
- whether travel was likely to be on business, leisure, or visiting friends and relatives; and
- whether travel was likely to be focused during the week, at weekends, or in particular seasons.

G.91 Railway undertakings might also carry out surveys of residents of the cities served and, where possible, passengers already travelling between them.

G.92 We discuss the rolling stock requirements, and operating costs, of this fictive night train network in Annex M.

Possible day trains routes

G.93 In the absence of reliable data on passenger numbers on existing or potential day train routes, it has proved difficult to identify the potential scope for further long-distance cross-border day trains. We examined cross-border air routes 250-500 kilometres which could, in principle, be served by rail, but found that many of them already had direct day trains or were over water and could not be served by day trains.

G.94 However, the principal difficulty is that, while long-distance cross-border night trains cannot attractively call at stations in the middle of the route, and serve mainly end-to-end traffic, long-distance cross-border day trains can serve many intermediate stations. This means that:

- They are not dependent on end-to-end or cross-border passengers, which may contribute only a small part of their revenue.
- The end points of a service may be determined by factors other than a significant volume of travel between them.

The fictive day train network

G.95 We therefore assumed that the fictive network of day trains would be based on the 27 new proposals identified in the TEE 2.0 proposal which we discuss below. We are aware that further routes might in principle be viable, but acknowledge that the TEE 2.0 study, prepared by various industry parties, is likely to have been informed by information not in the public domain and to which we do not have access.

G.96 As with the fictive night train network, we stress that this analysis is sensitive to at least four critical factors:

- the continuing emergence of new rail services proposals, which we discuss below;
- the future levels of airline services and fares;
- the scope to subsidise routes with economic, social or environmental benefits; and
- the operational feasibility of additional routes, given constraints on the infrastructure, which we discuss further in Annex L.

G.97 We discuss the rolling stock requirements, and operating costs, of this fictive day train network in Annex M.

G.98 We also note that infrastructure expected to be opened by 2030 would not have been authorised or funded without consideration of what services would operate on it, which in some cases would also include new long-distance cross-border services[147]. It could be argued that such services are implicitly part of the base of existing and planned services and should be excluded from the fictive network. In practice, such services would only be certain to be introduced in practice if they were specified in a PSO.

The effects of connectivity, speed and capacity

The effects on night trains

G.99 For each of the 24 proposed and potential night train routes analysed above, we identified:

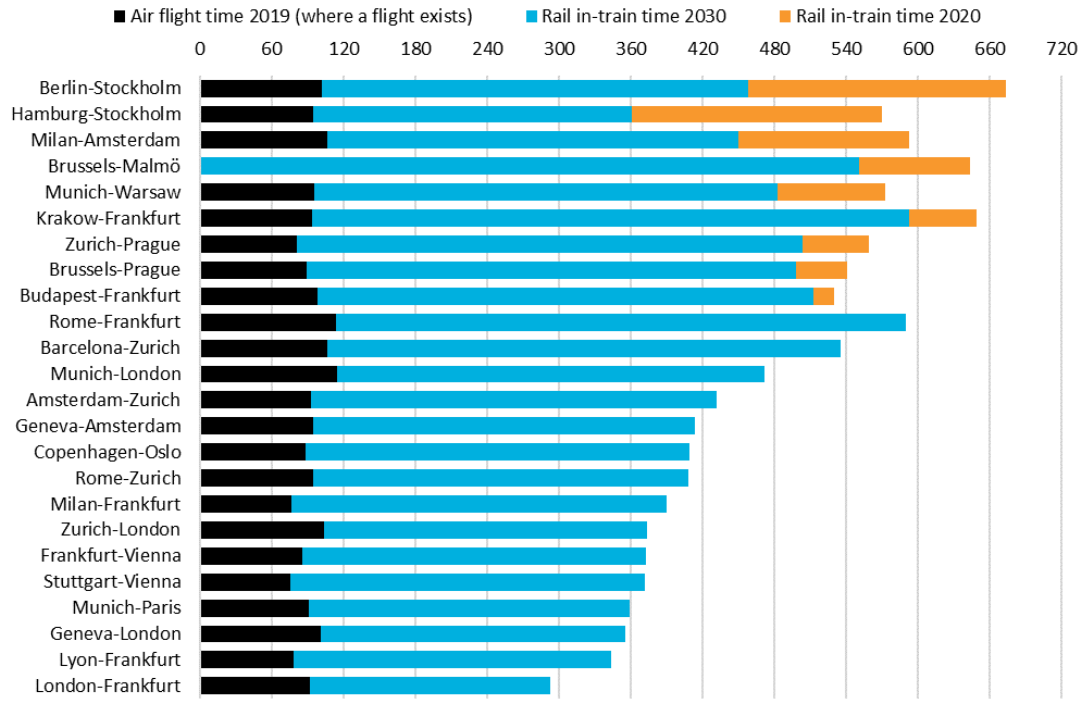
- The weighted average flight time in 2019, taken from OAG data, where flights existed between the airports serving the cities at the end points of the route;
- The 2020 rail in-train time derived as part of the evaluation of high-speed rail in Europe[148], described in greater detail in Annex E; and
- The 2030 rail in-train time forecast for 2030, taking into account projected infrastructure improvements.

G.100 The results are summarised in the figure below.

[147] High-speed lines from Belgium to France and the Netherlands, the Channel Tunnel from France to the United Kingdom, the Perpignan-Figueres link from France to Spain, and the Oresund link between Denmark and Sweden, were all planned and built specifically to operate new cross-border services, whether specified in a PSO or operated commercially. This is also the case for the Fehmarn Belt link from Denmark to Germany, and Rail Baltica from Estonia to Latvia, Lithuania and Poland.

[148] Evaluation of high-speed rail in Europe, Comprehensive literature review and potential of section upgrades for improving EU-connectivity, EBP for Commission, Final Report (Draft), November 2020.

Figure G.17: Overview of proposed, potential and withdrawn night train routes



Source: OAG, EBP, Steer analysis.
Note: there are no direct flights between Brussels and Malmö.

G.101 We note several points.

G.102 First, it can be seen that the average 2019 flight time varied little between the routes examined. The longest average flight time was around 115 minutes, and the shortest was around 75 minutes, a range of only 40 minutes. In practice, variations in average effective access times from origin to airport and airport to destination may be much greater than variations in flight times.

G.103 Second, nine of the proposed and potential night train routes may benefit from faster rail journey times by 2030 as a result of improvements on the TEN-T identified in the high-speed rail study by EBP. The outputs of that study show only the changes in journey time, and not which infrastructure proposals contribute to them, but the table below summarises our indicative interpretation of which schemes have contributed to the above savings.

Table G.6: Interaction between TEN-T and proposed and potential night train routes

Corridor	Origin	Destination	Travel times			Proposed or potential night train route								
			2020	2030	Change	Berlin-Stockholm	Hamburg-Stockholm	Milan-Amsterdam	Brussels-Malmö	Munich Warsaw	Krakow-Frankfurt	Zurich-Prague	Brussels-Prague	Budapest-Frankfurt
Total travel time saving estimated by EBP						**215**	**209**	**143**	**92**	**90**	**56**	**55**	**43**	**17**
SCMED	Stockholm	Copenhagen	315	180	135	●	●							
SCMED	Copenhagen	Hamburg	276	150	126	●	●		●					
NSMED	Brussels	Luxembourg	197	155	42			●						
BA	Vienna	Venice	459	349	110					●				
RD	Prague	Nuremberg	330	225	105						●	●	●	

Source: EPB, Steer indicative interpretation.

G.104 In practice, it has not proved possible, merely from the list of schemes provided in the study, to explain the changes in end-to-end journey times emerging from the network model.

G.105 Nonetheless, we note that the night train city pairs expected to see the greatest reductions in in-train time, Berlin-Stockholm (215 minutes) and Hamburg-Stockholm (209 minutes), will benefit:

- between Stockholm and Copenhagen, from the Ostlanken high-speed line in Sweden, due to be completed in 2028; and
- between Copenhagen and Hamburg, from the Fehmarn Belt fixed link between Denmark and Germany, due to be completed in 2029.

G.106 The Fehmarn Belt fixed link will also contribute to a projected reduction of in-train time between Brussels and Malmö (92 minutes).

G.107 Without detailed timetables for potential night train routes, it is difficult to assess how these might be improved by changes to the connectivity, speed or capacity offered by the infrastructure, either to improve or expand the services offered to passengers, or to allow railway undertakings to reduce costs or improve reliability. Nonetheless, we set out below several observations.

The effects on day trains

G.108 While details of the TEE 2.0 proposals are limited, similar issues will apply to additional day trains. We note, for instance, that journey times between Prague and Venice, and service introduction between Tallinn to Warsaw, will depend on the opening of new high-speed lines.

G.109 We next make some general points about the effects of connectivity, speed and capacity.

Connectivity

G.110 Increased connectivity of the rail network may improve the scope to operate night trains, through offering a wide range of routes or the opportunity to call in new places. ÖBB Nightjet's plans for 2024, for example, include routing night trains:

- between Augsburg and Mannheim, which we noted in paragraph G.77 might facilitate a new night train between Vienna and Stuttgart; and
- through Erfurt to Berlin, which would also allow Halle, Leipzig and Dresden to be brought into the network and would allow Prague to be served from the north and west.

G.111 However, both these services would use existing infrastructure. In addition, while improved network connectivity might allow more of the potential airport pairs identified in our analysis to be served by night trains, it would not expand the number of potential markets. To do so, it would be necessary to reduce the journey times between city pairs more than 1,000 kilometres apart, and with dense airline flows, so that they could be connected overnight, implicitly through higher speed.

Speed

G.112 Stakeholders generally agreed that, ideally, a night train should allow at least 8 hours' time in which to sleep, indicatively during the period 22:00 to 08:00, and a maximum journey time of 16 hours, indicatively within the period 18:00 to 10:00 and that, within this range, small reductions in journey time may be of little or no value to passengers.

G.113 In addition, reductions in potential in-train time may not result in equivalent reductions in actual journey times for either night or day trains. The European Court of Auditors (ECA) has pointed out that average speed of services on high-speed lines can be low[149]. Without through trains or adjusted connections, faster journeys on successive trains may merely result in longer connecting times between them.

G.114 Nonetheless, improvements in speed may allow a night or day train service to be:

- retimed to provide better arrival or departure times, or connections;
- extended to serve additional cities (ÖBB Nightjet, for example, can extend some services eastwards from its Vienna hub to serve Bratislava and, in some cases, Budapest); or
- operated more efficiently, by combining it with another service over part of its route.

Retiming services

G.115 For the proposed and potential night train routes, we note that none of the projected reductions in journey time would reduce the end-to-end in-train line below 360 minutes or six hours, in the case of Trafikverket's Hamburg-Stockholm PSO service. However, the shorter journey time might mean that more passengers preferred to use day trains, and that the Hamburg to Copenhagen journey, which in principle can be made on Snälltåget's new service (see Figure G.16), became too brief to give a full night's sleep, as we discuss below.

Extending services

G.116 Some of the projected reductions in journey time might allow the services to be extended. For example, it might be possible:

- to begin the Berlin-Stockholm service in Dresden or Prague; or
- to begin the Hamburg-Stockholm service in Dusseldorf, Cologne or Frankfurt.

[149] Speed yield analysis, Annex V, Special Report - A European high-speed rail network: not a reality but an ineffective patchwork, European Court of Auditors (2018)

G.117 However, this would depend on finding a path between these cities which resulted in attractive arrival and departure times at each city on the route, which may be difficult where infrastructure is congested, as we discuss below.

Combining services

G.118 At first sight shorter journey times might make it possible to combine more services. Trafikverket's two proposed PSO routes, Brussel-Malmö and Hamburg-Stockholm, might at first sight be combined into the single Brussels-Stockholm route that Trafikverket originally investigated. However, with shorter journey times between both Hamburg and Copenhagen and Malmö and Stockholm, this might mean that:

- There was no longer a viable market between Hamburg and Copenhagen/Malmö.
- Either Hamburg or Copenhagen and Malmö had to be served in the middle of the night.

G.119 This might mean that a combined route would need to run overnight between either Dusseldorf and Copenhagen or between Hamburg and Stockholm, and could not effectively connect all the points connected by two separate services.

G.120 We stress that the above analyses are illustrative, and that details would depend on an assessment of the potential markets, stopping patterns and timings as and when detailed timetabling took place. Nonetheless, they illustrate the potential complexities of taking advantage of new infrastructure but also retaining attractive timings, with departures between around 18:00 and 23:00 and arrivals between around 05:00 and 10:00.

Other opportunities

G.121 We noted above how relatively few night trains run in France and Spain, which have extensive networks of high-speed lines radiating from their capitals to other major cities. The evidence from the case studies is that the opening of high-speed lines is unlikely to create significant opportunities for night trains and is more likely to result in them being withdrawn because the cities they connected can now be reached quickly by day[150]. Stakeholders commented that, until night train stock is available which can be operated over long distances on high-speed lines, the speed offered by high-speed lines is of little relevance to night trains.

G.122 Porto could, in principle, be joined to the night train network, but its only air route with more than 500,000 seats is to Barcelona. This journey currently takes 16½ hours by rail, longer than the time window between the end of one working day and the beginning of the next. It might require major investment in new infrastructure and rolling stock before this could be reduced to an attractive overnight train journey.

G.123 Helsinki could, in principle, be joined to the night train network, but the densest routes are to Stockholm, Oslo, Gothenburg and Copenhagen, all of which would require a link across the Gulf of Bothnia[151].

[150] Night trains between London and Manchester were withdrawn in 1983. Day trains now operate every 20 minutes for most of the day, with a journey time of less than 2 hours 10 minutes. High-speed line is expected to reduce this journey time to less than 1 hour 10 minutes.

[151] Rail Baltica could, in principle, allow a route between Helsinki and Warsaw, but that had only 0.2 million airline seats in 2019.

Capacity

G.124 Measuring infrastructure capacity is technically complex, as the number of trains which can be fitted onto a link, or through a junction or station, depends on their relative speeds, dynamic behaviour and timings.

G.125 Our desk research, including studies of night train routes from Sweden[152] and the Netherlands[153], and our discussions with stakeholders, identified numerous references to the difficulties of obtaining suitable paths for new night trains, particularly in city centre stations which are already congested in the morning peak. We identified many stations which at least one source had reported as being congested at certain times.

G.126 The table below lists the potential and case study night train routes discussed above and identifies through which of these stations they might need to pass or arrive. For example:

- Night trains from Berlin to Paris might arrive in Paris Gare du Nord, as shown, but could also be routed to Gare de l'Est.
- In contrast, night trains to and from London would need to pass through Lille Europe and terminate at London St Pancras International station, both of which have been identified as congested or constrained.

[152] Underlagsrapport till Nattågstrafik till Europa, Kapacitet för nattåg till kontinenten, 2020:114, Trafikverket (2020)

[153] Slapend onderweg, Potentieel van de internationale nachttrein van en naar Nederland, Kennisinstituut voor Mobiliteitsbeleid (KiM), (2019)

Table G.7: Constrained stations existing proposals, Steer analysis of air and rail data, and case study night trains

Routes		Total	Amsterdam	Berlin	Cologne	Copenhagen	Frankfurt	Hamburg	Karlsruhe	Lille	London	Oslo	Paris Nord	Prague	Stockholm	Zurich
Proposals	Amsterdam-Zurich	2	●													●
	European Sleeper	2	●	●										●		
	Snälltåget	4		●		●		●							●	
	Barcelona-Zurich	1														●
	Malmö-Brussels	3			●	●		●								
	Prague-Zurich	1														●
	Stockholm-Hamburg	3				●		●							●	
	Rome-Zurich	1														●
Air and rail data	Zurich-London	2								●	●					
	Geneva-London	2								●	●					
	Frankfurt-London	4			●		●			●	●					
	Munich-London	2								●	●					
	Rome-Frankfurt	1					●									
	Milan-Amsterdam	1	●													
	Copenhagen-Oslo	2				●						●				
	Geneva-Amsterdam	1	●													
	Munich-Paris															
	Milan-Frankfurt	1					●									
	Budapest-Frankfurt	1					●									
	Stuttgart-Vienna															
	Venice-Frankfurt	1					●									
	Krakow-Frankfurt	1					●									
	Munich-Warsaw															
	Lyon-Frankfurt	1					●									
Case studies of withdrawal (See Annex C)	Barcelona-Paris															
	Madrid-Paris															
	Berlin-Paris	2		●			●						●			
	Lisbon-Madrid															
	Barcelona-Milan															
	Brussels-Italy															
	Cologne-Warsaw	1			●											
	Hamburg-Paris	2			●			●								
	Bucharest-Istanbul															
	Berlin-Budapest															
	Belgrade-Istanbul															
	Vilnius-Warsaw															
	Belgrade-Thessaloniki															
	Bucharest-Thessaloniki															

Source: Steer analysis and assumptions on route used and potential station calls.

G.127 All of the proposed new night train routes pass through at least one of these stations, and we discuss in Annex L how Snälltåget's new Stockholm to Berlin route passes through four of them (Stockholm, Copenhagen, Hamburg and Berlin). Trafikverket's new PSO routes would also both need to pass through three of the same stations.

G.128 We found repeated reference in reports and by stakeholders to the difficulty of obtaining suitable train paths to run even the proposed night trains. This raises the concern that it may rapidly become more difficult to add significant numbers of further services.

G.129 As we noted above, different night trains may pass through the same station several hours apart, with no interaction and little issue of capacity. However, most night trains will need to call in at least one, and often more, major stations during the period 07:00 to 10:00. We discuss in Annex L how ÖBB Nightjet's extensive network, operating from the new Vienna Hauptbahnhof, requires only eight evening night train departures and eight morning arrivals, which are spread over nearly three hours. However, of the proposed and potential routes listed in the table:

- Seven would end in Frankfurt.
- Five would end in Zurich.
- Four would end in London.

G.130 Without detailed timetable analysis, we cannot identify how many night trains could reasonably call at other, already congested, stations in this period. We note, however, the potential that it becomes increasingly difficult to add any further night trains at some stations at times which are attractive to passengers.

G.131 We discuss the issue of capacity and capacity allocation further in Annex L.

The TEE 2.0 proposal and the TET study

G.132 As noted above:

- On 17 May 2021, two weeks before the completion of our Interim Report, several ministers of transport published a letter of intent to introduce new long-distance cross-border night and high-speed day trains (a new Trans Europ Express, "TEE 2.0") and a proposal for EU-wide regular interval services ("Europatakt").
- On 20 May, three days later, the French government published a report on the development of new "TET" lines which also included proposals for additional cross-border services.

G.133 We next describe these proposals, compare them with our own analysis, and draw a number of conclusions.

The TEE 2.0 proposal

G.134 The TEE proposal took the form of a letter of intent to introduce new long-distance cross-border night and high-speed day trains.

Night trains

G.135 The table below lists the night train routes proposed "to be implemented in the near future".

Table G.8: TEE 2.0 proposals for long-distance cross-border night trains

Route as announced	Observation
Amsterdam-Cologne-Zurich	ÖBB route, announced for 2021
Zurich-Barcelona-Madrid	OBB route, announced for 2024, extended to Madrid
Zurich-Milan-Rome	ÖBB route, announced without a date
Brussels/Amsterdam-Cologne-Berlin-Prague/Warsaw	European Sleeper route, announced for 2022
Stockholm-Copenhagen-Berlin	Snälltåget route for 2021
Copenhagen-Berlin-Prague-Bratislava-Budapest	Snälltåget route for 2021 south of Copenhagen to Prague
Paris/Brussels-Mannheim-Berlin/Vienna	Paris-Berlin reinstates a case study route, see Annex C

Source: Steer analysis.

G.136 In summary:

- Five of the seven routes are proposals identified and discussed above, in the case of Zurich-Barcelona, with an extension to Madrid.
- One of the routes would parallel part of Snälltåget's new route, from Copenhagen to Berlin, with an extension to Prague. The Fehmarn Belt crossing (paragraph G.59) could remove the rationale for a Hamburg stop, and reduce the Copenhagen to Berlin journey time to eight hours or less, although this is not expected to open until 2029.
- One of the routes reinstates the Paris-Berlin case study route.

G.137 Our provisional view is that this announcement does not represent a fundamental change to the 8 routes we identified as already proposed, the 16 potential routes we identified, or the fictive network of 17 origin-destination pairs served with 11 combined routes. However, some potential routes might be combined with TEE 2.0 routes to create a single, more commercially viable route.

High-speed day trains

G.138 The table below lists the high-speed day train routes and the timescales over which it was proposed that they be implemented.

Table G.9: TEE 2.0 proposals for long-distance cross-border high-speed trains

Route as announced	Observation
Phase 1: implementation in the near future	
Munich-Bregenz-Zurich-Milan	
Berlin-Prague-Vienna-Graz(-Zagreb)	Existing service, Vindobona, increased frequency
Berlin-Strasbourg-Barcelona-Madrid-Málaga	
Paris-Brussels-Berlin-Warsaw	
Amsterdam-Brussels-Paris/London	Existing service
Amsterdam-Brussels-Paris-Lyon-Barcelona-Valencia-Murcia	
Brussels-Luxembourg-Strasbourg-Berne-Milan	Route of a closed night train, see Annex C
Hamburg-Berlin-Prague-Bratislava-Budapest	Existing service, Hungaria
Prague-Ostrava-Warsaw(-Gdynia)	Further infrastructure may reduce journey time
Venice-Graz-Vienna-Bratislava-Kosice	
Milan-Venice-Ljubljana-Zagreb-Budapest	Further infrastructure may reduce journey time
Frankfurt-Munich-Linz-Vienna-Budapest	Rerouting may reduce journey time
Barcelona-Nice-Milan-Venice	Route of a closed night train, see Annex C
Phase 2: implementation by the mid-2020s	
Hamburg-Basel-Milan	
Copenhagen-Hamburg-Amsterdam	
Amsterdam-Munich-Vienna	
Amsterdam-Berlin-Warsaw	
Amsterdam-Cologne-Basel-Rome	
Paris-Strasbourg-Stuttgart-Munich-Vienna-Budapest	
Phase 3: implementation by the end of the 2020s	
Berlin-Innsbruck-Rome	
Stockholm-Copenhagen-Hamburg-Brussels-Paris	
Hamburg-Bordeaux-Madrid-Lisbon	
Copenhagen-Berlin-Prague	
Prague-Dresden-Frankfurt	Full offer not until the 2030s
Prague-Vienna-Graz(-Ljubljana-Venice)	Depends on completion of high-speed line in Austria
Berlin-Prague-Vienna	
Prague-Dresden-Frankfurt(-Strasbourg-Paris)	
Stockholm-Copenhagen-Berlin-Munich	
Oslo-Malmö-Copenhagen	Identified by Steer as a possible night train route
(Helsinki-)Tallinn-Riga-Kaunas-Warsaw	Planned service on Rail Baltica II

Source: BMVI, Steer analysis.

G.139 The proposal lists 30 services, of which 27 would be new, but does not state how many train pairs would operate on each. Some routes may be operated by combining existing routes or using spare stock, and there is no statement of whether and when new rolling stock would be required and how it would be acquired. Without further details, it is unclear how many new long-distance cross-border trains would exist, at what times they would operate, how fares would be set, and how many passengers they would take from existing rail and air services.

The TET study

G.140 As noted above, on 20 May 2021, three days after the TEE 2.0 proposal, the French government published a report on the development of new "TET" lines which also included proposals for additional cross-border services.

G.141 Most of the services in the TET proposal would be domestic, but it also included proposals for night trains summarised in the table below, including one combined route from Paris and Brussels to Berlin and Vienna.

Table G.10: TET proposals for long-distance cross-border night trains

Stations at one route end	Join/split	Stations at another route end
Paris St-Pierre-des-Corps Bordeaux		Burgos Valladolid Madrid
Paris Dijon		Bologna Florence Rome
Paris Aulnoye Brussels Liège		Bremen Hamburg Copenhagen Malmö
Paris Metz	Mannheim or Frankfurt	Leipzig Berlin
Brussels Liège Cologne		Linz Vienna

Source: Étude de developpement de nouvelles lignes de trains d'equilibre du territoire (TET), Steer analysis.

G.142 We did not attempt to analyse the TET proposals in detail, but note that the Paris-Brussels-Hamburg-Copenhagen-Malmö corridor is similar to Trafikverket's proposal[154].

G.143 More widely, we note the continued emergence of new proposals for long-distance cross-border trains, and the difficulty of establishing whether and when they will emerge in practice, makes it difficult to either to define what services are already committed or to identify what additional fictive services could be added.

Additional passenger numbers on night trains

G.144 We discuss below the scope for new long-distance cross-border routes to carry more passengers.

Passenger numbers on existing night trains

G.145 As we set out in Annex D, there is no comprehensive source of data on rail passenger numbers between individual stations or on individual night trains. Only one stakeholder, Trafikverket, was able and willing to provide data on passenger numbers. We did, however, find indicative data on the number of passengers on some existing night train services.

Domestic services operated by Caledonian Sleeper

G.146 In the 2017 study for the European Parliament[155], we estimated that the domestic Caledonian Sleeper service in the United Kingdom had an average passenger load of 128. Operating six days a week in both directions, this suggests a total of around 80,000 passengers per year on each of the two main routes, or around 160,000 passengers per year. As context, between

[154] On 30 August 2021, Trafikverket announced that no bids had been received for a Malmö-Brussels service.

[155] Figure 37, Data for 2015/16, Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

London and the four main destinations of Glasgow, Edinburgh, Aberdeen and Inverness, there are around 7 million airline passengers per year[156]. This suggest that the night train carries only around 2% of the passenger carried by the airlines, although this is partly because of the fast and frequent day train service, with journey times of less than 5 hours from London to Glasgow and Edinburgh.

Domestic and cross-border services operated by ÖBB Nightjet

G.147 ÖBB's statistics[157] do not report numbers of Nightjet passengers, but the 2017 study also identified ÖBB aspiration to carry nearly 2 million passengers on Nightjet by 2018[158]. ÖBB currently operates around 10 trains per night (it refers to 19 "lines" including trains which split and join) which suggests it may carry 200,000 passengers per year per route.

G.148 Taken together, this limited evidence suggests that a successful night train route, whether subsidised not, may carry around 80-200,000 passengers per year.

Growth to 2030

G.149 We set out in Annex D our estimates of past growth in numbers of long-distance cross-border rail passengers, and Reference Scenario growth rates, as summarised below.

Table G.11: Growth rates used to estimate 2019 and 2030 demand from 2005, 2010 and 2015 demand

	Years	Source	Compound average growth rate
2005-2010	5	Steer analysis of Eurostat data	2.1%
2010-2015	5		1.8%
2015-2019	4		1.8%
2019-2020	1	EU Reference Scenario	1.7%
2020-2030	10		1.6%

Source: Eurostat, EU Reference Scenario, Steer analysis.

G.150 This suggests that cumulative growth in passenger numbers between 2019 and 2030 will be around 20%. With the additional services emerging from our review of the TEE 2.0 and TET proposals, this results in the numbers shown below.

Estimated passenger numbers on proposed and fictive trains by 2030

G.151 The table below summarises the estimated number of additional passengers which might be carried if all the proposed and fictive trains were operated. The introduction of the potential routes would depend, inter alia, on obtaining not only infrastructure capacity but also suitable rolling stock, which one study suggested could take from three to six years [159]. We stress that:

- The estimates are highly indicative, and that much will depend on the rate, and patterns, of recovery from the effects of the COVID-19 pandemic.

[156] CAA airport statistics.

[157] ÖBB Zahlen Daten Fakten (2019, 2019/20)

[158] Figure 6, Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

[159] De nachttrein naar Nederland, Rebel, September 2019 (2019)

- The estimates do not take into account the potential effects of TEE 2.0 and TET, and their interaction and overlaps with existing proposals and the fictive network.

Table G.12: Indicative passengers on additional night train routes, 2019 levels of demand

Routes	Origin-destination pairs	80,000 per route	200,000 per route
Proposed routes	8	0.64 million	1.6 million
Fictive network	17	1.36 million	3.4 million
Total	**25**	**2 million**	**5 million**
Total in 2030	**25**	**2.4 million**	**6 million**

Source: Steer analysis.

G.152 Nonetheless, this suggests a potential range of 2-5 million additional night train passengers if all the potential routes opened, rising by 20% by 2030.

Additional passenger numbers on day trains

G.153 As noted in paragraph G.93, we found it difficult to derive estimates of passenger numbers on potential future day trains from data on airline seats.

G.154 We note in Annex I (paragraph I.8) that a long-distance train might carry 200 passengers, but also in paragraph 3.34 that trains may be carrying an average of fewer than 150 passengers at the point at which they cross a border. If each new long-distance cross-border direct train carried 50 passengers who had not previously used rail, each train pair would carry 100 new passengers per day or 36,500 new passengers per year.

G.155 This suggests that one train pair on each of 27 new routes might add around 1 million passengers per year. We stress, however, that we have little basis on which to estimate:

- How many additional long-distance cross-border trains would or could be operated.
- How many passengers would actually cross one or borders on each train.
- Whether these would be long-distance passengers, or ones making relatively short journeys between neighbouring border regions.

The scope for car-carrying services

G.156 The map below, provided by Autoreisezug-planer, shows car-carrying services between Austria, Germany and Italy.

G.157 In practice, the mode suffers a number of complexities and limitations:

- Space may limited, and cannot be added easily, so services may rapidly be fully-booked.
- Special car-carrying vehicles are required.
- Loading ramps are required and may not be available in passenger stations, with the effect that passengers have to load their car at one point and board their train at another.
- Loading and unloading vehicles en route is slow, so vehicles are normally only carried between the ends of routes on which there is no need to minimise end-to-end journey times. This means that it is often only practicable to combine car-carrying services with night trains.

G.158 ÖBB Nightjet advertises car-carrying services to and from eight points in Austria, Germany and Italy[160], but in summer 2021 was operating a single route between Hamburg and Innsbruck.

[160] Dusseldorf, Feldkirch, Graz, Hamburg, Innsbruck, Livorno, Vienna and Villach.

Figure G.18: Car-carrying train services in Austria, Germany and Italy



Source: https://www.autoreisezug-planer.de.

G.159 Vienna, for example, has a dedicated loading facility built at the same time as the new Hauptbahnhof, but the map below shows how it is around 1.5 kilometres from the station.

Figure G.19: ÖBB car loading facility in Vienna



Source: ÖBB Nightjet.

G.160 We attempted to investigate the scope for car-carrying services, but in practice no information on demand for such services is available. We conclude that the opportunities for providing car-carrying services may be limited by:

- the number of night trains linking stations with suitable loading facilities;
- the number of these stations between which there is significant demand; and
- the additional operational cost and complexity of providing the service.

Summary

G.161 This Annex has highlighted the potential to operate additional long-distance cross-border trains but also the uncertainties of whether, and by when, suitable infrastructure capacity and rolling stock could be found.

The potential for additional long-distance cross-border services

G.162 Most existing night trains appear to parallel airline routes offering more than 500,000 seats and connecting airports between 500 and 1000 kilometres apart. We identified 96 such airport-to-airport routes within the study area connecting 91 city pairs, and found that these included all eight new night train routes proposed by existing and new operators. We identified a further 16 potential origin-destination pairs and estimated that these combined into 11 fictive routes serving 17 origin-destination pairs. However, we note that many of them have fewer airline seats than routes, on which night trains had ended, examined as case studies in Annex C. Some of the routes might be viable, whether operated commercially or on the basis of a PSO, but detailed operational and market studies would be required to

investigate. We estimate that these additional potential and fictive routes might, by 2030, carry an additional 2.4-6 million night train passengers per year.

G.163 It is much more difficult to establish whether additional cross-border day trains would result in either significant more train provision or significantly more cross-border passengers, or over what distance they might be travelling. Nonetheless, we estimate that 27 new long-distance cross-border trains might result in 1 million additional cross-border passengers.

G.164 In practice, the outcome would depend on:

- the details of the timings of the new trains;
- the structure and level of fares;
- the effects of the recovery from the COVID-19 pandemic;
- changes in public attitudes to the environment and transport; and
- the effectiveness of initiatives at the European and national level.

G.165 Some long-distance cross-border services, such as night trains connecting stations with suitable loading facilities, may be able offer a car-carrying service, although this requires special loading facilities and car-carrying vehicles and is technically complex to provide.

H Measures to stimulate cross-border services

Introduction

H.1 The Technical Specifications required us to identify any measures at European, (multi-)national or industry level, which were meant to stimulate cross-border (night and long-distance) train services or domestic night train services, including their level of success and failure.

Our approach

H.2 We based our analysis on our industry knowledge, desk research, and information provided by stakeholders.

H.3 The table overleaf summarises a range of past measures to stimulate, or in some cases to enable, cross-border services.

H.4 The table illustrates how the need for cooperation to provide cross-border rail services has been a continuous process since the nineteenth century. While local, regional and national railways had initially adopted several incompatible features, as they met at borders there was a growing opportunity to serve not only local, regional and national markets but also to support cross-border transport of both passengers and freight.

H.5 One consequence is that early differences related to the civil and mechanical engineering in the railways, and embedded in the construction of the infrastructure, remain largely unchanged because of the need for wholesale reconstruction to harmonise track and structure gauge. A recent example is the decisions to extent the standard gauge network within the areas using the Iberian gauge, where Spain has decided to build high-speed lines to the standard gauge, and the Russian gauge, where Rail Baltica II will extend the standard gauge network into three more Member States.

H.6 At first sight is has been simpler to remove early differences in the electrical and electronic engineering, and subsequent data and technology systems, used in the railways. Different electrification systems can increasingly be used by multi-voltage locomotives. European Rail Traffic Management System (ERTMS) and, within it, the European Train Control System (ETCS) create the prospect of a single Europe-wide signalling, train control and traffic management system[161]. However, many of the recent initiatives, often collectively described as "digitalisation", have still resulted in additional costs before beginning to provide benefits, and have not always delivered improved cross-border interoperability.

H.7 We discuss below several aspects of these past and current measures, discussing in turn:

- rolling stock standards and financing;
- ticketing for services on successive railway undertakings; and
- developments through EU policymaking.

[161] ETCS is being used widely outside Europe, most notably in China.

Table H.1: Past measures to stimulate cross-border and night train services

Challenge or aim	Measure	Level	Implemented and year	Aim achieved?	Unintended consequences	Remarks
International coupling standard	Berne Convention on technical unifications in the railway sector	Industrial-technical	✓ 1886	✓	✗	Implementation depended on national details, but most relevant European states implemented in the late nineteenth century.
Standardisation focusing on international traffic	Founding of UIC (Union internationale des Chemins de fer)	Governance	✓ 1921/ 1922	✓	✗	
International direct trains/ through coaches	RIC (Regolamento Internazionale delle Carrozze)	Industrial-technical	✓ 1922	✓	✗	RIV Similar measure for freight wagons.
International end-to-end ticketing	TCV/SCIC	Distribution and sales	✓ 1923/ 1924	✓	✗ ⇓ ✓	Further development over decades. TCV/SCIC has lost significance as yield management and market prices have been implemented separately from through tariffs.
Unlimited railway travelling in Europe	Interrail	Marketing	✓ 1972	✓	✓	2016 added of one return journey in country of residence with Global Pass. Free Interrail pass scheme. Some incumbents report that Interrail complicates yield management.
Cooperation between regions	Interreg	Funding	Part 1989	Part	✓	Positive measures of seed funding and financing, with some notable successes, but regularly scope limited to regional rail.
Replacement of many incompatible safety systems in Europe	ETCS (European Train Control System)	Industrial technical	Part from 1990s	✗/ Part	✓	Incompatible “national” ETCS versions exist, and in some cases there have been negative effects on capacity.
Opening of the market for international rail passenger	Third railway package (Directive 2007/58/EC)	Regulation	✓ 2007	✗	✓	Intended to boost commercial open access, but led to little entry, loss of cooperation, and in some cases worse services than before.
Establishing a single European railway area, and regulation of track access charges	Recast of first railway package (Directive 2012/34/EU)	Regulation	Yes 2012	✓	✓	Even after the recast, charges can be higher for cross-border than for domestic services. This is still permitted, and worsens the viability of cross-border services.
Completion of the Single European Railway Area	Fourth railway package (Regulation (EU) 2016/796 on ERA)	Regulation	Part 2016	Part		ERA will be a “one stop shop" entry point for applications, using easy, transparent and consistent procedures.
One-transaction international ticketing	OSDM	Distribution and sales	✗ 2022	✓		Stakeholders are optimistic about OSDM, but it depends on railway undertaking adoption and use.

Source: KCW analysis.

H.8 Two issues that were first identified and addressed in the nineteenth century are still of relevance today: rolling stock standardisation and financing, and the distribution and sale of tickets for successive railway services, which on cross-border journeys are often operated by more than one railway undertaking.

Rolling stock standards and financing

H.9 The Berne Convention on a common European standard for screw couplings dates back to 1886. Since 1922, common European standards have been developed and maintained for rolling stock in the areas of braking, power supplies for onboard services and door controls. The standards are established under the auspices of the "Regolamento Internazionale delle Carrozze" (RIC, international coach regulations), allowing RIC-standard vehicles to be deployed on services across Europe.

H.10 In 1956, several states and their incumbent operators founded Eurofima, a supranational organisation with the original aim of financing rolling stock for international services under favourable credit conditions. We understand that a further aim was to secure lower unit costs through joint orders for RIC rolling stock.

H.11 Eurofima-financed RIC vehicles formed the backbone of high-quality services on the EuroCity network developed by UIC and launched by incumbent RUs in 1987. The size of the network peaked in the late 1990s, including through carriages to a far greater range of destinations than is served today, as discussed in Annex C.

H.12 The continued existence of RIC coaches facilitates the provision of cross-border rail services including night trains. They are still used by both incumbent railway undertakings and new entrants such as RegioJet, which use RIC coaches on cross-border night trains.

H.13 RIC agreements have simplified railway operations throughout Europe for almost 100 years, as only locomotives need to be changed at borders. However, the coupling and uncoupling of railway vehicles with screw couplings can be labour-intensive. Rather than a common standard automatic coupler emerging, there has been a trend towards largely non-interoperable automatic couplings on modern passenger-carrying rolling stock.

H.14 We are aware of two industry initiatives aiming to address these issues. The first concerns automatic digital couplings for freight wagons under a project co-financed by the German transport ministry BMVI. The second is a programme to retrofit the ÖBB Railjet fleet with automatic couplings, speeding the splitting and joining of sets used on routes such as Budapest-Vienna-Munich/Innsbruck. However, wholesale conversion of the Nightjet fleet to automatic couplings could threaten the use of Railjet sets to convey additional RIC carriages, as is occasionally practiced by Austrian ÖBB and Czech ČD.

H.15 There remains a need to develop a universally interoperable automatic physical coupling to replace screw couplings on international passenger rolling stock in Europe. To reduce staffing costs, this would also need to replace manually connected cables for systems such as heating and door controls. This technical challenge that is yet to be overcome.

H.16 Finally, while push-pull operations are more economic than conventional locomotive-hauled services, there is no common standard for push-pull train control in Europe.

H.17 These issues appear to be critical for the restoration of the variety of destinations served directly by international services which, as we identified in Annex C, disappeared between 2001 and 2019. They would also facilitate proposals such as TEE 2.0, in which existing national

regular interval, clockface or "Takt" services would be joined to offer very-long-distance international journey opportunities. Stakeholders told us that the trains used should preferably be operationally compatible with existing fleets, to maintain sufficient capacity without disrupting rolling stock train plans.

Ticketing for services on successive railway undertakings

H.18 The International Union of Railways (UIC) has been involved in standardisation of processes since its inception in 1922. We understand that this included the initial development of an international tariff, and arrangements for ticket sales based on it, which later becoming the Special Conditions for International Carriage (SCIC).

H.19 There are essentially three means of offering tickets for journeys involving more than one train service, ideally at a single point of sale and as a single transaction:

- End-to-end or station-to-station fares from origin to destination were historically set by incumbent operators, under the auspices of the UIC, in the form of the SCIC international kilometric non-reservable tickets (NRT) tariff.
- Individual fares for components of a journey can be combined into a single ticket, but as of 2021, this remains rare for cross-border journeys. One example is the "Any Belgian Station" ticket, formerly free, and now a flat rate add-on fare, offered by Eurostar and Thalys for destinations not served by their own services.
- Interrail and other multi-trip passes can extend across a wide range of services. Interrail was first proposed by the Dutch incumbent railway undertaking in 1970 and launched two years later.

H.20 For many years the SCIC-NRT kilometric tariff adequately covered the needs of railway undertakings and passengers. However, the advent of market pricing at both national and international level, as well as increasing divergence on terms and discounts, such as for children and the elderly, has led to a stark decline in its relevance[162]. In addition, the tariff is no longer valid on many services, including high-speed trains in France and Spain and ÖBB's NightJet night trains.

H.21 Today, yield-managed through-tickets are only available for selected routes, often with widely differing terms and conditions. We understand that only DB currently offers yield-managed international through fares for journeys that do not start or end in the incumbent's homeland, such as for Amsterdam-Prague, and that these are based on bilateral agreements with other incumbents.

H.22 The UIC initiative Open Sales and Distribution Model (OSDM), described in Annex N, seeks to address these issues by establishing "a new online standard for the purchase of dynamically priced segments". OSDM will facilitate the option of combining several tariffs into summed fares that can be issued as a single transaction for the whole journey. Retailers should then be able to offer intending passengers the cheapest combination of tickets meeting their requirements.

[162] See, for example, the range of discounts for children shown in Figure 4.14 of Study on the prices and quality of rail passenger services, Steer for European Commission (2016)

Developments through EU railway policymaking

H.23 The railway policy of the European Union has sought to boost further harmonisation processes. Probably the most notable measure is the initiation of the European Train Control System (ETCS) as part of the European Rail Traffic Management System (ERMTS).

H.24 The aim of ETCS is to replace numerous different legacy safety and signalling systems across Europe. However, there is a poor business case for replacing existing train protection systems[163]. A Swiss stakeholder also referred to how ETCS can have negative impacts, such as loss of capacity compared to the legacy signalling system[164].

H.25 In the long term, ETCS is intended to be a single common system, but in the short term it is often an additional system required for a short part of a journey. For example, the implementation of ETCS in the Netherlands resulted in the discontinuation of DB's City Night Line night train services to/from Amsterdam in December 2014, as the deployment of an ETCS-compatible locomotive would have been too costly for the railway undertaking[165]. CER has stated that, "we are missing the 'E' in ERTMS, and we are missing the interoperable version for international services, but also within some countries because of what has been installed"[166].

H.26 More generally, interoperable train sets are more costly than non-interoperable train sets, with the effect that production costs for cross-border rail transport are higher than for domestic services.

H.27 European railway polices are led by the concept of a Single European Railway Area (SERA). However, we learned that measures intended to promote further harmonisation have not (yet) achieved their goal, as summarised in the table above.

H.28 The recast of the first railway package as Directive 2012/34/EU created a new framework for the regulation of track access charges within the EU. However, and as we note in Annex K, the Directive allows market-differentiated pricing, specifically for domestic and cross-border services[167]. This led to a significant reduction of track access charges for night trains on the German network in 2017/2018[168], but in other cases cross-border services pay higher

[163] https://www.railjournal.com/opinion/will-digitalisation-spur-etcs-deployment-in-europe (accessed 25.5.2021)

[164] https://www.bav.admin.ch/bav/de/home/publikationen/interviews/archiv/interview-autonome-mobilitaet.html (accessed 25.5.2021)

[165] https://www.bundestag.de/resource/blob/356570/41abb5806e2323cd23b10d51ef5583b3/026_sitzung_protokoll-data.pdf (accessed 25.05.2021)

[166] https://www.railjournal.com/opinion/will-digitalisation-spur-etcs-deployment-in-europe (accessed 25.5.2021)

[167] Annex VI, Article 1(c).

[168] https://fahrweg.dbnetze.com/resource/blob/1359338/6ad6cc2c965b209b6b53df695902d447/Ueberblick_genehmigtes_TPS18-data.pdf (accessed 25.5.2021)

infrastructure access charges than domestic services[169]. Harmonising access charges for all intra-EU services would simplify charging structures and ensure that there was no disincentive to introduce new cross-border services or to merge or extend existing ones across borders.

H.29 The third railway package included the opening of the market for international rail passenger train services under Directive 2007/58/EC. The intention was to boost long-distance cross-border open access services, but evidence to date suggests this has been extremely limited. New services have been largely confined to incumbents no longer working in cooperation with each other on cross-border services, rather than truly new offers[170]. This has had mixed effects on services for passengers and appears to be associated with the reduction of cross-border services to and from Italy, while resources were diverted to the defence of Italy's domestic rail market against the perceived threat of cabotage (see also the timeline in Annex C). We note that new entrant RegioJet launched domestic open access services within Czechia before extending some of them to Slovakia.

H.30 Regulation (EU) 2016/796 under the fourth railway package gave the European Union Agency for Railways (ERA) more responsibility for pushing forward the Single European Railway Area (SERA). However, one railway undertaking told us that rolling stock certification procedures under ERA have become more difficult than they were before.

Conclusions

H.31 European policy of creation of a liberalised Single European Railway Area has not boosted long-distance cross-border services as hoped. Some measures have proved to be counter-productive, at least in the short term. Many former initiatives of the rail industry require updating, notably on the operational interoperability of rolling stock at the level of physical couplings and multiple-working/push-pull train control.

H.32 Historic industry-led standards need to be reviewed and updated to address current and future challenges. Removing existing and effective EU policies or industry standard, such as RIC, may be counterproductive until adequate alternatives have been shown to be at least as effective, with no unanticipated negative effects. The OSDM initiative will require close monitoring to assess its effectiveness in facilitating ticketing at a single point of sale and single transaction, and the inclusion of non-incumbent railway undertakings and third-party vendors in ticket distribution.

H.33 Kick-start funding for regional cross-border rail services under Interreg is outside the scope of this study, but we note that it has effectively filled the gap between the funding available for domestic services and that needed to cover the additional costs associated with cross-border operation, at least during the start-up period.

[169] **https://ec.europa.eu/regional_policy/sources/docgener/studies/pdf/cb_rail_connections_en.pdf** (accessed 25.5.2021) p. 37

[170] **https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2013:0034:FIN:EN:PDF** (accessed 25.5.2021)

I The comparative costs of rail and competing modes

Introduction

I.1 The Technical Specifications required us to compare the main cost drivers identified for rail with those for aviation and long-distance coaches, noting that the latter might be based on a literature study.

I.2 In this Annex:

- We summarise additional analysis of the costs of rail services.
- We collate information on the cost of airline and coach services.
- We compare the costs of the modes.

Costs of rail services

I.3 We carried out desk research on the costs of rail services. Much financial information is either confidential or does not distinguish long-distance services or night trains. We describe next our findings from several sources of more detailed data:

- In Great Britain, domestic data are reported for each PSC contract ("franchise"), including the Caledonian Sleeper night train and the two operators of 200 km/h long-distance trains, all providing services between Scotland and London.
- In France, Germany, Italy and Spain, Fundación BBVA has reviewed the costs of high-speed rail services, although its report from 2007 used data collected in 2002.

Costs of rail services in Great Britain

I.4 Great Britain is unusual in that the Office of Rail and Road (ORR) publishes a range of information on Public Service Obligation (PSO) "franchise" services on a consistent basis. The most recent data available is for the financial year April 2019 to March 2020, as summarised below.

Table I.1: ORR data on franchises, 2019-20

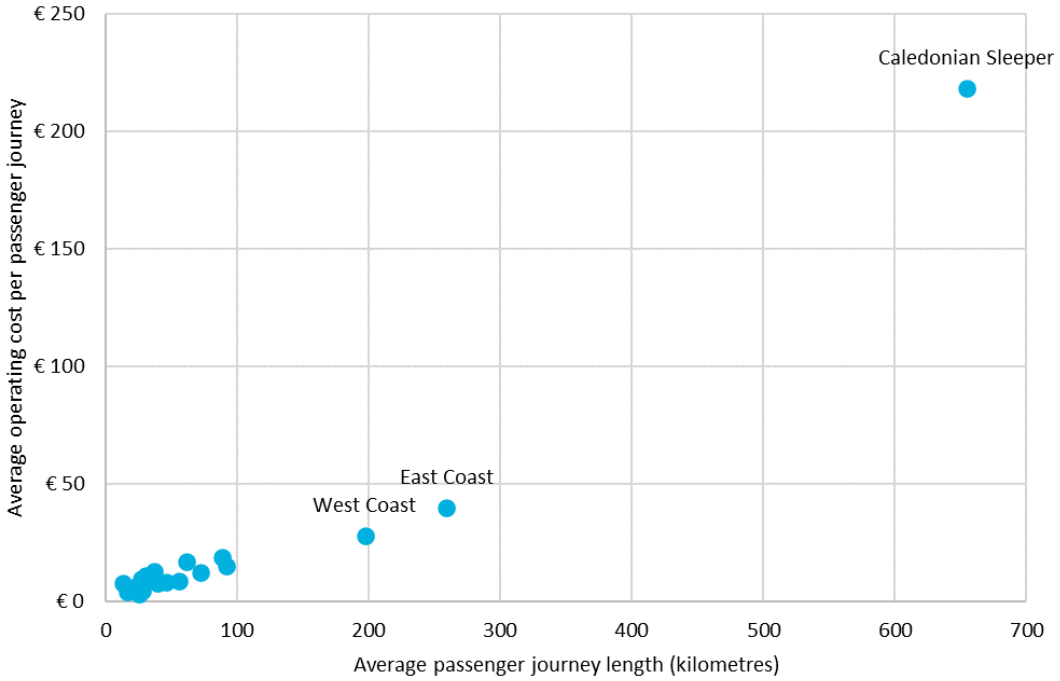
Table	Title	Contents
1223	Passenger journeys by operator	Passenger journeys by operator
1233	Passenger kilometres by operator	Passenger kilometres by operator
7223	Franchised passenger train operator finances by franchise	

Source: Office of Rail and Road.

I.5 This combination of information makes it possible to calculate the average passenger journey length on each operator and the average cost per passenger.

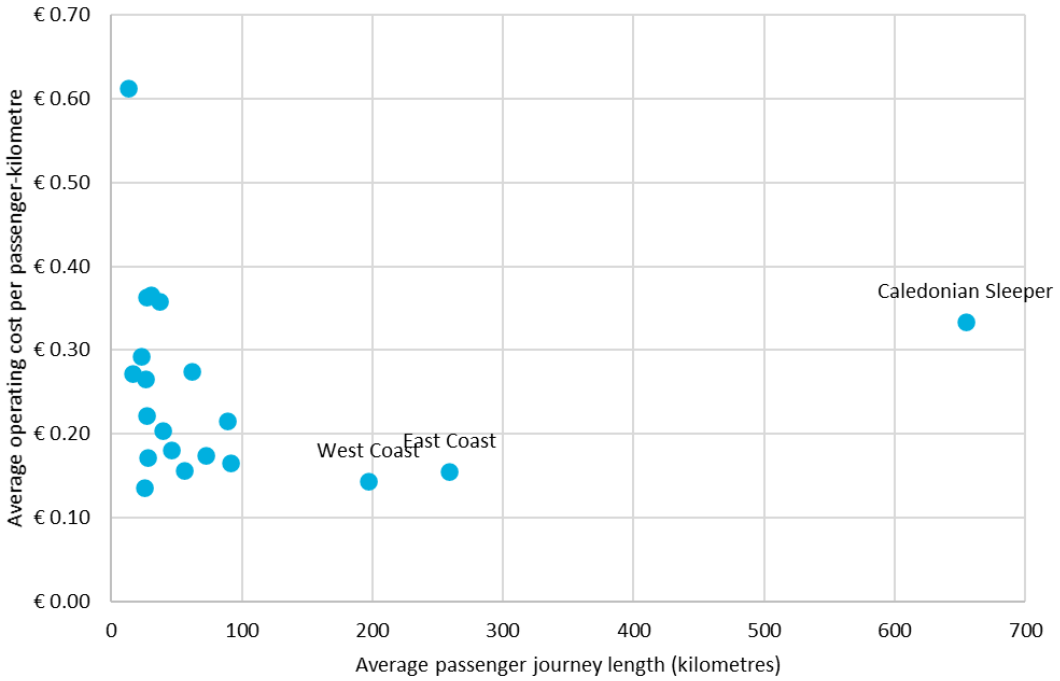
I.6 The first figure on the next page shows the average operating cost per passenger trip which, as would be expected, increase with average passenger journey length.

Figure I.20: Franchises in Great Britain: average operating cost per passenger journeyp



Source: Office of Rail and Road, data for 2019-20, Steer analysis.

Figure I.21: Franchises in Great Britain: average operating cost per passenger-kilometre



Source: Office of Rail and Road, data for 2019-20, Steer analysis.

I.7 The second figure shows the average operating cost per passenger-kilometre as a function of the average passenger journey length.

I.8 This is highest at short distances but is in the range €0.14-0.15 per passenger-kilometre for the two operators of long-distance day trains on the West Coast and East Coast routes, each of which carries an average of over 200 passengers. The corresponding cost for the Caledonian Sleeper night train is €0.33, each of which carries an average of around 125 passengers.

I.9 We have some reservations about using the costs of the Caledonian Sleeper as an example of the costs of a night train. Each 16-vehicle train to and from London has only two vehicles with "Comfort Seats" seating accommodation, and the remaining 14 vehicles comprise bar and restaurant vehicles and relatively high-quality accommodation, as shown in the figure below.

Figure I.22: Caledonian Sleeper accommodation

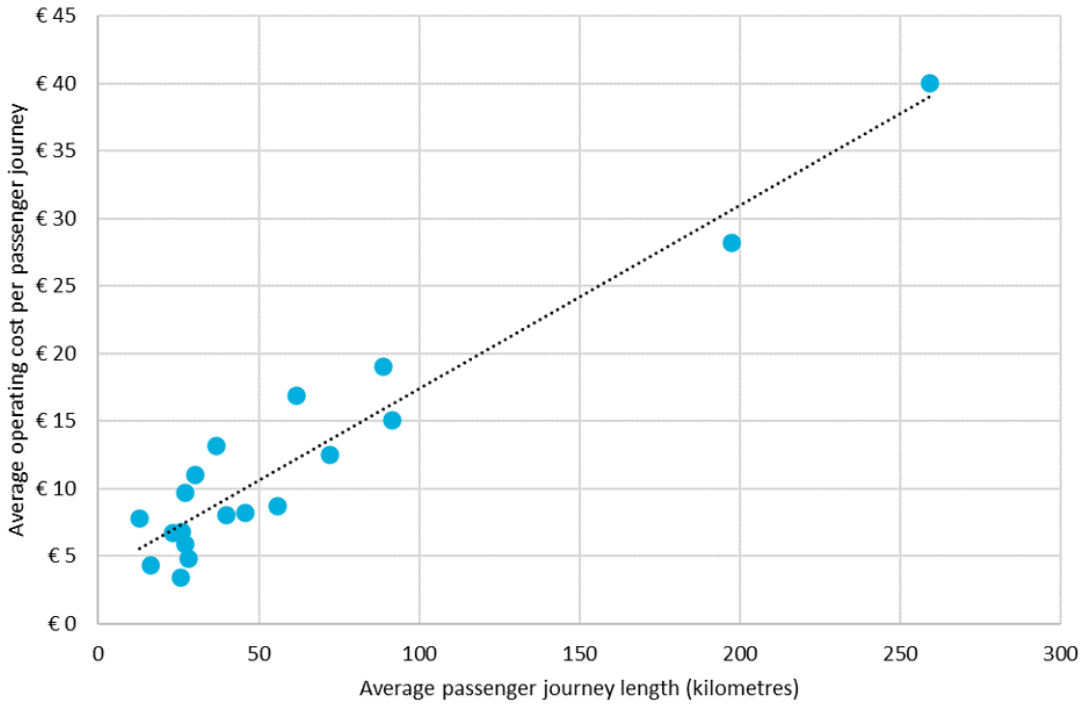


Source: Caledonian Sleeper.

I.10 We discuss further below how night trains elsewhere may include a relatively high proportion of seats and couchettes, with correspondingly lower average costs per seat and per passenger.

I.11 The figure below excludes the data for the Caledonian Sleeper and shows a regression analysis of the operating cost per passenger journey as a function of average passenger journey length.

Figure I.23: Franchises in Great Britain: average operating cost per passenger journey



Source: Office of Rail and Road, data for 2019-20, Steer analysis.

I.12 This suggests that, on average, each extra passenger-kilometre costs €0.14. The cost per seat-kilometre will be lower, but we identified no data on load factors in Great Britain.

Costs of high-speed rail services

I.13 We also examined evidence of the costs of operating high-speed rail services.

I.14 In 2007, Fundación BBVA reviewed high-speed rail services using data collected in 2002[171]. The figure below reproduces Table 1.3 of that report, which summarises operating cost per train-kilometre of various types of high-speed train. The analysis did not include an estimate of the associated infrastructure costs or charges, but suggested that average operating cost per seat-kilometre lay in the range €0.08 (for the relatively high-density French TGV Duplex) to €0.18 (for the German ICE 2).

I.15 In 2008, data were also published on the costs of the operation of 396-seat series 103 high-speed trains between Madrid and Barcelona[172]. These estimated an average cost of €17 per train-kilometre plus €9 infrastructure charges.

[171] A review of HSR experiences around the world, Javier Campos, Ginés de Rus and Ignacio Barrón, Fundación BBVA (2007)

[172] http://ferropedia.es/mediawiki/index.php/Costes_del_ferrocarril:_servicios#Costes_de_servicios_Alta_Velocidad:_Desglose

Figure I.24: Estimates of operating costs of high-speed trains, Fundación BBVA

Country	Type of train	Operating costs (€)			Maintenance costs (€)		
		Per train (million)	Per seat	Per seat-km	Per train (million)	Per seat	Per seat-km
France	TGV Réseau	17.0	45,902	0.0927	1.6	4,244	0.008
	TGV DUPLEX	20.8	40,784	0.0776	1.6	3,137	0.005
	THALYS	24.8	65,782	0.1478	1.9	5,039	0.011
Germany	ICE-1	38.9	62,041	0.1240	3.1	4,944	0.009
	ICE-2	26.0	70,652	0.1766	1.4	3,804	0.009
	ICE-3	17.9	43,132	0.1026	1.6	3,855	0.009
	ICE 3 Polyc.	20.4	50,495	0.1212	1.7	4,207	0.010
	ICE/T	15.5	43,417	0.1206	1.8	5,052	0.014
Italy	ETR 500	34.1	57,796	0.1605	4.0	6,779	0.018
	ETR 480	21.1	43,958	0.1526	3.2	6,666	0.023
Spain	AVE	23.7	72,036	0.1532	2.9	8,814	0.018

Source: Fundación BBVA, data for 2002, Steer analysis.
Note: excludes infrastructure costs.

I.16 In 2011, Steer carried out independent research into high-speed rail which has subsequently been published[173]. This found no material information on operating costs other than the earlier Fundación BBVA study.

I.17 In 2012, Fundación BBVA produced a further report which did not contain material new information on the operating costs of high-speed rail services[174].

I.18 In 2020, Steer obtained indicative estimates that the operating cost of a high-speed train in Europe was in the range €15-17, but without details of the source and calculation method.

I.19 We carried out further searches for more recent information but found no new data. We provisionally conclude that the typical operating cost of a high-speed train may be around €15-20 per train-kilometre, and that the cost per seat-kilometre may be around €0.10-0.20.

I.20 We noted in in Annex G how, on 20 May 2021, the French government published a report on the development of new "TET" lines, which included proposals for new cross-border services and a range of cost estimates. We have not taken this information into account in this Annex.

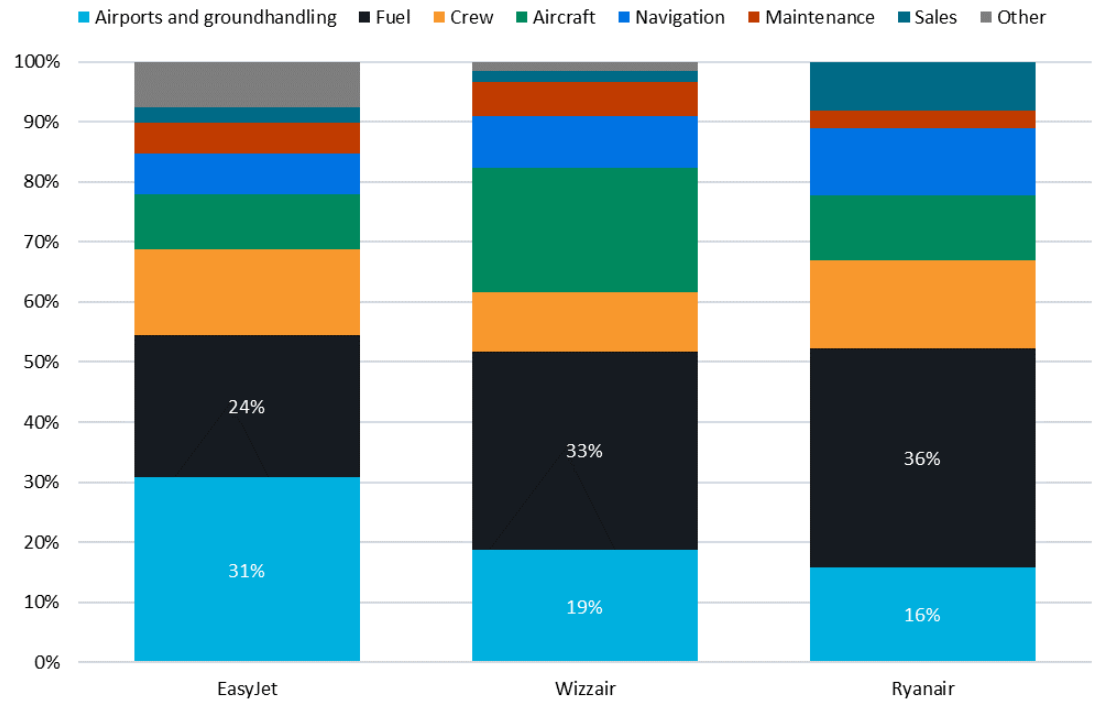
Costs of airline services

I.21 The figure below shows the average cost mix of three major European low-cost carriers: easyJet, Ryanair and Wizz Air.

[173] HSIPR Best Practices: Operating Costs Estimation, Steer for Office of Inspector General, US Department of Transportation (2011)

[174] Economic Analysis of High Speed Rail in Europe, Ginés de Rus, Ignacio Barrón, Javier Campos, Philip Gagnepain, Chris Nash, Andreu Ulied, Roger Vickerman, Fundación BBVA (2012).

Figure I.25: Cost mix of European low-cost carriers



Source: airline reports, Steer analysis.

I.22 Over half the total costs relate to airport and groundhandling charges and fuel, but their relative important varies with the length of the flight. For the short intra-European flights to which rail is most likely to be an alternative, airport charges are often the largest element of cost. We developed bottom-up estimates of costs per seat as a function of flight distance for:

- airport charges;
- fuel costs; and
- all other costs.

I.23 We based our analysis of an aircraft typically used for short-haul travel with Europe by both low-cost and legacy airlines, an Airbus A320 with 180 seats. We assumed that around 165 seats would be occupied, a load factor of just over 90%, and that there would be 100 hold bags. We assumed a turnaround time at each airport of one hour, but this could be more rapid at small and uncongested airports.

I.24 Costs vary with aircraft size and other factors, but at the short distances most relevant to cross-border rail services, the dominant determinant of costs is related to the airports, driven by their charges and the time spend by the aircraft and crew on the ground rather than flying.

Airport charges

I.25 Airport charges vary widely between airports depending on their size, cost and charging structure. They typically include elements related to the size and weight of the aircraft and to the number of passengers.

I.26 We used the Aircraft and Aviation Charges database created by IATA[175] to derive charges for the assumed aircraft and passenger numbers set out above for a range of European airports with different sizes and locations. The estimated total charge at departure varied widely, so we selected three airports to represent the range of charges which might apply:

- The cheapest airport, Brussels Charleroi, had estimate charges of just over €500.
- As an example of a mid-range airport, we selected Vienna, also the main base for ÖBB Nightjet night train services, which had estimate charges of just over €4,000.
- The most expensive airport, London Heathrow, had estimated charges of over €8,400.

I.27 In practice, this means that the costs of very short flights can be dominated by airport charges and the time spent on the ground, particularly at the more expensive and congested airports, as we discuss below.

Fuel costs

I.28 We used the ICAO Carbon Emissions Calculator Methodology[176] to calculate fuel consumption for the assumed aircraft and loading for a range of sector lengths. The calculation methodology does not result in a perfectly linear relationship between modelled fuel consumption and distance, so we performed a regression analysis to smooth the modelled relationship between distance and fuel consumption.

All other costs

I.29 The remaining costs of short haul airline operation include the costs of aircraft ownership or leasing and the time-related costs of flight and cabin crew and other staff. We removed payments to airports and for fuel and apportioned the remaining costs to represent:

- A fixed element to reflect the time spent on the ground, typically at a gate, between sectors in the air.
- A variable amount determined by the "block time" for each sector flown, defined by the time between push-back from the origin airport and arrival at the gate at the destination airport.

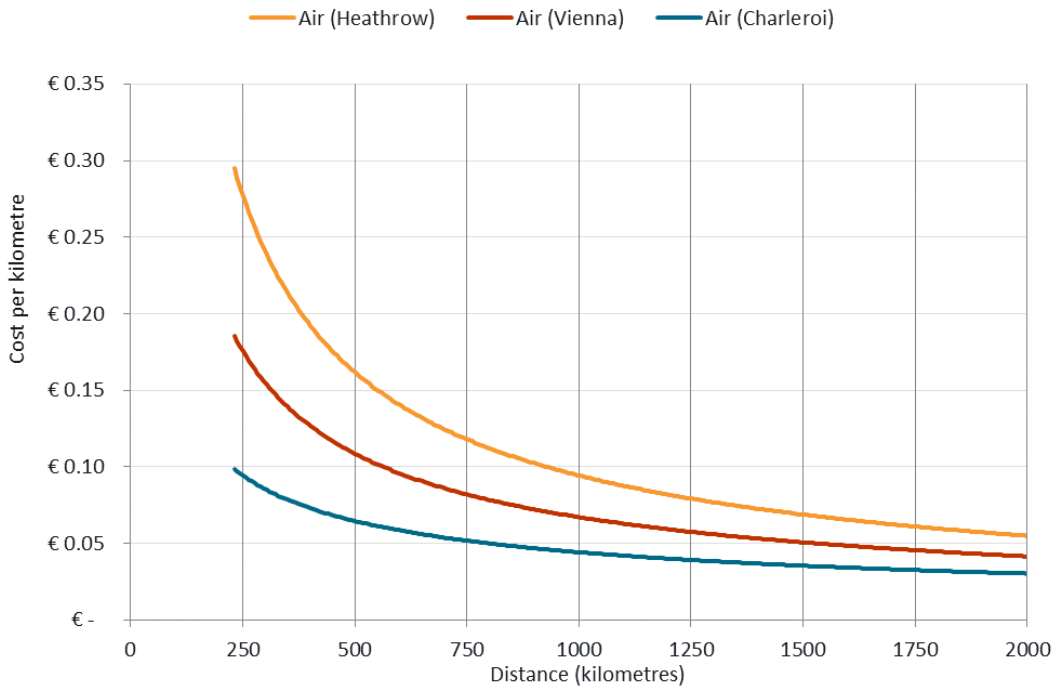
Summary of results

I.30 The figure below summarises our analysis, with the costs expressed as a cost per seat-kilometre flown, which falls with distance.

[175] https://aviationcharges.iata.org

[176] ICAO Carbon Emissions Calculator Methodology (Version 9), June 2016 (2016)

Figure I.26: Comparison of cost estimates for air by airport, 2019 cost levels



Source: Steer analysis.
Note: in practice, airline costs would be the average of the costs of the two airports at each end of the route.

I.31 The estimated costs are highest for more expensive airports: Heathrow is the extreme example, and any route from Heathrow would pay lower airport charges at the destination airport. However, we also note that airport charges tend to be higher at large airports which serve cities which are, prima facie, most likely to be connected by high-speed line or to act as origins or destinations for cross-border trains. While we did not attempt to calculate air cost by airport pair, this does suggest that long-distance cross-border rail services are most likely to compete directly with airports which are larger, and more expensive to serve, than average.

I.32 As an illustration of the average fares charged by the airlines, the table below summarises their reported revenue per passenger from all sources in the reporting year closest to 2019.

Table I.2: Airline revenues per passenger

Airline	Reporting year	Revenue per passenger
easyJet	To September 2019	€78
Wizz Air	To December 2019	€67
Ryanair	To March 2020	€57

Source: airline reports.
Note: easyJet revenue per passenger of £66.44 converted at £1=€1.17.

Costs of coach services

I.33 We used desk research to find evidence on the operating costs of interurban coach services. We discuss in turn a range of sources on coach cost and operating data.

Data on coach services in Spain

I.34 In 2012, the Ministerio de Fomento (now the Ministerio de Transportes, Movilidad y Agenda Urbana (MITMA)) in Spain provided a range of statistics on interurban coaches operated under concessions at the end of 2012, summarised in the table below.

Table I.3: Spanish data on interurban concessions, 2012

Indicator	Value	Units
Number of concessions	95	concessions
Number of cities and towns served	3,025	cities and towns
Total number of stops	5,083	stops
Average number of stops per concession	53.5	stops
Number of vehicles	1,304	vehicles
Average age of fleet	6.87	years
Route length	77,337	kilometres
Passengers carried	32,147,335	passengers
Passenger-kilometres	5,909,074,434	passenger-kilometres
Vehicle-kilometres	250,035,343	Vehicle-kilometres
Total revenue	€341,891,595	euros
Weighted average fare	€0.063	euro/kilometre
Average revenue per passenger-kilometre	€0.058	euro/kilometre
Average revenue per vehicle-kilometre	€1.367	euro/kilometre
Average seats per vehicle	51	seats
Average load factor	47%	24 passengers
Average passenger trip length	184	kilometres
Average revenue per passenger trip	€10.64	euros

Source: Ministerio de Fomento, 2012.

I.35 We note that demand in Spain is seasonal, with load factors highest in the summer months.

I.36 However, the Ministerio de Fomento data do not include direct estimates of the costs of coach operations, or indicate the extent to which the concessions were able to cover their costs.

Coach service costs

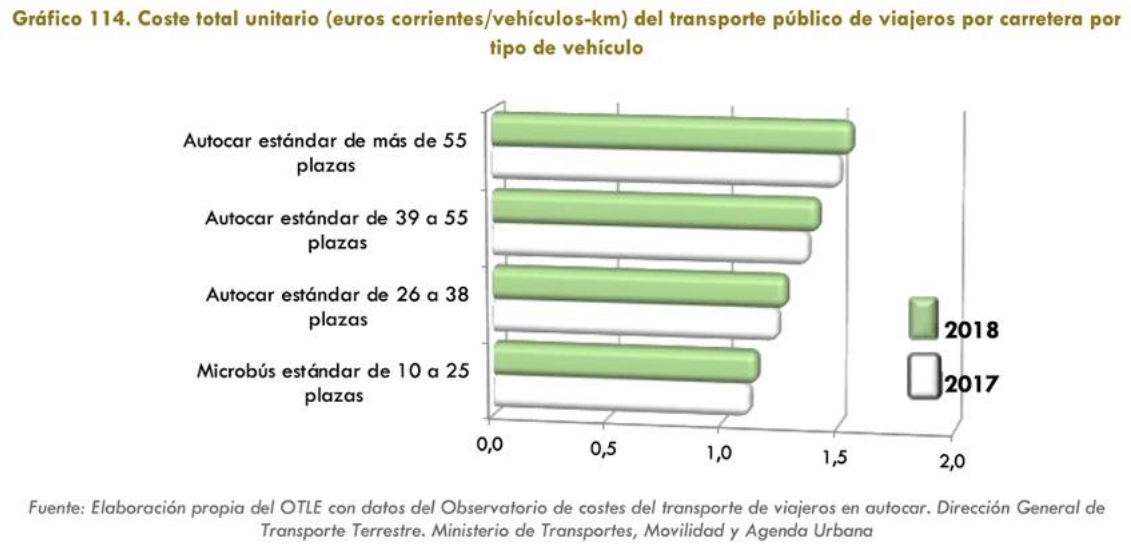
I.37 The most recent comprehensive study of interurban coach services in Europe was Steer's report for the Commission in 2016. This found limited data on coach operating costs but noted that "*The French Autorité de la Concurrence estimated that the operating cost of a long-distance coach was around €2.20 per kilometre. This would mean that a coach carrying 50 passengers for 500 kilometres might break even with an average fare of only €22.*" [177]

[177] Comprehensive Study on Passenger Transport by Coach in Europe, Final Report, April 2016, Steer for European Commission (2016).

I.38 In 2018, also in France, ARAFER carried out a further study of coaches, referred to below, which referred to an average cost of €2.26 per coach-kilometre.

I.39 In 2019, the Spanish observatory of transport and logistics provided cost analyses in its annual report[178], including estimates of operating costs per coach-kilometre for various sizes of vehicle.

Figure I.27: OTLE analysis of coach costs per kilometre, 2017 and 2018



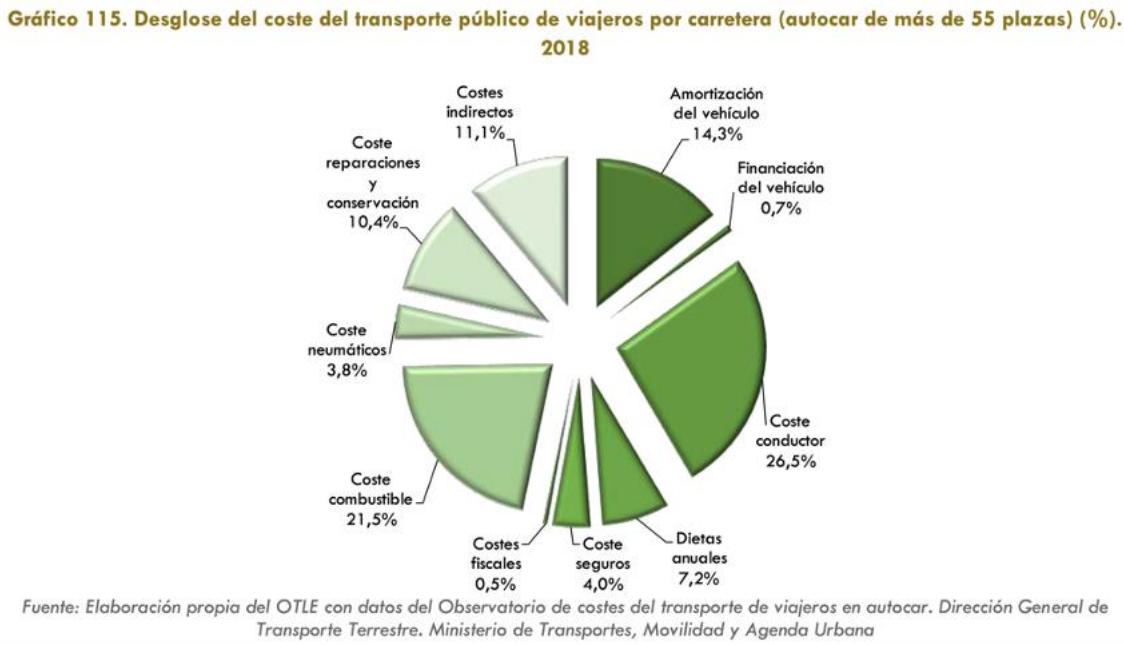
Source: Observatorio del Transporte y la Logística en España (OTLE) (2020).

I.40 The estimated cost per vehicle-kilometre varied with vehicle size from around €1.20 for a microbus to around €1.30-1.50 for vehicles with more than 39 seats.

I.41 The figure below shows the estimated composition of costs for the largest vehicle, with over 55 seats. The largest single element of costs, comprising 26.5% of the total, was the cost of the driver.

[178] Observatorio del Transport y la Logística en ESPAÑA, Informe Annual 2019 (2020).

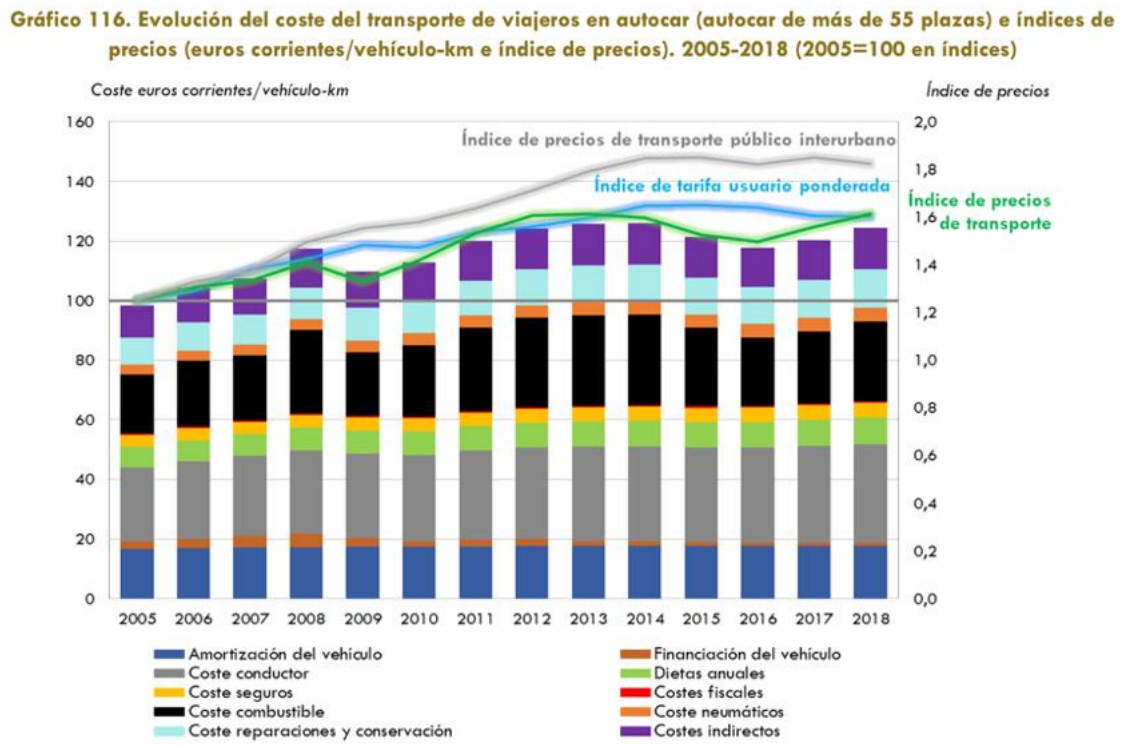
Figure I.28: OTLE analysis of costs of coaches over 55 seats, 2018



Source: Observatorio del Transporte y la Logística en España (OTLE) (2020).

I.42 The figure below shows in greater detail the history of estimated cost of the largest vehicles, with over 55 seats.

Figure I.29: OTLE analysis of cost of coaches over 55 seats, 2005-2018



Source: Observatorio del Transporte y la Logística en España (OTLE) (2020).

I.43 This suggests that the costs per vehicle-kilometre have been rising slowly over a number of years, and confirms that the data for 2017 and 2018 are broadly typical.

I.44 In practice, many of the costs of coach travel are driven largely by vehicle-kilometres, rather than seat-kilometres. This means that, as with air and rail travel, the cost per seat-kilometre tends to fall with the size of aircraft or train respectively. The number of seats on an interurban coach can vary from around 45 to around 75, depending on the size and layout of the vehicle.

Coach service fares

I.45 In the 2012 study of coaches in Spain described about, the Ministerio de Fomento estimated an average fare of €0.058 per passenger-kilometre.

I.46 In the 2016 comprehensive study, we noted that "*Where one mode offers more frequent and faster services, the other may have the characteristics of an "inferior good" and have to accept lower fares. Nonetheless, coach operating costs are often less than those of rail, and coach fares can be less than €0.05 per kilometre. At long distances, where air services are available, coach services can attract passengers by not charging for heavy baggage, and may be viable when rail services are not.*"

I.47 In 2014, following the 2013 liberalisation of the German domestic coach market for journeys over 50 kilometres, the Bundesamt für Güterverkehr carried out two studies of the effects on the market[179,180]. The study of the 2014 market noted that, for operations to be viable, the bus companies indicated a minimum revenue per kilometre of €1.10-1.20. A further €0.20 was required on routes with a second driver, and costs might rise further with additional costs such as overnight stays[181]. This does not refer to an average fare, but if a 50-seat coach carried, on average, 25 passengers, this would amount to a fare of €0.044-0.056 per passenger-kilometre.

I.48 In 2018, ARAFER (now ART) carried out a detailed study including data on average commercial coach fares, which are summarised in the figure below[182].

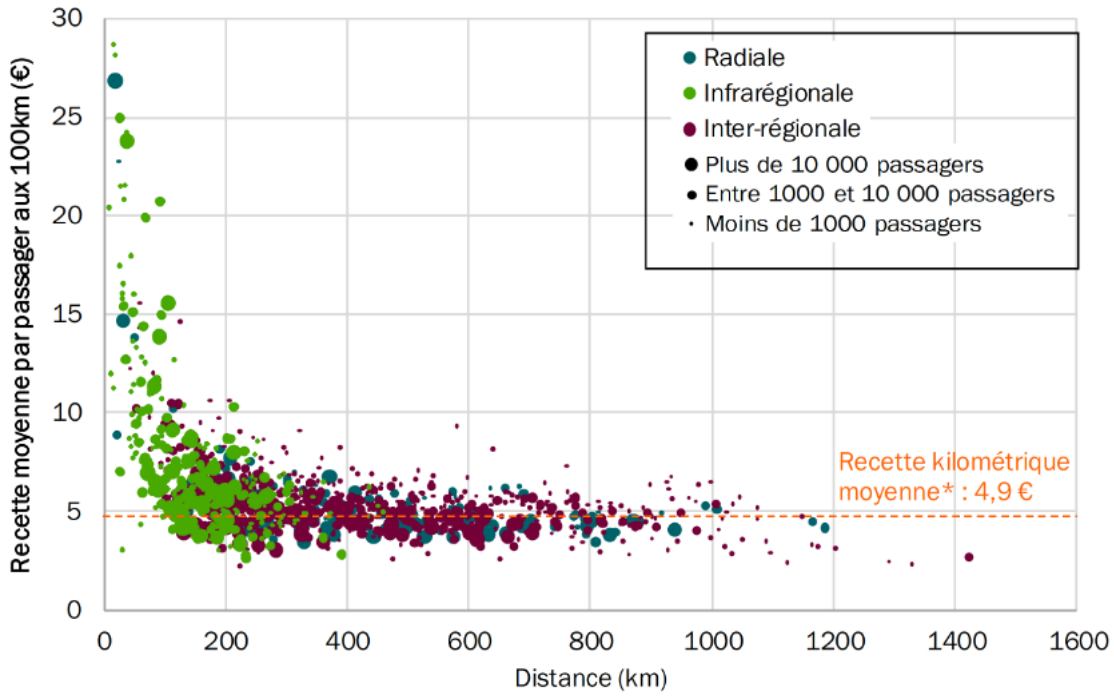
[179] Marktbeobachtung Güterverkehr. Marktanalyse des Fernbuslinienverkehrs 2014, Bundesamt für Güterverkehr (2015)

[180] Marktbeobachtung Güterverkehr. Marktanalyse des Fernbuslinienverkehrs 2015, Bundesamt für Güterverkehr (2016)

[181] "*Für die Kalkulation eines wirtschaftlichen Verkehrs wird seitens der Busunternehmen ein notwendiger Mindestbetrag je Kilometer von durchschnittlich zwischen 1,10 € und 1,20 € angegeben. Im Falle einer notwendigen Doppelbesatzung erhöht sich nach Unternehmensangaben der Kilometersatz beispielsweise um 0,20 €, weitere Kosten können beispielsweise für die Unterwegsübernachtung anfallen.*"

[182] Marché du transport par autocar et gares routières, Exercise 2018, Autorité de régulation des transports (ART)

Figure I.30: ARAFER analysis of commercial coach fares per kilometre, 2018

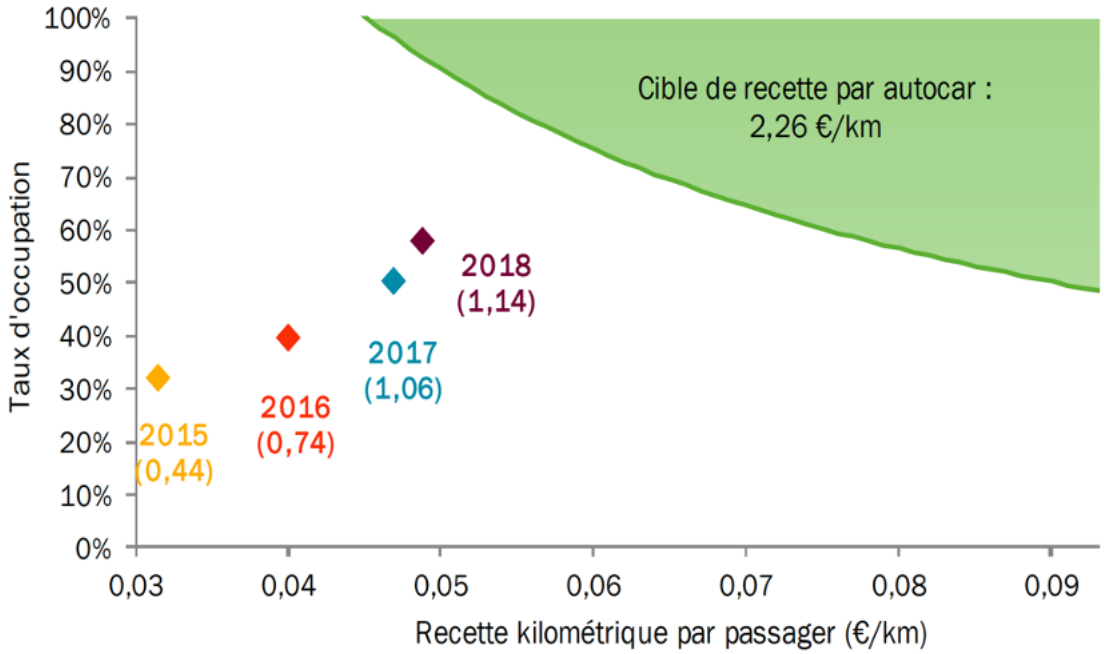


Source: ARAFER (now ART).

I.49 We note that the reported average fares per passenger-kilometre rise on shorter journeys, but that this effect is not material at journey lengths over 250 kilometres.

I.50 ARAFER noted that the average fare was €0.049 per passenger-kilometre, a mix of €0.048 where coach faced competition from other modes and €0.059 where it did not. ARAFER also noted that both average fare and load factor had been growing over the period 2015-2018, as shown in the figure below.

Figure I.31: ART analysis of coach cost-recovery, 2018



Source: ARAFER (now ART).

I.51 The average revenue of €1.14 per coach-kilometre in 2018 remained far below the €2.26 per coach-kilometre estimated by ARAFER as necessary to cover costs.

I.52 In the first quarter of 2019, a study examined the competition between two large new entrants, FlixBus and BlaBlaCar[183]. It noted that "*Since the beginning of operation (August 2015 in France and 2013 in Germany), 23 million passengers have travelled with coaches in France (2.3 million in the first quarter of 2019), which means an increase by 26% in comparison with the first quarter of 2018 and 4% increase since the last quarter of 2018. Similar to Germany, the market is slowly reaching a threshold and is season oriented (for instance, 234 cities are connected in the first quarter 2019, it means 11% less than the last quarter of 2018). The load factor is 59.8% and is continuously increasing for two years. Due to this result, the profitability is increasing slowly after the losses incurred by the operators in the years before. The income by coach-kilometre is increasing by 7% in 2018 and is reaching €0.97. The revenue per passenger-kilometre remains low: approximately €3.70 for 100 passenger-kilometres. As we will see later, competitive pressure is very strong on this market. The average travel distance is 284 kilometres in the first quarter of 2019.*"

I.53 From these data it is possible to infer, for the first quarter of 2019, that:

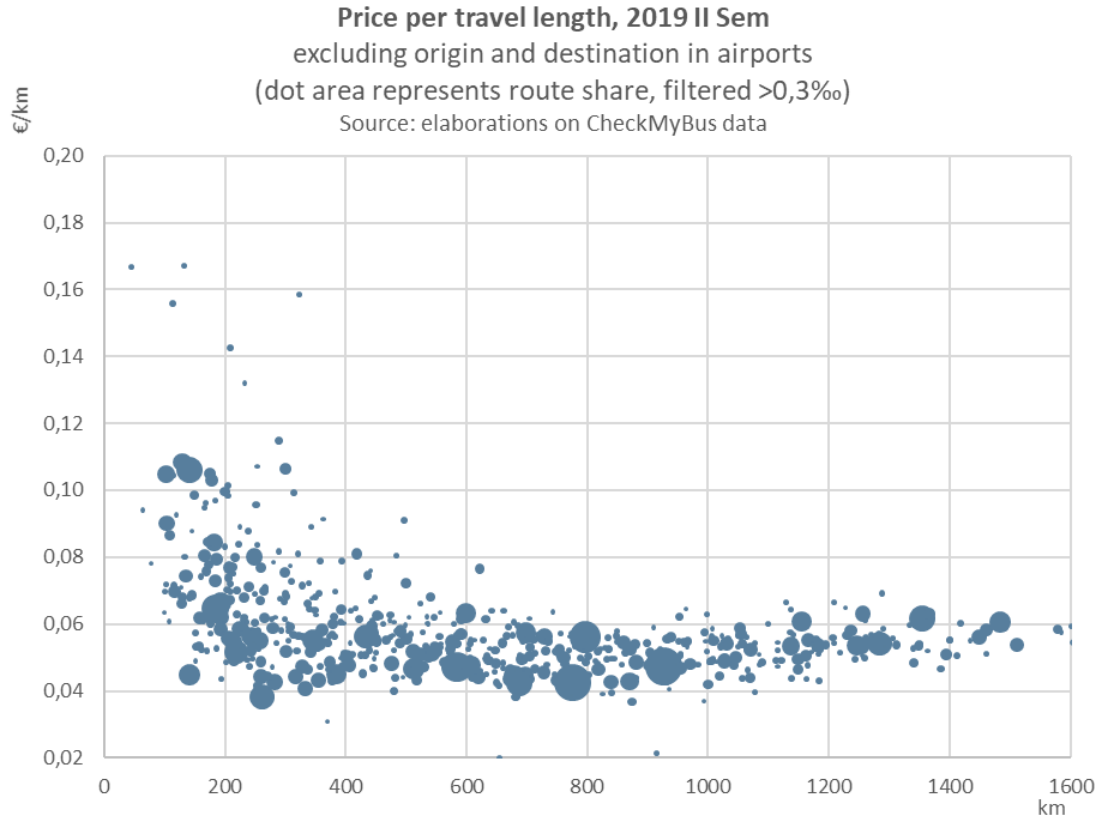
- €3.70 per 100 passenger-kilometres is an average fare of €0.037 per passenger-kilometre.
- This is equivalent to an average fare of €10.50 for a journey of 284 kilometres.
- An average income of €0.97 per coach-kilometre means an average load of 26 passengers.
- If this is a 59.8% load factor, the average vehicle has around 44 seats.

[183] Laurent Guihéry. Long Distance Coach Services in France and Germany: the new European competition between Flixbus and BlaBlaBus, Rivista Scientifica della Società, Italiana di Economia dei Trasporti e della Logistica (2019)

I.54 The study noted that profitability is increasing slowly, but did not state how these average data, for the first quarter of 2019, related to the breakeven point.

I.55 In the second half of 2019, TRASPOL, in collaboration with Checkmybus.it, produced a detailed analysis of fares as a function of distance on long-distance coaches using data available on the Checkmybus.it website[184]. The figure below shows the study's findings on average coach fares per kilometre.

Figure I.32: TRASPOL analysis of coach fares per kilometre, second semester of 2019



Source: TRASPOL, note that chart €/kilometre scale does not start at zero.

I.56 As with the ARAFER data shown in Figure I.30, we note that the reported average fares per passenger-kilometre rise on shorter journeys, but that this effect is not material at journey lengths over 250 kilometres.

I.57 It found that, at distances over 200 kilometres, coach fares are typically in the range €0.04-0.08 per passenger-kilometre, and at distances over 600 kilometres, this narrows into a range of around €0.04-0.06 per passenger-kilometre. This is broadly consistent with the ARAFER data shown above.

Summary

I.58 A common pattern following liberalisation is that operators accept short-term losses to grow market share, particularly while they are incurring start-up costs and have not yet moved to a

[184] Beria P., Tolentino S., Vardhman L. Rapporto sul Mercato delle Autolinee a Lunga Percorrenza in Italia | Anno 2019. TRASPOL Report 1/20 & CheckMyBus. Milano, Italy (2020)

stable longer-term cost base. It is not clear whether, in the early years of liberalisation, coach fares are yet sufficient to cover all operating costs. However, it appears reasonable to assume that:

- Coach operating costs are around €2.20 per coach-kilometre in France and €1.50 per coach-kilometre in Spain. They may vary with local wage costs and be lower elsewhere.
- Coach fares average around €0.04-0.06 per passenger-kilometre, which may be close to cost-recovery levels in Spain, but not in France.

I.59 This suggests that levels of coach fares in 2018 and 2019, before the COVID-19 pandemic, may not always have represented full cost-recovery.

Comparison of costs

I.60 While cost estimates can be derived for each mode, there is little consistency in the data available for rail, air and coach:

- Rail data in Great Britain is consistent but is effectively only available per passenger-kilometre, and there is no information on train-kilometres, train capacity or load factors.
- Air data is consistently calculated per seat-kilometre, but load factors are high, and cost data is widely available, making it relatively simple to estimate cost per passenger-kilometre.
- Coach data is fragmentary, but there are consistent reports of fares of around €0.05 per passenger-kilometre on journeys over 250 kilometres.

I.61 For comparative purposes, we therefore adjusted all the above estimates to a common basis of costs per passenger-kilometre, as summarised below.

Table I.1: Normalisation of cost estimates to costs per passenger-kilometre

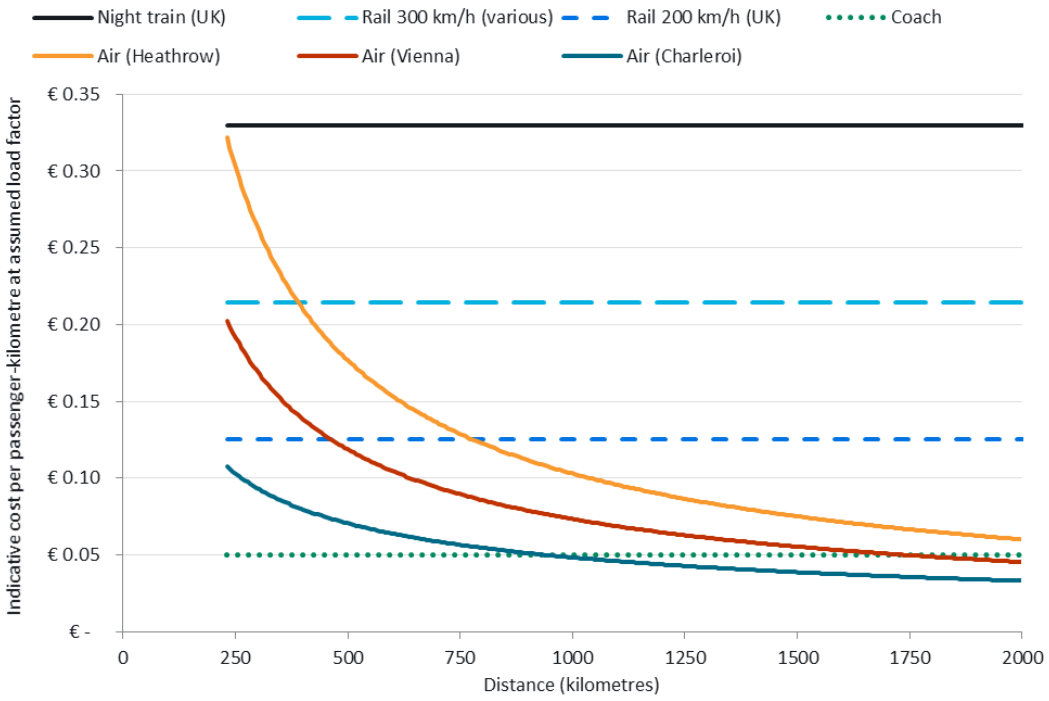
Mode	Approach	Rationale
Rail	Used Office of Rail and Road data.	There is no usable information on load factors.
Air	Converted costs per seat-kilometre to costs per passenger-kilometre using the assumed occupancy of 165 of 180 seats.	Load factors are well-documented.
Coach	Assume illustrative average costs of €0.05 per passenger-kilometre.	Various sources estimate an average fare of this level.

Source: Steer analysis.

Conclusions

I.62 The figure below compares the results at distances over 250 kilometres, beyond which coach fares per passenger-kilometre vary little.

Figure I.33: Comparison of cost estimates by mode, 2018-2019 cost levels



Source: Steer analysis, see text for details.

I.63 We stress that the estimates are drawn from limited sources and may not be representative of the variations in costs across the EU. We reviewed the cost data in the French government report on the development of new "TET" lines published on 20 May 2021, but found no means of converting it to a cost per train-, seat- or passenger-kilometre.

I.64 We also note that four other factors may also affect the comparison.

I.65 First, costs per passenger-kilometre are highly sensitive to load factors, as discussed above.

I.66 Second, infrastructure charges are included for air (airports and air navigation services), rail in the United Kingdom (Network Rail), coach (vehicle taxes and road tolls) but not for 300 km/h rail on new infrastructure, which may combine very high capital costs with modern technologies offering relatively low operating and maintenance costs.

I.67 Third, for rail, the costs of different types of accommodation may vary widely. We noted above how the Caledonian Sleeper provides mainly high-quality accommodation with no couchettes and relatively few seats. We would expect the costs of a seat on overnight trains using day vehicles to be similar to those of a 200 km/h train, and the costs of a couchette to be intermediate between these two levels.

I.68 Fourth, for rail, costs per passenger-kilometre may change even within a single journey for at least three reasons which are less relevant to air and coach:

- Infrastructure changes may change as the train moves between networks.
- Train operating costs may change if the services splits and joins.

- Load factors may vary as passengers board and alight.

I.69 Nonetheless, several features of the chart stand out.

Costs

I.70 Among surface modes, coach appears to have lower costs than rail and, within rail, costs are higher for high-speed trains and particularly for night trains focusing on high-quality accommodation.

I.71 Airlines can have very high costs at expensive airports and for short distance journeys. With the charges at Heathrow, the most expensive airport we identified, air costs would exceed typical high-speed rail costs at distances of up to around 400 kilometres[185]. However, even with airport charges as high as those at London Heathrow, air costs only around half as much as night trains at the distances of 500-800 kilometres typical of night train journeys.

I.72 Air can have much lower costs at cheaper airports and for long-distance journeys. We estimate that air costs per passenger with Charleroi's level of airport charges are less than 200 km/h rail at distances over 250 kilometres, and less than coach at distances over 1000 kilometres. Our work for the Commission on the long-distance coach market suggests that, at long distances, coach attracts many passengers carrying large amounts of baggage which would be expensive to take by air[186].

I.73 From the perspective of providing long-distance cross-border transport, we note that rail services of all types have higher costs than coach services. Relative to coach, 200 km/h rail and overnight trains costs more than twice as much, 300 km/h rail costs more than four times as much (and more when infrastructure costs are included) and night trains focusing on high-quality accommodation can cost more than six times as much.

I.74 This suggests that, on cost alone:

- Rail services cost more than coach services at any distance.
- Night trains with sleeping cars cost more than air at the distances at which they operate.
- Day trains only cost less than air at distances less than 750 kilometres, depending mainly on the level of airport charges at each end of the route.

Carbon

I.75 The backdrop for this study is the European Green Deal, which aims inter alia at shifting transport to less-polluting modes such as rail, and the European Commission has been asked by the European Parliament to assess how cross-border night train services can be promoted.

I.76 The Technical Specifications do not require us to compare the carbon impacts of different modes of transport, although we noted in previous studies that night train rolling stock almost

[185] In practice, all high-speed Eurostar services from London pay atypically high access charges to use High Speed 1 and, in the case of cross-border high-speed services, the Channel Tunnel, as we discuss in Annex K.

[186] Comprehensive Study on Passenger Transport by Coach in Europe, Final Report, Steer for European Commission (April 2016)

certainly has more "embedded" carbon per passenger-kilometre than trains using other rolling stock.[187] We note, however, that:

- Aircraft are currently powered almost exclusively by fossil fuel, and there have been only limited pilot projects of small battery-powered aircraft.
- Coaches continue to be powered by fossil fuels, although battery technology is being extended to a growing proportion of smaller road vehicles.
- Rail alone already has the potential to be powered wholly by renewable energy.

I.77 Higher market prices for fossil fuels, or higher taxes on them at the global, European or national level, would increase the relative costs of other modes relative to rail. Conversely, rail can be subsidised in recognition of its potential environmental benefits relative to other modes. We note that changes to taxation or subsidy of different fuels and different transport modes are being considered as policy measures at the European level and in many states.

[187] We carried out some analysis in our earlier study for the European Parliament, but did not derive a comprehensive comparison of carbon costs by mode. Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

J The costs of cross-border rail services

Introduction

J.1 The Technical Specifications required us to analyse the costs of cross-border rail services including:

- the production costs for cross-border night and long-distance train services, including the main cost drivers);
- their level of income; and
- their profitability, and the volume of passengers required to ensure financial break-even.

Approach

J.2 In this Annex we present detailed estimates of the costs of:

- a high-speed Hamburg-Berlin-Munich service, provided by a former state railway company, with a seven-car ICE 4 multiple-unit train in the K1s configuration;
- a conventional speed Berlin-Erfurt-Stuttgart long-distance service, provided by a non-state railway, locomotive-hauled with 10 cars; and
- a Berlin-Vienna night train, operated by an incumbent railway undertaking, with seven locomotive-hauled vehicles: two cars with seats, three couchette cars and two sleeping cars.

J.3 The first two services are not cross-border, although the main cost changes associated with them crossing a border would be differences in the structure and level of infrastructure charges and any additional costs of rolling stock capable of operation on another network. While infrastructure charges are fixed by market segment and section of track, some other costs, and particularly staff costs, will depend on the state from which they are provided. This creates an incentive for railway undertakings to provide cross-border services from the state with the lower, or lowest, cost base[188].

J.4 We note that, in practice, there is wide variation in costs between trains, for several reasons.

J.5 **Infrastructure charges** vary widely between networks, as we describe in detail in Annex K. A study by PwC found that, in 2017, the cost of a model long-distance train was between €0.72 and €8.68 per train-kilometre, with an average of €4.80 per train-kilometre[189]. In addition, the track access charges of the infrastructure managers differ greatly between different types of transport. DB Netz AG charges €11.90 per train-kilometre in the “Metro Max” category and €2.62 in the "Night" category, with an average charge of €7.61.

[188] The same opportunity and behaviour are observed in the cross-border airline and coach markets.

[189] Studie zur Gestaltung und Entwicklung der Eisenbahninfrastruckturpreise in Europa, PwC (2018)

J.6 **Labour costs** per hour in 2019 varied from €6.00 to €44.70 within the EU[190].

J.7 **Revenues** vary because of differences in passengers' average willingness to pay in different states, linked to the average labour costs and hence incomes, but also in specific markets, depending on regional and local variations in income, journey purpose and the availability of competing modes.

J.8 We therefore developed a model bottom-up, based on real costs and realistic revenues, for actual services. We discuss below how the assumptions and findings might be different in other markets.

Analysis

J.9 The table below summarises the input assumptions and the resulting cost calculations. Note that we assume that:

- The high-speed and night trains use new vehicles, and the conventional train uses used vehicles.
- The capacity of the night train is significantly lower than that of the day trains.
- The lengths of the routes are broadly comparable, but the night train has a lower average speed, in part to be able to offer suitable departure and arrival times. The journey time is therefore 6½ hours for the day trains and 12½ hours for the night train.
- The infrastructure charges in Germany were at the lower "night" rate, which applies from 23:00 to 06:00, although in practice, the rate would depend on the exact timing of the train.
- The high-speed and night trains operate six days a week all year round, and the conventional long-distance service on five days, to allow for more cost-effective maintenance.
- As a result, the day trains can achieve two single journeys every 24 hours, but the night train can only achieve one. The combination of fewer spaces and fewer, slightly shorter journeys per day, means that the night train generates only around one-fifth of the space-kilometres per year of the day trains.
- The costs of sales and distribution across all channels, including internal sales costs and commission paid to ticket vendors, are 5% for the high-speed and night train incumbent operators, and 3% for the conventional long-distance non-state operator, assuming a focus on internet sales.

J.10 We indicatively assume that all the services would achieve and average load factor of 50%.

J.11 The figures below summarise these results.

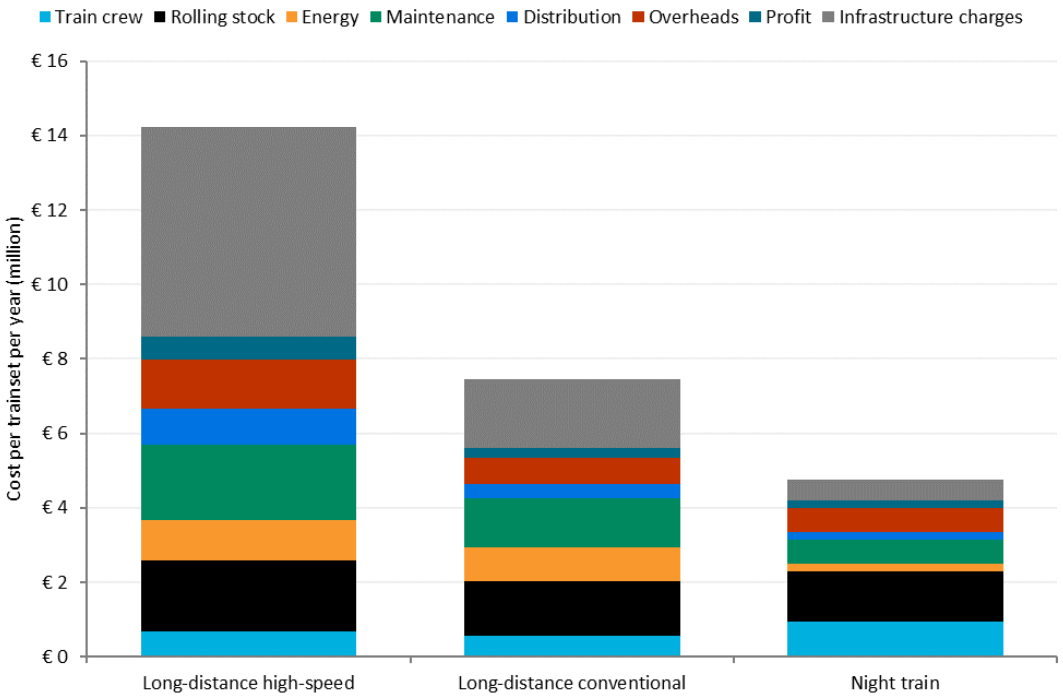
[190] Eurostat, News Release 52/2020, 31 March 2020, **https://ec.europa.eu/eurostat/documents/portlet_file_entry/2995521/3-31032020-BP-DE.pdf/570441ed-c00c-e497-b259-8ebff7fa65d5#:~:text=In%20year%202019%20the,euro%20area%20at%2031%2C4%E2%82%AC**.

Table J.1: Summary of input assumptions and cost calculations

Variable	High-speed day	Conventional day	Night train
Input assumption			
Type of stock	Multiple unit	Locomotive-hauled	Locomotive-hauled
Passenger vehicles	7	10	7
Type of vehicle	New	Used	New
Total seat or other spaces	456	600	256
Average spaces per vehicle	65	60	37
End-to-end route length (kilometres)	900	825	700
End-to-end journey time (hours)	6.5	6.5	12.5
Average speed (km/h)	138	127	56
End-to-end journeys per service day	2	2	1
Service days per week	6	5	6
End-to-end journeys per year	624	520	312
End-to-end spaces per year (thousand)	285	312	80
End-to-end space-kilometres per year (million)	256	257	56
Distribution costs as a percentage of sales	5%	3%	5%
Cost estimate per train set per year (million)			
Train crew	€0.67	€0.56	€0.94
Rolling stock	€1.92	€1.45	€1.36
Energy	€1.09	€0.91	€0.21
Maintenance	€2.02	€1.33	€0.63
Distribution	€0.96	€0.39	€0.19
Overheads	€1.33	€0.70	€0.67
Profit	€0.60	€0.27	€0.20
Infrastructure charges	€5.65	€1.86	€0.55
Total	**€14.24**	**€7.46**	**€4.75**
Cost estimate per train-kilometre			
Train crew	€1.19	€1.30	€4.28
Rolling stock	€3.40	€3.38	€6.20
Energy	€1.93	€2.11	€0.97
Maintenance	€3.58	€3.08	€2.90
Distribution	€1.71	€0.90	€0.87
Overheads	€2.36	€1.62	€3.05
Profit	€1.06	€0.62	€0.91
Infrastructure charges	€10.03	€4.31	€2.50
Total	**€25.27**	**€17.32**	**€21.68**

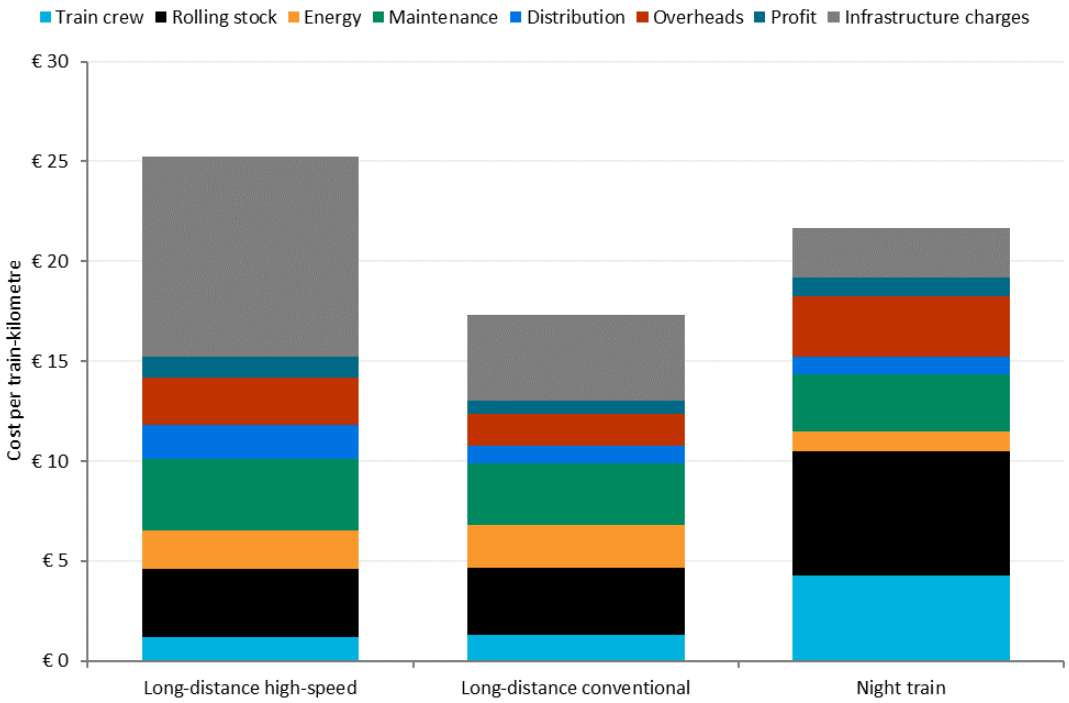
Source: KCW analysis, see text for details.

Figure J.34: Estimated costs per train set per year



Source: KCW analysis.

Figure J.35: Estimated costs per train-kilometre



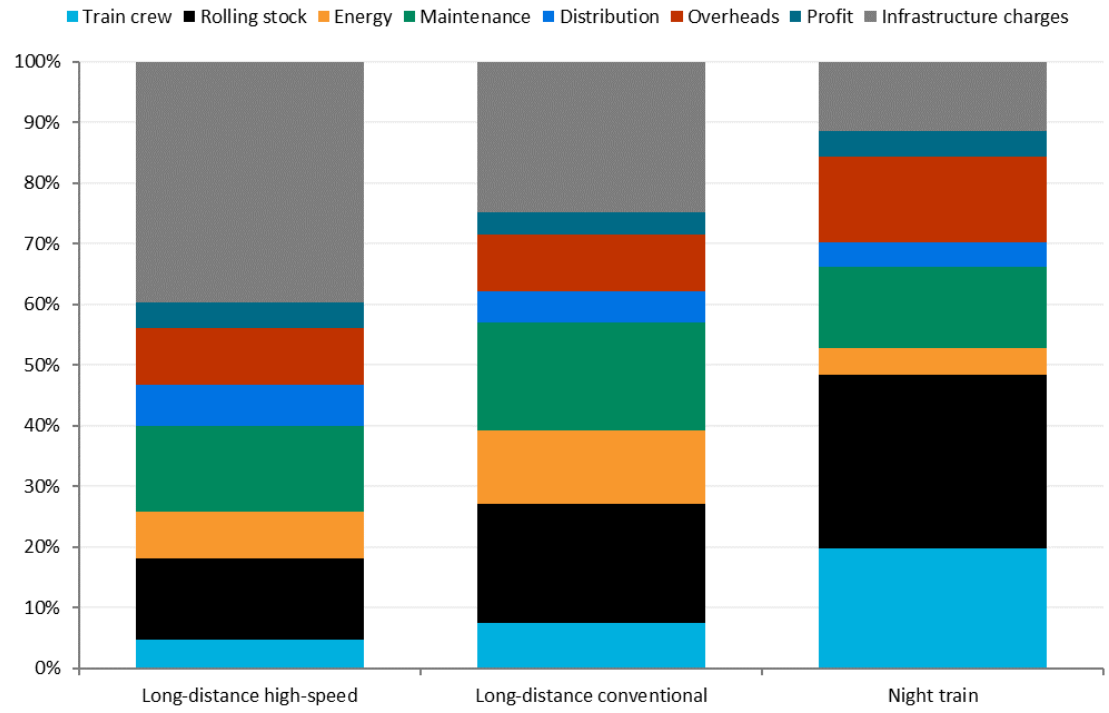
Source: KCW analysis.

J.12 We make several comments on the results of the analysis.

- **Train crew** costs per train-kilometre are similar for the day trains but much higher for the night trains, as a result of lower average speeds and the requirements for a second driver to comply with safety rules and additional passenger attendants.
- **Rolling stock** costs per train-kilometre are similar for the day trains but much higher for the night trains, largely as a result of the shorter distance covered per day.
- **Energy consumption** per train-kilometre for night trains is about half that of day trains.
- **Distribution costs** per train-kilometre are around twice as high for high-speed trains as for conventional day trains and night trains.
- **Overheads**, in activities such as service planning, operational planning, sales promotion, management and allocation of other costs, are likely to be around 20% for the state-owned railway companies but lower, potentially around 15%, for the non-state operator.
- **Infrastructure** costs are considerably lower for the night train than for the day trains, reflecting the charging structure in Germany.

J.13 The figure below expresses these costs on a percentage basis.

Figure J.36: Estimated mix of cost components



Source: KCW analysis.

J.14 On these assumptions, the largest components of costs are infrastructure charges for day trains, and particularly for high-speed trains, and rolling stock for night trains.

Revenue and profitability

J.15 Information on the revenue and hence profitability of individual rail services is rarely available at the level of individual services or groups of services. An exception is the data for the supported Caledonian Sleeper service which we analyse in Annex I.

J.16 All three of the services examined operate without direct support from competent authorities or co-financing of vehicles by European funds.

J.17 The day trains, whether high-speed train or conventional long-distance, can probably be operated commercially. The high-speed train can probably generate considerably higher revenues than the conventional train, although in other states much of its operating surplus may be captured by the infrastructure manager in infrastructure charges.

J.18 The night train, in contrast, appears unlikely to be able to recover all its costs from passenger revenues and likely to require support. In practice, it may benefit from using the maintenance facilities of the operator in Vienna at marginal cost.

Conclusions

J.19 This analysis is based on data for specific networks and routes and, like the analysis presented in Annex I, may not be relevant to other routes in other states. However, we note that:

- Infrastructure costs play a relatively minor role in night train costs in Germany, but this may be different in other states.
- Rolling stock is a major cost for night trains, due to the relatively high space per passenger in sleeping and couchette cars and the ability to carry out only one loaded journey every 24 hours. Providing subsidy to night train vehicles could help to raise new services above the profitability threshold.
- Fare revenue is a key factor in achieving profitability. Open access operators designing new services therefore focus on the number of potential customers and their willingness to pay.

K Obstacles: infrastructure charges

Introduction

K.1 One potential obstacle to the continuation and introduction of cross-border services on a commercial basis is the infrastructure charges which must be paid to infrastructure managers.

K.2 We estimate in Annex J how infrastructure charges can represent 40% of total costs for a high-speed operator. An open access operator told us that they could represent a third of train operating costs, or around one quarter of total costs. PRO-BAHN suggested that access charges need to be reduced, especially for night trains, to improve their viability. This means that infrastructure charges are a key consideration for the introduction of long-distance cross-border services on a commercial basis.

K.3 In this Annex we discuss in turn:

- the introduction of charges, including the separation of infrastructure and operations, charges for the use of the infrastructure, and the structure of infrastructure charges defined by Directive 2012/34/EU, including mark-ups;
- current infrastructure charges per train-kilometre;
- the impact of infrastructure charges on railway undertakings' operating costs;
- the impact of infrastructure charges on passenger numbers; and
- infrastructure charges as an obstacle to market entry.

The introduction of charges

The charging legislation

K.4 For most of their history, Europe's railways have been vertically integrated business, with management of the infrastructure and operation of services under common ownership and control. In 1991, Directive 91/440/EEC introduced separation between infrastructure management and transport operations[191].

K.5 In 2001, as part of the first railway package, Directive 2001/14/EU formalised a structure of infrastructure charges[192]. This was subsequently incorporated into the railway "recast" Directive 2012/34/EU as Chapter IV "Levying of charges for the use of railway infrastructure and allocation of railway infrastructure capacity". This was followed, in 2015, by Commission Implementing Regulation (EU) 2015/909 on the modalities for the calculation of the cost that is directly incurred as a result of operating the train service.

The structure of infrastructure charges

K.6 Article 31(3) of Directive 2012/34/EU requires that the charges for the **minimum access package** and for access to **infrastructure connecting service facilities** shall be set at the cost that is directly incurred as a result of operating the train service.

[191] Directive 91/440/EEC, Section III.

[192] Directive 2001/14/EU, Chapter II.

The variation in costs and data on them

K.7 Underlying direct costs vary between networks, and between individual sections of route within them, for several reasons which we summarise in the table below.

Table K.1: Drivers of variations in direct costs

Driver	Issues
Technology	Different approaches to the construction of rail infrastructure result in different structures of costs. For example: • Track may be built using timber or concrete sleepers or as slab track. • Signalling may be provided from large and permanently staffed control centres, or small local boxes, which may close outside regular opening hours and require additional staffing to serve night trains and overnight services.
Speed	Track to be used at high speeds requires maintenance to a more accurate horizontal and vertical alignment.
Axle weight	Track to be used by rail vehicles with heavier axles requires additional resistance to deformation.
Intensity of use	Track used intensively may be engineered to trade higher fixed costs for lower direct costs per train-kilometre, vehicle-kilometre or gross tonne-kilometre.
Geography and climate	Costs may vary according to the terrain in which the infrastructure is built and maintained, or the range of climate conditions in which it is required to operate. Variations include point heaters to prevent freezing in cold weather and additional maintenance of track and signalling exposed to sea water spray.
Averaging	Costs vary widely even within a single national network for the reasons set out above[193]. Costs will depend on the geography and period over which they are averaged (Directive 2012/34/EU Article 31(6) and Commission Implementing Regulation (EU) 2015/909 Article 5(1).

Source: Steer analysis.

K.8 This means that, even if infrastructure managers followed an identical approach to the calculation of charges, there might be variations in charges as a result of all these factors. In practice, Article 5 of Regulation (EU) 2015/909 allows that charges may be averaged over different parts of the network and different timescales[194].

The calculation of charges from costs

K.9 Article 32 of Directive 2012/34/EU required the Commission to adopt measures setting out modalities to be followed in applying the differentiation of the infrastructure charge. This led

[193] In Great Britain, variations in unit costs by region were observed in the Serpell report in 1983 and wide variations in unit maintenance costs by route were observed by the Office of Rail and Road in 2011-12.

[194] "If the infrastructure manager demonstrates to the regulatory body [] that the values or parameters [] are significantly different for different parts of its network, and after splitting its network into such parts, the infrastructure manager shall calculate average direct unit costs for the parts of its network by dividing the direct costs for these parts by the total number of vehicle kilometres, train kilometres or gross tonne kilometres forecast for or actually operated. The period of the forecast may cover several years."

to Commission Implementing Regulation (EU) 2015/909[195], which allows a wide range in exactly how the charges for the **minimum access package** and for **access to infrastructure connecting service facilities** are calculated. The combined effects of variations in costs, and data on them, and flexibility in the calculation method, have the effect that charges "set at the cost that is directly incurred as a result of operating the train service" can be calculated from a range of different underlying costs in a wide variety of different ways.

K.10 In addition to the charges for the minimum access package and for access to infrastructure connecting service facilities, set out in Article 31(3), Directive 2012/34/EU also permits a wide range of other charges. Our analysis shows that:

- There are wide variations in the underlying direct costs of railway infrastructure due to factors such as technology, speed, axle weight, intensity of use, geography and climate.
- Commission Implementing Regulation (EU) 2015/909 allows a wide range of approaches to how these calculations of direct costs and charge are made.
- Directive 2012/34/EU allows infrastructure managers a wide range of approaches to the types of charges they levy.
- Many of these charges need not be related to calculations or estimates of direct costs and may be related to full cost recovery or what the market can bear ("value") under Article 32.
- Directive 2012/34/EU permits the inclusion of mark-ups[196], but does not require that mark-ups are calculated from, or percentage of, another charge, or that infrastructure managers identify mark-ups within their charges.
- Directive 2012/34/EU permits, in Annex VI, that the mark-ups differ between domestic and international services.

K.11 These factors make it difficult either to identify "typical" track access charges or to identify the effect of mark-ups within these charges.

Current infrastructure charges per train-kilometre

K.12 In principle it is possible to use infrastructure managers' Network Statements, in some cases with supporting annexes and other documents, to calculate the charges which would apply for a hypothetical future train of a certain composition running in a train path over a specified route at a specified time. In practice, to do so for this study would be a major exercise and require detailed assumptions about the trains, including on some networks the exact vehicles, to be used.

K.13 We therefore drew on two independent analyses of infrastructure charges prepared by:

- RMMS, in its studies of charges from 2013 to 2018; and
- IRG-Rail, in detailed research by individual regulatory bodies on 2018 and 2019.

[195] Commission Implementing Regulation (EU) 2015/909 of 12 June 2015 on the modalities for the calculation of the cost that is directly incurred as a result of operating the train service (2015).

[196] For example, Sweden's Trafikverket Network Statement for 2021 sets out charges at two levels. The base charge reflects the average cost directly incurred as a result of operation train vehicles, and higher charges are applied on lines with high loads. The difference is reported as a mark-up (Article 32), although it has some similarity to a scarcity charge (Article 31(4)), but appears in part to reflect geographical variations in maintenance costs related to intensity of use (Commission Implementing Regulation (EU) 2015/909 Article 5(1)).

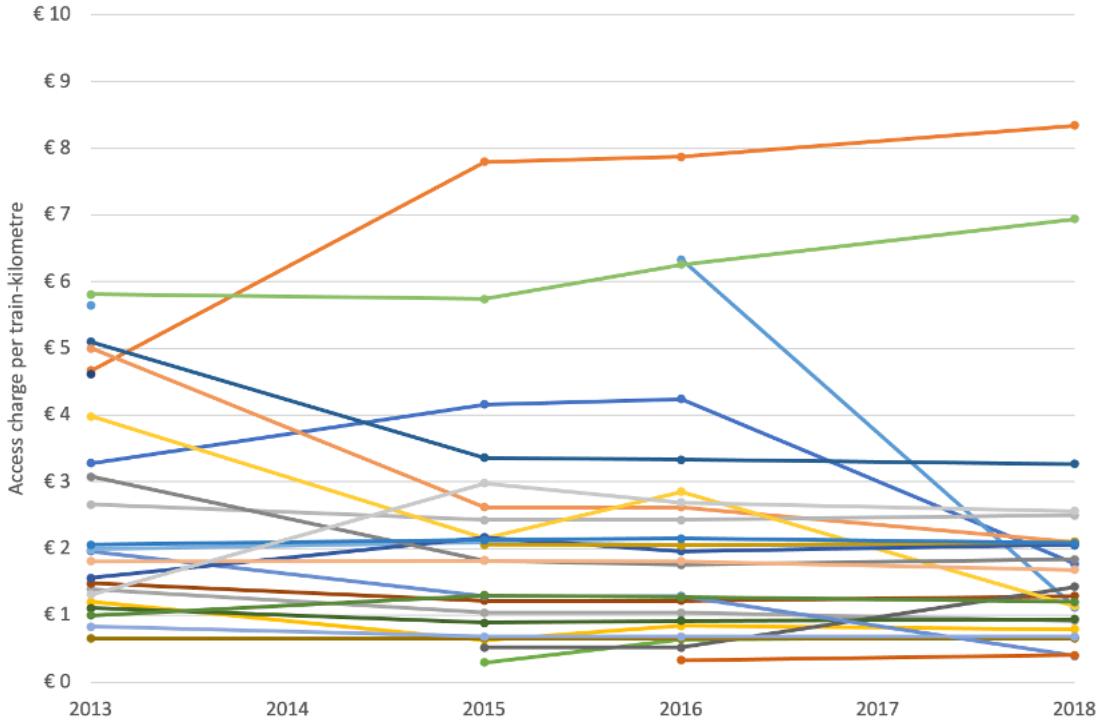
Evidence from RMMS

K.14 The Commission's monitoring of the rail market asks Member States to provide estimates of the access charges as specified in the Commission Implementing Regulation (EU) 2015/1100. This requires them to provide estimates of "Average track access charges (TACs) per train-kilometre for different categories of train", excluding mark-ups, for:

- passenger train providing conventional long-distance services; and
- passenger train providing high-speed services on dedicated high-speed lines.

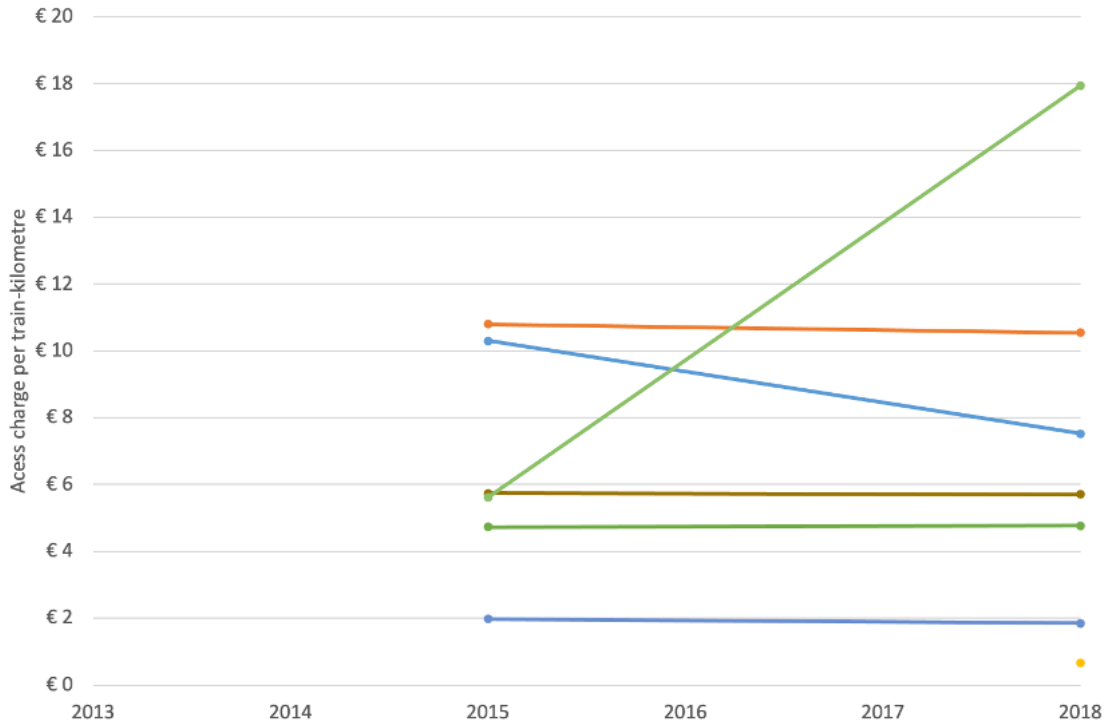
K.15 The figures below collate the average track access charges reported by the Member States for the years 2013 to 2018. Note that these are for long-distance trains, only some of which are long-distance cross-border trains.

Figure K.37: RMMS: charges excluding mark-ups for conventional long-distance services



Source: RMMS data excluding mark-ups, Steer analysis.
Note: Data are for long-distance trains, only some of which are long-distance cross-border trains.

Figure K.38: RMMS: charges excluding mark-ups for services on dedicated high-speed lines



Source: RMMS data excluding mark-ups, Steer analysis.
Note: Data are for long-distance trains, only some of which are long-distance cross-border trains.

K.16 For conventional long-distance services, charges excluding mark-ups varied from less than €0.3 per train-kilometre to more than €8 per train-kilometre, or a factor of nearly 30 to 1. In addition, between 2013 and 2018:

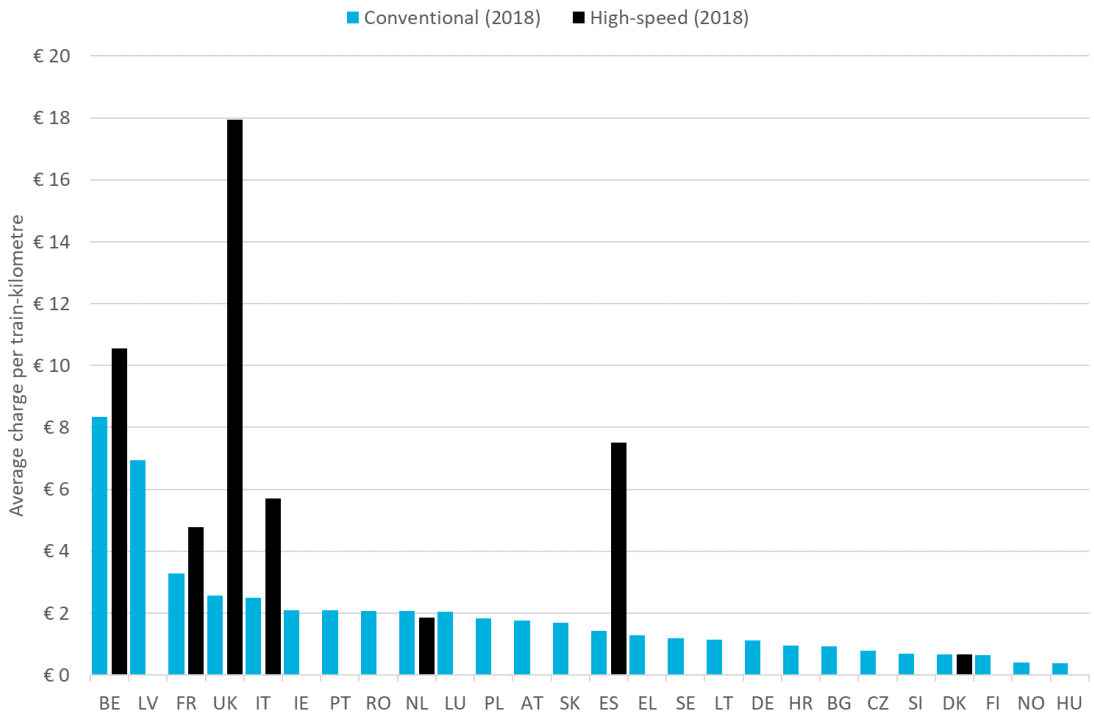
- In Belgium, charges rose by 79%, from €4.67 to €8.34 per train-kilometre.
- In Hungary, charges fell by 80%, from €1.96 to €0.39 per train-kilometre.

K.17 For high-speed services on dedicated high-speed lines, charges excluding mark-ups varied from less than €0.7 per train-kilometre to more than €10 per train-kilometre, or a factor of over 15 to 1. There is also wide reported variation in charges over time:

- In the United Kingdom on High Speed 1 (HS1), charges rose by 219%, from €5.62 to €17.95 per train-kilometre.
- In Spain, charges fell by 27% from €10.30 to €7.52 per train-kilometre.

K.18 The figure below compares the final points in each of the preceding figures, the charges in 2018 for conventional long-distance services and on dedicated high-speed lines in each state.

Figure K.39: RMMS: charges excluding mark-ups, 2018



Source: RMMS data excluding mark-ups, Steer analysis.
Note: Data are for long-distance trains, only some of which are long-distance cross-border trains.

K.19 RMMS reported that charges on dedicated high-speed lines, where they exist, are generally higher, including the extreme case of in the United Kingdom on High Speed 1. However, reported charges in Denmark were the same on conventional and high-speed lines (Denmark's first high-speed line, the 250 km/h Copenhagen–Ringsted line, did not open until 2019) and that charges in the Netherlands were lower on high-speed line (the 300 km/h HSL-Zuid).

K.20 The RMMS data provide little evidence that charging regimes have yet matured and stabilised to the point where they are stable and predictable for railway undertakings wishing to develop plans for market entry. Back-on-Track Belgium noted that there had recently been large increases in infrastructure charges in some states, including Spain. This contrasts poorly with how charges have often been stabilised under independent economic regulation[197]. We conclude that it is not clear whether the charges recorded in 2018 are typical of those which will apply in the future.

[197] Charges may be more stable where the infrastructure manager, or a regulatory body, fixes the charges, subject to any indexing to allow for inflation, for periods which may be as long as five years. In contrast, some independent regulators in the energy industry now set charges for access to transmission infrastructure for up to eight years. High Speed 1 may be considered a special case, because it is privately owned and receives all its income from infrastructure charges, which were revised upwards by the independent regulatory body to reflect revised forecasts of maintenance and renewal costs.

Summary of findings from RMMS

K.21 Analysis of RMMS data shows that charges vary significantly between networks and between conventional and high-speed lines: €0.3-€8 per train-kilometre for conventional long-distance services and €0.7-€18 per train-kilometre for high-speed services.

K.22 In several instances, charges have not become stable or predictable, which makes it difficult for railway undertakings to plan their businesses.

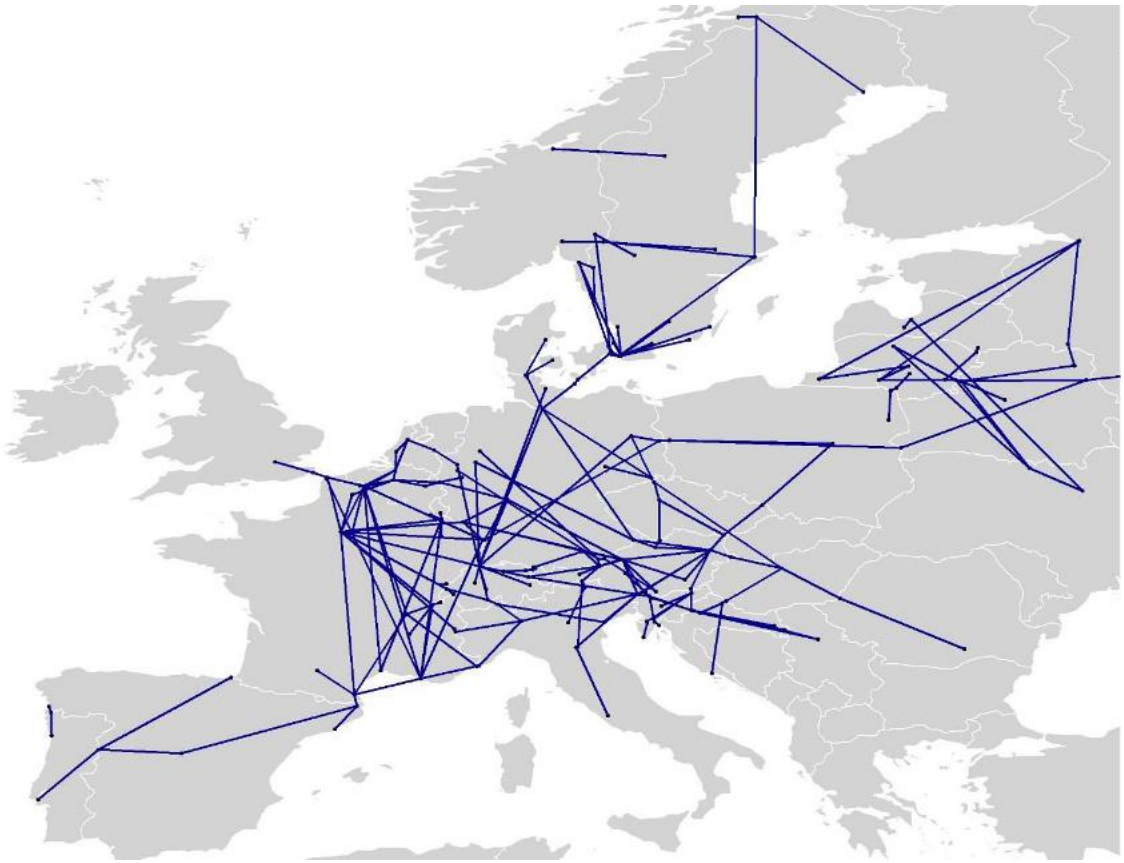
K.23 One new entrant railway undertaking told us that uncertainty in future access charges could be a major consideration for a new entrant preparing a business plan. While rolling stock costs could be fixed by purchasing the stock or agreeing a lease for several years, railway undertakings often had no means of obtaining a firm price for infrastructure capacity beyond the current year.

Evidence from IRG-Rail

K.24 IRG-Rail has also carried out an investigation of access charges, focusing on cross-border passenger services[198] and including data on both direct costs and mark-ups. This was based on detailed research by individual regulatory bodies on charges in 2018 and 2019 for specific international train paths on the networks for which they are responsible, as shown in the figure below, and included analysis of the charges for several ÖBB Nightjet night trains.

[198] Overview of International Passenger Services, IRG-Rail (20) 9, 2020.

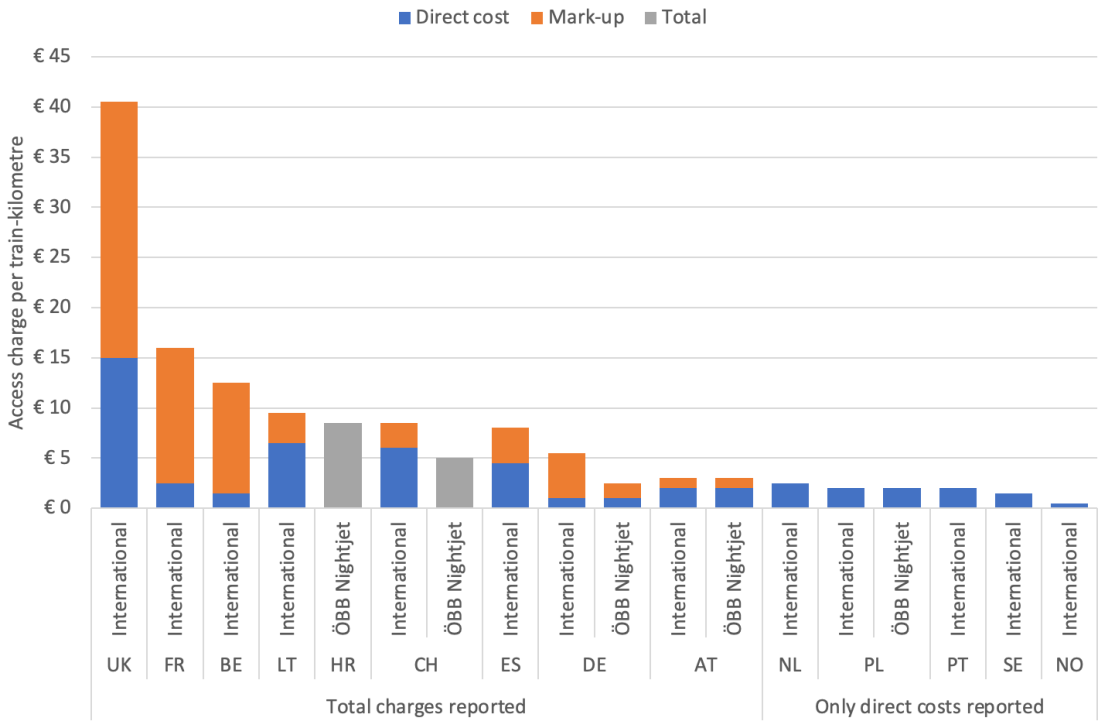
Figure K.40: IRG-Rail: routes for research of charges for cross-border passenger services



Source: IRG-Rail

K.25 IRG-Rail's findings are summarised in the figure below. In some cases they reported data for total charges, whether separated into direct costs and mark-ups or not, but in others they reported only data for direct costs.

Figure K.41: IRG-Rail: findings on charges for cross-border passenger services



Source: IRG-Rail, Steer analysis.

K.26 IRG-Rail, like RMMS, found wide variations in charges between states. It also identified relatively high mark-ups for international services on a number of networks, and particularly in France, Belgium and Germany. In addition, in Switzerland and Germany, but not Austria, it reported lower charges for ÖBB Nightjet than other international trains.

Infrastructure-connected service facilities

K.27 In addition, when trains are not in passenger service, railway undertakings require access to, and must pay charges for, infrastructure-connected service facilities. These service facilities may be provided by the infrastructure manager, but may be provided by several other parties including the railway undertaking itself, the supplier or maintainer of its rolling stock, or other parties[199]. Neither RMMS nor IRG-Rail identify the extent to which the charges quoted include charges for these services, which may account for some of the variation observed.

The impact of charges on railway undertaking operating costs

K.28 The Commission asked us to assess the impact of mark-ups on the operating costs of long-distance passenger services[200].

K.29 The analysis above shows that there is a wide variation in infrastructure access charges for different services, but we note that on, many networks, the reported charge excluding mark-

[199] In contrast, except when undergoing major maintenance or refurbishment, aircraft not in the air spend almost all their time at airports, which have published schedules of aircraft parking charges.

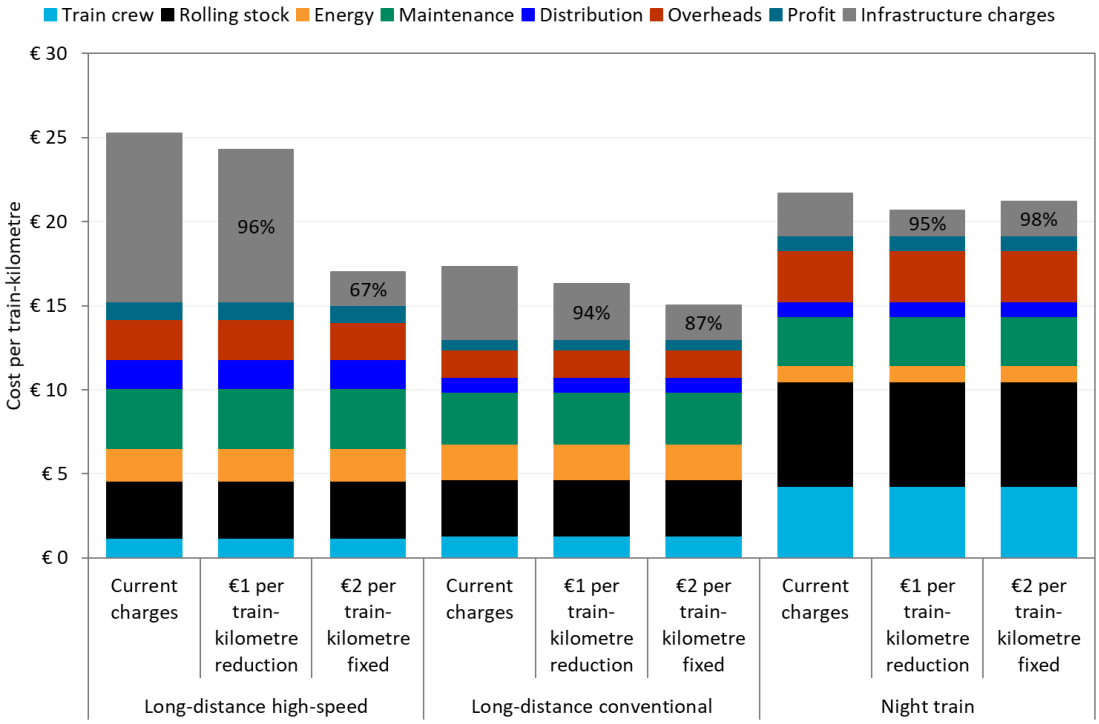
[200] At the study conference, one new entrant railway undertaking said that 73% of the charges paid by Eurostar are not direct costs (see paragraph R.25).

ups was around €2 per train-kilometre. We therefore considered, for illustrative purposes, the effect on the overall operating costs identified in Annex J of:

- €1 per train-kilometre reduction in all access charges; and
- €2 per train-kilometre standard charge for all cross-border passenger services.

K.30 The figure below reproduces the cost estimates presented in Annex J and the effect of reducing the top bar, infrastructure charges, either by €1 per train-kilometre or to a fixed charge of €2 per train-kilometre.

Figure K.42: Indicative impact of reducing access charges on modelled trains



Source: KCW and Steer analysis.
Note: percentages show total charges after reductions as a percentage of current charges.

K.31 For high-speed services, the relatively high access charges on high-speed lines in Germany mean that a €1 per train-kilometre reduction in average access charges would result in a 4% cost reduction. Fixing charges at €2 per train-kilometre would result in a 33% cost reduction.

K.32 For conventional long-distance services, a €1 per train-kilometre reduction in average access charges would result in a 6% cost reduction. Fixing charges at €2 per train-kilometre would result in a 13% cost reduction.

K.33 For night trains, a €1 per train-kilometre reduction in average access charges would result in a 5% cost reduction. In contrast, fixing charges at €2 per train-kilometre would result in only a 2% cost reduction.

K.34 We stress that the analysis and estimates in Annex J are for three specific services, operating predominantly in Germany at German levels of access charges, and that conclusions drawn from them might not apply to other services on other networks. Nonetheless, at current levels of charges in Germany, major reductions in infrastructure charges might result in:

- large reductions in the total costs of high-speed services, operated primarily by incumbent operators with large fleets of high-speed trains; and
- small reductions in the total costs of conventional services and night trains, the principal areas in which non-incumbent operators are active.

The impact of charges on passenger numbers

Setting passenger rail fares

K.35 Railway undertakings' approach to setting prices depends on not only the market in which they operate but also the extent to which fares are regulated and the extent of competition from other operators or modes. The response of railway undertakings to a reduction in access charges will depend on all these factors, and will differ between commercial and PSO passenger operations, as we discuss below.

Pricing of commercial passenger operations

K.36 Commercial operators of rail passenger services typically have an explicit or implicit objective of profit-maximisation, although some notionally commercial railway undertakings in state ownership may be set other objectives. Economic theory suggests that, in such circumstances, prices will be set so that the price elasticity of demand is around -1, and a small rise or fall in fares will have no effect on total revenue and profitability[201]. However, the ownership or leasing charges of their rolling stock may be fixed ahead for several years, their services are not dependent on individual contracts with specific customers, and they may have no direct on-rail competitors who will also be subject to the changes in access charges. Under these circumstances there is no reason why a change in input costs should result in a change in output prices, except if it also results in changes in the output prices charged by competitors.

Pricing of PSO passenger operations

K.37 Operators of Public Service Obligation (PSO) passenger services normally charge fares which are specified or regulated by a competent authority according to economic, social or environmental criteria.

Pricing of new open access operators

K.38 Except in the case of new open access operators, we saw no evidence that rail fares in Europe are based on costs, or that reductions in infrastructure charges result in reductions in fares[202]. The figures above show numerous examples of changes in access charges over the period 2013 to 2018. As far as we are aware, none has been accompanied by any proposal by the industry either to reduce or to increase fares, or any expectation by external stakeholders that this would happen.

[201] Some commercial railway undertakings carry out extensive research on the price-elasticity of demand to average levels of fare or to individual fares, at least on passenger journeys which contribute a material proportion of their revenue.

[202] Great Britain has a complex system in which many fares are regulated, rather than specified, but the regulatory system makes no reference to access charges. In practice, under standard PSCs, the effect of any changes to access charges is borne by the competent authorities and not the railway undertakings.

The effect of charges on fares

K.39 We conclude that removing mark-ups is only likely to result in lower passenger fares where a railway undertaking concludes that it will retain, or increase, market share by reducing fares.

K.40 Where two or more railway undertakings compete for the same passenger flow on a commercial basis, and one reduces its fares, it may gain market share in the short term, but may also trigger a subsequent reduction in its competitors' fares, offsetting some or all the initial gain in share, unless its competitor's services become unprofitable and withdraw from the market. These effects are common in dynamic and competitive markets but, as noted above, relatively few rail passenger markets experience dynamic competition between two or more railway undertakings.

K.41 A reduction in rail fares appears more likely to happen where railway undertakings compete with other modes, and particularly airlines, for a significant part of their market[203]. Lower rail fares at some distances might render competing airline services unviable and lead to their withdrawal.

The effect of charges on service volumes

K.42 As noted above, Article 32 of Directive 2012/34 states that "The level of charges shall not, however, exclude the use of infrastructure by market segments which can pay at least the cost that is directly incurred as a result of operating the railway service, plus a rate of return which the market can bear." If this requirement had been correctly applied, reducing infrastructure charges would not result in more services, but many stakeholders said that more services would be operated if charges were lower.

K.43 In practice, the wide variation in access charges, and the extent of mark-ups, make it seem likely that at least some services are excluded from the infrastructure which could pay at least some estimate of the cost that is directly occurred. Article 32 permits infrastructure managers to raise charges, and it can be argued that they may do so to the point where services are only just commercially viable.

K.44 Removal of mark-ups may therefore mean that railway undertakings conclude that new markets are viable, and therefore lead to new entry. They may be particularly attracted to markets which are currently poorly served, and hence where there is only limited threat of fares reductions by incumbent operators. In Great Britain, for example, new entry has focused on introducing direct services between cities where a connection was previously required[204]. Reduction in access charges and mark-ups might make it easier to make a commercial case to provide cross-border services where a connection was previously required.

K.45 We discussed this issue with a new entrant operator of a limited number of seasonal services. We were told that its service planning took into account estimates of the passenger numbers that could be attracted, and the fares that could be charged, at different times of the year, and with different numbers of services per week. These potential revenues were then compared

[203] Rail fares to and from London on Great Britain's East Coast Main Line, which has both PSO and open access railway undertakings, rise steadily with distance until Newcastle, from where there is significant airline competition, and at greater distances appear to be held down by the need to compete with air.

[204] In practice, new entry in Great Britain is largely confined to such markets by policies to protect the economic equilibrium of PSO services, as permitted under Article 11 of Directive 2012/34/EU as amended by Directive (EU) 2016/2370.

with incremental operating costs and infrastructure charges of offering additional services. Lower infrastructure charges might materially reduce the "breakeven" number of passengers required to operate at different times of year, and could lead to decisions to offer additional services which can pay at least the cost that is directly incurred.

The effect of charges on passenger numbers

K.46 We conclude that a reduction in infrastructure charges may have the greatest effects on the costs of high-speed services, and that the principal mechanisms which might lead to increases in demand would be:

- Existing commercial railway undertakings might reduce fares where they could attract additional passengers from competing airlines.
- Existing commercial services operated on a less-than-daily basis may become viable on more days of the week, or at more times of the year.
- New routes may become commercially viable, particularly if an entrant could offer a direct service where none previously existed.

K.47 Taken together, these points suggest that the most likely effect of reduced infrastructure charges is increased scope for new entry on high-speed lines to compete with incumbent high-speed operators, as Italo has done in Italy. In some cases, these additional passengers would also be on cross-border journeys.

K.48 We were asked to assess the impact on passenger numbers if ticket prices fell in the absence of mark-ups. We noted that there are around 10 billion rail journeys in the study area. We envisage that passenger numbers would rise as a result of lower fares from new entrants competing on fare in long-distance markets which became viable as a result of lower infrastructure charges. None of the data available provide any guide to what proportion of services are not, but could be, commercially viable, and many of them might currently be supported by a PSO[205]. We conclude that it is not possible to develop robust estimates of the scale of the effect.

Conclusions on Infrastructure charges as an obstacle to market entry

K.49 **Infrastructure charges vary considerably** between networks and between conventional and high-speed lines. The level of infrastructure charges has a direct impact on the cost of adding services, including long-distance cross-border passenger rail services. The issue appears to be greatest on high-speed lines.

K.50 Lower charges might not be necessary for an increase in service frequency, such a changing from an hourly to a half-hourly service, but might make it viable to extend the operating day or the seasons or days of the week when infrequent services were operated. Where capacity is available, lower charges could also lead to increased entry on the model of Italo.

[205] RMMS Figure 75 expresses the mix of PSO and commercial passenger transport by Member State in passenger-kilometres but not by passenger journeys, but provides no information on passenger journeys. Even with this data, and an estimate of what additional services could be commercially viable with lower access charges, it would also be necessary to identify how many would be limited by Member States on the grounds that would compromise the economic equilibrium of one or more PSCs under Directive 2012/34/EU as amended by Directive (EU) 2016/2370.

K.51 One operator noted that a structural and sustained reduction in charges would offer more scope for lower fares, implicitly to compete with air services.

K.52 However, **lack of predictability and transparency** of track access charges, which as yet show no signs of settling at consistent levels, mean that it is difficult for incoming operators to estimate charges and adds to the risk associated with market entry or service expansion.

K.53 One operator mentioned that they had been offered a discount on access charges for additional train services, but these were time-limited discounts to cover start-up costs.

K.54 Another operator had unsuccessfully requested a reduction for track access charges for cross-border night trains.

K.55 In addition, two changes could be made to the pairs of market segments defined in Annex VI to Directive 2012/34/EU:

- It is anomalous that **mark-ups are permitted to be higher for cross-border services** than for domestic services.
- As recommended in the 2017 study for the European Parliament[206], infrastructure managers could be required to **consider night trains as a market segment**.

K.56 If the Commission reopens Directive 2012/34/EU and Commission Implementing Regulation (EU) 2015/909, there will be the opportunity to introduce measures to reduce infrastructure charges for long-distance cross-border passenger rail services, for example, setting a cost cap per train-kilometre where appropriate.

[206] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

L Obstacles: capacity and capacity allocation

Introduction

L.1 The study Technical Specifications noted that international passenger trains are not generally prioritised by infrastructure managers during the capacity allocation process. This may lead to suboptimal timetables for cross-border passenger services, and hence to a lower level of attractiveness of the service for passengers. For night trains, priority issues may occur with capacity needed for maintenance works which often take place or intensify during night hours, as well as with freight trains. We were asked to:

- describe national legislation/rules for infrastructure capacity allocation;
- describe the practical implementation of international timetable coordination by IMs;
- assess the impact of the above-mentioned rules/legislation on the timetabling of cross-border passenger services, with special attention to cross-border night trains;
- analyse instructive examples of cross-border trains featuring in the 2020 timetable, if any;
- identify, any measures or best practices to improve infrastructure capacity allocation for cross-border services; and
- take into account any issues related to capacity constraints, including for stations.

L.2 On 17 May 2021, two weeks before the completion of this report, several ministers of transport published a letter of intent to introduce new long-distance cross-border night and high-speed day trains (a new Trans Europ Express, "TEE 2.0")[207] and a proposal for an EU-wide regular interval services ("Europatakt")[208]. The continued emergence of new proposals makes it difficult to define a base service level against which to investigate the scope for further long-distance cross-border trains or to identify the needs for infrastructure capacity or rolling stock.

The railway timetable

L.3 A railway timetable can be seen as a production plan for the railway. The timetable consists of a series of interlinked paths, of specified composition and characteristics, arranged to avoid direct conflicts en route, at junctions and in stations, which allow the efficient use of the rolling stock to create an attractive passenger timetable. The timetable must be adjusted periodically to reflect maintenance of the network, changes in the infrastructure and rolling stock, and changes in passenger demand.

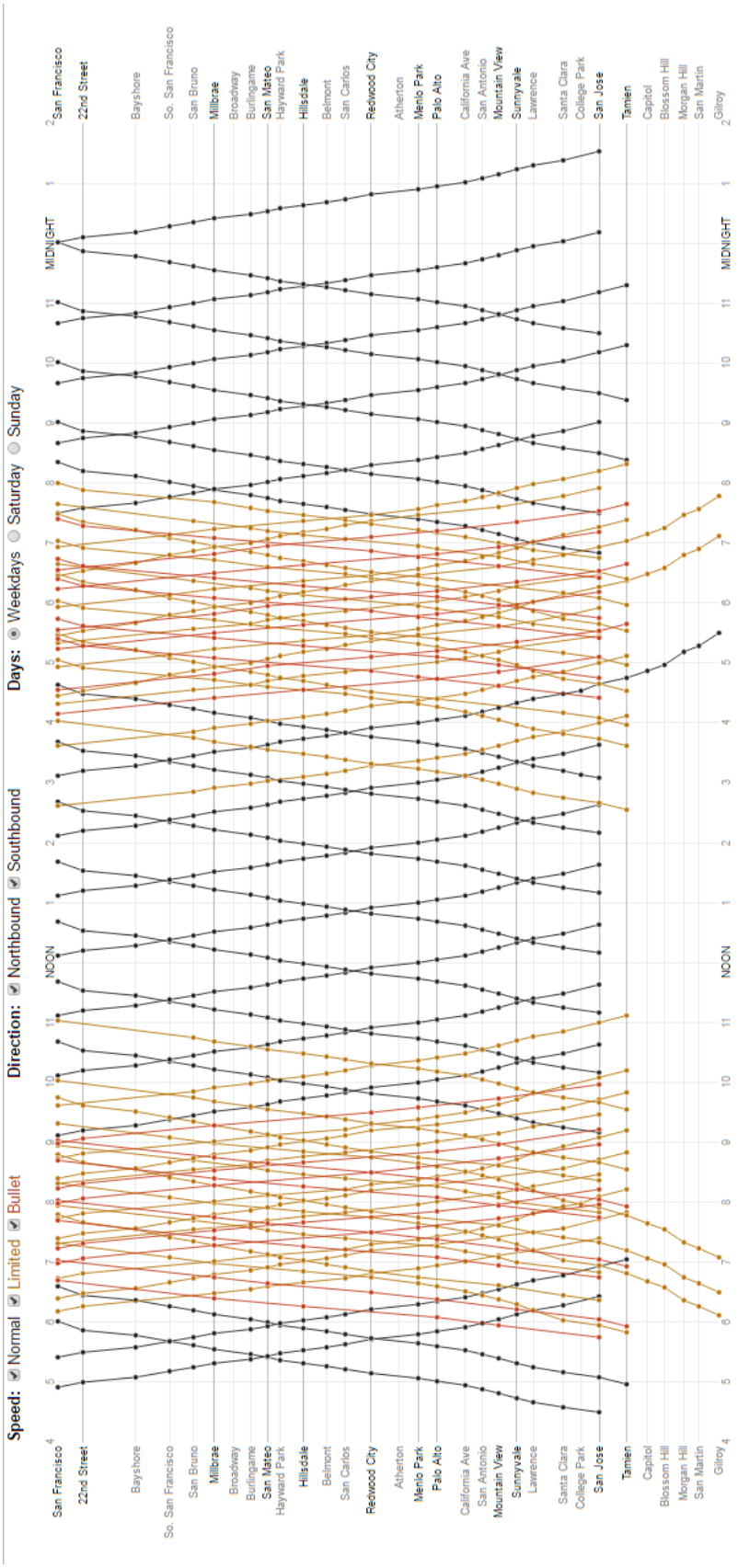
L.4 The figure below illustrates how a railway timetable can be shown on a train graph, with time on the horizontal axis and distance on the vertical axis[209].

[207] Letter of intent, International high-speed and overnight rail services (TEE 2.0), various ministers of transport, 17 May 2021 (2021)

[208] First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)

[209] The example is for San Francisco, but the same principles apply on any railway.

Figure L.43: Example of a train graph showing regular off-peak and frequent peak trains



Source: stackoverflow.com.

L.5 The timetable shows (black) a service operating at regular hourly intervals at off-peak times, generally stopping at all stations, as shown by the black dots. It also shows (orange) a denser and more complex service during peak periods, with different trains having different stopping patterns. It illustrates a number of points:

- A regular-interval timetable, as operating in the middle of the day, can provide a standard pattern of connections. It is also easiest for passengers to understand, and railway staff to operate, because they need only learn to operate a short, stable pattern of operations.
- At peak periods, most of all capacity may be consumed, particularly by urban and suburban commuter services and peak regional and long-distance arrivals and departures.
- Additional trains must find a gap between existing services, operating fast enough not to delay the train behind, but slowly enough not to catch the train in front. This is achieved by having trains with sufficient acceleration, speed and braking, omitting stops to increase speed or adding stops where this is possible.
- Long-distance trains must be found a path over many successive sections of route, potentially on the networks of different infrastructure managers. Over many hours en route, they are also likely to pass through one or more cities near or during peak periods. To be attractive, night trains must often arrive at one or more cities during the morning peak. We discuss below, from paragraph L.47, how Snälltåget's service between Stockholm and Berlin, which began operations in June 2021, must avoid congested times at Stockholm, Copenhagen, Hamburg and Berlin.

L.6 Assembling a workable, reliable and efficient timetable providing attractive and reliable paths for both domestic and cross-border services requires the integration of a wide range of information in relation the characteristics of the infrastructure and of the requested train paths, stopping patterns and rolling stock. This information is increasingly stored in interlinked databases including the relevant details of planned maintenance and engineering works, characteristics of infrastructure and rolling stock, rules on how the timings of trains are calculated, and the service specifications in Public Service Contracts (PSCs) and any framework agreements for the use of the infrastructure for longer than one working timetable period.

Directive 2012/34/EU

L.7 The legislative framework for the allocation of capacity is Chapter IV "Levying of charges for the use of railway infrastructure and allocation of railway infrastructure capacity" of Directive 2012/34/EU establishing a single European Railway Area. This legislation sets out broad principles of how infrastructure managers should create capacity rights, allow railway undertakings to apply for capacity, allocate the capacity as effectively as possible, and deal with issues such as congestion and disturbances.

L.8 In practice Directive 2012/34/EU has been implemented in different ways by the Member States, as we discuss further below.

Network Statements

L.9 Article 27 of the Directive refers to the Infrastructure Managers' Network Statement, and Annex IV of the Directive specifies the content of a Network Statement.

L.10 Annex VII sets out the schedule for process to allocate infrastructure capacity, as set out below.

Table L.1: Schedule for the capacity allocation process: summary

Date	Key provision
Working timetables and change dates	
Frequency	Once per calendar year
Change date	Midnight on the second Saturday in December
Change date options	Midnight on the second Saturday in June; and at other intervals between these dates as are required
	Different dates: if international traffic may be affected, infrastructure managers must inform the Commission
Deadlines, relative to the entry into force of the working timetable	
Final date for requests for capacity	No later than 12 months before
Provisional international paths established	No later than 11 months before
Draft working timetable	No later than 4 months before

Source: Directive 2012/34/EU as modified by Directive (EU) 2016/2370, Steer analysis, highlighting by Steer.

National legislation and infrastructure capacity allocation

L.11 In practice most Network Statements only provide some or all of:

- an overview of the process offered to railway undertakings;
- the application process and relevant forms and information requirements;
- the relevant cut-off dates; and
- processes for appeal and revision.

L.12 They do not normally describe the detailed processes carried out by infrastructure managers in response to these requests, the sequencing of these processes, or the mechanisms for managing conflicting requests for capacity[210].

L.13 In addition, the *de jure* description of the last dates at which capacity may be requested is often a poor guide to the *de facto* timescales at which capacity can be made available if infrastructure is congested, constrained, modified or enhanced, or major timetable revisions are proposed. In practice, infrastructure managers distinguish short-, medium- and long-term planning and, at the extremes:

- In some cases, it may be possible to operate additional trains at notice as short as days, such as to cater for major events or tourism flows, or even to improvise a timetable around a disrupted area.
- In other cases, development of a timetable concept begins as much as 15 years in advance, and railway undertakings and other stakeholders must make know their likely service aspirations so that provision for suitable train paths can be made.

L.14 We therefore focus next on a potentially critical aspect of the legislative framework, the treatment of congestion on railway infrastructure and the related priority rules, drawing on recent studies by the Commission's RMMS and IRG-Rail, as well as our own review of Network Statements.

[210] An exception to this is Adif. Section 4.5. Declaración sobre la red 2021, ADIF.

Congested infrastructure (Article 47)

L.15 Directive 2012/34/EU acknowledges, in Article 47, the principle that infrastructure may be declared congested if not all requests for infrastructure capacity can be adequately met.

L.16 In principle, the extent of infrastructure declared congested provides one indicator of the likely difficulty of adding or changing services. However, infrastructure may not be declared congested if railway undertakings either do not apply for capacity which they know will not be available, or withdraw applications which they conclude are unlikely to be successful.

L.17 We examined evidence of the extent of congestion of the railway infrastructure in different states. In 2021, the RMMS published data from EU Member States on the total length of track declared congested[211]. In 2019, IRG-Rail published a detailed analysis of the number of declarations of congested infrastructure[212]. We also examined the number of sections listed as congested in the 2021 Network Statements for the states listed in the IRG-Rail data, which are shown in the table below.

Table L.2: Declarations of congestion in Network Statements, 2021

Country	Location	Congested links
Sweden	Online "Överbelastad Infrastruktur"	Järna-Hallsberg
		Källeryd-Falköping
		Skövde-Falköping
		Stockholm central-Stockholms södra
Romania	Network Statement Annex 17	Sighişoara-Aţel Section Route name: Bucureşti-piscopia Bihor
		Vinţu de Jos-Coşlariu Section Route name: Curtici-Coslariu
		Micăsasa-Coşlariu Section Route name: Bucharest-Episcopia Bihor
		Vinţu de Jos-Simeria Section Route name: Curtici-Coslariu
		Brazi – Ploiesti Triaj-Ploiesti Sud Section Route name: Bucharest-Suceava
		Simeria-Glogovat Section Route name: Curtici-Coşlariu
		Braşov-Sighişoara Section Route name: București-Oradea
Lithuania	Online "Congested infrastructure"	Kužiai-Klaipėda (tarpstotyje Plungė-Šateikiai)
		Kaišiadorys-Radviliškis (tarpstotyje Livintai-Gaižiūnai)
		Radviliškis-Pagėgiai (tarpstotyje Viduklė-Tauragė)
Netherlands	Online "Knelpunten 2021"	Amsterdam-Amersfoort-Bentheim
		Den Haag Holland Spoor

[211] RMMS 7, Figure 73.

[212] A survey of congested infrastructure, priority criteria and capacity charges in Europe, IRG-Rail (2019)

Country	Location	Congested links
Spain	Network Statement 4.6	ADIF did not declare any infrastructure congested
United Kingdom High Speed 1	Network Statement 4.4.3	HS1 did not declare any infrastructure congested
United Kingdom Network Rail	Network Statement 4.4.3	Midland Main Line (Leicester to Cricklewood via Market Harborough and Corby)
		Reading to Gatwick Airport
		Castlefield Junction to Manchester Piccadilly East Junction (The “Castlefield Corridor”)
Germany	Network Statement Anlage 4-3-2	Strecke 1210 Niebüll-Westerland (Sylt)
		Strecke 1700 Wunstorf-Minden
		Strecke 1720 Uelzen-Stelle
		Strecke 2158 Bochum Hbf-Dortmund Hbf
		Strecke 2160 Essen Hbf-Bochum Hbf
		Strecke 2184 Duisburg Hbf-Mülheim (Ruhr) Hbf
		Strecke 2300 Mühlheim (Ruhr) Hbf-Essen Hbf
		Strecke 2650 Köln-Mülheim-Duisburg Hbf (Fernbahn)
		Strecke 2510 Viersen-Kaldenkirchen Gr
		Strecke 2633, 2639, 2650, 2652, 2658, 2659 Köln Hbf-Köln-Mülheim
		Strecke 3600 Hailer-Meerholz-Fulda
		Strecke 4000 Offenburg-Abzw. Gundelfingen
		Strecke 4000 Abzw. Leutersberg-Weil am Rhein
		Strecke 4010 Mannheim-Waldhof-Zeppelinheim
		Strecke 5200 Gemünden (Main)-Würzburg
		Strecke 5900 Knoten Fürth (Bay)-Bamberg
		Strecke 5910 Würzburg-Fürth (Bay)
		Strecke 6109 Berlin Ostbahnhof-Berlin Charlottenburg (Berliner Stadtbahn)
		Strecke 2630 Hürth-Kalscheuren-Remagen
		Bahnhof Berlin Spandau
		Bahnhof Hamburg Hbf
	Online “Überlastete Schienenwege 2020”	Strecke 2650 Gelsenkirchen Hbf-Wanne-Eickel Hbf
		Strecke 2200 Wanne-Eickel Hbf-Münster Hbf
		Strecke 6100 Berlin-Spandau-Nauen
		Strecke 6185 Wustermark-Rathenow
Norway	Network Statement 4.4.3.2	Oslo S-Ski (06:30 to 09:00 and 15:00 to 17:30 on working days)
		Oslo S-Lysaker (06:30 to 09:00 and 15:00 to 17:30 on working days)

Country	Location	Congested links
		Lillestrøm-Kløfta (the Main Line) (18:00 to 23:30 on working days)
		Lillestrøm-Kongsvinger (12:00 to 24:00 on working days)
		Oslo Central Station (06:30 to 09:00 and 15:00 to 17:30 on working days)

Source: Infrastructure manager Network Statements and websites, Steer analysis.

L.18 These studies indicate that there are differences between Member States in the implementation of the legislation on congested infrastructure.

L.19 In some cases, the exact wording of the Directive has been transposed into national law. Article 3 (20) defines "congested infrastructure" as "an element of infrastructure for which demand for infrastructure capacity cannot be fully satisfied for different periods even after coordination of the different requests for capacity".

L.20 In others, the definition in national law is based on the same concept as in the Directive, the applicant's rejection of the infrastructure manager's capacity proposal and the failure of the coordination process, but without using the exact wording of the Directive.

L.21 Some use definitions based on a ratio between the number of requests and the maximum capacity on each line:

- calculations or the theoretical and commercial capacities of macro-sections (the approach used in Italy[213]);
- whether the total volume of requests exceeds the infrastructure flow capacity;
- when rejected requests exceed 10% of the monthly theoretical capacity;
- assessment on the basis of analytical calculations and traffic studies on the performance of railway operations; and
- a definition related to both maximum flow regarding the signalling system, and noise and safety regulations.

L.22 In some cases, no definition of congestion has been transposed into national law or Network Statement. For example, ADIF has developed a measure to provide an indication of how much spare capacity is available on each part of the network. Annex H of ADIF's Network Statement tabulates a measure of "saturation" on each part of the network, which nowhere exceeds 78%[214]. While potentially useful, Annex H does not constitute either a formal declaration of congestion or a statement of where and when train paths for particular railway undertakings' requirements could be created.

[213] The regulatory body introduced a regulation on how to calculate the degree of congestion of each major section. It defined thresholds that, when exceeded, must lead to a declaration of congestion, resulting in 314 macro-sections (rather than long sections of track) being declared congested for the 2019 timetable.

[214] Anexo H, Capacidad Media de las Principales Líneas de Adif, Declaración sobre la red 2021, ADIF (2021)

L.23 National approaches to congested infrastructure also vary. In Norway, for example, some infrastructure has been declared to be congested but other infrastructure has been declared to be congested only at specific times. This means that the fact that infrastructure has been declared congested does not mean that it is not possible to operate additional services, especially if it is only congested at certain times of day. In Germany, for example, Berlin Spandau station, at which lines from the west merge before entering Berlin, has been declared congested. This has not precluded an investigation of the scope to operate more night trains to and from Berlin, some of which may need to pass through it[215].

Stakeholder views on national approaches to congested infrastructure

L.24 Eurostar, High Speed 1 (HS1) and PKP told us that they have not experienced cases of saturated or congested routes, though Eurostar notes that the Paris Nord terminal was regularly congested at peak times for international travel including Sunday evening and Monday morning, and an expansion has been proposed to increase passenger capacity. The Swiss Federal Office of Transport (FOT) told us that spare capacity is limited on some lines, but solutions have been found to allow additional ÖBB Nightjet services into Switzerland.

L.25 Some stakeholders questioned whether capacity issues are always genuine. One said that infrastructure managers are not sufficiently proactive, and railway undertakings have to drive the search for capacity. They noted the exception of HS1, a private company with a commercial incentive to find capacity for new services. They also mentioned that infrastructure managers tend to focus too much on the physical characteristics of the infrastructure rather than on their internal processes. Another stakeholder said that capacity issues could sometimes be addressed by better use of capacity, such as through slowing trains or changing stopping patterns, rather than by declaring capacity as congested and developing capacity enhancements plans.

L.26 One stakeholder mentioned that conflicts with overnight maintenance and freight transport meant that paths for night trains can be found but are sometimes suboptimal and less efficient, as the train needs to deviate to avoid freight trains or overnight maintenance.

L.27 A railway undertaking running night trains referred to the difficulty of obtaining paths for night trains to arrive in rail hubs in the morning peak hours and suggested that infrastructure managers should be required to reserve dedicated slots for night trains. Another organisation suggested coupling night trains to local and regional commuter trains to maintain attractive arrival times in the morning peak. This is technically possible with RIC interoperable stock or with standardised automatic couplings. Issues of train length could in principle be overcome where it is not strictly necessary to have all vehicles and doors in the platform.

Priority Rules (Articles 45, 47 and 49)

L.28 Article 47 of Directive 2012/34/EU allows infrastructure managers to employ priority criteria to allocate infrastructure capacity, as set out below.

[215] "Big plans to make Berlin a night train hub", Berliner Zeitung, 17 March 2021 (2021)

Table L.3: Use of priority criteria to deal with congested and specialised infrastructure

Article	Text
45(2)	The infrastructure manager may give priority to specific services within the scheduling and coordination process but only as set out in Articles 47 and 49.
47(3)	Where charges in accordance with Article 31(4) have not been levied or have not achieved a satisfactory result and the infrastructure has been declared to be congested, the infrastructure manager may, in addition, employ priority criteria to allocate infrastructure capacity.
47(4)	The priority criteria shall take account of **the importance of a service to society** relative to any other service which will consequently be excluded.
	In order to guarantee the development of adequate transport services within this framework, in particular to comply with **public-service requirements** or to promote the development of **national and international rail freight**, Member States may take any measures necessary, under non-discriminatory conditions, to ensure that such services are given priority when infrastructure capacity is allocated.
	Member States may, where appropriate, grant the infrastructure manager compensation corresponding to any loss of revenue related to the need to allocate a given capacity to certain services pursuant to the second subparagraph.
	Those measures and that compensation shall include taking account of the effect of this exclusion in other Member States.
47(5)	The importance of **freight services, and in particular international freight services**, shall be given adequate consideration in determining priority criteria.
47(6)	The procedures to be followed and the criteria to be used where infrastructure is congested shall be set out in the Network Statement.
49(2)	Where there are suitable alternative routes, the infrastructure manager may, after consultation with interested parties, designate particular infrastructure for use by specified types of traffic. Without prejudice to Articles 101, 102 and 106 TFEU, where such designation has occurred, the infrastructure manager may give priority to this type of traffic when allocating infrastructure capacity.
	Such designation shall not prevent the use of such infrastructure by other types of traffic when capacity is available.
49(3)	Where infrastructure has been designated pursuant to paragraph 2, this shall be described in the Network Statement.

Source: Directive 2012/34/EU as modified by Directive (EU) 2016/2370, Steer analysis, highlighting by Steer.

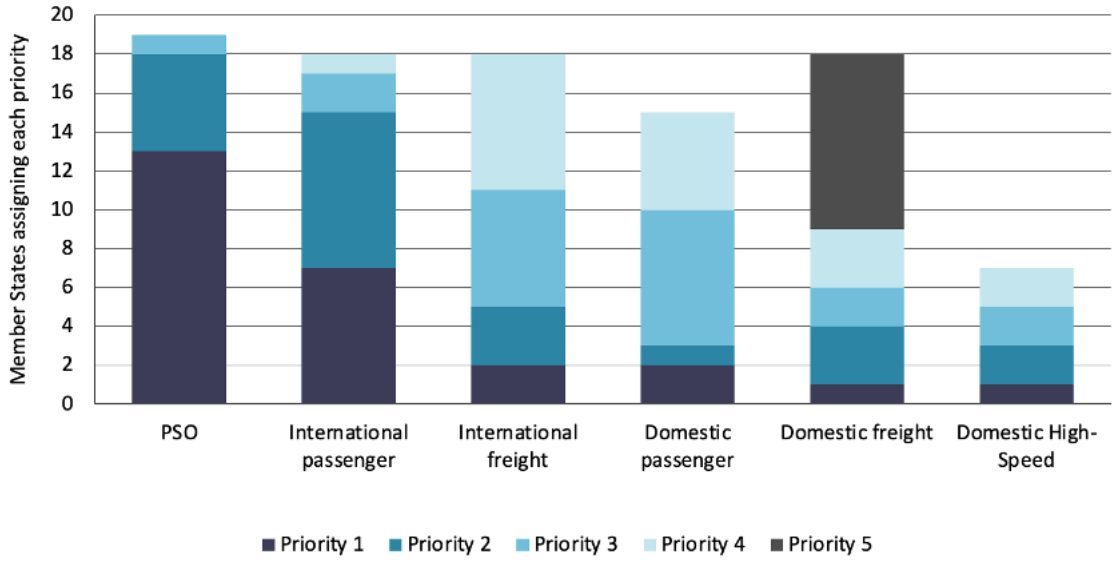
L.29 As highlighted in bold, the Article makes specific reference to:

- the importance of a service to society;
- public service requirements; and
- national and international rail freight.

L.30 We note that the Article makes no specific reference to **international passenger services.** As a result, they will only be granted priority if they address a public service requirement or if Member States consider those as important to society.

L.31 RMMS reports on the use of priority criteria by infrastructure managers, as set out below.

Figure L.44: Principal types of services prioritised by infrastructure managers, 2018



Source: RMMS 7, Figure 74.

L.32 PSO services were assigned the highest priority in 13 Member States and international passenger services were given the highest priority in 7 Member States. However, RMMS does not identify how these priority rules are applied in practice[216], and what the resulting impact has been on each type of service.

Stakeholder view on national approaches to priority rules

L.33 One new entrant railway undertaking stakeholder said that all the infrastructure managers with which it dealt had priority rules for timetable planning, and, on certain infrastructure, operations during disruption. Priority criteria are defined in the Network Statement and strictly applied to all train bids from all operators during the timetabling process. During disruption, some infrastructure managers have a priority list to apply to the movement of delayed trains, such as high-speed, then domestic, then freight.

L.34 An infrastructure manager said that priority criteria apply in all traffic. Another infrastructure manager said that they apply when dealing with conflicting paths, and third infrastructure manager referred to priority criteria, but did not give further details.

L.35 A new entrant to the night train market suggested that international trains should have priority when timetables are being developed.

L.36 In France, for example, railway undertakings are consulted in advance, with a first consultation three years before the annual service timetable and another consultation two years before.

[216] It might at first sight appear possible to accept requests for capacity in priority order until no more requests can be accommodated, but this would almost certainly result in poor use of a capacity, and poor connections between services. The actual timetabling process is much more complex and cannot be reduced to following a fixed procedure.

Cross-border infrastructure capacity allocation

L.37 We set out above how Directive 2012/34/EU has been implemented in different ways by the Member States, and the infrastructure managers are applying national legislation differently. While the formal application process for capacity is governed by the Schedule in Annex 7 of Directive 2012/34/EU, preparations often start earlier and vary between networks.

L.38 Partly as a result, processes for international timetable coordination vary more than processes for domestic timetabling, because they necessarily involve coordination between at least two infrastructure managers with different national history, objectives and constraints.

Forum Train Europe

L.39 Forum Train Europe (FTE) is a forum in which infrastructure managers and railway undertakings can discuss the allocation of cross-border rail capacity. It was established in its present form in 1997 and based in Berne, is a European association of railway undertakings and service companies that promotes cross-border rail freight and passenger traffic in Europe including the EU and neighbouring railways. It supports the cooperation of railway undertakings and enables them to plan and implement existing and new traffic, and is the coordination platform for the international harmonisation production plans and path requests.

L.40 FTE holds three cycles of coordination conferences as summarised below.

Table L.4: Forum Train Europe (FTE) coordination conference cycle

Conference	Month	Activities
FTE A	January	Preparation of path study requests
FTE B	March/April	Finalisation of path requests
FTE C	July	Fine-tuning of the deployment of coaches/wagons for passenger traffic (European Coach/Wagon Availability Plan (EWP))
		Validation of the Draft Timetable (Path Offer) and phrasing of observations
		Preparation and harmonisation of “Late Path Requests”
		Consultation on measures regarding construction works with international impact

Source: IRG-Rail.

L.41 Like the equivalent global airline route development conferences (Routes[217]), the FTE conferences are currently being held online due to the COVID-19 pandemic.

L.42 FTE encourages the use of Path Coordination System (PCS) managed by RailNetEurope (RNE). PSC is a web-based communication system for the international coordination process between the railway undertakings and the infrastructure managers during the production and train path planning phase.

L.43 In addition to FTE there are other bilateral and multilateral arrangements to coordinate cross-border timetabling, some of which we discuss further below.

[217] https://www.routesonline.com

The impact of rules on timetabling cross-border services

L.44 We discuss next four case studies of issues arising in international timetable coordination:

- for Eurostar;
- for new Snälltåget night trains to and from Sweden;
- for future Trafikverket night trains to and from Sweden; and
- for other new night trains.

Case study: timetable coordination for Eurostar

L.45 The operation of Eurostar services between London and Amsterdam illustrates the need for cross-border coordination in international timetabling. These trains cover a distance of just over 600 kilometres in just over three hours[218], using in succession the networks of High Speed 1 (HS1), Getlink (formerly Eurotunnel), RFF, Infrabel and ProRail. All except the Getlink infrastructure are high-speed lines, and all were built with a specific expectation that they would be used by cross-border services.

L.46 Each infrastructure manager has different approaches to the timing of engineering works, and on each network Eurostar services operate among other domestic, international and (in the case of Getlink) passenger and freight vehicle shuttle services. Eurostar needs to be able to offer competitive end-to-end journey times to compete with air services between Amsterdam and several London airports, over a shortest great circle distance of only 332 kilometres to London City Airport[219].

Case study: timetable coordination for new Snälltåget night trains to and from Sweden

L.47 We discussed with Snälltåget their proposals for a new night train, entering service in 2021, linking Stockholm, Malmö, Copenhagen, Hamburg and Frankfurt, and we subsequently examined their published timetable[220]. The table below illustrates how their single train per day each way is timetabled to avoid peak periods at several stations in each direction.

[218] Journeys from Amsterdam to London can be slower because of the need for additional security checks before entering the Channel Tunnel.

[219] Or 290 kilometres to London Southend Airport, also connected to central London by local rail services.

[220] **https://www.snalltaget.se/destinationer/kontinenten/berlin**

Table L.5: Potential constraints on night train between Stockholm and Berlin: selected station stops

Route and stops	Time	Issue	Comments
Stockholm to Berlin			
Stockholm	16:20	Timed to be before the PM peak	
Copenhagen	22:45		Calls at Høje Taastrup
Hamburg	05:31	Timed to be before the AM peak	
Berlin	08:52	Difficult in AM peak	Berlin-Gesundbrunnen is an alternative
Berlin to Stockholm			
Berlin	19:02	Timed to be after the PM peak	
Hamburg	23:26		
Copenhagen	06:38	Timed to be before the PM peak	Calls at Høje Taastrup
Stockholm	14:20		

Source: Snälltåget, Steer analysis.

L.48 This service is potentially constrained by peak traffic at three major cities in one direction and two in the other direction. From Stockholm to Berlin, the journey time from Hamburg to Berlin means that Hamburg can be served before, and Berlin served after, the AM peak. From Berlin to Stockholm, one issue is congestion approaching Copenhagen in the AM peak, even though the service will not call at, or pass through, the main station. Snälltåget also told us that obtaining operationally efficient paths into and out of Stockholm can be difficult, even outside peak periods. This illustrates how the timings of both night and day trains may be a compromise between the ideal departure and arrival times, the ideal time to serve intermediate stations, and the time required to complete the journey.

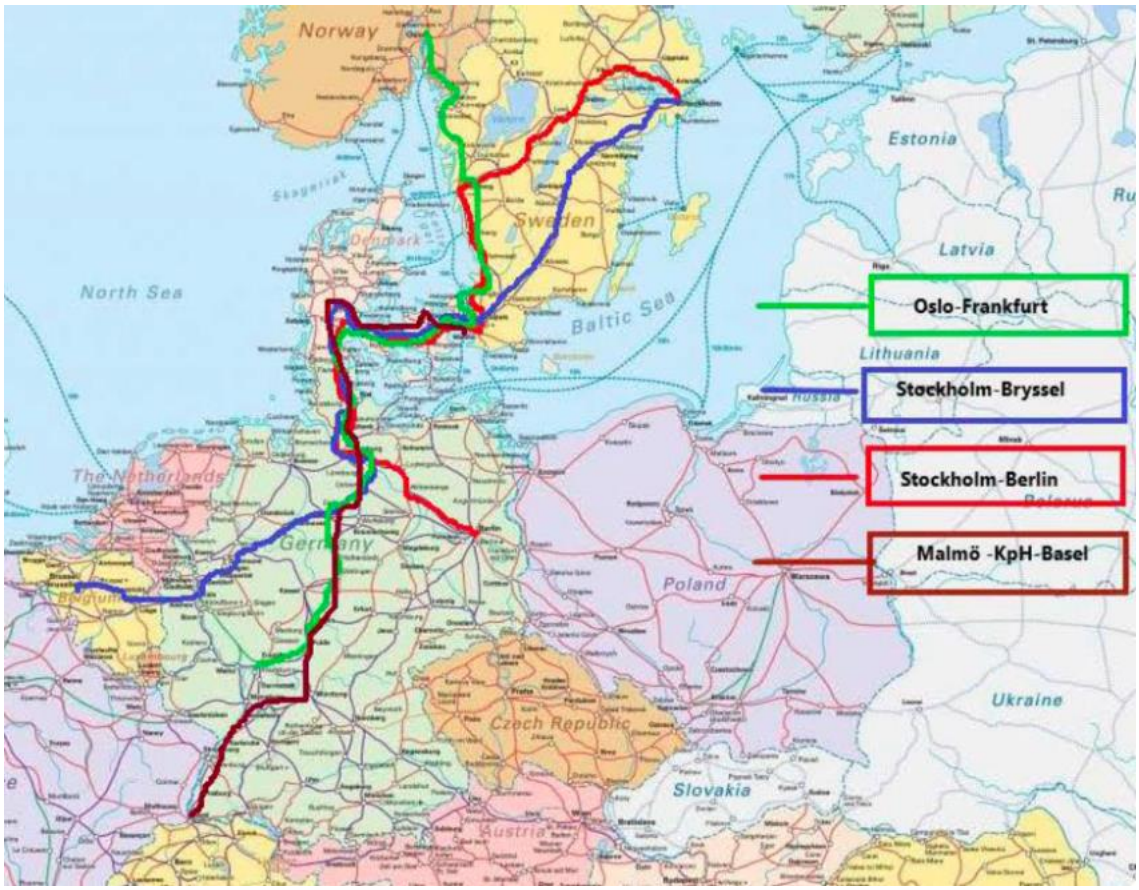
Case study: timetable coordination for future Trafikverket night trains to and from Sweden

L.49 In 2020, Trafikverket, the infrastructure manager in Sweden, also reported on a detailed study of the feasibility of operating night trains to the European continent, with a detailed annex on capacity issues[221]. This set out initial concepts for several routes, shown below:

- Oslo to Frankfurt;
- Stockholm to Brussels;
- Stockholm to Berlin; and
- Malmö to Basel.

[221] Underlagsrapport till Nattågstrafik till Europa, Kapacitet för nattåg till kontinenten, 2020:114, Trafikverket (2020)

Figure L.45: Night train routes investigated by Trafikverket



Source: Trafikverket.

L.50 Trafikverket assumed that the maximum acceptable journey time on a night train was 12 hours for business travellers and up to 17 hours for leisure travellers. Night trains from Stockholm could only reach northern Germany within 12 hours, but night trains from Malmö could reach further. A night train from Stockholm to Brussels would be desirable, but the total journey time would be over 17 hours, at least until the Fehmarn Belt Fixed Link opens, reducing journey times by approximately two hours. After focusing on two shorter potential routes, Stockholm-Hamburg and Malmö-Cologne, Trafikverket initially recommended Malmö-Cologne.

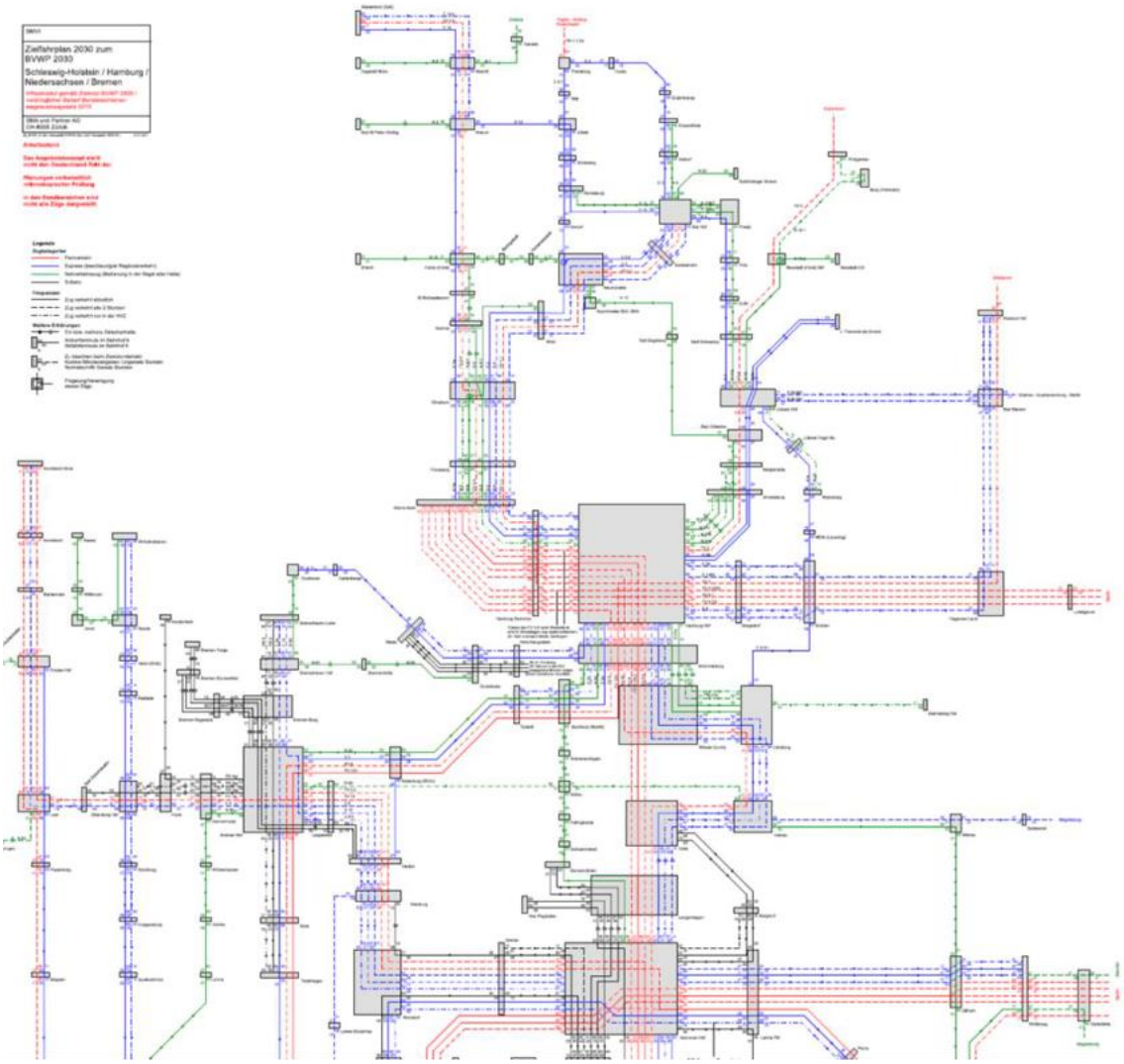
L.51 It noted several issues related to access to capacity[222]:

- The railways are congested, especially in Germany around major cities, as we noted above, and large rail yards.
- At peak times in the morning and late afternoon, it can be difficult to find train paths.
- This can limit the possibility of establishing a good timetable for night train services.
- Capacity is also limited by extensive investment and maintenance measures for infrastructure over the next ten years in Sweden, Denmark and Germany.

[222] Summary of the final report, Night trains to the European continent, Trafikverket, 12 May 2020 (2020)

L.52 Trafikverket illustrated these points with the diagram below, which shows the planned service pattern in northern Germany for 2030[223].

Figure L.46: Planned service pattern for northern Germany, 2030



Source: Zielfahrplan, Bundesverkehrswegeplan 2030, referred to by Trafikverket.

L.53 The figure illustrates how additional train services, including cross-border services, would need to be fitted between a range of existing and planned services, including on links, through junctions and at major stations, represented by grey blocks.

L.54 Trafikverket also noted that normally only railway undertakings can apply for capacity[224]. This may make it difficult for an infrastructure manager alone to attempt to create cross-border

[223] Bundesverkehrswegeplan 2030, Bundesministerium für Verkehr und digitale Infrastruktur, August 2016 (2016)

[224] "The Inquiry notes that it is the relevant operator that must apply for capacity. As infrastructure manager, the Swedish Transport Administration itself cannot do this ahead of a possible procurement. It

train paths, without a specific request from a railway undertaking which has identified its preferred timings and stopping patterns and the rolling stock it will use.

Case study: other new night trains

L.55 We also note that infrastructure managers have rejected several applications for paths for new night trains because of conflicts with freight trains[225]. Examples included Thello's service between Paris and Rome, discontinued due to intensive overnight freight on the same route, and the night train from the Netherlands to Lourdes. The declaration of Hamburg Hauptbahnhof as constraint led to a situation whereby night trains arriving in the morning peak terminated at less central stations at Hamburg Dammtor and Hamburg-Altona. This means that passengers to and from the central Hauptbahnhof did not have the opportunity to "lie in" on arriving night trains or "board early" on the return services[226].

Stakeholder views on international timetable coordination

Views relevant to the Eurostar case study

L.56 We interviewed Infrabel, ProRail and EIM, which represents the interests of the European rail infrastructure managers, and discussed international timetable coordination, including for the Eurostar services discussed above.

L.57 Infrabel and ProRail told us that they apply the RailNetEurope (RNE) timetable process and referred to the FTE dates discussed above:

- Work begins one year ahead, with submission of timetables studies (FTE A), which the infrastructure managers have nine weeks to study and, with the involvement of railway undertakings, prepare variants.
- The second Monday of April (FTE B), eight months before the timetable comes into force, is a deadline by which railway undertakings must submit their order for train paths into the Path Coordination System (PCS)[227]. All requests submitted by this deadline are treated equally.

L.58 The process of fitting new services among existing services is not straightforward:

- ProRail has a group involved in long-term capacity planning for domestic and cross-border trains using dedicated software. It plans 5-7 years ahead, and involves all operators of which it is aware, but cannot readily engage with operators who propose new services at short notice.
- For Eurostar, Infrabel told us that High Speed 1 and Getlink had been proactive in identifying potential services to and from London, and it was working with them to ensure that these were taken into account in plans.

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is possible for one or more operators to apply for train paths even if no agreements have yet been concluded, although this is not optimal from a train planning perspective."

[225] Slapend onderweg, Potentieel van de internationale nachttrein van en naar Nederland, Kennisinstituut voor Mobiliteitsbeleid (KiM), (2019)

[226] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

[227] https://pcs.rne.eu

L.59 However, other infrastructure managers may not plan so far ahead, or engage so early or extensively with potential operators.

Views relevant to the Trafikverket case study

L.60 We asked Snälltåget about Trafikverket's proposal for PSO night train services (see paragraph L.49) being introduced alongside commercial night train services (see paragraph L.47). They told us that Trafikverket was not expected to introduce directly competing services, but noted that Article 11 of Directive 2012/34/EU protected PSO services from commercial services, but not vice versa[228].

Views of other stakeholders

L.61 A large railway undertaking pointed out that the FTE process faced the challenges of dealing with the different dates used by each infrastructure manager, and that the coordination regarding engineering work, which has been mandatory at European level since 2017, needed to be better. We noted that Thello's service between Rome in Italy and Paris in France, launched in 2011, was withdrawn in December 2013 because it was unable to secure train paths on 85 days in 2014[229].

L.62 We also asked the ERA whether it would be possible to create Rail Passenger Corridors analogous to the nine Rail Freight Corridors. ERA suggested that this might be possible, but had not done detailed studies. We discuss another stakeholder's comments on the concept of Passenger Rail Corridors in Annex P.

L.63 An infrastructure manager also noted that capacity on its network was constrained by speed differences between passenger and freight trains, although the introduction of ETCS should result in some increases in capacity.

L.64 One incumbent railway undertaking noted that access to facilities such as depots, stabling points, refuelling and toilet emptying facilities could all be critical to creating a new cross-border service. In Italy, track access rights include access to the station and facilities, including services for Persons with Reduced Mobility (PRMs), but this was not the case on other networks. Another incumbent railway undertaking made a similar observation, that if new services were added to existing ones, access to stabling points would become a problem unless the timings and occupation of facilities could be coordinated.

L.65 A passenger body noted that gauge-changing Talgo stock was used to switch between standard and Iberian gauges at the France-Spain border, and argued that new cross-border trains need not be captive to a network of one gauge.

L.66 The Swiss Federal Office of Transport (FOT) also pointed out that it would not be possible for cross-border services to operate on or to penetrate small railways with unusual features to locations such as St. Moritz, Davos, Zermatt or Gstaad. FOT also summarised its views on best practice for capacity allocation:

- for the long term, capacity planning like in Switzerland;

[228] We understand that ÖBB extends PSO-supported night train services from Austria into Italy, but it is not clear what would happen if another operator sought to extend commercial services from Italy into Austria. In principle, these could be refused if it was argued that they affected the economic equilibrium of ÖBB's PSO services.

[229] International Railway Journal (IRJ), August 2014.

- for the medium term, the emerging TTR process; and
- for the short term, a normal request to the infrastructure manager.

L.67 An infrastructure manager raised the issue of the need for capacity to move trains between stations and depots, which could also be a constraint at peak periods. Another infrastructure manager said that moving stock to depots was not a limiting factor, but might become one if there was a major increase in the number of train sets to be dealt with.

Measures and best practice for cross-border capacity allocation

L.68 We discuss next several initiatives, some of which may be emerging best practice, to improve capacity allocation for cross-border services. We deal in turn with:

- the redesign of the International Timetabling Process (TTR);
- Europatakt;
- Eurolink; and
- the general principle of regular interval, clockface or "Takt" timetables.

The redesign of the International Timetabling Process (TTR)

L.69 In 2014, RailNetEurope (RNE) and Forum Train Europe (FTE) joined forces to begin the Redesign of the International Timetabling Process (TTR), enabling capacity to be allocated for both short- and long-term needs. The aim was that TTR would be implemented across Europe by 2025, and pilot projects are under way.

L.70 In 2020, IRG-Rail produced a report on the state of development of the TTR project and its pilots[230]. It noted that the implementation timelines in particular have proven difficult, and that TTR required extensive IT developments, costed at €675 million, to achieve a high degree of preplanning, automation and integration between legacy systems adapted for the purpose.

L.71 IRG-Rail also noted that there appeared to be widespread agreement among stakeholders that there is a need for revision of Directive 2012/34/EU. It said that the Commission notes this, but expects a more detailed cost/benefit analysis and some verified results from the TTR pilots before they are prepared to initiate a revision of the legal framework.

L.72 IRG-Rail also noted that Track Access Charges (discussed in Annex K) may not be sufficiently predictable and stable between infrastructure managers to provide clear financial incentives for applicants to adjust their requests.

L.73 IRG-Rail also raised several outstanding questions regarding TTR, which we summarise in the table on the next page.

L.74 Several of these questions relate to whether TTR will enable RUs to request capacity tailored to their specific proposals, allowing them to innovate, or whether it will focus on preconstructed paths, based on past requirements, and tend to favour incumbents.

L.75 The table also illustrates questions about whether the process will provide the right balance of incentives. RUs may make capacity needs announcements, which provide IMs with advance indications of their requirements. However, DB Netz planned to offer only preconstructed train paths, prepared from data on recent demand and made available via a "train path catalogue" system. Even if an infrastructure manager reserves capacity in the form of preconstructed paths, applicants can in principle request the rail infrastructure capacity they

[230] Report on the state of development of the TTR project and its pilots, IRG-Rail, November 2020 (2020)

need, rather than conforming to a preconstructed path. Will RUs be able to make realistic assessments of their needs, and be incentivised to stick to them, and will IMs by required to justify deviations from requests by applicants (Articles 45 and 46)?

Table L.6: IRG-Rail's assessment of outstanding questions with TTR (2020)

Issue	Questions raised by IRG-Rail
Supporting open access and innovation	Will the TTR model with its long lead times and need to disclose information be conducive to entry in the open access passenger market, or will that segment lose relative importance?
	Will there remain scope for competition and innovation through product differentiation (such as speed, acceleration and stopping patterns) or will all applicants have to adapt to predefined train paths?
	How can the format of the capacity needs announcements by RUs be designed to improve conditions for innovation and market entry?
	How can the process be designed in a way which protects RUs competing with a vertically integrated incumbent?
Behaviour of IMs	To what extent will IMs be required to justify deviations from requests by applicants?
Behaviour of RUs	What incentives will there be for RUs to stick to their capacity needs announcements when applying for train paths later?
Legal basis	What legal basis is required for full implementation and when does it need to be in place? IRG Rail suggests that implementation of TTR requires a revision of Directive 2012/34/EU. Can that be done in time, given that the Commission has expressed that they will be busy with the revision of Regulation (EU) 913/2010 until some point in 2022[231]?
Framework agreements	Will the TTR model be compatible with the use of framework agreements (Directive 2012/34/EU (Article 42), such as concerning conflicts between framework agreement requests and the multiannual rolling planning?
Monitoring by regulatory bodies	How can the capacity modelling be made transparent enough to allow monitoring by regulatory bodies while at the same time provide sufficient protection of sensitive business data?

Source: IRG-Rail.

L.76 IRG-Rail noted that its member regulatory bodies would continue to monitor TTR but, as the elements of TTR are not yet fully developed, findings based on the 2020 timetable can only be a first step in assessing the viability of the TTR process[232]. IRG-Rail considered that, before deciding to introduce new mechanisms and further actions, TTR needs to be thoroughly tested and evaluated, and that a system-wide implementation can only follow after all critical components have been tested and evaluated during pilot operations.

L.77 An infrastructure manager and a railway undertaking both referred to TTR as best practice, but we note that it is not yet clear whether:

[231] Regulation (EU) 913/2010 concerning a European rail network for competitive freight.

[232] We note that 2020 may in any case be an atypical year because of the COVID-19 pandemic and its effect on passenger and freight demand and services.

- Would TTR permit or enable the simultaneous or rapid introduction of a major new network of long-distance cross-border services?
- Would TTR result in operationally efficient and commercially attractive train paths and diagrams[233]?
- Would TTR result in timetables which could be operated reliably?

L.78 We also note that coordination between infrastructure managers will not in itself relieve capacity constraints on individual lines or at individual junctions or stations, which may make it difficult or impossible to add operationally efficient or commercially attractive long-distance cross-border services.

Europatakt

L.79 On 17 May 2021, two weeks before the completion of our Interim Report, several ministers of transport published a letter of intent to introduce new long-distance cross-border night and high-speed day trains (a new Trans Europ Express, "TEE 2.0")[234] and a proposal for EU-wide regular interval services ("Europatakt")[235]. The proposal consisted of a brief 8-page presentation, and did not set out details of how a Europatakt timetable would be created or would evolve.

L.80 Infrabel told us that it is working on a Takt timetable for 2030 in which domestic traffic would be considered a feeder for cross-border traffic.

Eurolink

L.81 Also on 17 May 2021, the Eurolink project, part of a long-term review of capacity management, published a presentation for Europe-wide coordination of timetables[236]. Eurolink noted the problem of planning cross-border trains within fixed national timetables, and suggested that cross-border services should be planned before domestic services.

L.82 We discussed Eurolink with EIM, Infrabel and ProRail. They told us that wide range of organisations are involved in the Eurolink project including DB Netz and SBB. The aim is to optimise capacity management with existing infrastructure capacity by 2030, with no additional investments. They pointed out that Eurolink is not a transport plan, but can only be a clockface or Takt arrangement by which potential origins and destinations could be linked. For example, there is a proposal for four trains per hour between Paris and Brussels, but provision could be included for these to be extended to the Netherlands and/or Germany.

[233] A train path is a single end-to-end journey offered to a railway undertaking. A diagram is the complete activity of a locomotive, train or train crew from the start to the end of the working day. "Closed" diagrams complete an even number of journeys over a relevant period, such as a day or a week, so that resources end that period at their starting point.

[234] Letter of intent, International high-speed and overnight rail services (TEE 2.0), various ministers of transport, 17 May 2021 (2021)

[235] First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)

[236] Towards a better international timetable in Europe, Jeroen Wesdorp and Thomas Moerman, Eurolink, 17 May 2021 (2021)

L.83 We asked how Eurolink would relate to TTR and were told that they are complementary. While TTR looks five years ahead, Eurolink looks 10-15 years ahead. In principle, Eurolink's vision for the longer term can inform TTR's plans for the shorter term.

Regular interval, clockface or "Takt" timetables

L.84 Europatakt and Eurolink's proposals both appear to be part of the trend to a systematic and long-term planning of the timetable on a regular interval or clockface pattern, referred to in German as "Takt".

L.85 Several railway undertakings said that they operate a clockface timetable or Takt timetable, but the extent of Takt varies:

- In Austria paths for international trains are included in the clockface timetable.
- In Sweden the clockface timetable is limited to domestic trains.
- Night trains are generally excluded from the clockface timetable.

L.86 We note that centralised timetable planning by infrastructure managers is a different approach from letting railway undertakings request whatever capacity they require. Adoption of national clockface timetables can make it difficult to create efficient paths for cross-border services.

L.87 One infrastructure manager said that it used a clock face timetable for local traffic, and that this could make it difficult to integrate international trains (by implication, from the Russian Federation). One incumbent railway undertaking did not see pre-allocated capacity for international services as a solution. They approached the question from the perspective of an open access operator needing to be flexible to adapt to changes in passenger demand.

L.88 A new entrant railway undertaking was concerned at the trend towards clock face timetables. These are the norm in Switzerland (since 1982) and Austria, and are being proposed in Germany, in the form of "Deutschlandtakt". Increasing congestion in Great Britain also means that all the main lines are constrained to run a standard hourly pattern, permitting only minor variations in the origins, destinations and stopping points of trains in each hour. Open access operators might not be able to reach major destinations if all capacity had already been absorbed by shorter-distance PSO services. The stakeholder said that their biggest concern was that a clock face could lead to over-regulation of rail to preserve multimodality within an urban area.

L.89 Another new entrant railway undertaking noted that some states appeared to have concluded that the third railway package liberalisation had failed, and that capacity should be devoted to a well-planned PSO network rather than waiting for open access services. "Letting politicians be the timetable planners" was not the approach envisaged in rail liberalisation, and there was a risk that clock face and "Takt" timetables would absorb all existing capacity and leave no scope for new services. There was also a concern that infrastructure managers might be reluctant to maximise the use of infrastructure capacity if it was operationally easier to deal with fewer trains.

L.90 We asked EBP, who carried out a detailed study of high-speed rail in Europe[237], whether there was a tension between clock face or Takt timetables and open access. EBP said that there was, and that the incumbent or dominant operator would have an enormous advantage. EBP noted that, in both Sweden and Great Britain, capacity allocation is supervised by an independent regulatory body responding to requests for future capacity. We note that in Great Britain, infrastructure enhancements which will lead to one extra hourly path may lead to requests for two or three additional services, and the regulatory body then carries out detailed studies of what pattern of services both has high social value and can be operated reliably[238].

L.91 EBP noted that two additional operators, Bern-Lötschberg-Simplon railway (BLS) and Südostbahn (SOB would be introducing interregional services in Switzerland in the 2021 timetable, but the train paths they required had been created as part of the overall timetable, rather than being derived from independent requests for capacity. Paths could in principle be reserved for potential new services, but these would have to be planned in advance, rather than on demand. The Swiss Federal Office of Transport (FOT) told us that this was possible because spare paths were built into the capacity concept (Netznutzungskonzept) which normally includes more paths on a line than the Takt needs. Additional trains must either be integrated into the Takt, and offer capacity for domestic travel, or operate outside the Takt, which would often mean leaving main stations 15 minutes after Takt services. This can be an advantage where 15 minutes is seen by passengers as an acceptable and reliable connecting time. However, the FOT noted that cross-border services which required new infrastructure might need to set out their proposals 15 years in advance.

Capacity at stations

L.92 We discuss below how congestion at city centre stations can mean that night trains must be diverted to another, less attractive station, in some cases without being able to call at the main station at all.

L.93 Our 2017 study of night trains for the European Parliament identified examples of congested stations[239]:

- At Hamburg in Germany, night trains arriving in the AM peak terminated at less central stations at Hamburg Dammtor and Hamburg-Altona. This means that passengers to and from Hamburg Hauptbahnhof did not have the opportunity to “lie in” on arriving night trains or “board early” on the return services.
- At Cologne in Germany, limited platform numbers meant that night trains could not begin or end their journey at the station, again leaving no opportunity at Cologne to “lie in” on an arriving night train or to “board early” on the return services.
- At Stockholm in Sweden, night trains only operated outside the peak periods.
- In Great Britain at London Euston, night trains arrive before the morning peak.

[237] Evaluation of high-speed rail in Europe, Comprehensive literature review and potential of section upgrades for improving EU-connectivity, EBP for European Commission, Final Report (Draft), 27.11.2020 (2020)

[238] See, for example Decision letter, Applications for access to the East Coast Main Line (ECML), Office of Rail and Road, 12 May 2016 (2016)

[239] Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

L.94 In addition, from 2030, all international trains calling in Amsterdam will serve Amsterdam-Zuid instead of Amsterdam-Central, to free platforms for domestic trains.

L.95 A Member State reported that there were limited numbers of train paths and platforms in major stations, and this meant that it was only possible to offer short boarding times to night trains. One proposal for a night train starting from Zurich would block two tracks, or one platform, for at least one hour, and this could not be accommodated before 23:00.

L.96 An incumbent railway undertaking said that there were problems related to domestic services and at congested stations, but did not provide specific examples.

L.97 A further issue, not strictly related to capacity, is the need for cross-border services to operate at commercially attractive times for domestic services, which may not fit with continuation across borders. Domestic passengers in cities near borders may expect services to the capital or other major destinations to leave early morning and return late evening to allow the longest possible day trip. Extending such services across borders would mean either even earlier departures and later returns or a shorter day in the capital. This is particularly an issue for cities served by only one or two trains per day in each direction.

L.98 **Case study: Vienna Hauptbahnhof**

The figure below illustrates the use of Vienna Hauptbahnhof by night trains listed on ÖBB Nightjet's brochure listing its 2021 services.

Table L.7: ÖBB Nightjet services through Vienna (2021)

Train	From	Arrive	To	Frequency	From	Depart	To	Train
EN463	Munich	06:34	Budapest	Daily	Budapest	23:27	Munich	EN462
NJ447	Bregenz	06:54				22:55	Bregenz	NJ446
NJ457	Berlin	07:00				22:10	Berlin	NJ456
EN407	Warsaw						Warsaw	EN40456
NJ236	Venice	07:55				21:27	Venice	NJ40466
NJ467	Zurich						Zurich	NJ466
NJ1234	Livorno	08:42				20:01	Livorno	NJ1237
NJ235	Milan	08:52				19:23	Milan	NJ233
NJ40294	Rome						Rome	NJ40233
EN1252	Split	08:58	Bratislava	2/week	Bratislava	18:01	Split	EN1253
NJ425	Brussels	09:19		3/week		20:13	Brussels	NJ50490
NJ40421	Amsterdam			Daily			Amsterdam	NJ40490
NJ491	Hamburg						Hamburg	NJ490

Source: ÖBB Nightjet, Steer analysis.
Note: trains are sorted in order of morning arrival.

L.99 The table illustrates several points about the operation of the Nightjet services.

L.100 First, while it lists services to a total of 13 destinations, portions are combined en route to reduce the total number of trains operated at Vienna. The 07:00 arrival has portions from Berlin and Warsaw, the 07:55 arrival has portions from Venice and Zurich and the 09:19 arrival has portions from Amsterdam, Hamburg and, on some days, Brussels.

L.101 Second, not all trains operate daily. This may reflect demand which is limited or which varies by day of the week[240]. For example, NJ50490 operates to Brussels only on Sunday, Tuesday and Thursday, and returns on Monday, Wednesday and Friday. This allows passengers to spend Monday morning to Friday evening in Brussels but not in Vienna.

L.102 Third, services with shorter journey times tend to arrive earlier and leave later than services with longer journey times, so as to ensure as far as possible that all services operate at times attractive to passengers. However, while departures are spread over the period 18:01 to 23:27, or almost 5½ hours, arrivals all take place between 06:34 and 09:19, or less than three hours. This reflects passengers' willingness to travel during evenings but preference for arrival in time for the working day[241]. However, it also means that there are five arrivals at Vienna Hauptbahnhof in the period 07:00-09:00, which in many city centre stations coincides with the morning commuter peak.

L.103 Fourth, not all ÖBB Nightjet trains start and finish at Vienna. The Munich service which forms the first arrival and last departure also serves Budapest, approximately three hours away, and the Split service also serves Bratislava, approximately one hour away. However, these extra stops affect passengers. For example:

- Passengers arriving from Munich must leave the train at 06:34, and cannot "lie in" on board, and those continuing to Budapest do not arrive until 09:19.
- Passengers travelling to Munich cannot board the train until it arrives just before 23:27.

L.104 The Vienna Hauptbahnhof is described by ÖBB as a hub in trans-European rail transport for domestic and international passenger traffic. It opened in stages from 2012 to December 2015, and from December 2014 became the hub for all night trains (and car-carrying trains) to and from Vienna. Other major European cities do not have the benefit of a new station planned as a hub for cross-border services, and many suffer from congestion or lack of platforms, particularly during the morning commuter peak period. The table below lists other stations identified in our research as actual, or potential, constraints.

[240] Trafikverket's study, discussed below, also noted that "Night trains that operate on a daily basis throughout the year are not considered to be profitable, as demand varies considerably between different times of the year and different days of the week."

[241] "For sleepers, a departure after 20:00 and arrival before 09:00 (but after 06:00) may be psychologically important", "I am ready to start a night train travel between 20:00 and 22:00".

Table L.8: Stations identified as constraints

State	Station(s)	Issues
Denmark	Copenhagen	Alternative of Høje Taastrup
France	Lille	Constrained station with no ready means of expansion
	Paris Gare du Nord	Limited space for Eurotunnel security and border formalities
Germany	Berlin Hauptbahnhof	Alternative of Berlin-Gesundbrunnen
	Berlin Spandau	Declared congested
	Cologne	Through station with limited platforms
	Frankfurt	Capacity limits
	Hamburg	Alternative of Hamburg Dammtor and Hamburg-Altona
	Karlsruhe	Arranging cross-platform connections
	Mannheim	Arranging cross-platform connections
Netherlands	Amsterdam	Need to free platforms for domestic trains
Norway	Oslo	Declared congested
Sweden	Stockholm	Declared congested Stockholm Central to Stockholms Södra
Switzerland	Zurich	Lack of platform capacity before 23:00
United Kingdom	London St Pancras	Limited space for Eurotunnel security and border formalities
	London Euston	Night trains must arrive before AM peak
	London Kings Cross	Number of platforms and capacity of station "throat"

Source: Desk research, stakeholders, Steer analysis.

L.105 We note that, in some cities with multiple stations, such as Amsterdam, Berlin and Rome, the network allows trains from some directions to use two or more stations. In others, such as Budapest, London and Paris, each station serves a different radial corridor and there is little scope to divert trains between them.

Stakeholder comments

L.106 We referred above to how, in Sweden and Great Britain, capacity allocation is supervised by an independent regulatory body which can allocate capacity in a way which maximises economic, social, environmental or other objectives. This is consistent with the provision, in Article 47(4) of Directive 2012/34/EU, that priority criteria to allocate infrastructure capacity "shall take account of the importance of a service to society relative to any other service which will consequently be excluded." A stakeholder referred to the inclusion of considerations such as the socio-economic and environmental impact and the value of services in path allocation as best practice. A Regulatory Body also said that capacity issues could be addressed by using this "most socially valuable timetable" approach.

L.107 At a conference on obstacles to long-distance cross-border rail[242], Peter Endermann of Regionalverband FrankfurtRheinMain referred to capacity constraints at Frankfurt Hauptbahnhof and the issues of arranging cross-platform connections at Karlsruhe and Mannheim.

[242] Overcoming Obstacles to Cross-Border Long-Distance Passenger Rail in 2021 – Time to Act in the Year of the Rail, online conference, 5 March 2021 (2021)

L.108 A passenger body informed us that their proposals for night trains would avoid the peaks or travel in the counterpeak direction.

L.109 An Infrastructure Manager said that it expected the implementation of ETCS to reduce capacity constraints.

Summary of capacity allocation as an obstacle to market entry

L.110 We summarise below several the themes emerging from our analysis, and in particular measures and good practice to remove capacity allocation as a barrier to market entry.

European Train Control System (ETCS)

L.111 A growing proportion of the study area's rail network, including cross-border corridors, is being controlled by ETCS. Subject to emerging differences in implementation on different networks, ETCS can offer a common interface between track and train, enable locomotives and crews to operate on more networks, and reduce or eliminate the need for changes at borders. ETCS can also increase the number of trains which can be operated at a given level of reliability, especially if combined with automatic train operation (ATO), which has already been implemented on constrained urban track.

L.112 One measure which has been suggested is further promotion of ETCS, including the Commission's grant support under the Connecting Europe Facility (CEF).

Redesign of the International Timetabling Process (TTR)

L.113 We noted above how TTR is intended to allow capacity to be allocated for both short- and long-term needs. Pilot projects have found that TTR requires extensive IT developments, and IRG-Rail's assessment of TTR is cautious and identifies several issues to be resolved. Nonetheless, TTR remains emerging best practice, at least unless and until further improvements are devised.

Regular interval, clockface or Takt timetables

L.114 The need for, and complexities of, capacity allocation on railways are driven by the fundamentals of railway technology: trains cannot pass each other on the same line, and each train already timetabled constrains the addition of further trains, which cannot pass through the same location at the same time. Some stakeholders argued that proven best practice is to plan a regular interval, clockface or "Takt" timetable designed around the efficient and reliable delivery of attractive services and connections, and then adjusting infrastructure and rolling stock to deliver them. However, others argue that one or more adjacent Takt timetables on a cross-border route limit the intended right for applicants to request the capacity they require, and force them to choose from pre-planned paths which may result in longer journey times or missed connections.

L.115 In reality, an increasing number of urban and suburban networks, constrained long-distance routes, and even national networks, are being timetabled on a Takt basis. It is not clear whether Takt is the best way of timetabling or promoting long-distance cross-border passenger rail services, or how it would affect the approach to addressing other obstacles including rolling stock, ticketing, connections and PSOs.

Most socially or environmentally valuable timetable

L.116 Where infrastructure has become constrained in Sweden and the United Kingdom, the allocation of capacity has been guided by the principal of devising the most socially valuable

timetable[243]. In principle, the concept could be extended or adapted to deliver the most environmentally valuable timetable. At city centre stations constrained in the morning peak, for example, it might be better to provide for a night train carrying long-distance passengers who would otherwise have travelled by air, rather than suburban passengers who would otherwise have travelled by tram, bus or bicycle, or on an earlier or later train.

Hubs for night trains

L.117 Some stakeholders have advocated "hubs for night trains", although we saw no clear statement of what is envisaged.

L.118 In Germany, BMVI told us that hubs are necessary and are being upgraded as part of the Federal Transport Infrastructure Plan (FTIP). BMVI provided the examples in the table below, which also includes stations we identified as constraints in Table L.8.

Table L.9: Hub stations in Germany identified by BMVI

Hub	Denmark	Sweden	Poland	Czechia	Italy	Austria	Switzerland	France	Netherlands	Belgium	Luxembourg	Identified as constrained in Table L.8
Hamburg	●	●										●
Berlin			●	●								● (Hauptbahnhof and Spandau)
Munich				●	●	●	●	●				
Stuttgart						●	●	●				
Mannheim							●	●				●
Frankfurt						●	●	●	●	●		●
Cologne									●	●	●	●
Hannover									●			

Source: BMVI.

L.119 In Austria, we note that Vienna's new main station was designed taking into account ÖBB's plans to operate an extensive Nightjet network.

L.120 In the Netherlands, the proposal at Amsterdam to serve local commuter services in one station and cross-border services in another (see paragraph L.94) could be seen as the creation of a hub for cross-border trains, and allows each station to be tailored to the distinct needs of each market.

L.121 A hub concept might need to be linked to provision of suitable line and platform capacity at peak periods, and arrangements for ticketing and connections.

Reform Chapter IV of Directive 2012/34/EU on allocation of railway infrastructure capacity

L.122 We noted that some stakeholders advocated complete reform of Directive 2012/34/EU. One specific and more limited area could be to review the flexibility allowed to prioritise domestic

[243] If Takt is seen as a proactive approach to optimising timetables, this can in principle be seen as a reactive approach to doing so. In practice, the approaches tend to converge on planning a repeating "standard hour" timetable designed to maximise social value.

PSO services over long-distance cross-border services, although it is not clear how a change in priority in theory would change timetabling in practice.

M Obstacles: rolling stock

Introduction

M.1 The study Technical Specifications noted that lack of suitable rolling stock is often quoted as an obstacle to the provision of cross-border trains. In this Annex:

- We examine the existing rolling stock fleet dedicated to night train services and evidence for shortages of stock.
- We estimate how much rolling stock and of what type would be needed to operate fictive night and day long-distance cross-border networks, described in Annex G, connecting the EU, Norway, Switzerland and the United Kingdom.
- We estimate the costs of operating these fictive networks.
- We identify measures which might increase the availability of rolling stock.

The existing rolling stock fleet

M.2 We were asked to identify the volume of rolling stock dedicated to night train services, which we agreed with the Commission could be defined as "Rail vehicles dedicated to, or reconfigured for, overnight travel" (see Table 3.1). In practice, night trains consist of three main types of vehicles:

- Cars with seats offer ordinary or reclining seats and are neither dedicated to, nor reconfigured for, overnight travel, and can often carry over 60 passengers per vehicle.
- Couchettes (Liegewagen) can be reconfigured for overnight travel, normally converting a 6-seat compartment to 4 or 6 beds, and can carry up to 60 passengers per vehicle.
- Sleeping cars (Schlafwagen or Wagons-Lits) are dedicated to overnight travel, and provide compartments with 1-3 beds, in some cases with facilities en suite, and can carry at most 40 passengers per vehicle.
- Car-carrying vehicles, used on a small number of night trains, as we discuss briefly at the end of Annex C.

The size of the fleets

M.3 The table below summarises our desk research on couchettes and sleeping car fleets across Europe.

M.4 Details of the exact composition, configuration, capacity and condition of stock are sometimes published for vehicles which are in use but not for those that are idle or in store. This means that some vehicles listed in the table may not currently be operable or in a condition which would be acceptable to passengers without refurbishment.

M.5 The largest fleets we identified are operated by state-owned Trenitalia, PKP and ÖBB. ÖBB has planned an expansion of the fleet to 213 vehicles by 2025, as we discuss below.

Table M.1: Vehicles dedicated to night train services

Operator	Commercial names or brands	Operations	Vehicles
Total			**1,467**
Trenitalia	Intercity Notte	Italy	264
PKP IC	Intercity	Poland	131
ÖBB	NightJet	Germany, Austria, Belgium, Switzerland, Italy, Poland	129
Renfe	Trenhotel	Spain, Portugal, France	100
SNCF	Intercités de Nuit	France	93
VR	Yöjunat	Finland	80
Vy	Nattåg	Norway, Sweden	75
Serco	Caledonian Sleeper	United Kingdom	75
Urlaubs-Express	Urlaubs-Express	Germany, Austria, Switzerland, Italy	70
RZD	Euronight	Russia, Poland, Germany, Austria, Italy, France	50
ZSSK	Slovak Expres	Slovakia	48
Railroad Development Corporation (RDC)	Alpen-Sylt Nachtexpress, Autozug Sylt	Germany	46
SJ	Nattåg	Sweden	45
MÁV-START	Euronight	Hungary	42
ČD	Euronight	Czechia	39
BDZ		Bulgaria	30
HŽ	Euronight	Croatia, Austria, Switzerland	29
TrainOSE	N/A	Greece	29
CFR Călători	N/A	Romania	26
Regiojet	N/A	Czechia	14
Go-Ahead Norge	Go-Ahead Nordic	Norway	14
Astra Trans Carpatic			10
Transdev	Snälltåget	Sweden, Denmark, Germany	10
Great Western Railway	Night Riviera Sleeper	United Kingdom	10
Wagon service travel			8

Source: Steer desk research.
Note: Some vehicles operated by Vy and SJ may be owned by other parties.
Note: BDZ ordered 30 vehicles in 2010, but we have not identified what older vehicles are still in use.
Note: CFR Călători data is for sleeping cars, but it also has couchette cars.
Note: RegioJet's identified fleet does not appear to be sufficient to operate all its known services.
Note: Go-Ahead Norge vehicles appear to be owned by Norske tog leasing company.
Note: Astra Trans Carpatic fleet may include other vehicles.
Note: Transdev's fleet may include other vehicles.
Note: We understand that DB retains some stock in store, but details of the remaining vehicles are not available.
Note: no data found for Bulgaria.

M.6 We discuss briefly below further details of the fleets of Trenitalia, ÖBB and selected other operators.

Trenitalia (Italy)

M.7 Italian national rail operator Trenitalia has the largest vehicle fleet and operates the second largest network of night trains, Intercity Notte, with up to 17 train pairs each night operated under a PSO specified by the Italian government. Trenitalia subsidiary Thello has also operated night train services between Venice and Paris through Switzerland, leasing the necessary rolling stock from Trenitalia[244].

M.8 On average, each Intercity Notte train contains 6.2 night train vehicles, typically two third couchettes and one third sleeping cars[245]. Services to and from Sicily usually include only couchettes and sleeping cars, but up to three cars with seats are included on services between Calabria/Puglia and the North of Italy.

M.9 Some night trains split at intermediate stations to serve more than one destination, mainly on trains to and from Sicily which split to serve the Western (Palermo) and the Southern (Catania/Siracusa) part of the island. These trains are loaded on dedicated ferries between Messina in Sicily and Villa San Giovanni in Calabria on the mainland.

Österreichische Bundesbahnen (ÖBB, Austria)

M.10 Austrian national rail operator ÖBB offers the widest range of overnight connections within Europe with a dedicated rolling stock.

M.11 The 2021 network includes 19 routes, most of which operate daily throughout the year. Overnight domestic travel is possible between Bregenz in the west and Vienna in the east, but most services are cross-border and the network extends to the Netherlands, Belgium, Germany, Italy, Switzerland, Poland, Croatia and Hungary (see Figure G.2 in Annex G). Some services do not terminate in Austria but pass through it, such as services from Munich to Budapest. For some cross-border services, ÖBB cooperates with other national rail operators from Croatia (HŽ), Hungary (MÁV-START) and Czechia (ČD) under the EuroNight brand.

M.12 In 2017 ÖBB acquired 43 couchette vehicles and 15 sleeping cars from Deutsche Bahn, which had closed its City Night Line service, and took over some of its routes to become one of the main night train operators in Europe. All the vehicles were modernised internally and externally to common technical standards.

M.13 By 2022, ÖBB expects to take delivery of 13 7-car sets ordered from Siemens. Each will include two cars with seats, three couchette cars and two sleeper cars. This appears to be the only significant order of night train rolling stock in Europe. One reason for the new fleet is new fire regulations in Italy from 2021, with which the existing fleet does not comply.

M.14 The table below summarises details of ÖBB's current and planned fleets.

[244] These Thello night train services are currently cancelled due to the COVID-19 pandemic.

[245] Based on data at **https://www.vagonweb.cz/**

Table M.2: ÖBB's night train fleet, 2021 and 2025

Vehicle	2021	2025
Total	**129**	**213**
Liegewagen (couchette)	64	50
Schlafwagen (wagon lit)	50	50
Multifunktionsliegewagen Bcmz 59-91	15	22
Nightjet 2.0		91

Source: ÖBB, Steer analysis.

M.15 In October 2019, ÖBB issued tenders to lease sleeping and couchette cars suitable for use in Germany, Denmark and Sweden, suggesting plans to extent the Nightjet network further north[246].

M.16 ÖBB's 19 routes, requiring 38 train portions in operation each night, are sustained by combining relatively small portions into longer trains. The average number of couchette and sleeping car vehicles to each destination is only 3.2, around half the 6.2 operated by Trenitalia, of which typically just over half are couchettes. Each portion also includes one or two cars with seats. Car-carrying vehicles are also included on some routes.

M.17 ÖBB's operating strategy appears to provide the benefit of serving a large number of destinations with minimum operating cost, but does require that the timings of trains to and from different points are synchronised in a way that is operationally robust and provides departure and arrival times which are attractive to passengers. One example is the service from Vienna to Hamburg, Amsterdam and Brussels (see also Table L.3 in Annex L)[247]:

- From Vienna, the train departs as a single service.
- In Nürnberg, the train meets a service from Innsbruck with portions for Amsterdam and Hamburg. The two trains are marshalled into two new trains, one for Hamburg and one for Amsterdam and Brussels.
- In Bonn, the Amsterdam and Brussels portions are split and continue to their destinations.

M.18 This enables five different origin-destination routes to be served with only two trains, but depends on consistent reliable operation.

[246] https://www.railwayage.com/passenger/europe-night-train-vision/

[247] In a previous study we identified a particularly complex example in Poland. One night train left Warsaw at 21:12 with portions for Prague in the Czech Republic, Vienna in Austria, and Budapest in Hungary. Another night train left Krakow at 22:02 with portions for the same three destinations. These six portions were marshalled en route to form four trains. The first reached Prague from Warsaw at 06:33. The second reached Vienna from both Krakow and Warsaw at 06:55. The third reached Prague from Krakow at 07:22. The fourth reached Budapest from both Krakow and Warsaw at 08:37. The six portions collectively bore seven train numbers (402, EN402, 407, EN407, 442, 444 and 477) and two names ("Chopin" and "Silesia"). Couchette accommodation on the portions to Prague was only provided at certain times of year. An equivalent service operated in the reverse direction. From 1.3 Splitting and joining, Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)

Other operators

M.19 SNCF, the French main national rail operator, is no longer using most of its dedicated night vehicles. Some are to be scrapped because of concerns that they contain asbestos prohibited under the REACH Regulation, but a core of 60-70 vehicles is likely to be retained for the potential reintroduction of night services.

M.20 Renfe, the Spanish main national rail operator, is reported to own around 100 vehicles dedicated to night services, some of which originally operated cross-border, such as between Barcelona and Milan, as described in case study 3 in Annex C. The train sets have gauge-changing axles which can operate on both standard and Iberian gauges. We understand that most of these vehicles are to be converted for use on day services.

M.21 RZD, the Russian national operator, owns around 7,000 coaches dedicated to night-train services, which are very common in the Russian Federation due to the large distances between cities. Before the COVID-19 pandemic, RZD offered several overnight services into the EU from Moscow:

- Whole trains operated to Paris and Nice, with conventional stock.
- Whole trains operated to Berlin with Talgo stock which, like Renfe's vehicles, has gauge-changing equipment which can switch between the standard and Russian gauges in around 20 minutes.
- Through carriages operated to Prague and Varna in the summer.

M.22 We have not been able to identify how many vehicles have gauge-changing equipment, but include in our analysis our estimate that 50 vehicles are required to operate the recent services. This is likely to underestimate the number of RZD vehicles which could in principle operate on the standard gauge network.

M.23 RDC, of Germany, appears to be the largest leasing company for dedicated night stock, with a current fleet of 46 vehicles.

M.24 Bulgaria has an extensive night train network, and its fleet includes at least 30 vehicles ordered in 2010.

Technical barriers to interoperability

M.25 The 1922 International Coach Regulations (Regolamento Internazionale delle Carrozze) includes the technical requirements for wagons which enable them to be used on most European railways. It was under the responsibility of the Swiss Railways until 1982, when it was transferred to the Union International des Chemins de fer (UIC).

M.26 Most existing vehicles meet the standard and can operate in most countries in continental Europe. Exceptions include vehicles built by Talgo for Trenhotel services between the Iberian and standard gauge networks, which we understand have only been licensed for use in France, Italy, Spain and Switzerland.

M.27 We discuss other technical, operational and safety obstacles to the use of rolling stock on different networks in Annex P.

New and used vehicles

M.28 As with other rolling stock, night train vehicles are produced by various manufacturers, may be owned or leased, may be new or secondhand and may be built, refurbished or reconfigured with a range of different accommodation. We noted above that, with only 91 new vehicles

delivered in the EU-27 over the period 2001 to 2017, or an average of fewer than six vehicles per year, it would take over 250 years to replace the 1,467 vehicles we identified.

Manufacturers

M.29 The current fleet of night train vehicles were originally built by manufacturers including Bombardier, CAF, Jenbacher Werke, Siemens and Talgo.

M.30 In 2015, SERCO ordered 75 Mark 5 vehicles from CAF for the United Kingdom's Caledonian Sleeper. Since then, ÖBB's order to Siemens appears to be the only recent order for rolling stock dedicated to night trains. Many operators of night train services, including Trenitalia and ÖBB, have chosen to refurbish existing rail cars, in some cases adding features such as air conditioning or Wi-Fi.

Refurbishment of older vehicles

M.31 Many vehicles in the current fleet are over 20 years old and have already been refurbished at least once. Relatively simple vehicles such as couchette cars tend to be in better condition than more complex ones such as sleeping cars, which are also affected by water damage from the extensive plumbing for sinks and sometimes toilets and showers.

M.32 Older vehicles may not be as comfortable as newer ones. One issue is that they may be less well-sealed against air pressure changes, and hence less comfortable when passing other trains or entering and leaving tunnels.

Market for secondhand vehicles

M.33 Some night train vehicles are traded (such as from DB to ÖBB) or become available on the secondhand market, although the latter are often in poor condition and need of refurbishment. We asked stakeholders for their views on whether rolling stock is withheld or scrapped to make it more difficult to operators to enter the market. Stakeholders referred to three alleged cases of rolling stock being withheld, but we identified only one documented case.

M.34 This was that a state-owned rail incumbent ČD could face a fine of up to €150 million for an alleged cartel agreement that sought to "eliminate" a new entrant competitor's access to secondhand rolling stock. A leaked e-mail communication was alleged to show that the management of two railway undertakings had agreed not to sell secondhand couchette vehicles to a new entrant, even though it had offered a higher price than another operator[248,249]. We understand that the case is still not resolved.

Leasing

M.35 The supply of leasing services for night train wagons appears to be limited, perhaps partly due to the declining demand in recent years. We noted above that RDC has around 45 night train vehicles. We understand that Swiss company HEROS GmbH also offers couchette cars and sleeping cars.

[248] Manažer Českých drah se domlouval s Rakušany na „eliminaci" RegioJetu, Seznam Zprávy, 4 March 2020 (2020)

[249] New revelation: alleged agreement between ÖBB and ČD to "eliminate" new entrant's access to rolling stock, ALLRAIL press release, 4 March 2020 (2020)

New concepts

M.36 Stakeholders suggested to us that the conventional night train sleeping compartment is out of date, partly because it can only be used on night trains and hence only on one journey per day. Hybrid solutions such as reclining seats are being re-examined with the aim of maximising potential use and hence cost-effectiveness.

M.37 We identify in Annex I how the United Kingdom's Caledonian Sleeper night train costs more than twice as much per passenger-kilometre more than 200km/h day trains operating on the same routes. However, passengers have increasingly high expectations of privacy and security, which can only be guaranteed with a lockable compartment, which costs more per space. ÖBB's new Nightjet trains feature MiniSuites, shown overleaf, which provide each passenger with a small lockable space, with the option of opening a connection to the adjacent space.

Figure M.47: ÖBB MiniSuites: exterior and interior



Source: ÖBB.

M.38 It is not yet clear how popular the MiniSuites, and other features of ÖBB's new fleet, will prove to be in practice.

The requirements of the fictive network

Night trains

M.39 We set out in Table G.5 in Annex G our estimates of a possible fictive network of night trains taking into account existing proposals and potential routes we identified. We ignored the services mentioned in the TEE 2.0 proposal and the TET study. In Table G.5 we identified 11 possible trains, 6 of which would involve splitting and joining to serve a total of 17 routes.

M.40 We assumed for simplicity that, when the existing night train fleet needs to be either expanded or replaced, the future replacements would be based on the composition of the 7-car Nightjet sets, a current market product, comprising two seating carriages, three couchette carriages and two sleeper carriages. We note that two Nightjet sets could probably be combined into a single 14-car train where routes split and join. We examined the formations used on existing night train services and considered several options for the length of trains which might be used on each route:

- one 7-car train;
- two 7-car trains, with splitting and joining; or
- two 7-car trains, coupled throughout.

M.41 However, in the absence of data either on potential passenger numbers or the mix of accommodation they would require, we concluded that it was not possible to identify the optimum composition on each route.

M.42 We estimated that the total fictive network could require 22-32 7-car sets, plus an allowance of 10% spares for maintenance and to replace vehicles damaged during the working life. In practice, larger operators might retain some spares, but those providing only a single daily train pair would probably create windows for maintenance either by closing services for maintenance periods at times of low demand or by working only on 6 or 5 days a week. We note that some existing night train route do not operate every day including, for example, ÖBB's portion to from Vienna to Brussels (see Annex L, Table L.4).

Day trains

M.43 We set out in Table G.6 in Annex G the difficulties of estimating what new long-distance cross-border day trains might operate. The table below lists illustrative assumptions which could be used to estimate the size of fleet required.

Table M.1: Assumptions to estimate fictive day network fleet size

Factor	Condition	Assumption
Days of operation		Daily through the year
Number of trains each way per day	Journey time up to 10 hours	5
	Journey time 10-12 hours	3
	Journey time over 12 hours	1
Turnaround time at end of route		30 minutes
Operating hours per day		12 hours
Average number of spare sets		10%

Source: Steer assumptions.

M.44 In practice, the operating hours per day vary widely between railway undertakings. At one extreme, small operators might have no spare vehicles but instead not operate at quiet times to provide an opportunity to carry out maintenance. We are also aware of one railway undertaking with a fleet of 29 trains which regularly operated 28 of them during the Friday night peak, with all maintenance carried out overnight or at weekends. At the other, some railway undertakings have agreements with their workforce that maintenance will be carried out during daytime working hours, Monday to Friday. The latter approach can mean procuring up to 40% spare stock. We discuss below how, if additional long-distance cross-border day trains are operated, some or all of the necessary resources may be made available by using stock which is currently spare, or by redesigning maintenance practices.

The costs of operating the fictive network

M.45 We were asked to estimate the costs to set up and operate fictive networks. We focused on the average annual operating cost once the networks were established, rather than any initial capital cost for infrastructure, rolling stock and facilities.

M.46 We developed our cost estimates from our estimates of the potential additional fleet sizes described above and the cost estimates for specific trains developed in Annex J, key elements of which are summarised below.

Table M.2: Cost estimates for fictive networks

Variable	High-speed day	Conventional day	Night train
Input assumption			
Type of stock	Multiple unit	Locomotive-hauled	Locomotive-hauled
Passenger vehicles	7	10	7
Type of vehicle	New	Used	New
Total seat or other spaces	456	600	256
Average spaces per vehicle	65	60	37
Cost estimate per train set per year (million)			
Train crew	€0.67	€0.56	€0.94
Rolling stock	€1.92	€1.45	€1.36
Energy	€1.09	€0.91	€0.21
Maintenance	€2.02	€1.33	€0.63
Distribution	€0.96	€0.39	€0.19
Overheads	€1.33	€0.70	€0.67
Profit	€0.60	€0.27	€0.20
Total excluding infrastructure charges	**€8.59**	**€5.60**	**€4.20**
Infrastructure charges	€5.65	€1.86	€0.55

Source: KCW analysis, for further details see Table J.1 in Annex J.

M.47 We excluded the infrastructure charges from the cost calculation because, as we note in Annex K, in many cases the charges exceed the costs directly incurred as a result of operating the train service. This means that at least part of the access charges would emerge as profit to

the infrastructure manager and, unless reinvested, could be used to reduce the need for other sources of income including government support.

Night trains

M.48 We noted above that the fictive night train network would consist of 11 combined routes serving 17 origin-destination pairs. We illustratively assumed that these would be operated as 7-car or 14-car trains, and on this basis estimated that they would require a total of 22-32 7-car sets plus 10% spares. If the annual operating cost of each of these train sets was €4.20 million, then the total annual operating cost of the fictive night train network would be €90-135 million, plus the infrastructure costs directly incurred as a result of operating the train service, which we expect would be relatively small.

M.49 Note that this estimate makes no allowance for the possible higher cost of stock designed to serve routes with additional technical or safety requirements, such as through the Channel Tunnel on routes to and from London.

Day trains

M.50 We estimated above that a fictive day train network of 27 long-distance cross-border services might add 1 million passengers per year. At most, these would require an eventual total of 54 train sets plus spares, most of which would be capable of operating on high-speed line. Depending on the exact formations, this might mean around 400-500 additional vehicles. If the annual operating cost of each of these train sets was €8.59 million, then the total annual operating cost of the fictive day train network would be up to €0.5 billion, plus the infrastructure costs directly incurred as a result of operating the train service, which we expect would be relatively small.

M.51 We stress that this is likely to be an overestimate of the additional costs of a fictive network of 27 long-distance cross-border day trains, for several reasons.

M.52 First, the costs would depend not only on how many routes were opened but also how many daily train pairs were operated on each of them. We illustratively assumed 1, 3 or 5 trains pairs, which if operated in a regular interval timetable might be spaced by 1, 2 or 4 hours. In practice, the aspiration may be for, or operational constraints may permit, only a single daily train, in which case many fewer additional trains might be operated.

M.53 Second, some new long-distance cross-border services would be operated by combining existing train paths to create end-to-end services. This is a common way of improving connectivity where similar types of service, with similar demand and capacity, meet at a common point, even if the demand for travel across the cross-border link is small. The new services might be provided by combining or retiming existing ones, with no net increase in operations or costs.

M.54 Third, even if the new services are genuinely additional train-kilometres, we noted above that some railway undertakings have large numbers of spare or reserve vehicles to cover maintenance and other requirements. We noted in Annex F that French low-cost rail operator OUIGO operates each train set twice as many hours per day as the standard TGV trains. Even small improvements in the average utilisation of train sets might allow additional day services to be operated without needing any additional rolling stock.

M.55 In summary, while we estimate that the gross operating cost of the fictive day network could be as much as €0.5 billion, a combination of fewer services, operated by combining existing

ones or better utilisation of existing stock, could reduce the additional cost of the fictive network by a large factor.

M.56 Note that our analysis refers only to costs, and we do not attempt either to estimate any offsetting revenue or to determine whether any or all of the routes in the fictive network would require support.

Measures to increase the availability of rolling stock

M.57 Stakeholders raised several points related to the availability of rolling stock, but we focus briefly on two main findings.

M.58 First, railway undertakings often begin operations with secondhand rolling stock, acquired at relatively low cost and risk, as a means of testing a potential market and business plan before committing to expansion, or purchase of new stock, on the basis of a proven business model and revenue stream. Beacon Rail, for example, pointed out that most new entrants providing long-distance cross-border services do so with conventional carriages hauled by locomotives.

M.59 Second, when railway undertakings are unable to obtain secondhand rolling stock, it is difficult to raise finance without a proven business model. This makes new entry difficult when secondhand stock is not available in the market.

M.60 From our research and discussions with stakeholders, we identified several potential measures to address this issue, summarised in the table below.

Table M.3: Measures to increase the availability of rolling stock

Measure	Comments
Require owners of redundant rolling stock to make them available to the market and to sell them through a transparent process.	• New entrants wish to test markets using secondhand rolling stock rather than committing to investment in new rolling stock. • There have been allegations that incumbent only sell redundant rolling stock to other incumbents, which blocks the market for secondhand stock.
Offer PSOs for long-distance cross-border services, to allow EIB to finance rolling stock acquisitions.	• EIB traditionally only finances part of a rolling stock acquisition, and only up to a certain amount. • This would only be a partial solution.
Allow railway undertakings to acquire framework agreements for capacity exceeding one timetable period.	• Framework agreements are provided for in Article 42 of Directive 2012/34/EU but are not used in the large networks of France, Germany or Poland[250]. • New entrants struggle to find financing for rolling stock acquisitions, because they cannot demonstrate to lenders that they have a right to use the stock over a sustained period. • They cannot guarantee that they will outlive the life of their lease contract or even that they will continue to have use of the same train paths over the term of their lease contract.
A pan-European public sector rolling stock leasing company, funded by the EU and/or Member States, holding all three types of rolling stock needed for long-distance cross-border services.	• New entrants currently struggle to find financiers for new rolling stock orders over around €200 million, due to the limited ability to demonstrate a robust business case. • A public sector leasing company would give new entrants access to the rolling stock market and access to rolling stock financing.
A pan-European public sector rolling stock leasing company holding all rolling stock for long-distance cross-border services and leasing it at standard prices.	• New entrants now pay a higher leasing charges than incumbents, who can offer a corporate guarantee, or PSO contractors, where the PSO includes a usage guarantee. • Standard and transparent prices would ensure that stock was available to all railway undertakings on equal terms.

Source: Steer research and analysis.

M.61 Stakeholders made several comments on these measures, including the final proposal for pan-European public rolling stock leasing companies.

M.62 A member state noted that a private sector rolling stock leasing company will not take the risk associated with night train rolling stock, as there could be no guarantee that the stock could be redeployed at the end of the lease contract.

M.63 A rolling stock company suggested that this is less of an issue for stock other than night train rolling stock for long-distance cross-border services, as most products now on the market could be redeployed in other markets. The rolling stock company did not think it would be

[250] RMMS 7 reported that "At June 2020, framework agreements were applied by the infrastructure managers of Austria, Italy, Norway and the United Kingdom. Framework agreements will be used in Spain to open the domestic high-speed rail market starting from the 2020-2021 timetable."

practicable to have both private and public sector leasing companies, and that either one model or the other should be adopted.

M.64 Open access operators told us that they were not in favour of public sector involvement.

M.65 One member state suggested that it would take a long time to obtain agreement at EU level to establish a pan-European public sector leasing company. They are therefore considering the creation of a public sector leasing company[251]. However, creating of a dedicated national leasing company might not be practicable or cost-effective in smaller Member States.

M.66 We also note the potential need to ensure that rolling stock is made available on standard and transparent prices[252].

[251] Sweden has had a public sector rolling stock leasing company since 1999, when Transitio was created jointly by the regional public transport authorities (PTAs) to acquire, finance and administer trains on their behalf.

[252] In the early days of the low-cost airlines, small new entrants found that they could not borrow, or buy or lease aircraft, on terms as attractive as those available to the large legacy carriers, many of which were also state-owned. This issue receded as the low-cost airline business model was proven and the low-cost carriers grew in size. As we note in Annex F, however, with notable exceptions such as Italo, new entrant rail operators have remained small, except where they have begun as, or become part of, a larger group.

N Obstacles: ticketing and rights for connecting passengers

Introduction

N.1 The Technical Specifications for this study identified ten tasks relating to ticketing and associated rights for connecting passengers (see Annex A). These included an assessment of the current offer of tickets in Europe and of recent developments in the offer (whether commercially-, technology- or policy-related).

N.2 Unlike other parts of the study, these tasks were not limited to passengers using long-distance cross-border services. As we discuss below, passenger rights differ between passengers on:

- long-distance or regional rail passenger services; and
- urban and suburban rail passenger services[253].

N.3 This Annex deals with four main topics, described below.

The current situation

N.4 First, we discuss the current situation regarding ticketing and rights for connecting passengers.

- We define integrated ticketing, end-to-end ticketing and through-ticketing.
- We suggest objectives for ticketing against which developments, obstacles and potential measures to address them can be assessed.
- We present the responses to detailed stakeholder questionnaires on the current offer, and how this has changed in recent years.
- We describe progress on ongoing initiatives including National Access Points (NAPs), Shift2Rail (S2R), and Full Service Model (FSM) which has been relaunched as Open Sales and Distribution Model (OSDM).

The new passenger rights Regulation (EU) 2021/782

N.5 Second, we describe the new passenger rights Regulation (EU) 2021/782, which was adopted on 29 April 2021. We also briefly assess how the Regulation, which applies from 7 June 2023[254], may address the objectives we have identified.

[253] Article 12(1) of Regulation (EU) 2021/782 states that "Where long-distance or regional rail passenger services are operated by a sole railway undertaking, that undertaking shall offer a through-ticket for those services. For other rail passenger services, railway undertakings shall make all reasonable efforts to offer through-tickets and shall cooperate to that end among themselves."

[254] Article 2(5) of Regulation (EU) 2021/782 states that "Until 7 June 2030 Member States may provide that Article 10 shall not apply where it is not technically feasible for an infrastructure manager to distribute real-time data within the meaning of Article 10(1) to any railway undertaking, ticket vendor, tour operator or station manager. At least every two years, the Member States shall reassess the extent to which it is technically feasible to distribute such data."

Measures to address obstacles

N.6 Third, we propose measures, also discussed in the main part of this report, which could be applied within the framework of Regulation (EU) 2021/782 or could be considered in any future revision to it[255] or to the wider framework of passenger rights for all transport modes.

Further research

N.7 Fourth, we present research specified in the Technical Specifications relating to issues which would, or might, involve changes to provisions only recently made in the new Regulation:

- We describe the potential impacts of wider through-ticketing on passengers and railway undertakings.
- We describe possible future models for the allocation of liability for missed connections and for end-to-end ticketing and supporting clearing arrangements.

The definition of integrated, end-to-end and through-ticketing

N.8 In our research and discussions with stakeholders we identified two different terms which were used widely but not always accurately or consistently.

Integrated ticketing

N.9 Directive 2012/34/EU, as amended by Directive (EU) 2016/2370, refers to integrated ticketing but does not formally define it[256].

N.10 In 2019 the Commission published a report on remaining challenges for EU-wide integrated ticketing and payment systems[257]. The report noted that "Although there is not a unique definition of integrated ticketing, this can be defined as **the purchase of a single ticket that allows passengers to travel using different modes of transport provided by one or more operators**[258] or as "**combining all transport methods in one single ticket**" (see glossary) and is considered as the natural partner to multimodal travel information and planning services[259]".

[255] Article 39 of Regulation (EU) 2021/782 states that "By 7 June 2026, the Commission shall report to the European Parliament and the Council on the implementation and the results of this Regulation."

[256] Article 13a of Directive 2012/34/EU, as amended by Directive (EU) 2016/2370, states only that "Without prejudice to Regulation (EC) No 1371/2007 of the European Parliament and of the Council (*) and Directive 2010/40/EU of the European Parliament and of the Council (**), Member States may require railway undertakings operating domestic passenger services to participate in a common information and integrated ticketing scheme for the supply of tickets, through-tickets and reservations or give the power to competent authorities to establish such a scheme. If such a scheme is established, Member States shall ensure that it does not create market distortion or discriminate between railway undertakings and that it is managed by a public or private legal entity or an association of all railway undertakings operating passenger services."

[257] Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report, Grimaldi and others for European Commission, July 2019 (2019).

[258] Integrated Ticketing on Long-Distance Passenger Transport Services, European Parliament Study, 2012, page 15.

[259] Towards a roadmap for delivering EU-wide multimodal travel information, planning and ticketing services, SWD (2014) 194.

Through-ticketing

The definition in Regulation 1371/2007

N.11 The definition of through-ticketing originated in Regulation 1371/2007, which defined a through-ticket as "**a ticket or tickets representing a transport contract for successive railway services operated by one or several railway undertakings**"[260].

N.12 Note that the definition does not state whether the through-ticket must:

- include a seat reservation for one train; or
- be valid only on one (or a limited number) of trains; or
- be accompanied by a statement that it will be valid on one (or a limited number) of trains.

The definition in new Regulation (EU) 2021/782

N.13 Regulation 1371/2007 defined a transport contract as "**a contract of carriage for reward or free of charge between a railway undertaking or a ticket vendor and the passenger for the provision of one or more transport services**".

N.14 Regulation (EU) 2021/782, which we discuss further from paragraph N.64, modified this to "**a contract of rail carriage for reward or free of charge between a railway undertaking and a passenger for the provision of one or more transport services**". This means that ticket vendors will no longer be able to create a transport contract or issue a through-ticket, unless they conclude such a contract on behalf of the railway undertaking.

End-to-end ticketing

N.15 To distinguish through-tickets, in which one party will have to be a railway undertaking, and similar tickets issued by other parties, we have introduced the term "end-to-end ticket" (see glossary) defined as "**A ticket or tickets for successive railway services operated by one or more railway undertakings**." This means that a through-ticket is an end-to-end ticket which is a transport contract between a railway undertaking and a passenger.

N.16 The table below summarises the differences between the three types of ticket.

[260] This definition originating in Regulation 1371/2007 but has also been added as Article 3(35) of Directive (EU) 2016/2370 amending Directive 2012/34/EU. Article 3(35) of Directive (EU) 2016/2370 is referred to in Regulation (EU) 2021/782.

Table N.1: Differences between integrated, end-to-end and through-ticketing

Feature	Integrated ticketing	End-to-end ticketing, for the purposes of this study	Through-ticketing, as defined in Regulation (EU) 2021/782
Modes covered	Different modes of transport	Railway undertakings	
Operators	One or more operators	One or more railway undertakings	
Number of tickets	A single ticket (one payment)	A ticket or tickets	
Number of contracts	Not stated	One transport contract	
Contracting party	Not stated	Not stated	A railway undertaking
Protected connections in Regulation (EU) 2021/782	✗	Partial[261]	✓

Source: Exploratory Study on passenger rights in the multimodal context, Steer analysis. See text for details.

N.17 Thus, all through-tickets are end-to-end tickets, but some end-to-end tickets are not through-tickets.

N.18 In practice, documents related to ticketing, and stakeholders responding to questions related to ticketing, rarely define the terms they are using, and often clearly use one of these terms to mean another. This has meant that in much of our research we have had to avoid taking references to any of these terms at face value, without clear confirmation that it has been used as defined.

N.19 A further practical issue has been that many documents, and most of our research, predate the new Regulation (EU) 2021/782 and the definition restricting through-ticketing to a transport contract with a railway undertaking.

N.20 For example, in its January 2018 position paper, the International Association of Public Transport (UITP)[262] stated that "it should be made clear that through-tickets are meant when the passenger buys their tickets from one single selling point, and when operators involved in one journey are aware of the connections, and have put in place the necessary resources to provide adequate assistance and compensation"[263]. Under the new Regulation (EU) 2021/782, it will not be sufficient that the passengers buy their tickets from one single selling point: they must have a transport contract which is with a railway undertaking.

[261] Passengers are afforded protection in circumstances where a ticket vendor or tour operator combines tickets purchased as a single transaction on its own initiative. Under Article 12 (4) of the Regulation, passengers experiencing a missed connection are then entitled to reimbursement of the value of the transaction and compensation equivalent to 75% of the same value (except where Article 12 (5) applies – see paragraph 5.39).

[262] Rail passengers' rights and obligations in the EU, Briefing, EU Legislation in Progress, European Parliament (2021)

[263] Recast of Reg. 1371/2007 on rail passengers' rights and obligations: the position of public transport operators and organising authorities, Position paper of the International Union of Public Transport (UITP), January 2018 (2018)

Stakeholder expectations of ticketing

N.21 It was clear from our discussions that, depending on their perspective, stakeholders discussing their expectations of ticketing may focus on any or all of:

- the need for a single **contract** between the passenger and a party taking overall responsibility for an end-to-end journey (which need not be a railway undertaking);
- the need for a single **transaction**, allowing a passenger to make a single purchase of the journey; and
- the need for a single end-to-end **price**, allowing the passenger to make simple comparisons between travel options. Several stakeholders stated that they expected this to be below the sum of the prices for individual elements of the journey.

N.22 The 2019 report on remaining challenges for EU-wide integrated ticketing and payment systems[264] set out a number of passenger expectations on ticketing. Similar expectations have also been identified by The Man in Seat 61[265]. While anecdotal, and not supported by formal consultation or research, these provide an indication of passenger expectations of ticketing which we discuss later in this Annex.

Table N.2: Potential benefits of ticketing

Focus of definition	Remaining challenges for EU-wide integrated ticketing (2019)	The Man in Seat 61 (2021)
Contract	Ensured journey connections	In the event that a delay meant a missed connection, protection against having to buy new onward tickets at full on-the-day prices.
Transaction	Ease of booking	The ability to make one transaction easily on one website with one headline price, rather than separate tickets booked on different websites.
Price	Lower prices and promotions	An attractive and competitive end-to-end price, rather than the sum of the fares for each train on the journey.

Source: stakeholders, Steer analysis.

Progress on ongoing initiatives

N.23 Against this background, we were asked to identify progress in four areas relating to ticketing and rights for connecting passengers:

- the availability of common information and through-ticketing systems, as requested in Article 13a of Directive 2012/34/EU as amended by Directive (EU) 2016/2370;
- National Access Points, established in compliance with Commission Delegated Regulation (EU) 2017/1926, supplementing Directive 2010/40/EU with regard to the provision of EU-wide multimodal travel information services;
- Shift2Rail (S2R); and
- Full Service Model (FSM), which has been relaunched as Open Sales and Distribution Model (OSDM).

[264] Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report (2019)

[265] A website offering travel advice (see **https://www.seat61.com/**).

N.24 We next describe our findings on each of these areas.

Common information and through-ticketing schemes

N.25 Following the adoption of the fourth railway package, the legislative framework governing the rail sector requires that:

"The Commission shall monitor rail market developments concerning the introduction and use of common information and through-ticketing systems and shall assess the need for action at Union level, taking into account market initiatives. It shall in particular consider non-discriminatory access for rail passengers to data necessary to plan journeys and book tickets. By 31 December 2022, it shall present a report to the European Parliament and the Council on the availability of such common information and through-ticketing systems, to be accompanied, if appropriate, by legislative proposals."[266]

N.26 The survey of stakeholders undertaken for this study, coupled with our wider research into the provision of cross-border services, was partly intended to support this monitoring and reporting activity. In the survey, we raised specific questions relating to integrated and through-ticketing schemes and related information systems with a range of stakeholders (see Annex B) and received only a limited number of responses.

N.27 Given our concern that stakeholders would not be familiar with the definition of through-ticketing, we preceded each question related to ticketing with a reminder that "Through-ticketing is defined as "a ticket or tickets representing a transport contract for successive railway services operated by one or more railway undertakings"". However, we note that:

- The stakeholder questionnaire predated the new Regulation (EU) 2021/782's addition of the definition of a transport contract as being between a railway undertaking and a passenger.
- Stakeholders rarely collect data on through-ticketing and, if they did, could not at that point have done so in a way that aligned with the new legal definition in Regulation (EU) 2021/782. Any data they provided might, at best, relate to the definition of through-ticketing from Regulation 1371/2007.
- Stakeholders often provided information which appeared to relate to integrated or multimodal ticketing, or other issues, rather than to through-ticketing as defined by either Regulation.

N.28 The survey results suggest that through-ticketing, as understood by the stakeholders at the time they were consulted, exists mainly within multimodal urban and suburban schemes where fares and ticketing are specified by competent local and regional authorities, although in some states it may be possible to buy through-tickets between any two stations.

N.29 The table below summarises the main survey responses to our questions.

[266] Article 13a of Directive 2012/34/EU establishing a single railways area, as amended by Directive (EU) 2016/2370 regarding the opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure.

Table N.3: Responses to questions on availability of through-tickets as defined before Regulation (EU) 2021/782

State	Stakeholder observations
International	• The SCIC NRT scheme is an integrated ticketing scheme that permits the purchase of through-tickets for cross-border travel as a single contract.
Austria	• The incumbent national operator, ÖBB, offers tickets for travel to a range of locations in Germany and elsewhere. • These tickets have a single end-to-end price, which does not vary according to whether a change of trains is required.
Czechia	• While the IDS and OneTicket schemes enable the purchase of through-tickets for domestic travel, they do not support through-ticketing for cross-border journeys. • Through-ticketing options have become more constrained in recent years. For example, the branch line to Český Krumlov is now operated by private operator GWTR, and it is no longer possible to buy a through-ticket between Prague and Český Krumlov, despite them being the two most visited locations in Czechia.
Denmark	• The Rejeskort is an electronic integrated ticketing system that covers some cross-border journeys. • Tønder-Niebüll and DSB offer through-tickets for cross-border journeys, for example across the Oresund and on journeys between Copenhagen-Padborg and Aarhus-Padborg with connections to Hamburg. • The Danish Ministry of Transport has stated that through-tickets representing a single contract have been available since 2010.
France	• In the case of SNCF, tickets are sold for a direct train with an expensive full-fare add-on for any onward journey. • The 14:22 TGV-Lyria from Paris is direct to Zurich at weekends, with a minimum fare of €29, but during the week it is necessary to pay the same minimum fare to Basel and then a further €30 for the onward Basel to Zurich train. This means that the fare more than doubles[267]. • SNCF sells a Bordeaux to Amsterdam journey as a single transaction, but the fare is the sum of the Bordeaux to Paris TGV fare and the Paris to Amsterdam Thalys fare, and the passenger receives two separate tickets[268]. • SNCF and Eurostar no longer issue through-tickets, and effectively sell "combined tickets" with separate fares and contracts for the two services.

[267] The Man in Seat 61, a provider of travel advice and information, characterised this as "the operational timetable is dictating fares and the tail is wagging the dog". An alternative interpretation is that SNCF finds that business travellers will pay €59 for a connecting journey during the week, but that to be attractive at weekends it must serve Zurich direct at a lower fare. Much depends on what the fare would have been in other circumstances.

[268] The Man in Seat 61 pointed out that Thalys is a separate railway undertaking, so the single transaction may represent two transport contracts with two railway undertakings and may not be a through-ticket. Only 70% of Thalys is owned by SNCF, so this issue will not be addressed by the Regulation (EU) 2021/782 definition of a "sole railway undertaking" discussed in paragraph N.65.

State	Stakeholder observations
Germany	• The incumbent national operator, DB, offers tickets to a range of locations in Germany, Austria, other neighbouring countries and further afield, such as to Budapest, Gothenburg, Stockholm and Zagreb. • In some cases, it is also possible to buy tickets across Germany, such as from Amsterdam to Warsaw, Brussels to Prague or Copenhagen to Zurich, all through the ticketing system managed by DB. • In contrast to the fares between Paris and Zurich, fares between Frankfurt and Zurich start at €27.90, irrespective of whether there is a change in Basel. • More generally, there is end-to-end pricing: the price is determined solely by the origin and destination stations, rather than whether a change of trains is needed.
Ireland	• Direct cross-border services operate between Dublin and Belfast, but there are no plans to introduce through-ticketing for cross-border services. • The National Journey Planner provides information on options for cross-border travel and the Leap Card is an integrated ticketing scheme supporting through-ticketing for journeys around Dublin.
Italy	• Mi.Co.Tra and CROSSMOBY are integrated ticketing schemes. • Trieste-Udine-Villach services began operating in 2012 and Udine-Trieste-Ljubljana services commenced in 2018.
Latvia	• Survey respondents were not aware of any information or integrated ticketing schemes supporting through-ticketing for cross-border travel.
The Netherlands	• Survey respondents were not aware of any information or integrated ticketing schemes supporting through-ticketing for cross-border travel.
Norway	• The Norwegian Railway Directorate specifies some requirements in contracts. • Through-tickets for cross-border journeys are not available.
Sweden	• Resplus is a national system for booking successive public transport journeys.
Switzerland	• Direct Services.

Source: Stakeholder survey responses and Steer research.

N.30 The table is not intended to be comprehensive but highlights apparent instances of extensive through-ticketing in and even between some Member States, such as Austria and Germany, and limited availability of through-ticketing in others. It further suggests that, despite Directive (EU) 2016/2370, which permitted Member States to "require railway undertakings … to participate in a common information and integrated ticketing scheme for the supply of tickets, through-tickets and reservations", progress in the implementation of such schemes has at best been mixed. The limited systems in place neither provide a platform supporting a step-change in the European through-ticketing offer nor make it clear how one could emerge.

N.31 We discuss next our desk research on other policy and industry-led initiatives that may be relevant.

New sales channels

N.32 We investigated the extent to which new sales channels, in particular third-party online ticket vendors, have extended the ticketing options available to passengers. An ALLRAIL press release from 2020[269] identified nine such vendors, one of which was no longer operating at the

[269] ALLRAIL press release, 7 October 2020.

end of 2020. We interviewed one, Trainline[270], and also sought the views of other stakeholders on the impact of third-party vendors on the availability of through-tickets.

N.33 ALLRAIL estimated that 30% of passengers buying from independent ticket vendors were making connections between services. Trainline indicated that they could often combine tickets to create an end-to-end ticket but could not offer a through-ticket (as defined in the new rail passenger rights Regulation (EU) 2021/782 discussed below) to the overwhelming majority of passengers wishing to travel on two or more railway undertakings. They pointed out that ticket vendors can only sell products that railway undertakings create and allow them to sell. They were unable to provide any quantitative data on the volume of end-to-end tickets they sold.

N.34 Another stakeholder agreed with Trainline that, while many ticket vendors can now sell tickets from two or more railway undertakings as a single transaction, they cannot create a single transport contract if the railway undertakings do not offer one. They also suggested that:

- Incumbent national operators can work together to the exclusion of new entrants to protect their own commercial interests.
- Rather than make a direct sale to a passenger requesting a journey, ticket vendors can often only go as far as giving the passenger a link to the railway undertaking which makes the sale. Ticket vendors should be able both to access timetable information and to complete the booking.
- Where ticket vendors can make a sale, they are not always given access to all fares, including promotions and youth fares[271].
- Ticket vendors need access to real-time data if they wish to keep passengers informed, including information on cancellations of services on which they have made bookings[272].

N.35 Other stakeholders also noted the following restrictions, which significantly limit the service that third-party vendors can provide to passengers:

- Railway undertakings may offer lower commissions to third party ticket vendors, and these may be too small for their businesses to be viable. This contrasts with the practice of standard commission rates agreed in some states.
- Railway undertakings do not offer consistent and long booking horizons, to enable rail to compete with other modes. We note that booking horizons may be constrained by the approach to maintenance planning of one or more infrastructure managers.
- Railway undertakings include clauses in distribution agreements preventing ticket vendors from bidding against them (for example, in the Google Ads auction) for important key words in online searches. This can limit the ability of ticket vendors to be found online.

[270] See **https://www.thetrainline.com/**.

[271] At the study conference, one incumbent railway undertaking said that fares rules for children which differ in every Member State make it extremely difficult for railway undertakings to agree on the pricing of end-to-end fares (see paragraph R.39).

[272] The new Regulation (EU) 2021/782 requires railway undertakings, tour operators and ticket vendors to provide travel information (Article 9); railway undertakings to provide travel information (Article 10(2)), infrastructure managers to distribute real time traffic data (Article 10(1); and, in the event of delays or cancellation, railway undertakings and station managers to keep passengers informed of the situation (Article 20). It is not year clear how these requirements will be delivered in practice, especially in real time, at times of disruption affecting thousands of passengers making different journeys.

- Ticket vendors do not inform railway undertakings of connecting journeys they have sold.

N.36 Hence, while ticket vendors can simplify the purchase of tickets for successive journeys and may facilitate the introduction of single transactions for an end-to-end journey, they cannot independently create or sell through-tickets (as defined in the new rail passenger rights Regulation (EU) 2021/782 discussed below). The limitations of their impact on ticketing are discussed further below in the context of allocating liability for service disruption.

N.37 Some of these issues have been addressed in the new rail passenger rights Regulation (EU) 2021/782, which we discuss below from paragraph N.64.

Revenue sharing mechanisms

N.38 We have not identified a formal typology of revenue-sharing mechanisms but are aware of a number of different approaches to allocating revenue under an integrated or through-ticketing scheme. These are described in the table below.

Table N.4: Revenue sharing mechanisms

Fare type	Application	Revenue allocation	Revenue-sharing involved
End-to-end fare	Sequential travel, fare is the sum of the fares of the railway undertakings.	Fare is allocated to the railway undertakings.	✗
End-to-end market price	Sequential travel, fare is a joint fare, typically less than the sum of fares of the railway undertakings.	Fare is prorated between operators on some basis, typically distance.	✓
Interavailability	Interavailable on the services or two or more railway undertakings on at least part of the journey.	Fare is shared on the basis of a model of which services passengers will actually use.	✓
Area tickets (not “point-to-point”)	Area pass.	Fare is shared between operators, including non-rail operators, on the basis of data such as usage surveys, travel diaries, or data provided by ticket gates.	✓

Source: Steer research.

N.39 In general, the more complex the basis of revenue allocation, the more costly the associated administrative arrangements, from simple pro-rating according to distance in some cases to complex modelling or surveys of the choices made by passengers in others. The basis on which revenue is shared is often considered commercially confidential, although the principles on which some schemes operate are transparent. We also note that any arrangement which involves revenue-sharing may attract the interest of, and require approval by, the competition authorities of the relevant Member State, since agreements between parties to set prices jointly is typically seen as potentially anti-competitive.

Case study: the Ticketing and Settlement Agreement in Great Britain

N.40 In Great Britain, the Ticketing and Settlement Agreement (TSA) enables passengers to purchase any of the fare types listed in the table above while also allowing operators to compete with each other through route-specific and train-specific fares. It illustrates the

requirements for a system facilitating the purchase of end-to-end tickets for successive journeys for a single, end-to-end fare. These include:

- processes for issuing end-to-end tickets between any two stations on the network as a single ticket;
- processes for setting end-to-end fares, responsibility for which is assigned to a "lead operator" from among the contracted train operators providing services;
- processes for sharing the revenue from interavailable tickets, often based on the industry's ORCATS model[273];
- processes for sharing the revenue from integrated tickets covering rail and other modes;
- processes for estimating the use of season, area and zonal tickets from passenger surveys and, more recently, data collected from ticket gates and the use of Pay As You Go (PAYG);
- auditable systems to allow tickets to be sold, commission paid, and the remaining revenue to be allocated or apportioned to railway undertakings; and
- approval by the competition authorities.

N.41 While technically complex, the TSA met the key objective, set at the time it was designed, of providing for the sale of tickets valid on the services of more than one operator, whether on successive or parallel services, while enabling competition between operators providing services between the same two stations. It has also delivered many of the benefits normally associated with integrated ticketing, as shown in the table below, although it does not involve the sale of through-tickets as defined in the legislation.

Table N.5: Benefits of the TSA in Great Britain

Benefit of integrated ticketing	Enabled by TSA?
Ticket reserves specific trains and connections	On some trains
Ticket reserves seats for all parts of journey	On some trains
Ease of booking by origin and destination as a single transaction[274]	✓
Ensured onward connections	Limited
End-to-end pricing	✓
Promotions	✓
Single coupon for all boardings	✓
Rail passenger rights under Regulation (EC) 1371/2007. These are delivered and, in some cases, exceeded. For example, some passengers receive automatic compensation for delays over two minutes.	✓

Source: Steer analysis.

[273] Operational research computerised allocation of tickets and services (ORCATS), developed in the 1980s.

[274] Research in Great Britain has investigated whether the ability to book a journey between any origin and destination as a single transaction results in a time saving which can be linked, via a journey time elasticity, to an increase in travel demand. However, the evidence of this effect is limited and we note that, at least for some journeys, the transaction itself may be only a small part of the passenger's total research before deciding whether, where, when and on what modes and services to travel. We discuss this further below from paragraph N.76.

N.42 However, in Great Britain there has been increasing passenger dissatisfaction with the existence of both end-to-end and separate tickets, for two main reasons:

- The different approaches chosen for the regulation of short- and long-distance fares have meant that peak fares have risen faster for long-distance fares than for short-distance fares[275].
- The scope for railway undertakings to offer operator-, route- or train-specific fares means that it can often be cheaper to use a combination of tickets than to pay the interavailable end-to-end fare valid on all operators, routes and trains.

N.43 Both these effects mean that, for many long journeys, on the same railway undertaking or even on the same train, it can be cheaper to buy two or more short-distance tickets than a single end-to-end ticket, a situation often referred to as "split-ticketing". This demonstrates that end-to-end pricing will not, in itself, ensure competitive pricing. It also has implications for the exercise of passenger rights, since rights to assistance, re-routing, reimbursement and compensation are defined with reference to expected or actual delay at the "final destination stated in the ticket or through-ticket". Rights for passengers with different combinations of tickets will be derived from, and may vary with, the final destinations stated on the ticket or tickets they have bought.

N.44 Depending on the type of rail passenger services involved, and the ownership of the railway undertaking or undertakings providing them, the new Regulation (EU) 2021/782 discussed below will require railway undertakings to offer, or to make reasonable efforts to offer, through-tickets[276]. However, the Regulation does not specify how through-tickets must or may be priced relative to other tickets. One possible outcome is that railway undertakings offer through-tickets to comply with the Regulation but offer them at fares, like those of end-to-end tickets in Great Britain, which may be unattractive relative to other tickets.

N.45 We also note that the TSA, which was put in place to preserve the passenger benefits of centralised ticketing and settlements at the time of rail privatisation in Great Britain, required major cross-industry effort and investment in new systems[277]. Establishing a similar mechanism at a European level would require substantially greater coordination and investment, even if its application could be restricted to a limited network of pan-European routes.

[275] Many commentators have suggested, in hindsight, that consistent regulation of short- and long-distance fares would have been a better approach, but this is difficult to implement in any state where urban, suburban and regional competent authorities specify or regulate fares in their area.

[276] Article 12(1) of Regulation (EU) 2021/782 states that "Where long-distance or regional rail passenger services are operated by a sole railway undertaking, that undertaking shall offer a through-ticket for those services. For other rail passenger services, railway undertakings shall make all reasonable efforts to offer through-tickets and shall cooperate to that end among themselves." and that "'sole railway undertaking' shall also include all railway undertakings which are either wholly owned by the same owner or which are wholly-owned subsidiary undertakings of one of the railway undertakings involved".

[277] The TSA is currently managed by the Rail Delivery Group (RDG), established in June 2011 by the major passenger and freight railway undertaking groups and infrastructure manager Network Rail. It was previously managed by the Association of Train Operating Companies (ATOC).

N.46 Hence, we conclude that, while a Europe-wide ticketing and settlement agreement might deliver many of the benefits of integrated ticketing[278], it would involve substantial cost and could not guarantee either:

- more low market-based fares, because railway undertakings and competent authorities are unlikely to create or market special fares or promotions for very small markets; or
- wider use of through-tickets, because even where these must be offered to comply with Regulation (EU) 2021/782 they may be priced at levels which make them unattractive.

The role of new technology and systems

N.47 In principle, the slow progress towards pan-European integrated and through-ticketing can be addressed, at least in part, through technological development and the application of new ticketing systems. We summarise below a number of EU-level policy and industry-led initiatives intended to progress such developments.

National Access Points

N.48 National Access Points (NAPs), which are mandated under European legislation[279], are intended to facilitate access, easy exchange and reuse of transport-related data, to support the provision of EU-wide interoperable travel and traffic services to end users. Hence, in principle they could facilitate both access to the train service information needed to plan cross-border travel and the selling of tickets and through-tickets for cross-border journeys. However, discussions with stakeholders indicate that their contribution to the development of the through-ticketing offer has been limited:

- We understand that few Member States are fully compliant with the legislation with regard to the provision of EU-wide multimodal travel information services. One stakeholder noted that, while static data should have been available since 2019, Italy does not yet provide even timetable data.
- NAPs are primarily national projects providing, to varying extents, for national requirements. Further, national operators seeking to protect their market position have little incentive to upload information that, if it were openly available, might benefit their competitors.
- Although many NAPs have static timetable data, few have real-time information or means of making a sale. The NAPs appear to have been designed mainly to deal with the needs of urban areas with simple fares, no yield management or reservations, and no need to transmit passenger data such as name, payment details, contact details, travel documents, and discounts or loyalty programme membership. They cannot normally handle complex tickets or add-on services, and rarely provide ticket vendors with the functionality to sell tickets, for which they would also need a distribution agreement.

[278] If integrated ticketing is defined as “the purchase of a single ticket that allows passengers to travel using different modes of transport provided by one or more operators” or “combining all transport methods in one single ticket” (see glossary), the benefits might include the ability to change or mix modes and operators, to travel on any service without reservation, to identify in advance the fare between any two points, and to pay with a smartcard, credit or debit card of mobile app without needing to acquire a physical ticket.

[279] Delegated Regulation (EU) 2017/1926, supplementing Directive 2010/40/EU with regard to the provision of EU-wide multimodal travel information services.

N.49 One stakeholder provided an example of the limitations of NAPs, noting that it is possible to travel direct from Paris to Mont-St-Michel on a regional train funded by Normandy, but that SNCF's website offers only TGV to Rennes and a connection. Passengers searching SNCF's website are not made aware that there is a direct train, although if all the data were openly available, other ticket vendors could draw their attention to this option. The stakeholder suggested that more open data would support more independent ticket vendors, which in turn would support wider passenger choice and more on-rail competition.

N.50 Other stakeholders were also supportive of the principle of open data portals. One noted that the provision of even limited timetable information allows ticket vendors to build itineraries for passengers. Another observed that, ideally, NAPs should enable competing service providers to sell each other's tickets, a practice long-established in the airline industry. However, as NAPs are nationally driven projects, they have failed to deliver the level of standardisation prevailing in air transport, and ticket vendors wishing to sell cross-border transport services are invariably required to write an API linking them to the relevant railway undertaking's systems, assuming they are permitted to do so.

N.51 None of the stakeholders interviewed envisaged that these issues would be resolved in the foreseeable future, and none suggested that NAPs would evolve into a platform useful for providing information and sales related to cross-border travel. A key constraint is the lack of incentive among train operators to upload and provide access to the range of information needed to establish such a platform.

Shift2Rail demonstration programmes

N.52 Shift2Rail (S2R) is a Joint Undertaking established under Council Regulation (EU) No 642/2014 to promote and oversee research and innovation (R&I) activity in the rail sector[280]. It is concerned with all aspects of rail transport, but much of its programme is directed towards improving the passenger experience of rail travel. In particular, its six objectives include:

"to contribute to… a more attractive, user-friendly (including for persons with reduced mobility), competitive, efficient and sustainable European rail system... providing users with an integrated end-to-end solution for their rail travel and transport needs, from transaction support to en-route assistance".

N.53 The most relevant part of S2R's overall programme in the context of this study is Innovation Programme 4, which focuses on "IT Solutions for Attractive Railway Services". This includes a number of "Technology Demonstrators" intended to enable the realisation of more integrated rail travel, as summarised in the table below.

[280] S2R was established to progress rail-related R&I in Europe during the period of Horizon 2020. We understand that a new JU with broadly similar responsibilities is being established for the period of Horizon Europe.

Table N.6: Key Technology Demonstrators within S2R's Innovation Programme 4

	Technology Demonstrator	Summary of activity
TD4.1	Interoperability Framework	The aim is to facilitate multimodal travel in a highly diverse environment and with many transport modes. The world of transportation service providers needs to be open-ended; it evolves at its own pace and uses multiple data formats and interfaces. The Interoperability Framework will define formal and explicit models of transportation in an open, standard, machine-readable language that can be exchanged automatically by computers.
TD4.2	Travel Shopping	The aim is to provide a comprehensive shopping application enabler which combines all modes of transport, all operators and all geographies, and provides a list of customer-relevant trip offers which are guaranteed available for booking, purchase and ticketing. The approach will promote the integration of distributed travel operators' data and the provision of services such as expert journey planning. It will be facilitated by the Interoperability Framework, which will enable applications based upon different standards or coding lists to communicate meaningfully but without costly adaptation.
TD4.3	Booking & Ticketing	This will enable multiple but parallel interactions with several booking, payment and ticketing engines, including the all-important roll-back activities, should any single transaction fail, in order to eliminate risk. Thanks to the concept of a unique traveller identifier and wallet, the traveller will have easy access to the complete and integral components of his/her journey, including easy production of the entitlement tokens required for all ticket validation controls encountered en route. It will radically simplify the traveller's life, by abolishing uncertainties associated with 'behind-the-scenes' multiple booking, payment and ticket processes.
TD4.4	Trip-tracker	This will give travellers in-trip assistance when navigating transport nodes, while also providing personalised information (related to predefined preferences) and up-to-date status reports on subsequent legs of the journey; it will support them in case of disruption, by proposing updated booking possibilities together with updated rights to travel.
TD4.5	Travel Companion	The traveller will have full control of the journey, thanks to their own personal and secured 'Travel Companion', which stores and shares their personal preferences in a wallet. It will give access to all travel services needed for the journey, shopping and booking, and allow storage of the rights to travel. At the same time, retailers and operators will be able to identify and authorise the Travel Companion to access their own systems and networks.

Source: https://shift2rail.org/research-development/ip4/.

N.54 While we have not reviewed each Technology Demonstrator in detail, together they appear to have the potential to deliver a step change in both the provision of passenger information on cross-border travel opportunities, including timetable and real-time information, and the selling of integrated and end-to-end tickets. S2R's Multi Annual Action Plan indicates that the demonstrators are expected to be completed in 2022 or 2023, at which point the industry will have access to proven technologies that can address many of the issues previously discussed.

N.55 However, as with any innovation, their impact will depend critically on the pace and extent of industry take-up which, given the nature of the technology, will in turn depend on the extent of pan-European collaboration and the willingness of industry stakeholders to invest. Securing the necessary commitment within the industry needed to apply the technology will be

challenging. We note that none of the stakeholders interviewed were confident that S2R's programme was likely to make a material contribution to rail ticketing in Europe in the near future. None suggested that it would result in more through-tickets being offered or bought, or fewer passengers suffering from missed or broken connections.

Open Sales and Distribution Model

N.56 Against this background, the Open Sales and Distribution Model (OSDM), a new European-wide industry standard for ticket sales, reservations and price distribution, is an encouraging development. Originally launched as the Full Service Model (FSM) in 2013, this industry-led initiative, jointly managed by UIC, railway companies, ticket vendors and other stakeholders, was relaunched as OSDM in November 2020. At the time of the relaunch, UIC stated that:

"The distribution of tariffs for international rail travel among railway companies and ticket vendors is set to become more advanced and flexible as UIC announces its new OSDM platform… by distributing international travel tariffs and prices among railway companies' distribution systems and making them available around the world. … UIC's objective is to make the OSDM platform available for railway partners and ticket vendors in April 2021."

UIC has also stated the aims of the project as:

- substantially simplifying the booking process for customers of rail trips;
- reducing complexity and distribution costs for distributors and railway carriers; and
- strengthening rail as a convenient and ecological means of transportation by simplifying distribution.

N.57 In time, it might be possible to extent the model to other transport modes, providing a platform for full integrated ticketing across Europe. It is not clear, however, whether it will lead to an expansion of through-ticketing, beyond the requirements of Regulation (EU) 2021/782, because it cannot force railway undertakings to expand their offer of end-to-end fares as single transport contracts.

N.58 In discussions, stakeholders were generally optimistic that OSDM would be widely adopted and would make it easier for railway undertakings to sell their products through a wider range of ticket vendors. EU travel tech described OSDM as an industry-wide and agreed "pipe/plug/socket" arrangement for connecting railway undertakings to ticket vendors which, if taken up, would deliver the interoperability and standardisation needed to strengthen the independent ticket vendor sector. More specifically, ticket vendors would need to write only a single API, interfacing with OSDM, to enable them to sell tickets for any railway undertaking using the OSDM interface. Benefits would therefore include the ability of any railway undertaking to sell connections onto others' services, effectively addressing the current limitations of NAPs, which focus mainly or exclusively on domestic travel and provide little if any sales functionality.

N.59 The next step is for railway undertakings wishing to enable new sales channels to write their side of the interface, enabling their own systems to present data in the OSDM format. However, it is up to railway undertakings to decide whether to do so, and the rate of take-up is not yet clear.

Further policy developments

N.60 In 2019 the Commission published a report on remaining challenges for EU-wide integrated ticketing and payment systems[281]. The report noted that "Although there is not a unique definition of integrated ticketing, this can be defined as the purchase of a single ticket that allows passengers to travel using different modes of transport provided by one or more operators[282] or as "combining all transport methods in one single ticket" and is considered as the natural partner to multimodal travel information and planning services[283]".

N.61 We noted above how the definition of integrated ticketing is much broader than the definition of through-ticketing. Nevertheless, integrated and through-ticketing are expected to deliver many of the same benefits to passengers, and making them generally available to passengers would require resolution of some of the same challenges, and some of the report's conclusions are therefore relevant to the current study. It did not offer a consolidated list of recommendations, but proposed options for further intervention using different policy instruments, namely:

- no direct measures to enable or encourage greater progress, but enhanced monitoring of the impact of action already taken, whether in the form of EU-level policy or industry-led initiatives;
- non-binding initiatives, such as codes of conduct and guidance, which would help the industry to take the necessary co-ordinated action to improve ticketing arrangements; and
- EU legislation, either revising existing Directives and Regulations or introducing a wholly new legislative framework, to mandate action across Member States.

N.62 The report's proposals are summarised below.

Table N.7: Proposals from "Remaining challenges for EU-wide integrated ticketing and payment systems"

Approach and recommendation
No new measure
• Monitor implementation of Delegated Regulation (EU) 2017/1926, in particular with reference to the options left to Member States concerning the extension of the access to dynamic data. • Monitor the implementation of Directive (EU) 2016/2370 on the fourth railway package, which promotes the development of EU-wide through-ticketing system. • Monitor market initiatives with potential to be developed on a larger scale, such as FSM projects.
EU initiatives which are non-binding
• Provide guidance to national authorities and stakeholders when accompanying the development of ticket distribution solutions and payment services. • Include a data sharing code of conduct which would provide guidance and clarification of travel dynamic data, as well as fare data access to third parties that want to develop integrated

[281] Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report, Grimaldi and others for European Commission, July 2019 (2019).

[282] Integrated Ticketing on Long-Distance Passenger Transport Services, European Parliament Study, 2012, page 15.

[283] Towards a roadmap for delivering EU-wide multimodal travel information, planning and ticketing services, SWD (2014) 194.

Approach and recommendation
ticketing services. The Code would include principles that the parties shall take into account when drafting commercially, applicable to identification, conditions of use (including the trademark) and complaint management, and include: – a description of the agreement's governance arrangements and internal control mechanisms, including administrative, risk management and accounting procedures, which demonstrates that those governance arrangements, control mechanisms and procedures are proportionate, appropriate, sound and adequate; – a description of the procedure in place to monitor, handle and follow up on incidents and related customer complaints, including an incident reporting mechanism; and – a description of the process in place to file, monitor, track and restrict access to sensitive or personal data and to handle security incidents. • Prohibit price parity clauses, to avoid potential anticompetitive effects or higher prices being charged to passengers. Both distributors/aggregators and transport operators should remain free to apply discounted prices, especially using promotions or fidelity programs. • Procedures to select PSO operators could set out conditions to provide integrated ticketing, including interoperability and data access, as part of the commercial offer. • Create a transparent contract notice requiring that the transport provider comply with the terms of interoperability, including a possible clear separation between the compensation and the fare revenues, to allow for the development of integrated ticketing from both third parties or transport operators and public authorities. • Explore the possibility of future revision to guidelines, for instance, adding guidelines as to how the exchange of information applies to multimodal ticketing. This would help alleviate operators' fears that, by collaborating, they may risk infringing Article 101(1) TFEU. • Clarify CJEU case law applicable to refusal to supply and abuse of dominant position to integrated ticketing, to provide operators with guidance.
EU legislation
Adopt specific EU legislative initiative on integrated ticketing and payment services. Establish new rules to: • close the identified gaps, in particular concerning the conditions for access to fare data and the role of PSOs; • provide more legal clarity; • ensure consistent application of the legislative framework across the Union; and • address fragmentation.
Option 1: revise Delegated Regulation (EU) 2017/1926 to include integrated ticketing and payment systems. • Revise the Regulation, moving from optional access to dynamic data to mandatory access for those dynamic data listed in the Annex and including dynamic fare data. • Include minimum standards to grant interoperability of API/interfaces of the services providers, included payment systems. • Introduce the definition of third-party service provider of integrated ticketing. The definition might take into account technological developments that have given rise to the emergence of a range of complementary services, such as digital wallets, mobile apps and smart ticketing. • Grant third party service providers access to the data and interfaces necessary to develop their services. Clarify that the access would be for distribution purposes and should therefore include data re-use for commercial purposes.
Option 2: revise Regulation (EC) 80/2009 on CRS code of conduct. • Review the Regulation on the CRS code of conduct to open it to other modes.
Option 3: a new legislative initiative in integrated ticketing, with a minimum set of essential data considered necessary to develop integrated ticketing and payment systems. • Require all public and private providers of mobility services to open up essential data about their services in open APIs, which should be in machine readable format.

Approach and recommendation
• Require transport operators to provide ticket distributors/aggregators with open access to the sales interface of their ticket, reservation or payment system, subject to reasonable and fair commercial conditions. • Require that the interoperability standards used by the service providers include the minimum standards, already developed for payment systems under the Directive, to support the account-based ticketing. • Grant aggregators the right to buy tickets on behalf of users, and grant users the right to buy tickets through aggregators and to choose what sales channel to use. • Define third-party service providers of integrated ticketing, taking into account technological developments that have given rise to the emergence of a range of complementary services, such as digital wallets, mobile apps and smart ticketing. Grant third party service providers access to the data and interfaces necessary to develop their services. • Require third parties that intend to provide integrated ticketing service providers to register with the competent national authorities. • Establish enforcement powers at national level. • Implement requirements for machine readable ticket/ID media with corresponding standardised description of travel rights. • Allow transport operators to sell tickets to end users at lower prices, including discounts and loyalty programmes. • Allow aggregators and distributors to compete and offer discounts and promotions.

Source: Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report, Grimaldi and others for European Commission, July 2019 (2019).

N.63 We note the report's findings that:

- Enhanced monitoring may prove useful in tracking the development of NAPs as well as S2R's Innovation Programme 4 and the rollout of OSDM but is unlikely, by itself, to have a material impact on the pace of improvement of the through-ticketing offer.
- Guidance may be particularly helpful to ensure a common approach in some technical areas, and to reduce the risk of anti-competitive behaviour manifested in price parity clauses, commissions policy or constraints on third party vendors[284]. It could also be used to help standardise the recording and publication of train arrival times and the calculation and publication of minimum connecting times.
- New legislation would need to be based on an overall vision for the future structure of ticketing across the EU, and in particular the extent to which choices might be needed between potentially conflicting objectives. No existing ticketing model meets all possible objectives or passenger expectations, and key trade-offs should be identified and made before drafting legislation. A key issue is whether any future policy initiative should be focused on intermodal ticketing for urban and suburban services or intramodal competition between long-distance and cross-border services.
- Revision of existing legislation would provide an opportunity to improve the definition of through-ticketing, to identify products and associated benefits more clearly, and to enable monitoring of through-ticket sales.

[284] For example, as previously noted, at present railway undertakings frequently sell tickets at lower prices than they offer to vendors and include clauses in distribution agreements preventing vendors from bidding against them for important key words in on-line searches in fora such as the Google Ads auction.

The new rail passenger rights Regulation (EU) 2021/782

N.64 As noted above, rail passenger rights legislation was revised during the course of our study. From 7 June 2023, Regulation 1371/2007 will be repealed and replaced with Regulation (EU) 2021/782[285], adopted by the European Parliament and the Council on 29 April 2021.

N.65 The new Regulation introduces a number of measures intended to improve ticketing and rights for connecting passengers:

- It defines "missed connections"[286] for passengers with through-tickets and clarifies the liability for them.
- It creates a right of "self re-routing" and reimbursement if the re-routing options are not communicated to the passenger within 100 minutes[287].
- It introduces a new obligation to offer through-tickets for long-distance or regional rail passenger services which are operated by a sole railway undertaking[288].

N.66 However, the scope of the new Regulation regarding missed connections is limited in two ways:

- The rights related to missed connections continue to be limited to passengers with through-tickets.
- Passengers with through-tickets are limited to those with a transport contract with a railway undertaking.

N.67 The new Regulation also introduces new obligations regarding access to traffic and travel information[289], which may be delayed until 2030 if not yet technically feasible.

N.68 The new Regulation can be assessed against the passenger expectations listed in Table N.2, as shown in the table below.

[285] https://eur-lex.europa.eu/eli/reg/2021/782/oj

[286] Article 3 of Regulation (EU) 2021/782 states that missed connection means "a situation where a passenger misses one or more services in the course of a rail journey, sold in the form of a through-ticket, as a result of the delay or cancellation of one or more previous services, or of the departure of a service before the scheduled departure time".

[287] Article 18(3) of Regulation (EU) 2021/782 states that "Where the available re-routing options are not communicated to the passenger within 100 minutes from the scheduled departure time of the delayed or cancelled service or the missed connection, the passenger shall be entitled to conclude such a contract with other providers of public transport services by rail, coach or bus. The railway undertaking shall reimburse the passenger for the necessary, appropriate and reasonable costs that he or she incurs."

[288] Article 12(1) of Regulation (EU) 2021/782, which relates only to long-distance and regional services, states that "'sole railway undertaking' shall also include all railway undertakings which are either wholly owned by the same owner or which are wholly-owned subsidiary undertakings of one of the railway undertakings involved."

[289] Article 10(1) of Regulation (EU) 2021/782 states that "Infrastructure managers shall distribute real-time data relating to the arrival and the departure of trains to railway undertakings, ticket vendors, tour operators and station managers."

Table N.8: Potential benefits of ticketing and Regulation (EU) 2021/782

Potential benefit	Effect of Regulation (EU) 2021/782	Potential limitations
Ensured journey connections	Rights related to missed connections.	• Limited to passengers with through-tickets, but passengers may not be aware of through-tickets or whether they have one. • The definition of a through-ticket does not require it to be valid only on one (or a limited number) of trains, or to include a statement that it will be valid on one (or a limited number) of trains (because tickets and reservations may be physically separate), and includes open tickets which in some cases may be valid for up to a month. It may be difficult for the industry to identify whether any passengers have experienced a missed connection.
	Clear allocation of liability for missed connections, delays and cancellations.	
Ease of booking	Broader obligations to offer through-tickets.	• No limit on the prices relative to other tickets. • Need not include a seat reservation for one train, so does not guarantee that they will find a seat on the train, or even that it will be physically possible to board the train.
Lower prices and promotions	Outside the scope of the Regulation.	

Source: stakeholders, Steer analysis.

Measures to improve ticketing and rights for connecting passengers

N.69 The new Regulation was only recently adopted, on 29 April 2021, and will apply from 7 June 2023. The first formal opportunity to review it will arise by 7 June 2026, when the Commission must report to the European Parliament and the Council on the implementation and the results of this Regulation and the report shall, where necessary, be accompanied by appropriate proposals (Article 39).

N.70 We have proposed seven measures which might address some of the obstacles identified elsewhere in this study, as summarised in the table below. The table distinguishes:

- measures which could be applied in the context of the new Regulation;
- measures which could be applied to prepare for different future arrangements, and in particular to make it possible to introduce different regimes for liabilities related to through-tickets; and
- measures which might be relevant to any potential revision by or after June 2026.

Table N.9: Potential measures to help meet passenger expectations

Timescale	Ensured journey connections		Ease of booking		Lower prices
Applicable in the context of Regulation 2021/782	TP2	Better information on connecting times for all passengers, even if they have no through-ticket	TP1	Wider use of OSDM	
	TP3	Passengers have options to specify connecting times other than the minimum connecting time, even if they have no through-ticket			
	TP4	Simpler arrangements when journeys go wrong for all passengers, even if they have no through-ticket			
Preparation for the future	TP5	Better delay information and attribution to support other liability arrangements, if required			
Potential revision from 2026	TP6	Review the provisions of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom			
	TP7	Reform the regulatory framework for passenger rights for all modes			

Source: Steer analysis.

Connecting times

N.71 Measures TP2 and TP3 focus on minimum connecting times, on which information is often not available, as we discuss below. Where minimum connecting times are published and used in journey planners, they often assume that connections can be made within a few minutes, and in some cases as little as three minutes. However, RMMS shows that the proportion of EU27 long-distance and high-speed passenger services arriving less than five minutes late fell from 84.9% in 2015 to 78.7% in 2018[290,291]. Many passengers may not wish to book connections if there is a significant risk that they will not work. In this context:

- Measure TP2 would define and publish minimum connecting times within and between stations, to make sure that the information was available to passengers and other parties.
- Measure TP3 offers passengers the option to request longer connecting times.

N.72 Unless and until the railways of Europe are able to offer much higher levels of punctuality (which may be increasingly difficult with growing congestion and other constraints), we consider that the best way to reduce disruption associated with connections is to allow passengers to specify longer connecting times. We discuss this further below.

Further research

N.73 In addition to the measures set out above, the Technical Specifications for the study required us to carry out a range of further research. In the remainder of this Annex we describe this

[290] Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council, Table 114.

[291] In Japan, the average delay is around 20 seconds for trains on high-speed lines (Shinkansen) and around 50 seconds for trains on other lines. However, this is the outcome of continued and sustained investment, and design of systems and operating practices, with a focus on punctuality.

work, which may not be of immediate relevance within the framework of the new Regulation, but which may help inform decisions on its future revision or reform, potentially after 2026, under measures TP6 and TP7. We discuss in turn:

- the potential impacts of wider through-ticketing on passengers;
- the potential impacts of wider through-ticketing on railway undertakings;
- models for the allocation of liability for missed connections; and
- models for end-to-end ticketing and supporting clearing arrangements.

The potential impacts of wider through-ticketing

N.74 The Task Specifications required us to assess the impact of through-ticketing on the market from the perspective of both passengers and railway undertakings. We concluded that it is not possible to quantify the impact on costs or passenger volumes since these will depend on a wide range of factors, including:

- how the framework ensures that through-tickets are available, how they are priced, and the extent to which third parties are able and willing to sell them;
- how the framework imposes obligations on different parties, and whether and how they react to minimise their costs, such as specifying longer minimum connecting times, or charging higher fares for tight connections[292];
- the scale of the European network to which such obligations apply and the size of the market for international travel that it might serve;
- the response of competing transport operators, particularly providers of air transport and coach services, to an improved rail offer;
- the measures in place to prevent evasion, which might need to include imposing obligations on intermediaries not mentioned in Regulation (EU) 2021/782[293];
- the costs of the processes and systems needed to deliver the requirements (potentially including a clear definition of minimum connecting times, systems for measuring and making public whether they have been delivered, systems for passing information on through-tickets through the industry, and systems for providing assistance, reimbursement, re-routing and compensation).

N.75 We nevertheless sought evidence on the implications of through-ticketing for passenger demand and operator costs, which we discuss in turn below.

Impact on passengers

N.76 Stakeholders responding to our survey reported that through-ticketing could deliver a number of passenger benefits although, as previously noted:

- Our stakeholder engagement preceded the new Regulation, the new definition of a transport contract (see paragraphs N.13 and N.14), and the limitations set out in paragraph N.66.

[292] In practice, railway undertakings could claim to be offering lower fares to passenger willing to accept a longer connecting times. Many passengers might prefer such an option.

[293] For example, a ticket vendor is defined in Regulation (EC) 2021/782 as "'any retailer of rail transport services selling tickets, including through-tickets, on the basis of a contract or other arrangement between the retailer and one or more railway undertakings". It is not clear whether "other arrangement" includes intermediary parties, systems or contractual structures, such as Great Britain's Ticketing & Settlement Agreement (TSA).

- Stakeholders may not have clearly distinguished through-tickets and other types of ticket.

N.77 If a single contract for successive rail journeys were to facilitate a single transaction, a single end-to-end fare, and ensured connections, these benefits might include:

- ensured connections, such that passengers book rail journeys with greater confidence;
- ease of booking, potentially reducing the associated transaction time; and
- more competitive fares and promotions that can be readily compared with the costs of travelling by other modes.

N.78 We investigated the evidence on the impact of these benefits on the demand for rail travel, drawing on guidance from the Passenger Demand Forecasting Handbook (PDFH), a key source of research findings and other data used to inform forecasts of rail demand in Great Britain[294]. The PDFH has been developed for the British market but is one of the most comprehensive sources of such information and is generally available to industry stakeholders, whether in the public or private sector, seeking to plan rail services. Many of its findings will be relevant for other European markets, although specific numerical results and parameter values will vary between countries.

Ensured journey connections

N.79 Our analysis above suggests that there is scope to improve the reliability of connections by calculating and publishing connecting times at stations which minimised the risk of passengers missing a connection. Steer has recently undertaken research on behalf of the Passenger Demand Forecasting Council that explored the different elements of the interchange penalty, but not in sufficient detail to provide a quantification of each of them[295]. In principle, it might be possible to estimate a potential demand impact of measures to improve confidence in interchange by reducing the interchange penalty and applying an appropriate elasticity to Generalised Journey Time (GJT). However, the impact could be expected to vary significantly by route and by journey purpose.

N.80 We also note that the nature of rail industry operations, with no staff on many stations, means that there might be little scope to provide any immediate assistance to passengers missing a connection. In these circumstances, they might need to make their own decisions on how to complete their journey, undermining the impact of through-ticketing on their confidence in making a connection[296].

Ease of booking

N.81 The PDFH provides guidance on the calculation of changes in demand due to changes in GJT. This suggests that, in principle at least, reductions in the transaction time associated with replacing paper tickets with e-ticketing can contribute to a reduction in GJT and hence an increase in passenger numbers.

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[294] **https://www.raildeliverygroup.com/pdfc/about-the-pdfh.html**.

[295] Review of the PDFH Interchange Penalty, Steer for Passenger Demand Forecasting Council, 2017.

[296] In principle, the new right to self re-routing may increase passenger confidence, but its effect would depend both on the number of passengers who become aware of it and the extent to which those confident to self re-route are doing so anyway without waiting 100 minutes from the scheduled departure time of the delayed or cancelled service or the missed connection.

N.82 In principle, a similar analysis could be used to estimate the impact of reduced transaction time if all tickets could be bought as a single transaction, but we note that:

- The PDFH's examination of the effects of replacement of paper tickets with e-ticketing may not be a reliable guide to the effects of replacing tickets for successive journeys with a through-ticket;
- the impact on demand will vary considerably according to the journey characteristics;
- the impact on transaction time might be dwarfed by the overall time taken to plan a journey (particularly where multiple options involving different transport modes are available); and
- railway undertakings might choose to take the benefit of increased demand in the form of higher fares, rather than higher passenger numbers.

Lower fares

N.83 We found examples of where end-to-end fares, whether associated with a through-ticket or not, are higher than, the same as, or lower than, the combined price of tickets for successive parts of a journey. Some stakeholders nevertheless suggested that making it easier for passengers to buy tickets with end-to-end prices as a single transaction might increase the incentives to railway undertakings to collaborate to offer lower prices and promotions, where permitted by the relevant competition authorities.

N.84 In the absence of information on the extent of such collaboration or its effect on fares, it is not possible to apply PDFH or other estimates of fare elasticities to calculate the impact on demand. However, we also note that the low-cost airlines choose not to offer end-to-end fares within their own networks, and TGV and Thalys do not offer end-to-end fares between their services. We doubt whether significant numbers of railway undertakings would consider it worthwhile jointly creating end-to-end fares for relatively small long-distance cross-border markets.

Impact on the costs of railway undertakings

N.85 We set out in paragraph N.74 how the impact of through-ticketing would depend on how the framework imposes obligations on different parties, and whether and how they react to minimise their costs, such as specifying longer minimum connecting times, or charging higher fares for tight connection. The table below is an exploratory analysis of how the industry might respond to the three liability models which describe from paragraph N.87 below.

Table N.10: Potential interaction between liability models, industry costs, and impacts on passengers

Model	Possible reactions and mitigations by industry	Possible impact on passengers	Possible consequences
1. Liability allocated to ticket vendor	• Independent ticket vendors offer only long connecting times or withdraw from the market. • Railway undertakings offer only long connecting times.	• Fewer opportunities to book connecting journeys. • Fewer short connections offered. • Longer overall journey times. • Less travel.	• Railway undertakings accept a fall in revenue as a means of mitigating costs. • Independent ticket vendors similarly accept a fall in revenues to mitigate costs.
2. Liability allocated to delay perpetrator	• Railway undertakings offer only long connecting times. • Infrastructure managers adjust timetables to make connections more reliable, possibly at the expense of longer journey times.	• Fewer short connections offered. • Longer overall journey times. • Less travel.	• Railway undertakings accept a fall in revenue as a means of mitigating costs. • To the extent that a fall in revenue leads to service reductions, infrastructure managers may experience a reduction in access charge revenue.
3. Re-routing under an extended AJC	• Railway undertakings asked to assist and re-route passengers bear liability for the actions of others. • Railway undertakings might mitigate by insisting on proof that a passenger had been delayed.	• Railway undertakings might be perceived as reluctant to honour rights.	• Railway undertakings bear higher costs dealing with delays and cancellations caused by others. • Higher enforcement costs.

Source: Steer analysis.

N.86 We stress that this analysis is purely illustrative, but note that it suggests that different liability models might result in different patterns or response by the industry and hence the effects on passenger demand and the costs to railway undertakings, infrastructure managers and other stakeholders.

Models for the allocation of liability for missed connections

N.87 The new rail passenger rights Regulation (EU) 2021/782 defines transport contracts and through-tickets and the rights and responsibilities associated with them, and imposes obligations on ticket vendors or tour operators who combine tickets at their own initiative[297]. However, the study Technical Specifications asked us to examine what liability scheme should

[297] Article 12(4) of Regulation (EU) 2021/782 states that "Where a ticket or tickets are purchased in a single commercial transaction and the ticket vendor or tour operator has combined the tickets on its own initiative, the ticket vendor or tour operator that sold the ticket or tickets shall be liable to reimburse the total amount paid for that transaction for the ticket or tickets and, moreover, to pay compensation equivalent to 75 % of that amount in the event that the passenger misses one or more connections."

be applied among railway undertakings performing different rail legs under one through-ticket and in cases of journey disruptions between ticket vendors (who bundled tickets of different railway undertakings, possibly with an insufficient connection time) and the railway undertakings performing the journey under one through-ticket.

N.88 We note that liability for both railway undertakings and ticket vendors has been defined in the new Regulation, but considered the future practicability of other liability arrangements.

N.89 Missed connections are defined in Regulation (EU) 2021/782 as "a situation where a passenger misses one or more services in the course of a rail journey, sold in the form of a through-ticket, as a result of the delay or cancellation of one or more previous services, or of the departure of a service before the scheduled departure time". As we noted above, given the definitions of "through-ticket" and "transport contract", this means that a missed connection, as defined, can only exist when a passenger has a single transport contract with a railway undertaking[298] for successive railway services.

N.90 To distinguish a missed connection, as defined, from the different issue of whether unpunctual operation has resulted in a connecting time which is shorter than advertised in the timetable, we define a broken connection (see glossary) as "a situation where the delay or cancellation of one or more services, or of the departure of a service before the scheduled departure time, reduces the interval between arriving and departing services below the minimum connecting time."

N.91 A broken connection is a simple test of whether trains ran at times which preserved the minimum connecting time, whereas a missed connection relates not only to the advertised connecting time (to determine whether the railway is at fault) but also to whether the passenger makes the connection, and whether they had a through-ticket, all of which need to be established to determine whether there has been a missed connection. A key distinction is that the industry can in principle identify broken connections from its own data, but will often only be able to investigate whether a missed connection has occurred after a passenger has claimed that they have experienced one.

N.92 In the event of a missed connection, Article 18 of the Regulation requires railway undertakings to offer passengers an immediate choice of re-routing[299], and they may allow passengers to re-route themselves[300], and requires them to let passengers re-route themselves if the railway

[298] Under Article 12(1) of the Regulation, for regional and long-distance services this includes a sole railway undertaking, which also includes all railway undertakings which are either wholly owned by the same owner or which are wholly-owned subsidiary undertakings of one of the railway undertakings involved. We note that this definition excludes any railway undertakings with other shareholders, no matter how small their shareholding.

[299] Article 18(1) of Regulation (EU) 2021/782 states that ""Where it is reasonably to be expected, either at departure or in the event of a mis sed connection or a cancellation, that arrival at the final destination under the transport contract will be subject to a delay of 60 minutes or more, the railway undertaking operating the delayed or cancelled service shall immediately offer the passenger the choice between one of the following options, and shall make the necessary arrangements."

[300] Article 18(3) of Regulation (EU) 2021/782 states that ""The railway undertaking may allow the passenger, at his or her request, to conclude contracts with other providers of transport services which enable the passenger to reach the final destination under comparable conditions, in which case the railway undertaking shall reimburse the passenger for the costs that he or she incurs."

undertaking has not done so within 100 minutes of the scheduled departure time[301]. In practice, these provisions may be of limited value to passengers, at least unless improved connectivity through devices such as smartphone apps makes it possible for passengers to complete more processes without direct access to railway staff:

- Many stations have no railway undertaking staff and, even if they do, they may not have the authority, information or means to re-route a passenger onto another service under comparable conditions.
- Many passengers may need, or decide, to re-route themselves without waiting 100 minutes for a railway undertaking to do so.

N.93 The result is that, in the event of many missed or broken connections, passengers make their own decisions on whether and how to continue their journey, and then seek redress from the industry in the form of reimbursement of any costs incurred and any compensation to which they are entitled. For such passengers, a key issue is identifying the party liable for their situation and the relevant complaint, reimbursement and compensation procedure.

N.94 Most of the provisions of Regulation (EU) 2021/782 assign obligations to a specific railway undertaking. This approach may be problematic where passengers make connections between different railway undertakings unless there is a clear framework for defining the roles of all the parties involved and identifying which of them should be responsible for broken connections between successive railway services operated by several railway undertakings. Establishing a clear allocation of liability for broken connections can have benefits for both passengers and other parties:

- From the perspective of passengers, it can ensure a single point of accountability for a journey, such that any claim for compensation for a missed or broken connection can be made against a single organisation.
- From the perspective of the parties held liable, it ensures a clear allocation of the commercial risk arising from claims for compensation, ideally aligned with each party's ability to manage such risk, with the party initially liable to the passenger able to claim against another party or parties responsible for the disruption. In principle, this could encourage railway undertakings to promote through-tickets more effectively.

N.95 Again, while many stakeholders accepted the need for greater clarity in the allocation of liability, there was no consensus on how this might be achieved. One stakeholder suggested that there could be a publicly controlled "insurance" system but did not explain how this might work in practice or what cover should be provided. The stakeholder interviews nevertheless highlighted three broad models, which we discuss in the following paragraphs.

Liability for broken connections Model 1: liability allocated to the party selling the ticket

N.96 One approach would be to assign liability to the party that sold the ticket to the passenger. In principle, this would provide passengers with a single point of contact when claiming compensation and incentivise parties selling tickets for two or more successive journeys to

[301] Article 18(3) of Regulation (EU) 2021/782 states that "Where the available re-routing options are not communicated to the passenger within 100 minutes from the scheduled departure time of the delayed or cancelled service or the missed connection, the passenger shall be entitled to conclude such a contract with other providers of public transport services by rail, coach or bus. The railway undertaking shall reimburse the passenger for the necessary, appropriate and reasonable costs that he or she incurs."

ensure that they had allowed adequate connecting time. However, it would involve a fundamental change in the role of ticket vendors (whether train operators or third-party vendors), from intermediaries selling products on a commission basis to organisations responsible for the reliability of the products and for meeting any associated obligations arising from passenger rights legislation. In discussions, many stakeholders noted that such a change in the business model of vendors would be impractical, since they were not able to manage downstream operational risks, and that allocating liability in this way would render third party vendors, in particular, unviable.

N.97 The views of these stakeholders echo those expressed by EPTO during our recent study on the framework of passenger rights legislation for the Commission[302]. Commenting on the issue of through-ticketing, EPTO noted that:

"…proposals have been suggested for ticket vendors to be made responsible for the performance of other operators downstream, where a through-ticket is issued, and for compensation to be made their responsibility where a connection is subsequently missed by a passenger due to this performance. It is the view of EPTO that such requirements are unreasonable, in holding one operator vicariously liable for the failure of another party, or indeed the effects of unavoidable and unforeseeable events on their ability to perform... There is a need for the responsibility to be jointly and fairly distributed between operators and passengers. The result will be, if an undue burden is placed on operators, an increase in ticket prices to recover that cost and risk, and that will apply to all passengers, whether making connecting journeys or not."

N.98 Some stakeholders also noted that this model raises further practical issues relating to the collection and dissemination of information on service punctuality and reliability and to the specification and publication of minimum connection times. These are also relevant to the other models considered here and are discussed in more detail below.

Liability for broken connections Model 2: liability allocated to the party causing the service disruption

N.99 At first sight, assigning liability to the party which causes the delay appears to be in line with the principle of efficient allocation of risk, and would provide an incentive on each party to minimise delays, subject to force majeure, as recognised in Article 19(10) of Regulation (EU) 2021/782. In addition, we identified some support for this model among stakeholders, for example ALLRAIL (representing independent passenger operators) and Snälltåget (an operator of long-distance services, including night trains, based in Sweden). In particular, Snälltåget told us that they accepted that they must deliver passengers' "reasonable expectations" in the event of disruption, and that they take responsibility for delays which they have caused.

N.100 However, while the principle underlying this model may have wider support among stakeholders, its implementation would raise several practical issues that railway networks in different states are often ill-equipped to address because they do not yet have in place the systems necessary to distribute real-time data relating to the arrival and the departure of

[302] Study on the EU framework for passenger rights, Steer for European Commission (2021) (Not yet published)

trains, as required in Article 10 of Regulation (EU) 2021/782[303]. First, the model assumes that it is possible to identify delays to services and attribute responsibility for them accurately from day to day and week to week. This is essential if passengers and railway undertakings are to determine both the extent of any delay and, in particular:

- whether a delay during the first leg of a journey has led to one or more of a broken connection, a missed connection, or a delay at the final destination;
- the cause of the delay, and the party agreed to be responsible.

N.101 In practice, some railways have established systems for accurately recording delays to individual trains and for attributing them to parties within or outside the industry[304]. For example, Deutsche Bahn sets out detailed processes for the coding of delay in its Network Statement[305], while the delay attribution principles currently in use in Great Britain extend to 168 pages[306], and more railways may develop such models with the introduction of additional railway undertakings as a result of the fourth railway package. However, many such systems rely on estimates of train positions and arrival times, and do not support the consistent documentation of reliable and auditable records of train times which would be needed for allocation of liabilities within a contractual or regulatory framework. For example, current systems cannot yet provide data on exactly when the doors are released when each train arrives at each station which, from the perspective of a passenger making a connection from the train, seems likely to be the most relevant measure of when a train actually arrived.

N.102 Second, the model relies on a common understanding of acceptable connection times since, without such an understanding, there might be frequent disputes over whether delays to a connecting train broke a subsequent connection. However, while all journey planners must make some assumption about minimum connecting times between trains, at present these need not be complete, accurate, consistent or publicised. Our investigation of data on connecting times in two Member States and Great Britain highlighted major differences in the extent to which such data is collected and published, as shown in the table below.

[303] Article 2(5) of Regulation (EU) 2021/782 states that "Until 7 June 2030 Member States may provide that Article 10 shall not apply where it is not technically feasible for an infrastructure manager to distribute real-time data within the meaning of Article 10(1) to any railway undertaking, ticket vendor, tour operator or station manager. At least every two years, the Member States shall reassess the extent to which it is technically feasible to distribute such data."

[304] However, Directive 2012/34/EU Annex VI requires only that "Wherever possible, delays shall be attributed to a single organisation, considering both the responsibility for causing the disruption and the ability to re-establish normal traffic conditions". Unlike Article 10 of the Regulation, the "wherever possible" does not expire in 2030. It is outside the scope of the study to carry out an evaluation of performance schemes, or what liability models the attribution process would support.

[305] Section 6.5.1, DB Netz AG Network Statement 2021 (2020)

[306] Delay Attribution Principles and Rules, Delay Attribution Board, April 2021 (2021)

Table N.11: Availability of minimum connecting time data

State	Minimum connecting time data consistently available?	Comments
Great Britain	✓	• Assumed minimum connection time is published for connection within all stations and for connection between many stations. • Journey planners do not offer connections with less than the minimum connecting time.
Germany	✗	• Assumed minimum connecting time is not stated. • Deutsche Bahn website identifies proposed connecting time and allows passenger to change it. • Other ticket vendors do not have access to this feature.
Spain	✗	• Assumed minimum connecting time is not stated. • Renfe website offers connections between its own services but not onto urban and suburban networks.

Source: Steer desk research and analysis.

N.103 The figure below shows an extract from the extensive information available online in Great Britain, which illustrates some of the potential complexities.

Figure N.48: Example of information on rail Minimum Connection Time

LONDON BLACKFRIARS is classified as a **LARGE** interchange station.

Minimum Connection Time is **3 minutes**, with the following exceptions:

Changing From	*Changing To*	Minimum Connection Time
London South Eastern Railwy (SE)	London South Eastern Railwy (SE)	**5 minutes**
London South Eastern Railwy (SE)	Thameslink And Gt Northern Tl (TL)	**5 minutes**
Thameslink And Gt Northern Tl (TL)	London South Eastern Railwy (SE)	**5 minutes**

FIXED LINKS	Hide these	
WHITECHAPEL		
TRANSFER	From 0001 until 0529	**20 minutes**
TUBE	From 0530 until 0659	**15 minutes**
TUBE	From 0700 until 1900	**10 minutes**
TUBE	From 1901 until 2359	**15 minutes**
LONDON VICTORIA		
TRANSFER	From 0001 until 0529	**21 minutes**
TUBE	From 0530 until 0659	**16 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 0700 until 1900	**11 minutes**
TUBE	From 1901 until 2359	**16 minutes**
LONDON CHARING CROSS		
TRANSFER	24 hours	**15 minutes**
LONDON FENCHURCH STREET		
TRANSFER	From 0001 until 0529	**27 minutes**
TUBE	From 0530 until 0659	**22 minutes**
TUBE	From 0700 until 1900	**17 minutes**
TUBE	From 1901 until 2359	**22 minutes**

Source: https://www.brtimes.com
Note: extract continues to show a total of 53 “fixed links”.

N.104 Great Britain began with an integrated network and on long-distances routes such as London-Birmingham and London-Manchester has services as frequent as every 20 minutes. Some stations allow interchange between frequent trains on multiple different routes. One station

can be served by over 100 trains per hour. National journey planning software has long been based on a public set of connecting times in which stations are classified by size, with minimum connecting times by time of day, and longer times where necessary for connections to and from international services which require check-in, security and passport control.

N.105 However, this approach can lead to difficulties and anomalies. One example is where an arrival at, and subsequent departure from, a station have different train numbers but are in practice operated by the same train. If the interval between arrival and departure is less than the minimum connecting time, the passenger will not be offered the connection even though, in practice, it is impossible for it to be broken[307]. Passengers who identify the connection and decide to risk the apparent tight connection might be concerned that it is running late but unaware that the connection is guaranteed.

N.106 It would in principle be possible to establish rules for calculating minimum connecting times and then to calculate and publish minimum connecting times at or between stations across Europe. However, the task would be complicated by the fact that minimum acceptable times will vary by type of service, journey purpose and the extent to which passengers are familiar with the station at which a connection is made.

N.107 Minimum connecting times of 3-5 minutes provided at London Blackfriars might be sufficiently reliable for passengers who are familiar with the station, or are connecting to frequent services, and whose tickets are open and valid on later trains.

N.108 However, trains operate from Blackfriars to two airports (Gatwick and London Luton) and Eurostar services from London St Pancras International to Belgium, France and the Netherlands. A passenger connecting to a flight or Eurostar might wish to be able to specify a much longer connecting time. ALLRAIL told us that a reasonable minimum connecting time for passengers connecting between long-distance journeys might be 30-40 minutes, and some passenger might wish to allow longer if connecting to a flight or Eurostar, both of which involve pre-boarding security checks. EU travel tech agreed that reasonable connecting times within the same station, or even between the same trains, could be very different for a passenger making an unfamiliar international journey and one who made the journey daily[308].

N.109 It would also be a major task to calculate the times and keep them up-to-date, especially if duplicated by multiple vendors and on a potentially inconsistent basis[309]. More specifically, this would require:

- an agreed set of rules for calculating times, to be applied across the European network;
- processes for ensuring they were kept up-to-date as timetables changed;
- mechanisms enabling them to be challenged where errors were identified or where they were otherwise considered unrealistic; and

[307] One of our team has twice made connections between two differently numbered flights, which proved to be operated by the same aircraft. This meant that it was impossible to miss the connection.

[308] Research in Great Britain has shown that different passenger identify different preferred connection times. Their preference may be at least partly related to the frequency of the service to which they are connecting.

[309] Minimum connecting times may vary temporarily during work at stations, or if services are diverted from one part of the station to another or even to a different station.

- processes for making them available to railway undertakings, ticket vendors and passengers.

N.110 The need for such arrangements raises the question of who should be responsible for establishing connecting times. One stakeholder told us that they did not have the specialist knowledge required to calculate such times, and in practice relied on those used by DB. However, while railway undertakings can and do set connecting times, at least for connections between their own services, if faced with liability for missed or broken connections they would have an incentive to specify long times to minimise the risk of compensating passengers for delays. This suggests that minimum connecting times could be set and published by a party independent of railway undertakings, such as an infrastructure manager, a competent transport authority, or an independent regulatory body[310]. In aviation, for example, it is common for airports to offer minimum connecting times to their customer airlines, who then take these into account in designing the connections they offer to their passengers[311].

N.111 A third practical issue arising in the implementation of this option concerns passengers using urban or suburban services to make part of their journey. In general, railway undertakings carrying passengers over a very short distance, for a very low fare, are likely to be reluctant to accept liability related to a missed connection to a much longer and more expensive journey. In some cities, for example, passengers might travel only a few hundred metres on one service before connecting to a regional, long-distance or cross-border train. Unless protected by large minimum connecting times, the potential liability to the first railway undertaking might be large compared with the fare they receive[312]. More generally, the extent to which the concept of through-ticketing, and any associated allocation of liability, should cover urban and suburban services (which may or may not be within the scope of the rail passenger rights legislation) is open to question[313].

N.112 Finally, any package of passenger rights under which passengers are entitled to assistance, compensation and reimbursement is likely to be subject to abuse or fraud. We did not ask about fraud in the stakeholder questionnaire or interviews, and fraud was only spontaneously mentioned by one stakeholder. Nonetheless, we would expect that railway undertakings and/or ticket vendors might raise the issue of fraud if consulted on the details of some of the proposed measures. Fraud is particularly an issue for the rail industry, where passengers' names are rarely identified on a ticket, and checks of tickets are rare on boarding and often en route. This makes railway undertakings particularly open to passengers fraudulently reusing tickets or falsely claiming to have been on a train which was delayed. While there is no obvious benefit to a passenger in deliberately missing a connection, we identified cases where it is possible to book an unwanted onward journey, at no extra cost, in the hope of entitlement to compensation for a missed connection.

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[310] One stakeholder suggested that the ERA could be responsible for defining and publishing minimum connecting times.

[311] Note that the minimum connecting time is offered by the airport to the airline, not to the passenger.

[312] Note that trains operating a long-distance or regional rail passenger services may also carry passengers short distances at fares set and collected by an urban or suburban competent authority.

[313] Non-rail services such as metro, light rail and bus, which may be required to connect between trains in some cities, are outside the scope of the rail passenger rights legislation, which is limited to railway undertakings.

N.113 Railway undertakings have developed a range of approaches to minimising or mitigating abuse and fraud, particularly where passengers use smartcards, and "big data" techniques can be used to detect suspicious patterns of behaviour. However, any extension of passenger rights would need to ensure that all industry parties, and in particular railway undertakings, competent authorities and other ticket vendors, could limit their exposure to abuse and fraud.

Liability for broken connections Model 3: delayed passengers permitted to rebook on later services of the railway undertaking whose services they missed

N.114 The third model identified for assigning liability would be for passengers missing a departure because they have been delayed being allowed to travel on any of the later services of the railway undertaking whose service they had missed, but not on other services or modes. This arrangement would not require the involvement of any other parties, including the party or parties who had caused the delay.

N.115 This could build on the existing voluntary agreement between railway undertakings regarding passengers who miss connections, the Agreement on Journey Continuation (AJC)[314]. In principle, if railway undertakings are already willing to accept liability Business-to-Business (B2B) on a voluntary basis through the AJC, it might be possible to require this arrangement to be extended to cover the Business-to-Consumer (B2C) relationship, enabling passengers to exercise their rights under the legislation more easily.

N.116 One option would be to require railway undertakings to take part in the AJC or a new agreement with the same effect, and to publicise its existence to passengers. We suggest that, within this framework, a two-stage approach could be implemented as follows:

- First, on booking a journey involving the use of more than one successive train, passengers would have the right to be issued an itinerary, listing the services on which they were intended to travel, and confirming that the relevant minimum connecting times had been included. Such an itinerary could be checked against official and published connecting times, and the ticket vendor held liable if these were not honoured. Note that it could be produced even if a passenger already held a ticket for part of their journey, provided that it was valid on, and they used it to travel on, the service or services shown in the itinerary.
- Second, if a passenger missed an onward connection, the undertaking providing the onward service would be required to allow them to travel, at no charge, on its own next available service or services with spare capacity. The railway undertaking would not, however, be required to provide the assistance such as meals and refreshments, hotel or other accommodation, specified in Article 20(2) of Regulation (EU) 2021/782.

N.117 One travel agent and ticketing body agreed that protection can be achieved by expanding normal CIV missed-connection rights to passengers making through journeys on multiple tickets. He noted that this approach was supported by most open-access operators as commercially sensible, because it costs nothing to rebook a delayed passenger on an unsold seat on a later train. In practice, the costs of occupying a seat are limited to wear and tear and cleaning, and a passenger with an open ticket may be able to re-route themself onto another

[314] We note, however, that while the AJC is in the public domain, one stakeholder indicated that railway undertakings do not publicise the AJC and that some third-party ticket vendors are not aware of it. The same stakeholder further suggested that if the AJC is to be of a real benefit to consumers, railway undertakings must be more transparent on which journeys are covered by it.

train on which it is valid without any assistance. However, staff or systems to identify the passenger's situation and rights, to provide information, or to issue a new reservation and/or ticket, even on one or more other services of the same railway undertaking, all impose at least some cost.

N.118 Implementation of this model would require resolution of several of the practical issues previously described for Model 2. In particular, Model 3 would similarly rely on accurate recording and attribution of delays and the publication of minimum connection times as well as measures to reduce the risk of abuse and fraud.

N.119 In addition, Model 3 raises a further specific issue, since it also relies on passengers and railway undertakings taking action to change the itinerary during a journey. In practice, this may be difficult to arrange, since many rail passengers make connecting journeys without any access to customer-facing staff, particularly when travelling on driver-only trains or at unstaffed stations. It is therefore not clear how any information or assistance tailored to their needs could be delivered to passengers in such situations, particularly where digital communication channels were unavailable. It seems likely that, in many cases of delays or cancellations, passengers might still need to make their own decisions, perhaps informed by any online real time service information to which they have access, and then claim any assistance, reimbursement or compensation after their journey was complete and their entitlement could be confirmed.

Summary of models for the allocation of liability

N.120 The table below summarises our initial review of models for allocating liability for missed connections or broken connections. As in the case of models of through-ticketing, we considered the extent to which each approach delivers the anticipated benefits and commented on the implications of implementing the model.

Table N.12: Initial review of liability models

Model	Benefits		Comment
	Single point of accountability	Clear and efficient allocation of risk	
1. Liability allocated to ticket vendor	●	●	• Strongly rejected by many stakeholders. • Requires fundamental change in business model of ticket vendors. • Could result in third-party vendors leaving the market.
2. Liability allocated to delay perpetrator	●	●	• Would require substantial improvements in systems for measuring/attributing delay across Europe. • Would require agreed minimum connection times to be published and regularly updated. • Could be open to abuse and fraud without further investment in systems to mitigate this.
3. Re-routing under an extended AJC	●	●	• Would require substantial improvements in systems for measuring delay across Europe. • Would require agreed minimum connection times within and between stations to be published and regularly updated. • Could be open to abuse and fraud without further investment in systems to mitigate this. • Raises further implementation issues, given lack of railway undertaking staff on trains and at stations.

Source: Steer analysis.
Key: ● indicates that the benefit is fully delivered, ● indicates that it is not delivered.

N.121 We conclude that definition of a liability allocation scheme for broken and/or missed connections that could deliver passenger rights is difficult without first devising a robust definition of rights and the circumstances under which they would apply. As a starting point, "through-ticketing" and "missed connection", and the roles of railway undertakings, ticket vendors, (probably) competent authorities and (possibly) infrastructure and station managers, would need to be defined in a sufficiently robust way that their obligations are clear and cannot easily be evaded. Whatever the definition of through-ticketing and missed connections, and the framework of rights, several technical challenges will be needed to make them valuable to passenger, deliverable in practice, and not unduly exposed to abuse and fraud.

N.122 Nonetheless, a potential approach, which appears to minimise the need to transfer payments between parties, would be Model 3, building on the existing AJC to establish a mechanism whereby railway undertakings provided free re-routing of passengers booked on their services who could show that they had intended to make a journey in which the recognised connecting time had been allowed for any connections. However, any such approach would still need to be supported by systems to record delays accurately and to identify, and keep up-to-date, minimum connecting times on which passengers, ticket vendors and railway undertakings could rely.

Models for end-to-end ticketing and supporting clearing arrangements

N.123 In accordance with the Task Specifications for the study, we considered possible models "to offer general through-ticketing in the Union, including any clearing house and existing best practices". The models discussed below cannot all be described as enabling through-ticketing as defined in the new Regulation, because they do not necessarily ensure the selling of successive train services as a single contract by a railway undertaking. We therefore refer to them as models for end-to-end ticketing, as defined in Table N.1.

N.124 However, they highlight different ways in which the anticipated benefits of through-ticketing might be delivered at a European level. After describing each model, we summarise their relative merits, noting in particular the extent to which they might:

- simplify journey planning for passengers, by enabling them to buy successive tickets in a single transaction and ensuring the availability of competitive end-to-end fares;
- support passengers by providing protection in the event of a missed connection; and
- the challenges that would need to be overcome in their implementation.

End-to-end ticketing Model 1: airline style ticketing

N.125 The global airline ticketing, reservation and settlement systems was developed in the 1940s when airlines operated infrequent services over mainly short distances, and cancellations and disruption were more common. Travel between minor cities, or between continents, might require the use of two or more airlines offering infrequent connections, with different airlines connecting on different days of the week. A missed connection, or a delayed or cancelled flight, might create a need to re-route a passenger on a different airline or airlines.

N.126 The solution adopted by IATA, the airlines' trade association, was a system of regulated but interavailable fares. Fares between two points were potentially valid on any airline or combination of airlines linking them, subject to a maximum mileage flown[315]. Where no fare existed, it was calculated from the fares for the component journeys, using agreed formulae for apportioning and discounting the sum of the fares. Tickets took the form of a book of coupons for each sector on an itinerary, each of which could remain open or include a reservation on a specific flight. In addition:

- An airline with a delayed or cancelled flight could access its competitors' reservation systems and re-route its passengers onto their flights.
- A passenger holding a flexible ticket with a reservation on one airline could ask the airline to endorse the ticket to allow them to travel on another airline.

N.127 Tickets remained valid even if a passenger missed a flight, but when passengers checked in to fly, the airline collected the coupon for that sector and issued a boarding pass and seat number:

- Settlement of fares between airlines, when necessary, was facilitated by each airline's possession of the flight coupons as evidence that the passenger had used their service.

[315] A Lisbon to Stockholm ticket might have been accepted on direct flights by TAP or SAS, via Madrid on Iberia, London on British Airways, Paris on Air France, Amsterdam on KLM, Frankfurt or Munich on Lufthansa, Zurich on Swiss and Vienna on Austrian, or any other route within the maximum mileage.

- Passenger fraud was difficult, because tickets and boarding passengers carried the passenger name, which could be checked at boarding.

N.128 The system delivered a number of passenger-friendly features:

- Passengers could book complex itineraries with a single transaction, ticket and fare[316].
- Passengers could be offered assistance and re-routing at airports, and airlines could re-route passengers onto competitors, subject to space being available.
- Passengers could be given refunds and compensation, because a clear record existed of which parts, if any, of their itinerary were completed, delayed or cancelled.

N.129 Over time, the system has successfully been adapted to deal with changes in the industry.

N.130 Fare liberalisation allowed airlines to undercut the full IATA fare with cheaper but more restricted fares, including lower fares only on their flights or connections[317]. Subject to the approval of the competition authorities, airlines also began to form alliances which could share costs and revenues and offer passengers a wide range of connections and routings through their networks[318]. Alliances of airlines had less need for their tickets to be interavailable, or shared, with airlines outside the alliance, and increasingly agreed how to set and share their own fares. One consequence was that the full interavailable IATA fares became increasingly irrelevant, as alliances of individual airlines almost invariably offered a lower fare valid on relatively frequent services. The fully interavailable fares were withdrawn in 2018. Paper tickets are no longer issued, and boarding passes may be printed at home or displayed as a QR code on a mobile device.

N.131 With these exceptions, the system still provides for the full flexibility and functionality described above, but the full IATA system requires a number of features not found in the rail industry:

- Operators accept common rules for the setting and apportioning of end-to-end fares.
- Tickets bear the passenger's name.
- Tickets are issued through a common system using a standard technology.
- Operators have staff at boarding points who can collect tickets or, in the event of disruption, re-route passengers onto a competitor's service.
- Fares which are not tied to one airline can be settled through an industry system.
- Tickets collected by airlines act as proof that the revenue has been earned for settlement.

N.132 For the low-cost airlines which emerged in the 1990s, this complexity, and the associated costs, were seen as unnecessary. Low-cost airlines normally work outside the IATA system and

[316] One of our team booked, with a single transaction, ticket and fare, an itinerary for London/Dar-es-Salaam/Kilimanjaro/Nairobi/Rome followed by Pisa/Genoa/Frankfurt/London. The Nairobi to Rome sector was booked on Kenya Airways but endorsed in Nairobi to allow the passenger to fly on Alitalia.

[317] As described in the case study above, in Great Britain similar system for rail fares, full interavailable fares are often undercut by individual railway undertakings, and split-ticketing can be cheaper than buying an end-to-end fare.

[318] A Lisbon to Stockholm fare might, in principle, be offered by Star Alliance (valid direct on TAP or SAS, or connecting on Lufthansa, Austrian or Swiss), by Oneworld (connecting on British Airways or Iberia) or by SkyTeam (connecting on Air France or KLM). Each airline or alliance could attract passengers onto connecting flights by selling spare seats at lower fares to attract passengers from direct flights.

instead sell only point-to-point fares on each flight, enabling them to remove all need for setting and offering end-to-end fares, planning or providing connections, or settling fares shared with other airlines. This is broadly similar to the way most railway undertakings offer fares only within their network or, in some cases, on individual trains.

N.133 For the rail industry to adopt the features of the original IATA system would involve major changes to the autonomy of railway undertakings and competent authorities at national, regional, suburban and urban level, with fares, and their apportionment between operators, set by industry-wide agreement. In addition, if railway undertakings were required to accept fares over which they had little or no control, it is not clear whether and to what extent they would be willing to accept revenue risk and operate commercially[319]. Implementation of the model would require legislation to mandate the introduction of pan-European ticketing and settlement arrangements, including (and potentially going beyond) the elements of Option 3 from the recent report on "Remaining challenges for EU-wide integrated ticketing and payment systems" (see Table N.7).

N.134 In addition, much of the functionality offered by the airline system is of limited value in the rail industry, which has few long-distance passengers and lacks the choice of overlapping alliance networks connecting distant points. Direct competition between operators on some routes exists[320], but:

- It is rare for a journey to be possible by two or more routes served by different railway undertakings or combinations of them.
- On journeys long enough to be possible by several routes, such as Lisbon to Stockholm, there are rarely sufficient passengers to justify the agreements between railway undertakings which would be necessary to set and settle an end-to-end fare. We note that the low-cost airlines do not set end-to-end fares within their own networks, and offer each flight as a separate transaction, ticket, contract and fare.

N.135 We conclude that:

- The rail industry would find it difficult to introduce the agreements, systems and staff required to provide the features offered by the airline industry.
- The rail networks offer very few opportunities for passengers to choose between competing operators or routes.
- Where such opportunities exist over long-distance journeys, there may be too few passengers for the railway industry to find it worthwhile to introduce the agreements and systems needed to set and share end-to-end fares.

End-to-end ticketing Model 2: a Europe-wide ticketing and settlement agreement

N.136 In principle the airline ticketing system could be simplified to reduce some of the costs but retain most of the benefits. In Great Britain's ticketing and settlement system, described in the case study above:

- Tickets do not bear the passenger's name.

[319] Reform of fares in Great Britain, which is now being proposed, may result in all PSC contractors effectively becoming gross cost contractors obliged to accept fares set by or for competent authorities.

[320] Such as between DB and FlixTrain in Germany, NTV and Trenitalia in Italy and MTRX and SJ in Sweden and the emerging competition between Renfe, ILSA-Trenitalia and OUIGO on high-speed lines in Spain.

- Operators do not have staff at boarding points to collect tickets or re-route passengers onto competitors' services.
- Tickets are not collected as proof of settlement, which is instead on the basis of the ORCATS model of which trains passengers would use for each journey.

N.137 In principle, it would be possible to introduce a Europe-wide ticketing and settlement agreement, administered by an independent third party, similar to that in place in Great Britain. This would not ensure through-ticketing as defined, but would allow tickets for journeys involving successive train services to be purchased as a single transaction and provide a centralised system for clearing, and could deliver protection in the case of broken connections.

N.138 As an illustration of the structural changes needed if fares across Europe were to become origin and destination-based rather than train-based, the Man in Seat 61, speaking at a webinar on 11 May 2021[321], asked who would set the fares from Helsinki to Palermo.

N.139 We identified the following options, all of which raise difficulties:

- All operators in the EU could be required to revert to distance-based or "kilometric" fares. However, this would reverse and remove most of the innovations in fares and ticketing introduced over the last 30 years and leave the railways at a disadvantage compared to airlines and coach operators who continued to apply market pricing.
- All operators in the EU could be required to share fares set by a lead operator. Assuming processes could be agreed for defining lead operators and sharing the fares they set, this would mean that railway undertakings and competent authorities would often be required to accept a portion of fares set by a party in another state.
- All operators in the EU could be required to share fares set by a central body, effectively creating a single pricing agency for all Europe.

N.140 Note that while it would not be necessary to set fares for every origin-destination combination across the European network[322], the level of coordination and investment required would nevertheless be substantial, not least because of the need to establish fare-setting protocols and a clearing system in which participating operators had confidence.

N.141 In addition, such a system could only create limited benefits to passengers, for the reasons set out above:

- It may not be possible for a long-distance journey to be made by two or more routes served by different railway undertakings or combinations of them.
- There are rarely sufficient rail passengers on a long-distance flow, such as Lisbon to Stockholm, to justify the agreements between railway undertakings which would be necessary to set and settle an end-to-end fare.

N.142 We conclude that, while cheaper to implement than the full airline model, a Europe-wide ticketing and settlement system could offer protection related to broken connections, but

[321] Night time on European Rails: The rise of night trains in Europe, Online discussion hosted by the Heinrich Böll Stiftung.

[322] In Europe, there are over 32,000 railway stations (see RMMS 7, Table 45) and hence over a billion possible station-to-station journeys.

would be difficult to introduce, might only benefit a small number of passengers, and might not lead to the introduction of material numbers of end-to-end fares.

End-to-end ticketing Model 3: industry-led initiatives

N.143 The industry has made some progress in developing an end-to-end or through-ticketing offer, although from the perspective of passengers it remains limited. In principle, it would be possible to rely on further, industry-led development of ticketing options that built on established bi- or multilateral agreements between train operators, such as between DB and ÖBB, enabling them to sell tickets for journeys between Germany and Austria as a single transaction, ticket, contract and fare.

N.144 This model largely describes the current situation, and its impact could be measured by reference to the expected developments of end-to-end ticketing, through the roll-out OSDM and other systems, in the absence of further policy intervention.

N.145 A model of this kind could be supported with direct clearing between the parties, without the need for centralised clearing arrangements. However:

- We have seen little evidence that, or how, a patchwork of different bilateral agreements can evolve into a single multilateral agreement.
- The outcome of bilateral agreements often reflects the relative bargaining power of the participants, which can disadvantage small parties[323] including new entrant railway undertakings.

N.146 In time, the availability of end-to-end or through-tickets might improve through increasing participation of train operators and ticket vendors in OSDM and/or take-up of the outputs of S2R's Technology Demonstrators. However, OSDM is not a reference standard and it is not yet clear how many railway undertakings will support it, what commercial conditions they will offer to ticket vendors and other railway undertakings, how much it will be used, or in which passenger markets. It would be for industry players to determine the commercial case for undertaking the investments necessary to take part in, implement, and use, OSDM or any other industry-led initiatives.

N.147 We stress, however, that we have not completed an impact assessment of such a model or even established what would happen if it were left to industry to develop initiatives.

Summary of models for end-to-end ticketing

N.148 Our discussions with stakeholders demonstrated that there is no clear consensus on which, if any, of these models represents an appropriate way forward. One stated that they believed in the development of market-based initiatives and voluntary agreements between carriers and third-party vendors, as in other markets. Two stakeholders said that common standards should be defined, such as an EU standard for encoding ticket information into a defined, standard format interoperable paper or digital QR code. Another stakeholder said that all companies should be required to share their data on one centralised and easily accessible platform.

[323] At the study conference, stakeholders mentioned that passengers in small Member States may be reliant on terminating or transit services provided by railway undertakings in larger Member States.

N.149 The table below summarises our findings based on stakeholder comments and our own research and includes, for information, the model currently used by the low-cost airlines.

Table N.13: Initial review of end-to-end ticketing models

Model	Passenger benefits								Comment
	Purchase			Pricing				PR	
	Single contract	Single transaction	Single ticket	End-to-end fares	Market priced end-to-end fares	Fares valid on any operator	Fares allowing multimodal travel	Protection for missed connections	
1. Full airline ticketing	🟡	🟢	🟢	🟢	🟡	🟢	🔴	🟢	• Expensive but established and flexible. • Requires passenger name on tickets. • Requires staff at boarding points. • Requires extensive settlement systems.
2. Europe-wide rail ticketing and settlement agreement	🟡	🟢	🟢	🟢	🔴	🟢	🟡	🟡	• Could build on existing initiatives such as NAPs and OSDM. • Requires investment and coordination across the European rail sector. • Requires legal agreement on fare-setting and revenue-allocation protocols and supporting methodologies and systems. • Exists on a limited network, as with DB/ÖBB, but expansion might require further rules and systems.
3. Rail industry led	🔴	🟢	🟡	🟢	🔴	🔴	🟡	🟡	• Expansion of the European through-ticketing offer would depend on market take-up of OSDM and other innovations, and the pace of change might be limited. • No requirement for centralised settlement. • Risk that bi- or multilateral agreements would constrain market entry, unless mitigated by guidance and ongoing scrutiny from competition authorities.
Low-cost airline ticketing	🔴	🔴	🔴	🔴	🔴	🔴	🔴	🔴	• Each flight has a separate transaction, contract, ticket and fare. • Connections are not offered.

Source: Steer analysis.

Key: 🟢 indicates that the benefit is fully delivered, 🟡 indicates that it is partially delivered, 🔴 indicates that it is not delivered.

N.150 In summary, the choice between potential models for end-to-end ticketing for the industry is one of the balance for the industry between:

- On the cost side, agreeing to adopt the common systems and processes of the airline industry, with the exception of the presence of staff to control boarding or to offer assistance or re-routing.
- On the benefit side, higher net revenues from passengers buying end-to-end fares. As noted above, the low-cost airlines operating within Europe do not set end-to-end fares and instead offer each flight as a separate transaction, contract, ticket and fare.

N.151 We conclude that, while it would in principle be possible to legislate to require railway undertakings to participate in an end-to-end ticketing system, the evidence from the low-cost airline industry suggests that few railway undertakings would jointly set end-to-end fares for the use of successive services.

Summary of conclusions on further research

N.152 We end this Annex with a brief summary of the further research described above.

The potential impacts of wider through-ticketing on passengers

N.153 Wider through-ticketing might, in principle, incentivise railway undertakings to operate more punctual services with shorter connecting times. In practice, we note that it is possible that they will either offer through-tickets only at prices which make them unattractive, or extend connecting times to minimise their liability.

N.154 Wider through-ticketing may contribute to ease of booking, but its impact would depend on the liability model adopted and the extent to which parties such as ticket vendors were able and willing to offer through-tickets.

N.155 Wider through-ticketing might, in principle, result in a wider offer of market-based fares and promotions, but the evidence from the low-cost airlines, and the lack of end-to-end fares between TGV and Thalys, suggest that railway undertakings may find little commercial value in developing special fares except in dense passenger markets.

The potential impacts of wider through-ticketing on railway undertakings

N.156 The costs to railway undertakings will depend on what liability they bear and whether they are able to mitigate it. As noted above, they may either offer through-tickets only at prices which make them unattractive, or extend connecting times to minimise their liability.

Models for the allocation of liability for missed connections

N.157 All models of liability have disadvantages, typically related to the need to apportion responsibility, to inform the passenger of the party responsible, and to move information and payment between the parties. Allocation of liability will not change the underlying features of the rail industry, which can track trains but rarely tracks passengers or has staff available to provide assistance.

Models for end-to-end ticketing and supporting clearing arrangements

N.158 The legacy airlines often offer good end-to-end ticketing, but the low-cost carriers often offer none. However, and as noted in paragraph N.155, the evidence suggests that railway undertakings may find little commercial value in developing special fares except in dense passenger markets.

O Obstacles: creating cross-border PSOs

Introduction

O.1 The Technical Specifications required us to examine several issues related to PSOs for the operation of cross-border services:

- to identify cross-border PSO schemes for rail services in the study area of the EU plus Norway, Switzerland and the United Kingdom in the 2020 timetable (Task 3.2.6.1);
- to identify long-distance cross-border rail services operated by combining a PSO-leg and a leg operated under an open access regime in the 2020 timetable (Task 3.2.6.2);
- to identify PSO-schemes for domestic night train services in the study area in the 2020 timetable (Task 3.2.6.3);
- to identify and describe in detail, for the three above-mentioned types of services, the institutional, procedural and contractual arrangements in place and their financial features (Task 3.2.6.4); and
- to analyse, in conjunction with the work performed under Task 3.1, what types and structures of PSO schemes would be suitable to support:
  - ramp-up costs of a European network of cross-border night trains; and, if deemed necessary
  - a permanent European network of cross-border night trains.

O.2 In this Annex we discuss in turn:

- cross-border rail PSO schemes within the study area;
- long-distance cross-border services with PSO and open access legs;
- PSO schemes for domestic night trains;
- PSO institutional, procedural, contractual and financial features; and
- potential PSO models to support cross-border night trains.

Definitions used in this Annex

O.3 **Cross-border rail connection** means a railway line linking two relevant countries. In 2017 and 2018, KCW led the study "Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders" for DG REGIO and DG MOVE, which compiled a full list of all current and historical cross-border rail connections along the land borders between the EU-27 states, the United Kingdom, Norway and Switzerland.

O.4 **Public Service Obligation** (PSO) means a requirement defined or determined by a competent authority in order to ensure public passenger transport services in the general interest that an operator, if it were considering its own commercial interests, would not assume or would not assume to the same extent or under the same conditions without reward.

O.5 **Public Service Contract** (PSC) means one or more legally binding acts confirming the agreement between a competent authority and a public service operator to entrust to that public service operator the management and operation of public passenger transport services subject to public service obligations; depending on the law of the Member State, the contract

O.6 may also consist of a decision adopted by the competent authority:

- taking the form of an individual legislative or regulatory act, or
- containing conditions under which the competent authority itself provides the services or entrusts the provision of such services to an internal operator.

O.7 **Open access** is a passenger rail service, either domestic or which uses cross-border rail connections between two or more states, which is not specified by a PSO in any of them. This definition applies whether the service is operated by an incumbent railway undertaking, as with DB's ICE Frankfurt-Cologne-Brussels services, or by a new entrant, as with RegioJet's Prague-Vienna services.

Cross-border rail PSO schemes within the study area

O.8 We began by identifying cross-border PSO schemes for rail services in the study area of the EU plus Norway, Switzerland and the United Kingdom in the 2020 timetable.

Data sources

O.9 In the 2017 and 2018 study "Comprehensive analysis of the existing cross-border rail transport connections and missing links on the internal EU borders", KCW compiled an inventory of cross-border rail connections within the scope of that study, the EU, EEA and EFTA internal borders. We used this inventory as the basis for this task.

O.10 The inventory identified 156 rail border crossings with regular passenger services in the 2017 timetable. We updated it using the European Rail Timetable (ERT) February 2020 edition, the last before public transport services in many parts of Europe were significantly reduced as a result of the COIVID-19 pandemic. In the 2020 timetable we identified 168 cross-border rail connections with regular passenger services, including services that should have operated on a seasonal basis but did not do so due to the pandemic.

O.11 Between 2017 and 2020:

- One cross-border connection had been abandoned, the service between Puttgarden in Germany and Rødby in Denmark, which was withdrawn as a preliminary measure for the construction of the Fehmarn Belt tunnel.
- Additional services appeared on entirely new or refurbished connections, such as the interurban Léman Express between Geneva in Switzerland and Annemasse in France or Mendrisio in Switzerland and Varese in Italy, or on connections which only had freight services in 2017, such as between Daugavpils in Latvia and Turmantas in Lithuania.

O.12 In the 2017 inventory, we recorded the competent authorities for PSOs. We used this information, and our market knowledge, to determine the PSO status of long-distance and regional services on most of the 168 relevant cross-border rail connections in the study area. Where necessary, we gathered additional information from stakeholders.

O.13 We found that, of the 168 cross-border rail connections with regular passenger services:

- 148 (88%) had at least one regional service, all of which were the subject of a PSO.
- 74 (44%) had at least one long-distance service.

Cross-border regional services

O.14 For at least 8 of these 148 regional services, only one competent authority was involved in the PSO, despite the services crossing a border. We found examples where a PSO specified in

country A included and financed a section of service in country B, such as the Retz-Znojmo line between Austria and Czechia.

O.15 In other cases we understand that there were informal arrangements to finance services in country B without their formal inclusion in the PSO in country A, such as between Germany and Poland, where German regional services extended a short distance across the border.

Long-distance cross-border services

O.16 As noted above, we identified 74 cross-border rail connections with long-distance services. The table below lists the 52 of these 74 long-distance services with PSO schemes on one or both sides of the border.

Table O.1: Cross-border rail connections with long-distance services under PSO schemes in 2020

State A	State B	Border station A	Border station B	PSO schemes	
				One side	Both sides
AT	CZ	Bernhardsthal Hst	Břeclav		●
AT	CZ	Summerau	Horní Dvořiště		●
AT	HU	Mogersdorf	Szentgotthárd		●
AT	HU	Nickelsdorf	Hegyeshalom	●	
AT	IT	Arnoldstein	Tarvisio Boscoverde		●
AT	LI	Tisis	Nendeln		●
AT	SI	Rosenbach	Jesenice		●
AT	SI	Spielfeld-Straß	Šentilj		●
AT	SK	Kittsee	Bratislava-Petržalka		●
BE	FR	Mouscron	Tourcoing		●
BE	FR	Froyennes	Baisieux		●
BE	FR	Quévy	Maubeuge	●	
BE	FR	Erquelinnes	Jeumont	●	
BE	LU	Arlon	Kleinbettingen		●
BE	LU	Gouvy	Troisvierges		●
BE	NL	Essen	Rosendaal		●
BE	NL	Antwerpen Centraal	Rotterdam Centraal	●	
BG	EL	Kulata	Promachon		●
BG	RO	Vidin	Golenți		●
BG	RO	Ruse	Giurgiu Nord		●
CZ	DE	Dolní Žleb	Schöna	●	
CH	AT	St. Margrethen	Lustenau	●	
CH	IT	Brig	Iselle di Trasquera		●
CH	IT	Camedo	Ribellasca		●
CH	IT	Chiasso VG	Como S. Giovanni	●	
CH	IT	Campocologno	Tirano	●	
CH	LI	Buchs SG	Schaan-Vaduz		●

State A	State B	Border station A	Border station B	PSO schemes	
				One side	Both sides
CZ	DE	Česká Kubice	Furth im Wald		●
CZ	SK	Mosty u Jablunkova zastávka	Svrčinovec zastávka		●
CZ	SK	Střelná	Strelenka		●
CZ	SK	Lanžhot	Brodské		●
DE	AT	Passau	Wernstein	●	
DE	CH	Bietingen	Thayngen	●	
DE	CH	Weil (Rhein)	Basel Badischer Bahnhof	●	
DE	DK	Flensburg	Padborg	●	
DE	NL	Emmerich	Zevenaar	●	
DE	NL	Bad Bentheim	Hengelo	●	
DK	SE	Københavns Lufthavne Kastrup	Malmö		●
ES	FR	Port-Bou	Cerbère	●	
ES	PT	Fuentes de Onoro	Vilar Formoso		●
HU	HR	Gyékényes	Botovo		●
HU	RO	Biharkeresztes	Episcopia Bihor		●
HU	RO	Lökösháza	Curtici		●
HU	SK	Szob	Štúrovo		●
HU	SK	Hidasnémeti	Čaňa		●
IE	UK	Dundalk	Newry		●
PL	CZ	Chałupki	Bohumín	●	
PL	CZ	Zebrzydowice	Bohumín	●	
SE	NO	Riksgränsen	Bjørnfell		●
SI	HR	Ilirska Bistrica	Šapjane		●
SI	HR	Dobova	Savski Marof		●
SI	HU	Hodoš	Bajansenye		●

Source: KCW analysis.

Long-distance PSO schemes on both sides of the border

O.17 On 35 cross-border rail connections, there were long-distance PSO schemes on both sides of the border, although there may be short sections from the last station in a country to the border not explicitly covered by PSO. The Romanian Ministry of Transport informed us that this is the case between Curtici in Romania and the border with Hungary. However, long-distance services on this route are covered by PSO schemes on both intra-Romanian and intra-Hungarian sections. We concluded that the short cross-border section should be considered to be part of a PSO service rather than, for example, an open access "bridge" linking two PSO services. We note, however, that in the absence of a PSO there is no contractual requirement to operate across the border.

O.18 In a similar situation in 2012 in Croatia, proposals were made to cut up to 56 cross-border services per day not protected by a PSO. Incumbent operator HŽ Putnički prijevoz d.o.o (HŽ)

noted that its PSO compensation applied exclusively to domestic transport, and that international transport is based entirely on market principles[324]. Analysis suggested that 46 of 56 cross-border routes carried an average of only 31 passengers per train and collectively lost HRK 38.6 million per year. HŽ appeared to invite competent authorities in neighbouring states to support the services.

O.19 From outside Croatia, this appeared as an imposition of access charges followed by a request for subsidy because they had made the service unprofitable. A Serbian magazine reported that "Until recently, European railway administrations dealing with international traffic took over the costs of using the infrastructure, each on its own territory, but now it is becoming almost a regular practice to charge a fee. At the end of last year, due to excessive fees in Italy and Austria, the Serbian railways were left without certain direct international lines."[325]

Long-distance PSO schemes on only one side of the border

O.20 On 17 cross-border rail connections, there were long-distance PSO schemes on only one side of the border, meaning that the service combined a PSO and non-PSO leg.

Long-distance open access services

O.21 On 27 cross-border rail connections, at least one long-distance service was fully commercial open access, including those which were infrequent or seasonal. In most cases, the open access service paralleled one or more PSO services between at least some pairs of stations.

O.22 Note that a single long-distance open access service might use more than one of these cross-border rail connections. For example, the 2020 seasonal RegioJet night service between Prague in Czechia and Rijeka in Croatia used three cross-border connections. In 2020, this service used the cross-border rail connections with no other open access passenger services:

- Slovakia to Hungary, between Rusovce and Rajka;
- Hungary and Slovenia, between Bajansenye and Hodoš; and
- Slovenia and Croatia, between Ilirska Bistrica and Šapjane.

O.23 On 22 cross-border rail connections, only the long-distance services were open access, but 17 of these cross-border rail connections also had regional PSO services.

O.24 On only 5 cross-border rail connections were all the rail services provided entirely under open access:

- France and Belgium (Lille/Paris and Brussels) by Eurostar and Thalys;
- France and the United Kingdom (Calais-Fréthun and Ashford International) by Eurostar;
- France and Spain (Perpignan and Figueres Vilafant) by Montpellier-Barcelona services;
- France and Spain (Hendaye and Irun) by the Sud Express night train to and from Lisbon (there are regional cross-border services on the parallel metre gauge link); and
- Sweden and Norway (Charlottenberg and Magnor) by Stockholm-Oslo services.

O.25 In summary, services supported by PSO are the predominant type in the organisation of cross-border rail transport:

- 100% of regional cross-border services were the subject of a PSO.

[324] https://web.archive.org/web/20121112213723/http:/www.hznet.hr/medunarodni-prijevoz

[325] https://www.6yka.com/novosti/hrvatska-ukida-10-vozova-ka-srbiji

- 70% of long-distance services (35 plus 17 of 74) of cross-border connections had at least one PSO on at least on one side of the border.
- Full open access service are rare in cross-border rail transport.

Long-distance cross-border services with PSO and open access legs

O.26 We next examined long-distance cross-border rail services which in the 2020 timetable were operated by combining a PSO leg and a leg operated under an open access regime. We used the data described above plus additional information provided by stakeholders. However, complete analysis was made difficult because:

- Competent authorities are not required to report details of PSOs to the Commission.
- Railway undertakings are not required to report non-PSO services to the Commission.

O.27 We noted above that there may be short sections between the last station in a country and the border which are not explicitly covered by PSO, but we treated these as PSO services.

Findings

O.28 We found that all the mixed long-distance cross-border services in 2020 were operated by incumbent operators.

O.29 We noted above that 17 cross-border rail connections had long-distance PSO schemes on only one side of the border, implying that the extension across the border is operated commercially.

O.30 Most of these mixed services were around Germany, which has no PSO competent authority at the federal level. For instance, international services between Austria and Germany are covered by a general Austrian PSO for domestic services and are operated on a commercial basis in Germany. Almost all long-distance services on the German territory are expected to be operated commercially by railway undertakings, including the procurement of rolling stock. The dominant operator is state-owned DB Fernverkehr.

O.31 A notable exception is the long-distance route from Munich in Germany to Plzeň and Prague in Czechia. This has been specified under a PSO by the Bavarian competent authority BEG since 2007, following the suspension of commercially-operated services by DB, and following a competitive procurement are operated by Die Länderbahn DLB.

O.32 However, mixed services can combine several legs of longer PSO and non-PSO sections. ÖBB gave the example of a Railjet service between Zurich in Switzerland and Budapest in Hungary (see Table O.5 below):

- In Switzerland, there is a Swiss long-distance concession, equivalent to a PSO.
- In Austria, between the Swiss border and Salzburg, there is an Austrian PSO.
- In Austria, between Salzburg and the Hungarian border, the services operate commercially.
- In Hungary, there is a Hungarian PSO.

O.33 In Austria, the situation was explained as follows:

- Between the Swiss border and Salzburg, the PSO is justified as serving the national needs in a region with low average train speeds arising from unfavourable topography.
- Between Salzburg and Vienna, there is no need for a long-distance PSO as long-distance services can be operated profitably on a commercial basis. Open access railway undertaking Westbahn provides regular-interval services on this section and has sued the

Austrian state for the direct award of long-distance PSCs, formerly including this route, to the incumbent ÖBB.

- Between Vienna and the Hungarian border, no PSO is justified for long-distance services, as the area is thinly populated and local needs are covered by regional PSO services.

O.34 In Germany, the federal government has rejected the need for PSOs for long-distance services since the rail reform of 1993. Since then, by law[326], only regional and local services are defined as a public service, and long-distance services must be operated on a commercial basis. This partly explains the focus of incumbent DB Fernverkehr on core daytime routes between major centres, which led to the contraction and closure of cross-country InterRegio services from 2002 and the City Night Line night train network from 2014. However, regional competent authorities may if needed procure long-distance services that fulfil an important role in regional and interregional traffic, as in the case of Munich-Plzeň-Prague.

O.35 We note, however, that a further mechanism exists to support what are formally commercially operated long-distance services. If a railway undertaking agrees to accept the cheaper tickets of regional passenger transport authorities (Verkehrsverbünde) it is eligible for compensation from the PTA.

O.36 In Austria, we understand that this option is used, including between Salzburg and Vienna.

O.37 In Germany, this option is used to reduce the need for regional competent authorities to procure their own regional train services. Within the scope of this this study:

- There are regular-interval long-distance services between Stuttgart and Zürich in Switzerland, on the 172-kilometre section between Stuttgart and Singen. The regional competent authority, the Land of Baden-Württemberg, pays compensation for these services to operator DB Fernverkehr.
- On the long-distance cross-border Berlin-Prague-Vienna-Graz train pair *Vindobona*, launched in June 2020, each train-kilometre in the 140-kilometre section between Elsterwerda and Berlin is compensated by the Verkehrsverbund Berlin-Brandenburg. Compensation is based on a formula set by DB Fernverkehr in its bid for the PSC for the PTA tariff recognition from June 2020[327].

O.38 In summary, we identified 17 cross-border rail connections with at least one service that was only partially covered by PSO. In some cases, this reflected local judgements on whether the service could be operated commercially, including where it duplicated a commercial open access service. In addition, in at least Austria and Germany, services can be supported without a formal PSO if the railway undertaking negotiates payment to accept PSO fares which it argues are below what it would otherwise charge[328].

[326] § 1 Regionalisierungsgesetz – RegG

[327] **https://ted.europa.eu/udl?uri=TED:NOTICE:335735-2020:TEXT:EN:HTML&src=0** (accessed 13 May 2021)

[328] The calculation of compensation for accepting lower fares is complex and often subject to negotiation. Lower fares attract additional passengers, so it is in principle necessary to estimate both what fares would otherwise have been charged and how many passengers would otherwise have been carried.

PSO schemes for domestic night trains

O.39 We next identified PSO schemes for domestic night train services in the study area for the 2020 timetable.

Data sources

O.40 Our principal source of timetable data was the European Rail Timetable (ERT) February 2020 edition, the last before public transport services in many parts of Europe were significantly reduced as a result of the COIVID-19 pandemic. From the ERT we identified domestic night trains from the national timetable pages. We included all services operating at least once per week for at least six weeks per year. Of the services found:

- In Austria, Slovakia and the United Kingdom, lists are published of the routes procured under PSO.
- In Sweden, national competent authority Trafikverket provided information on its PSO schemes.
- In other states, we used our market knowledge to determine the PSO status of domestic night train services.

O.41 We included as night trains any train consisting partly or wholly of night train rolling stock, defined in Table 3.1 as "Rail vehicles dedicated to, or reconfigured for, overnight travel." We treated all direct night train "through carriages" as individual services, as set out in Annex C. We excluded overnight services which did not include any dedicated night train rolling stock.

Main findings

O.42 The table below lists the domestic night trains we identified.

Table O.2: Domestic night train services operated under PSO in 2020

Country	Origin	Destination	Remarks
Austria	Vienna	Bregenz	• Specified under the PSC for long-distance (Fernverkehr) services in Austria.
Bulgaria	Sofia	Silistra	• Single PSC for almost all passenger train services in Bulgaria.
	Plovdiv	Varna	
	Sofia	Varna via Gorna Oryakhovitsa	
	Sofia	Varna via Karlovo	
	Sofia	Dobrich	
	Sofia	Burgas	
Croatia	Zagreb	Split	• Single PSC for all passenger train services within Croatia.
Finland	Helsinki	Kolari	• Single national PSC for many long-distance passenger train services in Finland.
	Helsinki	Kemijärvi (x2, but second train only on peak dates)	
	Helsinki	Rovaniemi	
	Turku	Rovaniemi	
France	Paris	Rodez / Albi	

Country	Origin	Destination	Remarks
	Paris	Latour de Carol	• Single national PSC for all long-distance, non-high-speed passenger train services (Trains d'équilibre du territoire) in France.
	Paris	Cerbère (continues 1.1 kilometres to Portbou in Spain, only in the southbound direction)	
	Paris	Briançon	
Italy	Turin	Reggio di Calabria	• Single national PSC for all long-distance, non-high-speed passenger train services within Italy.
	Turin	Salerno	
	Turin	Lecce	
	Trieste	Rome	
	Bolzano	Rome	
	Milan	Siracusa	
	Milan	Palermo	
	Milan	Lecce	
	Milan	Lecce via Taranto	
	Rome	Lecce	
	Rome	Siracusa (x2)	
	Rome	Palermo (x2)	
Norway	Oslo	Stavanger	• Specified under the combined PSC “Lot 1 Sør” for long-distance and regional services Oslo-Stavanger.
	Oslo	Bergen	• 2020: part of legacy national PSC with incumbent NSB/Vy. • From 13/12/2020: specified under the combined PSC “Lot 3 Vest” for regional and long-distance services Oslo-Bergen.
	Oslo	Trondheim	• From 7/6/2020: specified under the combined PSC “Lot 2 Nord” for long-distance and regional services Oslo-Trondheim-Bodø.
	Trondheim	Bodø	
Poland	Świnoujście	Warsaw	• Single national PSC for many long-distance passenger train services in Poland.
	Świnoujście	Przemysl	
	Świnoujście	Katowice	
	Kołobrzeg	Cracow	
	Gdynia	Zakopane	
	Szczecin	Zakopane	
Romania	Bucharest	Satu Mare	• Single national PSC for almost all long-distance passenger train services in Romania.
	Mangalia/ Bucharest	Satu Mare	
	Mangalia/ Bucharest	Oradea	
	Bucharest	Baia Mare	

Country	Origin	Destination	Remarks
	Bucharest	Cluj Napoca	
	Mangalia/ Bucharest	Cluj Napoca	
	Mangalia/ Bucharest	Arad	
	Bucharest	Bistriţa	
	Bucharest	Sighetu Marmaţiei	
	Iaşi	Timişoara (x2)	
	Mangalia/ Bucharest	Timişoara (x2)	
	Bucharest	Vatra Dornei Băi	
	Bucharest	Suceava	
	Constanţa	Iaşi	
	Mangalia	Iaşi	
	Mangalia	Suceava	
	Sighetu Marmaţiei	Timişoara (x2)	
	Constanţa	Arad	• Operated by new entrant Astra Trans Carpatic. Operates under a negotiated, directly awarded 1370/2007-compliant PSC since at least February 2020.
Slovakia	Bratislava	Prešov	• Single PSC for almost all passenger train services in Slovakia.
	Bratislava	Košice/Humenne (x2)	
Sweden	Stockholm	Duved	• Stockholm-Duved is procured under the PSC to operate on 265 days/year; on the other 100 days it is operated commercially. • Until 12 December 2020: single PSC for all PSO night trains in northern Sweden, including the international route to/from Narvik. Through carriages to/from Gothenburg operated commercially by incumbent SJ. • From 13 December 2020: separate “Norrland” and “Jämtland” PSCs with only one daily direct night train Stockholm-Luleå but with a new non-PSO route Stockholm-Umeå in additional to the commercially operated through carriages to/from Gothenburg.
	Stockholm	Luleå (x2, to 12 December 2020)	
	Stockholm	Luleå (x1, from 13 December 2020)	
UK	London	Edinburgh	• Caledonian Sleeper franchise specifically for Anglo-Scottish night trains. • Operated as two trains each way, which split and join: – London to Edinburgh/Glasgow, and – London to Fort William/Aberdeen/Inverness.
	London	Glasgow	
	London	Fort William	
	London	Aberdeen	
	London	Inverness	
	London	Penzance	• Part of combined long-distance and regional Greater Western franchise.

Source: European Rail Timetable, KCW analysis.
Note: some trains are combined over part of the journey.
Note: (x2) indicates two separate night train services.

O.43 In 2020, domestic night train services were operated in 14 states in the study area: Austria, Bulgaria, Croatia, Finland, France, Germany, Italy, Norway, Poland, Romania, Slovakia, Spain, Sweden and the United Kingdom.

O.44 We identified PSO domestic night train services in all the states except Germany and Spain, both of which leave the provision of night train services entirely to the market.

O.45 PSO domestic night train services are operated by incumbents under direct awards, with the exception of Norway, Sweden and the UK.

O.46 Austria, Bulgaria, Croatia, Finland, France, Italy, Poland, Romania and Slovakia each have a single PSC covers all long-distance services. Rolling stock is owned by the railway undertaking or, in Austria, a subsidiary of the incumbent holding company.

O.47 Norway, Sweden and the UK all have several PSCs for long-distance services. Only Sweden and the United Kingdom have PSCs specifically for night train services. In Sweden, selected services formally receive subsidy under PSO only in the "low season(s)", and at other times services are, at least formally, operated commercially by the incumbent using its own rolling stock.

O.48 Norway and the UK both have at least one PSC combining night trains, other long-distance trains and regional trains within a geographical area, with at least partial regulation of fares and ticketing. These arrangements facilitate cross-subsidy from market-priced long-distance day trains to other services provided within the contract, but do not identify the subsidy for each type of service. In both states, rolling stock is owned by third party rolling stock leasing companies. In Norway, Norske tog AS is 100% government-owned, but in the UK several private companies serve the rolling stock market.

O.49 In addition:

- We understand that the non-PSO domestic night train route in Sweden between Stockholm and Malmö receives financial support from the Skåne region, in the form of minimum revenue guarantees.
- On some routes in Italy, Romania, Slovakia and Sweden, and to a lesser extent Finland and Poland, there is more than one night train per night and direction. This offers passengers a choice of departure and arrival times as well as enabling the provision of more capacity.

O.50 In summary, not all domestic night train services have PSOs. Where they do, the PSO may cover all domestic services, a package including regional and long-distance services or, exceptionally, in Sweden and the United Kingdom, only night train services.

O.51 We also note that one consequence of the near-universal inclusion of night train services in larger PSCs is that information related to the PSCs, including subsidy, is not specific to the night trains. In Annex I we use information on the night train PSC in the United Kingdom to derive estimates of the costs of operating night trains, at least with the relatively high-quality mix of accommodation provided on those trains.

PSO institutional, procedural, contractual and financial features

O.52 We sought information to review the institutional, procedural and contractual arrangements and financial features of the PSO schemes identified in the analysis above.

O.53 Despite the reporting requirements of Regulation 1370/2007[329], little information is in practice publicly available on PSO specifications, status and payments. The stakeholders we contacted did not provide any financial data, and some sources of information contradicted each other. Our analysis was therefore necessarily restricted to the identification of examples and the features which we could identify.

O.54 We found a wide variety of PSO schemes with different characteristics. There were significant variations in the absolute and relative costs, and farebox revenues, at the levels of a network, a route or individual services.

O.55 We describe in turn below our findings for PSO schemes for:

- regional cross-border service subject to PSO on both sides of the border;
- long-distance cross-border service subject to PSO on both sides of the border;
- long-distance cross-border service subject to PSO on part of the route; and
- domestic night train service operated under PSO.

Findings: regional cross-border service subject to PSO on both sides of the border

O.56 The table below summarises examples of regional cross-border service subject to PSO on both sides of the border.

Table O.3: Examples of regional cross-border services under PSO on both sides of the border in 2020

Examples	Contractual structure		Award procedure		Remarks
	Country A	Country B	Country A	Country B	
A France (Lille, Tourcoing)	Regional PSC	Single national PSC	Direct to incumbent	Direct to incumbent	• 'Classic' cross-border model with services awarded directly and PSOs covering border section to first station on foreign territory; Belgian PSO specifies inclusion of services as far as Tourcoing (FR).
B Belgium (Mouscron, Kortrijk)					
A Czechia (Ústí nad Labem)	Gross cost contract for 5.5 years to 2019, extended for up to 4 years	Gross cost contract for ten years	Competitive, with later direct award extension to align contract end date with Czechia	Direct to incumbent	• Clause in German PSC requiring operator to cooperate with railway undertaking in Czechia in the operation of direct train services on whole route.
B Germany (Bad Schandau)					
A Czechia (Rumburk)					
A Denmark (Copenhagen)					• We understand that half the train sets are owned by the Danish

[329] Article 7(1) requires that "Each competent authority shall make public once a year an aggregated report on the public service obligations for which it is responsible, the selected public service operators and the compensation payments and exclusive rights granted to the said public service operators by way of reimbursement. This report shall distinguish between bus transport and rail transport, allow the performance, quality and financing of the public transport network to be monitored and assessed and, if appropriate, provide information on the nature and extent of any exclusive rights granted."

Examples	Contractual structure		Award procedure		Remarks
	Country A	Country B	Country A	Country B	
B Sweden (Malmö, Gothenburg, Kalmar)	Separate net cost contract, jointly procured with country B	Separate net cost contract, jointly procured with country A	Jointly coordinated competitive award to a Danish railway undertaking by Danish national competent authority	Jointly coordinated competitive award to a Swedish railway undertaking by Swedish regional competent authorities led by Skånetrafiken	operator, half by the Swedish operator. • We also understand that contractual arrangements will change from December 2022, with the Swedish competent authority taking on lead responsibility for procuring services on the section from Copenhagen to the Swedish border.
A Germany (Ostsachsen II) (Dresden, Zittau) B Czechia (Liberec)	12-year contract: Germany net cost and Czechia gross cost.		Joint competitive procedure of four regional competent authorities (two in DE, two in CZ) with single, joint PSC awarded to winning bidder		• Joint cross-border PSO specification and PSC model. • As of 2021 we understand this example to remain unique, but other networks will be tendered in this way in the future.
A Germany (Ostsachsen II) (Dresden, Görlitz) B Poland (Zgorzelec)	12-year net cost contract	4-6-year gross cost contract	Competitive award	Negotiated direct award	• We understand that there is a 10-year PSO specification in Poland but that funding constraints prevent 10-year PSCs from being concluded. • This was one reason preventing the Polish regional competent authority from becoming a contract partner, as an Ostsachsen II contract clause requires the railway undertaking in Germany to cooperate in the provision of cross-border services to Zgorzelec or beyond. • The Polish PSO excludes the section from the border to Zgorzelec, so 1.5 kilometres within Poland is paid for by the German regional competent authority.

Source: KCW desk research and analysis.

Competent authorities have separate contracts with one or more railway undertakings

O.57 In the past, many cross-border services were procured by each competent authority as far as the national border, or to the first major station over the border, with the railway undertaking in country A required to cooperate with a railway undertaking in country B in the anticipation of the cooperation delivering cross-border services.

O.58 This is the standard arrangement in Europe for direct awards to national incumbents on each side of the border, typically for a duration of ten years, and in 2020 could be found at most border crossings with passenger services.

O.59 One advantage of the model is that contracts can be awarded where competent authorities are unable or unwilling to align one or more of service specification, scope/financing or contract start date.

O.60 Close cooperation between competent authorities can exist at the level of PSO service specification, but they can still retain separate contract award schemes. One example is regional services over the Oresund Bridge between Denmark and Sweden, where services were awarded to separate railway undertakings in each country.

Competent authorities jointly tender the cross-border service to a single railway undertaking

O.61 The next level of cooperation is in the form of joint PSO service specification, joint tendering and the award of a joint cross-border PSC to a single railway undertaking.

O.62 This model generally requires a willingness both:

- to undertake competitive tendering on both sides, which remains the exception in Europe until the effects of the fourth railway package on competitive tendering are complete; and
- to align contract start dates and durations.

O.63 However, even in this arrangement, financial arrangements can still be tailored to individual circumstances.

O.64 For example, the Ostsachsen II contract is net cost in Germany and gross cost in Czechia. Additional documentation describes the contractual relationship between the German railway undertaking and its subsidiary, licensed as a railway undertaking in Czechia. We understand that Ostsachsen II remains a unique example of a "joint cross-border PSC", but that the model will be used for future contract award on the borders of Germany with Austria, Czechia and France.

Findings: long-distance cross-border service subject to PSO on both sides of the border

O.65 The table below is an example of a long-distance cross-border service subject to PSO on both sides of the border.

Table O.4: Examples of long-distance cross-border services under PSO on both sides of the border in 2020

Example long-distance direct services	Model
Two-hour regular interval service Prague (Czechia)-Bratislava (Slovakia)-Budapest (Hungary)	• PSO exist in each country, from border point to border point, with implicit requirement for railway undertakings to strive to operate services to/from named destinations abroad. • PSCs are directly awarded to incumbents.

Source: KCW desk research and analysis.

O.66 The approach could be considered best practice in that the PSOs stretch from border to border, leaving no sections of route not explicitly covered by a PSO.

O.67 We found only limited route-specific data for Czech PSO route Ex3, comprising services between Prague and both Vienna and Bratislava/Budapest. In 2020, the PSO support to the railway undertaking was around €2.95 per train-kilometre[330].

[330] https://smlouvy.gov.cz/smlouva/10930160 (Příloha č.3A Výchozí finanční model; accessed 14.04.2021). Euro cost based on 75 Czech Koruna, converted at €0.039.

Findings: long-distance cross-border service subject to PSO on part of the route

O.68 The table below summarises examples of long-distance cross-border service subject to PSO on part of the route.

Table O.5: Examples of long-distance cross-border services partly under PSO in 2020

Examples	Model
Switzerland (Zurich)	• PSO under Swiss long-distance concession to Buchs in Switzerland. • PSO under Austrian long-distance PSC from Buchs to Salzburg, including section through Liechtenstein. • Non-PSO, but with compensation for regional ticket acceptance Salzburg-Vienna-Hungarian border. • PSO in Hungary, understood to cover the entire section from border point to Budapest under national PSC.
Austria (Innsbruck, Vienna)	
Hungary (Budapest)	
Germany (Berlin, Dresden)	• Non-PSO within Germany up to Czech border, operated by long-distance division of German incumbent. • PSO under Czech long-distance PSC.
Czechia (Prague)	
Italy (Milan, Ventimiglia)	• PSO within Italy up to border station at Ventimiglia. • Non-PSO on section Ventimiglia-French border and within France, operated by daughter company of Italian incumbent established to operate open access services abroad.
France (Nice, Marseille)	

Source: KCW desk research and analysis.

O.69 These examples demonstrate that a non-PSO section in one country can be combined with either:

- a PSO section within the same country, as seen in Austria, where domestic open access railway undertakings operate services on the trunk non-PSO section; or
- PSO sections in other countries.

O.70 All but one of the long-distance cross-border PSO services are operated by national incumbents under direct award. The only exception we identified is the long-distance route from Munich in Germany to Plzeň and Prague in Czechia. Following a competitive tender by the regional Bavarian competent authority, this is operated by Die Länderbahn DLB in Germany and by ČD in Czechia. The mix of direct awards and competitive tenders may change as PSCs are renewed under the arrangements set out in the fourth railway package.

Findings: domestic night train service operated under PSO

O.71 The table below summarises examples of domestic night train service operated under PSO.

Table O.6: Examples of domestic night train services under PSO in 2020

State	Model
Austria Bulgaria Croatia Finland France Italy Poland Romania Slovakia	• Night train routes are specified as part of a national-level PSO for most or all long-distance services. • One PSC for most or all long-distance services directly awarded to incumbent, with a contract duration of 5-10 years. • We cannot identify whether railway undertakings are under- or over-compensated by PSCs.
Norway United Kingdom	• Night train routes are bundled with long-distance daytime services and/or regional services into regional concessions/franchises, awarded by competitive tender. • The model allows cross-subsidy from profitable to non-profitable routes. • The net cost basis or franchise model provides incentives for the railway undertaking to generate more revenue than projected in their bid.
Sweden United Kingdom	• PSCs are specific to one or more night train routes, awarded by competitive tender. • The net cost basis provides incentives for the railway undertaking to generate more revenue than projected in their bid. • In Sweden, some services are formally procured only in the low season.
Romania	• A rolling stock manufacturer establishes a new entrant railway undertaking to showcase the night train vehicles in its portfolio. • With this rolling stock, the railway undertaking operates a non-PSO route for 2–3 years. • The competent authority adopts this service (and others trialled by the railway undertaking) into a PSO, awarding the railway undertaking a PSC for the routes for 2 years. Fares are regulated within the PSO.

Source: KCW desk research and analysis.

O.72 We were unable to obtain further disaggregate information on the arrangements for night train routes included in the PSCs directly awarded to incumbents.

O.73 In Norway we found that, of the competitively awarded mixed PSCs:

- For the Oslo-Stavanger network, the railway undertaking will be paid €2.70 per train-kilometre [331].
- For the Oslo-Bergen network, which includes profitable long-distance daytime services, the railway undertaking will make "premium" payments averaging €19.8 million per year to the competent authority over the course of the franchise-style contract[332].

O.74 All bidders for the Norwegian contracts have access to legacy rolling stock provided by the national publicly owned leasing company Norske tog. Bids were assessed on both quality and price, and bidders could provide more than the minimum level of services specified under the PSO. In addition, railway undertakings can receive bonuses for exceeding performance targets.

[331] Euro cost based on 27.3 Norwegian Krone, converted at €0.099.

[332] Euro cost based on 200 million Norwegian Krone, converted at €0.099.

O.75 In Great Britain, the competent authority for the Caledonian Sleeper franchise anticipated that the railway undertaking would require, on average, €27.8 million per year over the course of the contract, which required the complete renewal of the passenger-carrying rolling stock. The best bid, taking into account price and quality, cost €34.3 million per year, which we estimate corresponds to €24.5 per train-kilometre[333]. We discuss in Annex I the relatively high quality and hence cost of the Caledonian Sleeper accommodation.

O.76 In Romania, the PSC awarded to Astra Trans Carpatic for its night train route in Romania also includes other daytime services. For 2020, we understand that the cost of providing these services was estimated at €6.1 million, while farebox revenues were estimated at €2.7 million, or around 44% cost recovery. We also understand that the PSC specifies that the railway undertaking was to generate farebox revenues of at least €2.1 million in 2020 in order to qualify for compensation of €2.7 million from the competent authority[334].

Features of Public Service Contracts (PSCs)

O.77 The table below summarises the various models for the treatment of the cross-border section from the last station in PSCs.

Table O.7: Treatment of the section from the last station to the border in PSCs

Model	Examples
Not included, leading to the situation in which the gap must be filled by pragmatic solutions	• Poland • Romania
Included for regional services up to the physical border	• Croatia • Slovenia
Included up to the physical border for all services	
Included up to and including the first station on the other side of the border, as with Belgian passenger rail transport PSO and the Dutch "Hoofdrailnet" concession	• Belgium-Netherlands
Included up to and including the first major hub on the other side of the border, as between Retz in Austria and Znojmo in Czechia	• Austria-Czechia

Source: stakeholders, KCW analysis.

Scope

O.78 The scope of PSCs varies enormously, from a simple indication of train-kilometres procured, through indicative service concepts, to detailed timetables with minimum train capacities.

Duration

O.79 The typical length of such PSCs is ten years, but can vary from 3 to 15 years.

Costs included

O.80 The costs which need to be covered by the competent authority in a typical PSC are:

- track and other infrastructure access charges;

[333] https://www.publiccontractsscotland.gov.uk/search/show/search_view.aspx?ID=JUL180058 (accessed 14.05.2021) Euro costs based on £23.8 million, £29.3 million and £20.90, converted at €1.17.

[334] http://legislatie.just.ro/Public/DetaliiDocumentAfis/226052 (accessed 14.05.2021) Euro cost based on Romanian Leu 30.6 million, 13.5 million, 10.7 million 13.3 million, converted at €0.20.

- energy;
- staff; and
- rolling stock.

Rolling stock

O.81 Rolling stock is typically procured within a PSC in the form of payments based on vehicle requirements for the network at the specified level of passenger-carrying capacity for the duration of the PSC. The residual value risk of rolling stock, which normally has a service life of 25 years or more, may lie with:

- the owner of the rolling stock, which for incumbents is often the railway undertaking;
- a public rolling stock leasing company (the pool model in Germany (for some regional PSCs), Norway (national pool) and Sweden (for regional PSCs)); or
- a private rolling stock leasing company (the United Kingdom and, we understand, Greece).

O.82 Rolling stock maintenance may be by the railway undertaking, or by third party specialists, or by the original manufacturer under an "availability" contract.

Revenue risk transfer: gross or net cost

O.83 Both gross and net cost PSCs are possible. The United Kingdom and Norway go further than net cost in that, at least until the COVID-19 pandemic, they may have "premium" payments from the railway undertaking to the competent authority, the franchise model.

O.84 However, franchising in the United Kingdom has proving increasingly problematic, and complex contractual arrangements for risk-sharing have not prevented railway undertakings from defaulting or seeking to renegotiate their terms. On 20 May 2021 the United Kingdom government announced that franchising would end and that PSC contracts would in future normally be on a gross cost basis.

Bonus and penalty performance schemes

O.85 Regardless of PSC type, bonus and penalty schemes can be incorporated to provide incentives for railway undertakings in the areas of quality, passenger growth and/or passenger satisfaction. Some railway undertakings are contractually compensated for revenue loss and/or additional costs caused by infrastructure managers, but others are not. This is particularly relevant where margins are already low, such as for night trains and other very long-distance services.

Mobilisation periods

O.86 PSC mobilisation time is mostly driven by:

- the complexity of scope (network size, number of actors), duration and financial arrangements;
- the need for rolling stock procurement, if any; and
- staff recruitment and training, if required: where staff do not automatically transfer to the railway undertaking, time is required to recruit staff to allow a smooth start to services.

O.87 The capacity of competent authorities to oversee complex awards may also be a factor. Four years is not atypical for regional rail contracts in Germany. The award process for Ostsachsen II was announced in the Official Journal of the European Union (OJEU) 59 months in advance of the original planned service start date.

Cost coverage

O.88 PSO status is often, not always, an indicator of whether a route or individual service is in receipt of net subsidy:

- In Switzerland, to facilitate cross-subsidy from one route to another, long-distance routes are bundled into a concession with no net subsidy.
- In Germany and Austria, we note that one early/late train pair on the Berlin-Elsterwerda section of the Berlin-Prague route, and all long-distance trains on the St. Pölten-Vienna section of the Salzburg-Vienna line, are not prescribed by PSO but are supported by "balance payments" to compensate the railway undertakings for accepting cheaper, regional tickets.

O.89 We understand that PSO services in many countries, including Belgium, Bulgaria, Portugal and Romania, are under-compensated, which has led to debt accumulation by state-owned incumbents.

O.90 The net cost nature of large PSCs with incumbents is intended to serve as an incentive to grow passenger revenues, but this appears to be hampered by poor quality rolling stock and/or infrastructure and often heavy regulation of fares. It is unclear to what extent efficiencies might be possible.

O.91 We assume that competitively awarded contracts allow a "reasonable" railway undertaking profit margin in the order of around 5%, based on calculations made at the time of bidding. In the case of net cost contracts, these calculations include estimated farebox revenues.

Potential PSO models to support cross-border night trains

O.92 A range of models have emerged for providing support to rail services in general and cross-border services in particular.

O.93 Support can be provided as a supplement to fares revenue, or as compensation to an operator for accepting PSO fares which it argues are lower than those it would otherwise have charged. However, neither approach requires the railway undertaking to provide the service.

O.94 Support can be provided through a formal PSOs, which vary widely in the level of detail with which services are specified and the range of services included. Many PSOs relate to a bundle of cross-border and other trains, which helps enforce cross-subsidy but leaves it unclear what support is provided to each service.

O.95 However, support through formal PSOs may be provided only for a section or several sections of a certain services. This is a common practice for European cross-border rail services and is consistent with the relevant Regulation (EC) 1370/2007, the Annex to which requires the accounts of public services to be separated. The Court of Justice of the European Union (CJEU) requires "an accounting separation between the public transport activities between contracts that give rise to the payment of compensation for public service obligations and those that do not".

O.96 In practice, it is not clear whether costs, revenues and support requirements can meaningfully be subdivided into elements for different parts of a service. Neither the costs of a single train, and the crew or crews who operate it, nor the revenue from fares of passengers on different parts of the journey, can be associated with a particular section of route. We identified services which receive several support payments, on several bases, from several sources, but the overall effect may be that the railway undertaking is over- or undercompensated. We also

note that many PSO packages mix profitable and loss-making services, with the apparent intent of forcing the successful operator to cross-subsidise the loss-making services from ones which could be commercially viable. The economic equilibrium test can then be used to prevent new entry on the commercially viable routes.

O.97 Gaps in support arising at borders can mean that the railway undertaking can withdraw the cross-border element without penalty, and it would be desirable for the entire journey to be included in the specification. Good practice appears to be joint PSO service specification, joint tendering and the award of a joint cross-border PSC to a single railway undertaking, but this model requires a willingness and ability both to undertake competitive tendering on both sides and to align contract start dates and durations. Joint specification, tendering and award become progressively more complex as more competent authorities are involved, particularly if one or more has no power to support long-distance or cross-border services or receives no obvious benefit. For example, a night train linking two states may travel mainly in a third in which it makes no stops at times attractive to passengers. It can become increasingly difficult to agree how to allocate the costs and the benefits of a single train service serving journeys within, and between, the areas for which different authorities are responsible.

O.98 Gaps in support also exist to avoid a situation in which a supported train competes with commercial services. The architecture of rail liberalisation envisaged protecting existing PSO services from new commercial competition, but not protecting existing commercial services from PSO competition. This issue has already arisen on night trains to and from Sweden, where commercial Snälltåget may face competition between at least some station pairs from PSO-supported services[335].

O.99 If new entry leads to more commercial services, the existing PSO regime may become increasingly unworkable, particularly if a long-distance cross-border train calls at pairs of stations which are also connected by domestic services supported by different competent authorities on different bases.

[335] In practice, the regulatory body in Great Britain has also effectively protected established commercial operators from competition by new PSO-supported services.

P Obstacles: other technical and operational barriers

Introduction

P.1 The Railimplement[336] and Servrail[337] studies carried out in 2005 and 2006 following the implementation of the first railway package identified many obstacles to the operation of rail services. Many cross-border services face additional technical, operational and safety obstacles resulting from the profusion of different technologies, legislation and practices in different states.

P.2 In this Annex we identify and describe the types of technical, operational and safety obstacles which may exist. We discuss in turn:

- examples of obstacles to cross-border passenger services identified from desk research, including a study by IRG-Rail;
- examples of obstacles to cross-border freight services, and their relevance to cross-border passenger services;
- examples of specific obstacles identified by stakeholders;
- ongoing measures to address the obstacles; and
- the costs of addressing the obstacles.

Obstacles to cross-border passenger services

P.3 Our desk research identified, and stakeholders confirmed, the existence of a range of broad types of obstacles. We also reviewed the latest IRG-Rail Market Monitoring Report, based on a questionnaire sent to IRG-Rail members[338]. IRG-Rail's analysis was not specific to cross-border passenger services and may have omitted obstacles not faced in the case of entry into domestic markets.

P.4 The table below lists all the generic obstacles identified and shows which were mentioned by IRG-Rail.

[336] Railimplement – Implementation of EU Directives 2001/12/EC, 2001/13/EC AND 2001/14/EC, Final Report, Steer for European Commission, 2005.

[337] Servrail, Final Report, Steer for European Commission, 2006.

[338] Eighth Annual Market Monitoring Report, March 2020, Pages 23-24, from **https://www.irg-rail.eu**.

Table P.1: Technical/operational/safety obstacles to the operation of cross-border services, IRG-Rail

Obstacles	Issues identified in Steer proposal	IRG-Rail
High initial cost of purchase of rolling stock.		●
Lack of access to leased rolling stock.		●
Cross-acceptance of rolling stock	Each locomotive type must be certified for each country in which it is to operate. The cost of homologation varies widely.	●
Lack of access to qualified personnel (rolling stock operations).		●
Railway operating systems	Different railways have different traffic management systems, operating procedures and rules. Train drivers and crew are normally required to be familiar with local rules.	●
Languages	Railways function in various languages. Train drivers may need to speak a relevant local language to comply with safety requirements. Other train crew may need to speak one or more local languages to make announcements and to deal with passengers.	●
Differences in track gauge	Four distinct track gauges: some stock can change gauge between the standard gauge (1435mm) and the Iberian gauge (1668mm) or the Russian gauge (1520-1524mm).	●
Differences in structure gauge	Structure gauges vary by network and sometimes also by route. The gauge is often larger in Scandinavia and smallest in Great Britain.	●
Incomplete electrification.		●
Differences in electrification systems	Railways may be electrified with AC or DC, at various voltages, with different variations of overhead line and third or fourth rail.	
Differences in platform and train floor heights	Even where equipment such as retractable steps are provided, platforms and train floors at different heights can act as material obstacle to travel by persons of reduced mobility (PRMs) and for those travelling with baggage, small children or pushchairs.	
Differences in signalling systems	Trains must operate safely under all the signalling systems on their main and diversionary routes. There are over 20 signalling systems in the study area and most locomotives can handle no more than 4 or 5 of them. Despite gradual standardisation on ETCS/ERTMS, due to be fitted on high-speed lines and TEN-T corridors by 2030, most networks will retain a range of legacy signalling systems and track to train interfaces.	
Access to infrastructure	New entrants require access to infrastructure in the form of train diagrams which allow efficient use of stock with commercially attractive station stops and calling times.	
Access to service facilities	New entrants also need access to overnight stabling, depots for maintenance, and facilities for cleaning, fuelling and toilet emptying.	
Access to ticket offices	New entrants may not be able to sell tickets through incumbents' ticket offices and may not be able to establish a sales presence in stations.	
Prioritisation	Under Directive 2012/34/EU, infrastructure managers may give priority to specific services where infrastructure is congested or specialised. PSO services often have priority over international services.	
Access to ticketing systems	New entrants may not be able to sell tickets on connecting services or create and sell through-tickets.	
Incumbents' knowledge of the market and of undertakings give them an economic advantage.		●
Incumbents have established transport networks with strong positive network effects.		●
Low volume entry is not profitable because of high fixed costs.		●

Source: stakeholders, IRG-Rail Market Monitoring Report, Steer analysis.

Obstacles to cross-border freight services

P.5 We also discussed with the Commission obstacles to freight interoperability which might also apply to cross-border passenger services. The Rail Freight Corridors (RFCs) have led the process of collating issues in the "Rail Technical and Operational Issues affecting Interoperability Logbook" which relates to freight operations[339]. The European Rail Infrastructure Managers (EIM) encourages its members to report operational issues[340].

P.6 The Logbook registers areas in which Technical Specifications for Interoperability (TSIs)[341] exists but one or more infrastructure managers have other national rules. In some cases they address "open points" where the TSI does not cover all situations. The long-term aim is to end national rules, which in principle are no longer allowed, but implementation takes time, particularly with the need to ensure safety at all stages of the transition.

P.7 The Logbook currently identifies 15 issues, some of which are shown in the table below.

Table P.2: Obstacles in the Interoperability Logbook

Issue		Description and potential issues for cross-border passenger trains
1-2	Braking sheets and performance	• Some IMs have local rules on braking ability which are inconsistent. • This may mean that a train may have to be checked against different rules, and may need more braking than physics dictates. • There may be an analogous issue for passenger trains operating at high speed, which need to brake within the signalling distance.
3	Tail lights	• This is only an issue for freight.
4-7	Train composition harmonisation of wagon list / handbrakes / buffer wagons	• This relates in part to safety compliance. Each infrastructure manager has different rules on what trains can operate in each location. • This may be less of an issue for passenger trains, but some infrastructure managers need to be informed of the exact composition of each train to calculate charges.
8-9	Technical checks at borders	• Many freight trains must be rechecked at border stations, in some cases on both sides. • Operators such as Eurostar and Thalys have avoided this, but some passenger operations might face similar issues.
11	New train number	• A late-running train can lose its priority code and be allocated a new train number, which means that many railway systems may no longer recognise it. • This appears to be a potential issue for passenger services.
13	Two-person cabin crew	• Some infrastructure managers insist that a single driver is not isolated in the driver's cab. • This is rarely an issue on fixed-formation passenger stock, which always provides access to the driver's cab.

Source: Rail Technical and Operational Issues affecting Interoperability Logbook, Steer analysis.

[339] https://ec.europa.eu/transport/modes/rail/interoperability/interoperability/ope-tsi_en

[340] https://eimrail.org/document/cross-border-issues-logbook/

[341] https://www.era.europa.eu/activities/technical-specifications-interoperability_en

Specific obstacles identified by stakeholders

P.8 Stakeholders mentioned many specific obstacles they had encountered in relation to proposals to introduce new cross-border service, many of which are discussed in earlier Annexes:

- infrastructure charges (Annex K);
- Obstacles: capacity and capacity allocation (Annex L);
- Obstacles: rolling stock (Annex M);
- Obstacles: ticketing and rights for connecting passengers (Annex N); and
- Obstacles: creating cross-border PSOs (Annex O).

P.9 CER listed several specific issues which illustrate the range of obstacles faced.

Selective door opening

P.10 In Belgium, national safety regulations require mandatory Selective Door Operation (SDO), which ensures that the doors can only be opened in stations and on the side of the train next to the platform. This means that night trains to Brussels must be hauled with locomotives with SDO and compatible carriages. SDO is not required in other states including Germany and Austria, the base of ÖBB Nightjet, but we understand that rules on SDO in Italy requiring modification also required modification to DB and ÖBB stock.

Axle loads

P.11 Between Germany and Belgium, the high-speed line between Aachen and Liège was designed with special axle load requirements, with the effect that Belgian locomotives with ÖBB Nightjet vehicles must use a different and slower route.

Maximum permitted speeds

P.12 The maximum permitted speed of the same type of locomotives also varies from network to network. In the Netherlands, for example, a locomotive may only travel at 100 km/h if it exceeds a certain mass. In Switzerland, the Vectron locomotive is formally licensed for 160 km/h, but is only allowed to run at 120 km/h on almost all lines.

Regular interval domestic services and urban and suburban peaks

P.13 CER also mentioned how long-distance cross-border passenger trains are also slowed down by national commuter traffic and interval timetable systems. There are no international train paths allocation systems analogous to those being piloted in the European Rail Freight Corridors. This is often an issue for night trains which typically reach one or more of their destinations during the morning peak period, when domestic services are at their peak. It would be beneficial to create allocation systems for long-distance cross-border passenger trains, improving their treatment relative to domestic regular interval (clockface or "Takt") services. Several stakeholders asked whether it would be possible to introduce Rail Passenger Corridors (RPCs), as we discuss further below.

Connections between infrequent services

P.14 CER also noted that it can be desirable for cross-border night trains to connect with onward services, and cited the example of travel from Basel to Copenhagen with a change at Hamburg. While it is not possible to have a perfectly timed connection between every arrival and departure, trains leave Hamburg for Copenhagen every two hours, at 08:55, 10:53 and 12:53, but the Nightjet was at one point timetabled to arrive at 09:01, missing the first connection by

six minutes and resulting in a nearly two-hour wait until the second. For railway undertakings wishing to provide specific connections, a few minutes can make the difference between serving and not serving a potentially material market.

Knowledge of local rules and practices

P.15 The example of connections at Hamburg mentioned by CER highlights the need for railway undertakings seeking capacity to carry out detailed research on the exact characteristics of the train path they require.

P.16 At first sight, an infrastructure manager's network statement sets out how and when railway undertakings can apply for capacity and the processes for allocating capacity. In practice, stakeholders pointed out that, to be successful, applicants must often carry our prior research on the existing and proposed timetable and the practices and precedents on the infrastructure concerned. Devising, requesting and negotiating a train path with several infrastructure managers, in some cases with timings to within a few minutes to create an effective connection, is technically complex. In contrast, an airline planning an intra-European flight needs to negotiate with only two airports, which may have ample spare runway, stand and terminal capacity, and strong incentives to accept new traffic, for take-off and landing slots separated by an interval comparable to the expected flight time.

Ongoing measures to address obstacles

P.17 A wide range of measures are already under way to eliminate or reduce obstacles to operating rail services across borders. For example, the Commission has introduced a Directive on cross-acceptance of rolling stock, which was intended to limit the effects of this obstacle. Cross-acceptance procedures have been put in place between Germany, Austria, Switzerland, Italy and the Netherlands which help to reduce the burden. However, the leasing costs of a locomotive capable of operating in multiple countries can still be over a third higher than one suited only to a single domestic market.

P.18 It has not, however, been possible within the scope of this study to list all the activity being carried out at European, national or local level, or on a multilateral, bilateral or unilateral basis, to address all the obstacles to cross-border passenger services which have been identified or may be identified in the future.

The costs of addressing the obstacles

P.19 Neither our desk research nor stakeholders identified or quantified the costs of addressing the many obstacles or whether it would be cost-effective to do so. The table below illustrates the potential scale of the costs and timescales required to address some of them.

Table P.3: Costs of addressing obstacles

Obstacle	Remedy	Indicative cost	Indicative timescales
Differences in structure gauge	Reconstruction of tunnels, cuttings, bridges and embankments to accommodate the largest gauge trains	€ hundreds of billions	40+ years
	Standardisation on smaller, narrower trains		30-40 years, as stock is replaced
Difference in track gauge	Reconstruction of track to a common gauge	€ hundreds of billions	
Differences in signalling systems	ERTMS	€ hundreds of billions	
Languages	Harmonisation of all rail operations on a single language, as in international aviation, requiring all railway operational staff to work in a second language		10 years
Prioritisation	Require changes to priority rules to promote cross-border services		10-15 years, as any framework agreements expire
Access to ticketing systems	OSDM		5 years or less, if railway undertakings use OSDM

Source: Steer indicative estimates analysis.

Conclusions

P.20 Our initial assessment is that, for many of technical, operational and safety obstacles, the principal issue is not cost, which might in any case be incurred as assets are replaced and processes are updated, but the need to define new standards, make any necessary legislative or regulatory changes, carry out pilot studies and implement changes, often on a phased basis coordinated with other changes.

P.21 The global aviation industry has adopted common standards and a single language. The effect is that trained aircrew can take off from, fly between, and land at, almost any airports in the world without additional training. In contrast, even as railway technology is harmonised through systems such as ETCS, the wide range of languages employed in Europe's railways remains a fundamental barrier to individual railway staff working across borders.

P.22 We also noted a specific proposal to address a combination of obstacles in a single process, through the creation of rail passenger corridors, which we discuss briefly next.

Rail passenger corridors

P.23 Several stakeholders referred to the existence of Rail Freight Corridors (RFCs) and asked whether it would be possible to introduce analogous Rail Passenger Corridors (RPCs). The Commission is currently revising Regulation (EU) 913/2010 concerning a European rail network for competitive freight (RFC-Regulation).

P.24 We discussed this with a member state, who noted that, in principle, a single entity could focus on a corridor and address several obstacles such as capacity, interoperability, and the use of languages.

P.25 Nonetheless, the member state commented that the existing Rail Freight Corridors do not function perfectly, and that freight and passenger services face different issues. Freight trains link terminals, and timing is rarely critical to within a few minutes. Passenger trains, in contrast, link city centre stations, often during peak periods, with relatively precise target timings, as the example of the Basel to Copenhagen connection in paragraph P.14 shows. Any cross-border passenger corridor would inevitably overlap with important domestic corridors, including into and through major cities with urban and suburban services. While the existence of a rail passenger corridor would not necessarily imply that capacity would be reserved for cross-border passenger services, the challenge would be to balance the interests of the cross-border and domestic railway undertakings.

P.26 The member state also mentioned the example of the operation of the cross-border regional Drielandentrein in Belgium, Germany and the Netherlands, which requires the involvement of three national governments and three regulatory bodies. One issue would be how the design of a network of Rail Passenger Corridors could be designed in advance of knowing what proposals for new long- (or short-)distance cross-border services might actually emerge.

Q Potential measures and preliminary assessment

Introduction

Q.1 This Annex contains additional material supporting Chapter 6 on potential measures. We discuss in turn:

- a Workshop with the Commission to discuss potential measures; and
- our preliminary assessment of these potential measures.

Workshop on potential measures

Q.2 On 11 June 2021 we held an Interim Workshop with the Commission, followed by targeted discussions, to discuss the findings of our Interim Report and potential measures to remove obstacles, as summarised in the table below.

Table Q.1: Interim Workshop agenda

Agenda items		Lead
Introductions		Steer project manager
Overview of key study findings to date		Steer and KCW
Commission comments on the Interim Report	Cross-border rail passenger market	All
	Market potential	All
	Identification of obstacles	All
	Executive summary and other comments	All
Identification of measures to remove obstacles		Steer and KCW lead
Approach to Tasks 3.3 and 3.4, preliminary assessment		Steer
Approach to Task 3.5, study conference (see Annex R)		Steer
Next steps and any other business		Steer project manager

Q.3 We discussed issues including the limited availability of cost and revenue data, passenger numbers and the average fares actually paid on existing services, the uncertainties created by the COVID-19 pandemic, and the emergence of new service proposals from the industry.

Q.4 The main Interim Workshop was followed by supplementary discussions by smaller groups of subject matter experts, as summarised in the table below.

Table Q.2: Interim Workshop: supplementary discussions

Obstacles and measures	Date
Infrastructure access charges	30 June 2021
Ticketing and passenger rights	1 July 2021
Cross-border Public Service Obligations (PSOs)	8 July 2021

Q.5 On infrastructure access charges, we noted that three major aspirations were to:

- reduce charges;
- harmonise charges for cross-border and domestic services; and
- ensure that charges were fixed or predictable for longer periods.

Q.6 On ticketing and passenger rights, we discussed:

- how a number of characteristics of rail made it difficult to identify parties who could provide passengers with assistance, re-routing, reimbursement or compensation, and hence the importance of passengers re-routing themselves under Article 18(3);
- the possibility of focusing on delivering ease of booking, lower prices and promotions, and ensured journey connections (see Table 5.1); and
- the narrow definition of through-tickets in Regulation (EU) 2021/782.

Q.7 On cross-border PSOs, we identified a number of steps before a PSO service could be brought into operation, including:

- the availability of demand from which to build a demand and revenue model, including the extent to which revenues would grow over time;
- the process of specifying a PSO, including setting out factors including between which stations a train should operate, the maximum journey time, at which stations it should call, how often it should operate, the times of the first and last services, the capacity to be provided, the range of onboard services, and the fares;
- the desirability of avoiding unfair competition with existing commercial services; and
- for cross-border services, the additional challenges of obtaining the agreement of multiple industry bodies and PSO competent authorities, often working in two or more languages.

Q.8 We also discussed and agreed a list of potential measures to address problems, which could be examined further.

Preliminary assessment of potential measures

Q.9 We discuss next our preliminary assessment of:

- Measures IC on infrastructure charges;
- Measures CA on infrastructure capacity allocation;
- Measures RS on rolling stock;
- Measures TP on ticketing and rights for connecting passengers;
- Measures PS on cross-border PSOs;
- Measures OT on other obstacles;
- Measures DA on data; and
- Measures OP on other proposals.

Measures IC on infrastructure charges

Measure IC1: ensure that infrastructure charges are set at the cost directly incurred

Q.10 Under this measure, infrastructure charges for the minimum access package and for access to infrastructure connecting service facilities would be set at the cost that is directly incurred as a result of operating each train service, as provided for in Directive 2012/34/EU Article 31(3).

Q.11 Directive 2012/34/EU begins with the principle that charges for services should reflect the cost they impose but permits wide divergence from it, in particular allowing charges to be raised to recover fixed costs. Many stakeholders argued that charges should be reduced, and one

means of achieving this would be to restrict the ways in which additional charges may be levied.

Q.12 Infrastructure managers are already permitted to restrict infrastructure charges to the cost that is directly incurred. For many national networks, however, and also the part of the Channel Tunnel within the EU, this could create a need for direct subsidy.

Table Q.3: Measure IC1

Dimension	Details
Measure	• Infrastructure charges for the minimum access package and for access to infrastructure connecting service facilities would be set at the cost that is directly incurred as a result of operating each train service, as provided for in Directive 2012/34/EU Article 31(3). • Mark-ups, permitted in Article 32(1), would no longer be applied. • Some infrastructure managers would require subsidy to cover unrecovered fixed costs.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	• Directive 2012/34/EU would be modified, focusing on Article 32, to remove the flexibility to add mark-ups. • Regulation (EU) 2015/909 would need to be rewritten to limit the scope to calculate "the costs directly incurred" which resulted in very high charges.
Parties required to take action to implement the measure	• The Commission would change legislation. • Implementation would be by infrastructure managers and, in some cases, regulatory bodies, calculating charges within the framework of Regulation 2015/909. • Some Member States would need to provide direct subsidy to infrastructure managers under Article 8. This would include many national networks and the part of the Channel Tunnel that is in the EU.
Anticipated outcomes of the measure being implemented	• Lower infrastructure charges for at least some rail services. • Reduced direct revenues for infrastructure managers. • Reduced support requirements for PSO services. • Additional commercial services on routes, or in seasons, or on days, or at times where railway undertakings judge that this would be viable. • More new entry, and the overall expansion of rail services would drive mode shift, although the extent and type of shift would vary with origin-destination pair. • Potentially, increased congestion on the network, leading to greater need for coordination, worse performance, less attractive train paths and infrastructure being declared congested (Article 47). • Potentially, subsequent mitigation through charges reflecting scarcity (Article 31), priority measures (Article 47), capacity analyses (Article 50) and capacity-enhancement plans (Article 51).
Indicative timescale	Short term, less than five years, to introduce new charges.
Linkages with other measures	This measure could be combined with any of measures IC2, IC3 and IC4 or as part of IC5.

Dimension	Details
Advantages and disadvantages	Advantages: • Simple conceptual change reverting to economic first-best of marginal cost pricing (Article 31) rather than second-best proxy for Ramsey pricing (Article 32). • Can be achieved relatively quickly because it does not require new assets, only changes to calculations and funding flows. Disadvantages: • Inconsistent with some MSs' views that infrastructure should be funded wholly through user charges. • Mark-ups account for only a part of the diversity in the structure and overall levels of charges permitted by Regulation (EU) 2015/909, which would also need to be changed. • Infrastructure managers have scope to revise the calculation of charges for the minimum access package and for access to infrastructure connecting service facilities within this framework, or to raise other charges to compensate. • Reductions in charges may result in windfall gains on some commercial services. • Additional rail services may lead to new constraints and congestion. • No evidence that lower infrastructure charges would result in lower passenger fares, except in markets where new services are introduced and lead to competition on price.

Source: Steer analysis.

Measure IC2: fix charges for a relevant period, with increases phased

Q.13 Framework agreements between infrastructure managers and applicants specify the characteristics of the infrastructure capacity required by and offered to the applicant over a period of time exceeding one working timetable period. They can reduce the risk associated with new entry by ensuring that infrastructure capacity will be available over an extended period. However, our desk research shows that charges can vary widely from year to year, making it difficult for applicants to prepare a long-term business plan. A proven approach in some states is for infrastructure managers or regulatory bodies to set charges for periods of five years or more, and to ensure that any major increases in charges are phased in over several years.

Table Q.4: Measure IC2

Dimension	Details
Measure	Charges fixed for the life of a framework agreement, or multiple years, with increases phased.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	• Difficult to mandate multi-year charges without mandating framework agreements. • At EU level, Directive 2012/34/EU and Regulation (EU) 2015/909 would be modified to mandate that infrastructure managers set charges several years in advance, with maximum rates of increase.
Parties required to take action to implement the measure	• The Commission would change legislation. • Implementation would be by infrastructure managers and, in some cases, regulatory bodies, calculating charges within the framework of Regulation (EU) 2015/909. • Some Member States might need to provide direct subsidy to infrastructure managers under Article 8, at least in years where charges were less than expenditure, including at least the part of the Channel Tunnel that is in the EU.
Anticipated outcomes of the measure being implemented	• Railway undertakings would see more predictable and stable charges, facilitating business planning and raising finance. • More new entry, and the overall expansion of rail services would drive mode shift, although the extent and type of shift would vary with origin-destination pair.

Dimension	Details
Indicative timescale	Short term, less than five years.
Linkages with other measures	This measure could be combined with any of measures IC1, IC3 and IC4, or CA1, CA4 and PS2, or as part of IC5 or CA7.
Advantages and disadvantages	Advantages: • The approach is proven: predetermined charges for multi-year periods have been used in Great Britain since 1994. • Infrastructure managers and regulatory bodies can consult before designing charges. • Allows charges to be predictable, even if year-to-year expenditure varies. Disadvantages: • Requires longer term forecasting of costs and revenues of infrastructure managers, with less scope to reset charges each year to balance expenditure. • Imbalances in individual years may create a need for infrastructure managers to borrow for short periods. • May be more difficult to restructure charges to deal with emerging problems or to align with other infrastructure managers.

Source: Steer analysis.

Measure IC3: compensate railway undertakings which cannot operate services due to works or closures

Q.14 Compensation from infrastructure managers to railway undertakings, who cannot operate services as specified in their track access agreements due to track closures, would minimise the commercial risk of long-distance cross-border services, especially night trains. This compensation could be on the basis of lost revenue or the additional costs associated with delays or using diversionary routes or both. Great Britain's infrastructure manager has compensation regimes for both planned infrastructure works and unplanned disruption[342].

Table Q.5: Measure IC3

Dimension	Details
Measure	Compensation from infrastructure managers to railway undertakings who cannot operate services due to infrastructure work or closures.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	• Directive 2012/34/EU would explicitly require compensation for consequential losses. • In practice the compensation rates would have to be determined by parties in the MSs.
Parties required to take action to implement the measure	• The Commission would change legislation. • Implementation would be by infrastructure managers and, in some cases, regulatory bodies. This would require the creation and calibration of regimes for calculating infrastructure availability and compensation for non-delivery.

[342] These are schedules to the track access contract between each railway undertaking and infrastructure manager Network Rail. The Schedule 4 regime compensates railway undertakings for the financial impact of planned possessions, when they cannot access the network because of Network Rail's engineering work. The Schedule 8 regime compensates railway undertakings for unplanned service disruption caused by Network Rail and other train operators.

Dimension	Details
Anticipated outcomes of the measure being implemented	• Railway undertakings would see compensation for losses causes by the infrastructure manager, facilitating business planning and raising finance. • More new entry as a result of the improved environment for market entry.
Indicative timescale	Short term, less than five years.
Linkages with other measures	This measure might, in practice, depend on the accessible database of train delays and attribution, measure TP5. This measure could be combined with any of measures IC1, IC2 and IC4 or as part of IC5.
Advantages and disadvantages	Advantages: • The principle of compensation for consequential losses is well-established. • The approach is proven: Great Britain has had a compensation scheme since the 1990s. Disadvantages: • Requires the design, calibration and implementation of a compensation scheme sufficiently robust to support compensation payments. • Potentially, windfall profits to existing railway undertakings which have remained viable without compensation. • Depending on scheme design, and infrastructure manager performance, infrastructure managers may require additional income to fund any net additional costs resulting from the compensation payments. • This may create imbalances in individual years and hence needs for infrastructure managers to borrow for short periods, deal with emerging problems or to align with other infrastructure managers.

Source: Steer analysis.

Measure IC4: analyse the ability of cross-border services to bear mark-ups taking into consideration their competition with other modes of transport as well as their competition with domestic services

Q.15 This measure would be a limited reform to ensure that mark-ups were only applied in the case of cross-border services when there was clear evidence that they were able to bear them.

Table Q.6: Measure IC4

Dimension	Details
Measure	• Annex VI of Directive 2012/34/EU could be modified to require clear evidence of the ability of cross-border services to bear mark-ups before they were applied. Alternatively, the Commission could issue guidance to that effect.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	• Directive 2012/34/EU could explicitly require analysis of the ability of an international service to bear mark-ups.
Parties required to take action to implement the measure	The Commission could change the Directive or issue guidance.

Dimension	Details
Anticipated outcomes of the measure being implemented	• The risk that adding or removing a border crossing would result in a change in charges on one or more national networks would be mitigated.
Indicative timescale	Short term, less than five years.
Linkages with other measures	This measure could be combined with any of measures IC1, IC2 and IC3 or as part of IC5.
Advantages and disadvantages	Advantages: • Establishes a clear principle related to the Single European Railway Area. • Simple change to legislation and/or provision of guidance. Disadvantages: • Any rebalancing of charges between cross-border and domestic services would create winners and losers, and could mean that some existing services were no longer commercially viable.

Source: Steer analysis.

Measure IC5: wider reform of infrastructure charging with the objective of meeting climate neutrality

Q.16 Some stakeholders advocated complete reform of Directive 2012/34/EU, although none offered a detailed analysis of the problems they have identified or the changes they proposed.

Table Q.7: Measure IC5

Dimension	Details
Measure	Wider reform of infrastructure charging with the objective of meeting climate neutrality: • Reform Chapter IV of Directive 2012/34/EU on levying of charges for the use of railway infrastructure. • For example, Directive 2012/34/EU could explicitly permit or require a reflection of Net Zero in areas such as the structure and level of charges.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	Stakeholders have suggested that the Directive should be reformed, but not identified specific problems or proposed specific objectives. A possible interpretation is that a suitable problem tree would be created, beginning with the issue of carbon emissions as a problem and then reworking the logic of the Directive within this framework.
Parties required to take action to implement the measure	The Commission would change the Directive.
Anticipated outcomes of the measure being implemented	• Better focus by the rail industry of policies, measures and actions which would contribute to Net Zero including, inter alia, mode shift from air to rail on longer journeys, many of which are cross-border. • Potentially, scarce or congested capacity allocated to the use which would create the greatest reduction in carbon use, such as rail services which would attract passengers from, or allow the closure of, air routes.

Dimension	Details
Indicative timescale	Short term, less than five years.
Linkages with other measures	This measure could be combined with any of measures IC1, IC2, IC3 and IC4 and CA7.
Advantages and disadvantages	Advantages: • Can be aligned with Net Zero. • Can be aligned with other objectives emerging from other existing or expected problems. Disadvantages: • Might require extensive research, consultation and design to establish how this could be done. • Not yet clear in what ways the Directive would need to change or how this would be implemented. • Major changes to the current legislative framework might prove disruptive and/or have unintended consequences.

Source: Steer analysis.

Measures CA on infrastructure capacity allocation

Measure CA1: where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables

Q.17 The need for, and complexities of, capacity allocation on railways are driven by the fundamentals of railway technology: trains cannot pass each other on the same line, and each train already timetabled constrains the addition of further trains, which cannot pass through the same location at the same time. Some stakeholders argued that proven best practice is to plan a regular interval, clockface or "Takt" timetable designed for the efficient and reliable delivery of attractive services and connections, and then to provide infrastructure and rolling stock with the characteristics required to deliver them. However, others argue that one or more adjacent Takt timetables on a cross-border route limit the intended right for applicants to request the capacity they require, and force them to choose from pre-planned paths, which may result in longer journey times or missed connections.

Q.18 In reality, an increasing number of urban and suburban networks, constrained long-distance routes, and even national networks, are being timetabled on a Takt basis. On 17 May 2021, the German Bundesministerium für Verkehr und digitale Infrastruktur (BMVI) published a proposal for a Europatakt which would extend this approach to the entire European network[343]. Eurolink also published a proposal that cross-border services should be planned before domestic services[344].

Q.19 The BMVI claims that Europatakt would "interlink the individual optimised clock-face timetables of the European countries to build up a coordinated network of international connections to reduce international journey times". While the vision is superficially consistent with an objective of promoting long-distance cross-border passenger rail services, it is not

[343] First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)

[344] Towards a better international timetable in Europe, Jeroen Wesdorp and Thomas Moerman, Eurolink, 17 May 2021 (2021)

clear whether it is the best way of doing so, or how it would affect the approach to addressing other obstacles including rolling stock, ticketing, connections and PSOs. However, the BMVI regularly states that long distances services are solely under the responsibility of the railway undertakings and therefore they will not be subject to PSO[345], so it remains unclear how the proposed Europatakt could be achieved.

Table Q.8: Measure CA1

Dimension	Details
Measure	Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	• Directive 2012/34/EU would need to be revised to establish a framework which required a regular interval, clockface or Takt timetabling approach. • It has not been established how this could be done in practice.
Parties required to take action to implement the measure	• The Commission would change the Directive. • Competent authorities, infrastructure managers, railway undertakings and regulatory bodies.
Anticipated outcomes of the measure being implemented	• Agreed economic, social and environmental objectives are met through a pre-planned timetable. • Stakeholders work through consensus and cooperation, rather than competition. • Passengers see stable and predictable services with consistent timetables and connections. • Infrastructure (and rolling stock) procurement and expenditure is based on a clear plan to deliver the agreed future timetable. • Potentially more structured and effective use of infrastructure capacity. • New services would need either to fit within the Takt or to be added in the longer term as it was redesigned. • Difficulty introducing new commercial services, with all timetabling centrally planned.
Indicative timescale	Short term, less than five years, for adoption of this approach, but longer before a regular interval timetable was completed, depending on the expiry of existing PSCs and framework agreements and any need to plan, build and commission new infrasrtucture and rolling stock.
Linkages with other measures	Could be linked with measures CA4 and IC2.

[345] Drucksache 19/22059, p. 3, Berlin, Deutscher Bundestag (2020), https://dserver.bundestag.de/btd/19/220/1922059.pdf

Dimension	Details
Advantages and disadvantages	Advantages: • Already implemented or being implemented in many networks, especially in urban areas. • Timetable is planned by consensus to address economic, social and financial objectives. • Infrastructure is planned to deliver the timetable efficiently and reliably. Disadvantages: • Differs from the "commercial first" philosophy of the legislative framework. • Risk of inflexible timetable driven by PSOs, with little or no scope for commercial entry. • Not clear how legislation could formally require (or restrict) a Takt approach. • Difficult to require coordination between infrastructure managers. • Change of processes in the Member States might mean long timescale before benefits were seen.

Source: Steer analysis.

Measure CA2: ensure further implementation of the European Train Control System (ETCS)

Q.20 A growing proportion of the study area's rail network, including cross-border corridors, is being controlled by ETCS. Subject to emerging differences in implementation on different networks, ETCS can offer a common interface between track and train, enable locomotives and crews to operate on more networks, and reduce or eliminate the need for changes at borders. ETCS can in principle also increase the number of trains which can be operated at a given level of reliability, especially if combined with automatic train operation (ATO), which has already been done on constrained urban track. However, it is not yet clear what improvements ETCS can deliver in practice on specific routes carrying specific traffic, or at what point other constraints will emerge.

Q.21 One measure which has been suggested is further promotion of ETCS, including the Commission's grant support under the Connecting Europe Facility (CEF).

Table Q.9: Measure CA2

Dimension	Details
Measure	Ensure further implementation of the European Train Control System (ETCS).
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	None identified, unless legislation could be adjusted to require acceleration of existing programmes.
Parties required to take action to implement the measure	• Member States and competent authorities to provide funding. • Infrastructure managers and railway undertakings to implement.
Anticipated outcomes of the measure being implemented	• Greater standardisation of signalling equipment, reducing one of the barriers to cross-border operations. • Some increases in effective capacity and/or reliability. • Better availability of real-time information, such as on train locations.
Indicative timescale	Short term, less than five years, to introduce new targets or budgets, but this is an existing programme.

Dimension	Details
Linkages with other measures	None, although some of the data captured by ETCS could support measures on compensation, real time information, and passenger rights.
Advantages and disadvantages	Advantages: • Already being implemented. • Standardised equipment and processes for all operations, including cross-border. • Potentially provides new and consistent information to support other measures. Disadvantages: • Difficult to accelerate an extremely complex of programme of infrastructure and rolling stock asset renewal. • ETCS has still resulted in some variants and "dialects" related to "open points".

Source: Steer analysis.

Measure CA3: explicitly permit capacity allocation to be based on social or environmental value

Q.22 Where infrastructure has become constrained in Sweden and the United Kingdom, the allocation of capacity has been guided by the principal of devising the most socially valuable timetable[346]. In principle, the concept could be extended or adapted to deliver the most environmentally valuable timetable. At city centre stations constrained in the morning peak, for example, it might be better to provide for a night train carrying long-distance passengers, many of whom would otherwise have travelled by air, instead of a day train carrying suburban passengers, many of whom would otherwise have travelled by tram, bus, bicycle, or on an earlier or later train. We note that the experience of the COVID-19 pandemic may lead to permanent changes to passengers' demand for, and ability to find alternatives to, both commuting and business travel. This also suggests a need to reassess the provision for, and priorities associated with, different types of rail journey.

Table Q.10: Measure CA3

Dimension	Details
Measure	Explicitly permit capacity allocation to be based on social or environmental value.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	Directive 2012/34/EU would be revised: • Article 47 would refer to the environment rather than the importance of service to society. • Other changes might be necessary or appropriate.
Parties required to take action to implement the measure	• The Commission would change the Directive. • Competent authorities, infrastructure managers and regulatory bodies would take a different approach to prioritisation of services, whether for incremental change or for major timetable restructuring.

[346] If Takt is seen as a proactive approach to optimising timetables, this can in principle be seen as a reactive approach to doing so. In practice, the approaches tend to converge on planning a repeating "standard hour" timetable designed to maximise social value.

Dimension	Details
Anticipated outcomes of the measure being implemented	• The industry would have a clear focus on delivering environmental objectives. • Priorities for capacity allocation would be clearer.
Indicative timescale	Short term, less than five years.
Linkages with other measures	This could be linked with OP1.
Advantages and disadvantages	Advantages: • Would link the objectives of the industry directly to environmental objectives. • Need only be applied where capacity is constrained and priorities need to be set. • Clearer prioritisation for capacity allocation. • Could be aligned with charges, if it were possible to devise market segments which accurately reflected environmental benefits. Disadvantages: • Work would be required to model how capacity allocation decisions, such as between long-distance and urban services, would affect environmental and climate outcomes. • Changes to prioritisation could create winners and losers among passengers.

Source: Steer analysis.

Measure CA4: offer more framework agreements for long-distance cross-border services

Q.23 Framework agreements for capacity exceeding one timetable period are provided for in Article 42 of Directive 2012/34/EU but appear to be used in only three Member States[347]. New entrants struggle to find financing for rolling stock acquisitions, because they cannot demonstrate to lenders that they have a business case to use the stock over a sustained period. Framework agreements for infrastructure capacity would increase the stability and financeability of their business plans.

Table Q.11: Measure CA4

Dimension	Details
Measure	Offer more framework agreements for long-distance cross-border services, to improve business planning and financeability.
Scope and coverage of the measure	All long-distance cross-border services, on all railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	At EU level, Directive 2012/34/EU would be modified, if a way were found to do so.
Parties required to take action to implement the measure	• The Commission would change legislation. • Implementation would be by infrastructure managers and, in some cases, regulatory bodies.

[347] RMMS 7 reported that "At June 2020, framework agreements were applied by the infrastructure managers of Austria, Italy, Norway and the United Kingdom. Framework agreements will be used in Spain to open the domestic high-speed rail market starting from the 2020-2021 timetable."

Dimension	Details
Anticipated outcomes of the measure being implemented	• Railway undertakings operating cross-border services would see more predictable and stable allocation of capacity, facilitating business planning and raising finance. • More new entry as a result of the improved environment for market entry.
Indicative timescale	Short term, less than five years, if a means were found of legislating for the change.
Linkages with other measures	This could be linked with CA1, CA5 and PS2.
Advantages and disadvantages	Advantages: • Would give greater certainty to railway undertakings and competent authorities proposing cross-border services. • Could be consistent with Takt timetables (measure CA1). Disadvantages: • Not clear how legislation could require that infrastructure managers conclude framework agreements. • Framework agreements for one service may, over time, prevent the operation of another service of higher economic, social or environmental value.

Source: Steer analysis.

Measure CA5: complete and refine the international Timetabling Process (TTR)

Q.24 TTR is intended to allow capacity to be allocated for both short- and long-term needs. Pilot projects have found that TTR requires extensive IT developments, but it remains the best approach yet devised, at least until further improvements emerge.

Table Q.12: Measure CA5

Dimension	Details
Measure	Complete and refine the international Timetabling Process (TTR).
Scope and coverage of the measure	All cross-border services, on all railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	We have not identified whether or how legislation could be used to improve or accelerate the TTR process.
Parties required to take action to implement the measure	Infrastructure managers, groupings of infrastructure managers, and forums of infrastructure managers.
Anticipated outcomes of the measure being implemented	• More efficient creation of cross-border timetables. • Potentially, creation of paths better suited to railway undertakings' requirements for cross-border services. • Potentially, for railway undertakings, more efficient and reliable operations. • Potentially, for passengers, more attractive and reliable services and connections.
Indicative timescale	Short term, less than five years, at least for some changes, but complex IT projects might take longer, particularly if there is a need to link or consolidate them across the EU.
Linkages with other measures	This could be linked with CA4.

Dimension	Details
Advantages and disadvantages	Advantages: • Builds on existing arrangements. • Current best practice in cross-border timetabling. Disadvantages: • Limitations of current approach have been identified by IRG-Rail. • Requires extensive IT projects. • Makes best use of existing infrastructure but does not, in itself, expand its capacity. • Not yet clear what challenges will emerge if more cross-border services are to be operated on an increasingly congested network.

Source: Steer analysis.

Measure CA6: develop hubs for long-distance cross-border trains

Q.25 Some stakeholders advocated "hubs for night trains", but we have seen no clear statement of what is envisaged. We note that Vienna's new main station was designed taking into account ÖBB's plans to operate an extensive Nightjet network, that the German Federal Transport Infrastructure Plan (FTIP) includes a number of hub stations, and that cross-border trains serving Amsterdam are to be focused on Amsterdam-Zuid station.

Q.26 A hub concept could be extended to all long-distance cross-border trains, but might need to be linked to provision of suitable line and platform capacity at peak periods, and arrangements for ticketing and connections.

Table Q.13: Measure CA6

Dimension	Details
Measure	Hubs for night trains or long-distance cross-border trains, which would depart from a single station in each city, which in principle could have additional facilities to support night train operations and passengers.
Scope and coverage of the measure	Urban areas of conurbations with more than one long-distance cross-border train pair.
Legislative implication	None.
Parties required to take action to implement the measure	Infrastructure managers, railway undertakings, competent authorities specifying related PSO services.
Anticipated outcomes of the measure being implemented	• Potentially, clearer focus of types of service on particular stations. • Potentially, more efficient allocation of capacity. • For passengers, clearer location of services. • For railway undertakings, simpler operational focus. • For neighbours to the railway, opportunity to manage overnight noise from night trains.
Indicative timescale	Short term, less than five years, depending on planning processes and other local issues. A longer period might be required where major infrastructure was needed, such as to provide connections between several night train routes and a single station.
Linkages with other measures	None.

Dimension	Details
Advantages and disadvantages	Advantages: • May enable clearer focus for different stations. • May be simpler for railway undertakings and passengers. Disadvantages: • May only be practicable in a few cities, where night trains can all reach a single station. • Segregating trains into different stations might result in more connections requiring travel between stations.

Source: Steer analysis.

Measure CA7: wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality

Q.27 This measure would reform Chapter IV of Directive 2012/34/EU on allocation of railway infrastructure capacity, although we noted that some stakeholders advocated complete reform of Directive 2012/34/EU. One specific and more limited measure could be to review the flexibility allowed to prioritise domestic PSO services over cross-border services (Eurolink suggested the opposite priority), although it is not clear how a change in priority in theory would change timetabling processes in practice.

Table Q.14: Measure CA7

Dimension	Details
Measure	Wider reform of the allocation of railway infrastructure capacity with the objective of meeting climate neutrality: • Reform Chapter IV of Directive 2012/34/EU on allocation of railway infrastructure capacity. • For example, Directive 2012/34/EU could explicitly permit or require a reflection of Net Zero in areas such as prioritisation and dealing with congestion.
Scope and coverage of the measure	All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU.
Legislative implication	Stakeholders have suggested that the Directive should be reformed, but not identified specific problems or proposed specific objectives. A possible interpretation is that a suitable problem tree would be created, beginning with the issue of carbon emissions as a problem and then reworking the logic of the Directive within this framework.
Parties required to take action to implement the measure	The Commission would change the Directive.
Anticipated outcomes of the measure being implemented	• Better focus by the rail industry of policies, measures and actions which would contribute to Net Zero including, inter alia, mode shift from air to rail on longer journeys, many of which are cross-border. • Potentially, scarce or congested capacity allocated to the use which would create the greatest reduction in carbon use, such as rail services which would attract passengers from, or allow the closure of, air routes.
Indicative timescale	Short term, less than five years.
Linkages with other measures	This measure could be used to support any or all of IC2, IC5, CA1 or CA4.

Dimension	Details
Advantages and disadvantages	Advantages: • Could align capacity allocation with objectives such as Net Zero. • Could reflect a changed importance for Takt (CA1) and framework agreements (IC2 for charges, CA4 for capacity). Disadvantages: • Might require extensive research, consultation and design to establish how this could be done. • Not yet clear in what ways the Directive would need to change or how this would be implemented.

Source: Steer analysis.

Measures RS on rolling stock

Q.28 In Annex M we set out potential measures to increase the availability of rolling stock, which we summarise briefly here.

Measure RS1: require that unused stock be offered for auction

Q.29 New entrants wish to test markets using secondhand rolling stock, which has already been authorised for use, rather than committing to investment in new rolling stock, which may still need to be authorised. There have been allegations that certain incumbents only sell redundant rolling stock to other incumbents, which blocks the market for secondhand stock. This measure would require owners of redundant rolling stock to make them available to the market and to sell them through a transparent process. There might, however, be practical difficulties in identifying stock which was unused, or in protecting it from deterioration.

Table Q.15: Measure RS1

Dimension	Details
Measure	Require that unused stock be offered for auction.
Scope and coverage of the measure	All rolling stock owned by railway undertakings established in the EU that is suitable for long-distance cross-border traffic, including operations by night trains.
Legislative implication	Directive 2012/34/EU would need to be revised to include a separate chapter on access to rolling stock. Other changes might be necessary or appropriate.
Parties required to take action to implement the measure	The Commission would change the Directive. • Regulatory bodies would monitor compliance with the provision and make information on disused rolling stock available to interested parties (railway undertakings, authorised applicants and leasing companies). • A third party would organise or supervise an auction for the disused rolling stock.
Anticipated outcomes of the measure being implemented	• More new cross-border train services. • Shorter lead time to start up (subject to the 18-month notice period). • More rail passengers. • More shift from other modes.
Indicative timescale	Short term, less than five years, to introduce the requirement.
Linkages with other measures	The measure could be combined with measures RS2/RS3, RS4 and PS1.

Dimension	Details
Advantages and disadvantages	Advantages: • Operators could build a market with second hand rolling stock first and decide to invest in new rolling stock once there is clarity about the earning potential of the new service. • Guaranteed integrity of the sales process through the auction process. • Potential to guarantee confidentiality around the identity of the buyer and/or the nature of the new train service through the auction process. Disadvantages: • Does not guarantee the viability of new services. • There is a risk that stock would be retained but allowed to deteriorate, and a need to define "unused rolling stock", such as by period out of use.

Source: Steer analysis.

Measure RS2: public sector guarantees to limit risks to leasing companies

Q.30 New entrants currently struggle to find financiers for new rolling stock orders over around €200 million, due to the limited ability to demonstrate a robust business case. A public sector leasing company holding all types of rolling stock for long-distance cross-border services would give new entrants access to the rolling stock market and access to rolling stock financing.

Table Q.16: Measure RS2

Dimension	Details
Measure	Consider a pan-European public sector leasing company with pan-European guarantees for the stock to leasing companies.
Scope and coverage of the measure	All rolling stock suitable for long-distance cross-border passenger transport.
Legislative implication	We have not identified a specific legislative approach.
Parties required to take action to implement the measure	The Commission would take the initiative: • to establish a pan-European leasing company; or • to provide a pan-European guarantee; and • to define a methodology to calculate leasing rates.
Anticipated outcomes of the measure being implemented	• More new cross-border train services. • Shorter lead time to start up (subject to the 18-month notice period). • More rail passengers. • More shift from other modes.
Indicative timescale	Short term, less than five years, to establish a leasing company.
Linkages with other measures	Could be combined with RS1, RS4 or PS1. RS3 is a variant on RS2.

Dimension	Details
Advantages and disadvantages	Advantages: • Improved access to rolling stock for long-distance cross-border transport. • Improved access to rolling stock financing for long-distance cross-border transport. • A pan-European company should benefit from economies of scale. Disadvantage: • It would still be possible to charge different lease rates to different lessors. • The relation between the public sector rolling stock company and private sector rolling stock companies is unclear. • It might be seen as unfair competition to existing leasing companies if the public sector rosco were to offer any type of rolling stock. One option might be to limit the public sector company's involvement to the acquisition of rolling stock that is too high risk for the private sector.

Source: Steer analysis.

Measure RS3: ensure non-discrimination in rolling stock leasing prices

Q.31 New entrants currently pay higher leasing charges than incumbents, who can offer a corporate guarantee, or PSO contractors, where the PSO includes a usage guarantee. Standard and transparent prices would ensure that stock was available to all railway undertakings on equal terms.

Table Q.17: Measure RS3

Dimension	Details
Measure	• Ensure non-discrimination in rolling stock leasing prices. • For example, a pan-European public sector leasing company could offer standard prices to ensure equal terms to all railway undertaking.
Scope and coverage of the measure	All rolling stock suitable for long-distance cross-border passenger transport.
Legislative implication	We have not identified a specific legislative approach.
Parties required to take action to implement the measure	The Commission would take the initiative: • to establish a pan-European leasing company; or • to provide a pan-European guarantee; • to ensure that the same terms are offered to all applicants; and • to define a methodology to calculate leasing rates.
Anticipated outcomes of the measure being implemented	• Fewer barriers to entrants which are small or have no established track record. • More new cross-border train services. • Shorter lead time to start up (subject to the 18-month notice period). • More rail passengers. • More shift from other modes.
Indicative timescale	Short term, less than five years, to establish a leasing company.
Linkages with other measures	Could be combined with RS1, RS4 or PS1. RS3 is a variant on RS2.

Dimension	Details
Advantages and disadvantages	Advantages: • Improved access to rolling stock for long-distance cross-border transport. • Improved access to rolling stock financing for long-distance cross-border transport. • A pan-European company should benefit from economies of scale. • Decreased costs for railway operators that do not benefit from corporate guarantees. • A fair level playing field for lessors. • It would not be possible to charge different lease rates to different lessors. Disadvantages: • The relation between the public sector rolling stock company and private sector rolling stock companies is unclear. • It might be seen as unfair competition to existing leasing companies if the public sector rosco were to offer any type of rolling stock. One option might be to limit the public sector company's involvement to the acquisition of rolling stock that is too high risk for the private sector.

Source: Steer analysis.

Measure RS4: consider wider EU and/or EIB co-financing of cross-border rolling stock

Q.32 Stakeholders identified a number of practical issues associated with making existing rolling stock suitable for cross-border operations. Examples include compliance with fire regulations and the provision of selective door opening required on some networks.

Q.33 EU co-funding could cover the additional costs of equipping rolling stock for cross-border operation, such as additional equipment for signalling or selective door opening.

Table Q.18: Measure RS4

Dimension	Details
Measure	Consider EU co-financing of cross-border rolling stock.
Scope and coverage of the measure	All rolling stock that could be equippped or modified for use on long-distance cross-border operations.
Legislative implication	None.
Parties required to take action to implement the measure	The Commission would take the initiative for the co-financing.
Anticipated outcomes of the measure being implemented	• Fewer barriers to adapting rolling stock for cross-border services. • More new cross-border train services. • More rail passengers. • More shift from other modes.
Indicative timescale	Short term, less than five years, to establish a co-financing system.
Linkages with other measures	Could be combined with RS1, RS2/RS3 or PS1.

Dimension	Details
Advantages and disadvantages	Advantages: • Reduced barriers to equipping stock for cross-border operations. Disadvantages: • The increase in cross-border passenger trains services resulting from this initiative is likely to be lower than with measures RS1, RS2/RS3 or PS1. • There is the risk that the investment cannot be recovered over the life of the rolling stock if technology or the regulatory framework changes.

Source: Steer analysis.

Measures TP on ticketing and rights for connecting passengers

Measure TP1: encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)

Q.34 Stakeholders were optimistic that OSDM would make it easier for ticket vendors to sell passengers multiple tickets in a single transaction, although much will depend on the behaviour of railway undertakings. One measure would be to require railway undertakings to make all tickets available on OSDM on fair, reasonable and non-discriminatory (FRAND) commercial principles.

Table Q.19: Measure TP1

Dimension	Details
Measure	Encourage use of OSDM on fair, reasonable and non-discriminatory (FRAND) principles.
Scope and coverage of the measure	This could apply to all rail tickets which are made available on at least one mode which can be supported by ticket vendors
Legislative implication	• Legislation could be introduced to require railway undertakings to make all tickets available through OSDM, perhaps by modifying Regulation (EU) 2021/782. • Requirements could include non-discriminatory access to all ticket vendors on fair, reasonable and non-discriminatory (FRAND) commercial principles).
Parties required to take action to implement the measure	• The Commission would legislate. • Railway undertakings and associations of them, PSO competent authorities, and associations of them, ticket vendors and associations of them.
Anticipated outcomes of the measure being implemented	• Wider scope for ticket vendors and railway undertaking to combine products to create an end-to-end itinerary and ticket, including for cross-border journeys using successive railway services operated by more than one railway undertaking. • Passengers have wider range of purchase points. • Greater competition to deliver attractive and efficient service.
Indicative timescale	Short term, less than five years. (OSDM is being rolled out in 2021, but rate of adoption is uncertain).
Linkages with other measures	None.

Dimension	Details
Advantages and disadvantages	Advantages: • Uses existing initiative • Wide industry buy-in Disadvantages: • Additional costs for railway undertakings and ticket vendors. • Mechanisms may be needed to prevent price and terms being used to make OSDM unattractive to ticket vendors and passengers. • Passengers may be confused by a proliferation of sales channels and, potentially, different prices for the same product.

Source: Steer analysis.

Measure TP2: define and publish minimum connecting times within and between stations

Q.35 In Annex N we contrasted the lack of information on connecting times in some states with online information on connections within, and between, stations in others.

Q.36 The UIC MERITS database contains information on minimum connecting times within, but not between, stations. We discussed MERITS with UIC, who told us that the process of collating minimum connecting times had been made more complex by the separation of operations and infrastructure and, in some cases, the separate management of stations. Depending on the state, minimum connecting times within stations could be reported to UIC, for inclusion in MERITS, by one or more of:

- the railway undertakings;
- the infrastructure manager; or
- station managers.

Q.37 We are also aware of examples of journey planning software suggesting connections within stations which, because of the layout of, or temporary changes to, the station concerned, could not in practice be made in the time available.

Q.38 One potential measure, which one stakeholder suggested could be managed by the European Union Agency for Railways (ERA), would be to establish a central database of connecting times within and between stations, accessible online.

Table Q.20: Measure TP2

Dimension	Details
Measure	• Define and publish minimum connecting times within and between stations. • Note that this information is not required in Annex II to Regulation (EU) 2021/782 "Minimum information to be provided by railway undertakings and ticket vendors".
Scope and coverage of the measure	This would ideally apply to all trains covered by Directive 2012/34/EU, without exemptions such as for urban and suburban or regional services, which would limit the value of the measure for passengers connecting from (or to) them.
Legislative implication	• Regulation (EU) 2021/782 could be modified to require infrastructure or station managers to provide this service, unless a suitable service was already provided by other parties.
Parties required to take action to implement the measure	• Infrastructure managers, railway undertakings and PSO competent authorities, or any other party voluntarily.

Dimension	Details
Anticipated outcomes of the measure being implemented	• Easier for passengers to identify minimum connecting times. • Fewer complaints of itineraries being created with impracticable connections. • Fewer passengers fail to make connections. • Fewer missed connections as defined in Regulation (EU) 2021/782.
Indicative timescale	Short term, less than five years. This is a relatively self-contained project to set up a database collating information which already exists or can easily be generated.
Linkages with other measures	Closely linked to TP3.
Advantages and disadvantages	Advantages: • Information of this type can be published, as in Great Britain. Disadvantages: • Costs of making data sufficiently reliable to be trusted by passengers and endorsed by passenger representative bodies. • Costs of keeing data up-to-date, for example during permanent or temporary changes of layout within stations.

Source: Steer analysis.

Measure TP3: offer passengers the option to request longer connecting times

Q.39 Another measure would be to ensure that passengers had access to functionality to specify higher connecting times when searching for travel options. At present, where this functionality exists, it may be offered by railway undertakings but not accessible by ticket vendors.

Table Q.21: Measure TP3

Dimension	Details
Measure	• Offer passengers the option to request longer connecting times. • Note that this functionality is already offered to passengers on DB's website, although we were told that ticket vendors do not have access to it.
Scope and coverage of the measure	This would ideally apply to all itineraries including trains covered by Directive 2012/34/EU, without exemptions such as for urban and suburban or regional services, which would limit the value of the measure for passengers connecting from (or to) them.
Legislative implication	• Legislation could require providers of reservation systems, who need not be a railway undertaking, where this functionality existed, to offer non-discriminatory access to all ticket vendors on fair, reasonable and non-discriminatory (FRAND) commercial principles.
Parties required to take action to implement the measure	• Providers of reservation systems, railway undertakings and PSO competent authorities.
Anticipated outcomes of the measure being implemented	• Passengers more confident to book and make journeys involving connections between successive railway services. • Passengers use functionality to tailor itineraries. • Fewer passengers fail to make connections. • Fewer missed connections as defined in Regulation (EU) 2021/782.
Indicative timescale	Short term, less than five years. Our understanding is that this would require journey search software to allow one input to the search algorithm to be specified by, or for, the passenger.

Dimension	Details
Linkages with other measures	Closely linked to TP2.
Advantages and disadvantages	Advantages: • Functionality of this type can be provided, as by DB. • Passengers could choose to take greater risks, but would be offered no rights to connect between trains separated by less than the minimum connecting time. Disadvantages: • Ticket vendors would need to modify their booking systems to offer this functionality to passengers. • Passengers would need to make their own judgements of what connecting time to risk.

Source: Steer analysis.

Measure TP4: use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible

Q.40 Stakeholders referred to voluntary agreements to assist passengers, including the existing "Agreement on Journey Continuation" (AJC) between railway undertakings, and suggested that this could be extended and made mandatory. One advantage of the AJC, if it became a business-to-consumer (B2C) agreement, is that it would be a direct agreement between a railway undertaking and a passenger who had missed one of their services and could show that this was for reasons beyond their control. This could simplify or remove the need for mechanisms to allocate responsibility or transfer reimbursements or compensation between parties.

Table Q.22: Measure TP4

Dimension	Details
Measure	Extend use of the provisions of the Agreement on Journey Continuation (AJC) to ensure that the industry assists and re-routes passengers as much as possible.
Scope and coverage of the measure	This would ideally apply to all itineraries including trains covered by Directive 2012/34/EU, without exemptions such as for urban and suburban or regional services, which would limit the value of the measure for passengers connecting from (or to) them.
Legislative implication	• Modification to Regulation (EU) 2021/782 to require railway undertakings and other parties to transport contracts to assist and/or re-route passengers who could prove that they had missed a connection due to a delay to an earlier train. • Could be extended to include delays to any other transport services.
Parties required to take action to implement the measure	• Railway undertakings and PSO competent authorities. • National enforcement bodies (NEBs) would also monitor.
Anticipated outcomes of the measure being implemented	• Passengers more confident to book and make journeys involving connections between successive railway services. • More passengers assisted and re-rerouted without a need to re-book. • Fewer passengers delayed, and by less time, at final destination.
Indicative timescale	Short term, less than five years. Our understanding is that the existing AJC would provide a template which could be adopted.

Dimension	Details
Linkages with other measures	None.
Advantages and disadvantages	Advantages: • Passenger need only deal with one party, the one offering the next service. • Does not require financial settlement system if remedies are confined to assistance and free re-routing by the next operator. Disadvantages: • It may be difficult for passengers to demonstrate in real time why they are late. (It may not be possible to rely on an earlier railway undertaking identifying a passenger as delayed.) • Clarity would be needed on how passengers would gain authority to board another service, such as when passengers need a reservation or other documents before boarding. • Passengers may rely on the system and not make reasonable efforts to complete the planned connection. • Reliable railway undertakings may effectively be expected to provide insurance for unreliable one.

Source: Steer analysis.

Measure TP5: record and publish delays and their attribution to causes and parties

Q.41 Regulation (EU) 2021/782 defines a missed connection as when "a passenger misses one or more services in the course of a rail journey, sold as a through-ticket, as a result of the delay or cancellation of one or more previous services, or of the departure of a service before the scheduled departure time". If this is to form the basis for contractual rights and obligations, it will be essential that the fact of a delay, or premature departure, and if necessary the cause and party responsible, can be recorded, agreed and checked by parties including railway undertakings, passengers, providers of dispute resolution, and national enforcement bodies (NEBs).

Q.42 One measure would be to build on existing best practice in delay measurement and attribution, such as the long-established performance regimes in Great Britain referred to in paragraph Q.14, to make sure that this information was consistently collected and available to interested parties.

Table Q.23: Measure TP5

Dimension	Details
Measure	• Record and publish delays and their attribution to causes and parties. • The aspiration is that this would provide a definitive public record of when each train arrived at and departed from each station, as measured by door release and door closure or locking. • In practice, this may require extensive new technology on trains and supporting databases to hold and share the information.
Scope and coverage of the measure	This would ideally apply to all itineraries including trains covered by Directive 2012/34/EU, without exemptions such as for urban and suburban or regional services, which would limit the value of the measure for passengers connecting from (or to) them.
Legislative implication	• Legislation could require, by a certain date, creation of a public database of all train arrival and departure times by infrastructure managers (using signalling data) and railway undertakings (using train data). • This could be linked to information of the causation of delays, although this would not necessarily be published.

Dimension	Details
Parties required to take action to implement the measure	• Infrastructure managers (using signalling data). • Railway undertakings (using train data). • Third parties collate and publish data, if not done direct, and make compensation payments.
Anticipated outcomes of the measure being implemented	• Accurate recording and attribution of delays. • Clear basis on which to assign liability for passenger rights such as reimbursement and compensation. • If linked to performance and compensation systems, greater financial protection to all that they would not suffer financially because of the delays and cancellations caused by others. • Better incentives to industry to reduce delay and cancellation. • Greater flexibility to draft passenger rights legislation which would be enforceable.
Indicative timescale	Long term, more than ten years. Full implementation will require signalling and on-train systems which collect relevant data, and systems to collate and publish them.
Linkages with other measures	This measure might, in practice, depend on the compensation from infrastructure managers to railway undertakings who cannot operate the service due to infrastructure works or closures, measure IC3.
Advantages and disadvantages	Advantages: • Proven approach already used in GB. Disadvantages: • Only acts as an enabler, which could contribute to addressing problems in the longer term. • Requires signalling and on-train technology which may only slowly become available. • Delay attribution requires extensive staff, procedures and dispute resolution processes (the associated cost has been widely criticised in Great Britain). • Delay attribution cannot be completed in real time, so cannot identify who must deliver passenger rights such as assitance and re-routing: it can only inform any subsequent reimbursement and compensation.

Source: Steer analysis.

Measure TP6: link the rationale of Regulation (EU) 2021/782 on rail passenger rights to ensure journey connection, easy booking and lower prices and promotions resulting therefrom

Q.43 Regulation (EU) 2021/782 claims that “through-tickets allow seamless journeys for passengers” but does not define “seamless journey” or what features of the legal form of a through-ticket mean that it would result in a seamless journey. One measure, which could take the form of guidelines, would be to define a series of specific outputs to be delivered to passengers, focused on what passengers themselves identify as priorities.

Table Q.24: Measure TP6

Dimension	Details
Measure	Link the rationale of Regulation (EU) 2021/782 on rail passenger rights to passenger priorities such as ensuring journey connections, easier booking and lower prices. Issues include: • Focus on rail passenger priorities and benefits, rather than duplication of rights more relevant to other modes. • Deliverability of passenger rights in a mode with the characteristics of rail. • Consistency with the overall framework for passenger rights.
Scope and coverage of the measure	As the Regulation: "International and domestic rail journeys and services throughout the Union provided by one or more railway undertakings licensed in accordance with Directive 2012/34/EU".
Legislative implication	The Commission would need to reform Regulation (EU) 2021/782: • To prioritise issues identified by actual and potential passengers. • To reflect the characteristics of the industry and its impacts on deliverability, taking into account the diversity of existing technologies and processes, gaps, and current and future developments.
Parties required to take action to implement the measure	The Commission.
Anticipated outcomes of the measure being implemented	• Clearer linkage of objectives to passenger expectations. • Realistic assessment of what can be delivered with current or future technology, taking into account potential changes in: ticketing media; ticketing distribution; passenger information systems; and delay recording through signalling and on trains. • Insights to inform the wider development of passenger rights legislation.
Indicative timescale	Short term, less than five years. The Commission could procure research to identify existing and potential issues.
Linkages with other measures	None.
Advantages and disadvantages	Advantages: • Preparatory work, limited to desk research and consultation. Disadvantages: • Technically complex subject matter, as shown by the "remaining challenges" study. • Predicting future technologies' functionality, rate of adoption by the industry, and rate of use by passengers is difficult. • Findings could be overtaken by new developments of technology or in the market, such as new ticketing media or wider passenger tracking. • Desirable to retain consistency in the passenger rights framework between modes.

Source: Steer analysis.

Measure TP7: reform the regulatory framework for passenger rights for all modes

Q.44 Stakeholders told us that the framework set by Regulation (EU) 2021/782 is a compromise which may deliver only limited benefits. When other enablers are in place, the Regulation could be reviewed to identify gaps which can be closed.

Q.45 Our detailed review of the Regulation identified many gaps in the framework it establishes, including that:

- It establishes only limited obligations, such as where rights only apply to passengers with a through-ticket, which can only exist if the passenger has a transport contract with a railway undertaking.

- It may be difficult to comply with some obligations, such as providing any service to a passengers on an unstaffed station or a driver-only train.
- There may be scope for abuse and fraud by passengers, such as by falsely claiming to have travelled on a train which was delayed.

Q.46 An evaluation of the way the Regulation works in practice could lead to further reform.

Table Q.25: Measure TP7

Dimension	Details
Measure	When other enablers are in place, review the regulatory framework for passenger rights for all modes, including Regulation (EU) 2021/782, to identify gaps which can be closed.
Scope and coverage of the measure	All transport, by all modes, covered by passenger rights legislation.
Legislative implication	The Commission could reform some of all of the Regulations relating to passenger rights, including Regulation (EU) 2021/782 for rail.
Parties required to take action to implement the measure	The Commission.
Anticipated outcomes of the measure being implemented	• Better alignment of the Regulation with rights which are important to passengers and can be delivered by the industry. • Wider scope to deliver assistance and re-routing in real time. Wider scope to deliver reimbursement and compensation based on a clear and enforceable framework of liability. • Clearer understanding of passenger rights and industry responsibilities. • Potentially, simplification and more automation of passenger information and systems for re-routing, reimbursement, compensation, complaint-handling and monitoring and enforcement. • Better incentives to industry to reduce delay and cancellation.
Indicative timescale	Medium term, five to ten years. Article 39 of the Regulation requires the Commission to report on the implementation and the results of the Regulation by 7 June 2026. Proposals for revisions could follow.
Linkages with other measures	None.
Advantages and disadvantages	Advantages: • Report on the implementation and the results of the Regulation by 7 June 2026 creates an opportunity. • Could address known and emerging limitations of the Regulation. • The Regulation sets a floor level of rights, but more generous terms may still be offered locally, as acknowledged in Article 18(3). Disadvantages: • Relatively long timescale to implement and address problems already identified. • May require a top-down review of definitions such as “through-ticket”, “transport contract”, “immediately” and time thresholds for re-routing (Article 18) and for compensation (Article 19).

Source: Steer analysis.

Measures PS on cross-border PSOs

Measure PS1: use PSOs for long-distance cross-border services to improve financeability

Q.47 Offering PSOs for long-distance cross-border services, such as the PSOs from the Netherlands and Sweden related to night trains, would address a number of issues:

- It would allow these services to be taken into account in planning networks of services and connections with other services, including setting fares and ticketing arrangements.
- Under Directive 2012/34/EU, it would allow these services to prioritised on congested infrastructure (Article 47) and in the event of disturbance (Article 54).
- It would allow the European Investment Bank (EIB) to finance rolling stock acquisitions. However, the EIB traditionally only finances part of a rolling stock acquisition, and only up to a certain amount, so this would only be a partial solution.

Table Q.26: Measure PS1

Dimension	Details
Measure	Use PSOs for long-distance cross-border services to improve financeability.
Scope and coverage of the measure	All long-distance cross-border train services in the EU. The measure could be limited in time and/or the PSO compensation could be limited to start-up costs.
Legislative implication	We have not identified a specific legislative approach.
Parties required to take action to implement the measure	The Commission would change the Regulation.
Anticipated outcomes of the measure being implemented	• More new cross-border train services. • Better coordination of services, connections and fares. • Shorter lead time to start up (not subject to the 18-month notice period). • More rail passengers. • More shift from other modes.
Indicative timescale	Short term, less than five years, to introduce new PSOs.
Linkages with other measures	Could be combined with RS1, RS2/RS3, RS4, and/or PS2 and/or PS3.
Advantages and disadvantages	Advantages: • Member States would fund the cost of the acquisition of rolling stock for long-distance cross-border transport that cannot be recovered through passenger revenues. • EIB could (co-)fund the acquisition of rolling stock for long-distance cross-border transport. • A uniform approach to long-distance cross-border transport across all Member States. Disadvantages: • Increased pressure on Member State finances. • Does not address the issue of identifying and specifying suitable cross-border services.

Source: Steer analysis.

Measure PS2: ensure that long-distance cross-border PSO services are specified in full

Q.48 The range of structures of cross-border PSOs is complex, as illustrated by Figure 5.3, but some PSOs only specify a service to the last station in a state rather than to the border. This creates a risk that railway undertakings to split the operation, leaving a gap at the border, if it is cheaper and operationally practicable to do so. This measure would need to be taken by the relevant competent authorities but could be the subject of guidance from the Commission.

Table Q.27: Measure PS2

Dimension	Details
Measure	• Ensure that long-distance cross-border PSO services are specified in full. • Specify PSOs in a way which ensures that every part of the service must be provided in a way that meets the perceived need.
Scope and coverage of the measure	All PSO services which cross one or more borders.
Legislative implication	None at Commission level.
Parties required to take action to implement the measure	• Competent national, regional and local authorities specifying PSOs.
Anticipated outcomes of the measure being implemented	• Clearer specification of service and stability of provision. • Reduce risk that "commercial" sections of PSO services are withdrawn by railway undertakings, for example because of changes in access charges or capacity allocation.
Indicative timescale	• Short term, less than five years. • Process would be gradual over 10 years, as existing PSOs expired and were replaced.
Linkages with other measures	This could be linked with IC2, CA4 and PS1.
Advantages and disadvantages	Advantages: • Can build on best practice in specfiying PSOs to ensure that social needs are met. • Where two or more competent authorities are involved, each benefits from the other providing a contractually enforceable service specification. • Potential reduction in subsidy, if profitable elements of service (peaks or core) cross-subsidise less profitable elements of service (off-peaks or extremities). Disadvantages: • Potential competition issues where a PSO service exists, or is introduced, which serves similar markets to a commercial service.

Source: Steer analysis.

Measure PS3: provide start-up funding support for new long-distance cross-border services

Q.49 Some stakeholders mentioned the scope for start-up funding for new cross-border services, which was anticipated in the study Technical Specifications and was intended for the extension of the ÖBB Nightjet service from Dusseldorf via Arnhem to Amsterdam[348]. Member States could use start-up funding to encourage new services to be trialled, even if they subsequently

[348] NightJet expands to Amsterdam and Brussels, Railway Gazette International, 11 October 2019 (2019)

proved not to be viable, although we note that this means of provision of subsidy without notification in the Official Journal of the European Union has been challenged[349].

Table Q.28: Measure PS3

Dimension	Details
Measure	Member States provide start-up funding support for new long-distance cross-border services: • New services involve a high degree of financial risk, which declines once demand is proven. • Demand takes time to build up: after initial losses, services may be commercially viable.
Scope and coverage of the measure	All new rail services which may be socially beneficial but commercially viable in the longer term.
Legislative implication	None: decisions to provide start-up funding would be for the Member States.
Parties required to take action to implement the measure	Competent authorities in the Member States and railway undertakings. Either party could propose a service, but the competent authority would need to assess the case for the proposed new service, and hence: • whether to hold a competitive tender; • the service specification and the amount of flexibility; and, potentially • what maximum level of support to offer.
Anticipated outcomes of the measure being implemented	• Wider range of new start-up services tested.
Indicative timescale	• Short term, less than five years. • Trafikverket in Sweden has already held, for a four-year PSO for night trains.
Linkages with other measures	This could be linked with PS1.
Advantages and disadvantages	Advantages: • Unlike other measures, this is a direct intervention to obtain new services, as a minimum at least on an initial or trial basis, and could be targeted on cross-border or night trains. • Competent authority can build knowledge of demand, revenues and costs. • May minimise need for ongoing support if services are commercially viable. Disadvantages: • Competent authorities need processes to decide how to specify services, what support to provide, and whether to continue. • Support to some services may raise competitive issues with existing or proposed commercial services in the same markets.

Source: Steer analysis.

Measures DA on data

Q.50 This study has been constrained by the limited data in the public domain on many aspects of rail passenger markets, operations and costs. One issue we identified in earlier studies is that market liberalisation tends to lead to sources of information becoming fragmented,

[349] Dutch state sued for subsidising NS Vienna-Amsterdam night train, Railtech, 5 May 2021 (2021)

inconsistent and often commercially confidential. We note in Annex D how, in one extreme case of Eurostat data on passengers by speed of train over the period 2015-2019, all data except for Turkey is either zero or marked confidential.

Q.51 It is an obstacle to both entrepreneurs wishing to identify and exploit market opportunities, and competent authorities wishing to ensure public passenger transport services in the general interest, if incumbents are allowed to conceal the information needed to plan services.

Measure DA1: extend reporting requirements, for example to RMMS

Q.52 Reporting requirements to RMMS could be expanded, perhaps on a phased basis and in consultation with the Member States, to include more information, focusing on the needs of competent authorities and potential market entrants.

Table Q.29: Measure DA1

Dimension	Details
Measure	• Extend reporting requirements, for example to RMMS. • The aim would be to make publicly available information which could be of use to competent authorities, railway undertakings and infrastructure managers proposing or planning rail services or infrastructure.
Scope and coverage of the measure	Potentially data related to: • All railway infrastructure in the EU as listed in Annex I of Directive 2012/34/EU. • All "International and domestic rail journeys and services throughout the Union provided by one or more railway undertakings licensed in accordance with Directive 2012/34/EU" as defined in Regulation (EU) 2015/1100.
Legislative implication	New or modified Commission Implementing Regulations (for RMMS, Regulation 2015/1100) expanding reporting requirements.
Parties required to take action to implement the measure	• The Commission would need to devise a new Regulation or Regulations or to amend existing ones. • Member States and bodies within them would need to comply and provide data.
Anticipated outcomes of the measure being implemented	• Unclear, as this would depend on availability and quality of data, the extent of exemptions and the extent of compliance. • In principle, more information could facilitate, or reduce the risk in, the planning of new rail services.
Indicative timescale	Short term, less than five years.
Linkages with other measures	None.

Dimension	Details
Advantages and disadvantages	Advantages: • A central authoritative source of data could be useful for planning purposes. Disadvantages: • Numerous practical obstacles including the existence of data. • Data might need to be provided by all competent transport authorities and railway undertakings. • Changes to the information to be provided to RMMS could require upstream changes in the Member States to include new data collection and processing and to standardise reporting and presentation, including definitions, units, reporting periods and exemptions for confidentiality. • It would be outside the scope of RMMS to recieve, store and present very large volumes of disaggregate data on individual rail corridors and services. • Planning wholly new services may in any case require data which does not yet exist.

Source: Steer analysis.

Measure DA2: create an open industry database of ticket sales

Q.53 The airline industry has long-established sources of data, such as the OAG data from which we extracted data on airline seats, flights and journey times by airport pair in Annex G. Great Britain's rail industry has a database of station-to-station sales by period, Latest Earnings Networked Nationally Overnight (LENNON), accessible, with confidentiality safeguards, to railway undertakings and competent authorities wishing to plan services. If and when there is increasing commonality in sales and ticketing systems across the EU, one measure would be to collate the information in an accessible database.

Table Q.30: Measure DA2

Dimension	Details
Measure	• Create an open industry database of ticket sales. • Such a database could be made available to competent authorities, railway undertakings and other parties, subject to structured protocols to manage confidential information.
Scope and coverage of the measure	Potentially all ticket sales, by all channels, related to all "International and domestic rail journeys and services throughout the Union provided by one or more railway undertakings licensed in accordance with Directive 2012/34/EU" as defined in the Regulation.
Legislative implication	New or modified legislation to establish, or to require Member States to establish, a database.
Parties required to take action to implement the measure	• The Commission would need to devise a new Regulation or Regulations. • Member States and bodies within them would need to comply and provide data. • At least one body would need to manage and maintain the database.
Anticipated outcomes of the measure being implemented	• Unclear, as this would depend on availability and quality of data, the extent of exemptions and the extent of compliance. • In principle, more information could facilitate, or reduce the risk in, the planning of new rail services.
Indicative timescale	• Medium term, five to ten years.
Linkages with other measures	None.

Dimension	Details
Advantages and disadvantages	Advantages: • A central repository of ticket sales data could be useful for planning purposes. Disadvantages: • Numerous practical obstacles including the existence of data. • Requires processes to standardise reporting and presentation, including coding of stations, ticket types, reporting periods, exemptions for confidentiality. • Passengers cannot be compelled to buy end-to-end tickets, so ticket sales may be a poor guide to demand for connecting or cross-border services. • Planning wholly new services may in any case require data which does not yet exist.

Source: Steer analysis.

Measures OP on other proposals

Measure OP1: wider reform of transport taxation, such as through the Delivering the European Green Deal package, with the objective of meeting climate neutrality

Q.54 Several stakeholders argued that differences in the taxation of air and rail modes do not result in a level playing field between the modes, and that there would be less need to promote long-distance cross-border rail services if taxation of the modes was harmonised.

Table Q.31: Measure OP1

Dimension	Details
Measure	Wider reform of transport taxation, such as through the DEGD package, with the objective of meeting climate neutrality: • Carbon pricing and increased energy taxation. • Stakeholders suggested that this would be desirable, apparently on the assumption that taxation currently favours air.
Scope and coverage of the measure	Carbon pricing and taxation of fuel and energy.
Legislative implication	The Commission would legislate to require Member States to internalise costs and increase energy taxation.
Parties required to take action to implement the measure	• The Commission would legislate. • Member States and bodies within them would need to comply.
Anticipated outcomes of the measure being implemented	• Possible shift of travel to modes which result in fewer or no emissions.
Indicative timescale	Short term, less than five years.
Linkages with other measures	This could be linked with CA3.

Dimension	Details
Advantages and disadvantages	Advantages: • Internatlisation of external costs will facilitate to find a better economic and environmental outcome. Disadvantages: • Technical complexities.. • Contraction of the airline industry, including the loss of employment, which might have a major impact on communities where many are employed in the aviation supoply chain.

Source: Steer analysis.

R Study conference

Objectives of the conference

R.1 Task 3.5 of the Technical Specification required us to hold a conference to present the results of the study. The conference was held on **Wednesday 1 September 2021**. We were not aware of any other planned events on this date listed under their "Events" pages of the Community of European Railway and Infrastructure Companies (CER), International Union of Railways (UIC) or European Infrastructure Managers (EIM).

R.2 The desired outcome of the conference was for stakeholders to gain a better understanding of the range of obstacles faced in growing the provision of long-distance cross-border passenger rail services and the concrete actions within the Commission's remit to remove those obstacles.

R.3 Throughout the study we sought to capture the viewpoints of a range of stakeholders. At the conference we sought to validate their collective views by presenting our emerging findings and allowing stakeholders another chance to have a say on them, triggering a constructive discussion between stakeholders on key issues related to the study.

R.4 Given the timing of the conference so close to the Final Report deadline, and that a significant proportion of organisations attending the conference had already provided input via interviews and questionnaires, we have not prepared a formal note of the conference. However, we retained internal notes and have received further comments from some stakeholders. We have summarised the key points of discussion and comments in this Annex and noted any new insights within the relevant sections of this Final Report.

Invitations

"Save the date" reminder

R.5 The conference was open to everyone and was planned to have a maximum capacity of 200. We invited:

- all the stakeholders approached during the study's stakeholder engagement;
- any other stakeholders who approached us during the study;
- members of the Platform on International Rail Passenger Transport; and
- members of the Commission as requested.

R.6 On 7 July 2021 we sent these stakeholders a "save the date" email with a brief introduction of the conference. We allowed invitees to invite colleagues or peers who might find the conference relevant.

Conference invitation

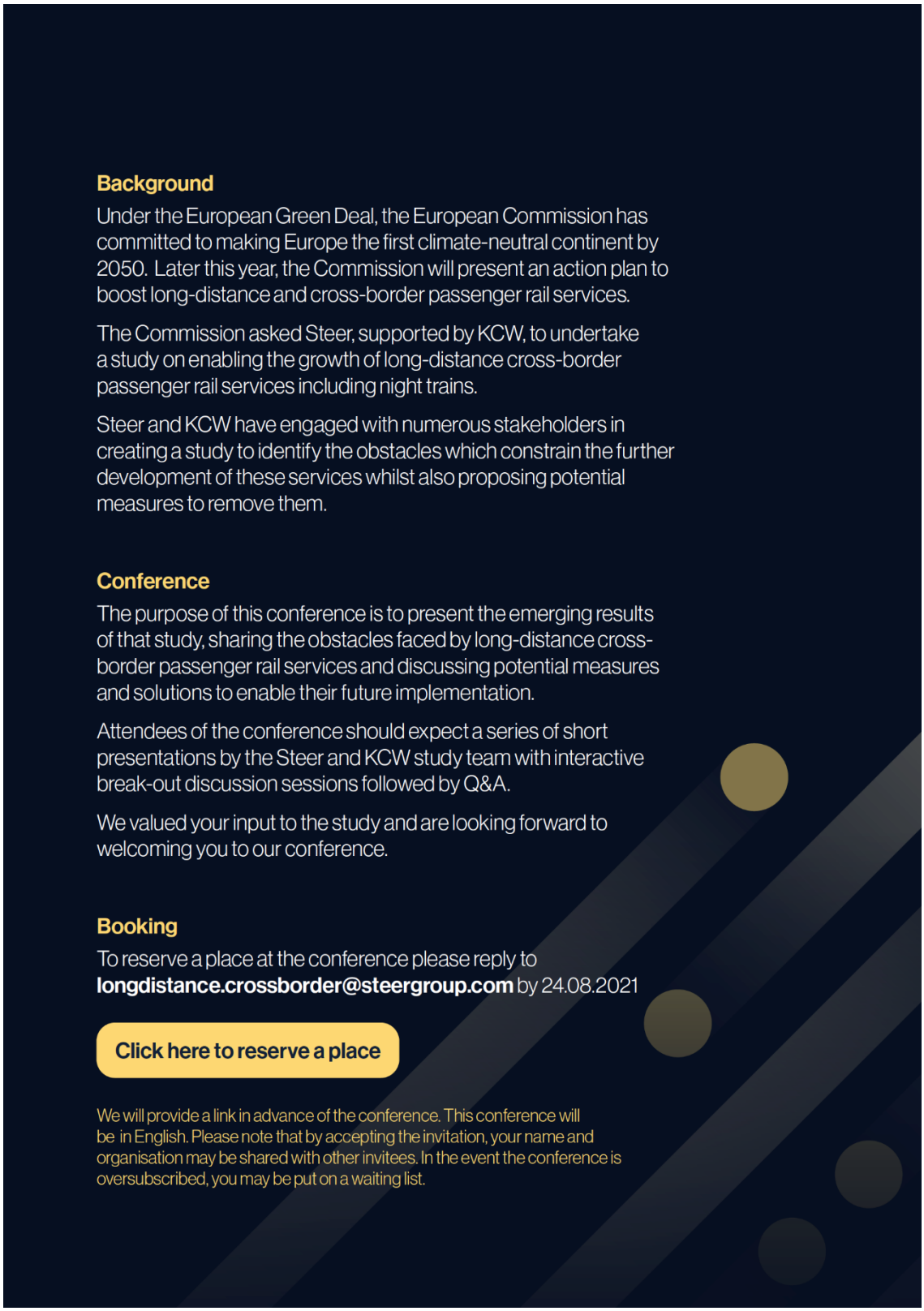
R.7 We developed a visual identity for the conference for use in email communication and in the conference presentation material.

R.8 On 4 August 2021 we sent out formal invitations to the conference, shown below, requesting responses by 24 August 2021. On 24 August 2021 we sent a reminder setting a final deadline of 31 August 2021.

Figure R.49: Conference invitation front



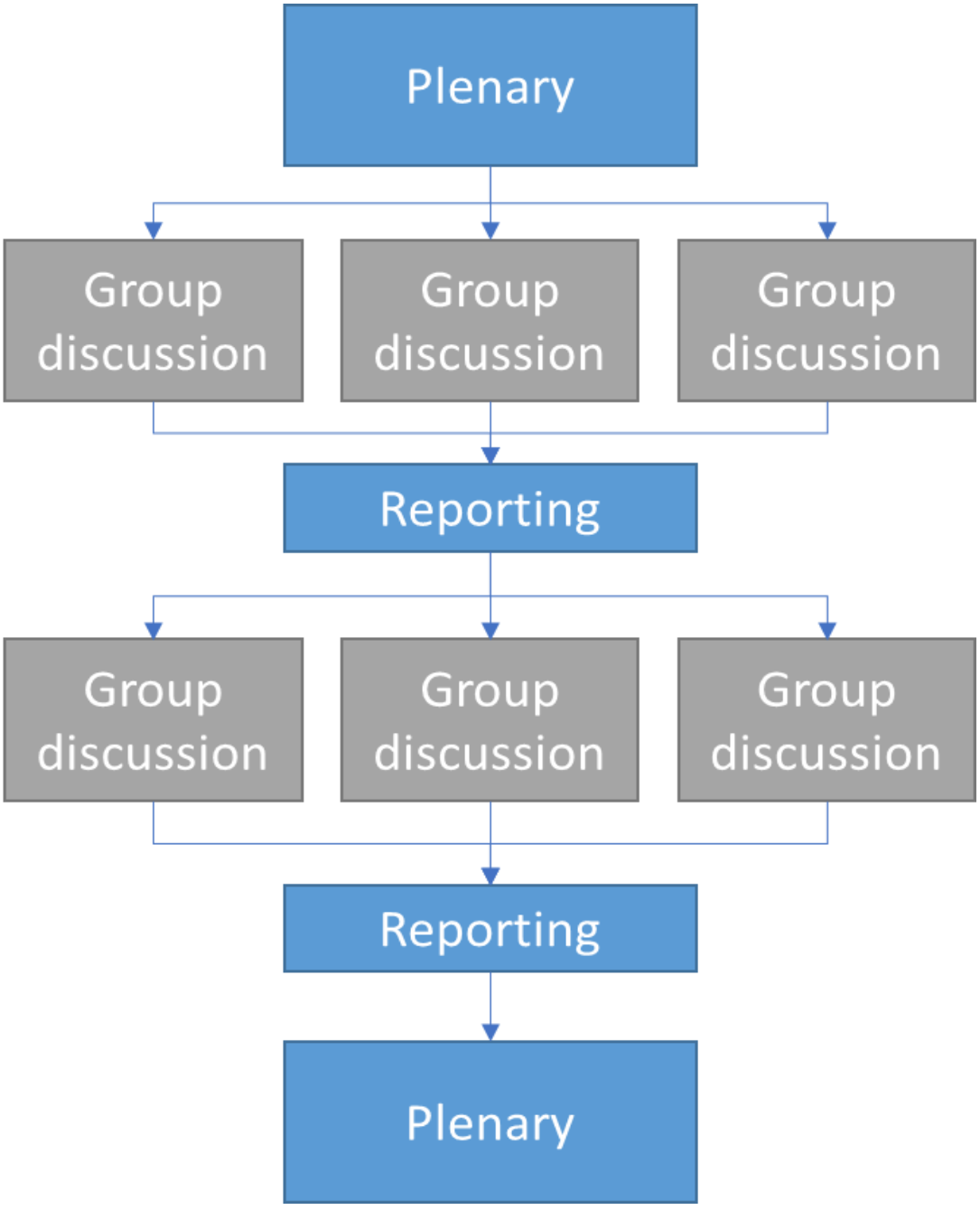
Figure R.50: Conference invitation rear



Format and agenda

R.9 The conference format is shown in the figure below.

Figure R.51: Conference format



R.10 For the online format to be impactful and engaging, we mixed plenary sessions attended by all with smaller break-out group discussions to encourage active engagement. It is widely recognised that most people feel more at ease sharing their views in a small group than in front of hundreds of attendees, especially where English is not their mother tongue.

R.11 We used **Microsoft Teams** as the conference platform. Most attendees would have Microsoft Teams installed on their computers and those who did not could access it via a web browser. Attendees could use the hand function to speak or chat box to raise questions or comments, providing a means for all attendees, rather than just the most vocal ones, to contribute.

R.12 The table below shows the conference agenda.

Table R.1: Conference agenda

Time (CET)	Format	Item	Duration	Lead
Part 1				
14:00-14:10	Plenary	Introduction by DG MOVE and Steer	10 minutes	Kristian Schmidt, All
14:10-14:30	Plenary	**Presentation 1: context and opportunities**		
		Study context and objectives	5 minutes	Karen Letten
		Service provision changes in the past two decades	10 minutes	Simon Maarfield
		Future market potential	5 minutes	Jonathan Tong
14:30-15:05	Group	**Group discussion 1**: • Introductions • Question: in your opinion, what are the obstacles to increasing long-distance cross-border passenger rail services?	35 minutes	Karen Letten, Simon Ellis, Dick Dunmore, Clemence Routaboul, Ludger Sippel, Simon Maarfield
15:05-15:30	Plenary	Feedback on Group discussion 1	15 minutes	
		Q&A on Part 1	10 minutes	
		Quick poll 1	-	Jonathan Tong
15:30-15:40	**BREAK 1**		10 minutes	All
Part 2				
15:40-16:15	Plenary	Agenda reminder and Quick poll 1 results	-	Jonathan Tong
		Presentation 2: obstacles and measures		
		Summary of obstacles and potential measures to overcome obstacles	35 minutes	Dick Dunmore
16:15-16:59	Group	**Group discussion 2**: • Question: have we identified all the right obstacles and potential measures? • Question: What are the most and least promising measures and why?	45 minutes	Karen Letten, Simon Ellis, Dick Dunmore, Clemence Routaboul, Ludger Sippel, Simon Maarfield
16:59-17:00	Plenary	Quick poll 2	-	Jonathan Tong
17:00-17:10	**BREAK 2**		10 minutes	All
Part 3				
17:10-17:50	Plenary	Agenda reminder and Quick poll 2	-	Jonathan Tong
		Feedback on Group discussion 2	20 minutes	Karen Letten, Simon Ellis, Dick Dunmore, Clemence Routaboul, Ludger Sippel, Simon Maarfield
		Q&A on Part 2	20 minutes	
17:50-18:00	Plenary	Summary of the day and next steps	5 minutes	Karen Letten
		Concluding remarks	5 minutes	Kristian Schmidt
18:00	**END**			

Source: Steer.

R.13 The **plenary sessions** consisted of short presentations of up to 35 minutes covering topics that introduced the subsequent group discussion.

R.14 The **group discussions** lasted around 35-45 minutes. Attendees were organised into six groups and stayed in the same group for both group discussions. We organised groups to include a mix of ministries, railway undertakings and rolling stock companies from different states, rather than grouping stakeholders by type or geography.

R.15 Each group discussion was attended by a Steer or KCW facilitator, who was responsible for facilitating the discussion. Those facilitators were briefed in advance and prepared with prompt questions. After the group discussion, they fed back a short summary of the discussion to the plenary session, focusing on any additional insights, and noting questions raised during the discussion to be addressed at the following Question and Answer (Q&A) session.

R.16 Given that the conference was for up to 200 attendees, there was a risk that any Q&A session in plenary form would not achieve the desirable outcome. Attendees might be hesitant to ask questions in front of many people, or the Q&A might be dominated by a small number of vocal attendees. The group discussions helped encourage many attendees to contribute to discussions in an orderly manner using the "hands up" or chat functions, with questions noted and addressed at the subsequent Q&A session. This worked broadly as intended, although the discussions in some groups were more lively than in others.

R.17 During the conference we included two **quick polls** using the online tool Slido. This allowed stakeholders to indicate which obstacles were most important and appeared most promising.

Duration and language

R.18 The conference lasted in four hours, in English, without simultaneous interpretation.

Presentation content

R.19 Given the audience and time available, the information presented at the conference was suitably a high-level with limited detail provided. The merits in this approach are as follows:

- It allowed the widest range of stakeholders to understand the concepts and principles discussed.
- It reduced the volume of content required to be approved by the Commission in advance of the conference, noting the timing of the conference meant that the content will need to be approved during the holiday period in August.
- It reduced the likelihood of presenting information that is not consistent with the Final Report.
- It allowed stakeholders to discuss issues in further detail in the group discussion sessions.

R.20 We circulated a PDF copy of the presentation to attendees on 3 September 2021.

Attendance

R.21 By close of play on 31 August 2021, the final deadline for enrolment and the day before the conference, we received a total of **136** requests to attend, including 16 from the European Commission. We sent a confirmational email and conference link to attendees that day.

R.22 We grouped stakeholders as shown in the table below, using the categories used in our stakeholder engagement (see Annex B), plus the European Commission and other stakeholders.

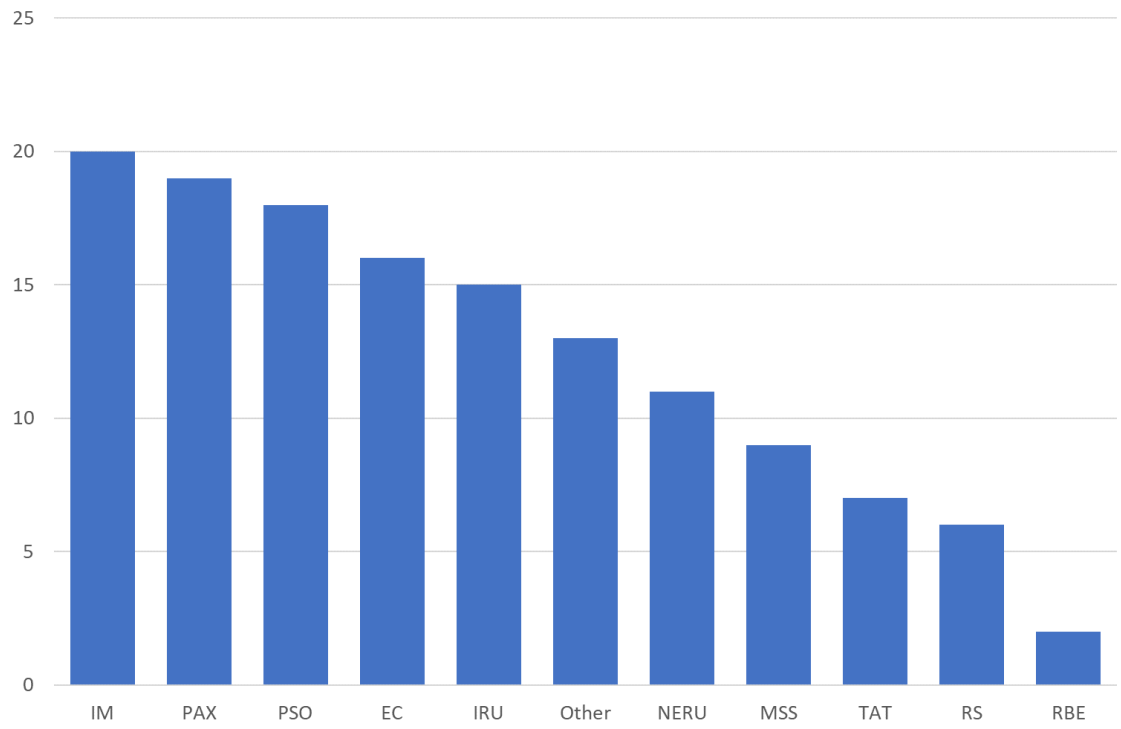
Table R.2: Stakeholder groupings

Group code	Organisation types
IM	Infrastructure Managers
IRU	Incumbent Railway Undertakings
MSS	Member States and Studies
NERU	New Entrant Railway Undertakings
PAX	Passenger Representative Bodies
PSO	PSO Competent Authorities
RBE	Regulatory Bodies and Timetabling
RS	Rolling Stock-related
TAT	Travel Agents and Ticketing
EC	European Commission
OT	Other stakeholders

Source: Steer analysis.

R.23 The figure below shows the balanced mix of acceptances.

Figure R.1: Conference invitation acceptances by stakeholder group



Summary of group discussions

First group discussion

R.24 In the first group discussion, the main question asked of the stakeholders was:

What are the obstacles to increasing long-distance cross-border passenger rail services?

Infrastructure charges

R.25 One new entrant railway undertaking said that 73% of the charges paid by Eurostar are not direct costs.

R.26 In one group, many participants mentioned these charges in the context of a level playing field. Separation of track and trains was seen negatively and as increasing complexity for no benefit.

R.27 One new entrant railway undertaking responded that routes with stable demand through the year are hard to find, which is difficult to reconcile with access charges paid annually.

R.28 Stakeholders also said that access charges for night trains are high because of route length and number of stops.

Capacity allocation

R.29 An infrastructure manager said that capacity rules differ between adjoining states. They advocated the Eurolink approach of planning top down: first EU-wide services and then domestic ones. A passenger body said that there should be a (single command) Eurocontrol for cross-border rail.

R.30 A regulatory body said that the rail system is complex and there is a need to keep improving capacity allocation processes.

R.31 An infrastructure manager said that capacity allocation needs to be a team game with different infrastructure managers and railway undertakings playing a role.

R.32 An infrastructure manager said that people will start travelling again after the COVID-19 pandemic, but there will probably be more leisure travel, and there will be a need to rethink how capacity is used.

R.33 An incumbent railway undertaking said that it can be difficult for infrastructure managers with infrastructure congested in the morning peak to decide whether to delay a lightly-loaded night train and an overcrowded local commuter train[350].

Rolling stock

R.34 Feedback on rolling stock included a statement from an incumbent railway undertaking that there was a lack of harmonisation of standards. A rolling stock body said that that fleet interoperability has been declining since 2010.

R.35 Several other groups also said that there was a lack of suitable rolling stock. One said that rolling stock was expensive compared to buses and standard aircraft models.

R.36 One passenger body said that night trains are the most inaccessible of trains. An incumbent railway undertaking said that there is a large potential for political intervention in this area.

Ticketing and rights for connecting passengers

R.37 In one of the groups, there was extensive feedback on ticketing, with one stakeholder saying that the new Regulation (EU) 2021/782 is disappointing and does not deliver what the European Parliament wanted.

R.38 A rolling stock body said that passenger rights legislation has worsened through-ticketing and that end-to-end tickets are difficult to obtain. Another stakeholder made the same point about

[350] In aviation the trade-offs are clearer. Changes in the jet stream can mean that large numbers of arriving long-haul flights will all be either late or early. If necessary, short-haul flights must be cancelled to free slots at their destinations so that the long-haul flights can land.

end-to-end ticketing. Several participants including a passenger body, the European Parliament and a travel agent and ticketing body said that booking tickets, especially for long-distance cross-border journeys, is difficult or impossible. A group also said that lack of access to all fares by third party retailers hinders the creation of fare comparison platforms.

R.39 An incumbent railway undertaking said that fares rules for children which differ in every Member State make it extremely difficult for railway undertakings to agree on the pricing of end-to-end fares[351].

Cross-border PSOs

R.40 Several groups were not positive about the use of Public Service Obligations (PSOs), saying either that operators were not interested in cross-border services, or that PSOs should not be used where commercial services are available. One said that there is a lack of interest in long-distance cross-border services and especially in night train services. They said that the offer is not constant throughout the year because there is insufficient demand during the low season.

R.41 One passenger body said that when a train operates on three national networks, it may be difficult to get cooperation from the middle one, which may not benefit from the service if there are no station stops.

R.42 There was extensive feedback on PSOs in one group, including one saying that many routes are not commercially viable, so there is a need for a PSO, but also that tendered PSOs introduce an element of price competition. An incumbent railway undertaking said that they operated most of their night trains commercially, but it is difficult to create the right business models with international trains, as operators are left at the mercy of partners to make cross-border services possible.

Other technical and operational issues

R.43 One incumbent railway undertaking said that the Brussels-Vienna night train has had to deal with many issues including Covid-19 and the floods.

R.44 An infrastructure manager and some incumbent railway undertakings said that there is a lack of a level playing field with air regarding taxation. This was also said repeatedly in another group. Participants asked what effect the rebalancing of aviation and rail costs could have.

R.45 Another issue brought up by a passenger body was that there is a lack of accessibility for all. During the second group discussion they added PAX that the Commission needs to honour its declarations on accessibility, such as through allocating funding for accessibility awareness training.

R.46 A participant wondered if liberalisation had been identified as a barrier and, in particular, said that incumbents feared ruinous competition among themselves.

R.47 In one group, a rolling stock body said that high-speed lines have killed night trains. A new entrant railway undertaking said that Eurostar has to deal with seven signalling systems.

R.48 One incumbent railway undertaking said that fares chargeable for night train services were out of line with underlying costs.

[351] See, for example, the range of discounts for children shown in Figure 4.14 of Study on the prices and quality of rail passenger services, Steer for European Commission (2016)

R.49 An incumbent railway undertaking said that railway businesses cannot make progress on the issue of ticketing without support from the EU and every state.

Second group discussion

R.50 The first question asked during the second group discussion was:

Have we identified all the right obstacles and potential measures?

R.51 Overall, there was a consensus that measures proposed by Steer represented the right direction of change.

R.52 One passenger body said the level of infrastructure charges should be fairer, and that environmental value should be a consideration for capacity allocation.

R.53 A timetabling specialist said that there is a need for standardisation of capacity allocation.

R.54 A new entrant railway undertaking suggested that infrastructure managers should enable a smart passing between fast and slow trains at the same time, and that infrastructure projects should be better coordinated between Member States and incumbent railway undertakings.

R.55 Another new entrant railway undertaking said that Eurofima provided finance for rolling stock but operated as a "closed shop": a similar model but available to a wider group of railway undertakings would help.

R.56 A Member State body said that the system of mark-ups for infrastructure charges does not work, particularly where a cross-border service is charged more than a domestic one.

R.57 A passenger body said that rolling stock is sometimes very old and not even refurbished, making it completely inaccessible for passengers with special needs.

R.58 A travel agent and ticketing body highlighted that a night train is not just a trip but also includes a hotel, which must be included when comparing the cost of rail and air.

R.59 The second question asked during the second group discussion was:

What are the most and least promising measures and why?

R.60 Participants in one of the groups included an infrastructure manager and a travel agent and ticketing body who fed back, respectively, that measure CA5 (**Complete and refine the international Timetabling Process (TTR)**) was good and that measure RS1 (**Require that unused stock be offered for auction**) was an issue. The travel agent and ticketing body also said that measure TP4 (**Use, refine or extend the Agreement on Journey Continuation (AJC) to ensure that industry assists and re-routes passengers as much as possible**) is good but that the AJC coordinator insists that the details of the agreement are not disclosed.

R.61 Measure TP1 (**Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)**) was also liked by a new entrant railway undertaking and a travel agent and ticketing body but another stakeholder added that OSDM will be part of TAP-TSI and will replace various parts of it. There was, however, a comment that "TAP-TSI doesn't do anything" and another travel agent and ticketing body said that TAP-TSI is still not implemented after ten years.

Most promising measures

R.62 Regarding the discussion on the most promising measures:

- Several participants expressed support for measure TP1 (**Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)**), which appeared to be the measure seen as most promising amongst the most participants.
- There were four positive comments for measure RS4 (**Consider wider EU and/or EIB co-financing of cross-border rolling stock**) although one participant wanted more detail on how it would work.
- There was also support from multiple participants for measures CA4 (**Offer more framework agreements for long-distance cross-border services**), RS1 (**Require that unused stock be offered for auction**) and DA1 (**Extend reporting requirements, for example to RMMS**). Other positive comments were received for measures IC3 (**Compensate railway undertakings who cannot operate services due to works or closures**), RS2 (**Public sector guarantees to limit risks to leasing companies**), RS3 (**Ensure non-discrimination in rolling stock leasing prices**), PS1 (**Use PSOs for long-distance cross-border services to improve financeability**), PS2 (**Ensure that long-distance cross-border PSO services are specified in full**) and OP1 (**Wider reform of transport taxation, such as through the DEGD package, with the objective of meeting climate neutrality**).

R.63 An infrastructure manager favoured measures that encourage private initiative, such as all rolling stock measures (RS1, RS2, RS3 and RS4).

R.64 One group had many suggestions for how to improve ticketing and passenger rights. This included a suggestion from a passenger body to have legislation for booked assistance, which currently does not extend beyond the station served by a particular operator. Another suggestion from a new entrant railway undertaking was that there should be a platform providing information about all night trains operated in Europe. One new entrant railway undertaking also said that addressing issues with tickets and track access charges is very important.

R.65 Participants such as one Member State body also wanted to see changes such as in the system of mark-ups to infrastructure access charges. This body also said that fares should not be discriminatory for passengers and that, on the subject of infrastructure capacity and capacity allocation, EU funding should be made available to support timetable changes which are particularly complex and can take more than a decade to arrange.

R.66 Regarding rolling stock, an incumbent railway undertaking said that leasing/co-financing measures such as RS4 (**Consider wider EU and/or EIB co-financing of cross-border rolling stock**) are good, but that there is also a need to have some common standards for procurement of rolling stock. There is also a need for research and development to decide the kind of vehicles needed.

Least promising measures

R.67 A number of measures were considered unhelpful:

- Measure CA6 (**Develop hubs for long-distance cross-border trains**) was seen as a hindrance rather than a help.
- Measure CA1 (**Where necessary, plan infrastructure to deliver regular interval (clockface or Takt) timetables**).
- Measure RS3 (**Ensure non-discrimination in rolling stock leasing prices**).
- Measure DA2 (**Create an open industry database of ticket sales**).

R.68 A new entrant railway undertaking said that cross-border services should not be specified by PSO where commercial services are provided. One participant said that measure PS1 (**Use PSOs for long-distance cross-border services to improve financeability**) would undermine the fourth railway package if too many PSOs were introduced.

Additional measures

R.69 Additional measures proposed by participants are summarised in the table below.

Table R.3: Additional measures proposed at the study conference

Theme	Proposed measure(s)
Dedicated independent long-distance cross-border operator.	Creation of an operator for long-distance cross-border services, with dedicated management freed of conflicting commercial interests.
Investment in conventional rail infrastructure.	Stepping up investment in conventional rail network infrastructure to support both night trains and daytime services serving smaller settlements off the high-speed lines, Potentially redirecting money from high-speed projects ("no more white elephants like Perpignan-Figueres").
Other technical measures.	Further and faster harmonisation of technical rules.
	Further speeding up of vehicle authorisation.
Rail industry reform.	An EU rolling stock pool accessible to all intending operators.
	Fundamental redesign of the economic framework for rail, with the explicit aim of removing the profit and competition motive.
	Significant reduction in rail sector complexity and fragmentation including restoration of vertical integration ("it works in Switzerland, China and India").
	Deregulation of the rail industry, such as in the area of passenger rights. A new entrant railway undertaking said that it is difficult to make all the arrangements needed to comply with the legislation when services cross various borders, such as from Stockholm to Barcelona, and that the coach market developed rapidly after deregulation, exemplified by FlixBus.
Aviation industry reform.	Introduce a minimum air fare.
	Ban short haul flights where rail provides a viable alternative.
	Specific EU targets on modal shift from air and road to rail.

Source: stakeholders.

R.70 One passenger body said the European Commission should examine future client policies. This would help railway undertakings to identify future trends including the potential of cross border trains to benefit the climate, resilience and social value. The body also favoured a recommendation by the study on which cities should be connected by long-distance cross-border trains, taking into account cohesion between west and east of Europe.

R.71 Finally, an incumbent railway undertaking said that trying to find a unique solution for the whole of the EU is very complicated, as the railway structures are very different. They said that rather than a single solution, modified solutions would be needed at a national level.

Results from the quick poll

R.72 The conference included two quick polls using the online tool Slido to seek a snapshot view from stakeholders.

R.73 **The second poll included only measures that require the Commission's intervention** in the form of new guidance, refined legislation or new legislation. It excluded measures that are already happening, or can be achieved by industry knowledge exchange, and do not strictly require the Commission's intervention. Stakeholders were allowed to select two options.

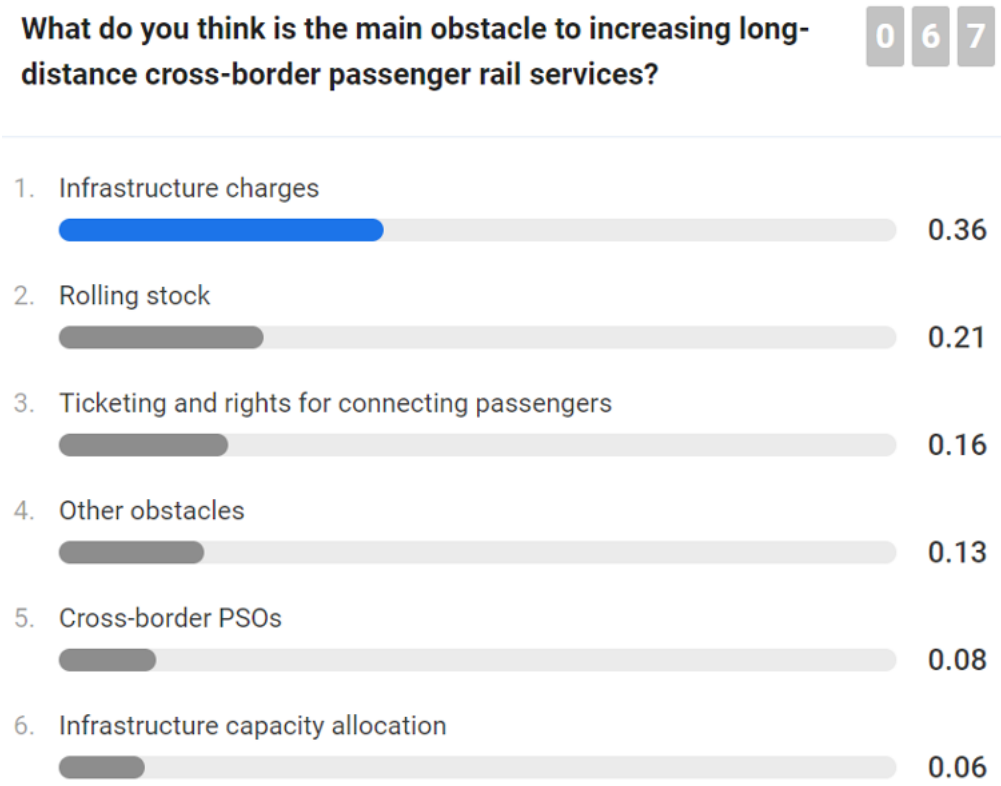
R.74 The following graphics document the results from the two quick polls. The key findings were:

- **Infrastructure charges** were seen by stakeholders to be the greatest obstacle, attracting 36% of the votes, followed by **rolling stock** (21%). Infrastructure capacity allocation was selected by the fewest stakeholders (6%).
- **Measure OP1** (**Wider reform of transport taxation, such as through the DEGD package, with the objective of meeting climate neutrality**) was the measure had the highest number of votes amongst stakeholders at 40%, followed by **measure RS4** (**Consider wider EU and/or EIB co-financing of cross-border rolling stock**) at 27%.
- **Measure DA1** (**Extend reporting requirements, for example to RMMS**) did not receive any votes.
- Three stakeholders noted that **measure TP1** (**Encourage access to sell railway undertakings' tickets on fair, reasonable and non-discriminatory (FRAND) principles, including through Open Sales and Distribution Model (OSDM)**) was important to them. However, this measure was not presented in the second poll as it did not require the Commission's intervention.
- Three stakeholders made reference to greater standardisation, integration and interoperability to varying degrees, including the introduction of a Europe-wide approach to railway planning.

R.75 We stress that **these views are based on the limited information presented and do not represent the views of the study team or any recommendations or decisions that follow**.

Quick poll 1: main obstacles to increasing long-distance cross-border passenger rail services

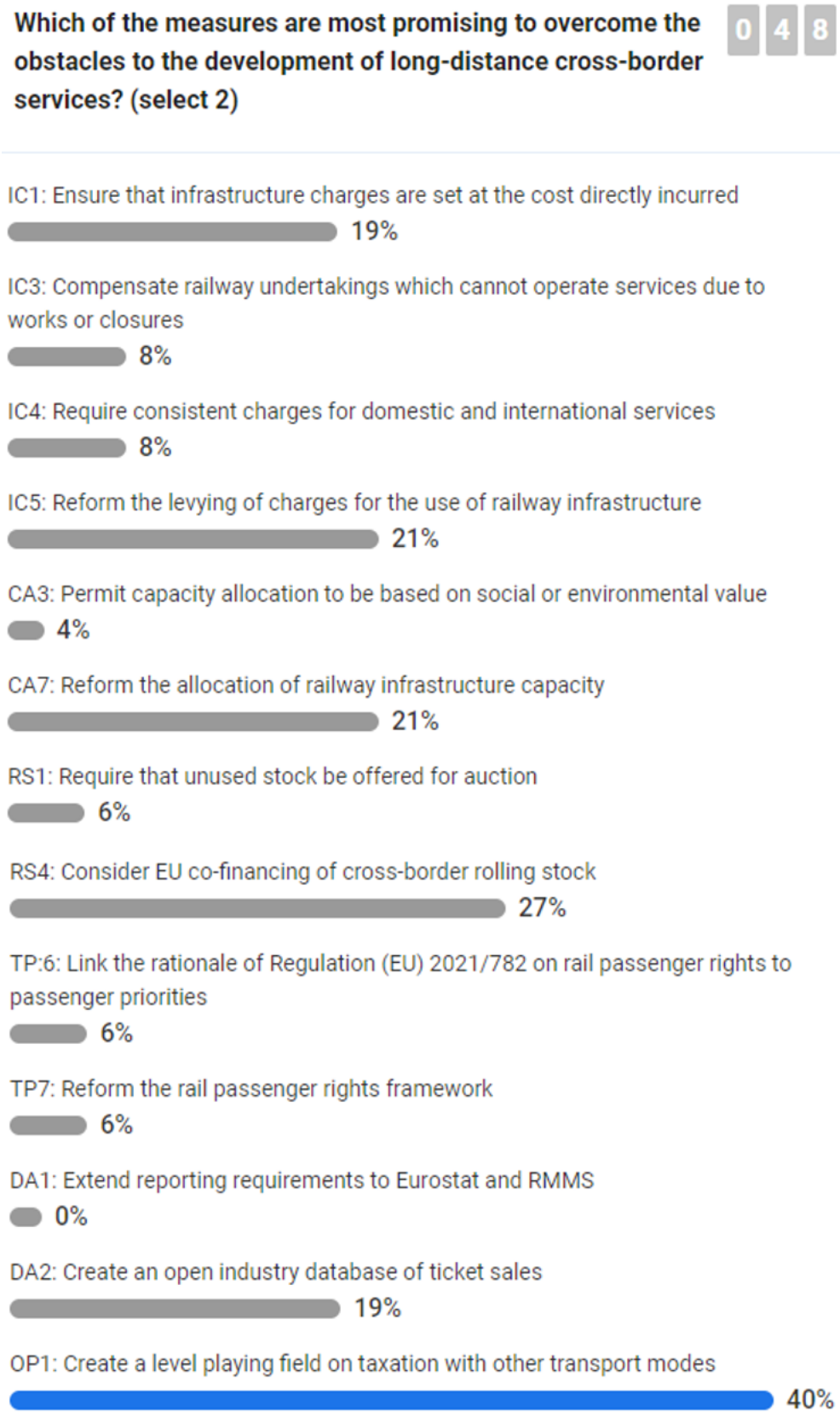
Figure R.2: Quick poll 1 responses (67 responses)



Source: conference stakeholders, live via Slido.

Quick poll 2: most promising measures

Figure R.3: Quick poll 2 responses (48 responses), on measures that required the Commission's intervention



Source: conference stakeholders, live via Slido.

Quick poll 2: other measures suggested

Figure R.4: Quick poll 2 responses (7 responses) selecting "other" measures



Source: conference stakeholders, live via Slido.

S Bibliography

Introduction

S.1 We summarise below a list of references quoted in the Report or examined in our research.

Table S.1: Bibliography

References
Main report
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Sustainable and Smart Mobility Strategy – putting European transport on track for the future, {SWD(2020) 331 final} (2020)
Research for TRAN Committee - Passenger night trains in Europe: the end of the line?, Steer (2017)
Executive Summary of the Evaluation, Regulation 80/2009 of the European Parliament and of the Council of 14 January 2009 on a Code of Conduct for computerised reservation systems, {SWD(2020) 9 final} (2020)
Delivering the European Green Deal (DEGD), previously know as Fit for 55, https://www.consilium.europa.eu/en/policies/fit-for-55/ (2021)
Regulation (EC) No 1907/2006 of the European Parliament and of the Council of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC (2006)
Annex C: cross-border rail services since 2001
Thomas Cook Publishing: European Rail Timetable Summer 2001. Peterborough (2001)
Magyar Allámvasutak Rt.: Hivatalos Menetrend 2001-2002. Budapest (2001)
Ministerstvo Transporta i Komunikacii Respubliki Belarus, Belo-russkaja Železnaja Doroga: Služebnoe Raspisanie passažirskih poezdov. Minsk (2001)
Actima AG Consulting & Services, Der europäische Nachtzug und seine Zukunft (2004)
Andersson, Bosse, Nattågstrafik 2013-2021, Rikstrafiken (2010)
Andersson, Bosse, Nattågstrafik efter 2018, Underlag för beslut om framtida trafikavtal för nattågstrafiken Stockholm-övre Norrland/Narvik, Trafikverket (2016)
Plenarprotokoll 18/183, pp. 186-190, Berlin, Deutscher Bundestag (2016)
Mise en œuvre de la feuille de route du Gouvernement pour un nouvel avenir des Trains d'Equilibre du Territoire. Ministère de l'Environnement, de l'Énergie et de la Mer, Secrétariat d'Etat aux Transports, à la Mer et à la Pêche (2016)
Ministerstvo Transporta i Komunikacii Respubliki Belarus, Belo-russkaja Železnaja Doroga: Služebnoe Raspisanie passažirskih poezdov. Minsk (2018)
České dráhy, a.s.: Jízdní Řád 2019. Praha (2018)
Compania Nationala de Cai Ferate: Mersul trenurilor de calatori 2018-2019. Bucuresti (2018)
HŽ Putnički prijevoz: Vozni red 2018-2019. Zagreb (2018)

References
Železnice Slovenskej Republiky: Cestovný poriadok vlakovej osobnej dopravy 2018/2019. Bratislava (2018)
Kursbuch Schweiz 2019. 2 Bände. Bern (2019)
European Rail Timetable Ltd.: European Rail Timetable Summer 2019. Oundle (2019)
Transport Statistics Great Britain, TSGB0607 (RAI0108): Channel Tunnel: traffic to and from Europe (2020)
NUTS: • https://ec.europa.eu/eurostat/documents/345175/7451602/2021-NUTS-1-map.pdf • https://ec.europa.eu/eurostat/documents/345175/629341/NUTS2021.xlsx
www.autoreisezuege.org
www.beluxtrains.net
www.fernbahn.de/datenbank/suche
www.mavcsoport.hu
www.vagonweb.cz
Annex E: cross-border supply in 2019
Airline Business World Airline Rankings, Leading airline groups by traffic, July-August 2019 (2019)
Evaluation of high-speed rail in Europe, Comprehensive literature review and potential of section upgrades for improving EU-connectivity, EBP for European Commission, Final Report (Draft), 27.11.2020 (2020)
OAG Traffic Analyser
Annex F: The commercial approaches of railway undertakings
Vanaf 2030 internationale trein centraal bij maken dienstregeling, Treinreiziger.nl, 21 May 2021 (2021)
Annex G: The scope for more cross-border services
Goeverden, C.D. van, Arem, B. van, Background factors explaining train choice in European long-distance travelling, 12th WCTR, July 11-15, – Lisbon, Portugal (2010)
Doll, Claus, Fraunhofer ISI, Very Long Distance Night Trains (2014)
De nachttrein naar Nederland, Rebel, September 2019 (2019)
Étude de developpement de nouvelles lignes de trains d'equilibre du territoire (TET), Direction générale des infrastructures, des transports et de la mer, Décembre 2020 (2021)
Nieuwe nachttrein met startplaats in Oostende moet ook naar Warschau sporen, Het Laatste Nieuws, 30 April 2021 (2021)
Letter of intent, International high-speed and overnight rail services (TEE 2.0), various ministers of transport, 17 May 2021 (2021)
Ny nattågssträcka till Europa, Trafikverket, 30 August 2021
Annex H: Measures to stimulate cross-border services
Hansard, Motorail and Sleeper Service to West Highlands (1995)
Study on the prices and quality of rail passenger services, Steer for European Commission (2016)
Annex I: The comparative costs of rail and competing modes
A review of HSR experiences around the world, Javier Campos, Gines de Rus and Ignacio Barron, Fundación BBVA (2007)
HSIPR Best Practices: Operating Costs Estimation, Steer for Office of Inspector General, US Department of Transportation (2011)

References
Economic Analysis of High Speed Rail in Europe, Ginés de Rus, Ignacio Barrón, Javier Campos, Philip Gagnepain, Chris Nash, Andreu Ulied, Roger Vickerman, Fundación BBVA (2012)
Marktbeobachtung Güterverkehr. Marktanalyse des Fernbuslinienverkehrs 2014, Bundesamt für Güterverkehr (2015)
Marktbeobachtung Güterverkehr. Marktanalyse des Fernbuslinienverkehrs 2015, Bundesamt für Güterverkehr (2016)
Comprehensive Study on Passenger Transport by Coach in Europe, Final Report, Steer for European Commission (April 2016)
ICAO Carbon Emissions Calculator Methodology (Version 9), June 2016
Décision n° 17-D-08 du 1er juin 2017 relative à des pratiques mises en œuvre dans le secteur du transport de voyageurs, Autorité de la concurrence (2017)
Marché du transport par autocar et gares routières, Exercise 2018, Autorité de régulation des transports (ART) (2018)
Laurent Guihéry. Long Distance Coach Services in France and Germany: the new European competition between Flixbus and BlaBlaBus, Rivista Scientifica della Società Italiana di Economia dei Trasporti e della Logistica (2019)
Beria P., Tolentino S., Vardhman L. Rapporto sul Mercato delle Autolinee a Lunga Percorrenza in Italia | Anno 2019. TRASPOL Report 1/20 & Checkmybus. Milano, Italy (2020)
Observatorio del Transport y la Logística en ESPAÑA (OTLE), Informe Anual 2019 (2020)
Rail industry finance (UK) (2019-20), Office of Rail and Road, Tables 1223, 1233, 7223 (2020)
Annual reports for easyJet, Ryanair and Wizz Air
Aircraft and Aviation Charges database, IATA
Annex J: The costs of cross-border rail services
Studie zur Gestaltung und Entwicklung der Eisenbahninfrastruckturpreise in Europa, PwC (2018)
Arbeitskosten pro Stunde lagen 2019 in den EU-Mitgliedstaaten zwischen 6,0€ und 44,7€, Eurostat press release 52/2020, 31 March 2020 (2020)
Annex K: Obstacles: infrastructure charges
Review of Railway Finances (Serpell Report) (1983)
Directive 91/440/EEC on the development of the Community's railways (1991)
Directive 2001/14/EU on the allocation of railway infrastructure capacity and the levying of charges for the use of railway infrastructure and safety certification (2001)
Directive 2012/34/EU establishing a single European railway area (recast) (2012)
House of Commons, Oral Evidence taken before the Transport Committee on Monday 4 March 2013, HC1001 (2013)
Underlagsrapport, PM Effektbeskrivning av förslag till nya avgifter för T15, Trafikverket (2013)
Commission Implementing Regulation (EU) 2015/909 of 12 June 2015 on the modalities for the calculation of the cost that is directly incurred as a result of operating the train service (2015)
Updated review of charging practices for the minimum access packages in Europe, IRG-Rail (15) 10, IRG-Rail (2015)
Directive (EU) 2016/2370 amending Directive 2012/34/EU as regards the opening of the market for domestic passenger transport services by rail and the governance of the railway infrastructure (2016)
Special Report - A European high-speed rail network: not a reality but an ineffective patchwork, European Court of Auditors (2018)
Studie zur Gestaltung und Entwicklung der Eisenbahninfrastruckturpreise in Europa, PwC (2018)

References
Eighth Annual Market Monitoring Report, March 2020, IRG-Rail (2020)
EC proposes economic relief measures to support rail through pandemic, International Railway Journal (2020)
Overview of International Passenger Services, IRG-Rail (20) 9, IRG-Rail Charges Working Group (2020)
Seventh monitoring report on the development of the rail market under Article 15(4) of Directive 2012/34/EU of the European Parliament and of the Council (RMMS 7) (2021)
Annex L: Obstacles: capacity and capacity allocation
Ökad konkurrens inom järnvägssektorn, Betänkande av Kommittén för ökad konkurrens inom järnvägssektorn (1993)
Determination of railway infrastructure capacity including aspects related to the fee for the use of the infrastructure, Inland Transport Committee, United Nations Economic Commission for Europe (UNECE), TRANS/SC.2/2001/13 6 August 2001 (2001)
Night Trains 2.0 – New opportunities by HSR?, UIC & DB (2013)
The practicalities of scarcity charging, Final Report, March 2014, Steer for Office of Rail and Road (2014)
Decision letter, Applications for access to the East Coast Main Line (ECML), Office of Rail and Road, 12 May 2016 (2016)
Bundesverkehrswegeplan 2030, Bundesministerium für Verkehr und digitale Infrastruktur, August 2016 (2016)
A survey of congested infrastructure, priority criteria and capacity charges in Europe, IRG-Rail (19) 4, IRG–Rail Working Groups Access and Charges (2019)
Slapend onderweg, Potentieel van de internationale nachttrein van en naar Nederland, Kennisinstituut voor Mobiliteitsbeleid (KiM), (2019)
Report on the state of development of the TTR project and its pilots, November 2020, IRG-Rail (20) 4, IRG-Rail Access Group (2020)
Underlagsrapport till Nattågstrafik till Europa, Kapacitet för nattåg till kontinenten, 2020:114, Trafikverket (2020)
Summary of the final report, Night trains to the European continent, Trafikverket, 12 May 2020 (2020)
Report on the state of development of the TTR project and its pilots, IRG-Rail, November 2020 (2020)
Network Statements, supporting documents and online supplements, infrastructure managers, (2021)
Entspannt über Nacht reisen!, Angebot 2021, Ausgabe 1/Fahrplan 2021, ÖBB Nightjet (2021)
A decision tree how to implement new international (very) long-distance trains, Harald Buschbacher, Schig (2021)
Overcoming Obstacles to Cross-Border Long-Distance Passenger Rail in 2021 – Time to Act in the Year of the Rail, online conference, 5 March 2021 (2021)
First proposal for an Europatakt, Secretariat of the Federal Government Commissioner for Rail Transport, 17 May 2021 (2021)
Towards a better international timetable in Europe, Jeroen Wesdorp and Thomas Moerman, Eurolink, 17 May 2021 (2021)
Annex M: Obstacles: rolling stock
Overview **https://back-on-track.eu/list-of-european-night-trains/**
Overview **http://www.night-trains.com/europe/**

References
Austria https://www.nightjet.com/dam/jcr:51e3c07e-c91e-46d6-beb4-0dce62d78347/nightjet-folder-2021.pdf
Austria https://company.sbb.ch/en/media/media-relations/press-releases/detail.html/2020/9/1509-1
Austria https://www.mobility.siemens.com/global/en/portfolio/rail/rolling-stock/passenger-coaches.html
France https://back-on-track.eu/france-to-redevelop-sleeper-trains/
Germany http://rrdc.com/news_rdcd_alpen_sylt_night_train_premiere_06_10_2020.pdf
Greece www.trainose.gr
Italy www.ntv.it
Italy www.trenitalia.it
Italy https://www.mit.gov.it/sites/default/files/media/documentazione/2017-12/Allegato%209.pdf
Poland www.booking.polrail.com
Poland www.pkpsa.pl
Russian Federation www.rzd.ru
Russian Federation https://www.mobility.siemens.com/global/en/portfolio/rail/rolling-stock/passenger-coaches.html
Spain www.renfe.com
Spain https://www.renfe.com/es/en/renfe-group/renfe-group/fleet-of-trains/trenhotel
Sweden https://www.snalltaget.se/en/about-us
Norway https://en.wikipedia.org/wiki/Go-Ahead_Norge
United Kingdom https://en.wikipedia.org/wiki/Night_Riviera
United Kingdom https://www.transport.gov.scot/public-transport/rail/caledonian-sleeper-franchise/#37372
Manažer Českých drah se domlouval s Rakušany na „eliminaci“ RegioJetu, Seznam Zprávy, 4 March 2020 (2020)
New revelation: alleged agreement between ÖBB and ČD to “eliminate” new entrant’s access to rolling stock, ALLRAIL press release, 4 March 2020 (2020)
Annex N: Ticketing and rights for connecting passengers
Ticketing & Settlement Agreement (TSA) (1995)
Integrated Ticketing on long-distance passenger transport services, TRT Trasporti e Territorio and MKmetric for European Parliament TRAN Committee (2010)
Impact Assessments on Regulation 1371/2007, Steer for the European Commission (2016)
Commission Delegated Regulation (EU) 2017/1926 of 31 May 2017 supplementing Directive 2010/40/EU of the European Parliament and of the Council with regard to the provision of EU-wide multimodal travel information services (2017)
CER, Full Service Model (FSM), http://www.cer.be/full-service-model-fsm (2017)
Recast of Reg. 1371/2007 on rail passengers’ rights and obligations: the position of public transport operators and organising authorities, Position paper of the International Union of Public Transport (UITP), January 2018 (2018)
National Rail Conditions of Travel from 4th December 2019, Rail Settlement Plan Ltd (2019)

References
Easier fares for all, The Rail Delivery Group's proposal for a more transparent, simpler to use, modern system of tickets and fares (2019)
Remaining challenges for EU-wide integrated ticketing and payment systems, Final Report, Grimaldi and others for European Commission, July 2019 (2019)
Shift2Rail IP4, CONNECTIVE presentation, Project Information, Updated December 2019 (2019)
Proposal for a Regulation of the European Parliament and of the Council on rail passengers' rights and obligations (recast) – Outcome of proceedings, 21 October 2020, Interinstitutional File: 2017/0237(COD) (2020)
Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions, Sustainable and Smart Mobility Strategy – putting European transport on track for the future, {SWD(2020) 331 final} (2020
FSM Status Update, 17th of December 2020: FSM 2.0/ OSDM V.1.0 Released, https://tsga.eu/fsm (2020)
National Access Points, A mechanism for accessing, exchanging and reusing transport related data under Delegated Acts of the ITS Directive (2010/40/EU) (2020)
Delay Attribution Principles and Rules, Delay Attribution Board, April 2021 (2021)
Report on the Platform on International Rail Passenger Transport (IRP), 29 March 2021 (2021)
Sector Stakeholder Statement on International Rail Passenger Services, by representatives of railway undertakings (CER/ALLRAIL/UIC/CIT) and infrastructure managers (EIM/CER/UIC), railway suppliers (UNIFE), passenger and consumers' organizations (EPF/BEUC), travel companies (EU Travel Tech/ECTAA) and distributors (EU Travel Tech/ALLRAIL), 30 March 2021 (2021)
Rail passengers' rights and obligations in the EU, Briefing, EU Legislation in Progress, European Parliament (2021)
The New Rail Passenger Rights' Regulation – Questions and Answers, European Commission, 29 April 2021 (2021)
Study on the EU framework for passenger rights, Steer for European Commission (2021) (Not yet published)
Annex O: Obstacles: creating cross-border PSOs
Judgment of the Court (third chamber), in Case C-482/14, 28 June 2017 (2017)
NightJet expands to Amsterdam and Brussels, Railway Gazette International, 11 October 2019 (2019)
Dutch state sued for subsidising NS Vienna-Amsterdam night train, Railtech, 5 May 2021 (2021)
Annex P: Obstacles: other technical and operational barriers
Railimplement – Implementation of EU Directives 2001/12/EC, 2001/13/EC and 2001/14/EC, Final Report, Steer for European Commission (2005)
Servrail study – Assessment of present and likely future conditions of providing rail-related services, Steer for European Commission (2005)
Further Action at European Level Regarding Market Opening for Domestic Passenger Transport by Rail and Ensuring Non-Discriminatory Access to Rail Infrastructure and Services, Steer for European Commission (2013)
Study on options for the security of European high-speed and international rail services, Final Report December 2016, Steer for European Commission (2016)
One Corridor – One Strategy, Interregional alliance for the Rhine-Alpine Corridor, EGTC (2017)
Rail Technical and Operational Issues affecting Interoperability Logbook, European Commission (2017)

Control Information

Prepared by

Steer
28-32 Upper Ground
London SE1 9PD
United Kingdom
+44 20 7910 5000
www.steergroup.com

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Author/originator

Dick Dunmore, Clémence Routaboul

Reviewer/approver

Karen Letten

Other contributors

Antonio Beltrán Arranz, Rory Gayton, Simon Maarfield, Andrew Mellor, José de la Paz Noguera, Julian Nolte, Rob Quincey, Ludger Sippel, Rachele Tavano, Jonathan Tong, Francesco Vaninetti, Sekai Zengeza

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