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Geachte leden van de staten en gemeenteraden,

Bijgaand een onderzoek dat u zal moeten interesseren ook in de context met de 'Ontwikkelagenda openbaar vervoer 2040'. Hoe wordt Noordoost-Nederland opgenomen in de nachttreinen die door Europa gaan. Welke rol kan de opwaardering van de verbinding Groningen - Bremen spelen. Zwolle en Groningen eindelijk de internationale spoorknoop in Noordoost-Nederland?

Raad het aan te lezen. Om stappen vooruit te zetten.

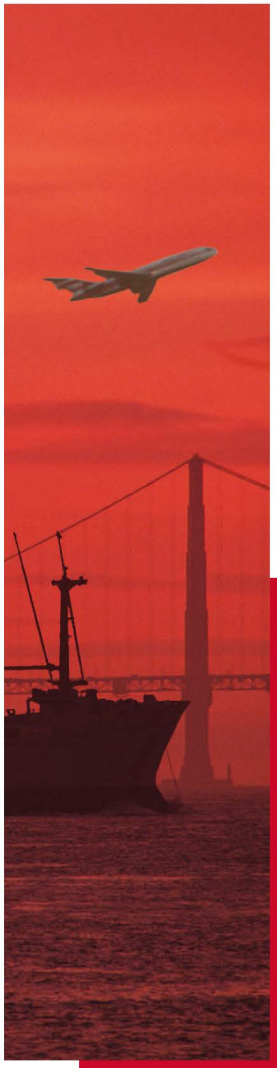
Met vriendelijke groet,

Frank Menger

European Parliament

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

POLICY DEPARTMENT B
STRUCTURAL AND COHESION POLICIES



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Research for TRAN Committee - Passenger night trains in Europe: the end of the line?

STUDY

EN FR

2017

European Parliament

DIRECTORATE-GENERAL FOR INTERNAL POLICIES

Policy Department for Structural and Cohesion Policies

Transport and Tourism

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STUDY

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Transport and Tourism

Research for TRAN Committee - Passenger night trains in Europe: the end of the line?

STUDY

Abstract

The number of passenger night trains offering sleeping accommodation operated within Europe has declined rapidly since around 2010. This paper presents findings on what drives the financial, economic, social and environmental viability of services and hence decisions on whether to operate them or subsidise them. It presents conclusions and recommendations for the monitoring, management and regulation of the sector.

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LIST OF ABBREVIATIONS

ALSA Automóviles Luarca, S.A. (a coach company) (Spain)

Arafer Autorité de régulation des activités ferroviaires et routières (Regulatory authority for rail and road activities) (France)

ARTC Australian Rail Track Corporation (Australia)

ASK Available Seat Kilometre (in aviation)

AV Alta Velocità (high-speed) (Italy)

BAG Bundesamt für Güterverkehr (Federal Transport Authority) (Germany)

CAA Civil Aviation Authority (United Kingdom)

CaSL Cancelled and Significantly Late (United Kingdom)

ČD České Dráhy (Czech Railways) (Czech Republic)

CER Community of European Railway and Infrastructure Companies

CFR Călători Căile Ferate Române Călători (Romanian State Railways) (Romania)

CN Canadian National (Canada)

CNL City Night Line (Germany)

CP Canadian Pacific (Canada)

DB Deutsche Bahn (German Federal Railways) (Germany)

DoT Department of Transportation (USA)

ECU European Currency Unit, the predecessor of the euro

EEC European Economic Community

ERT European Rail Timetable

EU European Union

HSR High-Speed Rail

HS2 High Speed Two Limited (United Kingdom)

ICE Intercity-Express (Germany)

ICN Intercity Notte (InterCity night) (Italy)

IFEU Institut für Energie- und Umweltforschung Heidelberg (Institute for Energy and Environmental Research Heidelberg) (Germany)

IPS International Passenger Survey (United Kingdom)

IRJ International Railway Journal

JR Japan Railway (when used in the brand name of a Japanese regional railway companies)

JRC Central Japan Railway Company (Japan)

KTZ Kazakhstan Temir Zholy (Kazakhstan National Railways) (Kazakhstan)

LGV Ligne à Grande Vitesse (high-speed line) (France)

MIT Massachusetts Institute of Technology (USA)

MP Member of Parliament (United Kingdom)

NRPS National Rail Passenger Survey (United Kingdom)

NSW New South Wales (Australia)

NTV Nuovo Trasporto Viaggiatori (New Passenger Transport) (Italy)

ÖBB Österreichische Bundesbahnen (Austrian Federal Railways) (Austria)

OMR Operations, maintenance and renewals

PKP Polskie Koleje Państwowe SA (Polish State Railways) (Poland)

PPP Public Private Partnership

PRM Persons with Reduced Mobility

PSC Public Service Contract

PSO Public Service Obligation

Renfe Red Nacional de los Ferrocarriles Españoles (National Network of Spanish Railways) (Spain)

RGI Railway Gazette International

RMMS Rail Market Monitoring Survey

RPK Revenue Passenger Kilometre (in aviation)

RZD Rossiyskie Zheleznye Dorogi (Russian Railways) (Russia)

SBB-CFF-FFS Swiss Federal Railways (Switzerland)

SCHIG Schieneninfrastruktur-Dienstleistungsgesellschaft mbH (Rail infrastructure service company) (Austria)

SJ Statens Järnvägar (State Railways) (Sweden)

SNCF Société Nationale des Chemins de fer Français (French National Railway Corporation) (France)

Talgo Patentes Talgo (Talgo Patents) a manufacturer of railway rolling stock, abbreviated from Tren Articulado Ligero Goicoechea Oriol (Goicoechea-Oriol light articulated train) (Spain)

TAP-TSI Telematics Applications for Passenger Services Technical Specifications for Interoperability

TEN-T Trans-European Transport Network

TET Trains d'Équilibre du Territoire (Territory balance trains) (France)

TREMOD Transport Emission Model (developed by IFEU) (Germany)

UIC International Union of Railways

UNESCO United Nations Educational, Scientific and Cultural Organization

VAT Value-Added Tax

VFR Visiting Friends and Relatives

VLDNT Very Long Distance Night Train

VUC Variable Usage Charge (United Kingdom)

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EXECUTIVE SUMMARY

Introduction

For this research study on passenger night trains we have used the following definition: "*A passenger night train is any train consisting partly or wholly of rolling stock dedicated to, or reconfigured for, overnight travel*".

Our approach focused on timetable analysis, desk research and case studies on night trains in Europe and elsewhere, and interviews with night train operators and their funders.

The operation of night trains

An "idealised" night train might run non-stop from after 22:00 to before 08:00 and allow passengers to sleep for 8 hours or more, but this is rare. Many night trains run for up to 16 hours in the time between the end of one working day and the beginning of the next. Some continue for several days, alternating between "night" and "day" modes. Many passengers on these night trains therefore travel only by day.

Night trains are normally slower than the equivalent day trains, either to provide sufficient time for sleep, to allow for splitting and joining to serve multiple destinations, or to fit around freight trains or network congestion. Access to infrastructure can be difficult at city centre stations, particularly in the morning peak period. Some night trains have been withdrawn due to lack of infrastructure capacity, but stakeholders generally reported that they are reliable and punctual. Longer journey times, and trains which only run on some days, mean less productive rolling stock and staff.

Night trains usually include several types of accommodation such as "day" seating, reclining seats, couchettes, and sleeping compartments without or with en-suite facilities. Provision for Persons with Reduced Mobility (PRM) is common. As on long-haul aircraft, better accommodation requires progressively more space per passenger.

The provision of night train services

Time-series data on measures such as train-kilometres or passenger-kilometres are not available specifically for night trains, but we found examples of service withdrawals completed since 1980 and service withdrawals planned for 2017 and beyond. Domestic night trains now operate in only 11 EU Member States, whether as part of a national Public Service Obligation (PSO), a PSO specific to night trains, or commercially. International night trains currently serve or pass through 18 Member States, three of which are only connected by night trains to Russia.

Night trains which are operated on a clearly-commercial basis appear to be restricted to:

- a corridor including SJ's Stockholm to Malmo service in Sweden; and
- the large area of central Europe covered by Austria's ÖBB Nightjet network radiating from Vienna to Germany, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Italy and Switzerland.

Flights between Vienna and many of the cities served by these night trains are infrequent or inconvenient and, in Austria, domestic competition from coach operators is tightly regulated. This may improve the commercial viability of night trains in Austria.

The current viability of night trains

Night trains have higher costs per passenger space than day trains:

- rolling stock is more complex, built in smaller volumes and carries fewer passengers per vehicle;
- staff are typically required to work overnight and away from home; and
- additional services such as shunting, bed-making and laundry are needed.

Night trains are large, with 200 passenger spaces or more, compared with competing small aircraft or coaches, which can be used to offer many more services with the same total capacity.

Even where financial information for night trains is available, their viability may be difficult to assess and may require management judgement. If night trains are withdrawn, some of their ticket revenue may be retained, because passengers would change to day trains, and some of their costs may still be incurred, because some parts of the service might have to be provided under a PSO. The underlying infrastructure cost may be no more than €2 per train-kilometre, but many infrastructure managers apply "mark-ups" which can form a significant part of operating costs. Apparent costs also depend on the accounting treatment of rolling stock: services which appear viable with fully-depreciated rolling stock may not be affordable with new stock built to current standards.

Where subsidies specific to night trains can be identified, the apparent subsidy per passenger ranges from €20 in Sweden to €100 per passenger for trains recently withdrawn in France.

The future challenges to night trains

The use of night trains for business travel appears to be in decline, although the best accommodation with the highest fares on some trains appears to be sold out first. The use of night trains is dominated by leisure travel, a growing proportion of which may be by passengers visiting friends and relatives, for whom the night train may offer no savings in hotel costs. Changing social norms, and rising expectations, mean that passengers are less willing to sleep with strangers, or without direct access to a toilet or an opportunity to shower or bath. Night trains also face growing competition from other modes.

European high-speed lines have been built to provide faster and more frequent day trains, which may take demand away from night trains. However, they have rarely been used to allow night trains to connect more remote points, as has occurred in China and India (please see Annex M on case studies outside Europe). We examined a proposal for a "Very Long Distance Night Train" (VLDNT) operating up to 2,000 kilometres on high-speed lines, but it is not clear who in Europe would be willing to build or fund a fleet of as few as two high-speed night trains to enter an untested market. Half of all rail travel between Member States is via the Channel Tunnel between France and the United Kingdom, the Oresund bridge between Denmark and Sweden, or the Perpignan-Figueres link between France and Spain, all of which have opened since 1990, and none of which are used by night trains.

Airline liberalisation has led to the growth of low-cost airlines within Europe. They may not focus on dense business markets, but have led to a fall in real fares, and extensive yield management, and provide many more connections than can be offered by night trains. They not only compete with night trains but also connect points that night trains do not.

International coach services were liberalised in 2011, and since 2013 three large Member States (Germany, Italy and France) have liberalised their domestic services. Many coach

operators provide overnight services, and most night train services in Germany and France have since been withdrawn. Overnight coach fares often undercut even the cheapest seats on night trains.

Many night train networks may now be too small for there to be market awareness of them ("visibility") except to regular and local passengers. Several operate with fewer than 100 vehicles of several types and increasing age. The EU-wide average annual requirement for new stock may be only two trains, varying between four track gauges and many vehicle types. Manufacturers may charge high prices for such small orders of replacement vehicles.

The sector's scope to respond

The EU plays only a limited role in relation to night trains: setting the overall regulatory framework, including for rail infrastructure charges, and investing in infrastructure.

The Member States could require infrastructure managers to reduce infrastructure charges, or could subsidise night trains in recognition of their benefits, as occurs in (at least) Austria, Sweden, the United Kingdom and France. However, parliamentary debates in 1983 (in the United Kingdom) and 2016 (in Germany) rejected the idea that any long-distance services should be subsidised.

The operators of night trains generally appear to manage them well. Cross-border operations, and changes of locomotives and crew, are long-established. The past practice of allocating blocks of tickets to each railway for sale through stations is declining. Best practice appears to be:

- to offer a range of accommodation and the opportunity to pay more for exclusive use of a compartment;
- to use yield management to maximise revenue from the capacity available; and
- to sell through a single (multilingual) website.

However, some operators appear to offer only a small range of accommodation at fixed low fares, probably to meet an inflexible national PSO.

The Trans-European Transport Network (TEN-T) core network corridors may be of some help to night trains, where they provide additional capacity, but major new international links appear not to have attracted night train services, and high-speed lines appear to have contributed to their decline.

Private sector companies act as subcontractors to night train operators, operate some luxury night train services, and provide a range of information, reservation and travel websites. However, unlike the airline industry, the night train sector has not developed either a standardised set of products or a standard tool for describing and selling them. It may be increasingly difficult to persuade the private sector to sell or to market a declining range of night train services.

We conclude that night trains may continue to decline as rolling stock needs replacing, new high-speed rail infrastructure improves the competitiveness of day trains, and if more coach services are liberalised. The replacement of night train services by coaches may mean passenger inconvenience and staff redeployment, but the overall effect on employment is unclear.

The case for subsidising night trains

There is no clear case that night trains are less environmentally damaging than other rail or road transport. Night trains appear to have higher direct CO_2 emissions per passenger-kilometre than coaches and day trains. Even if all trains were powered wholly by renewable energy, night train rolling stock would still have more embedded CO_2 per passenger space than day train rolling stock.

There is no clear evidence of unfair competition between modes, given the difficulty of defining whether any individual passenger has been subsidised.

Recommendations

Neither the European Commission nor many of the Member States see preservation of night trains as a specific objective. However, a number of measures could be considered:

- Monitoring of night trains could be improved, possibly through the existing Rail Market Monitoring Survey (RMMS).
- Directive 2012/34/EU could be modified to specify that night trains be considered as a market segment, and to ensure that their viability is not undermined by excessive mark-ups to infrastructure charges.
- Subsidy could be provided without specifying the exact timetable, which in practice may need to be adjusted to meet passenger requirements. Subsidy could take the form of a compensation for providing a minimum total annual capacity, a compensation per passenger, or a percentage of the revenue earned from passengers.

On balance, while night train services have declined, they still contribute to the mobility needs of European citizens. The suggested measures may help sustain their retention in future, although it seems unlikely that the night train sector will grow beyond a small niche.

1. THE OPERATION OF NIGHT TRAINS

KEY FINDINGS

- Night trains often differ from day trains in their patterns of operation: many night trains split and join portions, operate only on some days of the week (or month, or during some seasons, or around specific holidays), and operate at lower average speed.
- Little evidence is available on the reliability or punctuality of night trains. However, a slightly delayed arrival may not be important for many night trains passengers.
- Restrictions on infrastructure capacity have been cited as the cause of the closure of at least one night train service, operated by Thello between Rome in Italy and Paris in France. They also appear to affect night trains serving a number of cities, including Hamburg and Cologne in Germany, Stockholm in Sweden and London in the United Kingdom, and we found that they also occur in cities in Australia. This can make it difficult to optimise timetables or to provide passengers an opportunity to "lie in" on an arriving train or to "board early" on the return service.

1.1. The definition of night trains

For the purpose of this study, we have used the following definition: *"A passenger night train is any train consisting partly or wholly of rolling stock dedicated to, or reconfigured for, overnight travel".*

In the remainder of this study, we generally abbreviate "passenger night trains" to "night trains", which we contrast with (passenger) "day trains", except where necessary to make clear a distinction between passenger and freight trains.

The duration of night train journeys varies widely, as summarised in Table 1.

Table 1: Hours of operation of night trains

Duration	Hours of operation	Examples	Comments
Idealised "overnight" train	Less than 10 hours 22:00 to 08:00	Vienna in Austria to Krakow and Warsaw in Poland and Košice in Slovakia. London to Glasgow/Edinburgh in the United Kingdom.	All passengers travel long distances overnight.
Evening and morning	Up to 16 hours 18:00 to 10:00	London to Aberdeen, Inverness, Fort William in the United Kingdom. Most other night trains in the EU.	May carry significant numbers of short-distance "evening" and "morning" passengers.
All day	Up to 24 hours	Stockholm in Sweden to Narvik in Norway. Cairns to Brisbane in Australia.	Operates as both a night train and a day train, and may carry many "day" passengers on journeys of up to 16 hours.
Multi-day	36 hours or more	Moscow in Russia to Paris/Nice in France. VIA Rail services in Canada.	Operates as both a night train and a day train, with a wide mix of passengers.

Source: Steer Davies Gleave analysis of case studies.
Note: an alternative analysis of the duration of night trains can be found in UIC-Study Night trains 2.0, UIC and DB (2013).

Idealised "overnight" train

An idealised overnight train would provide a non-stop journey of 8-10 hours between two stations, departing after 22:00 and arriving before 08:00. In practice, few night trains operate wholly within this period, and none that we have identified do so without stops en route, with the result that few offer an uninterrupted journey of more than six hours[1].

If necessary, short journey times may be extended by two means:

- Passengers may be allowed to "board early", and hence to go to bed, before the train departs.
- Passengers may be allowed to "lie in", and hence remain in bed, after the train arrives.

[1] A notable exception is the remaining services in France. Trains between Paris and Latour-de-Carol run non-stop for nearly seven hours between Les Aubrais (70 minutes from Paris) and Toulouse. Trains between Paris and Nice run non-stop for over eight hours between Paris and Marseilles on a journey lasting 11 hours. However, day trains connect Paris and Nice in 5 hours 36 minutes, and the Paris-Nice night train will be withdrawn from October 2017.

However, these options can only be offered at the beginning and end of the night train route and not at intermediate stops. In addition, as we discuss below in Section 1.7, limited infrastructure capacity means that it is not always possible for the night train to remain in the station for a long period, particularly when its arrival coincides with the morning commuter peak.

Evening and morning night train

Where geography and demand dictate that more points are served, a night train may have one or more "pick-up" points in the evening and "set-down" points in the morning, ideally while preserving a long and uninterrupted period overnight during which to sleep.

Night trains with journey times of up to 16 hours can be operated outside the working day, avoiding the need to interrupt business, work or education before or after the journey. They may also act as the last train of the evening or the first train of the morning for a number of short distance passengers, particularly those commuting into the destination station. For example, The Caledonian Sleeper services in the United Kingdom act as the last evening, or first morning, service on part of their routes, and 10% of their passengers are making short "day" journeys.

All-day night train

Longer services may operate for up to 24 hours but, with such a long journey time, relatively few of the passengers may actually make a long overnight journey. For example:

- Trains between Stockholm and Norrland in Sweden and Narvik in Norway begin their journeys between 15:00 and 16:00, allowing "day" journeys of up to 8 hours[2].
- In Australia, a passenger boarding a southbound train at 09:00 from Cairns could make a 15-hour journey to Cardwell without wanting sleeping accommodation.

Multi-day night train

Over even longer distances, passengers may be on the same train for two successive days or nights, and will expect to be provided with, and use, both day and night accommodation.

Summary

Night trains need to be reconfigured to operate overnight and may, under some circumstances, alternate between night and day configurations during the journey.

1.2. The definition of night train rolling stock

This variation in the duration of night train journeys is reflected in the different types of accommodation provided on different trains, not all of which are dedicated to, or reconfigured for, overnight travel, as summarised in Table 2.

[2] In practice, at the high latitudes in Sweden and Norway, the sun may have set by 15:00, so such a "day" journey may be wholly in the dark.

Table 2: Stock dedicated to, or reconfigured for, overnight travel

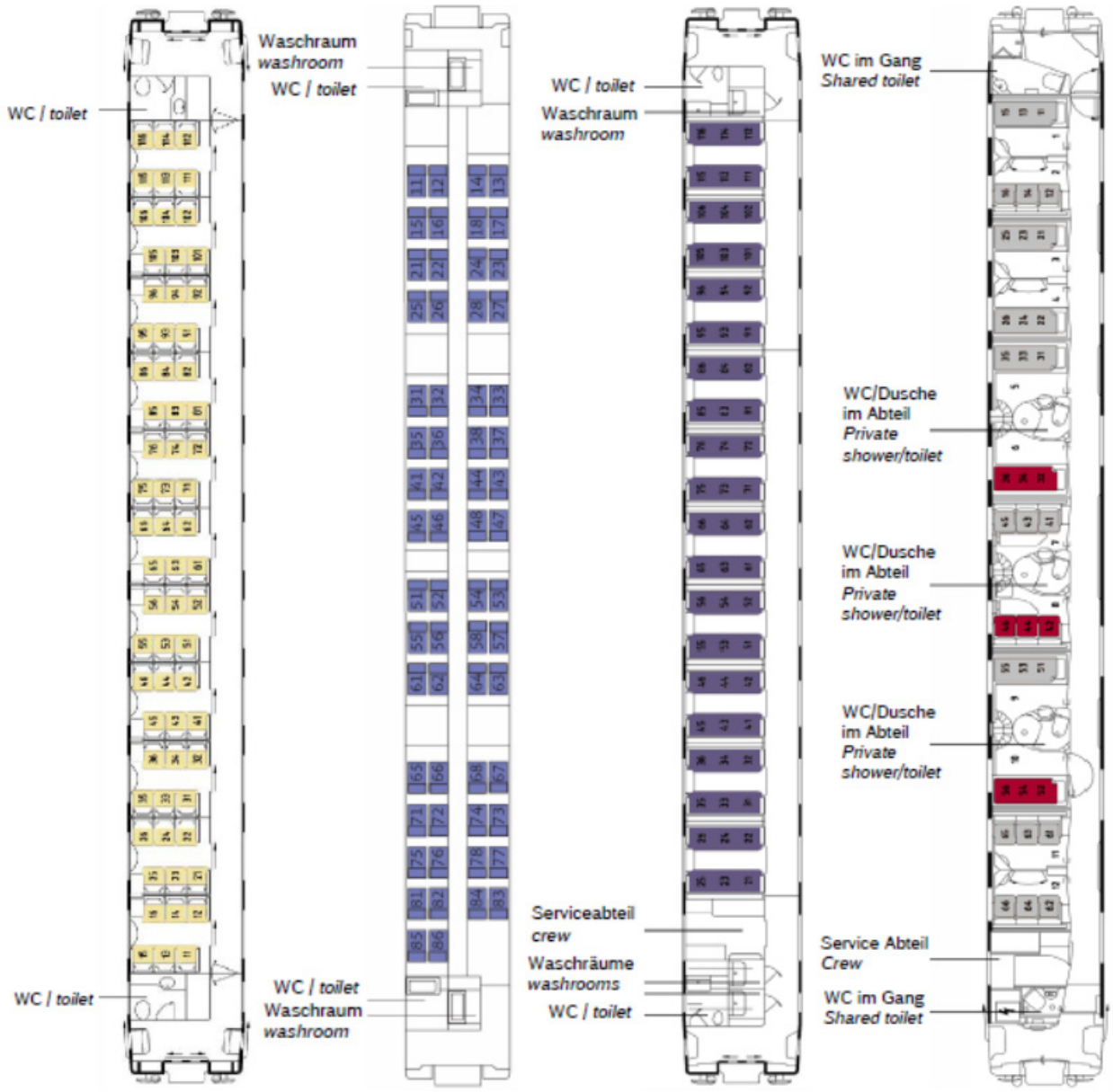
Accommodation	Examples	Notes
Seat	Common throughout Europe	Basic "day" accommodation, particularly for short-distance "evening" and "morning" passengers.
Reclining seat	Germany (DB City Night Line) Australia (Spirit of Queensland) France (SNCF Intercités de Nuit) Spain (Renfe Trenhotel) Japan (Nisho-Nippon Railroad)	Not normally included in day trains.
"Dormitory"	China Railway Corporation Indian Railways	Bays of basic bunks off a corridor, with no doors or segregation.
"Nobi Nobi"	Japan Railways	Individual low-headroom sleeping pallet along the side of the corridor (please see Annex M on case studies outside Europe).
Couchette	Common throughout Europe, except in the United Kingdom	Typically contains six beds, but only five or four may be allocated to passengers.
Sleeping compartment	Common throughout Europe, except in France	Typically contains three beds, or two in the restricted loading gauge in the United Kingdom.
Sleeping compartment with ensuite	Common throughout Europe, except in France	Increasingly common, particularly on services marketed as "hotel trains" which provide higher quality and more space.
Lie-flat "pod"	Australia (Spirit of Queensland)	Similar to airline Business Class seats, and can be changed between "seat" and "bed" at will.
"Berth"	Canada (VIA Rail)	A bay with transverse seats by day and two longitudinal beds by night.
"Cabin for one"	Canada (VIA Rail)	A bay with transverse seats by day and one longitudinal bed by night.

Source: case studies, note that one vehicle may carry several types of accommodation.
Note: some night trains also include day stock and/or car-carrying vehicles, outside the scope of this study.

Within the European Union (EU), the dominant forms of overnight accommodation are couchettes (except in the United Kingdom) and sleeping compartments (except in France). In most cases, each individual vehicle contains only one of these two types of accommodation, typically with at least some vehicles including accommodation adapted for Persons with Reduced Mobility (PRMs).

For example, until its services ended in December 2016, Germany's DB City Night Line (CNL) operated several different types of stock, the layouts of some of which are illustrated in Figure 1.

Figure 1: DB City Night Line: seated, reclining seat, couchette and sleeper layouts



Compartments
66 seats

Reclining
seats
62 seats

Couchettes
60 beds

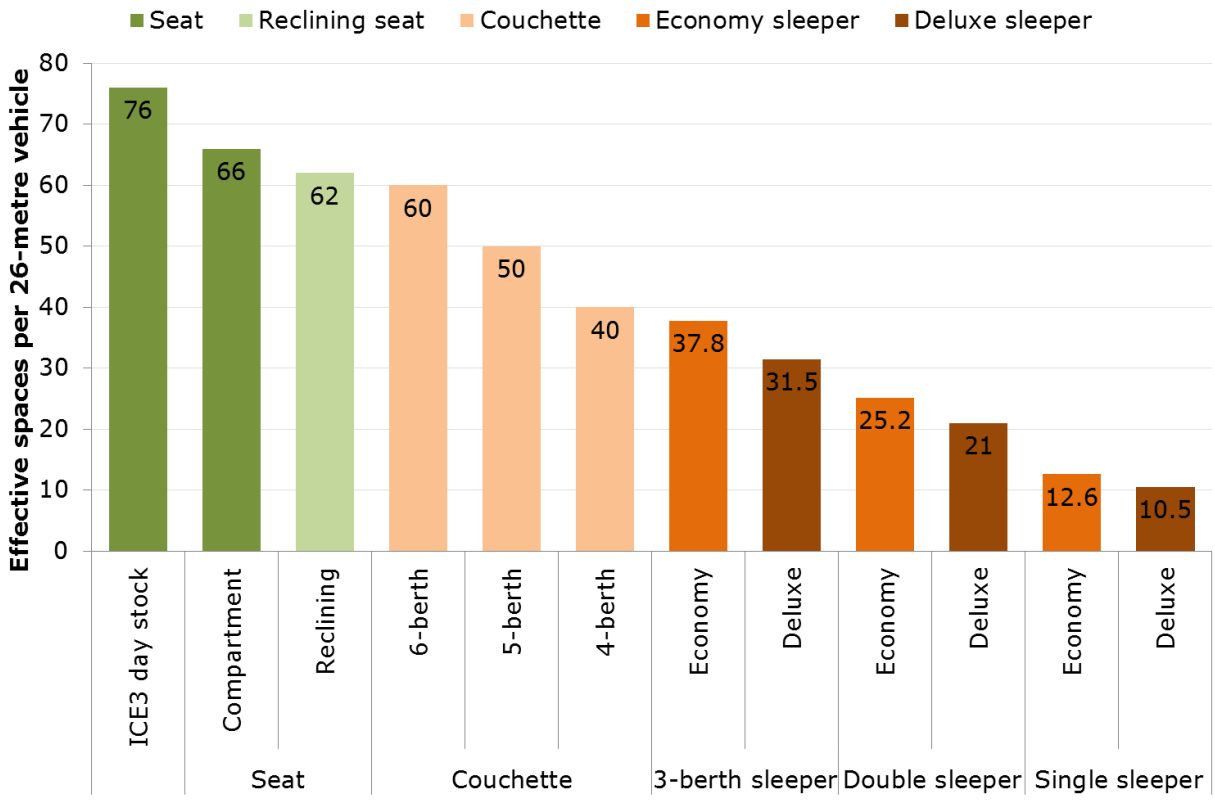
Sleeper
27 Economy
(no ensuite)
9 Luxury
(with ensuite)

Source: DB City Night Line.

Many high-speed day trains operated by Germany's DB use Intercity-Express ICE3 stock, not shown in the Figure, which can seat up to 76 passengers in a Second Class coach. City Night Line stock required progressively more space per passenger, with 66 seats in compartment stock (left), 62 seats in reclining seat stock, 60 beds in couchette stock and only 36 beds, without and with ensuites, in sleeping car stock (right).

Figure 2 compares the effective spaces per vehicle with a coach of ICE3 stock. It takes into account the progressively greater space required by reclining seats, couchettes and sleeping compartments and, in Deluxe accommodation, the addition of en-suite facilities. It also takes into account the effects of allowing passengers to reserve a whole couchette compartment for only five or four people, or a whole sleeping compartment for only one or two people.

Figure 2: DB City Night Line: effective spaces per vehicle



Source: DB City Night Line, Steer Davies Gleave analysis.
Note: in practice, City Night Line never sold more than 5 berths in a 6-berth couchette compartment.

While ICE3 day stock may hold up to 76 (Second Class) passengers per vehicle, the space occupied by a single occupant of a Deluxe sleeper was equivalent to only 10.5 passengers per vehicle. This differential of over 7 to 1 is greater than the different spaces occupied on long-haul aircraft by an Economy seat and a First Class suite. We discuss later in this report the extent to which the space per passenger on night trains affects costs, fares and environmental impacts per passenger.

We did not systematically investigate provision for Persons with Reduced Mobility (PRMs), which on night trains typically requires adjustments to the design of stock similar to that found on day stock:

- Stock with seating or reclining seating requires provision of a wheelchair toilet and a space for a wheelchair.
- Stock with couchettes or sleeping compartments requires a wheelchair toilet and a compartment with a suitable door. In addition, the PRM can only occupy the lowest bunk or bed.

In Germany, CNL used eight types of vehicle, of which we understand that two, the single-deck sleeper stock (shown on the right of Figure 1 above) and a variant of the couchette

stock, had provision for PRMs. In Sweden, Trafikverket (the Swedish Transport Administration) provides night train operators with eight types of stock of which three, two with seats and one with sleeping compartments, are adapted with a wheelchair lift. However, there is no provision for PRMs in Trafikverket's couchette stock. In Spain, operator Renfe includes provision for PRMs in its Trenhotel services. Other night train operators within the EU also appear to make at least some provision for PRMs although, as in Sweden, PRMs may not be catered for in every type of accommodation.

The patterns of operation of night trains are also complex in a number of other ways. We discuss below:

- splitting and joining of portions of night trains;
- less-than-daily services;
- lower operating speeds;
- reliability; and
- infrastructure capacity.

1.3. Splitting and joining

Night trains may split and join, dividing into portions to serve more than one destination. A particularly complex example operates from Poland.

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.

1.4. Less-than-daily services

Night trains do not always operate every night. Patterns we identified in the European Rail Timetable (ERT) include:

- Some services operate every night except Saturday, when demand is often lowest. For example, night trains in the United Kingdom do not operate on Saturdays.
- Some services, in contrast, operate only at weekends, including Saturday nights.
- Some services operate only on some nights of the week, or even only once a week.
- Some services, particularly in Russia, do not have a fixed weekly cycle, but operate only on even- or odd-numbered days. This pattern requires specific adjustments around the ends of months ending in 29 or 31 days.
- Some services operate as a night train in one direction and a day train in the other direction, such as Russia's RZD's services between Moscow and Riga in Latvia.
- Some services only operate in particular seasons, or around particular public holidays.

This means that passengers planning an unfamiliar journey, particularly if working from a printed timetable, may find it difficult to identify what services operate on a given day.

It also means that it is difficult to define or calculate the total number of night trains operated, either on a given day or over a longer period, or to identify and describe a "typical" pattern of service. In the case studies supporting this report, we have attempted to illustrate the service operated on the greatest number of days (a "typical midweek operating pattern"). In practice, however, the only rigorous approach would be to identify all trains operating on an arbitrary but specific date.

The issues of splitting and joining and less-than-daily services illustrate the potential complexity of night train services, not only for the operator but also for an intending passenger working from a printed timetable such as the European Rail Timetable. A well-designed online journey planning tool would allow a passenger to specify an origin, destination and required date and time of departure or arrival, and to be offered a clear list of day and night trains meeting these criteria, with prices for each type of accommodation offered. However, few of the websites and journey planners we examined provide all this information[3].

1.5. Lower operating speeds

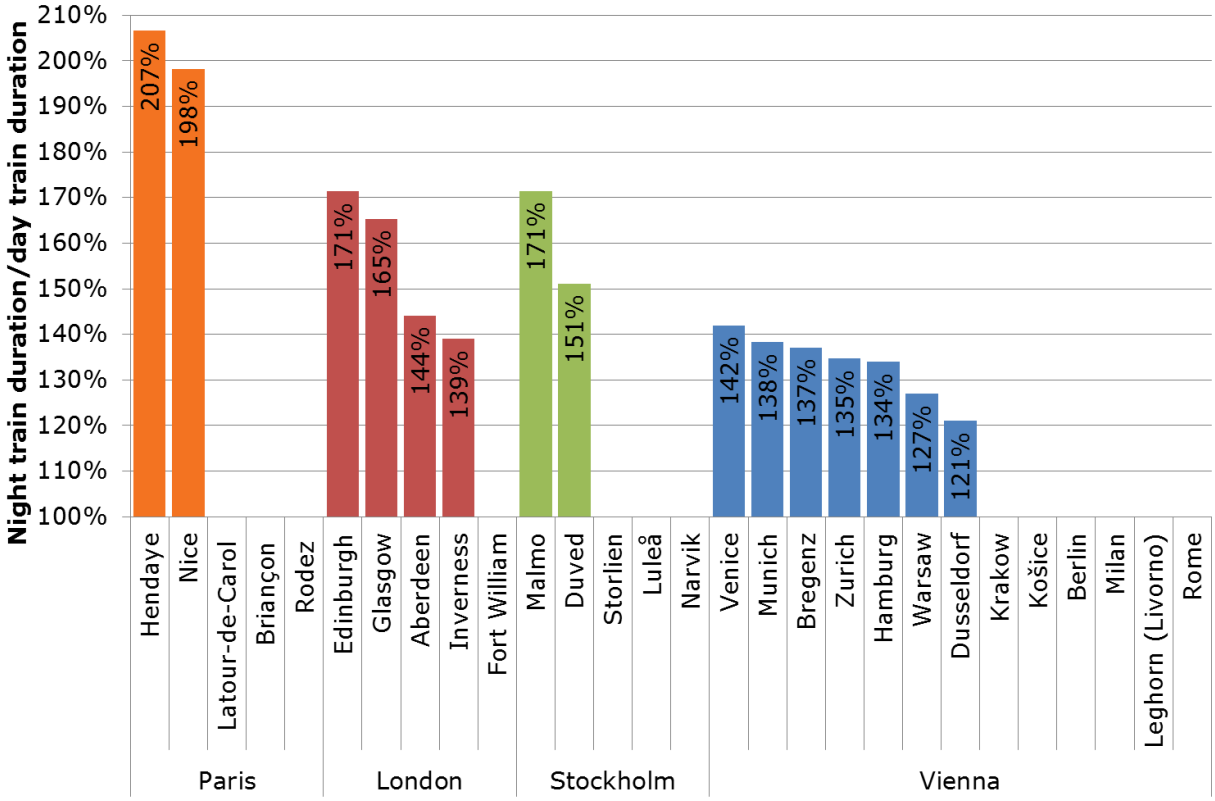
A further complication is that journey times on night trains can be more than double those on day trains, where these exist, between the same two end points, as shown in Figure 3.

We identified a number of apparent reasons for these extended journey times:

- Time is added to provide a sufficiently long journey time to allow passengers to sleep, one clear example of which is the night trains between London and Edinburgh in the United Kingdom. Day train journey times between London and Edinburgh have in the past been as low as 3 hours 59 minutes, and are currently just over 4 hours. In contrast the night train journey time is extended to over 7 hours, partially by operating at a maximum speed of 130 km/h compared with 200 km/h for day trains.
- Time is added to split or join stock, or to change locomotives, en route.
- Many rail networks carry significant numbers of freight trains at night, and these often operate at lower speeds than passenger trains. This means that night trains, irrespective of the capabilities of their rolling stock, must slow to speeds which are compatible with the freight services.
- Many parts of the rail network are congested, particularly where there are extensive commuter operations in the morning peaks, as we discuss further below. In some cases, it may be necessary to extend the night train journey time to arrive after the morning peak.

[3] Online journey planners are provided by a wide range of organisations including national, regional and local transport authorities, railway operators, specialist travel and reservation websites and tourism operators. However, the range of services covered, information provided and functionality offered varies widely between websites. Some websites list night trains and their stopping patterns but provide no information on the types of accommodation available.

Figure 3: Comparison of night and day train journey times on selected routes



Source: European Rail Timetable, The Caledonian Sleeper, Steer Davies Gleave analysis.
Note: blank city pairs have no direct day train service.

1.6. Reliability

We found no systematic reporting of the punctuality of night trains, but in some case studies and interviews we obtained at least some information on their reliability and punctuality.

On reliability, normally defined as whether a train operates as advertised, we found evidence that some services could not be operated reliably for a number of reasons including engineering works and conflicts with other rail services such as freight. As an extreme example, the International Railway Journal (IRJ) reported in August 2014 that Thello's service between Rome in Italy and Paris in France, launched in 2011, had been withdrawn in December 2013 because it was unable to secure train paths on 85 days in 2014.

On punctuality, normally defined as whether a train arrives at its destination, or at intermediate points, on time, we found only limited information. One interviewee told us that the punctuality of night trains is worse than that of other services. However, operators in both Austria and Italy told us that maintaining a reliable and punctual service did not present any special problems. In the United Kingdom, we found that detailed information on The Caledonian Sleeper trains "Cancelled and Significantly Late" (CaSL) showed that these were improving[4].

In practice, the opportunity, or need, to extend night train journey times may often offer a buffer against delays en route which is not normally available for day trains. In addition,

[4] CaSL is a measure of both reliability, whether trains are cancelled, and punctuality, whether trains are late.

arrivals 5, 10 or 15 minutes late, which might be seen as significant on a commuter or interurban day service, appear less likely to be material to a passenger on a night train unless, on arrival:

- They have an appointment or activity soon after the night train is timetabled to arrive.
- They need to make a tight connection to another train or transport service.

1.7. Infrastructure capacity

We noted above the general point that rail networks are often congested at specific times and locations[5].

High-speed infrastructure is not always of relevance to night trains. This may be for a number of reasons:

- The high speeds achieved by day trains would result in too short a journey time to be attractive at night.
- Night train rolling stock is not normally adapted to operate at high speeds or on high-speed lines.
- For commercial reasons, night trains call at points which are not on the high-speed network.

DG MOVE[6] told us that one issue faced by operators of passenger night trains was obtaining infrastructure capacity (quality train paths), particularly where standard overnight paths were set to suit relatively slow freight trains. Freight traffic may limit the commercial speed of night trains, meaning that departures are earlier, or arrivals are later, than would be commercially optimum, or may prevent their operation because capacity is not reliably available. We identified that freight services had constrained (and ultimately resulted in the abandonment of) Thello's service between Rome in Italy and Paris in France, and that freight trains resulted in a major constraint to passenger services in the Sydney Metropolitan area in Australia. Freight trains also constrain timing at Hanover in Germany.

Poor service reliability or punctuality on lines where there are overnight closures to carry out maintenance works could also affect the market attractiveness of night trains. One interviewee pointed out that passenger night trains may be indirectly penalised by the absence of other trains at night, particularly as the delivery of post, parcels and newspapers has moved from rail to other modes. This can mean that a passenger night train is the only user of the infrastructure during the night, with a number of cost implications:

- Operation of the passenger night train may require the provision of an overnight shift of signalling or other operations staff, which could be avoided completely if it were withdrawn.
- Operation of the passenger night train may prevent or restrict night time maintenance or renewal of the infrastructure, potentially imposing additional costs on the infrastructure manager.

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[5] Railway Recast Directive 2012/34/EU recognises the issue of congestion and makes provision for a charge which reflects the scarcity of capacity of the identifiable section of the infrastructure during periods of congestion. The United Kingdom's Office of Rail and Road has published a detailed study on "The practicalities of scarcity charging."

[6] European Commission - Directorate General for Mobility and Transport.

Either of these costs could, in principle at least, be considered a "*cost that is directly incurred as a result of operating the train service*", in the wording of Article 31 of Directive 2012/34/EU on principles of charging. We discuss the effects of infrastructure charging on the viability of night trains in greater detail in Section 4.5.

Capacity bottlenecks in the morning and evening rush hours exist at a number of major stations. For example:

- In Germany, at Hamburg Hauptbahnhof (main station), we have been informed that there is congestion in the morning peak, and this may mean that it is not possible for a night train to terminate there. In practice, in the 2017 timetable, Austria's ÖBB Nightjet's services to Hamburg pass through the Hauptbahnhof at 08:30 (from Zurich in Switzerland via Berlin in Germany) and 08:36 (from Vienna and Linz in Austria) but continue to less central stations at Hamburg Dammtor and Hamburg Altona. This means that passengers to and from Hamburg Hauptbahnhof do not have the opportunity to "lie in" on arriving night trains or "board early" on the return services, which pass through the Hauptbahnhof at 20:29 and 20:52.
- Also in Germany, a single train serves the two major destinations of Cologne, which it passes through at 08:15, and Dusseldorf. We have been informed by the station manager at Cologne that operational constraints mean that trains may only stop at the station for a maximum of two or three minutes. As with at Hamburg, this means that there is no opportunity at Cologne to "lie in" on an arriving night train or to "board early" on the return services.
- In Sweden, at Stockholm Central, one night train departs at 15:59, which may be to avoid the evening peak period between 16:00 and 19:00, and three night trains arrive at 06:16, 06:30, 06:31, during the morning peak between 06:00 and 09:00. Even if capacity is available during these peak periods, trains operating in them are subject to a "passage charge"[7], permitted under Directive 2012/34/EU, to reflect congestion at these times. Similar restrictions and passage charges also apply at Gothenburg and Malmo.
- In the United Kingdom, at London Euston, the last night train arrives at 07:47, but passengers must leave it by 08:00, and we understand that this may be to avoid the morning commuter peak.
- In our case study of Australia (please see Annex M on case studies outside Europe), we were also told of similar constraints at the principal stations in Brisbane (Roma Street), Melbourne (Southern Cross) and Sydney (Central).

In summary, from a limited number of case studies we have been able to identify a number of specific constraints, particularly at city centre stations serving major commuter flows, where it is impracticable or impossible to arrange for an arriving night train to remain in the station, whether to allow passengers to lie in or to service the train. We also note that the operations of ÖBB Nightjet, the only operator currently expanding its night train network, centre on the new Vienna Hauptbahnhof (main station) which we understand was designed for current levels of service, including night trains.

[7] Trafikverket, Network Statement 2017, Section 6.

2. THE PROVISION OF NIGHT TRAIN SERVICES

KEY FINDINGS

- Night trains are not consistently defined, managed or monitored as a sector. Instead, they are often operated and managed with other long-distance services.
- During 2016, 11 Member States had wholly domestic night train services, but 18 had stations called at by at least one international night train.
- Night train services have been closing since the 1980s. However, most recently, Germany's DB has closed all its services, and France's SNCF has closed all but three routes, following recent liberalisation of domestic coach services in those Member States.
- Western Europe has limited night trains, with tourist-focused "hotel trains" in Spain, Portugal and Ireland and limited Public Service Obligation (PSO) services in the United Kingdom.
- Eastern Europe has a large number of services operated under PSOs or, in some Member States, by Russia's RZD's international services.
- Central Europe retains a network of services operated by Austria's ÖBB Nightjet, which has taken over some routes closed by DB, and is planning to expand.

2.1. The history of night trains in Europe

Table 3 below summarises a number of factors which make it challenging to present a concrete history of the night trains in Europe.

Table 3: Availability of data on the history of night trains in Europe

Factors	Issues
Definition	No standard definition of night trains exists in the EU or elsewhere. Some trains are branded or described as "hotel trains", but this appears to be a marketing point rather than a guarantee of specific facilities. Some night trains operate by day (please see Table 1 in Section 1.1), include "day" stock (please see Table 2 in Section 1.2), or merge with "day" trains.
Classification	Railways typically distinguish only interurban, urban/suburban and regional services. Night trains are not reported as a distinct category.
Capacity	Many night trains carry a mix of accommodation types, and the composition of the train may vary from day to day or even within a single journey.
Days of operation	Many night trains only operate on some days of the week or month, or during some seasons, or around specific holidays.
Service patterns	Many night trains split and divide, making it difficult to define, for any given service, measures such as train-kilometres, vehicle-kilometres, seat-kilometres by type, or passenger-kilometres.

Factors	Issues
Usage and revenue	Passengers and revenue may not be identified as relating to night trains, and some passengers would in any case have used day trains.
Costs	Costs of night trains may not be identified, particularly where they are shared between a number of operators. Reported costs may overstate the net cost of night trains if "evening", "morning" and "day" sections of the journey would otherwise need to be provided under a PSO.
Time series	Little data is available as a consistent time series, except timetable information in the European Rail Timetable (ERT).

Source: Steer Davies Gleave desk research.

As railways expanded during the nineteenth century, it soon became possible for a single train to carry passengers for many hours or, in the case of transcontinental travel, even for many days. This led to the development of rail vehicles designed for such longer journeys, including vehicles designed to enable passengers to sleep at night. In Europe, by the 1930s, the Compagnie Internationale des Wagons-Lits ("International Sleeping-Car Company", and also known as Wagons-Lit) had built up a fleet of over 2,000 vehicles to provide a network of night trains as far as Istanbul[8].

Night trains remained the premium mode of travel within Europe until at least the second world war, after which commercial aviation began to grow and, in parallel, car ownership rose and a network of motorways, allowing average speeds of over 100 km/h, developed.

Night trains were often operated as an extension of the day train service, with tickets for seated accommodation valid on both day and night services, and supplements charged for the higher standards of accommodation listed in Table 2 in Section 1.2. The option of paying a "Sleeper supplement" to a ticket for day travel remains on The Caledonian Sleeper services in the United Kingdom and, until they ended in December 2016, on the DB City Night Line services in Germany.

The overall quality of night train services has also improved over time, with the introduction of both "hard" features such as safer rolling stock, retention toilets, showers and air-conditioning, and "soft" features such as better passenger information and WiFi. However:

- Some major improvements in rolling stock normally only take place when it is replaced, which can be at intervals of up to 50 years.
- Competing modes including air, coach and car travel also continue to upgrade their offer, normally with a much shorter vehicle replacement cycle.

In Europe, we identified a number of withdrawals of, and adjustments to, night trains over the last fifty years, and further withdrawals currently planned, as we summarise in Table 4.

[8] Compagnie Internationale des Wagons-Lits (et des grands express européens), or The International Sleeping-Car (and European Grand Expresses) Company, was founded in Belgium in 1872.

Table 4: Past and planned or proposed changes to night train services in Europe

Year	Month	State(s) at route ends	Changes or proposed changes
1980	October	France and United Kingdom	End of Paris-London night ferry, which carried sleeping cars between the French and United Kingdom rail networks without passengers leaving their beds.
1983		United Kingdom	End between London and Manchester, Liverpool, Holyhead and Barrow-in-Furness.
1995		United Kingdom	Consultation on end of London to Fort William service, which subsequently continued to be included in a PSO.
2005		United Kingdom	Consultation on end of London to Cornwall "Night Riviera" which subsequently continued to be included in a PSO.
2008		France	End between Reims and Nice.
2009		France	End between Lille and Nice.
		France and Switzerland	Shortening Quimper-Lyon-Geneva to Quimper-Lyon.
2010		France	End between Nantes and Nice and Quimper and Lyon.
		France and Italy	Shortening Paris-Nice-Ventimiglia to Paris-Nice.
2011		France	Merging Paris-Dax-Hendaye and Paris-Dax-Tarbes.
2012		Spain and Switzerland	End of Irun-Tarbes-Lyon-Geneva.
		Spain and France	End between Irun and Nice.
2013		Spain and Switzerland	End between Madrid and Zurich.
		France and Italy	End between Paris and Milan.
2014		France	End between Paris and Lûchon.
2014	December	Germany and France	End between Germany and Paris.
		Germany and Netherlands	End between Germany and Amsterdam.
		Germany and Denmark	End between Germany and Denmark.
2015	December	Germany	End between Berlin and Munich.

Year	Month	State(s) at route ends	Changes or proposed changes
	December	France and Italy	End of Thello services between Rome and Paris.
2016	April	Sweden	Seasonal only between Stockholm and Jamtland.
	October	France	End of a range of services including Paris-St Gervais, Paris-Bourg-Saint-Maurice, Paris-Cerbère and Strasbourg-Nice. Merging Paris-Toulouse/Rodez and Paris-Latour-de-Carol.
	December	Germany and others	End of all night trains operated by Deutsche Bahn (please see Figure 14 in Annex B on DB City Night Line in Germany). Some services were taken over by ÖBB Nightjet (please see Figure 16 in Annex C on ÖBB Nightjet in Austria).
	December	Russia and France	Trans-European Express connecting Moscow and Paris reduced from three days per week to one day per week (please see Table 28 in Annex K on RZD in Russia).
2017	July	France	End between Paris and Tarbes/Hendaye.
	October	France	End between Paris and Nice.
	Planned (date not confirmed)	Italy	End one of two services between Rome and Sicily, with some offsetting capacity increase on the remaining service.
2018	Potentially	Sweden and Norway	Consultation on level of service to Norrland and Narvik, which will now operate until at least 2020.

Source: various, where no month is stated, service withdrawals typically apply from the December timetable.

In Japan, we also identified that the network of night trains will declined to a single route during 2016 (please see Figure 78 in Annex M on case studies outside Europe).

We asked whether DG MOVE formally monitored, or had developed a policy regarding, passenger night trains. DG MOVE told us that they did not specifically monitor, or carry out research on, or have policies specifically related to, passenger night trains. Nonetheless, these are part of the market being addressed through the Single European Railway Area, and benefit from policies on access to rolling stock and access and charging for infrastructure and on which they collect general statistics within the Rail Market Monitoring Survey (RMMS).

We also asked DG MOVE whether there was scope for Eurostat to collect and publish basic data on night trains, such as train-kilometres and passenger-kilometres. DG MOVE told us that this would need to be agreed to and supported by the Member States, but noted that there were gaps in the current level of information provision and that it might be difficult to obtain reliable data. However, DG MOVE said that it would be useful to identify at least the extent to which passenger night trains were specified in PSOs.

2.2. Night train services in 2016

Table 5 summarises which Member States have domestic and/or international night train services. In identifying domestic services, we include only trains operated wholly within a Member State. We excluded international trains allowing travel between two or more stations within the same Member State. These stations might in practice be served either too early in the evening or too late in the morning, or by too brief a journey, to be considered a night train service. For example, night trains between Paris in France and Moscow in Russia operate during the day between Berlin (in Germany), Warsaw (in Poland), and Brest (in Belarus), and night trains between Moscow and Paris operate during the day between Minsk (in Belarus) and Berlin.

Table 5: Night train services by Member State, from December 2016

Member State	International	Domestic	Domestic regime, where known
Austria	●	●	Commercial & PSO
Belgium	×	×	
Bulgaria	●	●	
Croatia	●	×	
Cyprus	No railways		
Czech Republic	●	×	
Denmark	×	×	
Estonia	● Russia only	×	
Finland	● Russian only	●	
France	●	●	National PSO
Germany	●	×	Commercial
Greece	●	×	
Hungary	●	×	
Ireland	× (Seasonal "hotel train" only)	×	
Italy	●	●	National PSO
Latvia	● Russian only	×	
Lithuania	×	×	
Luxembourg	×	×	
Malta	No railways		
Netherlands	×	×	
Poland	●	●	

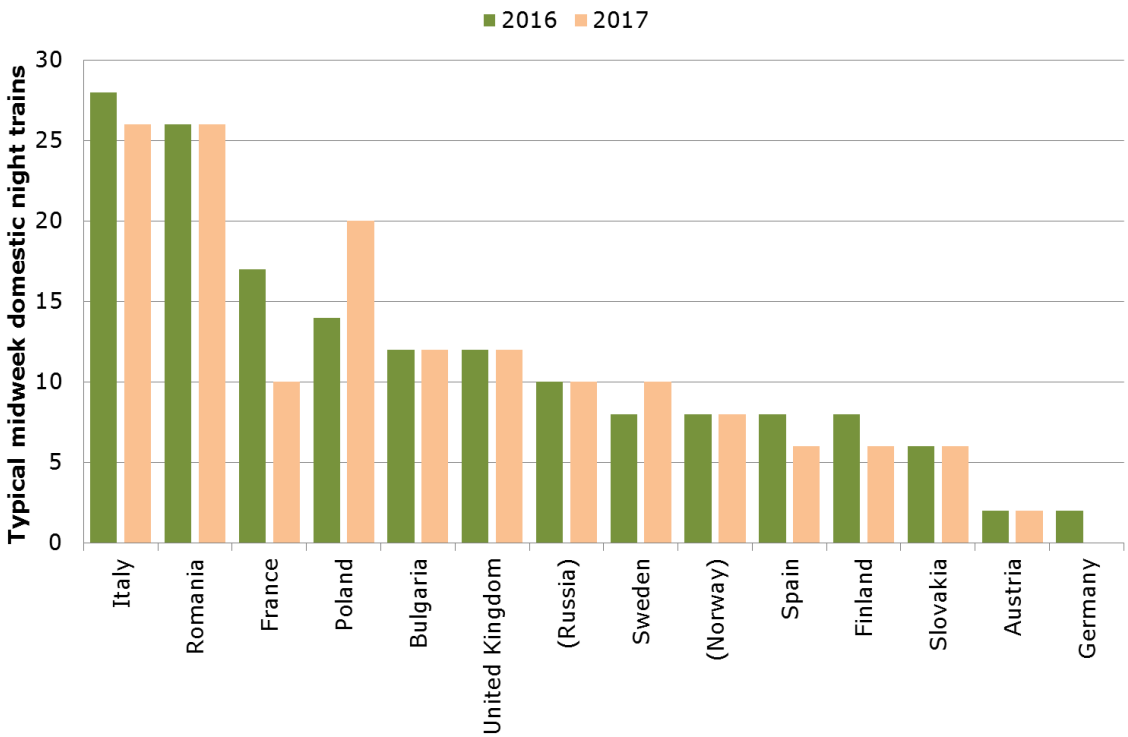
Member State	International	Domestic	Domestic regime, where known
Portugal	× (other than Renfe Trenhotel)	×	
Romania	●	●	
Slovakia	●	●	
Slovenia	●	×	
Spain	● (other than Renfe Trenhotel)	●	
Sweden	● (Norway, and via ferry to Germany)	●	Night train PSO
United Kingdom	×	●	Night train PSO

Source: European Rail Timetable, studies of railway regulation.

2.3. Domestic night trains

We also examined the number of domestic night trains in each Member State from the European Rail Timetable. We treated each destination served by a splitting-and-joining service as a separate route, although in practice the portions of a train may be combined for a large proportion of the total journey. The results of our analysis are shown in Figure 4.

Figure 4: Typical midweek domestic night trains by network (2016 and 2017)



Source: European Rail Timetable, showing total end-to-end routes served, Steer Davies Gleave analysis.
Note: 2017 data are for services in January. Services in France will decline to six by the end of 2017.
Note: not all trains operate in both directions, so in some cases the total number of trains is odd.

Figure 4 shows that both Italy and Romania still have more than 20 domestic night train services per night, although two services in Italy may be combined later in 2017 (please

see Annex F on Intercity Notte in Italy). However, many Member States have ten or fewer wholly domestic services, Austria has only one and, since December 2016, Germany has had none.

The domestic regimes for night trains in each Member State include the following:

- Commercial: night trains are operated, if at all, on a commercial basis, typically by a state-owned national operator. Services are not subject to a PSO and may in principle be cut at any time, although where the operator is state-owned, the State (as shareholder) may expect or direct it to continue to run night train services without a formal PSO.
- National PSO: all day and night services are specified in a national PSO, which may be based on historic operating patterns. Subsidy may be paid as a single amount for the PSO as a whole, rather than paid for particular services after an analysis of their social value, costs and revenues.
- Night services PSO: night trains are identified as socially necessary, are specified and, if needed, are subsidised in a specific PSO.

In practice the national PSO model dominates, and in many Member States there may have been little or no attempt to identify whether night trains, individually or as a sector, are commercially viable or require subsidy. In the event of funding constraints, however, it would be for the national operator to provide a Member State with a judgement of how specific service cuts would reduce overall subsidy requirements.

2.4. International night trains

The majority of night trains within the EU operate wholly within the 1435 millimetre standard gauge network, but:

- "Hotel trains" operate on the 1668 millimetre gauge network in Spain and Portugal.
- "Hotel trains" operate on the 1600 millimetre gauge network of Ireland and Northern Ireland (in the United Kingdom).
- Night trains operate on the 1520 millimetre Russian broad gauge networks including Finland (notionally 1524 millimetre), the Baltic States, and Belarus, where some of them exchange bogies to enable them to operate on the standard gauge network.

This range of track gauges places some restrictions on the scope to run international services without facilities for changing the gauge of the night train vehicles. In practice, this only regularly takes place between the standard gauge and the Russian broad gauge, at Brest in Belarus.

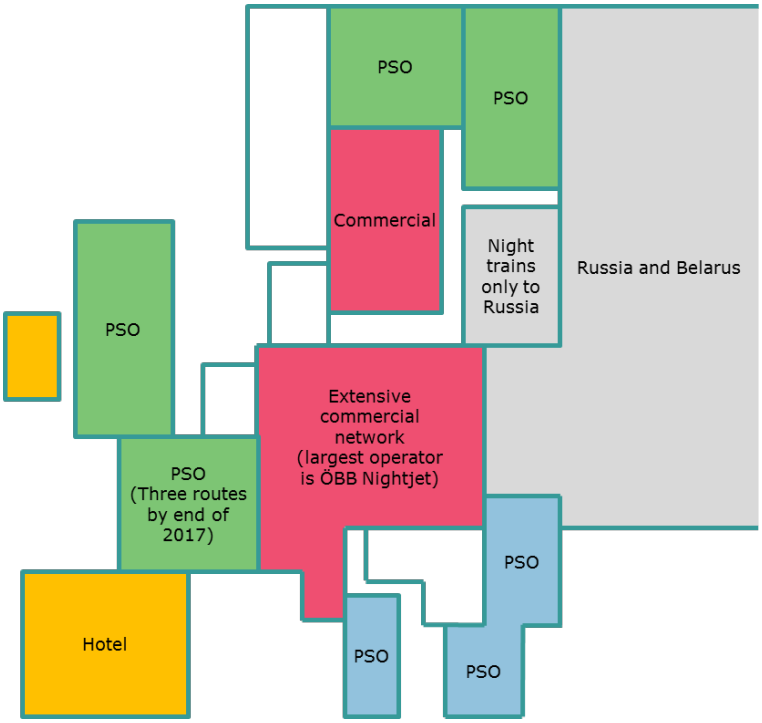
Given the patterns of operation we have identified in the European Rail Timetable, and the more detailed examination of services in our case studies, it appears that:

- The most important cross-border night train links operating within the EU are those of Austria's ÖBB Nightjet, which on most nights offers seven pairs of trains splitting to serve thirteen destinations in Austria, eight other Member States, and Switzerland. ÖBB has plans to expand these services further.
- The most important cross-border night train links operating between the EU and third countries appear to be Russia's RZD's services to Russia, Belarus, three Member States on the Russian broad gauge network and nine Member States on the standard gauge network. However, from December 2016, RZD reduced the frequency of services between Moscow and Paris in France, via Belarus, Poland and Germany, from three services per week to one service per week.

Further details are provided in case studies in Annex C on ÖBB Nightjet in Austria and Annex K on RZD in Russia.

Figure 5 sets out a simplified summary of the findings of our case studies and detailed review of the European Rail Timetable, on the patterns of night train service operations across Europe, broadly on the basis of the timetable operating to December 2016.

Figure 5: Night train regulation across Europe (2016)



Source: European Rail Timetable, operator timetables, Steer Davies Gleave analysis.
Note: diagram has been simplified, please see Table 6 below for key, and text below and case studies for details.

Table 6: Key to regulatory regimes in Figure 5

Colour	Description	Method of operation of night trains	Examples
Orange	Hotel	Operated on a commercial basis with no subsidy	Ireland, Portugal, Spain
Red	Commercial	Operated by long-distance operator with no subsidy	Austria, Czech Republic, Hungary
Blue	National PSO	Included in a national PSO	Austria, Bulgaria, Greece
Green	Night services PSO	Specified and supported by a night services PSO	Finland, France, Sweden
Grey	Russian	Night trains radiate from Moscow, with Russian broad gauge to Finland and the Baltic States, and bogie exchange in Belarus, to other Member States	Estonia, Latvia, Lithuania
Clear	None	No domestic night trains	Belgium, Denmark, Netherlands

Source: European Rail Timetable, operator timetables, Steer Davies Gleave analysis.
Note: descriptions have been simplified, please see text for details.

In France, only three night train routes will remain at the end of 2017. One will operate from Paris to Rodez during the week, with an extension to Albi at weekends. The others will operate from Paris to Latour-de-Carol and to Briançon.

Western Europe

Western Europe has limited domestic night train services:

- In Spain and Portugal, Trenhotel operates a limited number of "hotel train" services. From 2016, Ireland also has a "hotel train" service from April to October.
- In France, only three night train routes will remain at the end of 2017. One will operate from Paris to Rodez during the week, with an extension to Albi at weekends. The others will operate from Paris to Latour-de-Carol and to Briançon.
- In Great Britain, night trains provide sleeping accommodation specified in PSOs for services between London and Scotland, operated by a dedicated operator, Serco Caledonian Sleepers, and between London and south west England.

Eastern Europe

Eastern Europe can be subdivided into two main areas:

- Most Member States with Russian broad gauge railways still have night trains to Moscow and, in some cases, also to Saint Petersburg. Finland also has domestic night trains specified under a PSO, but the only night trains in the Baltic States are to and from Russia.
- Member States with standard gauge railways, including Greece, Bulgaria and Romania, have domestic night trains.

Central Europe

Night trains continue to operate on a commercial basis:

- Domestic services operate commercially in Sweden, between Stockholm and Malmo.
- Mainly international services operate in an area including Germany, Poland, the Czech Republic, Slovakia, Austria, Hungary, Northern Italy (domestic north-south services in Italy operate under a PSO), Slovenia and Croatia.

Night trains serve individual markets, rather than Member States, and a number of factors may explain variations in how successful they are in the Member States with railways.

Two Member States, Cyprus and Malta, have no railways (please see Table 5 in Section 2.2).

Thirteen Member States (Belgium, Croatia, the Czech Republic, Denmark, Estonia, Hungary, Latvia, Lithuania, Luxembourg, Ireland, the Netherlands, Slovenia and Portugal) are too small to have domestic night services, because the maximum distance between significant sources of passengers is too short, or covered too rapidly and frequently by day services.

Three Member States (Sweden, Finland and the United Kingdom) have areas with small and thinly-spread populations. Sweden and the United Kingdom have made explicit decisions to subsidise night trains connecting relatively remote regions to the dominant or capital city.

Five Member States (Bulgaria, Greece, Poland, Slovakia and Romania) have relatively slow day rail services, and relatively undeveloped motorway networks, and continue to operate some domestic night train services, typically as part of a national PSO.

Four large and populous Member States (France, Germany, Italy and Spain) have high-speed rail networks, but their behaviour has diverged:

- Germany has extensive high-speed rail and motorway networks, and in January 2013 deregulated the provision of domestic long-distance coach operations. As of December 2016, it has no remaining domestic night trains.
- France has an extensive high-speed rail network and in August 2015 deregulated the provision of domestic long-distance coach operations. From October 2017, it will have only three night train routes.
- Spain has an extensive high-speed rail network but the provision of domestic long-distance coach operations remains highly regulated. It retains only relatively luxurious Trenhotel night trains.
- Italy has high-speed rail services and, following deregulation in 2014, a growing long-distance coach market, but retains a network of domestic PSO night trains.

Lastly, one relatively small Member State, Austria, has retained a domestic night train network. However, this may, at least in part, be because many major population centres in Austria lie on a single east-west corridor, over 1,000 kilometres long by rail, with driving times of 6-7 hours between Feldkirch in the west and Vienna in the east. Austria's ÖBB operates a number of night trains through this corridor and into the surrounding countries. We discuss in Annex C a number of other factors which may support the use of night trains in Austria.

3. THE DEMAND FOR NIGHT TRAINS

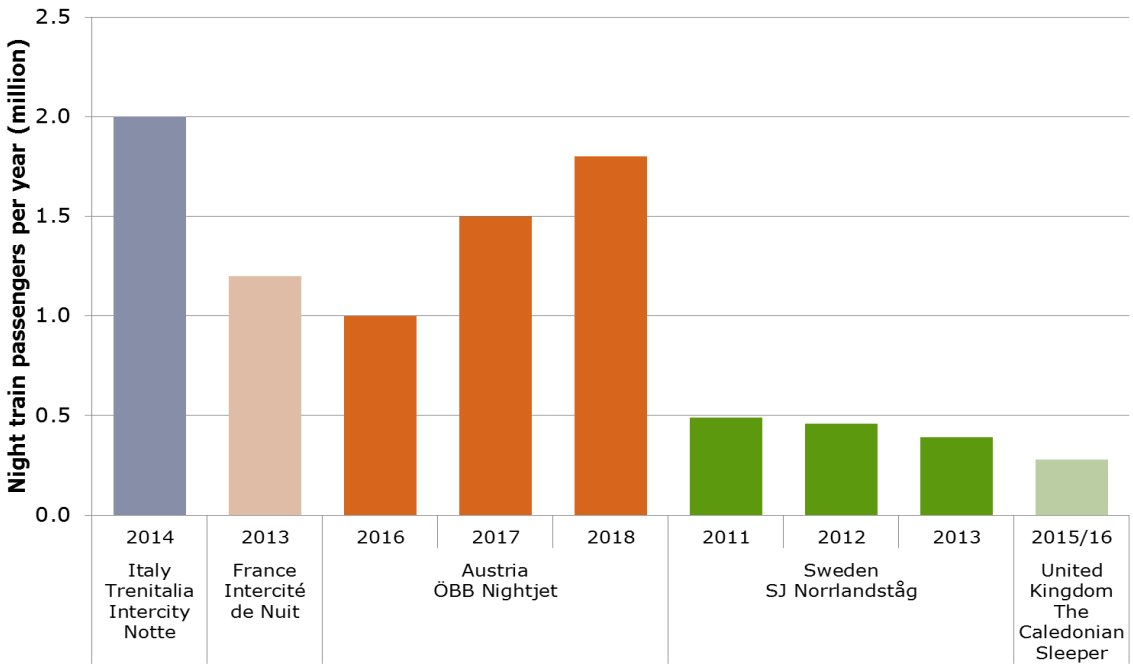
KEY FINDINGS

- Some competent authorities or night train operators collect and publish data on the use and users of night train services. However, others do not, and this means that no consistent data are available to monitor the sector.
- In Sweden, most passengers are Swedish or Norwegian, travelling either for tourism or leisure, with fewer than 10% giving their journey purpose as business, work or school or education.
- In the United Kingdom, one survey found that only 21% of passengers were travelling for work, but a night train operator told us that around 50% were business travellers. 60% of passengers booked at least a month in advance and 48% held a Railcard entitling them to some form of discount.
- An increasing proportion of travel is by passengers visiting friends and relatives. This suggests that night trains do not always save passengers the cost of a hotel room. The only passengers who always save hotel costs are tourists away from their home base, such as those from another continent on a multi-centre holiday in Europe.

3.1. The use of night trains

In economics, demand is normally considered not to be a fixed quantity but instead to be a function of supply, including quality, and price. We have found only limited data on the number of passengers using night trains, which we summarise in Figure 6 below.

Figure 6: Past and predicted night train passenger numbers, where available



Source: case studies, Steer Davies Gleave analysis.

Note that a million passengers per year is equivalent to around 1,400 passengers per night in each direction.

Italy's Trenitalia Intercity Notte carries around 2 million passengers per year and Austria's ÖBB Nightjet, which has taken on some DB services, plans to increase passenger numbers to nearly this level. Subsidised services in Sweden, and the United Kingdom's Caledonian Sleeper, in contrast, carry fewer than 0.5 million passengers per year, equivalent to fewer than 700 passengers each way per night.

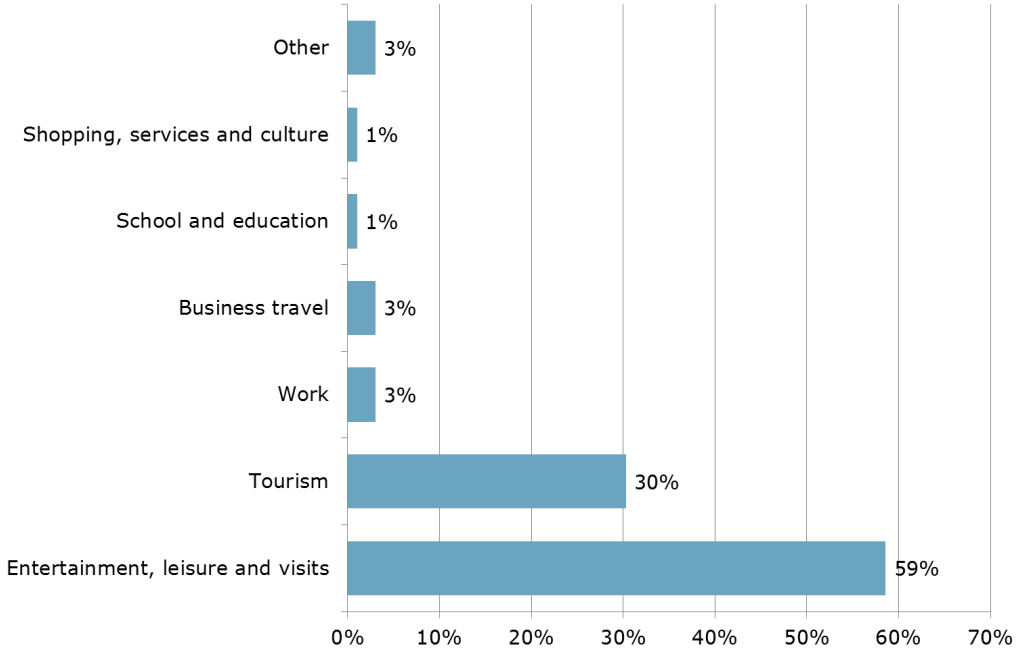
3.2. The users of night trains

Compared with the equivalent day train services, night trains are typically a relatively small operation, used by a relatively small number of passengers. For such a small market, night train operators and sponsoring authorities may be reluctant to carry out surveys to identify factors such as journey purposes. This means that no consistent source of data is available to national statistical offices or to Eurostat. Nonetheless, we identified at least some information on users of four night train networks, which we summarise below.

Sweden (SJ Nattåg)

In Sweden, Trafikverket has carried out detailed studies of the subsidised services to Norrland in northern Sweden and Narvik in Norway, including surveys of passenger journey purposes. Figure 7 illustrates the mix of users of the services.

Figure 7: SJ Norrland and Narvik: users of the service



Source: Trafikverket (2016).

At first sight, 89% of passengers were either engaged in tourism or "entertainment, leisure and visits". However, Trafikverket cautions that this finding is based on surveys in June and July 2015, when business travel, or any regular commuting to school or work, may be lower than average.

83% of passengers surveyed were Swedish, 6% Norwegian and 11% were from elsewhere. However, predominantly domestic passengers using subsidised services through northern Sweden may not be typical of the mix of passengers elsewhere in Europe.

United Kingdom (The Caledonian Sleeper)

Users of The Caledonian Sleeper service include:

- some regular passengers, including Scottish Members of Parliament (which sits in Westminster in London) who spend the working week in London and weekends in Scotland;
- some regular passengers who travel between homes in London and Scotland; and
- some infrequent overseas visitors who travel between Scotland and London in one or both directions, either to save accommodation costs or to reach points in the Scottish Highlands which are remote from an airport.

Serco Caledonian Sleepers[9] told us that around 50% of passengers were travelling on business. They said that there is more business travel to the commercial centres of Edinburgh and Glasgow, and more leisure travel to Fort William, Inverness and the Highlands, with a mix to Aberdeen.

The United Kingdom's National Rail Passenger Survey (NRPS) publishes results for each franchised passenger service. The Quarterly Report sampled 609 passengers in February to April 2016 and asked their journey purpose: 21% were travelling for work and 79% were travelling for leisure. NRPS estimated that the mix of passengers was:

- 33% First Class;
- 44% Standard Class, sharing a compartment;
- 3% Standard Class, not sharing a compartment; and
- 20% Seat, half travelling to/from England and half on local journeys in Scotland.

In addition, 48% of passengers held a Railcard entitling them to some form of discount.

Despite 21% of passengers travelling for business, only 4% had booked in the week before travel, and almost 60% had booked between a year and a month in advance. This suggests that even business users of The Caledonian Sleeper often plan their journeys well in advance, which may be because they are regular travellers.

NRPS also identified that 92% had booked in advance via website or App, 7% by phone and 1% through a travel agent[10]. None had bought tickets in advance at a station.

Austria (ÖBB Nightjet)

We did not identify any reporting of passenger data in Austria, but ÖBB told us that:

- Some environmentally-minded passengers wishing to avoid car or air use sleeper accommodation.
- Some school groups use couchettes. This is also common practice in Italy.
- Some budget and price-sensitive travellers use seated accommodation. The International Railway Journal (IRJ) also reported that seated accommodation competes on price with coach travel.

Schieneninfrastruktur-Dienstleistungsgesellschaft mbH (SCHIG) suggested that Austria has a culture of using night trains which contributes to demand for them. If this is true, it is not clear whether and how such a culture could emerge in other parts of Europe.

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[9] Serco Caledonian Sleepers is the operator of The Caledonian Sleeper brand.
[10] NRPS did not identify which website, App or travel agent had been used.

Italy (Intercity Notte)

Trenitalia told us that passengers on Intercity Notte services include students, school groups (which often make block-bookings of couchette accommodation), families with children, the elderly and "night train lovers". This last category suggests that, as in the United Kingdom and Austria, at least some customers are regular users of the night train, either for a specific and regular journey or as a preferred means of travel where it is available.

Users' ability to save accommodation costs

One potential attraction of night trains is that they offer their users the ability to save the accommodation costs that they would otherwise have incurred. However, Table illustrates that many night train passengers would not have incurred accommodation costs if they had not used a night train.

Table 7: Night trains: saving in accommodation costs by passenger type

Passenger type	Hotel avoided outbound	Hotel avoided inbound
Commuter between two homes, or Visiting Friends and Relatives (VFR)	×	×
Business from home base	Employer may pay	Employer may pay
Tourism from home base, such as short break	✓	×
Business away from home base, visiting two cities	Employer may pay	Employer may pay
Tourism away from home base, visiting two cities	✓	✓

Source: Steer Davies Gleave analysis.

Passengers returning home, or visiting friends and relatives, or whose expenses are paid by an employer, may not save any accommodation costs by using a night train. The only group in the Table who will always save hotel costs are tourists away from their home base, such as those on a long holiday from another continent.

4. THE CURRENT VIABILITY OF NIGHT TRAINS

KEY FINDINGS

- Few data are available on the costs, revenues and subsidies associated with night trains, making it difficult to compare the performance either of night trains on different networks or of night and day trains on the same network.
- Some users of night trains would have travelled by rail anyway. This implies that, in the absence of night trains, more revenue would have been earned on other trains.
- Night trains which appear to be viable using rolling stock which has been written off, or attracts depreciation based on historic prices, might not be viable if and when it became necessary to buy new stock at current prices.
- Mark-ups to infrastructure charges mean that these charges overstate the actual costs to the infrastructure manager, and part of the apparent "cost" of a night train may be used to support fixed costs or to cross-subsidise other rail services.
- We estimate that the underlying infrastructure cost for a typical night train may be less than €2 per train-kilometre.
- Night trains may not be viable practically, either where they impose additional costs on the infrastructure manager, or where they compete for restricted capacity with other services of greater economic, social or environmental value.

4.1. Costs

The costs of sustaining night train services typically include operations, maintenance and renewals (OMR) and, in particular, the costs associated with staff, the night train rolling stock, and the railway infrastructure.

Identifying details of the overall costs of operating night trains is challenging. Even where night trains are operated as a distinct business, as is the case with the United Kingdom's Caledonian Sleeper, where we spoke to both the procuring authority (Transport Scotland) and the operator (Serco Caledonian Sleepers), we were not able to obtain detailed cost data. In addition, Serco Caledonian Sleepers has no access to the costs of other operators providing day trains on the same routes to provide a comparison.

Nonetheless, Table 8 and the subsequent explanations illustrate a number of factors, including maintenance, which mean that the cost of operating passenger night trains, and particularly the cost per passenger space, may be higher than that of day trains between the same points.

Table 8: Factors affecting the cost of night trains

Factors affecting cost	Comments
Capital costs per passenger vehicle	Higher unit costs of couchettes/beds and basins/toilets/showers. Unit manufacturing costs are higher for small fleets.
Vehicle utilisation	Sleeper and hotel stock makes at most one journey per day, compared to up to four for day stock, depending on the route or routes on which they operate.
Higher mass per passenger space	Higher mass means more fuel, energy and emissions per passenger space (please see Figure 1 and Figure 2 in Section 1.2).
Higher operating costs	Journeys may be slower, and hence staff hours longer. Trains have relatively large numbers of on-board staff working antisocial hours and spending nights away from home. Preparation of bedding and facilities requires additional work.
Requirement for locomotives	Unlike multiple unit day stock, sleeper stock requires a locomotive.
Requirement for shunting	Many night trains split and join, requiring shunting and locomotives to be provided in the middle of the night. Many international night trains require a change of locomotive and driver at borders. Night trains moving between the Russian broad gauge and the standard gauge also require a change of bogies.
Additional skills and management	Operators must manage additional fleets of vehicles and types of staff for a relatively small element of total revenue.
Trains are large	Typical night train formations have 200 or more passenger spaces to be filled.

Source: case studies and interviewees, Steer Davies Gleave analysis.

Capital costs per passenger vehicle

At first sight, the largest cost difference between day and night trains is that railways operate large fleets of day vehicles with space for up to 100 passengers, but only much smaller fleets of night vehicles with space for as few as 10. In Germany, for example, we identified day stock with up to 76 spaces per vehicle and single occupancy Deluxe sleeper accommodation with the equivalent of 10.5 spaces per vehicle (see Figure 2 in Section 1.2). This can make the unit costs per vehicle, and per passenger space, of replacement night vehicles particularly high. The new fleet planned for the United Kingdom's Caledonian Sleeper franchise, which operates two trains each way, six nights a week, comprises only 75 vehicles, but they are of five different types, fitted with four types of accommodation[11]. The new fleet will also require separate locomotives for haulage.

[11] The Caledonian Sleeper, 13 February 2015.

Vehicle utilisation

Other factors contributing to higher costs than day trains are that night train stock can only be used once per day, using staff working hours which are not only antisocial but also longer, because sleeper trains operate at lower speeds to extend journey times[12].

In addition, where night trains only operate on some nights of the week, or in some seasons, the effective utilisation of the stock over the year may be reduced further. Even if its initial capital costs have been fully depreciated, there is a cost associated with stabling and storing rolling stock, and ensuring that it remains ready for use when required. In addition, low vehicle utilisation means a higher embedded carbon cost per journey, as we discuss in Section 7.3.

Higher mass per passenger space

Night train stock also has more mass, and hence require more fuel, per passenger, than day stock. Unless they are powered entirely by renewable energy, the carbon cost per passenger-space-kilometre may be higher than that of day stock, as we discuss in Section 7.3.

Higher operating costs

Night trains require not only drivers but also on-board attendants, to help passengers and to meet safety and security requirements.

Security is a particular issue on night trains where compartments may be dark and passengers may be asleep and have valuables in their luggage. There may be considerable opportunity for theft, particularly if there is scope for a thief to leave the train at an intermediate stop[13]. Mitigation measures include compartment doors lockable from inside and video surveillance. It is also possible to lock connecting doors between coaches, to limit the scope for thieves to move around the train, but this can affect safety in the event of an emergency. Partly to provide security, most night trains have high levels of staffing:

- Russia's RZD's night trains have two attendants, "provodnik" (male) and "provodnitsa" (female) in each coach[14].
- The United Kingdom's Transport Scotland told us that The Caledonian Sleeper trains of up to 16 vehicles have at least one member of staff for every two coaches, plus a train manager, implying up to nine staff on a train, plus a driver. Serco Caledonian Sleepers told us that this requires around 95 on-board staff to operate a six days per week service of two trains, splitting into five portions, in each direction.

All these staff must work longer hours than staff on the equivalent day journeys, because of the longer journey times illustrated in Figure 3 in Section 1.5, and may be entitled to higher rates of pay for night work. In addition, unless night trains can be arranged to "meet" and exchange crews to allow them to return to their origin station, all these crew may need to spend a day away from home before returning the following night. Serco Caledonian Sleepers told us that night work was not seen as a problem, and that it had proved possible to recruit staff in Scotland willing to work "night out, day away, night back" round trips to London.

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[12] On the United Kingdom's West Coast Main Line, day trains operate at 200 km/h and night trains at 130 km/h.

[13] We have seen press articles describing claims by passengers that they have been drugged and robbed while on night trains, but have found no independent confirmation that this has occurred.

[14] Seat61, a website.

A further cost specific to any accommodation dedicated to, or reconfigured for, night travel is the need to provide, change and launder items such as pillows, blankets, sheets and towels. This applies to all the types of accommodation listed in Table 2 in Section 1.2 and used in Europe, except seats and reclining seats. However, this work can be carried out by local staff or subcontractors during a day shift, unlike the work of night train drivers and crew.

In August 2015, Germany's DB's website featured an article "City Night Line: Zeit sparen – nachts fahren" (City Night Line: save time – travel by night) promoting its services. This stated that a typical night train might have 100 spaces in sleeping cars, 200 in couchettes and a further 62 seats, a total of over 350 spaces. The need to change, and subsequently launder, 300 sets of linen would be comparable to the workload of a medium-sized hotel. DB also said that a typical night train would require refilling tanks with 10 tonnes of water and removing 100 kilograms of rubbish. This work normally takes six to eight hours, although one advantage is that it can normally be carried out during the day, and be suitable for subcontracting to a local cleaning or service company.

Requirement for locomotives

Over the last 50 years, there has been a trend for day trains to be operated by multiple-unit stock, in which all vehicles carry passengers, rather than hauled by a separate locomotive carrying only the driver. As far as we have been able to establish, all night trains continue to be hauled by a locomotive, which may be for a number of reasons:

- The design of night stock, making maximum use of floor-to-ceiling space to include berths and beds, does not leave room for traction and other equipment.
- Over the distances operated by night trains, there may be a need to change between electric and diesel locomotives (the United Kingdom's Transport Scotland informs us that this happens in Edinburgh) or track gauges (as on Russia's RZD's services, which use both broad and standard gauges).
- On international services, separate locomotives may be provided on each network, either to meet a technical or safety requirement such as local electrification or signalling standards, or for drivers to be familiar with both the locomotive and the route, or as a long-standing convention between the various operators involved.

Requirement for shunting

Splitting and joining of night trains, which we described in Section 1.3, and which is extensively used on night trains, requires the additional cost of locomotives, drivers, and potentially other safety-critical train crew, at intermediate points in the journey. As examples:

- The example, described in Section 1.3, of trains between Warsaw and Krakow (in Poland) and Prague (in the Czech Republic), Vienna (in Austria) and Budapest (in Hungary), requires the shunting and marshalling of six train portions en route in each direction.
- The United Kingdom's Transport Scotland informed us that the splitting of the "Highland" Caledonian Sleeper into three portions in Edinburgh involved changing between an electric locomotive and four diesel locomotives, and that this change takes place around 01:00 (for joining southbound trains) and 04:00 (for splitting northbound trains).

Additional skills and management

Many of the activities listed above – changing of bedding, changing of locomotive, or splitting and joining – are either never or rarely required in the operation of passenger day trains, and the need to train, provide and supervise staff to carry them out is increasingly limited to the passenger night train sector. This has the effect that night trains, as a market segment, add complexity to the operation of the railway, which can be eliminated or minimised by focusing on day services.

Trains are large

Finally, the need to provide a locomotive and driver, and usually to provide several types of accommodation, means that night trains often have capacity for 200 passengers or more, whereas aircraft and day or sleeper coaches have can 40 seats or fewer.

To be commercially viable, a night train must be sustained by passengers in a single corridor or, through splitting and joining, a combination of corridors, if necessary adding intermediate stops to increase the number of station-to-station journeys that can be served. Aircraft, in contrast, normally link a single pair of airports with no intermediate stops. This enables the airlines to offer a wide range of services from major European cities: several capitals have flights to over 100 points in Europe, in each case with frequencies and aircraft sizes adapted to each market[15]. It would be impracticable for passenger night trains to compete effectively with, or replace, more than a small portion of these services in the short to medium term.

4.2. Fares

Night train fares normally begin at the level of day train fares, with price increasing with the quality of accommodation. Germany's DB City Night Line allowed, and the United Kingdom's Caledonian Sleeper allows, access to night train accommodation by paying a supplement to a day train ticket. Austria's ÖBB confirmed that night train operators can generally charge higher fares than for the same journeys by day, offsetting some or all of the increased costs per passenger. In Sweden, a comparison of fares on different night train routes similarly shows that night train fares can also be higher where there is less effective competition from day trains.

4.3. Subsidies

Article 3 of Regulation (EC) No 1370/2007 requires that "*Where a competent authority decides to grant the operator of its choice an exclusive right and/or compensation, of whatever nature, in return for the discharge of public service obligations, it shall do so within the framework of a public service contract.*"

In practice, it is rarely possible to identify a specific subsidy to night train services, primarily because they may be cross-subsidised by other services provided by the same operator, whether operated commercially or within the scope of a common, or national, Public Service Obligation (PSO). For example:

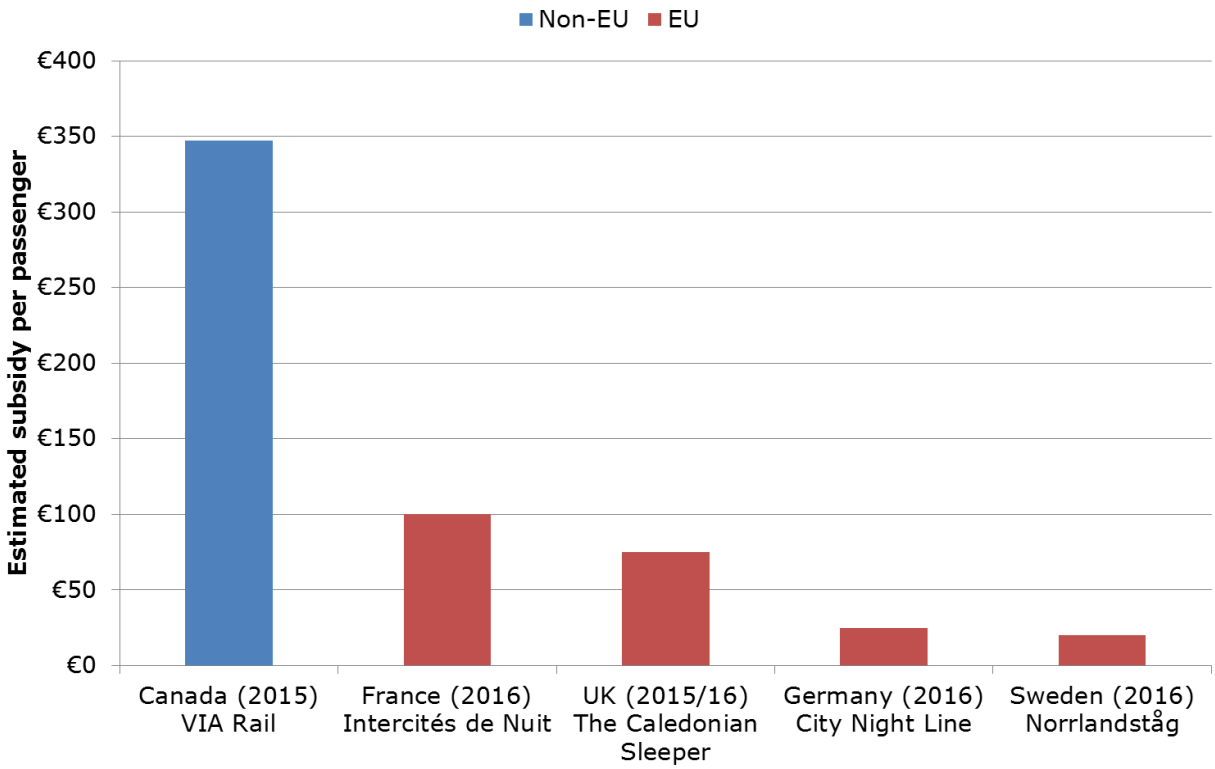
- Germany's DB City Night Line's losses were implicitly cross-subsidised by day trains.
- Austria's ÖBB Nightjet services to Italy benefit from subsidies to the domestic part of the service.

[15] Amsterdam (in the Netherlands), Frankfurt (in Germany), London (in the United Kingdom), Madrid (in Spain) and Paris (in France) all have flights to more than 100 other European cities.

- In the United Kingdom, The Caledonian Sleeper receives an explicit subsidy. However, the only other night train in Great Britain, the Night Riviera, is operated as part of a package with other long-distance, regional and suburban services (please see Annex E on The Caledonian Sleeper in the United Kingdom).

Nonetheless, in our case studies we identified the reported average levels of subsidy per night train passenger summarised in Figure 8.

Figure 8: Apparent levels of subsidy per night train passenger



Source: case studies, Steer Davies Gleave analysis.
Note: please see case studies for the details of the basis of these estimates.

We stress that these results must be interpreted with caution, for a number of reasons.

First, levels of subsidy to services are typically reported after payment of infrastructure charges but, as we discuss later in this Chapter, in some Member States these include mark-ups permitted under Directive 2012/34/EU. The element of mark-up in infrastructure charges is technically a transfer payment from the operator ("railway undertaking") to the infrastructure manager, but from the perspective of the operator, it is indistinguishable from a cost.

Second, we calculated the average subsidy per passenger but have no information on which accommodation they occupy. On some services, including The Caledonian Sleeper services in the United Kingdom and Norrland and Narvik services in Sweden and Norway, some passengers are making short "day" journeys in seats rather than in couchette or sleeper accommodation. This means that levels of subsidy per passenger are not directly comparable, because passengers on each service are using a different mix of accommodation.

Third, average levels of subsidy may conceal wide variations within a package of services or between subsidised and unsubsidised services:

- In Germany, for example, the apparent subsidy was the average for all services formerly operated by DB as City Night Line. However some of these services have been taken over by Austria's ÖBB Nightjet, suggesting that they may have been commercially viable. If this is the case, it would imply that the other DB City Night Line services required even greater average subsidy.
- In Sweden, in contrast, the apparent subsidy is for the services to Norrland and Narvik, and does not include the Stockholm-Malmo route, which is profitable. This would imply that the average subsidy per night train passenger in Sweden is less than shown in the Figure.
- In the United Kingdom, effective levels of subsidy per passenger to "Highland" and "Lowland" Caledonian Sleeper services are not identified, but may be very different.

Additionally, subsidies will only be paid where Member States' competent authorities have established a willingness, and mechanisms, to do so. We identified two factors which appear to contribute to a lack of willingness to subsidise night trains:

- In many Member States, transport is primarily a local or regional responsibility.
- In some Member States, there is no provision for the national government to subsidise rail services.

Many Member States subdivide rail passenger services into three or four broad groups, urban/suburban, regional, long-distance and international. In many Member States, the funding and management of these services are separated, rather than combined in a single national PSO. A common pattern of responsibility for domestic services is that urban/suburban services are the responsibility of city authorities, regional services are the responsibility of regional (or County, or Department, or Land) authorities, and long-distance and international services are the responsibility of national government. However, journeys which can justify an overnight service must be long, and hence are prima facie unlikely to occur wholly within a regional boundary. In Sweden, for example, where the Län (Counties) are responsible for local transport, Trafikverket identified that 98% of journeys of the Norrland and Narvik night trains were longer than 100 kilometres and 96% of them crossed a County boundary. It would require multilateral agreement for the Counties to subsidise such a service[16].

Some Member States have also established policies that long-distance services should be operated commercially and not be supported. We found similar statements of this policy in parliamentary debates in the United Kingdom (in 1983) and Germany (in 2016). In both cases, the national parliament explicitly agreed that it should not, or could not, interfere in the commercial remit of the railway. In Germany at least, there appears to be no process for supporting long-distance services, including night trains, because the Länder (States) are responsible only for local transport. In principle, it would be possible for a number of Länder to support a night train, but it might prove difficult in practice to do so: a train from Hamburg to Munich, for example, must pass through a minimum of four Länder, two of which might derive little or no benefit from the service. In contrast, in Sweden the national government retains responsibility for, and powers to support, services crossing the boundaries of the Län (Counties). In the United Kingdom the Scottish government has powers to support services connecting Scotland with other parts of the United Kingdom.

[16] Night trains between Stockholm and the Norwegian border pass through six of Sweden's 21 Counties: Stockholm, Uppsala, Gävleborg, Västernorrland, Västerbotten (West Bothnia) and Norrbotten (North Bothnia).

4.4. Financial viability

Operators of night trains are not obliged to manage them separately from other services, to identify their revenue or costs, or to prepare or publish accounts for night trains as an activity. Discussions on the financial viability of night trains are therefore dependent on what steps have been taken to identify the finances of night train services, as we discuss below.

Railway undertakings may not allocate costs and revenues to specific sections of route, or to specific night trains. They may not even consider night trains as distinct from day trains. This is particularly likely to be the case where the same ticket can be used on both night trains and day trains (interavailable tickets[17]), or where resources such as depots, locomotives, drivers and other staff are shared between services. This can also be the case if there is a single national PSO and the railway operator has no obligation or incentive to disaggregate the costs and revenues associated with providing it. This also means that, in some cases, there may be hidden cross-subsidies, either between day and night trains, or between some night trains and others.

Even where financial data for individual services exist, it may appear that some trains are financially viable and others, such as those shown in Figure 8 as receiving subsidies, are not. However, as we have already implied, apparent levels of financial viability need to be interpreted with caution, for a number of reasons which we summarise in Table 9 below and discuss further afterwards.

[17] An interavailable ticket is one which is valid on more than one type of service, or on the services of more than one operator.

Table 9: Factors affecting the apparent viability of night trains

Factors		Issues
Tending to overstate viability	Estimation of revenues	Some users of night trains would have travelled by rail anyway, so the incremental revenue of night trains is overstated.
Neutral	Allocation of interavailable fares	Allocation of interavailable ticket revenue to night trains and other trains may not represent actual usage.
	Additional skills and management services	Internal charging for services required to operate night trains may exceed, or be less than, their incremental cost.
	Cost allocation conventions	There is no uniquely correct means of allocating costs within a railway. Different conventions applied by different management may return different results.
Tending to understate viability	Estimation of incremental costs	Some portions of a night train journey would need to be provided anyway, such as to provide for local travel, so the incremental cost of night trains is overstated.
	Allocation of fixed costs	Recovering fixed or common costs from night trains may overstate the actual incremental costs of their operation.
	Depreciation and capital costs	The purchase of existing rolling stock is a sunk cost which cannot be recovered. However, it may be represented in the accounts by a lease charge, by depreciation or, if fully written off, as no cost at all.
	Mark-ups to infrastructure charges	Mark-ups mean that access charges overstate actual costs. The "cost" of a night train may be supporting fixed costs or cross-subsidising other rail services.

Source: Steer Davies Gleave analysis.

Allocation of interavailable fares

The first point related to fares revenue is that many night train operators accept interavailable tickets, particularly for seated accommodation, which are also valid on day trains. Holders of an interavailable ticket for a seat are allowed to use it on night trains.

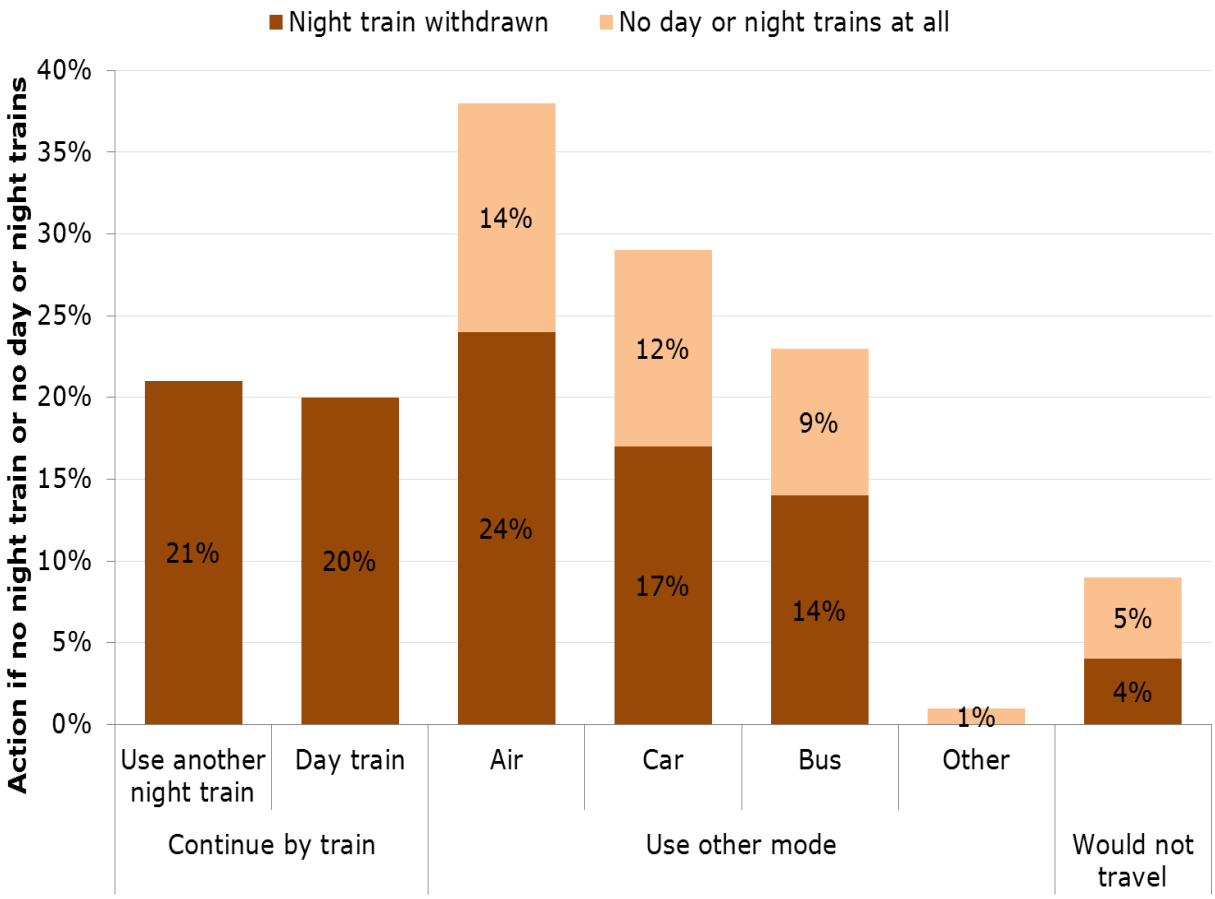
Unless all tickets are either dedicated to a particular operator or collected as proof of travel, some assumption must be made about which train, and which operator, the buyer of the ticket used. These mechanisms for allocating ticket revenue to different services vary from railway to railway: in some cases, if usage of the tickets on one operator is very small, they may be completely ignored. More widely, the assumed allocation may not reflect the services actually used by the passengers.

Operators of night trains may attempt to minimise this scope for misallocation of revenue by selling their own tickets direct to passengers. Both the United Kingdom's Caledonian Sleeper and Austria's ÖBB Nightjet informed us that they aimed to increase the proportion of sales through their own website, but did not identify specific targets or timescales.

Estimation of revenues

The second point related to fares revenue is that, even if the fares paid by passengers on night trains are identified, this does not mean that all these fares would be lost if the night trains were not operated. In Sweden, for example, Trafikverket identified what mode passengers would have used in the absence of the night train. The results are summarised in Figure 9 below.

Figure 9: SJ Norrland and Narvik: passenger intentions if services were removed



Source: Trafikverket, Steer Davies Gleave analysis.
Note: use of bus if night train withdrawn was not included: we have inferred it as a residual item.

Trafikverket's analysis suggests that, in the absence of the specific night train on which they travelled, 41% of the passengers would have used another rail service. This suggests that much of the revenue allocated to the night train service would have been earned even in its absence. If no train service of any type had been available, 38% of passengers would have travelled by air, 29% by car and 21% by bus or coach. Only 9% stated that they would not have travelled.

We stress that Trafikverket's analysis relates to a single night train service and therefore cannot be extrapolated, but on balance we conclude that a large proportion of revenue allocated to night trains, by whatever mechanism, might in their absence have been earned on day trains.

Additional skills and management services

We described above how the operation of passenger night trains may require additional skills and management which are used less, or not at all, in the operation of other rail services. Estimates of the financial viability of night train services may depend on how these costs are allocated to night trains:

- At one extreme, particularly if the resources concerned are used exclusively or mainly by night train services, all the costs may be clearly allocated to them.
- At the other extreme, resources may be provided centrally within the railway organisation and provided without charge to the operation of night trains and other services.

The financial viability of night trains may be underestimated in the first situation and overestimated in the second situation.

Cost allocation conventions

The apparent financial viability of night trains may also be affected by the railway's approach to the allocation of other costs to different services. Even if costs are allocated to services, rather than being borne centrally, there may be a wide range of approaches to doing so, depending on the different conventions adopted by different managements.

Estimation of incremental costs

We noted above how the incremental revenue associated with night train services may be overestimated because, in the absence of night trains, some passengers would have used other trains and paid the associated fares. A similar issue applies to costs if, in the absence of night trains, some additional day services would have been provided anyway. The United Kingdom's Transport Scotland informed us that, in the absence of The Caledonian Sleeper, it would probably have been necessary to specify, and pay for, additional late evening and early morning PSO services as part of the ScotRail franchise.

This means that the apparent cost of operating night trains may overstate the incremental costs, resulting in a tendency to understate the viability of the services.

Allocation of fixed costs

A further issue in the allocation of costs is whether night train operations are allocated only the costs which are incurred as a result of their operation, or whether a share of fixed costs are also included. This is also an issue for infrastructure charges, where some or all fixed costs may be recovered through mark-ups, as we discuss in Section 4.5 below. If some or all fixed costs are allocated to night train services, their financial viability may be underestimated.

Depreciation and capital costs

A major element of the cost of providing night trains is the cost of rolling stock. As we set out in Table 8 in Section 4.1, relative to day stock, there may be both a higher cost per vehicle, because of higher unit manufacturing costs for the typically small night stock fleets, and a higher cost per passenger space, because night stock typically has fewer spaces per vehicle. These effects may, however, be partly offset by the longer service life of night rolling stock. In Germany, the International Railway Journal (IRJ) noted that many of the vehicles used by DB City Night Line are more than 20 years old, so depreciation

costs were low. In the United Kingdom, some of The Caledonian Sleeper's stock will have been in use for almost 50 years before it is replaced.

The apparent financial cost of operating night trains may therefore depend on how the costs of provision of rolling stock are treated. Rolling stock may be provided as a service by a manufacturer, leased from a rolling stock leasing company, provided free by a competent authority, or owned by the operator and depreciated in the financial accounts. Where depreciation is included in the accounts, it may be based on the historic cost of stock up to 50 years old and may in many cases be fully written off once the accounting life has been exceeded. Rolling stock accounting lives rarely exceed 30 years, although the United Kingdom's Transport Scotland told us that the planned life of new Caledonian Sleeper stock is 35 years.

IRJ summarised these points in August 2014, stating that "*In many countries the average age of overnight rolling stock is also considerably higher than the conventional fleet, and renewal or major refurbishment will be a consideration for vehicle owners in the next few years. Night train operations need to be financially sustainable if a business case is to be made for such investments.*"[18]

This variation in the means of provision, and accounting treatment, of rolling stock, can mean that, while night train services using fully written off rolling stock may appear to be financially viable, no case can be made for their replacement with new stock. This would need to be written off at a commercially prudent rate.

We asked Sweden's Trafikverket what plans had been made for the replacement of their night train stock, and they informed us that no decisions had been made on what would happen to services after 2028. The planned 35-year life of new Caledonian Sleeper stock, in contrast, extends to 2053.

4.5. Mark-ups to infrastructure charges

Infrastructure charges are set in accordance with the First Railway Package of 2001, subsequently incorporated into the "Railway Recast" Directive 2012/34/EU. Infrastructure charges are dealt with in Section 2 of Chapter IV of the Directive, with the most relevant items being summarised in Table 10 below.

[18] IRJ also noted that Europe's remaining overnight services "*are burdened with high fixed costs, requiring dedicated rolling stock and train crew. In an environment dominated by fixed-formation multiple-unit operation, sleeper trains often need dedicated fleets of locomotives, which have few other uses to the operator, frequently resulting in poor utilisation of costly assets.*" IRJ's comments support many of the points set out in Table 8.

Table 10: Infrastructure charges: legislation

Article and Paragraph	Text	Summary: Infrastructure charges …
Article 31 paragraph 3	Without prejudice to paragraph 4 or 5 of this Article or to Article 32, 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.	… shall be set at the cost that is directly incurred, but …
Article 31 paragraph 4	The infrastructure charges referred to in paragraph 3 may include a charge which reflects the scarcity of capacity of the identifiable section of the infrastructure during periods of congestion.	… may be raised to reflect scarcity, and …
Article 31 paragraph 5	The infrastructure charges referred to in paragraph 3 may be modified to take account of the cost of environmental effects caused by the operation of the train. Any such modification shall be differentiated according to the magnitude of the effect caused.	… may be raised to take account of the cost of environmental effects, and …
Article 32 paragraph 1	In order to obtain full recovery of the costs incurred by the infrastructure manager a Member State may, if the market can bear this, levy mark-ups on the basis of efficient, transparent and non-discriminatory principles, while guaranteeing optimal competitiveness of rail market segments. The charging system shall respect the productivity increases achieved by railway undertakings.	… may be raised to recover all costs, but …
	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.	… shall not exclude market segments which can pay at least their direct costs …
	Before approving the levy of such mark-ups, Member States shall ensure that the infrastructure managers evaluate their relevance for specific market segments, considering at least the pairs listed in point 1 of Annex VI and retaining the relevant ones. The list of market segments defined by infrastructure managers shall contain at least the three following segments: freight services, passenger services within the framework of a public service contract and other passenger services.	… but night trains need not be considered a market segment …
	Infrastructure managers may further distinguish market segments according to commodity or passengers transported.	… but anything, including night trains, may be considered a market segment.

Source: Directive 2012/34/EU.

In practice, the Directive provides wide flexibility to set infrastructure charges reflecting, among other things:

- economic first principles, that charges should be set at (social) marginal cost (Article 31); and
- Member States' policies on the extent to which infrastructure should be directly funded by charges (Article 32).

We asked DG MOVE whether there had been any examination of whether Directive 2012/34/EU's Article 31 (Principles of charging) and Article 32 (Exceptions to charging principles) were sufficiently precise or had been adequately enforced. DG MOVE drew our attention to the permissive nature of the Directive. Article 32 requires that "*The list of market segments defined by infrastructure managers shall contain at least the three following segments: freight services, passenger services within the framework of a public service contract and other passenger services*". Annex VI provides a list of market segment pairs to be considered by infrastructure managers with a view to introducing mark-ups. Infrastructure managers are free to add night trains to either list but were not obliged to do so, or to set a specific level of mark-up.

Of the Member States we examined in the case studies:

- In Sweden, the first Member State to separate infrastructure and operations in 1988, Trafikverket's charges are normally set at calculated marginal cost (Article 31 paragraph 3) but also include charges related to scarcity (Article 31 paragraph 4).
- In Germany, infrastructure manager DB Netz's charges are designed to recover all costs, with mark-ups for different types of line and service, on the basis of Article 32 paragraph 1.
- In Great Britain, charging principles, and hence the overall level of charges to operators, have been changed in successive five-year charging periods since 1994.

Table 11 summarises the elements of infrastructure charges which would apply to an additional train operated on the networks of Sweden and Great Britain.

Table 11: Infrastructure charges: elements used in Great Britain and Sweden

Article and paragraph	Infrastructure charges …	Charges in Great Britain	Charges in Sweden
Article 31 paragraph 3	… shall be set at the cost that is directly incurred, but …	Variable usage	Gross tonne-kilometre Train path
Article 31 paragraph 4	… may be raised to reflect scarcity, and …	×	Passage
Article 31 paragraph 5	… may be raised to take account of the cost of environmental effects, and …	×	×
Article 32 paragraph 1	… may be raised to recover all costs, but …	×	×
	… shall not exclude market segments which can pay at least their direct costs …		
	… but night trains need not be considered a market segment …		
	… but anything, including night trains, may be considered a market segment.		

Source: Network Statements, Steer Davies Gleave analysis.
Note: includes only variable elements applicable to night trains.

The charge calculations on both networks have been based on extensive research and analysis of the charges which can be justified by Article 31 paragraphs 3 and 4, and can be used to estimate "*the cost that is directly incurred as a result of operating the train services*".

In Great Britain, the relevant charge per additional train is Network Rail's Variable Usage Charge (VUC), which is based on models of the wear and tear on infrastructure from each vehicle operating at its typical speed. Charges for default vehicle types during control period 5, from 2014-2019, are £0.6276 per locomotive mile and £0.1156 per coach mile, at 2015/16[19] price levels. This means that in 2017 a locomotive hauling a 10-vehicle night train might incur a charge of around £1.7836 per mile, approximately equivalent, after inflation to 2017, to €1.40 per train-kilometre.

In Sweden, Trafikverket informed us that the total infrastructure charges paid by night trains are around SEK 68 million (€6.8 million) per annum, or around 20% of the night trains' total costs. Trafikverket's Network Statement 2017 sets out charging principles, and describes three elements:

- a charge per gross tonne-kilometre and a tiered charge per train path, both levied on the basis of Article 31 paragraph 3; and
- a "passage charge" for trains passing through Stockholm, Gothenburg and Malmo during peak periods, levied on the basis of Article 31 paragraph 4.

Table 12 summarises our estimates of the 2017 charges for a 500-tonne passenger train (equivalent to a 100-tonne locomotive and ten 40-tonne coaches) from Stockholm to Luleå.

[19] The railway industry in the United Kingdom reports on financial years running from April to March. 2015/16 runs from April 2015 to March 2016.

Table 12: Infrastructure charges: estimates for Sweden (2017)

Route section	Kilometres	Gross tonne-kilometre charge	Charge	Train path charge/ kilometre	Charge
Stockholm-Gävle	182	SEK 0.014	SEK 1,274	SEK 6.30	SEK 1,146
Gävle-Boden	848	SEK 0.014	SEK 5,936	SEK 2.30	SEK 1,950
Boden-Riksgränsen	509	SEK 0.014	SEK 3,563	SEK 6.30	SEK 3,332
Sub-total	1,539	SEK 10,773		SEK 6,429	
Grand total	SEK 17,202				
Grand total	€1,702				
Average per train-kilometre	€1.10				

Source: Trafikverket Network Statement 2017, Steer Davies Gleave analysis.
Note: calculation excludes 25% Value-Added Tax (VAT).

These estimates of "*the cost that is directly incurred as a result of operating the train services*" (Article 31, paragraph 3) - €1.40 per train-kilometre in Great Britain and €1.10 in Sweden - are broadly similar, and much lower than the charges including mark-ups imposed on some networks[20].

On networks which apply mark-ups, night trains may therefore be subject to charges higher than "*the cost that is directly incurred as a result of operating the train services*", and there may be no effective check that the charges do 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*" (Article 32, paragraph 1).

However, caution is needed in assuming that all night trains should be subjected to an infrastructure charge of less than €2 per train-kilometre, for two reasons.

First, the infrastructure charges "*may include a charge which reflects the scarcity of capacity of the identifiable section of the infrastructure during periods of congestion*" (Article 31, paragraph 4). In Sweden, for example, Trafikverket imposes a "passage charge" related to scarcity of capacity in major cities at peak times:

- One night train leaving Stockholm between 15:00 and 18:00, and three night trains arriving in Stockholm between 06:00 and 09:00, pay a passage charge of SEK 416 or €41.60. However, this is small compared with the other charges, and may be revised, reduced or removed after July 2017, when Citybanan, a new line through Stockholm, opens and provides a major increase in capacity.

[20] For example, a study by UIC and Germany's DB of Very Long Distance Night Trains (VLDNT), which we review in Section 6.3, assumed infrastructure charges of €21 per train-kilometre.

- Trains to/from Luleå and Duved, which are coupled together between Stockholm and Kramfors, incur only one train path charge over the distance of 516 kilometres.

Second, and as we noted above, one interviewee pointed out that a passenger night train may be the only user of the infrastructure during the night, with a number of cost implications:

- Operation of the passenger night train may require the provision of an overnight shift of signalling or other operations staff, which could be avoided completely if it were not operated.
- Operation of the passenger night train may prevent or restrict night time maintenance or renewal of the infrastructure, potentially imposing additional costs on the infrastructure manager.

In these circumstances, an infrastructure manager would appear to be justified in concluding that the additional costs of providing a night shift, or of carrying out infrastructure maintenance by less efficient means, were "*directly incurred as a result of operating*" a single night train service. These costs could then, in principle, be included in charges specific to night trains, or even charges specific to a single night train.

4.6. Practical viability

In the previous Sections of this Chapter, we have discussed whether night trains are a viable option financially. A number of other issues need to be taken into account in assessing whether night trains are a viable option practically.

First, where capacity is restricted, night trains may compete for capacity with other, and potentially more valuable, train services. If capacity remains constrained, night trains may not derive the highest value from it, particularly if they need to occupy congested stations for much longer than competing commuter train services. If capacity expansion is considered, they may not generate sufficient value to justify the costs of expansion to make them possible. We note, for example, that the new Vienna Hauptbahnhof (main station) used by Austria's ÖBB Nightjet appears to have ample capacity for night trains, but a number of other major stations do not.

Second, Article 31 paragraph 5 of Directive 2012/34/EU states that charges "*may be lowered or raised to take account of environmental effects*". We discuss the wider environmental effects of passenger night trains further in Section 7.3.

Third, Regulation (EC) No 1370/2007 on public passenger transport services by rail and by road states that "*In keeping with the principle of subsidiarity, competent authorities are free to establish social and qualitative criteria in order to maintain and raise quality standards for public service obligations, for instance with regard to minimal working conditions, passenger rights, the needs of persons with reduced mobility, environmental protection, the security of passengers and employees as well as collective agreement obligations and other rules and agreements concerning workplaces and social protection at the place where the service is provided.*"

This Regulation gives competent authorities wide discretion to choose to subsidise rail services on grounds of quality, the needs of Persons with Reduced Mobility (PRM), the environment and security. Among our case studies we note, for example, that:

- In Sweden, Trafikverket has carried out detailed studies, taking into account most of these factors, leading to its decision to continue to support night train services.

- In the United Kingdom, Transport Scotland prepared and published a detailed business case for The Caledonian Sleeper which enabled the Scottish Ministers, as decision-makers, to make an informed decision.
- In France, the decision to reduce night train services was set out in an official note summarising the evidence and explaining the rationale.

5. THE FUTURE CHALLENGES TO NIGHT TRAINS

KEY FINDINGS

- Investments in high-speed rail networks appear to have reduced the viability of existing night trains without leading to the introduction of new night train services.
- Some journeys formerly served by night trains can now be made by day trains with journey times as short as 2-3 hours.
- Liberalisation of intra-EU air services in 1993 has lowered airline costs and air fares. The airlines' pricing and yield management models enable them to offer fares as low as €1 if booked sufficiently far in advance.
- Liberalisation of international and domestic coach services to date has led to a rapid expansion of coach services. Many compete directly with rail and offer overnight services, which may parallel existing night train services. ÖBB Nightjet's viability might in principle be undermined by further liberalisation of coach services.
- Night trains also face challenges from rising expectations for privacy and en-suite facilities, which can only be provided at higher cost than more basic accommodation, and in particular at higher cost than day trains.
- Several night train operations now have a fleet of fewer than 100 vehicles. It may become difficult to obtain cost-effective replacement fleets at the end of their lives.
- While some Member States are willing to subsidise domestic night trains in recognition of their economic, social or environmental value, mechanisms rarely exist to subsidise international night trains.

5.1. Competition from day trains, airlines and coaches

The factors affecting passengers' decisions to travel, and their choice of mode, route and level of service, are broadly understood. They can be explained largely by factors such as journey time, service frequency, price (and how it varies with the number of passengers travelling), and the need to travel with baggage, pets or other items. We identified a number of papers describing these factors, and illustrating them through aggregate data on mode shares, but found little information specific to night trains, which typically form only a small part of the overall travel market[21].

None of our case studies or interviews identified a quantitative model of demand for night trains, although we understand that bidders for The Caledonian Sleeper franchise in the United Kingdom may have built relatively complex models of competition between different combinations of night train timetable, quality and fares, in credible scenarios of competitive developments. In Sweden, Trafikverket identified from interested parties a number of possible reasons for the decline in use of night trains, although most of these relate to the night train service rather than to the competitive environment:

- competition from other modes of transport, notably air;
- delays and cancellations due to winter problems;
- infrastructure problems;

[21] The International Railway Journal (IRJ) noted that night trains represented 17% of Austria's ÖBB's long-distance revenue but had represented only 1% of Germany's DB's long-distance revenue. Night trains represent a smaller share of total rail revenue, and a smaller share still of total passenger revenue or travel. The small size of the night train market means that it is difficult to justify extensive data collection or studies specific to night trains.

- flaws in the interaction between the operator and the tourism industry; and
- the timetable does not provide sufficiently attractive arrival and departure times.

In the absence of quantitative models of demand for night trains, it is not possible to show that there is a specific linkage between developments in other modes and the decline in night train services. However, we identify in Table 13 below a number of factors which appear, prima facie, to have contributed, or may in the future contribute, to the decline in night train services.

Table 13: Competition to night trains

Modes	Factors	Examples
Rail	New infrastructure does not appear to cater for, or be relevant to, passenger night trains.	The Channel Tunnel between France and the United Kingdom, the Oresund bridge between Denmark and Sweden, and the Perpignan-Figueres line between France and Spain, all opened since 1990, carry nearly half all rail passengers crossing intra-EU borders (Eurostat). None are used by night trains.
	High-speed lines reduce day train journey times.	In France, most cities can be reached from Paris in 5-5½ hours on day services on high-speed lines. In the United Kingdom, city pairs once linked by night trains are now linked by day trains taking as little as 2 hours and operating every 20 minutes. In Sweden, high-speed lines have been proposed which, if built, would shorten day journeys on subsidised (Stockholm to Norrland and Narvik) and commercial (Stockholm to Malmo) night train routes (please see Annex D on SJ Nattåg in Sweden).
	Growing demand means that day trains are more frequent and operate over longer periods.	Many interurban routes have services every hour or even every half hour. In the United Kingdom, the time available in Manchester on a day trip from London has risen from less than 6 hours in 1958 to almost 13 hours in 2016 (please see Annex E on The Caledonian Sleeper in the United Kingdom, European Rail Timetable).
Coach	Liberalisation of international services from 2011 by Regulation (EC) No 1073/2009.	There has been rapid expansion of operators such as Lux Express (operating international services from the Baltic States) and FlixBus (following German deregulation) which has built a Europe-wide network since early 2013. Germany's DB told us that competition from liberalised coach travel has forced it to lower prices.
	Subsequent liberalisation of domestic services.	There has been liberalisation of domestic coach services in Germany (2013), Italy (2014) and France (2015).
	Coaches now offer a wide range of facilities.	Facilities often include air conditioning, television, seatback video and WiFi, which make long-distance trips more comfortable and attractive.

Modes	Factors	Examples
Air	Intra-EU air services were deregulated in 1993, enabling a major expansion in air services.	Low-cost airlines have emerged and entered many domestic and international markets within the EU. Low-cost airlines offer extremely low fares for travel booked sufficiently far in advance.
Car	Expansion of car ownership and EU-wide motorways.	Long-distance travel by road is possible at average speeds of over 100 km/h.
Hotel	Low-cost hotel chains with online reservation systems.	Overnight accommodation can be available for as little as €40-50, particularly if booked in advanced.

Source: case studies, Steer Davies Gleave analysis.

One factor common to competitors to rail is that they can operate efficiently in a smaller market, or equally offer the same market a more frequent service, a wider range of travel options, a mix of express and stopping services, or a wider range of routes. We noted above (please see Section 4.1) how Germany's DB City Night Line night services typically offered accommodation for over 350 passengers, but coach and airline services may operate with 40-50 seats and private cars and taxis may operate with 4-5 seats.

We discuss some of these factors in turn below, focusing on developments in coach services, on which we commissioned additional research from the Politecnico di Milano.

Rail

Investment in, and expansion of, passenger rail services appears to have facilitated developments in day train services, but offered few new opportunities for night train services. We identified a number of examples of this effect.

First, until 1980 London and Paris had been connected by a night train by boat across the English Channel, but journey times between the capital cities fell to 3¼ hours in 1994, with the opening of the Channel Tunnel, and 2¼ hours in 2007, when high-speed lines extended all the way to both cities. Night train stock was built to operate services between the United Kingdom and the continent when the tunnel opened, but no commercial case was found for doing so, and the stock was eventually sold to Canada[22].

Other major investments in infrastructure to cross the natural barriers of the Oresund (the Oresund bridge between Denmark and Sweden) and the Pyrenees (the Perpignan-Figueres link between France and Spain) are not used by night trains, although these three links carry nearly half of all rail passengers crossing intra-EU borders (Eurostat). Night trains between France and Spain, for example, extend only a short distance across the border using "classic" low-speed railway lines (European Rail Timetable).

A potential issue for the operation of night trains is the added security at the Channel Tunnel and the Oresund bride. Following an incident on a Thalys international high-speed train in August 2015, the Commission was tasked to examine the impacts of a number of possible initiatives to address rail transport security in the EU, for which it commissioned a

[22] One factor contributing to the lack of long-distance or night services through the Channel Tunnel was that an airline attracting 200 passengers per day could offer flights, in suitably-sized aircraft, at a wide range of different times. While a single train, whether by day or night, could carry all these passengers, its timing might only be attractive to a small minority of them.

study "Options for the security of European high-speed and international rail services"[23]. Any new initiatives would require a definition of the scope of the term "high-speed" and, provided it did not mean "any stock using a high-speed line", night services might be excluded from it by using stock limited to 200 km/h or less. However, "international" appears unambiguous, and any additional security measures which either added costs or inconvenienced passengers would, prima facie, weaken the night train offer further. We also note that even some domestic night trains can stop at up to 20 stations, each of which might need to have additional security measures in place in the middle of the night.

Second, high-speed lines have reduced journey times between a number of major cities, meaning that journeys which formerly required overnight travel can now be completed in only 2-3 hours, as is the case with London to Manchester in the United Kingdom, between which trains now operate every 20 minutes, and London to Paris.

Third, growing demand means that operators of day trains have, where capacity permits, introduced more frequent services with earlier first arrivals and later last departures.

Air

In 1992, the "third package"' (Council Regulations (EEC) 2407/92, 2408/92 and 2409/92) removed all remaining commercial restrictions for European airlines operating within the EU, thus setting up the "European Single Aviation Market"[24]. This led to rapid growth in cross-border airline services within the EU, which now have a number of features:

- Aircraft are faster than trains, and flying times within Europe are generally short[25].
- A wide range of air routes means that, particularly for leisure travel, passengers can reach a much wider range of destinations than are served by night trains.
- On busy routes, airlines may offer a wide range of flights, with prices varying depending on the exact time of travel. Flights which are likely to be busy, particularly those timed for the convenience of business travellers, are likely to have higher fares. Flights at other times can cheap or even "free", using points earned in an airline loyalty programme.
- On minor routes, in contrast, flights may be infrequent, inconveniently timed, or require a connection which can increase the end-to-end time by two hours or more. Our case study of Austria's ÖBB Nightjet shows how few of the cities it connects with Vienna have direct flights at convenient times (please see Figure 19 and Figure 20 in Annex C on ÖBB Nightjet in Austria).

This suggests that, in dense business markets, airlines can often offer both peaks flights conveniently timed for business travellers and off-peak flights with very low fares for leisure travellers and tourists. Their competitive position relative to night trains is weaker in smaller markets, where flights may be fewer, or less convenient, or require a connection.

Coach

International and domestic coach travel within the EU has been liberalised extensively in recent years, as we summarise in Table 14 below.

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[23] The study was completed in 2016, but is not yet published.
[24] Fact Sheets on the European Union – 2016, "Air transport: market rules".
[25] Kayak.com, a travel website, shows that flights between Larnaca (in Cyprus) and London (in the United Kingdom), or Lisbon (Portugal) and Helsinki (Finland), which are among the longest direct flights within the EU, take no more than 4½ hours.

Table 14: Liberalisation of key long-distance coach markets

Date	Geography	Notes
1985	Domestic, United Kingdom	The 1985 Transport Act abolished road licensing in Great Britain and fully deregulated local bus services, except in London.
2011, December	International, EU-wide	Liberalised through Regulation (EC) No 1073/2009.
2012	Domestic, Sweden	Liberalised, with the removal of two earlier conditions of operating at least 100 kilometres and crossing at least one border between Sweden's 21 Län (Counties).
2013, January	Domestic, Germany	Liberalised by cumulative amendment to domestic legislation, the Personenbeförderungsgesetz (Passenger Transport Act). Coach services are authorised provided passengers are carried at least 50 kilometres and any local or regional rail service takes more than one hour, or the existing rail service is insufficient, or rail passenger volume is unlikely to be materially affected by the new coach service.
2014, January	Domestic, Italy	Liberalised by domestic regulation (Decree-Law No. 7/2007, converted into Law No. 40/2007) over a transition period from 2007 to December 2013, which is now complete.
2015, August	Domestic, France	Liberalised by domestic legislation (Law No. 2015-990 "Macron Law") which removed restrictions to passenger coach operations on routes whose distance between two stops is over 100 kilometres, and permits operations on other routes subject to a check that they do not threaten a Public Service Contract (PSC).

Source: Politecnico di Milano, prepared for Steer Davies Gleave.

The case studies on Sweden's SJ Nattåg, the United Kingdom's Caledonian Sleeper, Italy's Intercity Notte and France's Intercités de Nuit annexed to this report all show that day and night coach fares can be cheaper than even the cheapest accommodation on night trains[26].

In France, DG MOVE suggested that liberalised coach operators were offering fares much lower than those on TGV high-speed services, and that the passenger night train market may need to offer both seated accommodation (to compete with very low coach fares for students and budget travellers) and sleeping cars (with en-suite facilities to meet business requirements). In practice, SNCF offers only seats and couchettes, with no sleeping compartments or en-suite facilities, although in 2016 it carried out a trial with Russia's RZD's sleeping cars (please see Annex H on Intercités de Nuit in France).

Figure 10 shows how the coach operators in Italy, where domestic coach services were only fully liberalised from the beginning of 2014, collectively operate a night coach network (blue) not only serving the main destinations on the rail network (orange) but also penetrating to a much wider range of points.

[26] Please see Annex D on SJ Nattåg on Sweden, Annex E on The Caledonian Sleeper in the United Kingdom, Annex F on Intercity Notte in Italy, and Annex H on Intercités de Nuit in France.

Figure 10: Italy: night train and coach services (2015)

Source: Politecnico di Milano, prepared for Steer Davies Gleave.

Figure 72 in Annex M on case studies outside Europe also compares the density of the coach and rail networks in New South Wales in Australia.

In Austria, in contrast to the liberalised environments listed in Table 14, coach transport remains heavily regulated, with a complex authorisation process which can take up to six months, even for a successful applicant. In addition, the dominant operator of domestic coach services is ÖBB Postbus, an ÖBB subsidiary which operates regional and inter-regional services which complement ÖBB's rail services. Most of these services are provided under a PSC and procured through competitive tendering. ÖBB Postbus carries up to 214 million domestic passengers per year serving up to 1585 communities, and is the only form of public transport in more than a third of the areas which it services (ÖBB data for 2016). In 2016, ÖBB began operating international coach services through subsidiary ÖBB-Fernbus GmbH under the brand Hellö. As of February 2017, it operates ten routes to Croatia, the Czech Republic, Germany, Italy and Slovenia, most of which include an overnight service.

In Austria, there are also provisions that proposed new coach routes must not affect the patronage of existing rail and coach operators. These provisions give ÖBB an effective veto on services which would affect the financial viability of its services, including ÖBB Nightjet.

Table 15 shows how most coach operators across Europe offer not only day but also night services. Coach services operated at night are relatively immune to the problems of road congestion and can achieve faster and/or more reliable journey times, and hence reductions in some time-based elements of operating costs, than equivalent coach services by day.

Table 15: Major coach operator domestic, international and night services

Member State	Operator	Domestic	International	Night
Italy	Baltour	●	●	●
	Marozzi autolinee	●		●
	Marino autolinee	●	●	●
	FlixBus	●	●	●
France	Ouibus	●	●	●
	Eurolines/Isilines	●	●	●
	FlixBus	●	●	●
Sweden	Swebus	●	●	●
	Nettbus	●	●	●
	Ybuss	●		●
	FlixBus	●	●	●
Poland	Polskibus.com	●	●	●
	FlixBus	●	●	●
	BP Tour	●		●
	Mobilis group	●		
United Kingdom	National Express	●		●
	Eurolines		●	●
	Megabus	●	●	●
Spain	ALSA	●	●	●
	Avanza	●	●	●
	Samar	●	●	●
	Socibus	●	●	
	Damas	●	●	

Source: Politecnico di Milano, prepared for Steer Davies Gleave.

In a number of our case studies, we sampled fares on night trains with fares on competing day and night coach services. Where practicable, we compared fares for travel booking three months ahead and one day ahead[27]. However, it was not always possible to book night trains three months ahead. This can mean that passengers who wish to book early are effectively unable to choose night trains. In most cases, we found that:

- Three months ahead, day and night coach fares were no more, and sometimes considerably less, than the lowest fares for seated accommodation on night trains.
- One day ahead, coach and rail fares were often higher than three months ahead, but coach fares had risen less than night train fares.

While night trains offer a range of accommodation at a range of prices, coaches operate commercially while offering only basic seated accommodation, often at a lower price than the cheapest accommodation on night trains.

5.2. Other challenges

We asked a number of interviewees whether the need to work for extended hours, overnight, and often away from home, made it difficult to recruit staff willing to work on passenger night trains. None of the interviewees identified this as an issue, and we note that the same concern could be applied to those working on overnight coach services or, to the extent that they operate on intra-European routes, overnight air services.

We also asked DG MOVE whether they were aware of any concerns about night train staff working overnight or away from home. They told us that they were not aware of any complaints this subject, which was a matter for DG Employment. They drew our attention to Directive 2005/47/EC on the Agreement between the Community of European Railway and Infrastructure Companies (CER) and the European Transport Workers' Federation on certain aspects of the working conditions of mobile workers engaged in interoperable cross-border services in the railway sector. DG MOVE also noted that some staff might be provided by subcontractors, and it might be difficult to link changes in night train services directly to changes in employment.

However, we identified a number of other issues faced by the night train sector.

First, a number of interviewees mentioned the issue of changing social norms and rising expectations. Over the 50-year period we consider in this study, many passengers have become progressively less willing to sleep with strangers, without direct access to a toilet, or without an opportunity to shower or bath each night. These rising expectations mean that night trains must offer higher standards of accommodation, at least if they are to provide an acceptable substitute for a night at home, with friends or relatives, or in a budget hotel.

DG MOVE suggested that, with a "greying" society, a cohort of citizens might emerge who would not wish, or be allowed, to fly but might travel by train. As Figure 2 in Section 1.2 shows, higher quality accommodation means fewer passengers per vehicle. In contrast, night train accommodation on some trains in China and India continues to include "dormitory" accommodation with open bays of bunks (please see Fgure 74 in Annex M on case studies outside Europe). An issue would be whether the potential market size would be sufficient to justify investment in rolling stock.

[27] We were able to sample coach and night train fares three months and one day ahead in Italy, Spain and France, three months ahead in Austria, Sweden and the United Kingdom, two months and five days ahead in Poland, and the fixed night train fares in Greece and Romania. We also compared night train and air fares in Queensland in Australia.

Second, for this and for other reasons set out in Table 8 in Section 4.1, night trains are likely to have higher costs per passenger space than their closest competitor, day trains on the same route, which often offer a service which is both more frequent and faster. Competition to night trains from day trains is particularly important, because decisions on both types of service are often internalised by railway management when deciding how best to compete with non-rail modes. Explicit competition on the same route between a night train operator and a day train operator in separate ownership is rare, although it occurs to a certain extent:

- in Germany, between Austria's ÖBB Nightjet and Germany's DB;
- in Italy, between Trenitalia Intercity Notte and Italo; and
- in the United Kingdom, between The Caledonian Sleeper and Virgin Trains West Coast and East Coast.

In addition, the liberalisation of rail services envisaged under the market pillar of the Fourth Railway Package[28] may mean increased competition, lower fares, and lower profits for operators on a number of long-distance day services. If this occurs, it may make it harder for operators to cross-subsidise lossmaking night trains from profitable day trains. In practice, however, few night train services remain in France and Spain, the principal large domestic markets in which competition to the national operator is not yet permitted.

Third, competing modes continue to expand and improve their offer, particularly in the coach sector, where recent liberalisation has led to rapid expansion of both day and night services with very low fares. Low-cost airlines, in contrast, are of limited relevance to business travel between business centres, which tend to be time-sensitive and price-insensitive, and have long been served by the legacy airlines. Low-cost airlines have only a limited presence in Austria, and ÖBB Nightjet's services may benefit from the fact that many of the routes it serves have limited, poorly-timed or indirect air connections.

Fourth, there are limited markets in which night trains can be effective. As shown in Table 1 in Section 1.1, night trains might operate ideally with a journey time of 8-10 hours, corresponding to the hours of sleep, or up to 16 hours, achievable between successive working days, but including time when passengers will be awake. With longer journey times, some passengers will need to be able to change between "night" and "day" arrangements, and others will make their journey wholly by day. This means that accommodation on the night train must be changed between "night" (sleeping) and "day" (sitting) configurations:

- With tilting or reclining seats, such as the Rail Beds on the Spirit of Queensland in Australia (please see Annex M on case studies outside Europe), this is done by the passenger.
- In couchette and sleeping compartments, this may be done by the train crew, although couchette passengers on PKP Intercity Night services in Poland are

[28] The Fourth Railway Package is a set of six legislative texts designed to complete the single market for Rail services (Single European Railway Area). The "technical pillar", which was adopted by the European Parliament and the Council in April 2016, includes Regulation (EU) 2016/796 on the European Union Agency for Railways and repealing Regulation (EC) n° 881/2004, Directive (EU) 2016/797 on the interoperability of the rail system within the European Union (Recast of Directive 2008/57/EC), and Directive (EU) 2016/798 on railway safety (Recast of Directive 2004/49/EC). The "market pillar", which was adopted in December 2016, includes Regulation (EU) 2016/2338 amending Regulation (EU) 1370/2007, which deals with the award of public service contracts for domestic passenger transport services by rail ('PSO Regulation'), Directive 2016/2370/EU amending Directive 2012/34/EU, which deals with the opening of the market of domestic passenger transport services by rail and the governance of the railway infrastructure ('Governance Directive'), and Regulation (EU) 2016/2337 repealing Regulation (EEC) 1192/69 on the normalisation of the accounts of railway undertakings.

expected to make their own beds (please see Annex J on PKP Intercity Night in Poland).

A related issue is the importance to night train operators of the ability to refocus services to serve markets which are most likely to be viable. A national Public Service Obligation (PSO), specifying the continued operation of historic services irrespective of demand, revenue or social value, may be a poor means of providing greatest value with the subsidy resources available. Austria's ÖBB Nightjet, in contrast, has been able to close some routes to refocus its capacity onto a core network.

Fifth, a decline in the provision of night trains, caused by any of all of the preceding factors, can lead to a loss of critical mass:

- On the demand side, passengers may not be aware of, or consider using, night trains as a mode of travel.
- On the supply side, night train operators may lose economies of scale, with the need to support costs with an ever-smaller market. This factor may have contributed to the willingness of Austria's growing ÖBB Nightjet to offer services which were abandoned by Germany's declining DB City Night Line.

Sixth, even where night trains which are not commercially viable may be of social, economic or environmental value, we noted above how the current policy and institutional environment in some Member States may make no provision for them to be subsidised.

Finally, there is also a general lack of mechanisms to subsidise international long-distance services including night trains. This is particularly the case where the policy of one of more of the Member States that they connect is that all long-distance services or international services, including night trains, should be left to the market and operated on a commercial basis.

6. THE SECTOR'S SCOPE TO RESPOND

KEY FINDINGS

- Night trains continue to be threatened by improvements in day rail services and in competing modes, in particular from low-cost day and night coach services.
- Not all the means of improving the performance of other transport services are appropriate to night trains. Night trains operators must ideally offer a long journey time, low fares, and the option of paying for higher quality accommodation if the passenger requires it.
- As night train services continue to decline, it may be difficult to find cost-effective means of replacing small fleets of existing rolling stock when it becomes life-expired.
- The Trans-European Transport Networks (TEN-T) may help night trains by providing additional capacity, but major new international links appear not to have attracted night train services, and high-speed lines appear to have contributed to their decline.
- The private sector acts as subcontractors to night train operators, operates some luxury night train services, and provides a range of information, reservation and travel websites. However, it may be increasingly difficult to persuade the private sector to sell or market night train services.

6.1. The role of the EU

The competences of the EU include:

- setting the overall regulatory framework;
- investment in, and regulation of, infrastructure, which may change the balance of competitive advantage between modes, and between day and night trains; and
- determining the extent to which Member States are permitted to protect, or subsidise, specific services.

In practice, the current policy framework may weaken the competitiveness of the night train sector, for a number of reasons.

First, investment in rail infrastructure, and expansion of rail demand, has led to improvements in day trains but has been of little or no value to night trains, except perhaps where they make use of capacity which would not otherwise remain available.

Second, liberalisation of coach and air services has increased competition to rail services. Coach operators offer day and night city-to-city coach services with day seating but very low fares, and airlines offer not only evening and morning business flights to time-sensitive business travellers but also low advance fares for price-sensitive leisure travellers.

If the EU were to adopt a specific objective of helping the passenger night train sector to survive, a number of approaches would, in principle, be possible:

- The EU could formally monitor the night train sector and develop a policy for it, including requiring that it be considered a distinct market segment in infrastructure charging.

- The EU could review the freedom to apply mark-ups to infrastructure charges, and the mechanisms for ensuring that market segments which can pay the cost that is directly incurred as a result of operating the railway service are not excluded.
- The EU could consider whether greater consistency was required in restricting competition between different modes.
- The EU could halt or restrict liberalisation measures in competing sectors.

6.2. The role of governments

The role of Member State governments is currently defined in a range of European law. Among other things:

- It permits them to support road and rail services through Public Service Contracts (PSCs).
- It does not permit them to restrict air services to protect PSC rail services.
- It permits them to restrict other rail services to protect PSC rail services.
- It permits them to restrict international and domestic coach services.

We discussed with DG MOVE how regulation of transport was primarily by mode, rather than by market, with the effect that formerly commercial passenger night train services might be made unviable by deregulated air, coach or passenger rail services. DG MOVE pointed out the potential difficulties of treating all modes equally: for example, air services are typically point-to-point, with limited network effects and no intermediate stops, and the history and infrastructure provision of each mode is different. However, the potential need for a more "comprehensive approach" in the future was taken into account in the 2011 White Paper "Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system".

In practice, however:

- Some Member States choose not to exercise all their powers to protect rail services from competition, and in some cases deny these powers to regional or local competent authorities.
- Some Member States have a policy that all long-distance rail services should be operated commercially, with no exception for night trains.

Member State governments could therefore, in principle, do a number of things to help the night train sector survive.

First, they could ensure that infrastructure capacity was available to enable them to operate, although as we note in Section 1.7, at a number of major cities it is not clear whether this would be possible without expensive capacity expansion, for which funding or planning consent might not be forthcoming.

Second, they could adopt a policy, as Sweden has done, that access charges should not be subjected to mark-ups and should be set on the basis of marginal costs, subject only to additional charges where capacity was scarce and not all infrastructure users could be accommodated.

Third, they could extend the use of rail Public Service Obligations (PSOs) to long-distance domestic or international services. However, we note that Member States such as Germany and the United Kingdom have an explicit and long-established policy that long-distance services should not be subsidised.

In Germany, the Länder (States) are responsible for specifying and subsidising local transport, but are too small to support internal night train services. In Sweden, in contrast, where 96% of passengers on the Norrland and Narvik services cross between the Län (Counties), there is provision for specification and subsidy of inter-County services at national level by Trafikverket. In the United Kingdom, The Caledonian Sleeper services are specified and subsidised by Scottish government, which receives funding taking into account the historic provision of connections to the United Kingdom's capital city, London.

Austria subsidises domestic night trains to Villach, and we understand that they continue to Italy on a commercial basis. Sweden subsidises domestic night trains to Riksgränsen, and Norway contributes to the cost of extending them to Narvik. We did not identify any other examples of explicit decisions to subsidise cross-border night trains, but note that, in Greece, Romania and possibly Bulgaria, international night trains may be implicitly subsidised through a PSO covering all existing services.

In some cases there may be historic understandings between governments and/or national railway operators that cross-border night train services will continue to operate, whether explicitly subsidised or not. In other cases, continued operation of cross-border night trains may remain a decision for the railway undertaking, or group of railway undertakings (such as those of Poland and Austria, or the Czech Republic and Hungary) providing the service.

6.3. The role of the night train operators

Table 16 below sets out a number of initiatives which a transport operator might take to improve competitiveness, and examines whether these initiatives would be applicable to night trains and, if so, have been adopted by their operators.

Table 16: Initiatives to improve night train competitiveness

Measures	Examples	Effectiveness and applicability	
Build a network of connecting services	Airport and coach hubs	×	"Connections" between night trains take all day.
Bundling travel with accommodation	Packaged flights, hotels and car hire	×	Night train operators cannot usefully bundle their services with hotels or car hire.
Offering more frequent departures	Most other rail and transport services	×	Some routes have more than one departure per night, but frequency is of limited value.
Reducing journey times	High-speed day trains	×	Counter-productive, as with "redeye" flights[29]. Some night trains must travel slowly to offer a minimum 6-7 hour journey.
Using speed to extend services	High-speed day trains	?	This appears to happen in China and India, but may be commercially risky.

[29] A "redeye" flight is an overnight flight which is too short in duration to allow a full night's sleep.

Measures	Examples	Effectiveness and applicability	
Offering less frequent departures	Services only some days, or seasonally	?	Acceptable for tourism, but reduces the value of the service to the business and Visiting Friends and Relatives (VFR) market segments.
Adjusting capacity to match demand	Airlines can vary both frequency and aircraft size	?	Little saving from shortening trains, although Sweden's SJ adjusts formations to match demand.
Better marketing	Identify existing and potential customers	?	Marketing can identify, and be directed at, regular users, but it is harder to identify or reach potential users, such as visitors from outside Europe.
Reducing or optimising costs	Cut catering provision Merge routes	✓	Cost reductions, where achievable, will always improve financial performance.
Focusing on core or dense markets	Identify a core network	✓	Many operators have merged routes. Austria's ÖBB has identified a core network.
Moving downmarket	Airlines and coach night services use the same vehicles as day services	✓	Rail operators such as DB are now providing low-price overnight services with day train stock.
Moving upmarket	Airlines provide flat beds and more space	✓	"Hotel trains" and en-suite facilities command a premium, but the market is small.
Market segmentation with multiple classes of travel	Long haul airlines have up to four types of seating	✓	Widespread among night train operators: ÖBB Nightjet has up to nine different "products".
Yield management	Capacity is retained for sale to those who value it most	✓	Widespread among night train operators, but not always fully developed, and some appear still to have fixed prices.

Source: case studies, Steer Davies Gleave analysis.

We discuss these initiatives in more detail below.

Little scope for building a network of connecting services

Many transport operators provide connections from a "hub" airport, railway or coach station. For a night train operator, operating from a hub may be efficient, and save costs, but there is little scope for passengers to connect between two night trains which must, by definition, require an additional day.

Little scope for bundling travel with accommodation

Many transport operators also "bundle" travel as a package with accommodation, or with hire cars, or even as whole holidays. This approach appears to be of limited relevance to night train operators for several reasons:

- Night trains are already a "bundle" of night train accommodation and overnight accommodation.
- Night train fares can be very low, giving little scope to offer a proportion of the fare to a city centre hotel as an incentive to offer a "city break" package.
- Night trains rarely serve "package holiday" destinations, such as beach or ski resorts, and demand at these destinations is often highly seasonal or peaked. (Many holiday packages last seven or fourteen nights from Saturday night to Friday night inclusive. A night train operator would need to provide travel over Friday night, which may be the busiest in the week, and over Saturday night, when some night trains do not operate to allow for engineering work.)
- Hire cars are rarely needed in city centre destinations, and rarely available at minor stations, except at considerable extra cost to the hire car operator. (In contrast, most airports are served by a number of hire car operators throughout their operating day.)

Anecdotal evidence suggests that tourists in Europe visiting a number of centres may use a night train once or twice during a holiday to avoid losing a whole day travelling, but it would rarely be practicable or attractive to spend successive nights on night trains.

Little scope for offering more frequent departures

An alternative means of attracting passengers is to offer more frequent departures: we noted that in the United Kingdom the cities of London and Manchester, once linked by a night train, are now connected by 200 km/h trains every 20 minutes.

Our analysis of night train timetables in the Annexes shows how a choice of departures is available on some night train routes, such as between Vienna and Innsbruck (please see Figure 16 in Annex C on ÖBB Nightjet in Austria) or between Moscow and Warsaw (please see Table 28 in Annex K on RZD in Russia). However, this is only possible where it is viable to operate two or more night trains, each of which may have capacity for several hundred passengers.

Little scope for reducing journey times

Most transport operators can improve the attractiveness of their services by reducing journey times and, as a result, carrying more passengers and/or charging higher fares. This approach is rarely open to operators of night trains, who in contrast must offer a minimum journey time of 7 hours or more to offer adequate opportunity to sleep. For example:

- We set out in Figure 3 in Section 1.5 how night trains already have much longer journey times than the equivalent day services, particularly in France between Paris and Hendaye/Nice, in the United Kingdom between London and Edinburgh/Glasgow, and in Sweden between Stockholm and Malmo.
- We set out in Table 13 in Section 5.1 how major new infrastructure which reduce journey times (including the Channel Tunnel, the Oresund link, and the Perpignan-Figueres link) are not used by night trains.

We discuss below whether operators of night trains could make use of journey time savings to introduce new services linking city pairs over longer distances.

Some scope for using speed to extend services

Instead of reducing journey times, operators of night trains could in principle make use high speeds to introduce new services linking city pairs over longer distances. In China and India, where integrated national railways operate over sub-continental distances, our case studies in Annex M found that, rather than making night trains redundant, high-speed lines are being used to accelerate and extend their routes.

We examined a study by the International Union of Railways (UIC) and Germany's DB which proposed a "Very Long Distance Night Train" (VLDNT) operating on the European high-speed rail network. This would be 400 metres long and carry 102 seats, 400 couchettes and 13 "luxury beds" on journeys of up to 2,000 kilometres[30]. It argued that the principal obstacles to such a service would be that:

- There might be restrictions on access to high-speed lines due to night-time maintenance, but these could probably be overcome.
- Infrastructure charges of €21 per train-kilometre would represent over 50% of the total costs of the service, which were estimated at from €0.07 per seat-kilometre, compared with just over €0.05 per seat-kilometre for a low-cost airline.
- Largely as a consequence, VLDNT would only be viable if all the stakeholders develop and implement a special pricing model for night trains.

We estimated in Section 4.5 that access charges for a 10-coach train on conventional lines need not exceed €2 per train-kilometre in the absence of mark-ups. However the data we used, from the United Kingdom and Sweden, does not allow us to estimate the equivalent cost for a 400-metre train on a high-speed line.

The UIC study put forward an analysis of a non-stop 12-hour, 2,200 kilometre journey between London and Madrid. It estimated that a train would have much lower emissions than an aircraft, and that by 2025 such a route could be viable if it attracted 10% of the expected air demand[31]. If capacity were available, it might be possible for the access charges to be much lower than €21 per train-kilometre.

A VLDNT might be relatively environmentally friendly, and in principle it could be zero-emission if powered by renewable energy sources. However, the UIC study included no analysis of the carbon embedded in the specially-constructed night train vehicles, or the higher emissions per passenger than day trains associated with accommodation such as "luxury beds".

The UIC study identified high-speed rail and low-cost airlines as competitors, but did not comment in detail either on the established airlines targeting the business market or the rapid expansion of low fare, and overnight, long-distance coach services.

Initial forecasts for the Channel Tunnel, prepared in 1987, suggested that high-speed cross-Channel rail services would attract a significant proportion of the market between the United Kingdom and Spain[32]. In practice, the evidence now shows that almost all travel through the Channel Tunnel is relatively short-distance, and Eurostar attracts negligible numbers of passengers between the United Kingdom and Spain. We have not investigated

[30] UIC-Study Night trains 2.0, UIC and DB (2013).
[31] Data on passenger numbers by airline route is widely available from airport and civil aviation authority statistics, and the growth in air travel is broadly predictable.
[32] One of our team was involved in forecasting demand for the Channel Tunnel from 1988 to 1994.

what additional arrangements might be needed to satisfy the safety and security arrangements of the Channel Tunnel, or the extent to which these might add costs or deter passengers[33].

Faced with this competitive market, it remains unclear whether a commercial case exists for a VLDNT service, for a number of reasons:

- First, it is not clear how many city pairs separated by 1,500-2,000 kilometres would generate enough demand to fill a night train. Demand for travel tends to fall not only with cost but also with time, distance, and changes in language and culture.
- Second, an initial service would require the construction of a fleet of only two high-speed sleeper trains, which if not successful would have no obvious alternative use.
- Third, it is not clear whether a single overnight service could attract sufficient demand from airlines, operating flights throughout the day, to be commercially viable. Nor is it clear whether such a service could offer sufficient reduction in total carbon emissions, relative to the alternatives, that it would become commercially viable at a higher carbon price.
- Fourth, we doubt that the Member States along a route (which for a service between London and Madrid would be Spain, France and the United Kingdom) would be willing either to buy such stock or to commit to support the services by any other means. Long-established policy in many Member States has been that there should be no government or public sector support for long-distance, including international, services.

Some scope for offering less frequent departures

An alternative means of optimising the performance of a night train service is to operate only at times of the week, or of the year, when there is sufficient demand to justify a service. We noted in Section 1.4 that many night trains operate on only some days, which may enable some reduction in costs, although:

- Rolling stock utilisation falls, and increased inspection may be required if it is not used for long periods.
- Staff may be less productive if they have to be employed all year but only work certain seasons or days.
- Passengers may be less aware of, or find it more difficult to understand, night train services which only operate at certain times of the week or of the year.

The most important impact of these factors may be that, the lower the number of nights per year on which rolling stock is used, the higher its effective cost per journey.

Some scope for adjusting capacity to match demand

A further approach to optimising costs is to match the size of the vehicle to demand. At some European airports, airlines operate aircraft with as many as 500 seats and as few as 20. Coach operators also vary capacity by adding duplicate or multiple coaches. In contrast, most night trains appear to operate mainly as fixed formations. Trafikverket

[33] At present, all passengers and baggage are subject to security checks before entering the Channel Tunnel, if necessary by making them leave the train at Lille (in France) and returning to it after a security check. The International Railway Journal (IRJ) reported in September 2014 that the security checks would require a 1 hour 43 minute stop for Eurostar passengers from Marseilles (in France) to London, although we have not

reported that the actual composition of the train on each out-and-back trip can be varied to reflect expected demand. This may save some fuel, maintenance and crew costs, but does not save the fixed costs of owning a fleet and keeping it serviceable.

Some scope for better marketing

Many of the operators have easy-to-find websites, up-to-date databases of regular customers (for example, almost half of the United Kingdom's Caledonian Sleeper customers have a Railcard, which is often linked to their email address) and active accounts on social media such as Twitter and Facebook. This means that regular, past or likely future customers can be contacted and informed of products, offers or promotions.

In contrast, interviewees pointed out that it is relatively difficult to market the concept of night train use to some potential users, such as visitors from another continent, who may only be aware of night trains through travel magazines or websites, or websites for package and inclusive tour operators. In addition, their experience or expectations of night trains, or even of rail travel, may be limited or misinformed, and it may be difficult to persuade them to try an unfamiliar product. We discuss the role of the private tourism industry in Section 6.5 below.

Considerable scope for reducing or optimising costs

A wide range of techniques are available for reducing costs. For example, Germany's DB City Night Line had removed most of its catering provision before the services were withdrawn in December 2016. However, much larger cost savings have been possible in other areas:

- All the night train services we examine in the Annexes connect several destinations with a single train, minimising the over-provision of capacity and making effective use of locomotive, driver and infrastructure capacity. However, splitting and joining trains to serve points on two or more rail routes adds a need to marshal trains and to provide additional locomotives and crew.
- Since the closure of City Night Line in December 2016, Germany's DB has operated overnight services with day stock, eliminating the need for a dedicated fleet and for many of the higher costs set out in Table 8 in Section 4.1.

Operators who provide services following a competitive tender, such as Sweden's SJ Norrlandståg and the United Kingdom's Serco Caledonian Sleepers, would have strong incentives to find the most cost-effective means of meeting the procuring authorities' requirements. We also note, however, that airlines and coach operators continue to improve both their product and their efficiency.

Considerable scope for focusing on core or dense markets

A common business improvement technique is to review the range of products offered by a company and to focus on the ones which are most profitable, such as those in dense markets which can be operated most efficiently. Many of the night train operators have done this by consolidating services. Austria's ÖBB Nightjet, for example, has focused on a core network radiating from Vienna but also operating long distances within Germany, where it links Hamburg in the north with Freiburg, Munich and Passau in the south. ÖBB suggested that the configuration of its network, and the closure of some of DB City Night

confirmed the actual duration of the stop. Unless equivalent checks were carried out in Madrid before departure, passengers on a VLDNT to London might have to leave the train at Lille for security checks.

Line's less financially viable services, contributed to its decision to operate services which Germany's DB would not.

Considerable scope for moving downmarket

Airlines and coach operators have successfully introduced a "downmarket" overnight product merely by using their normal ("day") vehicles overnight, providing only basic seated accommodation. The same approach is open to train operators: since closing City Night Line in December 2016, Germany's DB has expanded other overnight services operated with day stock. However, that approach means withdrawing and replacing night trains as they have been defined for the purposes of this study.

Considerable scope for moving upmarket

Airlines offer more upmarket products, particularly on long haul services, where Business and First Class cabins now often offer flat beds and, on at least one airline, the option of a shower. Coach operators have in the past tended to focus on basic accommodation, but coaches with flat beds are now operated in the United Kingdom, and some coaches in Japan have individual compartments (please see Annex M on case studies outside Europe).

Some night train operators appear also to be moving upmarket, with increasing provision of en-suite facilities, which are often among the first accommodation to be booked. However, and as illustrated in Figure 1 and Figure 2 in Section 1.2, quality improvements requiring more space per passenger mean that operating costs must be recovered from a smaller number of passengers per vehicle.

One possible scenario for the future is that a limited number of night trains continue to operate with a relatively upmarket product. What is not yet clear, however, is whether these will primarily be a transport service, as is still the case with trains between Moscow and Saint Petersburg in Russia, or a tourist experience, as in Canada and Australia.

Considerable scope for market segmentation with multiple classes of travel

A standard business technique is to offer passengers a wide range of products, with different quality and prices, allowing them to decide what they are willing to pay. Night train operators already offer a wide range of products:

- In France, SNCF Intercités de Nuit has seats and couchettes and can offer three different products (please see Annex H on Intercités de Nuit in France).
- In the United Kingdom, The Caledonian Sleeper has seats and sleeping compartments and can also currently offer three products. This range will grow when stock with ensuites is introduced, which is expected to be in 2018 (please see Annex E on The Caledonian Sleeper in the United Kingdom).
- In Austria, ÖBB Nightjet has four types of accommodation and offers nine different products, more than a long-haul airline and comparable with the range on a cruise ship (please see Annex C on ÖBB Nightjet in Austria).

In this area, at least, night train operators offer a much wider range than their competitors.

Considerable scope for yield management

A related business technique is yield management, the process of reserving capacity for those who will pay the most for it, which for night trains can take a number of forms:

- They can adjust the relative price of single and multi-occupancy fares to ensure that the eventual combination of occupants of each compartment is the one that would pay the highest price. For example, at busy times it may be best to sell three berths, while at quieter times it may be best to sell the sole occupant a premium fare for a guarantee of exclusive use of a compartment.
- They can raise prices as bookings are made, to make sure that space is always left for last-minute bookings, which are often by business travellers who are not price-sensitive.

Many night train operators are using active yield management, with prices for last-minute travel being higher. However, two operators told us that their most expensive accommodation tends to sell out first, which suggests that it may be relatively underpriced. There was little variation in the fares for Poland's PKP and Spain's Renfe Trenhotel, and none for Romania's CFR Călători, where fixed fares were quoted.

Some Member State railways have little discretion either to introduce new classes of travel or to introduce yield management. This may be a major competitive disadvantage, particularly where liberalised coach services are free to exploit these techniques. On some routes in the United Kingdom, for example, the only charge for coach travel booked sufficiently far in advance was a booking fee of less than €1.

Problems may arise where night trains are provided jointly by two or more operators, each of which is allocated, and sold, blocks of tickets independently through their ticket offices. This can result in a train being reported as full through some sales channels while spaces are still available, and seats remaining unsold despite demand. Austria's ÖBB and the United Kingdom's Serco Caledonian Sleepers told us that an important part of their sales approach was to make maximum use of their own website as a sales channel.

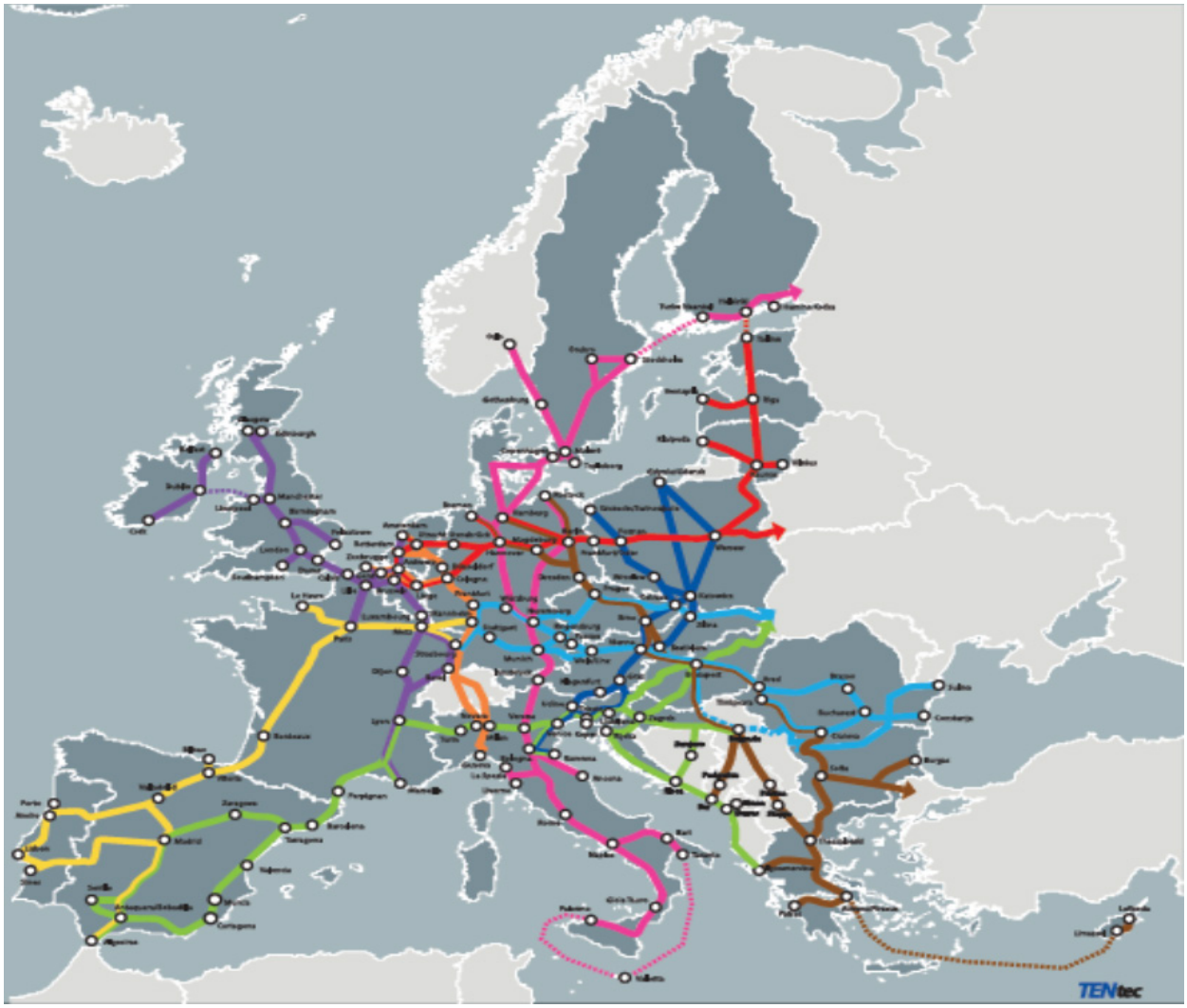
6.4. The role of the European core networks

We considered whether passenger night trains could be linked with the European core networks. Figure 11 shows Austria's ÖBB Nightjet network, Figure 12 shows the TEN-T core network corridors and Figure 13 repeats, for comparison, Figure 5 in Section 2.4, which shows our summary of night train regulation across Europe.

Figure 11: ÖBB Nightjet: network (2017)

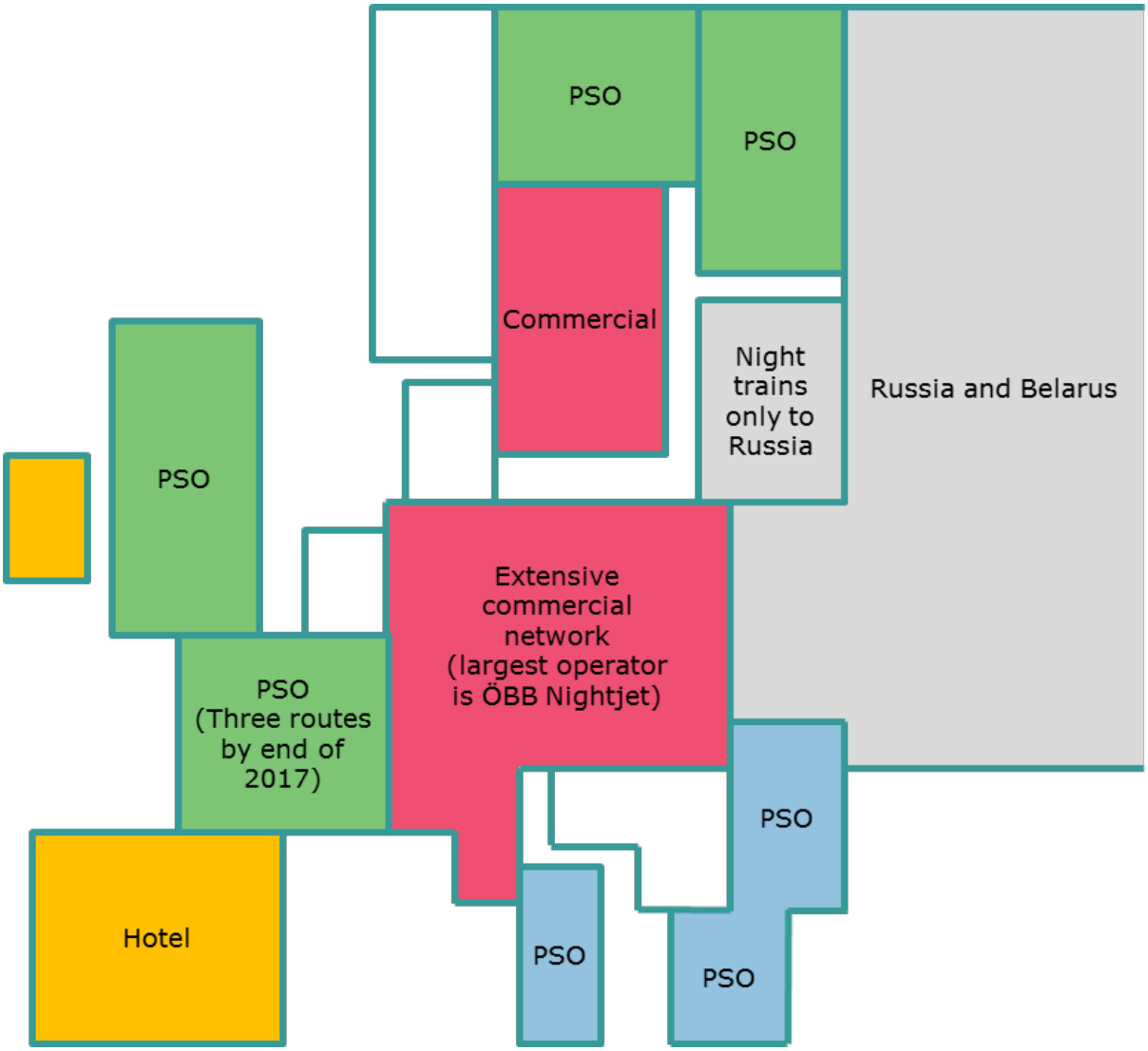
Source: ÖBB Nightjet.

Figure 12: TEN-T core network corridors



Source: European Commission.

Figure 13: Night train regulation across Europe (2016)



Source: European Rail Timetable, operator timetables, Steer Davies Gleave analysis.
Note: Please see Table 6 in Section 2.4 for key and text for details.

At first sight there is some similarity between the three diagrams, which suggest that Austria's ÖBB Nightjet network, and our own simplified diagram of where night trains operate commercially, coincide with the TEN-T core network corridors. TEN-T core network corridors also carry SJ Nattåg's commercial night train between Malmo and Stockholm in Sweden, and the United Kingdom's PSC Caledonian Sleeper between London and Scotland.

In practice, however, the relationship between night trains and the TEN-T core network corridors appears more complex, for a number of reasons.

First, while there is some similarity between the diagrams, it is not clear how far ÖBB Nightjet's services operate on the TEN-T core network corridors, particularly when the night trains need to call at specific passenger stations. However, the TEN-T core network corridors may support the practical viability (please see Section 4.6) of the operation of ÖBB Nightjet services on other lines, for example if they carry freight trains which would otherwise have constrained ÖBB Nightjet's services.

Second, as we pointed out in Section 6.3, three major new cross-border TEN-T links, the Oresund bridge (between Denmark and Sweden), the Channel Tunnel (between France and

the United Kingdom), and the Perpignan-Figueres link (between France and Spain), carry no night train services.

Third, TEN-T core network corridors within France and Spain are mainly on high-speed lines, which appear to have contributed to the decline of domestic night train networks.

Fourth, in Eastern Europe, where most night trains appear to be operated as part of a national PSO, TEN-T links do not offer particularly high operating speeds. The resulting long journey times on day trains may be a major contributor to the continued provision of night trains in Member States such as Romania. This suggests that improvements to the TEN-T core network corridors which allow higher speeds may weaken the case for the operation of night trains.

Other developments in infrastructure on, or parallel to, the TEN-T core networks may further marginalise night trains:

- From 2026, in the United Kingdom, the planned HS2 high-speed line will reduce the demand for night trains between London, Edinburgh and Glasgow.
- From 2029, between Denmark and Germany, the Fehmarn Belt crossing will allow rail journeys between Malmo (and Copenhagen) and Berlin in around 5-6 hours, undermining the current Berlin Night Express night train, operating by Snälltåget, which uses a ferry to connect Malmo and Berlin[34].
- From 2035, in Sweden, a high-speed line between Stockholm and Malmo would reduce the demand for night trains between those two cities.

On balance, it appears that capacity on the TEN-T core network corridors may be used by, or contribute to, the operation of some night trains, particularly in central Europe. However:

- New international TEN-T links do not appear to result in new night train services.
- Improvements to TEN-T core network corridors, particularly if they result in faster or more frequent day trains, may result in further contraction of the area in which night trains can be operated on a commercial basis.

6.5. The role of the private tourism industry

We considered the role that the private tourism industry could play in supporting the night train sector.

Private sector operation of night trains

A number of the night train operators examined in our case studies subcontract at least some of their activities to the private sector, particularly in "hotel" activities such as catering, cleaning, train preparation, bed-making and laundry.

One way in which the private sector could extend its role in the night train sector is to operate night trains itself. For example, the hotel and leisure company Belmond operates a number of luxury trains within the EU, of which the Venice Simplon-Orient-Express and the Grand Hibernian offer overnight accommodation. However, both are designed, priced and marketed primarily as luxury tourism experiences, rather than as a transport service.

In principle, the private sector could also operate conventional night trains, particularly where national railway operators have withdrawn from the market. However, no operators

have replaced the services closed in Germany that have not been taken over by Austria's ÖBB (please see Annex B on DB City Night Line in Germany and Annex C on ÖBB Nightjet in Austria), or accepted the French government's invitation to take over the services closed in France (please see Annex H on Intercités de Nuit in France).

A number of open access rail operators have also introduced low-cost day rail services using rolling stock with a high seating density. Ouigo, a subsidiary of France's SNCF, provides low fare high-speed day services between Marne-la-Vallée, near Paris, and other stations in France. Izy, a subsidiary of Franco-Belgian Thalys, provides a low-fare conventional speed service between Brussels and Paris. It would, in theory, appear possible for the private sector to introduce low-cost night trains, perhaps using only couchette stock, or even the "dormitory" style stock used in China (please see Figure 74 in Annex M on case studies outside Europe). However, to be commercially viable, such services would need to attract sufficient passengers, all willing to travel in basic accommodation, to cover their costs, including the costs of the rolling stock.

Other private sector involvement

The private sector could in principle become involved in the night trains sector by a number of other means, such as:

- publicising night train services, in some cases in exchange for an advertising fee;
- acting as a sales channel for night train operators in exchange for commission; or
- "packaging" night trains with other activities as part of a tour, again in exchange for commission, paid by the operator, or a premium paid by the customer.

Publicising night train services

A number of websites publicise night train services. For example Interrail, Eurail and Seat 61 all provide information on night trains and links to the operators' websites[35]. We have not examined their business model, but like many search websites they may be paid a small fee for each "click" on their links to operator websites, whether or not this leads to a sale.

Acting as a sales channel

An alternative approach is to act as a sales channel for night trains by providing a booking facility in exchange for a commission. However, our research found that it can be difficult to book night trains even with well-established railway websites:

- In Greece, we could not readily determine from TrainOSE's website whether the advertised night trains were operating.
- In France, searches on SNCF's website for late-night journeys between Paris and Latour-de-Carol, one of the three remaining night train routes, did not show the night train.
- In the United Kingdom, the industry's National Rail website and the popular "Train Times" and "Trainline" apps all show The Caledonian Sleeper's services. However, National Rail and "Trainline", which also provide fares information, only show fares for seated accommodation. In contrast, The Caledonian Sleeper website offers more

[34] Contracts with Femern AS were signed May 2016 (World Highways), and the link could open in 2029 (Die Welt).

[35] The first three Google hits for "night trains Europe" are Interrail, Eurail, and Seat61, all of which have collated information on night train services and timetables (Google search on 3 February 2017).

information and enhanced functionality directly relevant to its point-to-point sleeper services (please see Figure 34 in Annex E on The Caledonian Sleeper in the United Kingdom).

In Germany, in contrast, DB's website showed, and offered us prices for, all nine types of accommodation on ÖBB Nightjet's service between Hamburg and either Passau, in Germany, or Vienna in Austria, in any of eight languages[36]. This demonstrates that the functionality to deal with the range of accommodation on night trains can be included in external websites, but providers of such sites cannot be forced to include it.

One factor which may have contributed to the limited facilities for booking night trains is that there has been no standardisation of the types of accommodation offered[37]. This means that any business wishing to sell accommodation on night trains must have software capable, as a minimum, of listing the names, availability and prices of all types of accommodation offered by each provider. As we noted above, even the United Kingdom's National Rail website does not have the functionality to sell anything other than seated accommodation. This suggests that it may be difficult for the private sector to act as a sales channel for night train operators.

Three night trains in Europe are among Lonely Planet's ten "Super Sleeper Trains"[38]: Italy's Trenitalia night train from Rome to Syracuse, Russia's RZD's Nice to Moscow service, and the United Kingdom's Caledonian Sleeper from London to Fort William. In contrast, SNCF's remaining night trains in France do not have an established reputation or proposition as a tourism experience, and SNCF would find it much more important to market its large and famous TGV network. For the operator, the costs of maintaining links with tour operators become increasingly disproportionate in relation to the volume of services offered.

Packaging night trains with other activities

A third approach for the private sector is to act as a travel agency or travel planner and to "package" night trains with other activities as part of a tour. Travel agents may offer "pre-packaged" tours including night train accommodation, or suggest a night train as a component of a package custom-designed for a client. However, unless the night train is seen as part of the objective of the tour, as may be the case with some luxury trains, tourists may not be visiting two points connected by a night train, and may not wish to use the night train if they do.

A further difficulty is that many tourists do not now visit a travel agent to buy or create a package, but instead book their own flights, hotels, hire cars and other elements of their tour directly with the providers. If they are not aware of night trains, they may not see or look for information on them[39]. In addition, as we showed above, even if they look for information on night trains, they may not find anything.

Informing potential customers of the night train product

Relatively little information is available on the users of night trains, or the extent to which their travel is tourism-related or booked in conjunction with their other travel. However, both Sweden's Trafikverket and the United Kingdom's Transport Scotland cited tourism,

[36] DB's website functions in Czech, Danish, Dutch, English, French, German, Italian and Spanish.

[37] In contrast, the global aviation industry operates with four standardised types of accommodation, First, Business, Premium Economy and Economy, all of which can be searched and booked via many sales channels.

[38] Lonely Planet, October 2015. We discuss in Annex F on Intercity Notte in Italy how Trenitalia's night train from Rome to Syracuse is under review and may be consolidated with another service later in 2017.

[39] In practice, we are aware of visitors to Europe who expect that all interurban travel is by air and do not even consider rail as a means of travelling between cities.

and the resulting economic activity, as a major reason for retaining subsidised night trains. Trafikverket had also received comments from interested parties that "The interaction between the operator and the tourism industry has flaws"[40].

DG MOVE told us that they receive correspondence about passenger night trains from citizens. Some noticed that cross-border night services have been disappearing. Others reported difficulties in buying international or through tickets, or inconsistencies in pricing, the availability of discounts, or other functionality between different sales channels. In principle, however, the TAP-TSI[41] should result in a step change in data sharing, opening up the possibility of significantly improved offerings in journey planning and ticket retailing.

We discussed with the United Kingdom's Serco Caledonian Sleepers the practicalities of working with the tourism industry to market a night train service to tourists who were not familiar with it, and in particular to visitors from outside Europe who might use it to travel between centres on a long holiday. We were told that it is difficult to identify and target potential passengers directly. Adding either marketing outlets or sales channels can only be justified if the additional revenue earned exceeds the additional costs[42].

A wider issue is how night train operators can provide incentives for private sector parties working in areas such as travel planning or tourism to market their services. The decline in the night train sector reduces the effectiveness of inclusion of night trains in marketing material produced either by national or regional tourist authorities or by organisers of package tours.

6.6. The scope for survival in the longer term

The principal criteria for the survival of night trains in the long term, whether or not based on detailed financial, economic, social and environmental appraisal, will be either:

- the commercial decisions of the operator's management to operate night trains; or
- the administrative decisions of one or more competent authorities to fund night trains, whether as a specific service or as part of a larger service package or national timetable.

For international night trains, the principal criteria will either be the commercial judgement of the railway undertaking's management and shareholders, particularly in the case of Austria's ÖBB Nightjet and Russia's RZD, or the agreements (which may not be formal contracts) between railway undertakings on where they will continue to cooperate to provide services.

A number of dates may be critical in the future of night train services:

- In 2020, in Sweden, the commitment to operate night trains to Norrland and Narvik ends, and the provision of the service will probably be reassessed.

[40] "Samverkan mellan operatör och besöksnäringen har brister". However, Trafikverket does not identify which parties made these remarks, or provide any detail which explains or supports them.

[41] Telematics Applications for Passenger Services Technical Specifications for Interoperability (TAP TSI) entered into force on 13 May 2011 as the Commission Regulation (EU) No 454/2011. Its purpose is to define Europe-wide procedures and interfaces between all types of railway industry actors (passengers, railway undertakings, infrastructure managers, station managers, public transport authorities, ticket vendors and tour operators).

[42] Uniquely in Europe, Serco Caledonian Sleepers won a Public Service Contract (PSC) to operate night train services in competition with other operators, all of which would be required to submit a Marketing Plan as part of their bid. Serco Caledonian Sleepers' choice of marketing outlets or sales channels is almost certainly based on its detailed analysis, for its Marketing Plan, of whether this would be commercially beneficial.

- In 2021, in Italy, rolling stock operated through tunnels will have to comply with updated fire safety regulations (National Decree 28/10/2005), which will require fire extinguisher systems, which means that additional expenditure will be required.
- In 2026, in the United Kingdom, HS2 may reduce journey times between London and Scotland, with further journey time reductions from 2033, potentially undermining the case for the subsidised night train service.
- In 2029, the Fehmarn Belt crossing will allow rail journeys between Malmo (Sweden) and/or Copenhagen (Denmark) and Berlin (Germany) in around 5-6 hours, undermining the current Berlin Night Express night train using a ferry to connect Malmo and Berlin.
- In 2030, in Sweden, potentially, a "Norrbotniabanan" (North Bothnia Line) high-speed line could be built (please see Annex D on SJ Nattåg in Sweden), which would reduce day train journey times between Stockholm and Luleå, potentially undermining the case for the subsidised night train service.
- In 2035, in Sweden, potentially, a high-speed line could be built between Stockholm and Malmo, potentially undermining the case for the commercial night train service.

However, the timing, or the impacts of, a number of other changes are harder to predict:

- Other than in Sweden, the United Kingdom and Italy, we have not identified the end dates of current PSOs which include night trains.
- The effects of liberalisation of domestic coach services in Germany, Italy and France are continuing to emerge, and the European Commission is considering further liberalisation which would include Member States such as Austria.
- The liberalisation of domestic rail services, through the Fourth Railway Package, may result in more competition between, and lower fares on, day trains, as has already happened in Italy. This may attract passengers from night trains, or make it harder to cross-subsidise night trains with the profits from day trains.

A number of services appear likely to continue to operate until the end of the effective life of their rolling stock, which varies considerably. In Sweden, much of the stock is already old. In contrast, Austria's ÖBB has acquired some relatively new stock from DB City Night Line, and the United Kingdom's Caledonian Sleeper is about to acquire a new fleet.

Once existing rolling stock becomes either unattractive to passengers, or uneconomic to operate, or cannot be made compliant with new technical requirements, it is not clear where and when it will be possible to make a case to replace it.

On the evidence of the development of the market, the factors most likely to hinder the survival of night train services include:

- Further investment in infrastructure and rolling stock would allow day train services to be faster, or more frequent, or to operate over a longer working day including, potentially, overnight as a lower cost alternative to night trains.
- Further growth in the liberalised long-distance coach market could also offer a wide range of overnight travel.

The factors most likely to support the survival of night trains are if a wider range of Member States agree that:

- infrastructure charges should be set at a lower level; or
- night trains should be subject to a PSO on account of their economic, social or environmental benefits.

6.7. The consequences of withdrawal

The evidence of the last five years suggests a number of consequences when night trains are withdrawn.

From the perspective of passengers:

- A proportion of night train passengers would change their time of travel and use day trains.
- Expanded and liberalised coach services would increase their capacity to offer at least basic and low-cost overnight travel, potentially with a wider range of point-to-point services than the remaining night trains.
- Airlines would find it more profitable to serve high value business travellers, if necessary using relatively small aircraft, subject mainly to the availability of slots at any congested airports.
- Some passengers would drive or not travel.

This suggests that the passengers who would lose most would be those who currently use "middle-quality" accommodation on night trains (couchettes or shared sleeping compartments without en-suite facilities) who would have to decide whether to trade down (to coach) or up (to air travel), to travel by car or taxi, or not to travel.

From the perspective of competent authorities, it might be necessary to specify and procure some additional late evening and early morning services to cater for travel which would not be catered for on a commercial basis.

We discuss the evidence for the net environmental and employment impacts of withdrawal of all night trains in Chapter 7.

7. THE CASE FOR SUBSIDISING NIGHT TRAINS

KEY FINDINGS

- Night trains create employment but require many staff to work at night and to spend two successive nights away from home. Night trains attract passengers from other modes, but many of these passengers might otherwise have used day trains operated at lower cost.
- The carbon footprint of night train passengers may be similar to the carbon footprint of coach passengers, but is higher than the carbon footprint of day train passengers.
- Unlike day travel, including most intra-EU flights, night trains create noise throughout the night, but in practice this appears to lead to few complaints.
- While different modes of transport have different cost structures and are taxed differently, this cannot be shown to result in unfair competition between modes. Many Member States choose not to use their powers to protect Public Service Obligation (PSO) rail services from competition.
- Night trains specified in a PSO have been competitively procured on a number of occasions, either as a distinct service or as part of a wider packages of services.

7.1. Night trains and employment

Night trains may affect the job market through two principal mechanisms:

- the provision of employment within the railway or in subcontractors; and
- the facilitation of employment through the provision of connections which link employees to employment or, more widely, lead to growth and trade.

Either or both of these impacts might be a rationale for intervention through subsidy.

Night trains create employment directly but may require considerably more staff-hours per passenger-space-kilometre than equivalent day trains. This suggests that if night trains were withdrawn and the equivalent capacity were provided by day trains, there could be a considerable reduction in overall employment in the railway. A secondary consideration, however, is the employment created in other modes competing with night train operators, including airlines and coach operators.

Austria's ÖBB Nightjet carried around 1 million passengers in 2016 and has around 800 direct and subcontracted employees (please see Annex C on ÖBB Nightjet in Austria). Sweden's SJ Norrlandståg carried around 400,000 passengers in 2013 on the Norrland and Narvik night trains, and Trafikverket told us that it has around 200 employees (please see Annex D on SJ Nattåg in Sweden). While this may not be typical of night train operations, it corresponds to one employee for every 1,250-2,000 passengers per year.

Despite the high levels of on-board staff on night trains, day and night coaches may be more labour-intensive, not least because a separate driver is needed for each coach. Studies for the European Commission have estimated that, on long-distance coach operations, there may be one employee for every 300-2,500 passengers per year[43]. While

[43] A study of the EU coach market for the Commission obtained estimates of both passenger-kilometres and employment in the coach sector. Only limited data were available, and the apparent productivity in different Member States varied, with the result that it appeared that an additional employee was required for every 0.2-1.5 million passenger-kilometres per year. If converted to passengers per day making (illustratively) a 600-kilometre journey, this corresponds to one employee for every 300-2,500 passengers per year.

this is a wide range, it suggests that, for a given number of passengers, the coach sector may create at least as much employment as, and possibly much more employment than, the night train sector.

On airlines, Massachusetts Institute of Technology (MIT) publishes data on airlines in the USA including available seat-miles per employee, which rose from 1.9 million in 1995 to 2.75 million in 2015. At a typical 70% load factor, this corresponds to 3 million passenger-kilometres per employee, or the equivalent of 5,000 passengers per year making a 600-kilometre journey. This suggests that, for a given number of passengers, the airline sector may create less than half as much employment than the night train sector.

In summary, compared to the night trains sector, the coach sector may create similar or more employment, and the airline sector may create less employment, for a given volume of passenger travel.

The second linkage between night trains and employment is the extent to which they help to connect businesses with their staff or their customers. It would not be possible to commute on a daily basis on a night train, but they may extend the ease with which it is possible to spend a working week in one city and a weekend at home in another. The United Kingdom's Transport Scotland confirmed that a number of The Caledonian Sleeper passengers commute between work in London, typically from Monday to Thursday, and home in Scotland.

A wider issue is the extent to which night trains facilitate business travel, particularly for regular journeys between suppliers, employers or customers in different locations. However, most interviewees said that business travel is a declining component of their market. A possible conclusion is that air travel and hotels have become readily affordable to most business travellers, and that those who continue to use night trains do so mainly because of their relative convenience for a specific journey, as we illustrate in the case study of ÖBB Nightjet (please see Annex C on ÖBB Nightjet in Austria).

Night trains may also provide a particularly useful link in States with distinct administrative and commercial centres. This appears to be the case in Kazakhstan (the capital is Astana but the main commercial centre is Almaty), Russia (where there is a large market for travel between Moscow and Saint Petersburg) and, to a lesser extent, Sweden (Malmo and Stockholm) and the United Kingdom (Edinburgh/Glasgow and London).

7.2. Night trains and modal shift

The clearest evidence we have found of the shift between night trains and other modes is studies by Sweden's Trafikverket of passengers on the night trains to Norrland and Narvik, which we summarised earlier in Figure 9 in Section 4.4. We stress, however, that Figure 9 is based on passenger statements on how they would have travelled under other circumstances, rather than evidence of actual behaviour. In addition, passengers in the Norrland and Narvik markets may not be typical of passengers elsewhere. The proportion of passengers who would change to air, bus or coach travel, for example, might be highly dependent on what air, bus and coach alternatives exist.

7.3. Night trains and the environment

A number of documents we reviewed commented on the relative environmental performance of different modes, although we found insufficient detailed source data to enable a direct comparison of the average carbon emissions per passenger on any given route. Table 17 below summarises a range of literature we found on environmental impacts.

Table 17: Literature on comparative emissions from night trains and other modes

Date	Source	Data presented
2009	The Guardian	Examples of direct emissions in CO_2 per passenger-kilometre: • 74g from diesel trains on the West Coast Main Line • 60g from The Caledonian Sleeper • 27g from electrified trains on the West Coast Main Line • 24g from Eurostar London to Brussels • 11g from Eurostar London to Paris
2009	New Scientist	Studies of "full life cycle" emissions in the USA taking into account infrastructure and vehicles' embedded emissions and total use over their lifetimes. Uplifts on direct emissions to allow for embedded emissions: • 50% for rail • 30% for car • 10-20% for air Emissions vary 8-fold with variations in occupancy or load factor.
Undated	UIC and DB	Average emissions of CO_2 per passenger-kilometre: • 190-215g for aircraft • 15-45g for rail Between Valence and Marseilles, full life cycle emissions of air are 15 times those of high-speed rail (although in practice we have found no evidence of flights between Valence to Marseilles). On specific routes between cities: • 39.3g (day trains) and 46.9g (night trains), Berlin to Munich • 5.1g (day trains) and 6.1g (night trains), Paris to Toulouse Overall emissions per passenger-kilometre from night trains are estimated to be 20% worse than day trains, possibly because of the lower number of passengers per metre of vehicle.
Undated	Trenitalia	Average emissions of CO_2 per passenger-kilometre: • 180g for air transport • 85g for "road transport", understood to be car • 30g for night trains • 24g for day trains on the same route
2016	Trafikverket	600g of CO_2 per vehicle-kilometre by a bus on rural roads. 180g of CO_2 per vehicle-kilometre by a car on rural roads. Estimates of emissions of hydrocarbons, NO_x and particulates were also included.

Source: as indicated.
Note: we have not independently verified any of these estimates.

In practice, the range of estimates varies widely, and an explicit comparison of night trains with non-rail modes serving the same market is only made in two of the sources (Trenitalia and UIC). Nonetheless, we comment below on two elements of CO_2 emissions associated with a journey:

- the direct emissions, through burning of carbon-based fuel en route; and
- the embedded emissions associated with manufacturing vehicles.

Direct emissions

The variability of the estimates of emissions from different sources illustrates the difficulty of comparing different modes and suggests that, in practice, a number of factors need to be taken into account.

First, what is the energy source of night trains? In France, this may be predominantly electricity from nuclear power. In Sweden, it may be predominantly electricity from renewable sources. Within much of Scotland, it is currently diesel fuel, although this may change in the future.

Second, at what load factor does each mode operate, and how much space does each passenger occupy in practice? We set out in Figure 2 in Section 1.2 how the effective passenger spaces per vehicle on the stock used by DB varied from 76 on day stock to as low as 10.5 on night stock, a variation of over 7 to 1. In contrast, long-haul airline First Class seats typically occupy as much space as 5 or 6 economy seats.

Third, if night trains were not available, what other modes, if any, would passengers use instead? As already discussed, 41% of night train passengers in Sweden reported that they would change to another train (see Figure 9 in Section 4.4), which the reference in the UIC and DB study suggested might have lower emissions. In Sweden, 24% of night train passengers also reported that they would switch to air. In Austria, in contrast, air may not be an effective competitor on the routes served by ÖBB Nightjet, as we show in Figure 19 and Figure 20 in Annex C on ÖBB Nightjet in Austria.

We also note that Trafikverket estimates that the emissions from a bus, or coach, operating on rural roads, are 600g of CO_2 per vehicle-kilometre. This compares with estimates of night train CO_2 per passenger-kilometre of zero in Sweden, 6.1g in France and 39.3g in Germany, suggesting that to have lower per-passenger emissions than a night train, a French coach would need to carry an unachievable 100 passengers, but a German coach would need to carry only 15.

Embedded emissions

A second component of full life-cycle emissions is the energy embedded in the transport infrastructure and vehicles. Night train rolling stock may perform relatively poorly on this measure, because of the large space per passenger and the low daily or annual utilisation. However, this may be partially offset by the resulting longer vehicle life. We noted in Section 4.4 that rolling stock accounting lives rarely exceed 30 years, but some night train stock has been kept in service for up to 50 years.

Summary

We have not examined emissions such as hydrocarbons, NOx and particulates, but have found that the environmental merits of night trains may vary widely with their own power source and load factor, and the efficiency of the alternatives which passengers would use in their absence. In Sweden without night trains, many passengers would switch to day trains,

which appear to have lower emissions, or coach, which may have lower emissions, or not travel, rather than use air or car. In Austria, our analysis of the ÖBB Nightjet network suggests that air does not offer attractive times to many of the destinations served by night trains, which may strengthen the competitive position of the night trains.

With existing technologies, there is scope for both night and day trains to become largely emission-free over time. Until this happens, however, day trains may always have lower emissions and embedded carbon per passenger space than night trains.

The evidence and analysis above suggests that night trains may have lower emissions than air and car, similar emissions to coach, and worse emissions than day trains. Policy measures to deter the use of fossil fuels are therefore likely to favour night and day trains at the expense of other modes. However, unless both the construction of the railway vehicles and the motive power of the trains is provided from wholly renewable sources, night trains are likely to result in higher emissions per passenger than day trains operating on the same route.

7.4. Night trains and noise

In principle, any passengers transferring to night trains from other modes may contribute to a reduction in the noise generated by those modes, but the effect of a few thousand passengers per night across all of Europe is too small to be detectable.

Many airports have restrictions on night operations to reduce noise. However, night flights are typically either long-haul flights constrained by crossing time zones to arrive at antisocial times[44], or freight flights, including "hub and spoke" operations for overnight parcels[45]. In contrast, the intra-European flights with which night trains compete are timed for the convenience of passengers in Europe and do not normally arrive or depart at night.

Unlike intra-European flights, most intra-European night trains make multiple stops en route, at all times of night, in stations which will often be in an urban area or have housing nearby. There is, therefore, considerable potential for night trains to be seen as a source of noise pollution.

Interviewees in the United Kingdom mentioned that there had been a single complaint about noise from diesel engines operating in the centre of Edinburgh in the middle of the night, but one reported that the smaller communities affected by noise from the night train appeared to accept it as a price to be paid for having access to the service. No other interviewee mentioned any issue of noise. Sweden's Trafikverket pointed out that noise from freight trains attracted more complaints.

We conclude that the overall effect of night trains on noise pollution may in principle be adverse, but in practice seems to be accepted almost exclusively without complaint.

7.5. The treatment of different modes

It is difficult to evaluate whether the treatment of different modes is consistent, for a number of reasons.

[44] For example, there are five late night departures from Hong Kong to London Heathrow, at 23:10, 23:45, 23:55, 23:55 and 00:25, but the difference in local times mean that they are scheduled to arrive at 04:50, 05:30, 05:35, 05:40 and 06:20. The departure times are very late and the arrival times are very early.

[45] In "hub and spoke" systems, flights from various airports converge at a central airport, where passengers and/or freight may be exchanged, and then diverge back to the original airports. This means that each airport needs only one flight to be connected to every other airport, through at most one interchange.

First, and as we noted above in discussing emissions, the costs of a mode include the costs of construction, maintenance and operation of the infrastructure. Rail, road and air infrastructure is all used, in varying proportions, by passenger night services, passenger day services, and freight services. There is no agreed, and evidence-based, means of allocating the fixed costs of infrastructure, or any part of those costs not paid for by users, to particular passenger or freight services. This means that mark-ups permitted under Directive 2012/34/EU, which dominate the infrastructure charges paid by some operators, need not be related to, or based on, any analysis of the fixed costs of the infrastructure.

Sweden, the first Member State to separate rail infrastructure and operations, avoided the issue of cross-subsidy by setting charges for both rail and road modes based on marginal costs, and accepting that the balance of fixed costs would not be recovered from users. None of the other Member States has taken this approach, and all apply either mark-ups, or average cost pricing, to at least some modes.

Second, in the specific case of night trains, we set out in Section 4.1 a number of factors which complicate estimates of costs. In particular, rolling stock may be provided as a service, or leased, or owned and subject to depreciation, or owned and fully-depreciated, or even provided free by a competent authority. Under these circumstances, it is even more difficult to assess the extent of the "real" subsidies for passenger night trains.

Third, all efficient transport operators first commit, or contract, to operate a service, and then attempt, subject to any price regulation, to obtain the maximum possible revenue from it in a competitive market place. Increasing yield management of air, coach and rail services mean that there is no basis on which to say whether any individual passenger has been subsidised. For example, commercial airlines such as Ryanair may offer initial fares as low as €1[46]. In Italy, we found Intercity Notte fares from Rome to Bolzano varying from €13, which is almost certainly above short run marginal cost but below average cost, to €184, which may be above average cost (please see Annex F on Intercity Notte in Italy).

Fourth, taxation varies between modes, between Member States, and between domestic and international travel. For example, DB and Die Linke, a German political party, both state that it is inconsistent that international air travel is not subject to VAT but domestic rail travel in Germany is subject to VAT (please see Annex B on DB City Night Line in Germany). However, domestic rail travel is subject to VAT in some Member States, at different national rates, but not in others. It is not clear what consistency is appropriate or what tax rates should be changed to achieve it.

For all these reasons, even if a national, regional or local authority has provided funding for particular infrastructure or operations, it is rarely meaningful to assert which services, or passengers on them, have benefited from a subsidy.

7.6. Evidence of unfair competition

Several interviewees suggested that infrastructure charges for rail, which increase rapidly with distance, should be lower, as we discussed in detail in Section 4.5. None specifically mentioned unfair competition.

There is limited scope in European Law to protect night trains from competition from other modes:

- Aviation law does not provide for any limitation of air services to protect rail services.

[46] Ryanair reported in February 2017 that its average fares were €33 per passenger (This is money).

- Regulation (EC) No 1370/2007, on public passenger transport services by rail and by road, permits competent authorities to grant operators in receipt of a PSO an exclusive right to operate a service. In practice, many Member States choose to restrict or forbid the award of exclusive rights.
- Regulation (EC) No 1073/2009, on common rules for access to the international market for coach and bus services, permits competent authorities to object to authorisations for regular services picking up or setting down passengers in their territory. In practice, some Member States have stated that they will not object to any such authorisations.

This means that rail services cannot be protected from unfair competition from air services, and the extent to which competent authorities are permitted, or choose, to protect them from competition from other modes varies at national, regional or even local level.

7.7. Public Service Obligations and competitive tendering

Table 18 below lists the cases we have identified in which night trains have been operated following an open public tender.

Table 18: Tenders for privately operated night trains

Member State	Service	Contract period	Contract	Successful?
Sweden	Stockholm to Norrland	2002-2003	Night trains	✓
		2003-2008	Night trains	✓
		2008-2018	Night-trains	✓, only one bidder
United Kingdom	London to Scotland	1997-2004	Day and night trains	✓
		2004-2015	Day and night trains	✓
		2015-2030	Night-trains	✓
	London to South West	1996-2006	Day and night trains	✓
		2006-2019	Day and night trains	✓

Source: case studies and interviewees, Steer Davies Gleave analysis.

All eight examples relate to Sweden and the United Kingdom, which were early liberalisers of railway operations. In Sweden, the night trains have been tendered since 2002 as a self-contained contract, but in the United Kingdom it has only been since 2015 that The Caledonian Sleeper has operated as a dedicated night trains business. All the tender competitions have been successful, although:

- In Sweden, there was only one bidder for the most recent contract, from 2008 to 2018.
- In the United Kingdom, the contract for day and night services between London and the South West has been extended, in stages, from 2013, with an option for a further three years, to 2019. However, the extensions do not appear to relate to the night trains, which form only a small part of the business.

None of our interviewees identified any particular difficulties in operating a successful tender competition, although other studies of contracting for the provision of PSO rail services have identified a trend decline in the number of bidders for each contract.

8. CONCLUSIONS AND RECOMMENDATIONS

8.1. Conclusions

The provision of night train services

A number of night train services have closed over the period from 1980 to 2017. Shortly after their domestic long-distance coach markets were liberalised, Germany's DB closed its City Night Line services and the network of France's Intercités de Nuit was severely reduced.

In 2016, only 11 EU Member States had wholly domestic night train services (please see Figure 4 in Section 2.2) and 18 had stations called at by at least one international night train service (please see Table 5 in Section 2.2). Patterns of operation vary widely, but we estimate that on a typical midweek night in 2016 there were more than 20 wholly domestic night train services in Italy and Romania, but fewer than five in Austria, Croatia and Germany. All domestic night train services in Germany operated with dedicated stock ended in December 2016.

The overall pattern of night train services, which we summarised with some simplification in Figure 5 in Section 2.4, is that by the end of 2017:

- Central Europe will retain a number of services operated on a commercial basis, mainly on Austria's ÖBB Nightjet network (which currently extends to eight other Member States and Switzerland) and in southern Sweden.
- Western Europe will have limited night trains, with tourist-focused "hotel trains" in Spain, Portugal and Ireland, a number of subsidised services in the United Kingdom, three remaining subsidised services in France, and no services in the Benelux countries.
- Eastern Europe will have a large number of services, whether operated by Russia's RZD on the Russian broad gauge network or subsidised through Public Service Contracts (PSCs).

In Austria, operator ÖBB Nightjet has taken over some of Germany's DB City Night Line routes and plans to expand its network. ÖBB Nightjet appears to benefit from two major advantages:

- First, competition to ÖBB Nightjet is limited. Austria has no high-speed rail network, the coach market remains highly regulated (and the dominant coach operator is an ÖBB subsidiary), and many of the destinations served by ÖBB Nightjet from the new Vienna Hauptbahnhof (main station) have limited or poorly-timed air services. All these factors may contribute to the viability of the ÖBB Nightjet network.
- Second, as we illustrated in Figure 11 and Figure 12 in Section 6.4, ÖBB Nightjet's network appears to coincide with the densest part of the Trans-European Transport Network (TEN-T) network, which in turn coincides with a large number of cities in central Europe.

We note, however, that ÖBB Nightjet's viability might in principle be undermined by further liberalisation of coach services.

Business travel on night trains appears to be in decline, with most travel now being for leisure or tourism purposes. Passengers visiting friends and relatives often have access to accommodation at both ends of their journey and would obtain no saving in hotel costs by

travelling on a night train. The only passengers who will always save hotel costs are tourists away from their home base, such as those from another continent on a multi-centre holiday in Europe.

The viability of night trains

Costs per passenger space-kilometre appear likely to be higher for night trains than for day trains for a number of reasons. These include:

- higher unit capital cost of small fleets of special vehicles;
- higher space per passenger (which also affects energy consumption and, potentially, emissions);
- lower utilisation of the vehicles;
- higher operating costs resulting from night operations; and
- additional locomotives and shunting when services are split and joined.

Night train operations may also need to retain some skills or specialisms not required by other rail services.

Offsetting these higher costs, night trains command higher fares than the equivalent day services. We identified fares per single journey of up to €200 for late bookings in single-occupancy sleeping compartments.

The overall result is that some night trains appear to be commercially viable and others require continued subsidy, with apparent subsidies per passenger varying from €20 in Sweden to around €100 for services in France, most of which have now been withdrawn. However, judgement is required in assessing whether a service is viable, which is likely to depend on factors such as how many passengers would have travelled by train anyway, whether part of the service would have been required anyway, mark-ups to infrastructure charges, and the way in which the costs of rolling stock are estimated. Furthermore, services which appear to be commercially viable while operated with old or life-expired stock may not be able to afford to replace it with modern stock complying with current standards.

In some cases, however, night trains might appear more viable if infrastructure charges were reduced to the costs directly incurred as a result of operating them, which we estimate might be below €2 per train-kilometre for a typical night train.

Increasing competition

Night trains face increasing competition from air services. Airlines may continue existing services that compete with night trains, and may introduce new services to destinations not served by night trains.

Night trains face increasing competition from the network of coach services that emerged after recent international and domestic liberalisations and may still be growing. EU-wide liberalisation of domestic coach services could present a further threat to the remaining night train services, such as those operated by Austria's ÖBB Nightjet along its core east-west corridor[47].

[47] This corridor runs from the border with Hungary and Slovakia at Bratislava through Vienna, Linz, Salzburg and Innsbruck to the border with Switzerland and Liechtenstein at Feldkirch.

Loss of critical mass

Some DB City Night Line services in Germany have been taken over by Austria's ÖBB Nightjet, helping it to grow and expand but, as Figure 6 in Section 3.1 shows, night train operations in Sweden, the United Kingdom (and by implication in France and Spain) are now on a much smaller scale.

Small networks also mean loss of economies of scale when procuring new rolling stock, which is critical to the survival of any rail business. The remaining fleets will continue to age, but only small replacement fleets will be required. Poland's PKP has only 102 passenger night stock vehicles, Sweden's Trafikverket has only 73, and the United Kingdom's new Caledonian Sleeper fleet will consist of only 75 vehicles, of five different types. Given that many sleeper vehicles have working lives of up to 50 years, the EU-wide average annual requirement for new stock may be equivalent to only two trains, varying across a range of gauges and accommodation types.

The sector's scope to respond

Many night train services appear to be well-managed. Cross-border operations, and changes of locomotives and crew, are long-established. The past practice of allocating blocks of tickets to each railway for sale through stations is declining. Best practice appears to be:

- to offer a range of accommodation and the opportunity to pay more for exclusive use of a compartment;
- to use yield management to maximise revenue from the capacity available; and
- to offer all types of accommodation for sale through a single (multilingual) website.

However, some operators appear to offer only a small range of accommodation at fixed low fares, probably to meet an inflexible national PSO. In addition, many websites have not developed the functionality to sell all types of night train accommodation.

Member States could also require infrastructure managers to reduce infrastructure charges, or could provide subsidy to night trains in recognition of their benefits, as occurs in (at least) Austria, Sweden, the United Kingdom and France. However, parliamentary debates in 1983 (in the United Kingdom) and 2016 (in Germany) rejected the idea that any long-distance services should be subsidised.

We conclude that most night train operators appear to be doing what they can to respond, but that the financial performance of some operators could be improved by introducing, or optimising, modern yield management systems and sales websites. However, it may be difficult, or not cost-effective, to persuade private sector businesses to advertise or sell a small and fragmented range of night train services.

The case for subsidising night trains

The net effect of night trains on modal shift is not clear, and almost certainly depends on local circumstances, but Trafikverket's survey in Sweden (please see Figure 9 in Section 4.4) suggests that in their absence up to 40% of passengers might continue to travel on other trains.

The effects of having different taxes, subsidies and regulatory measures for each mode are unclear. It is not practicable to compare subsidy to passengers using different modes, or to demonstrate that there is unfair competition between modes. Regulation varies by mode, with the effect that rail services provided under a PSO can be protected from competition

from rail or coach services but not from air services. However, many Member States choose not to exercise their powers to protect PSO rail services.

8.2. Policy recommendations

Data gathering

Any policy initiatives to support night trains will need to be informed by a clear identification of the current status of the sector, a definition of a problem which is to be solved, development of policy options, and an impact assessment of potential policy interventions. Any or all of these steps would be better supported by the systematic collection of information on night trains, which could be collated by the Member States but would ultimately originate with the railway undertakings providing night train services.

We recommend considering the establishment of an EU-wide definition of night trains, possibly based on the definition we adopted for this study.

We recommend considering an extension of existing monitoring arrangements such as the Rail Market Monitoring Survey (RMMS) to collect key information on night train services. We envisage that, subject to any practical details, this should include some or all of the following:

- annual train-kilometres operated by night trains;
- annual space-kilometres operated by night trains, equivalent to the Available Seat Kilometres (ASKs) used to monitor airline capacity, ideally subdivided by types of accommodation such as day seat, couchette, and sleeping berth; and
- annual passenger-kilometres carried on night trains, equivalent to the Revenue Passenger Kilometres (RPKs) used to monitor airline usage, again ideally subdivided by types of accommodation.

We caution, however, that any such reporting system would need to have clear arrangements for the consistent reporting of passengers on international journeys, or on the services of more than one operator, and for ensuring continuity of reporting in circumstances such as the transfer of a service from one operator to another.

Directive on infrastructure charges

We summarised in Table 10 in Section 4.5 the elements of Directive 2012/34/EU dealing with infrastructure charges. Annex VI of this Directive lists a number of pairs of market segments "*to be considered by infrastructure managers when they define a list of market segments with a view to introducing mark-ups in the charging system*".

We recommend considering the addition of "day trains versus night trains" to this list.

We recommend considering a review of the framework for mark-ups to infrastructure charges. This should ensure that charges for night train services (and others) do 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*", for example by requiring that all charges are limited to this level.

We recommend reviewing the provision relating to congested infrastructure (Article 47 of Directive 2012/34/EU), and in particular to a capacity analysis and a capacity-enhancement

plan, to ensure that they are specifically required to take into account market segments including existing or potential night trains[48].

However, we note that the existence of either a capacity analysis or a capacity-enhancement plan does not in itself mean that either funding or planning permission for the identified enhancement will be made available, or that the capacity will become available sufficiently rapidly to be of use to the proposer of a new or expanded service.

Support to night train services

Regulation (EC) No 1370/2007 on public passenger transport services by rail and by road states that Public Service Contracts (PSCs) shall "*clearly define the public service obligations with which the public service operator is to comply, and the geographical areas concerned*". This is widely implemented through a contract to operate a specific timetable, with stock of specified type and capacity. However, other models exist which give operators more flexibility to offer competent authorities the maximum economic, social or environmental value for a given level of subsidy.

We recommend considering the provision of explicit guidance that PSOs can be designed to be flexible, and in particular that:

- One possible contracting model is for the competent authority to require the contractor to provide a certain minimum volume of service, potentially measured in terms of seat-kilometres per annum, with flexibility to reshape services to maximise revenues as a proxy for economic, social and environmental benefit. This would allow operators to vary services by time of week or year to reflect seasonality, or in the longer term to reflect changing patterns of demand. This model is used by Trafikverket for the Norrland and Narvik services in Sweden.
- Another possible contracting model is for the competent authority to offer the contractor a fixed compensation per passenger carried, or a percentage uplift on the passenger revenue, providing it incentives to maximise either volume or revenue without specifying a particular service or timetable. This model has been tested in the Netherlands but we understand that it is not currently used.

[48] Note, for example, that we have not examined the mechanisms by which existing, planned or potential night train services were taken into account in the planning of the Vienna Hauptbahnhof (main station).

ANNEX A: BIBLIOGRAPHY

We summarise below a list of references quoted in the Report or examined in our research, listing in turn: research and studies; press articles; legal documents; annual reports; and websites.

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Table 22: Annual reports

Sources
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Table 23: Principal websites used as sources

State	Link	Organisation
Austria	www.bahnkarten.at	Ruefa Bahn & Fährencenter
	www.helloe.com	ÖBB - Hellö
	www.nightjet.com	ÖBB - Nightjet
	www.oebb.at	ÖBB (national rail operator)
	www.schig.com	Schieneninfrastruktur-Dienstleistungsgesellschaft mbH (Rail infrastructure service company)
	www.wien-hauptbahnhof.oebb.at	ÖBB - Vienna Hauptbahnhof
Belgium, France, United Kingdom	www.eurostar.com	Eurostar (international rail operator)
Bulgaria	www.bdz.bg	BDZ (national rail operator)
Czech Republic	www.cd.cz	České Dráhy (national rail operator)
Denmark	www.femern.com	Femern A/S
France	www.arafer.fr	Autorité de régulation des activités ferroviaires et routières (Regulatory authority for rail and road activities)
	www.railpassion.fr	Les Éditions La Vie du Rail Rail Passion
	www.sncf.com	SNCF
France, Italy	www.thello.com	Thello
Germany	www.badische-zeitung.de	Badische Zeitung
	www.bag.bund.de	Bundesamt für Güterverkehr (Federal Transport Authority)

State	Link	Organisation
	www.bahn.de	DB (national rail operator)
	www.bahn.com	DB (English version)
	www.bmvi.de	Bundesministerium für Verkehr und digitale Infrastruktur (Federal Ministry of Transport and Digital Infrastructure)
	www.bundestag.de	Deutsche Bundestag
	www.diepresse.com	Die Presse
	https://fahrweg.dbnetze.com	DB Netze (national rail infrastructure manager)
	www.flixbus.com	FlixBus
	www.ifeu.de	Institut für Energie- und Umweltforschung Heidelberg GmbH (Institute for Energy and Environmental Research)
	www.inside.bahn.de	DB News
	www.nachtzug-retten.de	Nachtzug retten (Save the night trains)
	www.spiegel.de	Der Spiegel
	www.stuttgarter-zeitung.de	Stuttgarter Zeitung
	www.welt.de	Die Welt
Greece	www.trainose.gr	TrainOSE (national rail operator)
Italy	www.ntv.it	Nuovo Trasporto Viaggiatori (New Passenger Transport)
	www.trenitalia.it	Trenitalia (national rail operator)
Poland	www.booking.polrail.com	Polrail

State	Link	Organisation
	www.pkpsa.pl	PKP (national rail operator)
Romania	www.cfrcalatori.ro	Căile Ferate Române Călători (national rail operator)
Russia	www.rzd.ru	Rossiyskie Zheleznye Dorogi (national rail operator)
Serbia	www.zeleznicesrbije.com	Serbian Railways
Spain	www.renfe.com	Renfe (national rail operator)
	www.vialibre.org	Via Libre
Sweden	www.dn.se	Dagens Nyheter
	www.fria.nu	Fria Tidningar
	www.sj.se	Statens Järnvägar (national rail operator)
	www.trafikverket.se	Swedish Transport Administration
United Kingdom	https://www.caa.co.uk/home/	Civil Aviation Authority
	https://data.gov.uk/publisher/office-for-national-statistics	Office for National Statistics (for National Rail Passenger Survey and International Passenger Survey)
	http://hansard.millbanksystems.com/	Hansard 1803–2005
	www.independent.co.uk	The Independent
	www.nationalrail.co.uk	National Rail
	www.networkrail.co.uk	Network Rail (national infrastructure manager)
	www.ons.gov.uk	Office for National Statistics
	www.parliament.uk	Parliament
	www.pressandjournal.co.uk	The Press and Journal

State	Link	Organisation
	www.sleeper.scot	The Caledonian Sleeper (operator Serco Caledonian Sleeper)
	www.telegraph.co.uk	The Telegraph
	www.theguardian.com	The Guardian
	www.thetrainline.com	Trainline
	www.thisismoney.co.uk	This is Money
	www.transportfocus.org.uk	Transport Focus
	www.transport.gov.scot	Transport Scotland
EU	www.ec.europa.eu	European Commission
	www.eur-lex.europa.eu	EUR-Lex
	www.europarl.europa.eu	European Parliament
European	www.eraa.org	European Regions Airline Association
	www.europeanrailtimetable.eu	European Rail Timetable
	www.cer.be	Community of European Railway and Infrastructure Companies
	www.comparabus.com	ComparaBus
	www.greens-efa.eu	The Greens - European Free Alliance
International	www.belmond.com	Belmond (hotel and leisure company)
	www.breakingtravelnews.com	Breaking Travel News
	www.eurail.com	Eurail
	www.europeanrailwayreview.com	European Rail Review
	www.globalrailnews.com	Global Rail News
	www.google.com/earth/	Google Earth
	www.hongkongairport.com	Hong Kong International Airport

State	Link	Organisation
	www.interrail.com	Interrail
	www.izy.com	Izy
	www.kayak.com	Kayak
	www.lonelyplanet.com	Lonely Planet
	www.megabus.com	Megabus
	www.newscientist.com	New Scientist
	www.ouigo.com	Ouigo
	www.priceline.com	Priceline
	www.railjournal.com	International Railway Journal
	www.railwaygazette.com	Railway Gazette International
	www.rome2rio.com	Rome2Rio
	www.sciencedirect.com	ScienceDirect
	www.seat61.com	The Man in Seat Sixty-One
	www.uic.org	UIC (International union of railways)
	www.unece.org	United Nations Economic Commission for Europe
Australia	www.artc.com.au	Australian Rail Track Corporation
	https://bitre.gov.au/	Bureau of Infrastructure, Transport and Regional Economics and Australasian Railway Association
	www.greatsouthernrail.com.au	Great Southern Railway
	www.nswtrainlink.info	NSW TrainLink
	www.queenslandrailtravel.com.au	Queensland Rail
Canada	www.viarail.ca	VIA Rail Canada
China	www.chinahighlights.com	China Highlights

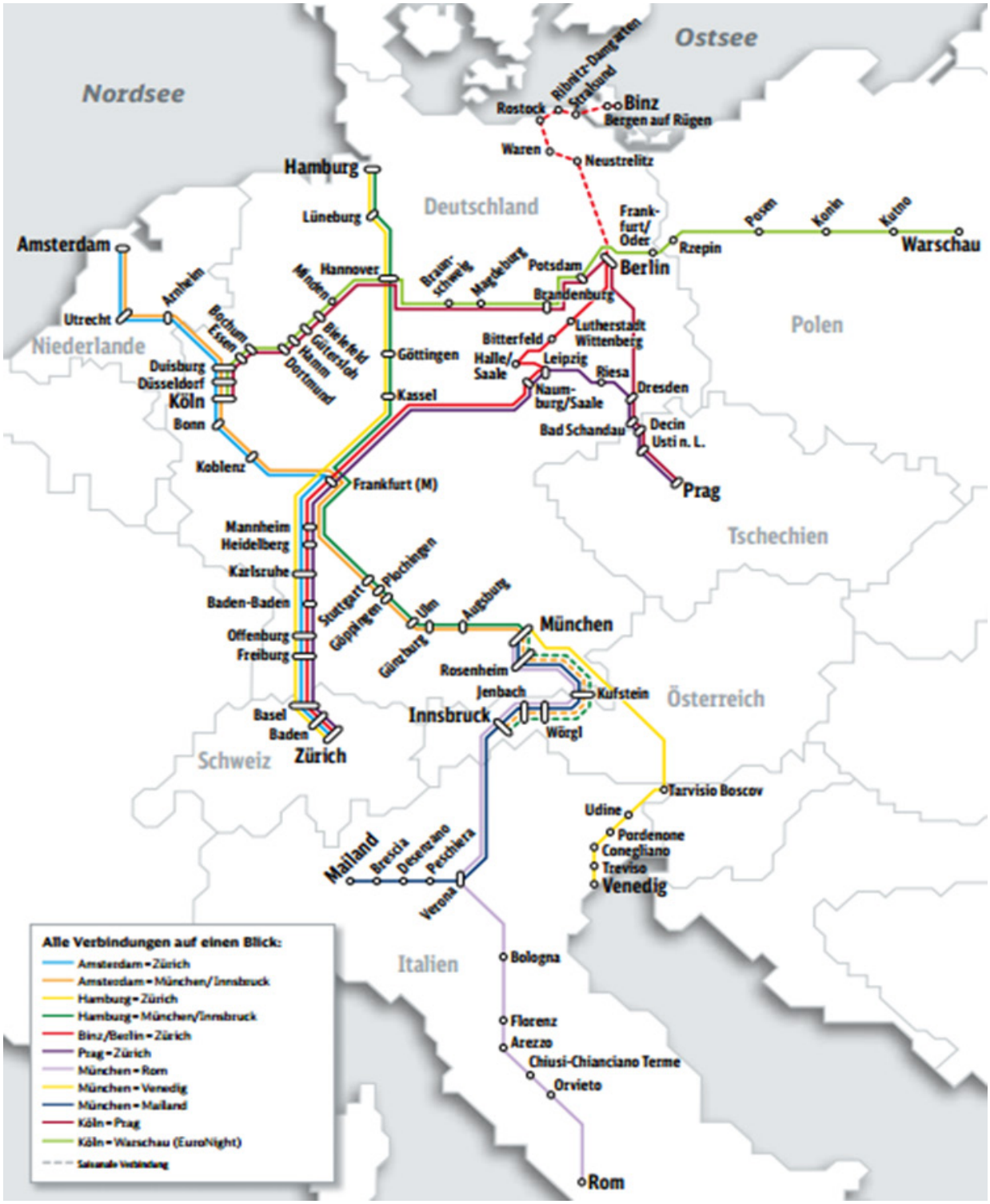
State	Link	Organisation
	www.chinatibettrain.com	China Tibet Train Travel & Tours
India	www.economictimes.indiatimes.com	The Economic Times - India Times
	www.prsindia.org	PRS Legislative Research – India
	www.timesofindia.indiatimes.com	The Times of India
Japan	www.cruisetrain-sevenstars.com	Kyushu Railway Company - Seven Stars Cruise Train
	www.japantimes.co.jp	The Japan Times
	jprail.com	JPRail.com
	www.jreast.co.jp	Japan Railway Company
	www.jr-central.co.jp	Central Japan Railway Company
	www.osakastation.com	Osaka Station
	www.twilightexpress-mizukaze.jp	West Japan Railway Company - Twilight Express
Kazakhstan	www.railways.kz	KTZ
	www.temirzholy.kz	KTZ
	www.tickets.kz	Tickets.kz
USA	www.amtrak.com	Amtrak
	http://cs.trains.com/	Trains.com
	www.edition.cnn.com	CNN

ANNEX B: CASE STUDY: DB CITY NIGHT LINE (GERMANY)

Introduction

Figure 14 shows the night trains operated by Deutsche Bahn (DB) City Night Line until December 2016.

Figure 14: DB City Night Line: network (2016)



Source: City Night Line Flyer (January 2016).

The effect of the federal structure

Under Germany's federal structure, the Länder (States) support public transport through Public Service Obligations (PSOs). Federally-owned rail operator Deutsche Bahn (DB) is expected to operate its DB Fernverkehr (long-distance) subsidiary on a commercial basis, and this principle was reasserted in the Bundestag[49] as recently as July 2016, as we discuss below. This means that, while in principle two or more Länder could agree to support a long-distance service which was in their mutual interest, in practice night train services are not normally considered by any of the competent authorities responsible for public transport. (We discuss in case study D on SJ Nattåg in Sweden how Sweden has provision to support services through both national and local authorities.)

Night trains

In 1995, the German, Austrian and Swiss federal railways (DB, ÖBB and SBB-CFF-FFS) began the joint operation of night trains under the joint venture CityNightLine AG.

In 1997, DB acquired the whole business and merged it with the existing DB Nachtzug (night train) services to form City Night Line, which operated a range of services within Germany and into surrounding States. As noted above, DB Fernverkehr receives no direct support for its long-distance services and would be expected to operate them only if it could do so on a commercial basis.

In August 2015, DB's website featured an article "City Night Line: Zeit sparen – nachts fahren" (City Night Line: save time – travel by night) promoting its services.

Commenting on its operations, it said that the night train timetables typically allow a 10-hour daytime window during which the trains can be serviced and prepared, although it noted that normally only 6-8 hours are required. This facilitates maintenance and preparation by a small team of day workers under limited time pressure, in contrast to day train stock which must often be maintained in a much shorter overnight window. However, the article emphasised the need to remake up to 100 beds, equivalent to a small hotel, to remove up to 100 kilograms of rubbish and to load 10 tonnes of water, as well as food and drink, before safety checks such as a brake test.

Operating patterns before closure in December 2016

In practice, the City Night Line network has been contracting since 2010, and the 2016 network shown in shown in Figure 14 is the final network before all services were ended in December 2016. In particular:

- From December 2014, DB cut back services to Amsterdam in the Netherlands and ended all City Night Line trains to Paris in France and to Denmark.
- From December 2015, domestic services between Munich (München in Figure 14) and Berlin ended.
- From December 2016, DB announced in December 2015 that it would withdraw all remaining trains using night vehicles such as couchettes and sleeping cars, although it would continue to cooperate with other operators of night train services into Germany (by implication, Austria's ÖBB and Russia's RZD).

According to the International Railway Journal (IRJ), DB had stated that the service had remained "stubbornly unprofitable" with a loss of €32 million on a turnover of €90 million.

[49] The Bundestag is the national Parliament of the Federal Republic of Germany.

This implies that less than 75% of total costs of €122 million were recovered, and the average loss was €25 per passenger.

DB Fernverkehr carries out detailed scenario planning using revenue forecasting tools and cost estimates, and also considering service quality and punctuality. For example, the costs and revenues associated with on-board food and drinks services, often a critical component of a night train service, are considered an integral part of the service offer and hence part of the overall operating cost and revenue.

However, DB Fernverkehr has also told us that the appearance of long-distance coach operations, following deregulation in 2013, has forced it to lower its prices. This has also affected local operators, to whom it pays a proportion of revenues from through tickets.

Since the closure of City Night Line, DB has expanded its Intercity-Express (ICE) night services using day stock, avoiding the need for special night stock. Some of DB's night services, and some of its rolling stock, have also been taken over by Austria's ÖBB for its Nightjet services, which we discuss in the next case study.

Competition from coach services following their liberalisation in 2013

Liberalisation of Germany's long-distance coach market in 2013 led to a rapid expansion of day and night coach services. The Bundesamt für Güterverkehr (BAG)[50] has carried out detailed studies of market developments[51]. It has noted that DB faces competition including coach services, and that DB has cut services including night trains, but describes this as "mainly for economic reasons"[52] and does not assert that these are cause and effect.

Accommodation and pricing

The final City Night Line trains, offered as an adjunct to day services, had four classes of accommodation (see Figure 1 in Section 1.2):

- seating;
- 5-bed couchette[53];
- "Economy" 3-, 2- and 1-bed sleeping compartment with wash basin; and
- "Deluxe" 3-, 2- and 1-bed sleeping compartments with showers.

The livery was standardised as white with a red stripe, and all vehicles were air-conditioned.

Figure 15 shows how pricing reflected space per passenger in each type of accommodation. City Night Line offered three levels of pricing:

- minimum prices for a domestic service;
- minimum prices for an international service (starting €10 higher); and
- minimum supplements to an existing ticket.

Note that all the prices are quoted "ab" ("from") and are minima which may rise over time as accommodation is booked.

[50] The German Federal Transport Authority.
[51] Marktanalyse des Fernbuslinienverkehrs 2014, Marktanalyse des Fernbuslinienverkehrs 2015.
[52] "zumeist aus wirtschaftlichen Gründen".
[53] City Night Line's couchette stock contained six berths but it only sold a maximum of five of them.

Figure 15: DB City Night Line: standard service offer (2016)

Fahrkarte	Komfortklasse	Komfortkategorie	Gesamtpreis innerdeutsch (z. B. Sparpreis) ab	Gesamtpreis international (z. B. Europa-Spezial) ab	Aufpreis* ab (Reservierung bei vorhandenem Fahrschein)
2. Klasse	Sitzwagen	Sitzplatz	29 €	39 €	–
	Liegewagen	5er-Belegung	39 €	49 €	10 €
	Schlafwagen	Economy 3er-Belegung (mit Waschgelegenheit)	69 €	79 €	40 €
		Economy Double (mit Waschgelegenheit)	89 €	99 €	60 €
		Economy Single (mit Waschgelegenheit)	129 €	139 €	100 €
1. Klasse	Schlafwagen	Deluxe 3er-Belegung (mit Dusche und WC)	99 €	109 €	40 €
		Deluxe Double (mit Dusche und WC)	119 €	129 €	60 €
		Deluxe Single (mit Dusche und WC)	159 €	169 €	100 €

* Für Passinhaber (wie z. B. Interrail und Eurail Pass) gelten gesonderte Aufpreise.

Source: City Night Line flyer (January 2016).
Note: footnote states that additional charges apply for those with passes such as Interrail and Eurail.

Passenger data

On average, 45-50% of spaces on City Night Line night trains were occupied and, given 2016 levels of cost-recovery, it would be necessary to increase average occupancy to 60-65% to reach financial sustainability.

DB's August 2015 article "City Night Line: Zeit sparen – nachts fahren" referred to a wedding party going to Rome (which it later implied was actually a special charter), business travel and group travel, but stated that most passengers were travelling on holiday or between cities.

Typical users of night trains included the elderly, weekly commuters (with work and home in different cities, presumably causing peaked demand on Friday and Sunday nights), tourists (particularly from other countries) and a declining segment of business travel.

Future developments

Bundestag debate

On 7 July 2016, three members from Die Linke, a German political party, submitted to the Bundestag a proposal entitled "Save the night trains – enabling climate-friendly long-distance travel in the future"[54]. Among the arguments made in their document were that:

- The German constitution requires that transport needs are provided for.
- Night train operations have been cut back and now rely on complex shunting operations.
- Night train capacity had been mismanaged, with capacity allocated to other railways remaining unsold after German customers had been told that trains were full.
- The rail industry should not pay higher Value-Added Tax (VAT) than that applied to international aviation.
- Travel between Berlin and Paris (in France) generates 118.5 kilograms of CO_2 by air travel but only 32 kilograms by (day) rail travel (quoting TREMOD, a Transport Emissions Model developed by IFEU).

The proposal argued that the German government should support night trains, citing examples in Sweden and the United Kingdom, covered in other case studies (please see Annex D on SJ Nattåg in Sweden and Annex E on The Caledonian Sleeper in the United Kingdom), and Norway.

The proposal was debated briefly[55,56] and a number of claims[57] were made:

- One speaker argued that the former night train between Frankfurt and Paris had been replaced by a 3¾ hour day journey. DB was right to cut services as the night trains had consistently been making losses, and services in Austria and the Czech Republic receive subsidy. He also pointed out that the Federal government was not legally permitted to intervene in the detailed decisions of DB.
- One speaker argued that night trains had lost their appeal and that the Federal government should not interfere. She dismissed the argument that the constitution could be interpreted as requiring a night train service.
- One speaker argued that air and hotel costs had fallen but that night trains still had high operating costs. If ÖBB had the structure and capacity to operate night trains, let it do it.
- One speaker supporting the proposal argued that there should be a Europe-wide "Luna Liner" network of connecting night trains[58]. She argued that former night train staff were moving into other areas, creating a staff shortage in advance of the final closures planned for December 2016.
- One speaker stated that DB Netz, the German rail infrastructure manager, offers lower infrastructure charges between 23:00 and 06:00[59].

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[54] "Die Nachtzüge retten – Klimaverträglichen Fernreiseverkehr auch in Zukunft ermöglichen".
[55] Deutscher Bundestag, Stenografischer Bericht, 183. Sitzung, Berlin, Thursday 7 July 2016.
[56] There was a similar debate on the closure of night train services in the United Kingdom parliament in 1983 (please see Annex E on The Caledonian Sleeper in the United Kingdom).
[57] We cannot verify the correctness of these statements and therefore refer to them as "claims".
[58] In practice, as we pointed out in Table 16, "connections" between night trains take all day and are unlikely to be attractive.
[59] ÖBB told us that these reduced charges would not come into place until 2017. On 15 March, in response to a question in the European Parliament, Violeta Bulc said "Other Member States like Italy and Germany have

Technical press comments

In December 2016, IRJ suggested that the network might have had a future if management had been more positive and market-focused, or there was explicit government support for night trains. One practical issue in Germany is that the Länder (States) specify Public Service Obligation (PSO) services. Supporting any specific night train might have required the explicit support of a number of Länder over the distance required to make services viable.

In January 2017, the Stuttgarter Zeitung (the Stuttgart newspaper) reported that it had seen internal DB documents (the December Nachtzugmonitoring, or night train monitor) showing that City Night Line had reduced its losses in the period immediately before the final closure, with losses of €13.5 million on costs of €82.5 million, implying almost 85% cost recovery. The improvement was partially attributed to the removal of compulsory reservations on many routes, implicitly making it easier to "turn up and go" on night trains (IRJ). However, we note that:

- The removal of compulsory reservations was related to night trains operated with day stock, rather than with special night stock. If this is the case, it suggests that the commercial logic was to operate night trains with day stock, although demand for night travel on day stock was highly price-elastic.
- By the time these figures were available, DB had already not only made the decision to withdraw services but also contracted with Austria's ÖBB to sell some of the night stock, as we discuss below. ÖBB told us that one factor in DB's decision was the need to install a fire extinguisher system to comply with Italian requirements from 2021.
- The apparent short-term profitability of a service may not reflect its longer term prospects or the viability of reinvestment, as we discuss in the main report.

DB City Night Line comments

DB reports separately on the provision of night trains using special rolling stock, the subject of this research, and trains using day stock but operated during the night. DB had been trying to maintain services with specialised night stock for around twenty years, with investment in new night stock including sleeping cars (some stock was bought in 2007) and restaurant cars. However, overall demand (passenger-kilometres) had been in decline, making it harder for a commercial organisation to justify further investment in the network.

On the supply side, rolling stock had become more expensive, although we note that this may not be an issue until there is a need to replace fleets, which can last up to 50 years. However, it may become increasingly difficult to make a commercial case for replacement investment.

On the demand side, factors cited by DB included competition from high-speed day trains, low-cost airlines, long-distance coaches (liberalised in Germany in 2013), and falling prices for fuel and for hotel accommodation, through the expansion of cheaper but higher quality hotel chains. In consequence:

- Travellers have become far less willing to sleep with strangers in a night train compartment and much more keen to combine high-speed rail or air travel and a hotel.

indicated that they plan to implement differentiated night charging." We assume that this latter statement is correct, and that the speaker in the Bundestag was misinformed.

- General trends to lower fares, particularly from deregulated airlines and coach companies, increasingly restricted the fares possible for any given quality of service.

DB also drew our attention to inconsistencies in the treatment of rail and competing modes:

- International air travel is not subject to VAT.
- Rail operators pay a marginal charge per vehicle or train-kilometre, but coach operators and car users do not.
- Passenger rights legislation requires railway undertakings to compensate passengers for service disruption even in some cases where it is beyond their control.

Employment

DB told us that the withdrawal of night train services with night stock had not yet resulted in any overall reduction in employment, as the workers were either transferring to other roles within the organisation or continuing their existing roles as drivers or other staff under subcontracts to ÖBB. In the longer term, however, closures might result in an overall reduction of employment within the rail industry.

Conclusions

DB informed us that they expect the total number of passengers carried at night to grow, but the demand will increasingly be for low-fare overnight trains using day stock instead of high-quality night trains using specialised stock.

It would in principle be possible for an open access operator to acquire suitable stock and to operate night train services, perhaps focusing on relatively expensive "hotel train" services. The limited synergies with day trains (requiring completely different stock and crew) suggest that (as in Sweden and Scotland, discussed in other case studies) a small operation should be possible. However, we have seen no reports of proposals to attempt to operate further services on a commercial basis. It may be that ÖBB has already identified all the services which can be profitable, or that services can only be profitable if run as part of Austria's ÖBB Nightjet network, which we discuss in the next case study (please see Annex C on ÖBB Nightjet in Austria).

We also note that one support mechanism used in Germany is when DB Fernverkehr services stop at minor stations and accept local tickets at lower fares, but the Land (State) responsible for those fares compensates it with any shortfall on its own fare for the same journey. This allows local competent authorities in Germany to support station stops without the need to issue a PSO for additional services, and could in principle be used to retain or support non-commercial station calls on otherwise commercial night train services. In contrast, in Sweden for example, long-distance operator SJ is required to accept local tickets without compensation.

ANNEX C: CASE STUDY: ÖBB NIGHTJET (AUSTRIA)

Introduction

The 2017 ÖBB Nightjet network is shown inFigure 16.

Figure 16: ÖBB Nightjet: network (2017)

Source: ÖBB Nightjet flyer for services from December 2016.

From around 2000, services had been thinned, with the closure of uneconomic services to Belgrade and Sofia (not shown on Figure 16), but services to Germany, Switzerland and Italy were retained as the core network. Capacity on this core network was increased with rolling stock used from the lines which had been closed. Note that operating fewer but longer trains can, in principle, result in lower locomotive, fuel, crew costs and infrastructure

charges, depending on how these are structured. The current number of passengers on the core network is broadly stable, especially in the sleeping cars.

Following DB's decision to close its remaining City Night Line operations from the end of 2016, ÖBB decided to take over some of these services and to integrate them into the network. The most important of the routes taken over were to Berlin/Hamburg in Germany and to Zurich (Zürich on Figure 16) in Switzerland. It invested €40 million in 42 sleeping cars and 15 couchettes from DB to operate the new services and to upgrade its existing fleet. This implies an average price of at most €700,000 for each vehicle, considerably less than the average price per new vehicle for The Caledonian Sleeper (please see Annex E on The Caledonian Sleeper in the United Kingdom).

A number of factors contributed to the decision to expand services, including that:

- Vienna is distant from some core European cities such as Frankfurt in Germany, Brussels in Belgium and Paris in France, resulting in journey times of seven hours or more by land transport. This is unlikely to change as there are only limited proposals for high-speed lines in Austria.
- Low-cost airlines have only a limited presence in Austria.
- The ÖBB Nightjet network allows a number of operational synergies, particularly if further routes are added.

ÖBB did not see the coach sector as a major threat, with most ÖBB Nightjet customers wanting to lie in a couchette or bed. We note that this contrasts with DB's finding that demand for night trains using day stock was growing.

ÖBB said that the principal challenges facing ÖBB Nightjet were infrastructure availability and regulatory issues. Regulation was particularly demanding in Italy where:

- There is a special regulation relating to door closing systems, requiring adaptations to rolling stock.
- From 2021, there will be a requirement for a fire extinguisher system, requiring a major investment in rolling stock which probably contributed to the decision of Germany's DB to close down City Night Line. The International Railway Journal (IRJ) reported that ÖBB intends to procure new stock which meets these requirements and to transfer the existing stock to other routes.

In a January 2017 interview in IRJ, ÖBB reported that it was important for the services to be operated by a single company, rather than as a "joint production" between various railways.

Operating patterns

Operation of Austria's ÖBB night train network appears to have been facilitated by the creation of a new concept for replacing two existing terminal stations in Vienna, the Südbahnhof (south station) and Ostbahnhof (east station), with a new through Hauptbahnhof (main station), with specific provision for long-distance and night train services. This contrasts with constraints at other major European city centre stations including Hamburg and Cologne in Germany, Stockholm in Sweden and London in the United Kingdom, but we note that Germany's new Berlin Hauptbahnhof, opened in 2006, did not prevent the decision of DB to close City Night Line.

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.

During 2016, ÖBB announced that it would be taking over some of Germany's DB City Night Line services and operating them under the new brand, Nightjet, in a livery of dark blue with stars. It proposed to add three new services into Germany:

- Hamburg-Berlin-Basle (in Switzerland, Basel on Figure 16);
- Hamburg-Munich (München on Figure 16)-Innsbruck (in Austria); and
- Dusseldorf (Düsseldorf on Figure 16)-Munich-Innsbruck.

It subsequently announced the addition of three further services:

- Munich-Villach-Venice (in Italy, Venezia on);
- Munich-Salzburg-Villach-Florence (in Italy, Firenze on Figure 16) – Rome (in Italy, Roma on Figure 16); and
- Munich-Salzburg-Villach-Verona-Milan (in Italy, Milano on Figure 16).

In an interview with IRJ in January 2017, ÖBB reported that these operating patterns provide a number of synergies through the use of common depots and "splitting and joining" services to share infrastructure paths, locomotives and train crews. As Figure 17 and Figure 18 below show, only the services to Munich (in Germany), Bregenz and Leghorn (in Italy, Livorno onFigure 16) do not split and join.

ÖBB informed us that punctuality and reliability of ÖBB Nightjet trains were satisfactory, but they faced practical issues in obtaining attractive arrival and departure times:

- In Italy, they told us that timings in Verona and Milan are difficult.
- In Germany, they told us that timings at Hanover (Hannover on Figure 16) are difficult, due to priority given to freight trains.

Competition from coach services

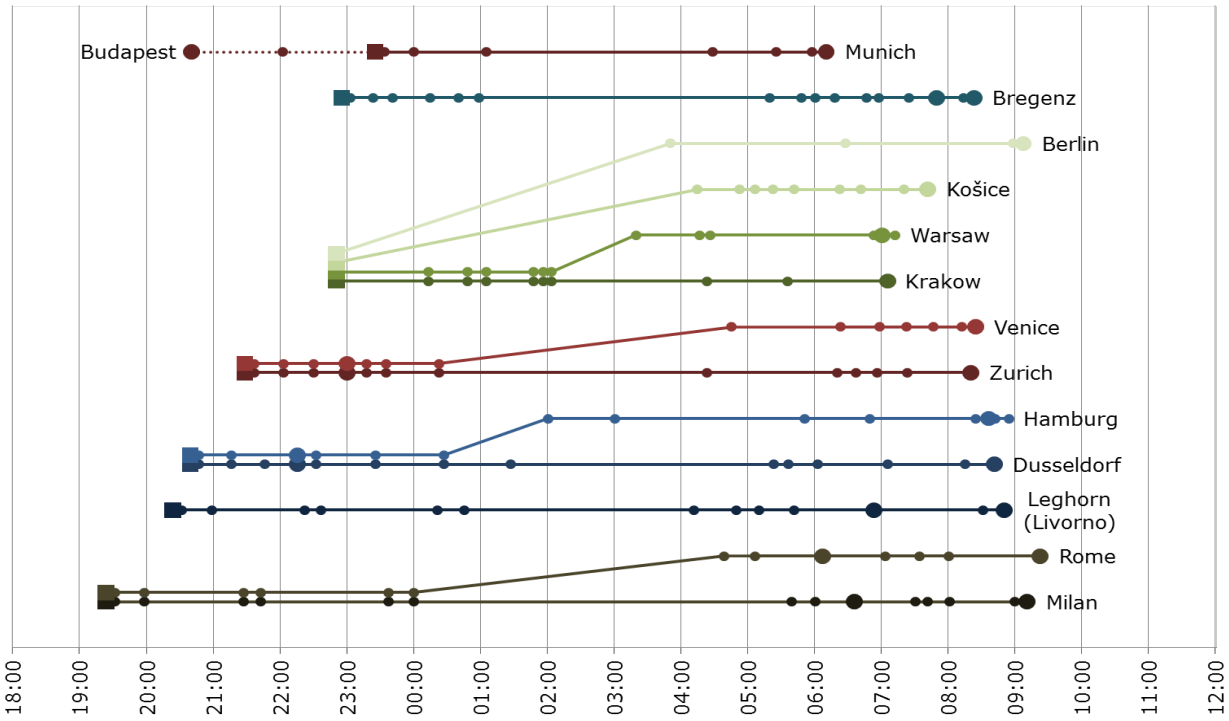
In contrast to the liberalised environment in Germany and other Member States, coach transport in Austria remains heavily regulated, with a complex authorisation process which can take up to six months, even for a successful applicant. In addition, the dominant operator of domestic coach services is ÖBB Postbus, an ÖBB subsidiary which operates regional and inter-regional services which complement ÖBB's rail services. Most of these services are provided under a Public Service Contract (PSC) and procured through competitive tendering. ÖBB Postbus carries up to 214 million passengers per year serving up to 1585 communities, and is the only form of public transport in more than a third of the areas which it services (ÖBB data for 2016). Austrian regulatory provisions state that proposed new coach routes must not affect the patronage of existing rail and coach operators. This gives ÖBB an effective veto on services which would affect the financial viability of its services, including ÖBB Nightjet.

In 2016, ÖBB introduced international coach services through its subsidiary ÖBB-Fernbus GmbH under the brand Hellö. As of February 2017, it operated ten routes to Croatia, the Czech Republic, Germany, Italy and Slovenia, most of which include an overnight service.

Competition from air services

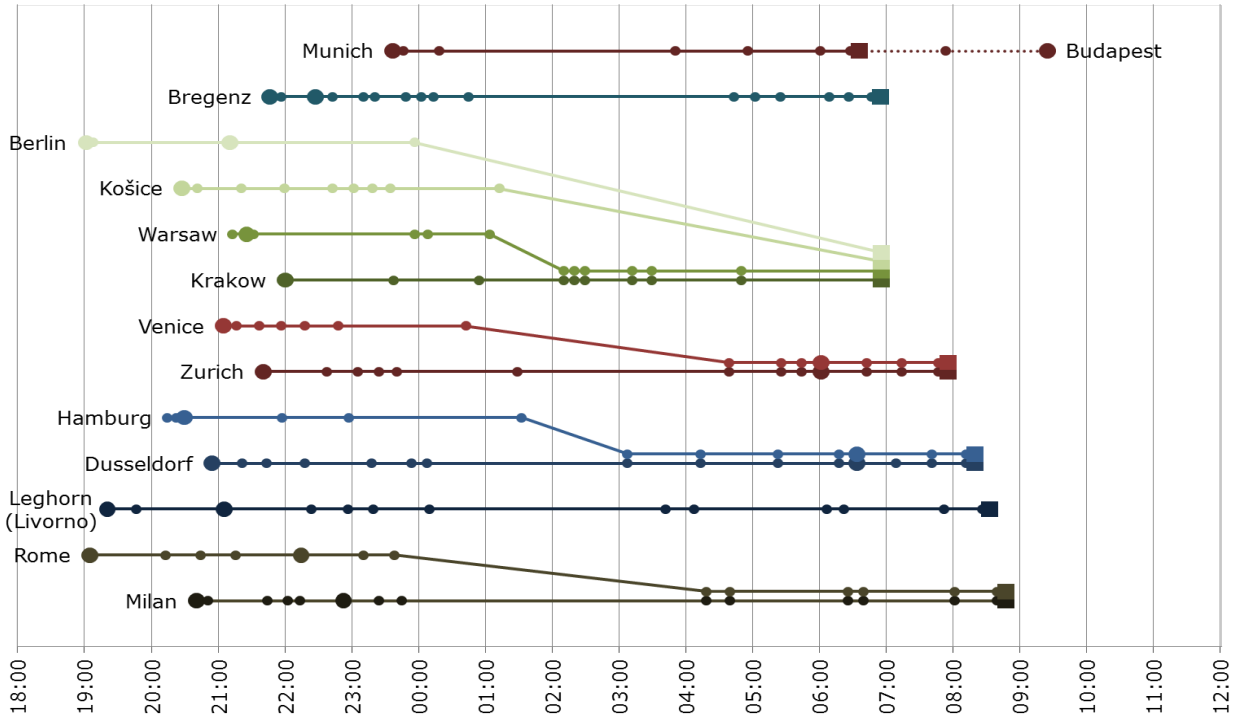
To assess competition between air transport and ÖBB Nightjet, we compared the timings of the ÖBB Nightjet services from and to Vienna with those of the last evening flight and first morning flight. The results are shown in Figure 19 and Figure 20.

Figure 17: ÖBB Nightjet: typical operating patterns from Vienna (2017)



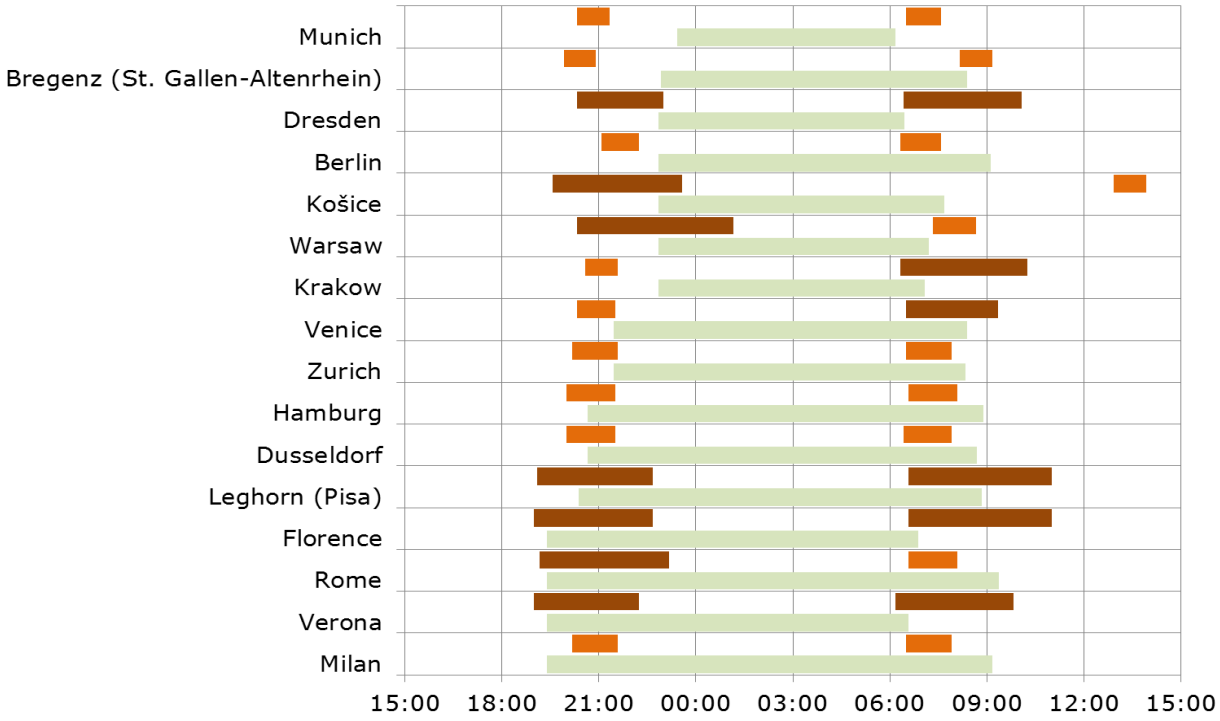
Source: ÖBB Nightjet flyer for services from December 2016, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Vienna is represented by a square marker.

Figure 18: ÖBB Nightjet: typical operating patterns to Vienna (2017)



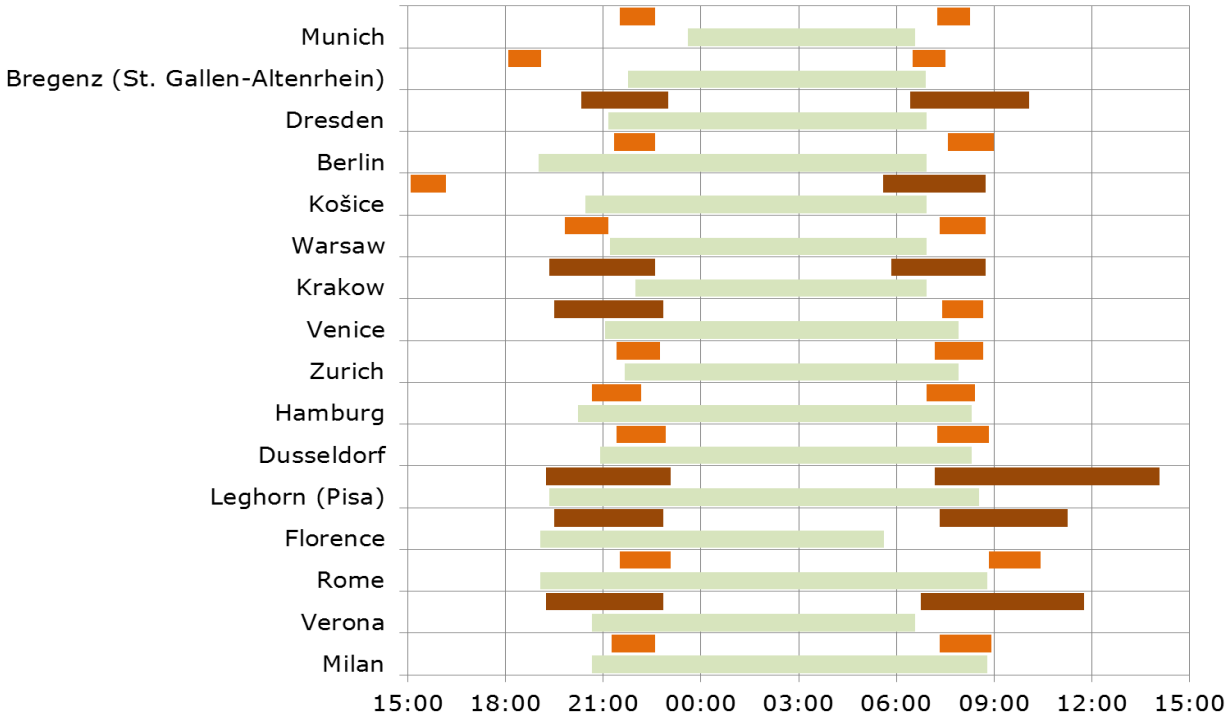
Source: ÖBB Nightjet flyer for services from December 2016, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Vienna is represented by a square marker.

Figure 19: ÖBB Nightjet: competitiveness with airlines from Vienna (2017)



Source: ÖBB Nightjet flyer for services from December 2016, Steer Davies Gleave analysis.
Note: colour code is explained in the text below.

Figure 20: ÖBB Nightjet: competitiveness with airlines to Vienna (2017)



Source: ÖBB Nightjet flyer for services from December 2016, Steer Davies Gleave analysis.
Note: colour code is explained in the text below.

Figure 19 illustrates services travelling from Vienna. The last flight from Vienna each evening (orange) leaves earlier than the night train (green). In addition, the last flights to Dresden (in Germany), Košice (in Slovakia), Warsaw (in Poland, Leghorn (Livorno, in Italy,

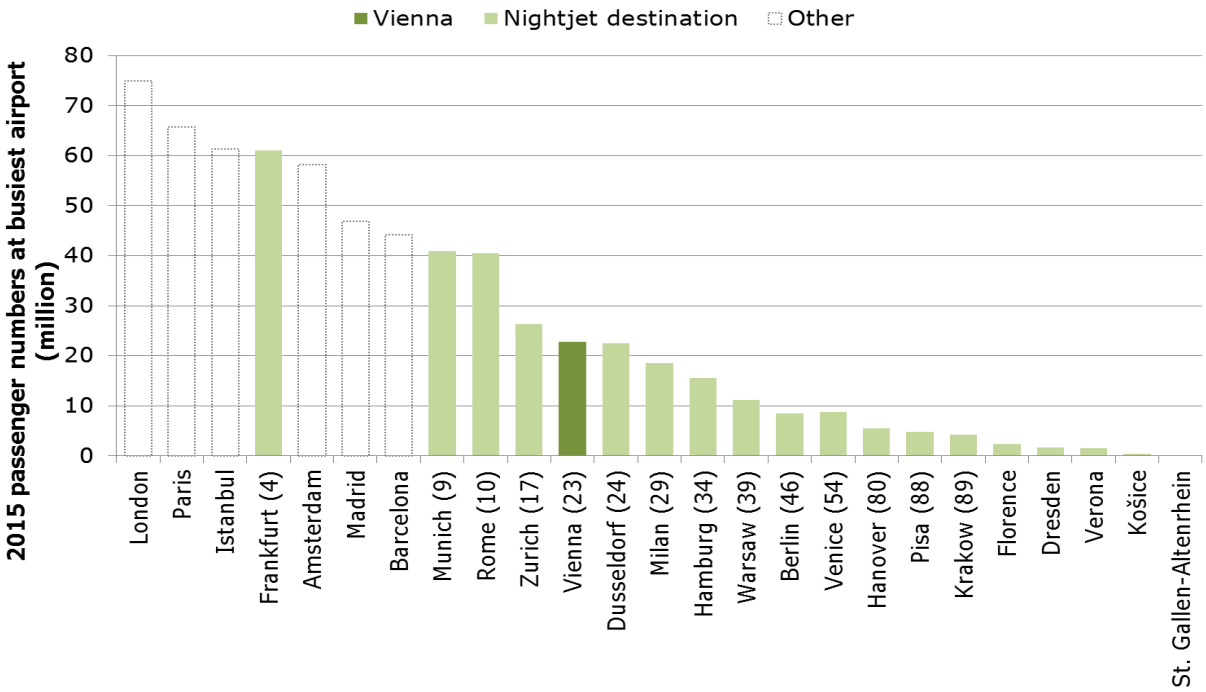
served by Pisa airport), Florence, Rome and Verona (all in Italy) all require a connection (brown), resulting in an overall flight time of four hours or more. Only Milan, the principal business centre of Italy, had a direct flight departing later than the night train. The first flight from Vienna each morning sometimes arrives earlier than the night train. In Italy, for example, direct flights to both Rome and Milan (red) arrive before the night train, although additional time would be required to reach the city centre from the airport. Flights to Leghorn, Florence and Verona all require a connection (brown) and, in the case of Leghorn and Florence, it would be difficult to reach the city centre much before midday.

Figure 20 illustrates services travelling to Vienna. The last flight to Vienna each evening (red) often leaves earlier than the night train (green). From Italy, where the night trains depart relatively early, there are sometimes later flights, but from Leghorn, Florence and Verona these all require connections (brown). The first flight to Vienna each morning arrives later than the night train from all the cities studied, with few flights arriving much before 09:00, and arrivals from Dresden (in Germany), Florence, Verona and particularly Leghorn arriving much later.

These illustrative analyses indicate the potential attractiveness of the ÖBB Nightjet offer even for business travel between Vienna and many of the cities served by ÖBB Nightjet.

This may partly reflect the fact that Vienna, and many of the cities connected to it by ÖBB Nightjet, have "second tier" airports with relatively small numbers of flights. Figure 21 compares 2015 passenger numbers at Europe's busiest airports with those of Vienna and the destinations connected to it by ÖBB Nightjet.

Figure 21: ÖBB Nightjet: destinations and their airports



Source: airport websites, Steer Davies Gleave analysis.
Note: numbers after an airport's name show its rank by passenger numbers.
Note: in cities where there are two or more airports, only the largest airport is shown: London (Heathrow), Paris (Charles de Gaulle) and Berlin (Schönefeld).

Only Frankfurt (in Germany, served en route to Hamburg), Munich (in Germany) and Rome (in Italy) are among the ten busiest airports, with at least 40 million passengers in 2015, and Vienna itself is ranked at number 23, with nearly 23 million passengers in 2015.

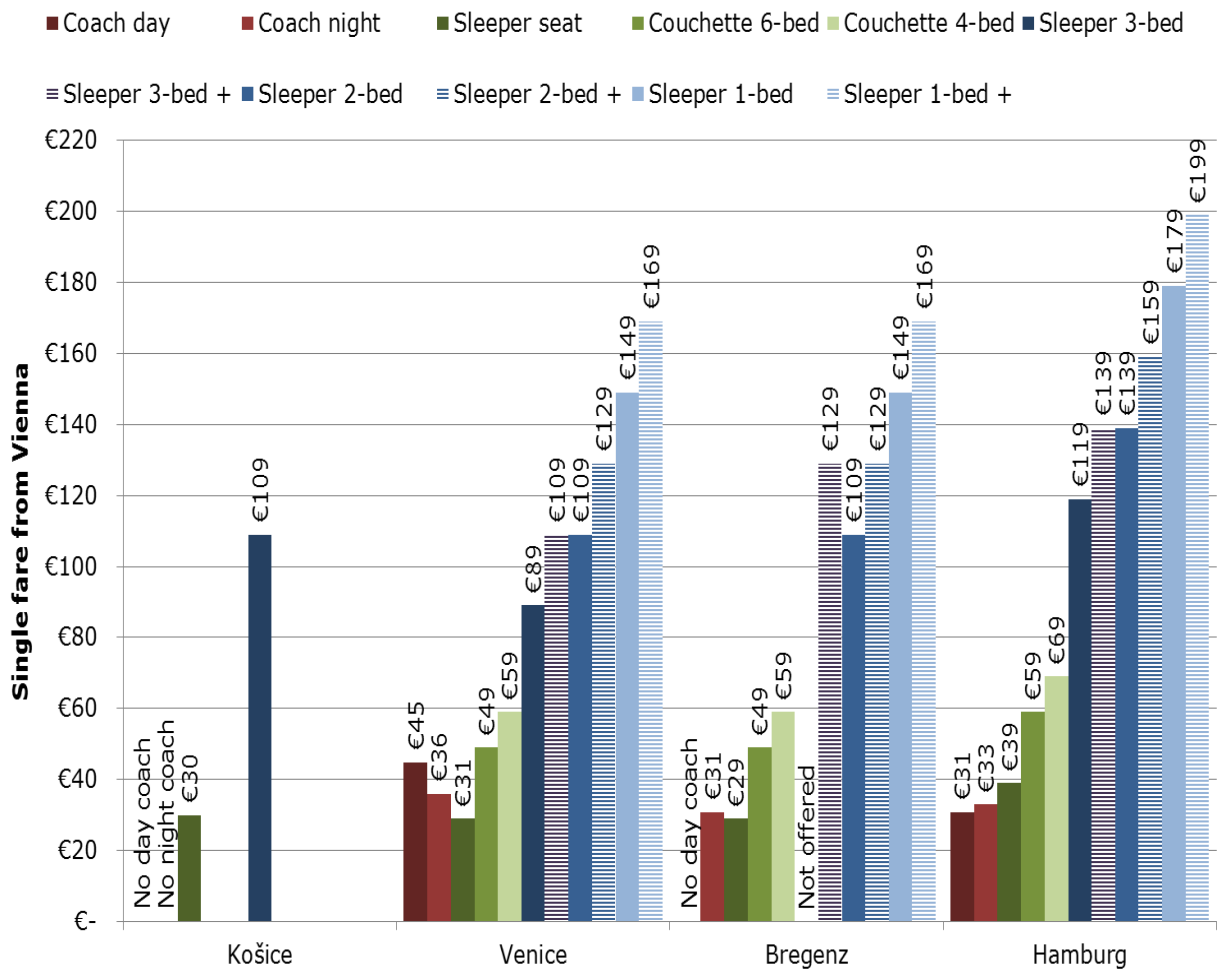
One possible interpretation is that night trains are more likely to be viable if they connect cities between which there are few flights.

Accommodation and pricing

ÖBB Nightjet offers a range of accommodation, and a pricing structure, similar to that of Germany's DB City Night Line shown in Figure 15 in Annex B on DB City Night Line in Germany.

We compared ÖBB Nightjet fares with those from coach operators such as FlixBus. Figure 22 shows the structure of ÖBB Nightjet and competing coach operator fares for travel booked three months in advance. Reservations are obligatory in all accommodation, including seats.

Figure 22: ÖBB Nightjet: sample fares three months ahead



Source: Nightjet, FlixBus, Rome2Rio.
Note: fares may be higher for immediate travel, "+" has shower and WC en suite.

The Figure shows how, booking three months ahead, prices for coach services, where they were available, were similar to prices for ÖBB Nightjet's sleeper seats and were always lower than prices for ÖBB's cheapest couchettes.

We also investigated, on 9 December 2016, fares for travel from Vienna to Hamburg that night. ÖBB Nightjet's price for a seat had risen to €109, the cheapest couchette space was €129 and the cheapest sleeper space, without ensuite, was €149. ÖBB's overall range of fares had risen from €39-199 three months ahead to €109-224 for immediate travel.

ÖBB uses yield management, partly to deal with seasonality and peaks in demand, but acknowledged to us that its systems are not as sophisticated as those of some airlines. With a largely constant supply of seats, prices vary mainly in response to forecast and emerging demand.

The sales strategy, and choice of sales channels, was important. Sales outside Austria had historically been through partner railways, and it was essential for the night train product to be "visible" to potential customers booking through any railway[60].

ÖBB's current strategy is to increase the number of sales channels and to facilitate sales online, as the airlines have done. IRJ reported that www.nightjet.com will be the principal distribution channel, reducing ÖBB Nightjet's dependence on other railways to sell tickets.

Passenger data

ÖBB told us that it plans for an increase in passenger demand from 1 million in 2016 (contributing 17% of ÖBB's long-distance revenue, compared with 1% of DB's from City Night Line in Germany), to around 1.5 million in 2017. IRJ reported an expected increase to around 1.8 million in 2018. Examples of passengers include:

- in sleeper accommodation, environmentally-minded passenger wishing to avoid car or air transport;
- in couchettes, school groups (this is also common practice in Italy); and
- in seated accommodation, budget and price-sensitive travellers (IRJ reported that seated accommodation competes on price with coach travel).

Schieneninfrastruktur-Dienstleistungsgesellschaft mbH (SCHIG) suggested that a culture of use of night trains contributes to demand in Austria. If this is the case, it is not clear whether and how such a culture could emerge in other parts of Europe.

Demand for ÖBB Nightjet services is seasonal, and load factors vary from 70% in summer (and even higher in sleeper accommodation and couchettes) to less than 50% after Christmas, with an annual average of 50-60%. Seasonality is less, however, on routes to the major German business centres of Munich and Hamburg (IRJ).

Many ÖBB Nightjet services are profitable, but we understand that without subsidy the overall network would be smaller. ÖBB informed us that is has been paid subsidies for night services within Austria, since 2010, with the aim of preserving service levels. However, the same Public Service Obligation (PSO) may include both day and night trains.

There is no system of subsidising international services, except where competent authorities in the relevant Member States are able to do so and, specifically, there is no subsidy for night trains between Austria and Germany. However, subsidies for the domestic services as far as Villach helps support the continuation of these trains into Italy.

Except where specific subsidies are in place, however, ÖBB acts commercially and its decisions to expand the network were taken on this basis.

[60] The German Bundestag had been told that this was sometimes with a block of tickets allocated to each railway, which could result in passengers being told by one railway that a train was fully-booked, while another railway still had tickets available.

Future developments

ÖBB's business plan for ÖBB Nightjet envisages further growth, but ÖBB mentioned a number of factors which they suggested would facilitate the business:

- Subsidy or pricing reflecting the relative CO_2 emissions of different modes, which could in some cases enable ÖBB to introduce new routes.
- Reduced infrastructure charges at night, which come into place in Germany from 2017.
- Greater priority in the allocation of infrastructure and station capacity.

SCHIG also suggested that ÖBB Nightjet could be helped through a combination of tax changes for other modes, changes to infrastructure charges, and the introduction of mechanisms for cross-border PSOs.

Longer term, ÖBB envisages that the sector will see further growth and new entry, particularly in response to environmental issues. However, we understand that ÖBB Nightjet is expected to remain a niche product.

Employment

ÖBB has 400 staff working in aspects of the night train business including driving, maintenance and sales, and subcontract the provision of a further 400 on-board staff.

ANNEX D: CASE STUDY: SJ NATTÅG (SWEDEN)

Introduction

Sweden was the first EU Member State to separate the railway infrastructure from the operator, in 1988, and has since deregulated long-distance rail and coach markets. However, the country is sparsely populated and transport markets are thin, particularly north of the three largest cities, Malmo, Gothenburg and Stockholm. Much of the network in the north is single track, constraining both the scheduling of services and the completion of maintenance works.

National operator SJ is expected to act commercially and may withdraw from services which it does not find commercially attractive. When this happens, services may be supported by a Public Service Obligation (PSO):

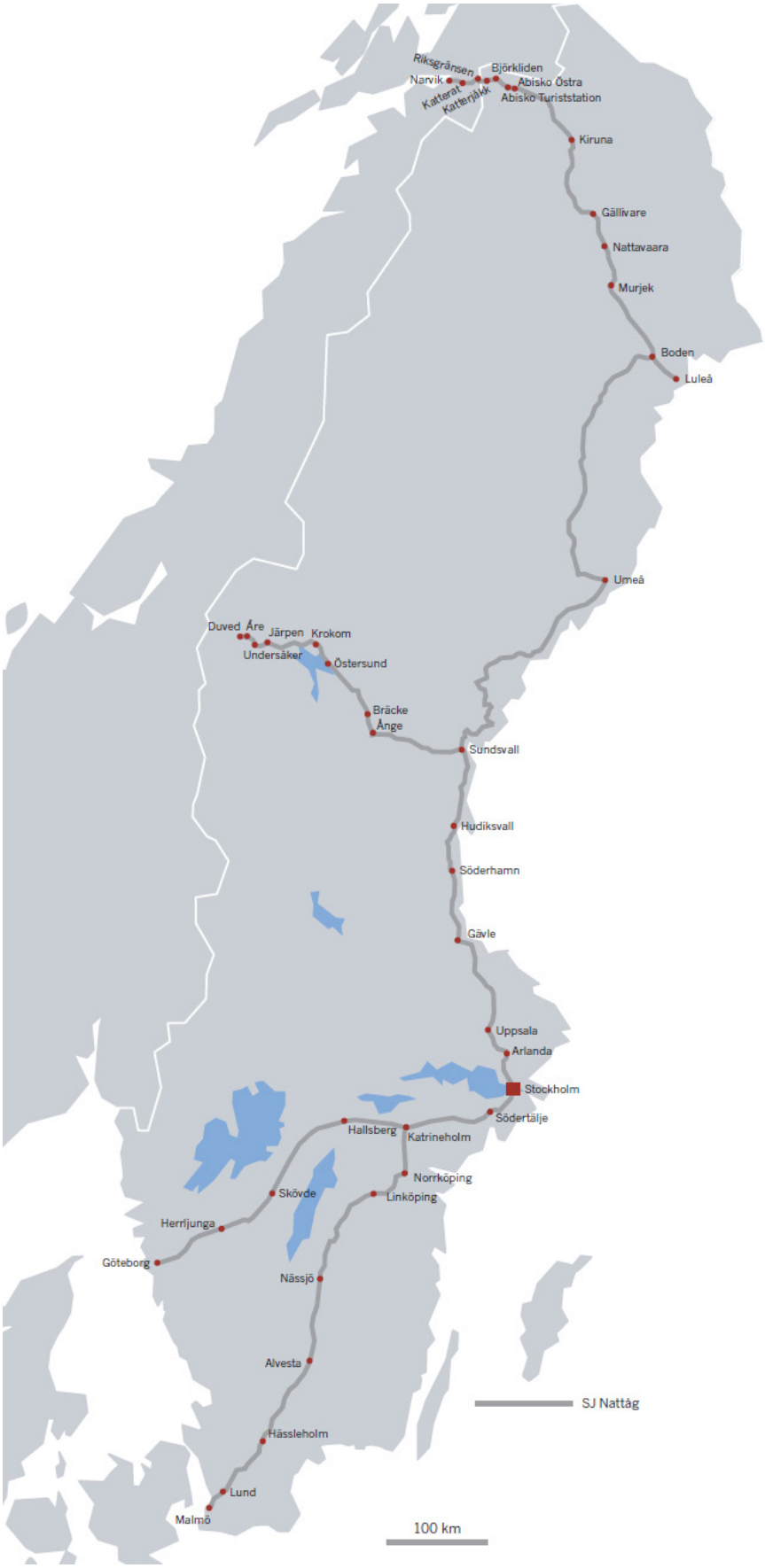
- Services within a County (Län) may be procured by the County authorities.
- Services connecting Counties or operating nationally, such as night trains, may be procured by Trafikverket, the Swedish Transport Administration.

The Counties and Trafikverket also support a range of other transport services including, in the case of Trafikverket, seven regional air routes. Trafikverket informed us that the same criteria (namely the impact on accessibility) are applied to rail, air and coach modes.

Operating patterns

The 2016 Swedish night train (Nattåg) network is shown in Figure 23.

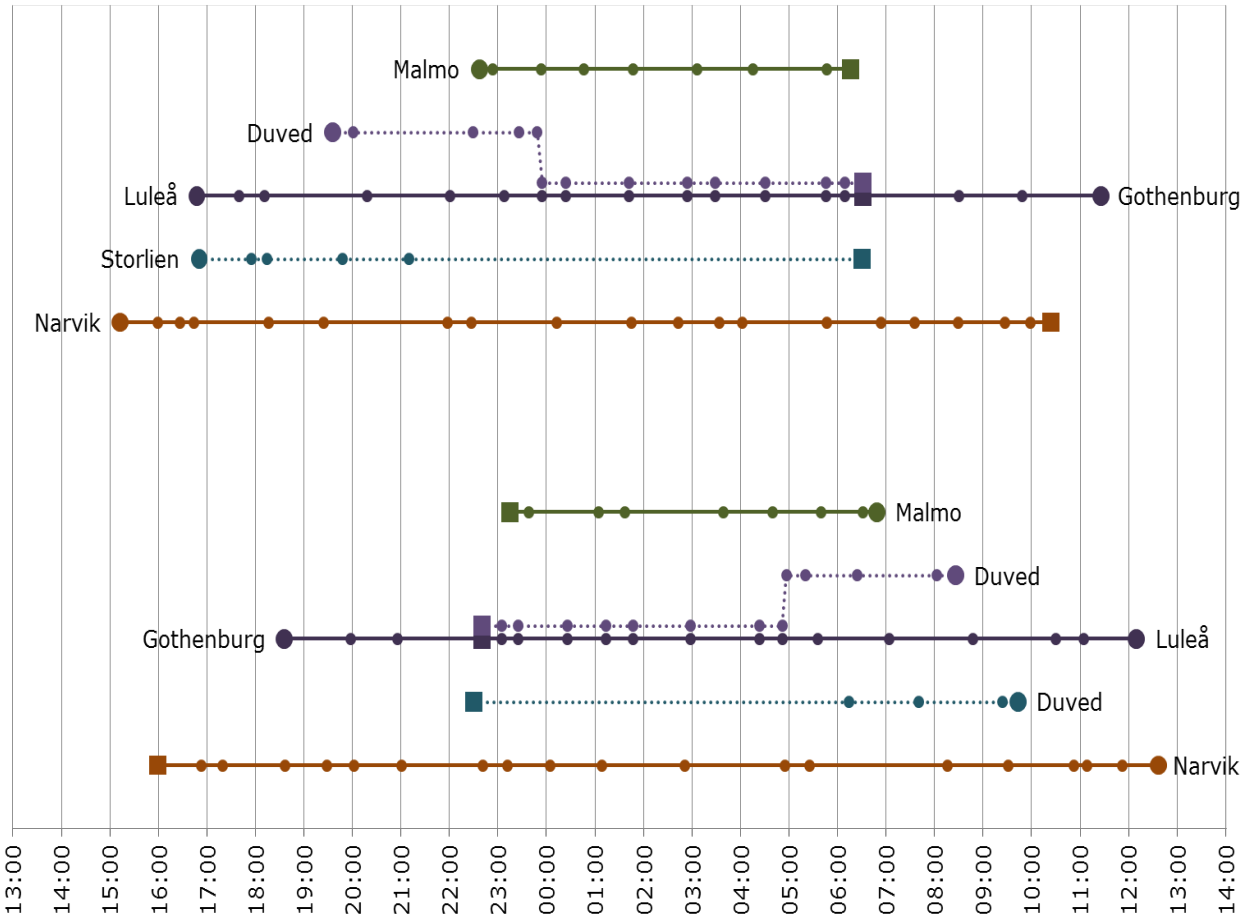
Figure 23: SJ Nattåg: network (2016)



Source: SJ.

Typical operating patterns are shown in Figure 24.

Figure 24: SJ Nattåg: operating patterns from Stockholm Central (2016)



Source: European Rail Timetable (January 2016), based on weekday pattern, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Stockholm is represented by a square marker.
Note: dotted services only run seasonally.

Five different night train (Nattåg) services operate from Stockholm, but not all operate daily, or all year round. Typical services include:

- Daily, a service operates to Narvik in Norway via Boden (with a day train connection to Luleå).
- Daily, a service originates in Gothenburg (Göteborg on Figure 23) and runs as a night train from Stockholm to Kramfors and on to Luleå. A second portion is attached at Stockholm and detached at Kramfors to run to Duved.
- Six days a week, excluding Saturday nights, a service operates to and from Malmo (Malmö on Figure 23).
- Three to four days a week, a service operates to Duved and returns from Storlien on the Norwegian border. These services, shown dotted, are operated commercially but are now only seasonal, having been cut back by SJ during 2016[61].

Note that night trains can be stopping and starting at (mainly) urban stations in different places in Sweden for almost 22 hours a day. This makes it unclear whether night trains

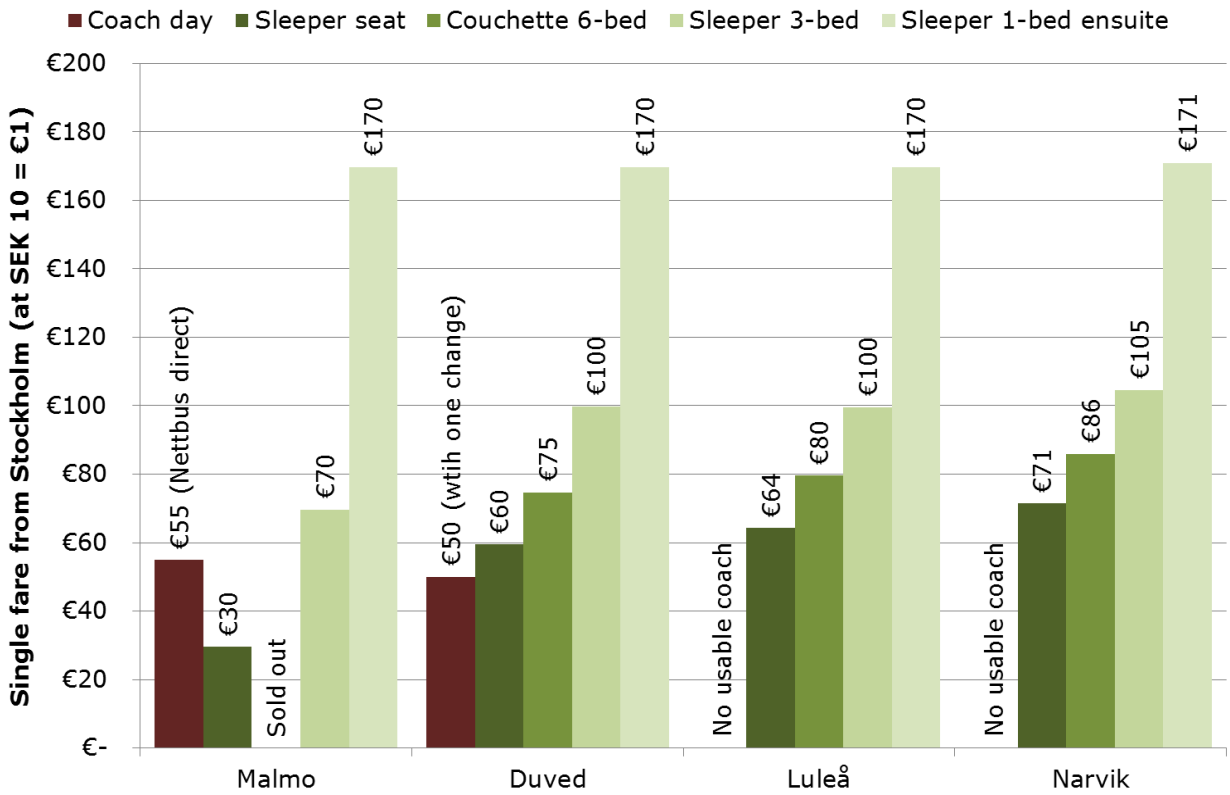
[61] From Dagens Nyheter, a newspaper.

result in a net reduction in noise pollution, especially when many of the major Swedish airports are remote from the cities they serve. However, Trafikverket told us that complaints about railway noise at night were more likely to relate to freight trains.

Accommodation and pricing

Figure 25 compares a range of fares available from Stockholm three months ahead, to Malmo, Duved, Luleå and Narvik, with the fares on any comparable coach services.

Figure 25: SJ Nattåg: sample fares three months ahead



Source: SJ, Nettbus, Rome2Rio.
Note: fares may be higher for immediate travel.

SJ Nattåg's fares are not regulated, and hence are constrained only by the market including the competing offer from air and coach services. Trafikverket informed us that night train fares vary, but not as widely as day fares, which are extensively yield-managed.

However, Sweden's low population density means that commercial coaches do not serve all these destinations from Stockholm, as shown in Figure 25. There are direct day coaches to Malmo but we found no night coach. Travel to Duved requires a change of coach. There is a twice-weekly night coach to Piteå near Luleå, but on other days travel by coach even to Luleå requires a number of changes.

Malmo can be reached by coach in around 11 hours on a service operated by Nettbus, and we found a fare of SEK 549 (€55) booking three months ahead. Seats three months ahead on the night train were available for SEK 295 (€30), 6-berth couchettes had already sold out, spaces in 3-bed sleeping compartments were SEK 696 (€70) and 1-bed en-suite compartments were SEK 1,697 (€170). There are also frequent flights between Stockholm and Malmo, taking around one hour, although Malmo airport is remote from the city and it can be more convenient to fly to Copenhagen in Denmark and connect to Malmo city centre by train over the Oresund bridge.

Duved can only be reached by coach, with a change, for SEK 500 (€50). Prices on the night train start at SEK 595 (€60) for a seat, SEK 746 (€75) for a couchette, SEK 997 (€100) in a 3-bed compartment and SEK 1,697 (€170) for a 1-bed en-suite compartment.

Luleå and Narvik have no effective coach services, but night train prices from Stockholm cost only slightly more than those to Duved. This may reflect both the effectively fixed operating cost per night of sleeping accommodation occupied only once, no matter what distance it travels, and the relatively frequent air services between Stockholm and Luleå (up to 10 per day) and Kiruna. Seats and couchettes on the night train to Malmo are cheaper than on other night trains, however, possibly to be competitive with day rail and coach services.

Stockholm to Malmo

The Stockholm to Malmo night train is the shortest of the night train services operated by SJ, operating six days a week with sleeping cars and couchettes, and with a total journey time of just over 7½ hours in each direction. Day services take around 4½ hours, meaning that the night train journey is approximately 70% longer. Average end-to-end speeds are 116 km/h by day and 68 km/h by night.

In June 2015, SJ reported that passenger numbers were 65% higher than in 2014, meaning that the service had become profitable following several years of losses. SJ cited a number of reasons for the dramatic increase in traffic, with retiming the departure from 21:30 to 23:14 as one of the main causes[62]. SJ also claimed that its campaign to promote the service to politicians and business people in southern Sweden has yielded results (IRJ).

SJ reported that the train would continue to run until the end of 2016 (IRJ), but we understand that it is continuing and were able to make trial bookings for March 2017. We have seen no data on the mix of passengers using the service, but a service connecting the first and third largest cities in Sweden may appeal to residents who need to travel regularly between them.

We also examined Trafikverket proposals for expansion of Sweden's high-speed rail network to the south. A 320 km/h line linking Stockholm, Gothenburg and Malmo could reduce total journey time to 2½ hours by around 2035. While not yet committed, if constructed it would probably render the night train service unattractive, but might make it easier to add Gothenburg and/or Malmo to services to the north of Sweden and Norway, discussed next.

Stockholm to Jamtland: Duved and Storlien

Services to Jamtland were cut back during 2016 to operate for around 100 days a year on a seasonal basis, but the services which continue are operated without subsidies.

Stockholm to Norrland: Luleå and Narvik

In contrast to the Malmo and Jamtland services, services to Luleå and Narvik in Norway have been operated under a PSO: from 2000-2003 by Tågkompaniet; from 2003-2008 by Veolia; and from 2008-2018 by SJ Norrlandståg, which was the only bidder. Narvik on the Atlantic coast is only 40 kilometres by rail from the border at Riksgränsen, and Norway makes a contribution to this element of the service.

[62] SJ referred to this retiming in the International Railway Journal (IRJ) in June 2015, but our own checks showed that the train operated at 23:14 in 2009. It is not clear when the change took place.

Trafikverket informed us that the current operator, SJ Norrlandståg, operates all these night train services with about 200 employees, and that it has not identified any difficulties with recruiting staff willing to work overnight.

Trafikverket informed us that the current subsidy to the service is around SEK 120 million (€12 million) per annum, and it understands that the remainder of costs of around SEK 300-400 million (€30-40 million) are covered by fares revenue. While Trafikverket is in principle responsible for route and service planning, in practice it specifies only the minimum number of services and the operator is free to finalise the timetable, set fares, and choose the rolling stock used. The fleet available to operate the services consisted of 85 vehicles, divided into no fewer than 10 distinct types shown in Table 18.

Table 24: SJ Norrland and Narvik: rolling stock fleet

Type	Total number	Variant	Number
Electric locomotives	12	Rc6 with ERTMS	8
		Rc6	4
Seating cars	23	B2	10
		B9	3
		BF4 with wheelchair lift	7
		BFS9 with wheelchair lift	3
Couchette cars	20	BC4	20
Sleeping cars	25	WL6	20
		WL4 with wheelchair lift	5
Restaurant cars	5	R12	5

Source: case studies and interviewees, Steer Davies Gleave analysis.

Figure 26 shows how traffic on the night trains to the north has declined since 2001.

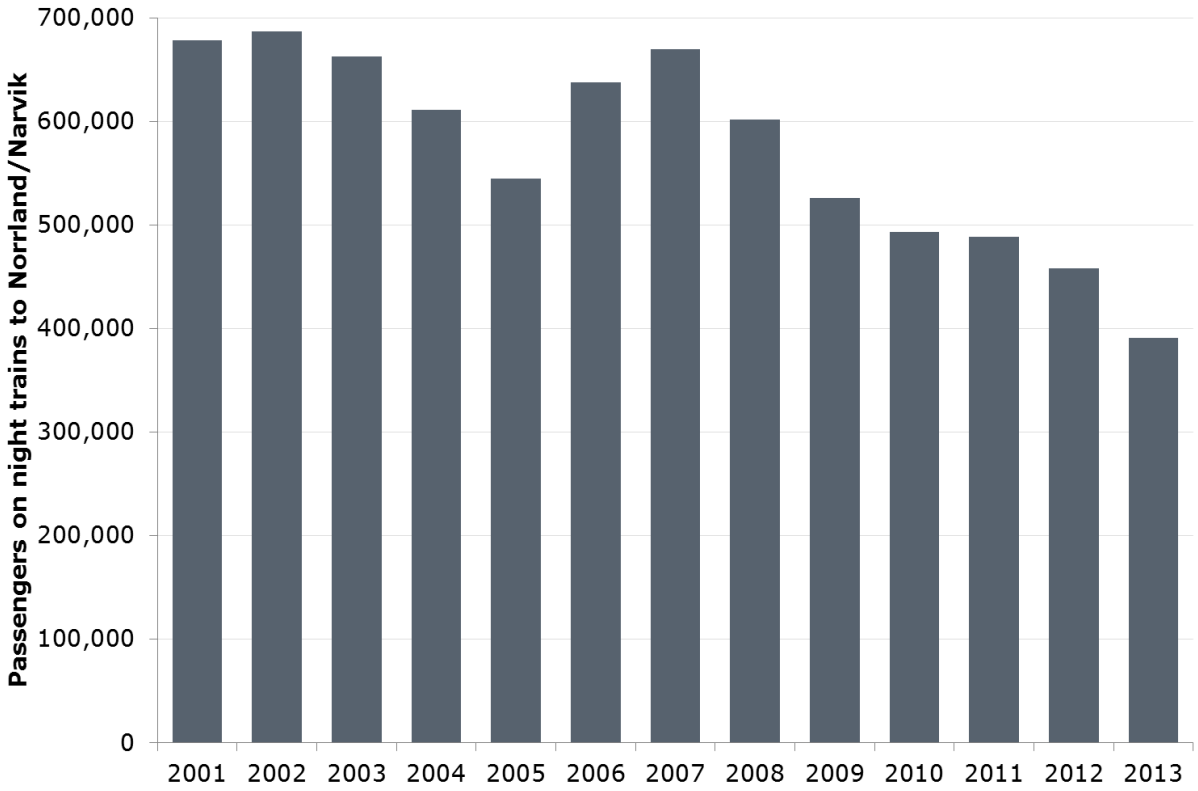
Trafikverket identified from interested parties a number of possible reasons for the decline:

- competition from other modes of transport, notably air;
- delays and cancellations due to winter problems;
- infrastructure problems;
- flaws in the interaction between the operator and the tourism industry; and
- the timetable does not provide sufficiently attractive arrival and departure times.

However, Trafikverket's report does not identify which parties made these remarks, or provide any detail which explains or supports them.

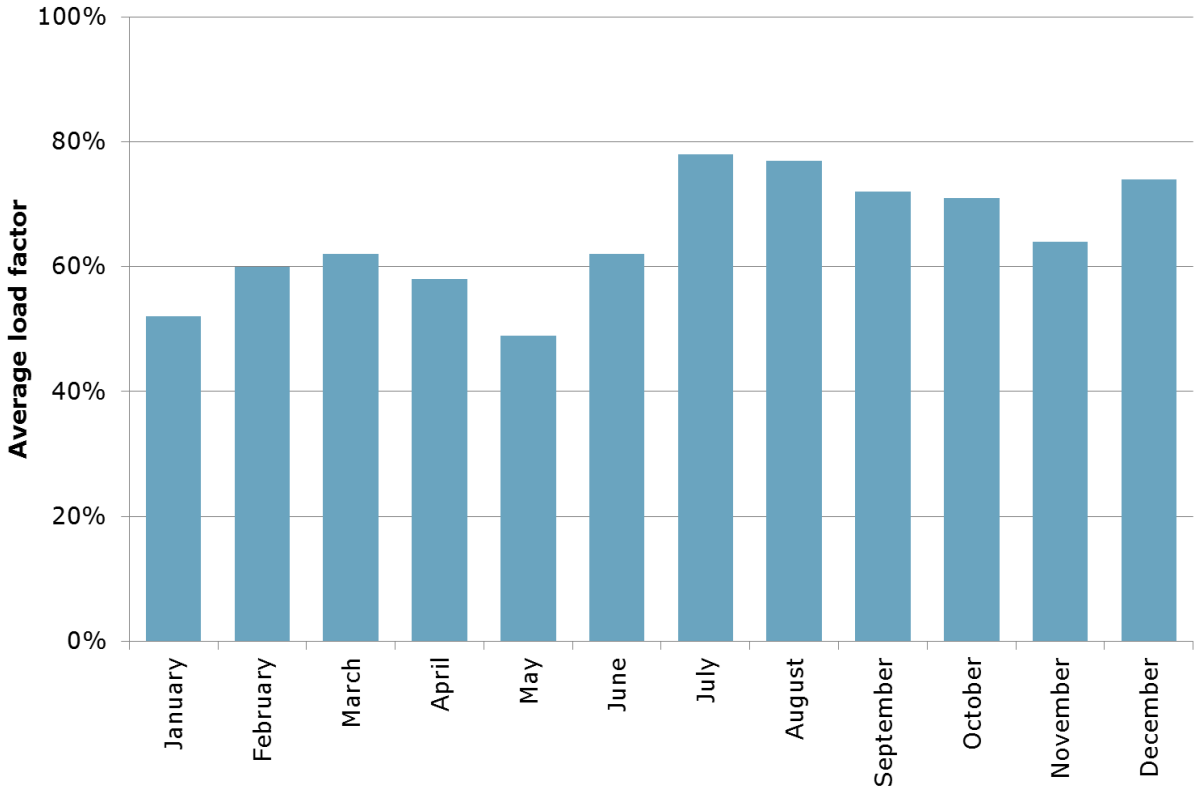
Figure 27 shows how average load factors on the services vary by time of year.

Figure 26: SJ Norrland and Narvik: passenger numbers (2001-2013)



Source: Trafikverket, Steer Davies Gleave analysis.

Figure 27: SJ Norrland and Narvik: load factors (2015)

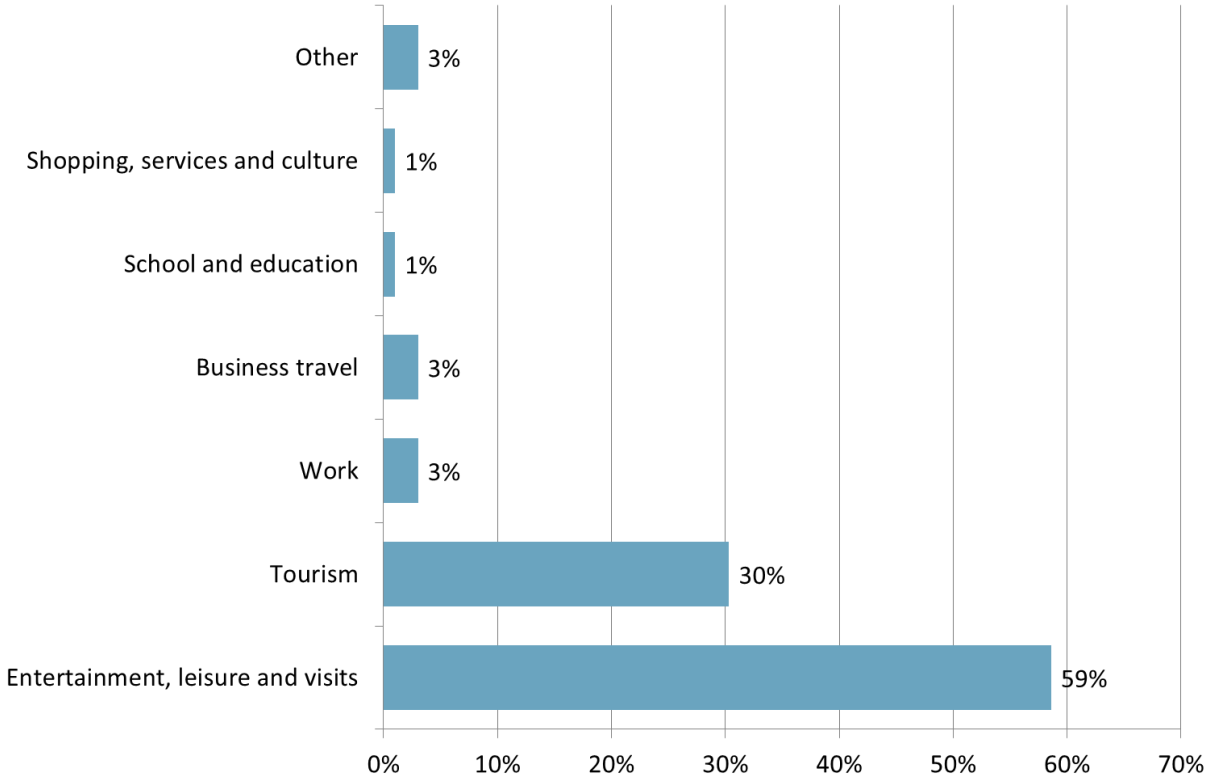


Source: Trafikverket, Steer Davies Gleave analysis.
Note: operator SJ Norrlandståg adjusts the train formation according to forecast demand.

As noted above, the PSO contractor, SJ Norrlandståg, must provide a specified minimum number of seats, couchettes and sleeping car beds per year, but is free not only to vary the fares but also to vary the train formation to carry projected demand. However, the only direct saving of a shorter train is likely to be some fuel and the distance-related elements of vehicle inspection and maintenance. In addition, the Norrländska Socialdemokraten[63] newspaper reported in mid-November that the night trains were already fully-booked from 21-24 December 2016, the week before Christmas, even using all the vehicles that could be made available. This illustrates the difficulty of dealing with highly-peaked demand.

Figure 28 illustrates the mix of users of the Norrland and Narvik services, although Trafikverket cautions that this is based on passenger surveys in June and July 2015, when business travel, or any regular commuting to school or work, may have been depressed. 83% of passengers surveyed were Swedish, 6% Norwegian and 11% were from elsewhere. 98% of journeys were longer than 100 kilometres and 96% of journeys crossed a County (Län) boundary. This illustrates the potential difficulty of supporting night services in other Member States where there is no provision for subsidy except by local or regional competent authorities.

Figure 28: SJ Norrland and Narvik: users of the service

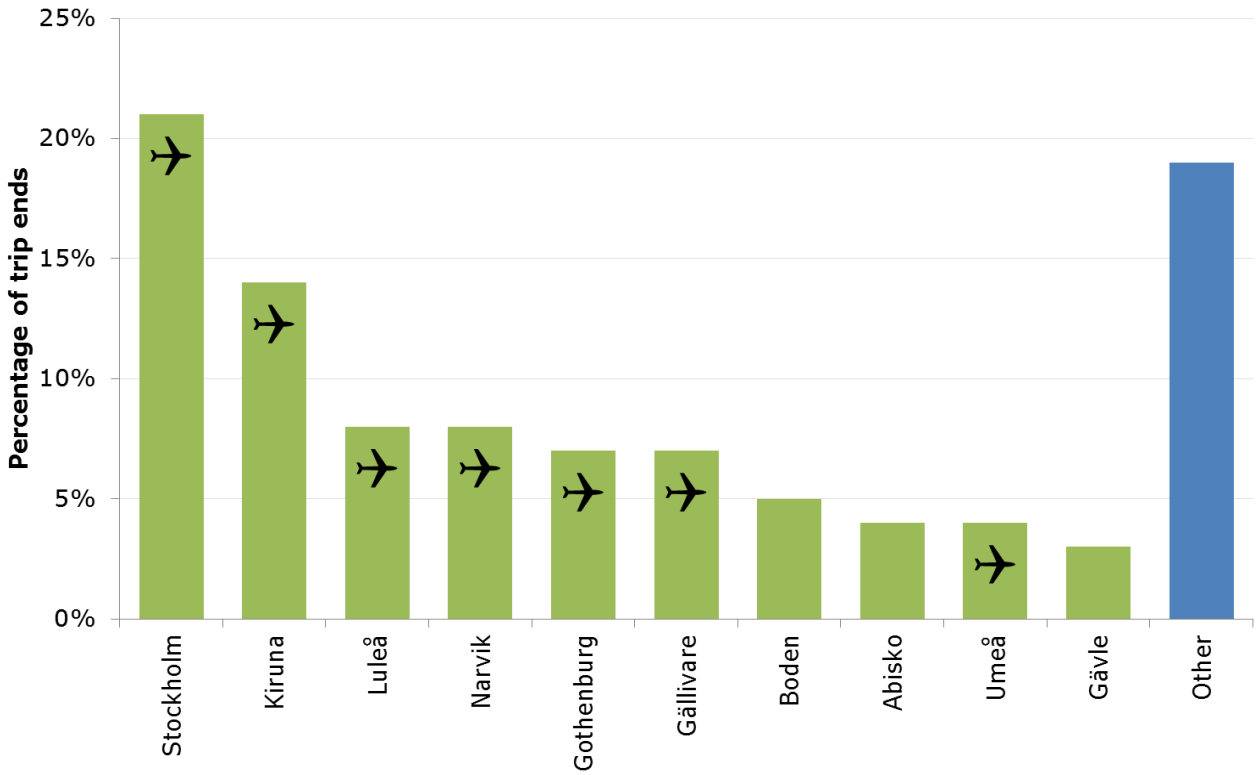


Source: Trafikverket, Steer Davies Gleave analysis.

Most passengers travel from a limited number of stations, as shown in Figure 29, many of which have airports, although travel between them by air may require connecting between flights at Stockholm airport. Ten stations account for 80% of all trip ends, but the remaining passengers may be travelling to, from or between minor stations not conveniently connected by other modes. Trafikverket also identified what mode passengers would have used in the absence of the night train, summarised in Figure 30.

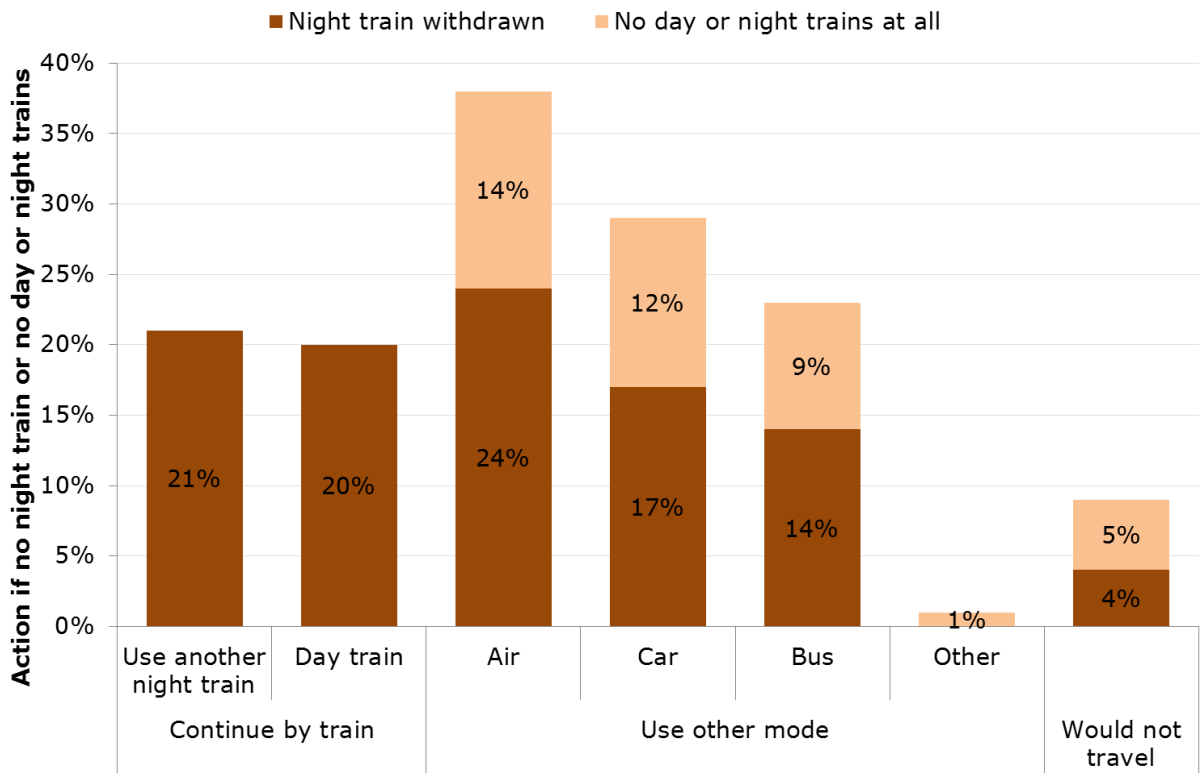
[63] A regional daily newspaper published in Norrbotten Län (North Bothnia County).

Figure 29: SJ Norrland and Narvik: trip ends by station



Source: Trafikverket, Steer Davies Gleave analysis.
Note: ✈ denotes a station at a town or city with a domestic airport.

Figure 30: SJ Norrland and Narvik: passenger intentions if services were removed



Source: Trafikverket, Steer Davies Gleave analysis.
Note: use of bus if night train was removed was not included: we have inferred it as a residual item.

Trafikverket stressed to us that total closure of night trains had not been considered, but if the specific night train they used had been withdrawn:

- 41% of passengers would have used another train, split evenly between another night train and a day train.
- 55% of passengers would have travelled by another mode, including 24% by air.
- 4% of passengers would not have travelled.

If no train service had been available at all:

- 91% of passengers would have travelled by another mode, including 38% by air.
- 9% of passengers would not have travelled.

This suggests that, at least in Sweden and where they are available, the closest substitute for night trains is day trains, with two implications, if many passengers would in any case have used another train:

- The effective net revenue of night trains may be overstated.
- The effective net environmental benefits of night trains may be overestimated.

Trafikverket's report included an analysis of the causes of delay. Around one quarter of delays were due to Trafikverket as infrastructure manager, and one quarter to SJ as train operator. The remaining half of delays were due to accidents, incidents and external factors, operations management, and consequential delays.

Future developments

During 2016 Trafikverket opened a consultation for options to continue the Norrland and Narvik service after 2018. The two main options were:

- to continue with the current two services, or
- to remove one service either outside the tourist season or completely.

In January 2017, it was reported that Trafikverket had decided to extend the operation of the night trains to and from Luleå and Narvik from 2018 until at least 2020[64]. One issue highlighted in the press was the relative average subsidy to passengers on supported night trains (SEK 197, €20) and supported air services (SEK 745, €75). However, we noted in the introduction to this case study that the criteria for support are the same for all modes, and conclude that this difference should not be interpreted as a bias in favour of air services.

We asked Trafikverket what would happen when it was necessary to replace the current night train rolling stock fleet of 73 passenger vehicles, of 8 distinct types (please see Table 24), much of which dated from the 1990s or earlier. We were informed that no decision had been made on services beyond 2028, although it might be possible to extend the life of the stock further beyond that date.

Trafikverket is also planning a number of infrastructure schemes, which would significantly reduce day train journey times.

North from Stockholm to Luleå and Narvik, a "Norrbotniabanan" (North Bothnia Line) to Luleå, for which no funding is yet available, would reduce journey times from Umeå to Luleå by 90 minutes and could be completed by 2030. With other improvements, this could reduce journey times from Stockholm to less than 6 hours to Luleå and 11 hours to Narvik.

[64] From FRIA.NU, a free Swedish national newspaper.

South from Stockholm to Malmo, we mentioned above the proposed 320 km/h line linking Stockholm, Gothenburg and Malmo, which could reduce total journey time between Stockholm and Malmo to 2½ hours by around 2035. This is not yet a firm commitment, but the line is on a Trans-European Transport Network (TEN-T) corridor and, if constructed, would almost certainly render the night train service obsolete. However, it might make it easier to add Gothenburg and/or Malmo to night train services to the north of Sweden and Norway.

With both proposed lines, even a Malmo to Narvik journey could also be completed in a (long) day journey of around 14 hours. This would weaken the case for retaining a fleet of stock, including nearly 50 sleeping and couchette cars, when any end-to-end journey could be made within a day.

Trafikverket told us that these improvements were not yet committed, but that there might still be a role for night trains even if they were. For example, even with these journey time improvements it would be possible to leave Malmo in the evening, travel overnight from Stockholm to Luleå or Kiruna, and reach Narvik later in the morning.

ANNEX E: CASE STUDY: THE CALEDONIAN SLEEPER (UNITED KINGDOM)

Introduction

Great Britain was an early deregulator of transport markets. By the 1980s, long-distance rail services were expected to be profitable and operated commercially, as we discuss below. Long-distance coach services were deregulated in 1986 and open access rail services have been permitted since 1994, subject to rules designed to protect rail services operated under a Public Service Contract (PSC).

Night trains between London and the North West

As late as 1983, the former national operator, British Railways, continued to operate night trains between London and the North West to Manchester (296 kilometres), Liverpool (312 kilometres), Holyhead (424 kilometres, for the ferry to Dublin) and via Preston to Barrow-in-Furness (424 kilometres).

Proposals to close these services in May 1983 led to a Parliamentary debate on 9 March 1983[65].

One Member of Parliament (MP) reported random checks showing, during the four weeks ending on 15 May 1982 (the preceding year) that 96 of 140 First Class berths and 255 of 358 Second Class berths had been occupied, an average of over 70%. He also stated that British Rail's argument for withdrawal of the services was that it was not possible to justify the cost of new stock, at £250,000 a vehicle[66], and argued that stock could be refurbished at a much lower cost. A number of other MPs argued that the night train was the only realistic way of obtaining a full working day in the city at the other end of the line, except by catching an early morning flight.

The Under-Secretary of State stated that night trains formed part of the InterCity sector, which the major political parties had agreed should operate without subsidy, and that British Railways had been given a remit to act commercially. The rolling stock had dated from as early as 1957 and was already 25 years' old, and any replacements would have to be based on the newer Mark III stock first introduced in the late 1970s, partly to introduce fire prevention measures following a fire on a night train in 1978[67]. He also said that, between 1969 and 1981, annual use of the night train had declined from 20,000 to 6,900 between London to Liverpool and 21,000 to 7,900 between London to Manchester, a decline of 64% or an average year-on-year decline of 8%[68]. Demand had been imbalanced, with most of the journeys southbound to London.

In 1958, travel between London and Manchester had taken four hours, with only just over six hours before the first arrival and the last departure. In contrast, day trains now operate between London to Manchester every 20 minutes for most of the day, with a journey time of less than 2 hours 10 minutes. It is possible to be in Manchester by 08:28 and to stay until 21:15, allowing a working day visit of 12¾ hours, twice as long as in 1958.

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[65] There was a similar debate on the closure of night train services in the German Bundestag in 2016 (please see Annex B on DB City Night Line in Germany).

[66] Approximately 450,000 ECU (European Currency Units) in 1982.

[67] The fire occurred in a sleeping car train at Taunton in England on 6 July 1978 and killed 12 people and injured 15 people.

[68] We have reported the passenger numbers stated, but 7,900 passengers per year would suggest that average usage of the Manchester night train had already fallen to fewer than 20 passengers each way per working day.

Night trains between London and the North West have now all closed, and the only night trains now remaining within Great Britain are as follows:

- The Night Riviera is operated six nights a week between London and Penzance, covering 523 kilometres by rail in around 8 hours (or an average of 65 km/h) operated as part of the Great Western franchise.
- The Scottish Lowland (Glasgow and Edinburgh) and Highland (Aberdeen, Inverness and Fort William) night trains are operated six nights a week by The Caledonian Sleeper franchise, which we discuss in greater detail below.

Night trains between London and Scotland

Progressive increases in train speeds, which reached 200 km/h in the late 1970s, have resulted in day journey times between London and Edinburgh as short as 3 hours 59 minutes. Typical day journey times are now less than five hours between London and Edinburgh (via the East Coast Main Line) and Glasgow (via the West Coast Main Line). Nonetheless, night trains between London and Scotland continue to be specified in Public Service Contracts (PSCs).

Following the introduction of Directive 91/440/EEC, the government of the United Kingdom decided to subject all existing passenger services to franchising. Bidders were asked to provide a minimum level of service but could add further services either within their bid or during the life of the franchise, which varied from 5 to 15 years. Night trains between London and Scotland have been provided under franchise, supported by a Public Service Contract (PSC), by three successive operators:

- From March 1997 to October 2004, night trains were operated by National Express as part of the ScotRail franchise let by the Department for Transport.
- From October 2004 to March 2015, night trains were operated by First Group as part of the ScotRail franchise let by Transport Scotland.
- From April 2015, night trains have been operated by Serco as a dedicated franchise, The Caledonian Sleeper, let by Transport Scotland.

This means that The Caledonian Sleeper services, unlike many other night train services in Europe, are now run as a dedicated contract under a specific PSC, and that a range of data specific to these services is available.

Operating patterns

Night train services originally operated from both London Kings Cross, via the East Coast Main Line, and Euston, via the West Coast Main Line. Over time, the pattern of operation has been consolidated and simplified. All services have now been combined into two trains each way per night, every night except Saturday, to and from London Euston, although they can be diverted to operate to Kings Cross at times of engineering works or disruption.

The current pattern of service is shown in Figure 31:

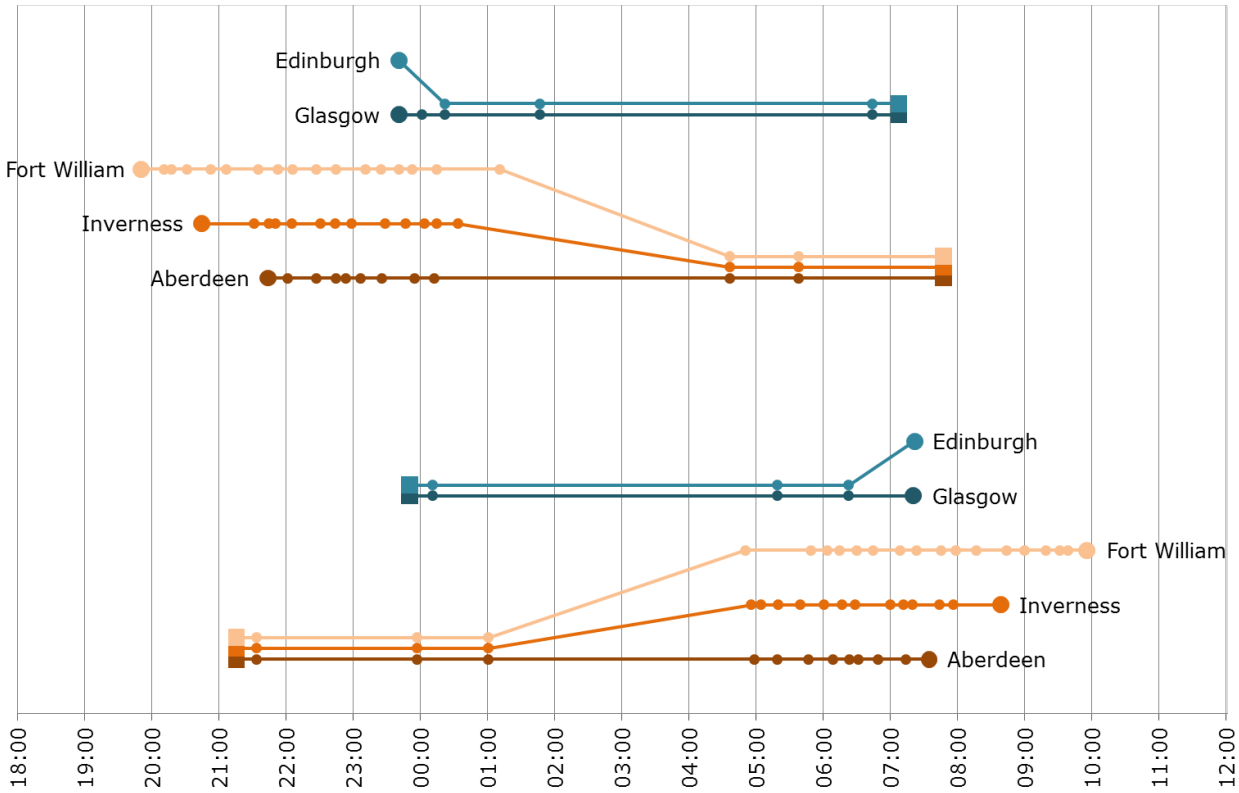
- One train to/from London divides/joins at Edinburgh, with portions for Fort William, Inverness and Aberdeen.
- One train to/from London divides/joins at Carstairs, with portions for Edinburgh and Glasgow.

Figure 31: The Caledonian Sleeper: network (2016)

Source: The Caledonian Sleeper.

We carried out a detailed analysis of the operating patterns for May to December 2016, as shown in Figure 32.

Figure 32: The Caledonian Sleeper: operating patterns (2016)



Source: The Caledonian Sleeper timetable for May to December 2016, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, London Euston is represented by a square marker.

Northbound, a train left London Euston at 21:15 and stopped at Watford Junction, Crewe and Preston, before splitting (and reversing) at Edinburgh to form three portions:

- to Aberdeen, arriving at 07:34;
- to Inverness, arriving at 08:38; and
- to Fort William, arriving at 09:55.

Onward connections were available from all these points.

A second train left London Euston at 23:50 and travelled via Carlisle to Carstairs, where it split into portions arriving at Edinburgh (at 07:21) and Glasgow (at 07:20)[69].

Southbound the pattern was reversed, but one constraint was the need for the night trains to reach London Euston before the morning peak period. This meant that the Fort William portion set off at 19:50 (and 19:00 on Sundays) to ensure arrival at Euston by 07:47. Passengers were allowed to remain on the train until 08:00.

Serco Caledonian Sleepers[70] told us that the Preston call (04:36 southbound, 01:00 northbound) is used by some business passengers from the Highlands to fly from Manchester airport, because it enables them to use flights departing too early, or arriving

[69] These arrival times were for arrivals on Tuesday to Friday. Slightly different timings applied to arrivals on Saturday and Monday.
[70] Serco Caledonian Sleepers is the operator of The Caledonian Sleeper brand.

too late, to have connections from any of the Scottish airports. This illustrates how a single minor call on a night train can serve a distinct and, in this case, high value market.

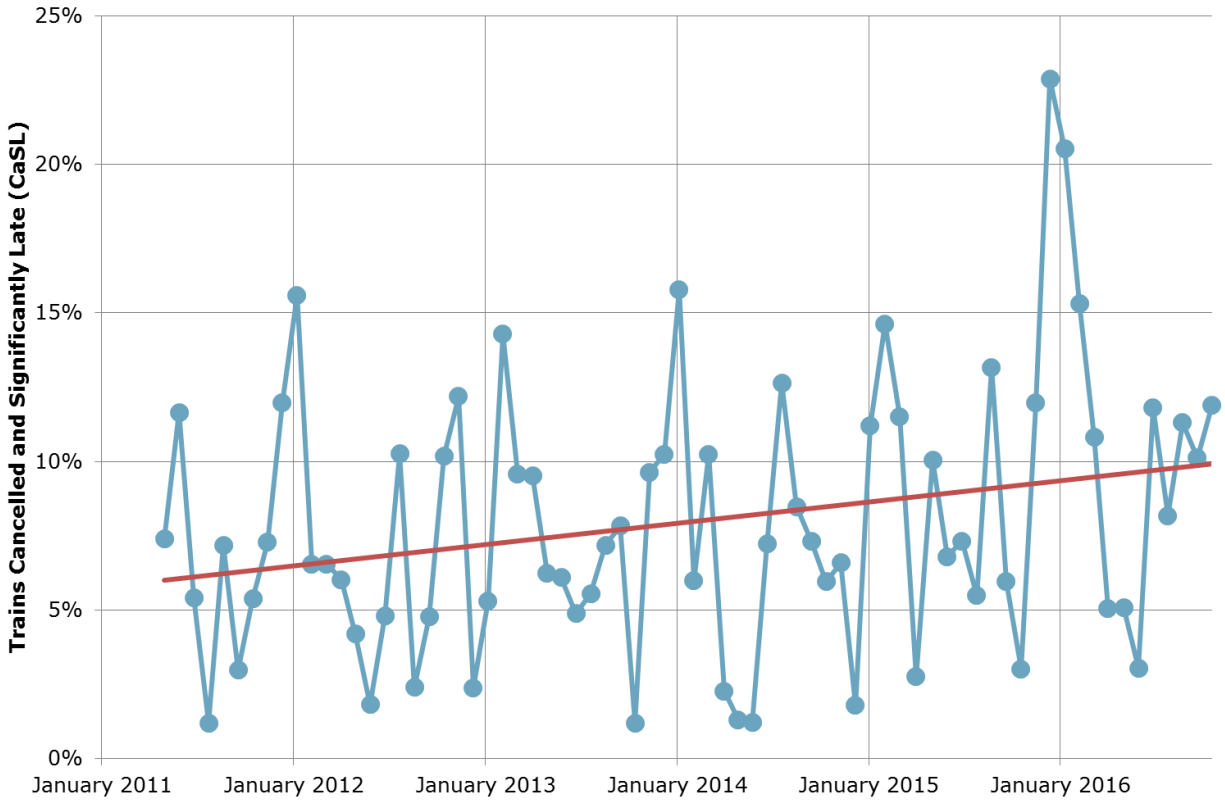
Journey times between London and Edinburgh/Glasgow are artificially extended to over 7 hours by operating at only 130 km/h on the West Coast Main Line, on which the day trains operate at 200 km/h. The result is that night train journey times are up to 70% longer than those of the equivalent day trains.

The average effective speed between London and Glasgow is over 120 km/h on day services but falls to under 75 km/h on night services. The average effective speed of the night service between London and Fort William is less than 55 km/h.

Punctuality and reliability

Performance, as measured by trains Cancelled and Significantly Late (CaSL), is generally worst in December and January, although this reflects the difficulties not only of winter weather (services to Inverness cross the highest point on the rail network) but also engineering work carried out during the Christmas and New Year breaks.

Figure 33: The Caledonian Sleeper: cancellations and late trains



Source: Office of Rail and Road, Steer Davies Gleave analysis.
Note: each point on the chart represents the average for the preceding four-week period.

Accommodation and pricing

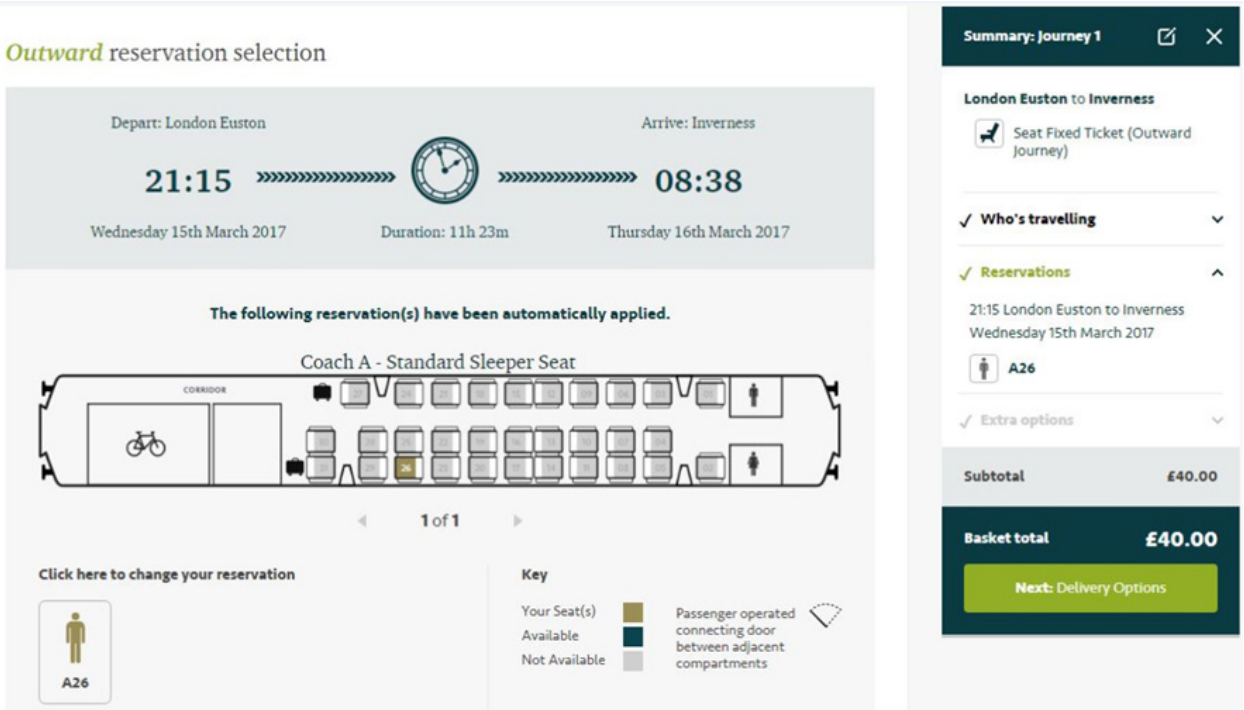
Under the system of ticketing in Great Britain, many tickets must be interavailable between operators, and the lead operator responsible for setting day fares between London and Scotland is not The Caledonian Sleeper. This means that tickets to use the night trains can be either booked direct or paid as a "berth supplement" to an existing interavailable ticket. Three levels of comfort are currently provided:

- Seat. London to Edinburgh and Glasgow portions each have one seating coach with 31 seats.
- Standard sleeper, in which the passenger may either book both beds or share the compartment with another passenger of the same sex. London to Edinburgh and Glasgow portions each have two coaches configured as Standard class, with 26 berths each.
- First Class sleeper, in which one bed is locked away and there is only one passenger per compartment. London to Edinburgh and Glasgow portions each have three coaches configured as First Class, with 12 available berths each.

Sleeping compartments have wash basins but there are no shower or WC facilities en suite in the current rolling stock.

Figure 34 illustrates a trial booking screen for a seat from London to Inverness booked three months ahead, with a price of £40 (approximately €50) for a specific train: flexible fares are available for approximately 20% more.

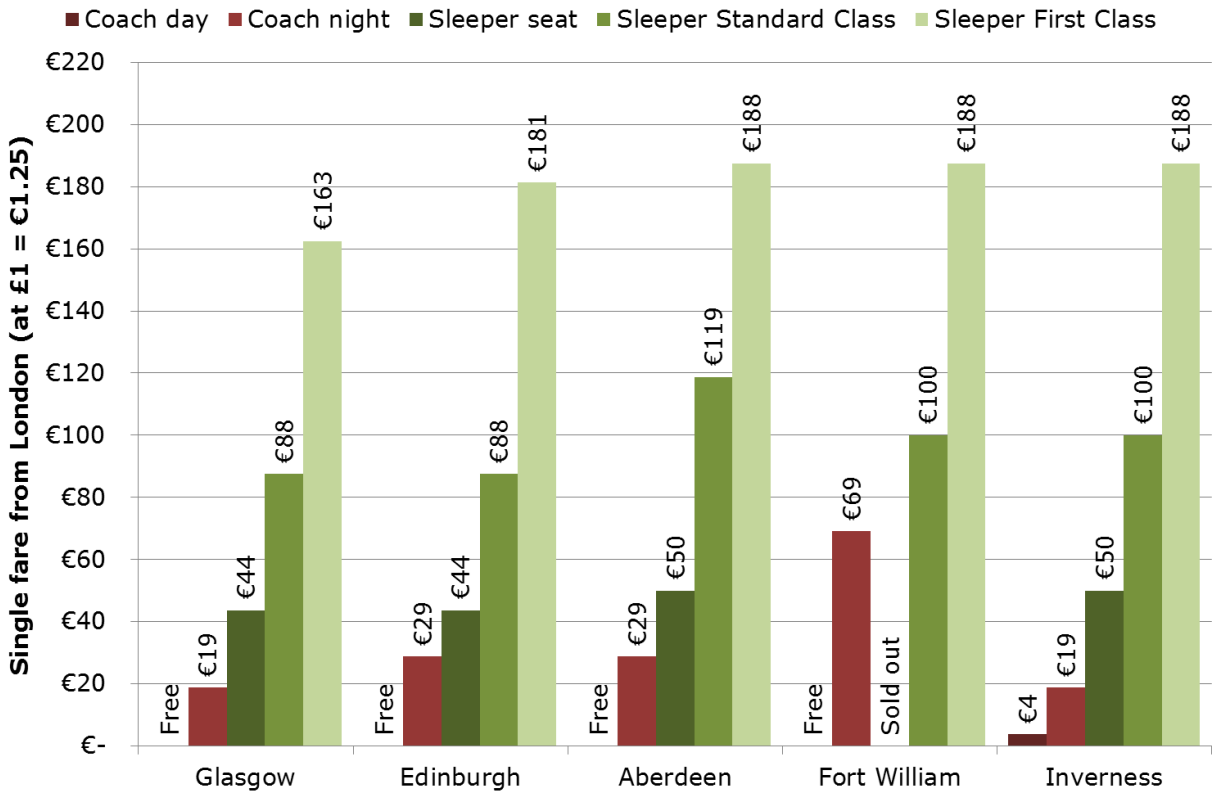
Figure 34: The Caledonian Sleeper: illustrative booking



Source: The Caledonian Sleeper.

The lowest prices offered for midweek travel three months ahead are shown in Figure 35.

Figure 35: The Caledonian Sleeper: sample fares three months ahead



Source: The Caledonian Sleeper, Megabus, National Express.
Note: fares may be higher for immediate travel.

On the date researched, seated accommodation to Fort William appeared to have been sold out, and fares appeared to be above the minimum level for Standard class to Aberdeen and First Class to Edinburgh.

Coach operators were offering much lower fares on the same day. Megabus was offering travel "Free" (subject to a booking fee) on a number of routes, and National Express was offering travel for as little as €4. This means that passengers wishing to travel as cheaply as possible, and able to book well in advance, were almost certain to use coach rather than the night train.

Passenger data

The National Rail Passenger Survey (NRPS) publishes results for each franchised passenger service. The Quarterly Report sampled 609 passengers in February to April 2016, of whom 21% were travelling for work and 79% were travelling for leisure. The mix of passengers was:

- 20% Seat, half travelling to/from England and half on local journeys in Scotland;
- 44% Standard class, sharing a compartment;
- 3% Standard class, not sharing a compartment; and
- 33% First Class.

In addition, 48% of passengers held a Railcard entitling them to some form of discount.

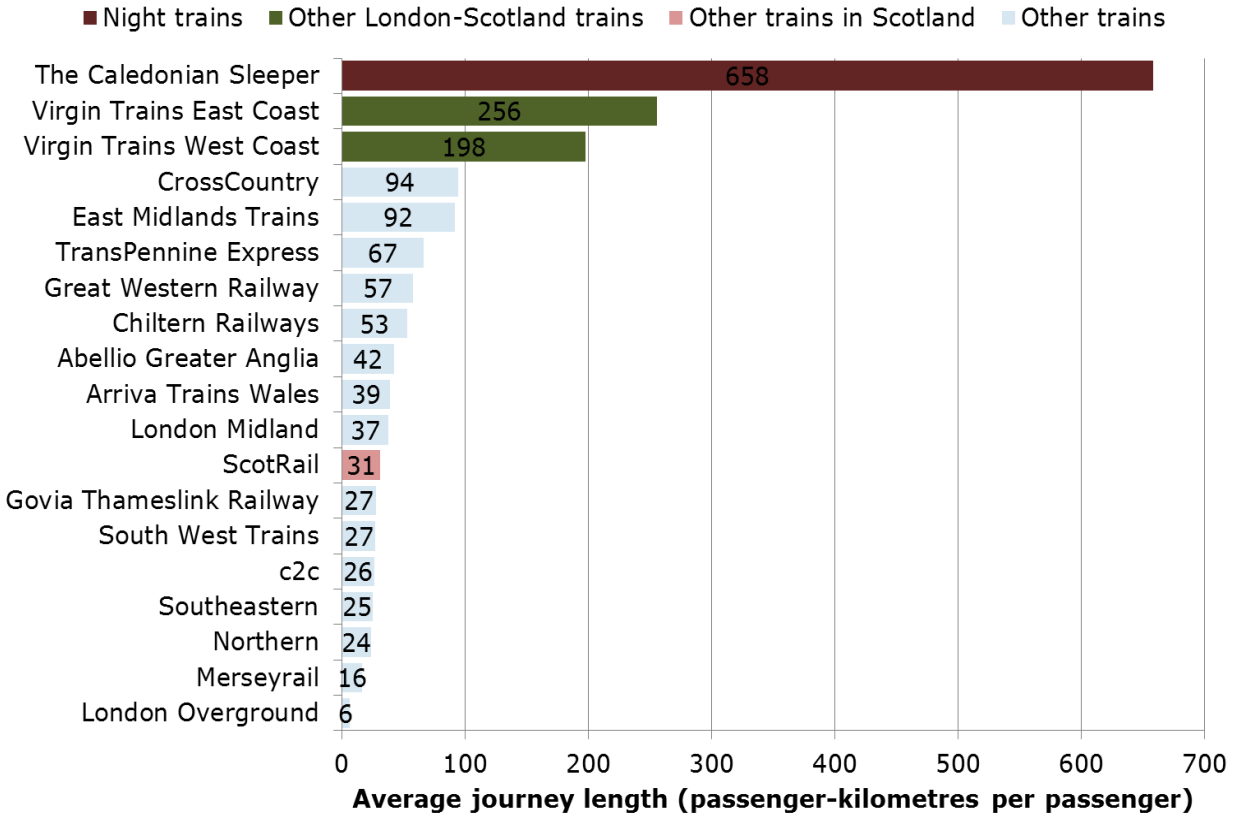
Only 4% of passengers had booked in the week before travel and almost 60% had booked between a year and a month in advance. 92% had booked in advance via website or App,

7% by phone and 1% through a travel agent. None had bought tickets in advance at a station.

The Office of Rail and Road published detailed information on franchised passenger services. In Figure 36 to Figure 39 we compare data for 2015/16[71] for The Caledonian Sleeper with the main ScotRail operation and the two long-distance operators on the East Coast and West Coast Main Lines[72].

Figure 36 shows how The Caledonian Sleeper has an average passenger journey length of over 650 kilometres, by far the longest of any operator. The NRPS data suggests that 90% of passengers are travelling overnight between England and Scotland and the remaining 10% are using the services locally for late evening or early morning travel within Scotland. In contrast, journeys on East Coast and West Coast operators average only 200-250 kilometres. This reflects how travel is dominated by London, with three West Coast trains per hour to Birmingham (185 kilometres) and Manchester (296 kilometres). In contrast, average journey length on ScotRail services within Scotland is only 31 kilometres.

Figure 36: The Caledonian Sleeper: average journey lengths (2015/16)



Source: Office of Rail and Road, Steer Davies Gleave analysis.

[71] The railway industry in Great Britain reports on financial years running from April to March. 2015/16 runs from April 2015 to March 2016, and was the first year in which The Caledonian Sleeper had operated, and been reported, as a dedicated franchise.

[72] We are aware that the reported data are based on estimates and assumptions and report on this where appropriate. For example, we have not established how the calculation of average train load takes into account trains which divide into two or three portions.

Figure 37 shows the average train load on different operators. Loadings are highest on Virgin Trains East Coast and West Coast, with an average load of over 200 passengers per train. In contrast, the average passenger load on The Caledonian Sleeper night trains is 128. This appears to reflect at least two factors:

- Less accommodation is available on night trains. For example, a London to Edinburgh and Glasgow Caledonian Sleeper train has 238 spaces (72 First Class, 104 Standard Class, and 62 seats), which represent only 40% of the capacity (589 seats) of the day trains operated between London and Glasgow by Virgin Trains West Coast.
- Demand varies within the week, with peaks for weekend travel, and seasonally.

Figure 37: The Caledonian Sleeper: average train loads (2015/16)

Source: Office of Rail and Road, Steer Davies Gleave analysis.

Financial data

We noted above that the financial viability of the night trains was questioned in 1983, and that the Franchising Director proposed not to include them in the original ScotRail franchise from 1997. The need for subsidy was debated in the House of Lords in 27 March 1995, when the government was asked whether it would direct him to include them in the franchise (Hansard). The then Scottish Office refused to subsidise the services but they were eventually included in the specification of the franchise let by the Department for Transport and awarded to National Express. In subsequent franchises, funding has been routed through Transport Scotland.

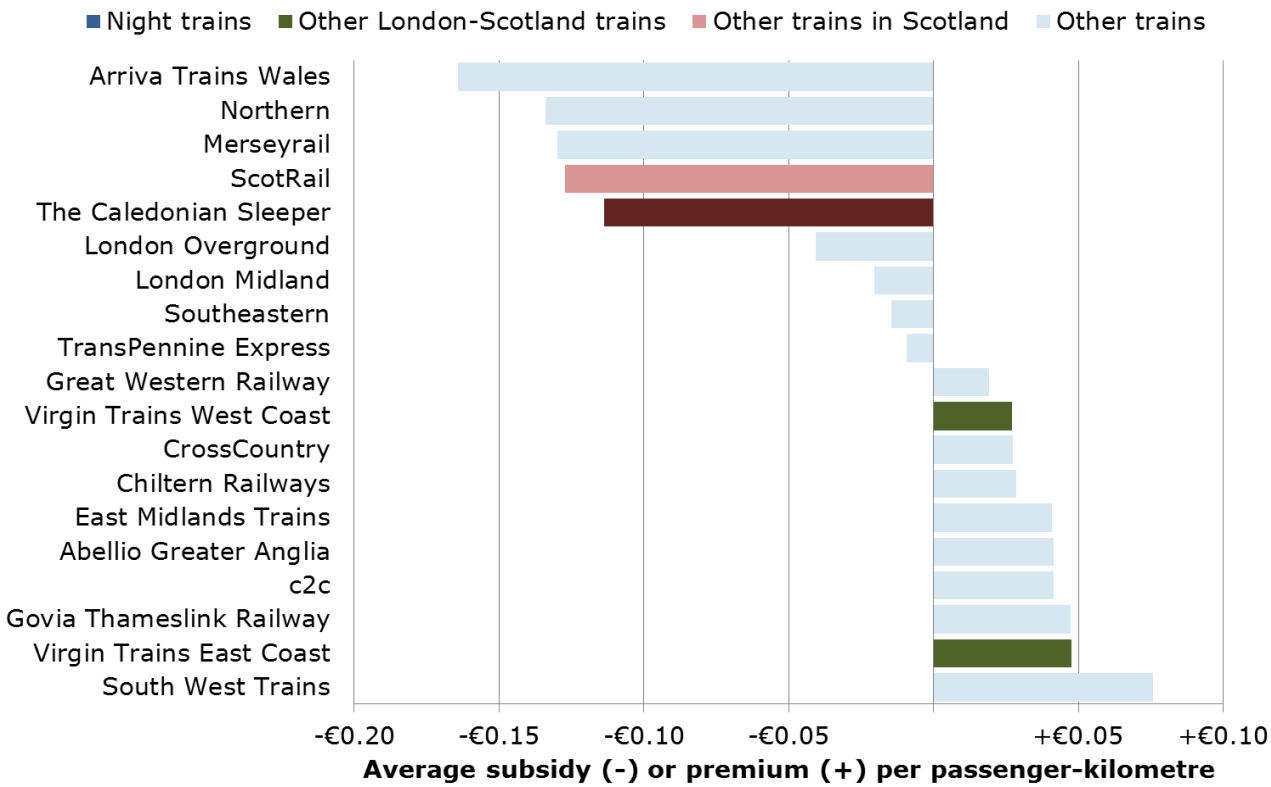
Over the 15 years of the new Serco Caledonian Sleepers franchise, from 2015 to 2030, projected revenues are £800 million (€1 billion) including £180 million (€225 million) of franchise payments (Railway Gazette International (RGI), May 2014). This suggests an average annual turnover of approximately £50 million (€62.5 million) and cost recovery of

75-80%. However, neither funding authority Transport Scotland nor operator Serco Caledonian Sleepers was able to provide any further financial data.

Figure 38 compares the average subsidy per passenger-kilometre in 2015/16 for each operator. Note that:

- Franchise operators are paid a subsidy over the life of their franchise (in the case of Serco Caledonian Sleepers, 15 years from 2015 to 2030) which they expect to cover their costs plus a reasonable return, but subsidy in any one year may not correspond to the profit or loss in that year.
- The subsidy level paid reflects the current level of access charges, which are subject to review every five years by the Office of Rail and Road.

Figure 38: The Caledonian Sleeper: subsidy per passenger-kilometre (2015/16)

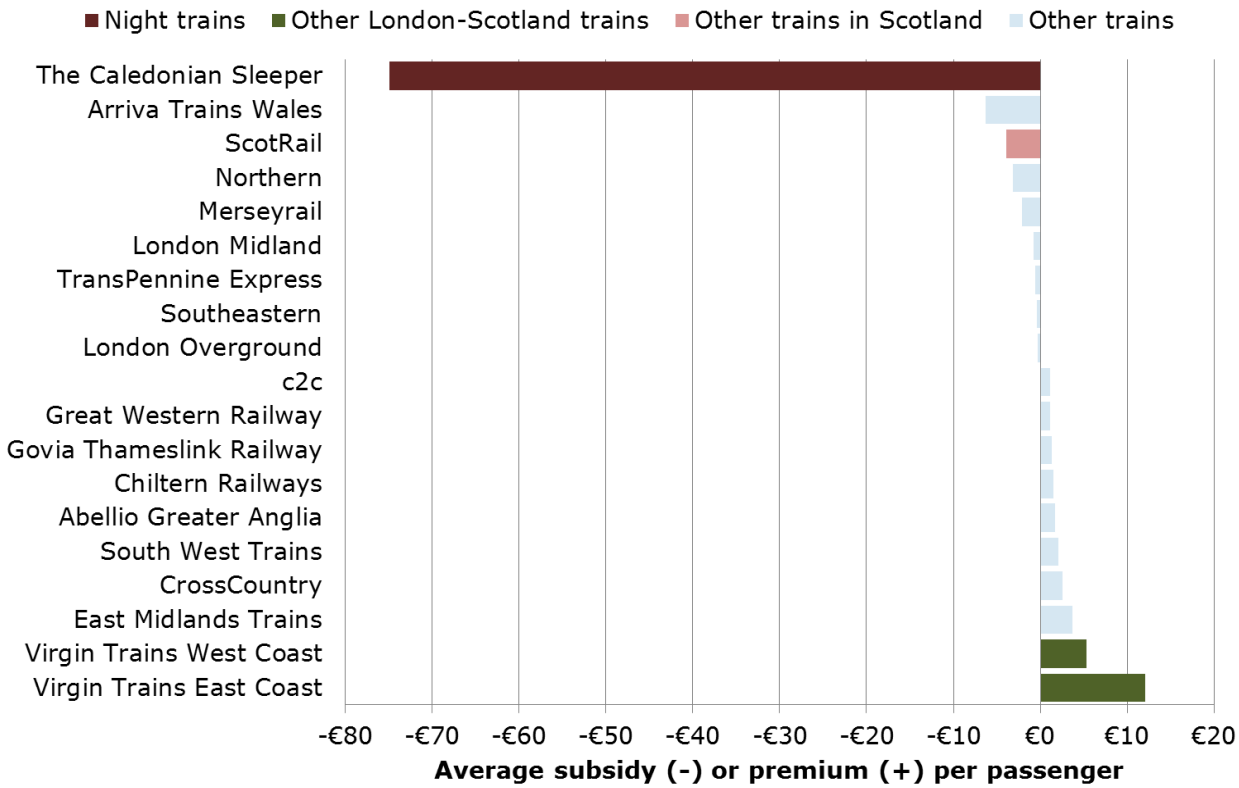


Source: Office of Rail and Road, Steer Davies Gleave analysis.

At current levels of access charges, a number of franchises received negative subsidy (they paid a "premium"), including both Virgin Trains East Coast and Virgin Trains West Coast. The Caledonian Sleeper, in contrast, received among the higher levels of subsidy per passenger-kilometre.

Figure 39 shows the effect of multiplying the average subsidy per passenger-kilometre in Figure 38 by the average journey length in Figure 36. At the top of the Figure, The Caledonian Sleeper required the highest subsidy per passenger of almost €75. At the bottom of the Figure, the other operators of London-Scotland trains required no subsidy and paid a premium to operate the service. Virgin Trains West Coast paid over €5 per passenger and Virgin Trains East Coast paid over €12 per passenger. This illustrates how, in Great Britain at least, the financial performance of night trains can be extremely different from that of long-distance day services on the same route.

Figure 39: The Caledonian Sleeper: average subsidy per passenger (2015/16)



Source: Office of Rail and Road, Steer Davies Gleave analysis.

This analysis reflects the specific situation in the United Kingdom, including levels of infrastructure charges, rail fares and competition from other modes. However, it demonstrates that the financial performance of night trains, where it has been identified, may be very different from that of long-distance day services on the same route. In many Member States, however, night trains and other long-distance services are managed and reported together.

The oldest rolling stock currently in operation on The Caledonian Sleeper dates from 1975. Part of Serco's proposal for the current franchise was to replace the fleet and include a brasserie style Club Car, en-suite facilities and "pod flatbeds", similar to lie-flat seats used in airline Business Class and on the "Spirit of Queensland" in Australia (please see Annex M on case studies outside Europe). As with Germany's DB City Night Line and Austria's ÖBB Nightjet, inclusion of at least basic en-suite facilities moves the sleeping car service upmarket and represents a partial move towards the more luxurious "hotel train" concept.

In May 2015, it was reported that the fleet would cost £100 million (€125 million) for 75 vehicles formed into four train sets, including 30 full sleeping cars, 11 cars with pod flatbeds, 11 seat cars, 11 lounge cars and 12 "hybrid" cars. These would be formed into four 16-car trainsets, each containing 8-car portions containing all five types of stock.

In July 2016, full-scale models of the new stock were displayed. There would be a fleet of 75 vehicles costing £150 million (€187.5 million), to be operated in four 16-car train sets with 11 spare vehicles[73]. Features will include key-card entry, reclining seats, and WiFi, but the "pod flatbeds" will not now be included.

[73] Rail operators normally order spare vehicles to cover for when vehicles are being maintained, overhauled, refurbished or repaired, or are no longer usable after an accident.

The average unit cost of this new stock, €2.5 million per vehicle, is more than three times the €700,000 per vehicle paid by ÖBB Nightjet in Austria for the City Night Line stock it acquired from DB in Germany. However, Transport Scotland told us that, once a commitment has been made to operate services under a Public Service Contract (PSC), it may cost proportionately relatively little, but provide a high commercial return, to specify higher quality. This suggests that a decision to support night trains with a PSC does not mean that quality must be kept low to minimise costs: on the contrary, the lowest net cost may sometimes be obtained if high quality drives high usage or high yield.

Future developments

One consequence of the franchising process is that, within the life of a franchise, services can only be changed to meet market requirements if this is permitted by the franchise specification, which may allow little flexibility. This means that the principal driver of service changes is the process of specifying a new franchise, which since 1997 has on average taken place only every 10 years.

The current Caledonian Sleeper franchise operates for 15 years, from 2015 to 2030, at which point the new stock will be around 12-13 years old and suitable for use for at least one further 15 year franchise to around 2045.

Major developments expected over this period include a new high-speed line, HS2, which will open in phases in 2026 and 2033, reducing journey times between London and Manchester by around 1 hour and, in principle, making possible day journey times between London and Glasgow/Edinburgh in 3½ hours and Aberdeen in 6 hours. HS2 will reduce the demand for the Glasgow/Edinburgh night train services, which would gain no benefit from higher speed, but the benefit to the other services would depend on whether, and at what speed, the new night train stock can operate on HS2.

ANNEX F: CASE STUDY: INTERCITY NOTTE (ITALY)

Introduction

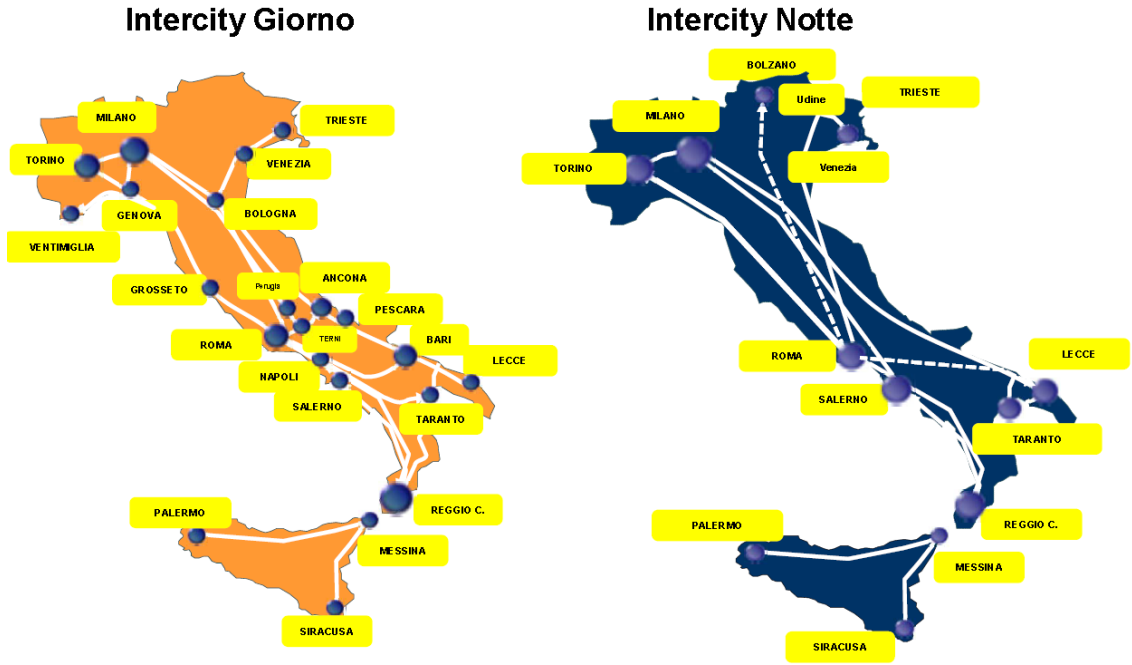
Subsidised train services in Italy are called "universal services" and divided into two categories:

- Long-distance domestic services which are not commercially viable are negotiated directly by the national government through an agreement with national operator Trenitalia. Night train services have never been put out to tender.
- Regional services are defined by agreement between the regional governments and the operators ("railway undertakings", to date, Trenitalia or a regional company).

National operator Trenitalia's contract for universal services is agreed with the Ministry of Infrastructure and Transport and the Ministry of Economy and Finance. The contract defines the night train timetable, capacity, quality standards, and fares, although Trenitalia may decide to offer discounted or promotional fares at some times of year.

Trenitalia's last contract for subsidised long-distance services, for 2009-2014, was extended to 2015 and then to 2016. The new service contract, for 2017-2026, relates mainly to "medium-to-long-distance" trains which will be provided to maintain a minimum level of connections between different areas of Italy. It also includes a number of night services, particularly on north-south links, as shown in Figure 40. These provide services to connect friends and relatives living in different regions, following the internal migration flows of the last century[74].

Figure 40: Trenitalia: long-distance subsidised day and night networks (2017)

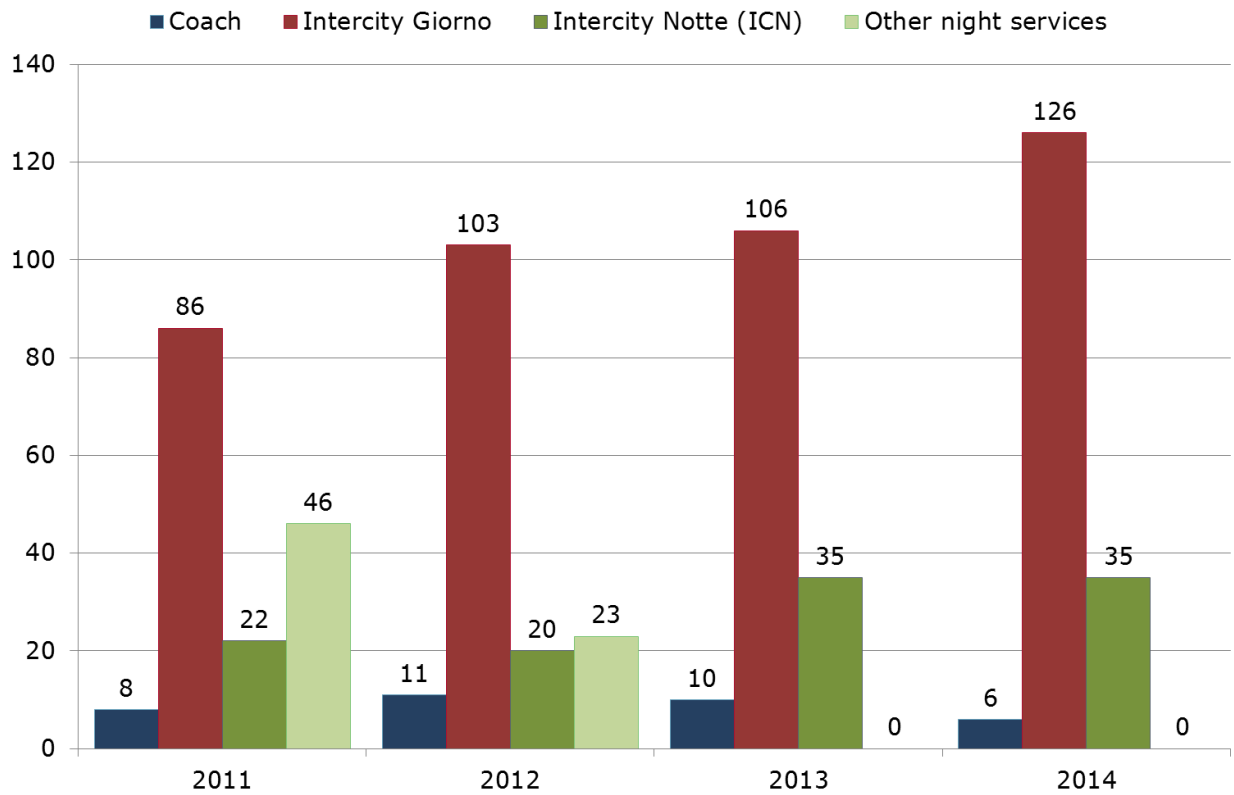


Source: Trenitalia service contract for 2017-2026[75].

[74] Beria P., Laurino A. and Bertolin A. (2014).
[75] Il nuovo Contratto di Servizio Intercity Giorno e Intercity Notte 2017-2026.

The definition and nomenclature of long-distance services has changed in the past, but since 2013 the contract has included only the services shown in Figure 40: subsidised conventional-speed intercity services, operating by day or night, and a limited number of bus services replacing train services.

Figure 41: Trenitalia: long-distance subsidised train services (2011-2014)



Source: Trenitalia service contract for subsidised long-distance services, Steer Davies Gleave analysis.
Note: in 2011, one Eurostar Italia train service (not shown) was also subsidised.
Note: "Other night services" in 2011 and 2012 included "Espresso", Treno-hotel and car-carrying trains.

The total number of night services (ICN and "other") has changed over the years. The proportion of subsidised long-distance services they represent has declined from 35% in 2011 to 24% in 2014. The principal causes of the decline appear to be that:

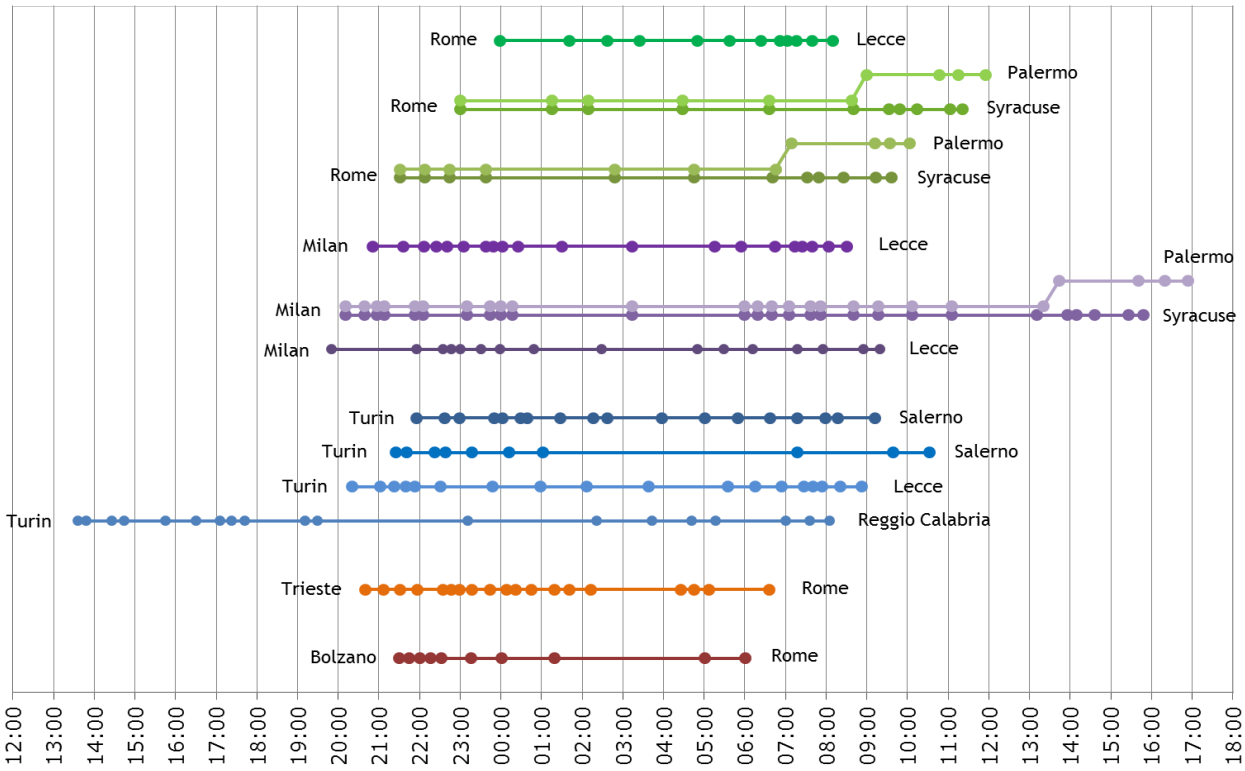
- There has been a one-third reduction in the scale of operations in 2012 as a result of a reduction in the funding available.
- The "Notte&AV" (night and high-speed) fare scheme offers night train travel to the hubs of Naples, Rome, or Bologna, arriving early morning to change to a high-speed service. This transfers part of each journey from night trains to high-speed day trains.

Operating patterns

From December 2015, Trenitalia operated nine domestic ICN night train routes, operating mainly north-south or connecting Rome with the rest of the country, and we identified a total of 20 trains operating daily and 4 trains operating only at weekends.

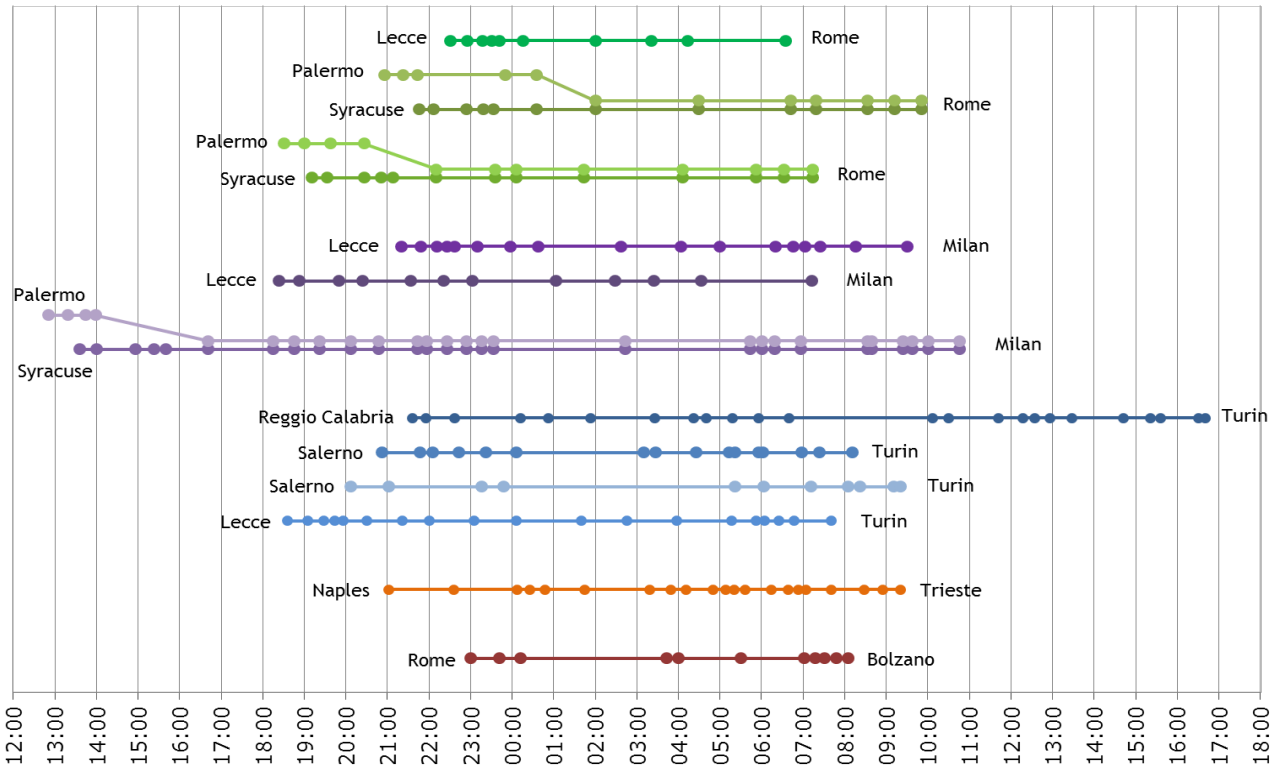
From December 2016 to June 2017, Trenitalia introduced new operating patterns which we analyse in Figure 42 and Figure 43.

Figure 42: Trenitalia Intercity Notte (ICN): southbound operating patterns (2017)



Source: European Rail Timetable (Winter 2016/2017 Edition), Steer Davies Gleave analysis.
Note: services are sorted by origin: Rome, Milan, Turin, Trieste, Bolzano.

Figure 43: Trenitalia Intercity Notte (ICN): northbound operating patterns (2017)



Source: European Rail Timetable (Winter 2016/2017 Edition), Steer Davies Gleave analysis.
Note: services are sorted by destination: Rome, Milan, Turin, Trieste, Bolzano.

The effective service pattern has remained largely unchanged for a number of years, with the exception of the reduction of the Rome-Bolzano connection from a daily service to a weekend-only service, with departures from Rome on Friday and Saturday and from Bolzano on Saturday and Sunday. The current services comprise:

- 6 daily services each way between Turin and Milan in the north with southern mainland regions of Apulia (Lecce) and Calabria (Salerno and Reggio Calabria);
- 3 daily services each way between Milan and Rome on the mainland, connecting by ferry to Palermo and Syracuse in Sicily;
- 1 service between Rome and Lecce on Friday, returning on Sunday;
- 1 daily service between Rome/Naples and Trieste; and
- 1 weekend-only service between Rome and Bolzano.

Night train journey times vary depending on the length of the route served. Two night trains extend to about 8 hours, eight extend to about 12 hours, and two extend to over 20 hours. In contrast to some other night trains (please see Figure 3 in Section 1.5), journeys are not much slower than the equivalent day services, but both are much slower than high-speed services.

Northbound, the need for the night trains to reach the northern cities in the early morning constrains them to leave their starting point in the south earlier than the equivalent southbound services. For example, southbound night trains from Milan to Palermo and Syracuse in Sicily leave at 20:10, but the return services leave Palermo at 12:50 and Syracuse at 13:35.

Punctuality and reliability

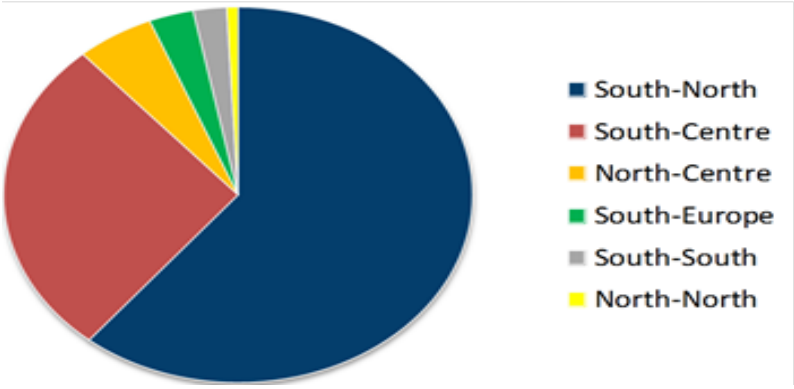
Trenitalia told us that maintaining the punctuality and reliability of night trains was not particularly difficult, and that there is little disruption from infrastructure maintenance and freight traffic. There is relatively little freight traffic on the night train routes, and maintenance can normally be scheduled so as not to affect night trains.

Competition from coach services following their liberalisation in 2014

Domestic coach services in Italy have been effectively fully liberalised since January 2014, and there has been a rapid growth in both day and night services.

Figure 44 summarises the distribution of the overnight coach services between the different areas of the country and the dominance of north-south routes.

Figure 44: Distribution of overnight coach services in Italy (2015)



Source: Politecnico di Milano, prepared for Steer Davies Gleave.

Figure 45 compares overnight coach (blue) and night train services (orange) for an average week in 2015. (Please see Figure 72 in Annex M on case studies outside Europe for a comparison of the coach and rail networks in New South Wales in Australia.)

Figure 45: Italy: night train and coach services (2015)

Source: Politecnico di Milano analysis of companies' timetables 2015, prepared for Steer Davies Gleave.

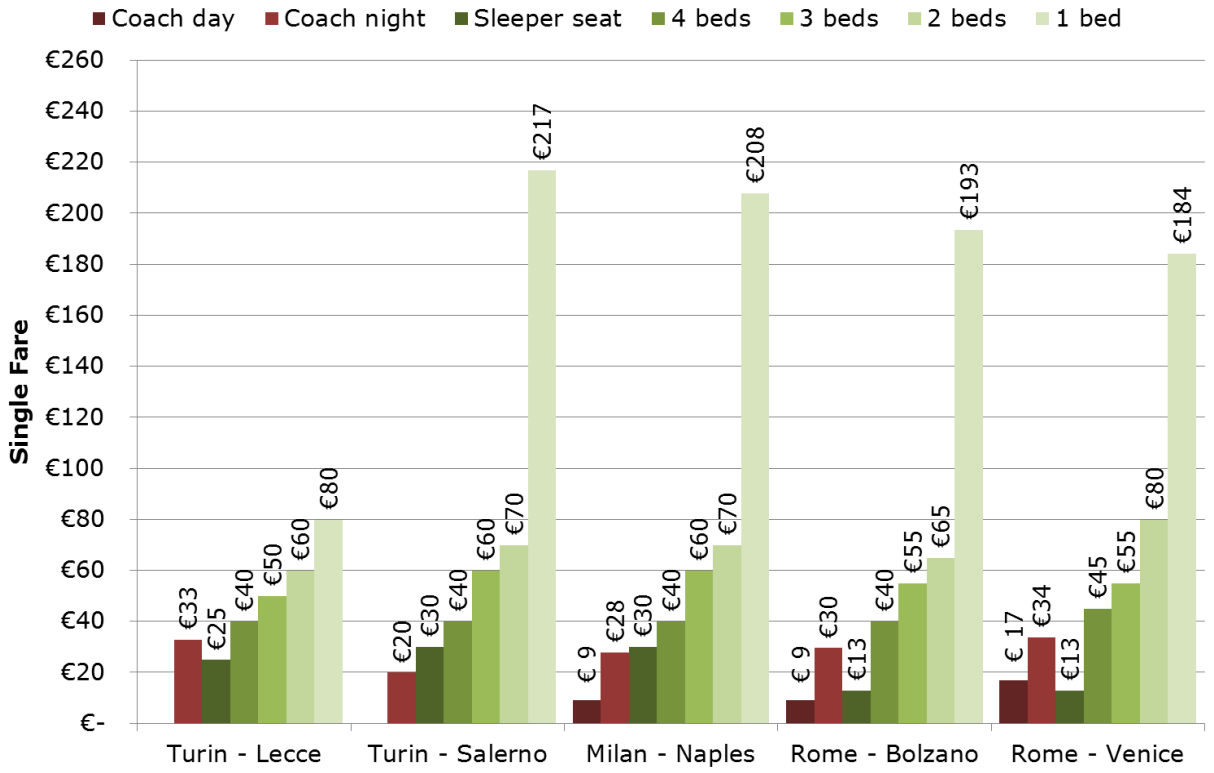
Accommodation and pricing

Trenitalia offers four types of accommodation on night trains:

- Second Class seating;
- "Comfort" 4-berth couchettes;
- "Deluxe" sleeping compartments for 3, 2 or 1; and
- "Excelsior" 4-berth compartments, with shower and WC facilities en suite, in new T3S vehicles operating between Rome and Sicily.

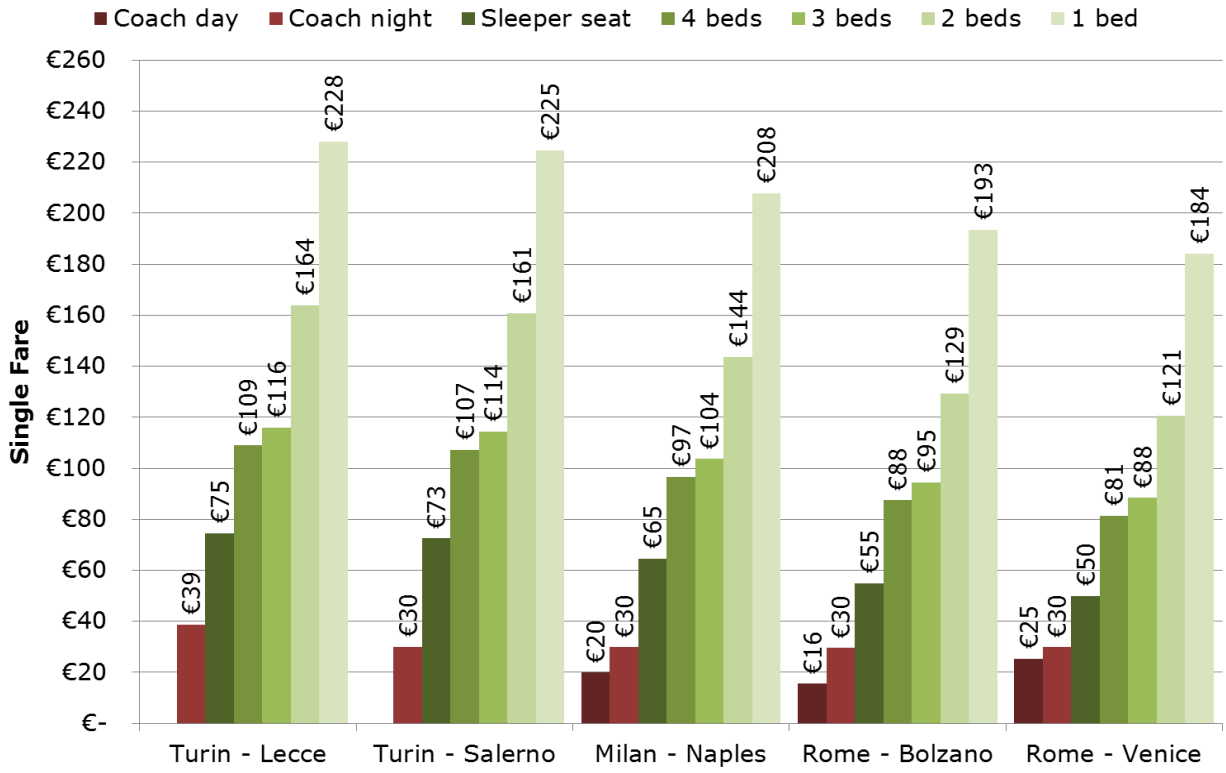
Figure 46 and Figure 47 show the lowest fares we identified for midweek coach and night train travel three months in advance and one day in advance. For night trains, we considered the fares for a seat and for beds in 4-, 3-, 2- and 1-bed compartments.

Figure 46: Trenitalia Intercity Notte (ICN): sample fares three months ahead



Source: FlixBus, Trenitalia.

Figure 47: Trenitalia Intercity Notte (ICN): sample fares one day ahead



Source: FlixBus, Trenitalia.

For travel three months in advance, night train travel in seats and all types of multi-occupancy compartment was available for less than €80 on all five routes we examined. In contrast, single occupation of a compartment on all the routes cost at least €184. This differential is consistent with our findings, and operator comments, in other case studies, that the highest quality accommodation was often sold out first.

Only Second Class seats on night trains appeared to compete with FlixBus' overnight coach fares of €28-34. FlixBus does not offer day services on the Turin-Lecce and Turin-Salerno routes, but its day fares on the remaining three routes were only €9-17.

For travel only one day ahead, most ICN fares were higher than when booked three months ahead, and the price differential between single occupancy and multi-occupancy compartments had declined. The cheapest seat from Rome to Venice cost €50, compared with €30 and €25 for FlixBus' night and day coaches.

Passenger data

The main users of night train services are students, school groups (which often make block-bookings of couchette accommodation), families with children, the elderly and "night train lovers". There has been a decline in business travel, and overall demand has been in trend decline, with a shift to high-speed rail, low-cost air and coach services between the same points, and the decline has been greatest in the north of Italy. This appears to be because competing services offer higher quality standards, lower prices (especially for coach travel) and perceived higher on-board security.

The expansion of Italy's high-speed network, the entry of open access railway operator NTV (Nuovo Trasporto Viaggiatori, (New Passenger Transport)) as a competitor to Trenitalia, and the remodelling of conventional speed services, have all led to expansion in the use of commercial long-distance day services. In contrast, use of subsidised long-distance services, including both day and night trains, fell from 8.5 billion to 4 billion passenger-kilometres between 2009 and 2014, equivalent to a loss of 14% per annum, caused in part by the rationalisation of the network and the reduction in night train services.

In 2012, as noted above, Trenitalia introduced a model of north-south services, in which some ICN services from the south connected in Naples, Rome or Bologna with AV (Alta Velocità, high-speed) services onward to Turin, Milan and Venice. Whatever its merits and effectiveness, this new business model has not proved sufficient to halt or reverse the overall decline.

In 2014, ICN night trains carried around 2 million passengers, an average of 180 per train, down from 260 in 2009 or an average decline of 30%, equivalent to a loss of 7% of passengers per annum[76]. The lowest loadings were on services between Rome and Bolzano and Trieste. Trenitalia told us that it would be necessary at least to double current passenger numbers to operate without subsidy.

The apparent explanation for much of this decline is a shift of passengers to other modes:

- High-speed day train services and low-cost air services offer shorter journey times.
- Long-distance coach services offer lower fares and better network penetration, as shown in Figure 45.

[76] In practice, "passengers per train" is typically calculated by railway undertakings as the estimated number of passengers divided by the scheduled number of train services, and cannot be related to an average load factor or occupancy.

Financial data

Trenitalia confirmed that night trains require subsidy and that they cost more to operate than equivalent day trains, primarily because of higher costs of train crew, catering and cleaning staff, some of which are subcontracted.

Environmental data

Trenitalia estimates that the emissions due to night train travel average 30g of CO_2 per passenger-kilometre, and that this is a typically 25% higher than those of a day train on the same route, but 65% lower than (unspecified) road transport and 80% lower than air transport (please seeTable 17 in Section 7.3 for other estimates related to emissions).

We have not identified whether or how Trenitalia estimated the variation in emissions between different classes of accommodation.

Future developments

Trenitalia told us that it has invested heavily in high-speed domestic services, which have been successful but inevitably attract some passengers from night trains.

Despite the relatively rapid decline in demand over the period 2009-2014, Trenitalia told us that it expects future demand to be stable overall, but with further decline on some routes, resulting in a slight decline over the medium term until around 2026. In response, it expects to reduce or reshape services, particularly to reflect seasonality.

Trenitalia also told us that it is reviewing the continuation of two night train services linking Rome to Palermo and Syracuse[77] in Sicily, via ferries across the Strait of Messina. Specifically, it intends to replace the two 8-coach trains operating two hours apart from Palermo and Syracuse by a single 12-coach train later in 2017[78]. This would save costs but reduce capacity by around 250 spaces each way per day, allowing the replacement train to operate at close to full capacity.

Trenitalia stressed that, to retain demand, it will be necessary to improve service quality through improving quality and security, renewing rolling stock and offering more and better on-board services. The new service contract from 2017-2026 will include investments in internal and external refurbishment.

Trenitalia suggested that the European Union should support night trains through the provision of financial resources to support investment or operations. In Italy, for example, there was a need for on-board video surveillance systems to enhance security[79].

On 15 March 2017, the European Commissioner for Transport, Violeta Bulc, reported that Italy had indicated that it planned to implement differentiated night charging for rail infrastructure, but provided no further details.

[77] The night train from Rome to Syracuse is are among Lonely Planet's ten "Super Sleeper Trains".
[78] This change has not yet been reported in the European Rail Timetable (ERT).
[79] Study on options for the security of European high-speed and international rail services, Steer Davies Gleave, (2016, not yet published).

ANNEX G: CASE STUDY: RENFE TRENHOTEL (SPAIN)

Introduction

From 1985 to 2015, Spain's national rail operator Renfe operated long-distance Tren Estrella (Star Train) night trains using traditional carriages. From the early 1900s, Renfe also operated Trenhotel (Hotel train), a high-quality overnight train service, using Talgo[80] articulated tilting trains technology and sleeping cars, as listed in Table 25.

Table 25: Renfe Trenhotel: current and past services (2017)

Service	Name	Route		Status
Domestic	Galicia (route "Vigo")	Barcelona	Vigo	✓
	Galicia (route "La Coruña")	Barcelona	La Corunna	✓
	Rías Gallegas	Madrid	Pontevedra	✓
	Atlántico	Madrid	Ferrol	✓
	Alhambra	Barcelona	Granada	×
	Antonio Gaudí	Madrid	Barcelona	×
	Antonio Machado	Barcelona	Cadiz	×
	Gibralfaro	Barcelona	Malaga	×
	Asturias/Pio Baroja	Barcelona	Gijón	×
International	Lusitania	Madrid	Lisbon	✓
	Sud Expresso/Surex*	Lisbon	Hendaye	✓
	Pau Casals	Barcelona	Zurich	×
	Salvador Dalí	Barcelona	Milan	×
	Joan Miró	Barcelona	Paris	×
	Francisco de Goya	Madrid	Paris	×

Source: various sites, Steer Davies Gleave analysis.
Note: "✓" = service still operates in 2017, "×" = service had closed by 2017. * Sud Expresso night train service between Lisbon and Hendaye is reported as closed by various web sites, likely to be used by potential passengers, while in fact it is still operating.

[80] Talgo is the trade name of Patentes Talgo (Talgo Patents) a Spanish manufacturer of railway rolling stock. The name is an abbreviation of Tren Articulado Ligero Goicoechea Oriol (Goicoechea-Oriol light articulated train) named after the founders, Alejandro Goicoechea and José Luis Oriol.

By the 1990s, the Estrella night train network had more than 20 routes but demand was lost to the newer Trenhotel and to high-speed trains. Trenhotel offers high-quality services and accommodation, with compartments for two or four people with private shower and WC in First Class, entertainment systems, cafeteria and, in the past, a restaurant car.

Estrella services were progressively withdrawn or replaced by other services, mostly operating by day. In April 2015, Renfe withdrew the last Estrella night service, the "Costa Brava" between Barcelona and Madrid, which had been connected by high-speed line.

However, Trenhotel is also in decline, as Spain has built a network of domestic high-speed lines, and improved connections to France. A total of fifteen different Trenhotel routes have been cut back to four domestic and one international services, as shown in Table 25 above.

Operating patterns

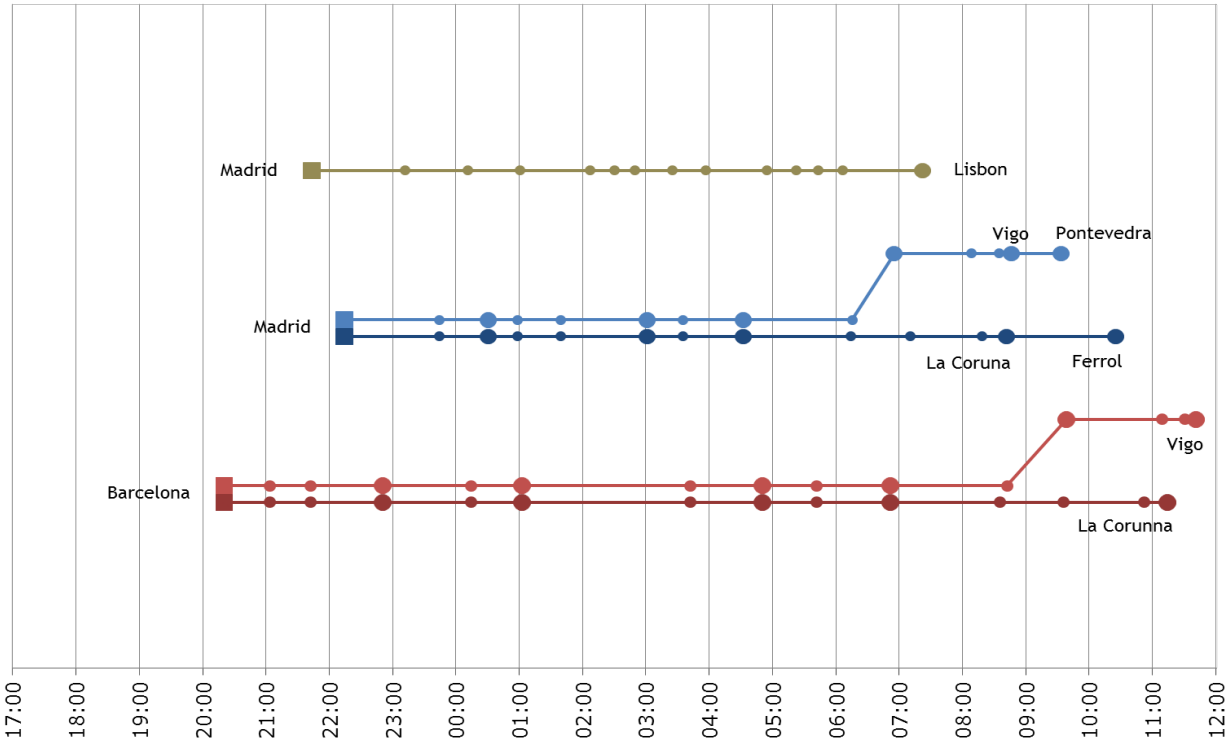
Figure 48 shows the route of the first service listed, the Vigo from Barcelona to Vigo. Note that there are frequent stops along the route, with no long uninterrupted sections.

Figure 48: Renfe Trenhotel: Barcelona to Vigo route

Source: Renfe.

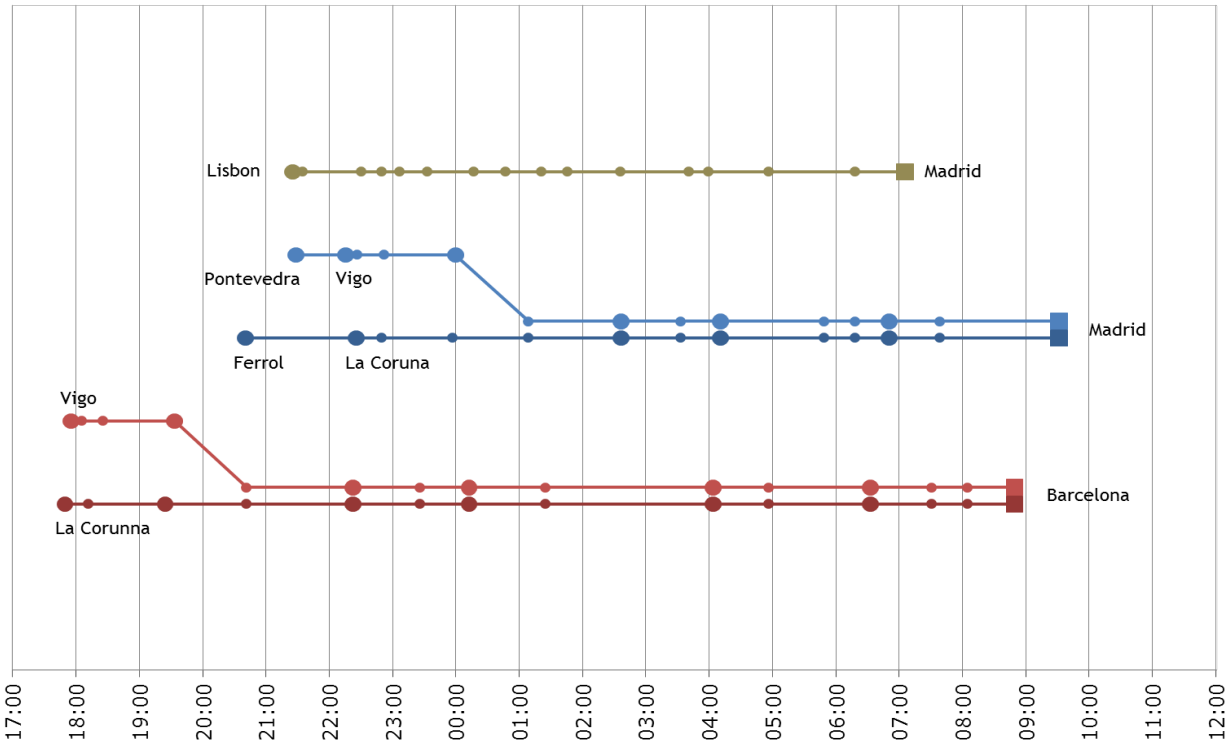
Figure 49 and Figure 50 show the operating patterns of the five Trenhotel services remaining in the 2017 timetable, which typically operate six days per week.

Figure 49: Renfe Trenhotel: operating patterns from Madrid and Barcelona (2017)



Source: European Rail Timetable, Renfe, Steer Davies Gleave analysis.
Note: on each service, Barcelona or Madrid is represented by a square marker.
Note: large round markers represent major destinations and small round markers represent other calling points.

Figure 50: Renfe Trenhotel: operating patterns to Madrid and Barcelona (2017)



Source: European Rail Timetable, Renfe, Steer Davies Gleave analysis.
Note: on each service, Barcelona or Madrid is represented by a square marker.
Note: large round markers represent major destinations and small round markers represent other calling points.

Westbound, trains leave Barcelona at 20:20 and pass through Zaragoza, Longroño, León, and Ponferrada, before splitting and reach La Corunna (La Coruña, A Coruña) at 11:14 and Vigo at 11:41, an overall journey time of around 15 hours. The shortest journey is the international service, which leaves Madrid at 21:43 and reaches Lisbon in Portugal at 07:22, within ten hours. All the services make multiple stops en route. Eastbound trains set out earlier so as to provide arrivals in Madrid and Barcelona before 10:00.

Where day trains exist, the night trains on the same route are considerably slower. Night trains journey times are 50% longer than high-speed trains, and 10-15% longer than other day trains, between Barcelona and La Corunna/Vigo. Night train journey times are 85% longer than high-speed trains between Madrid and Pontevedra/Ferrol.

Accommodation and pricing

Trenhotel offers five classes, including provisions for Persons with Reduced Mobility (PRM), as summarised in Table 26.

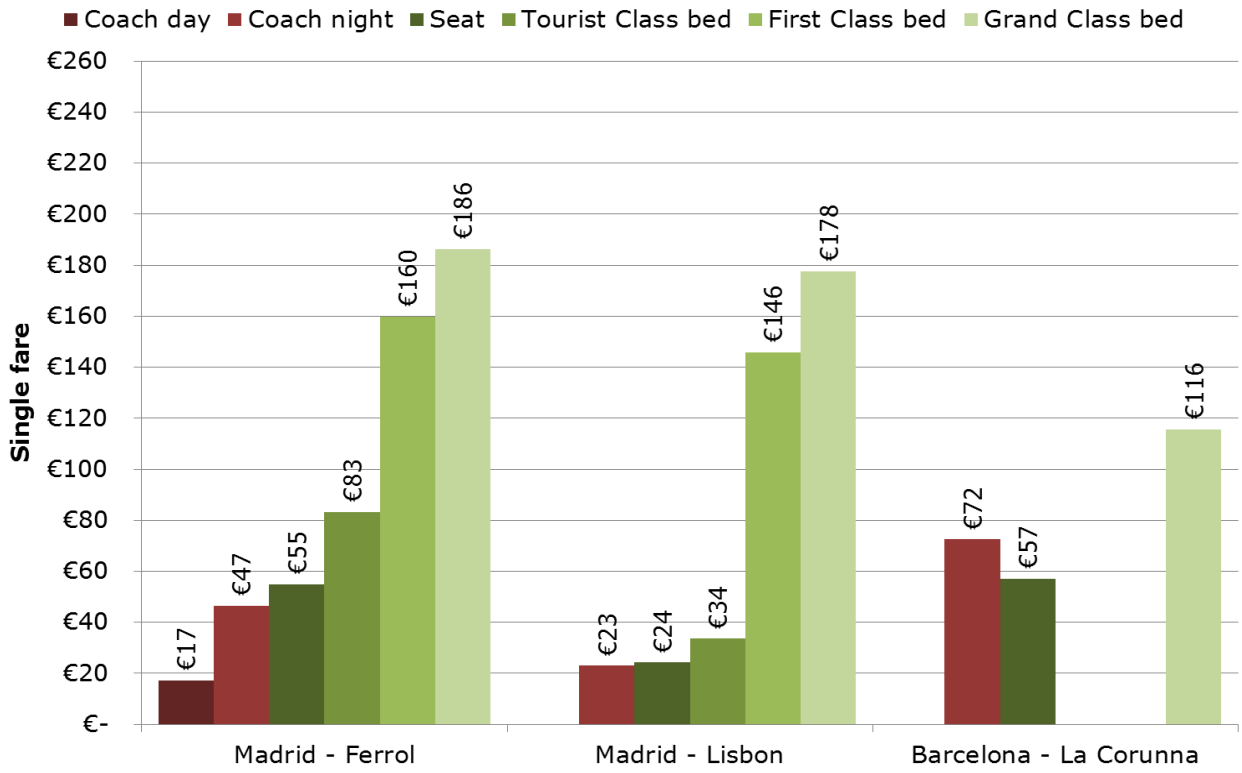
Table 26: Renfe Trenhotel: accommodation offered

Class	Beds	Washing facilities	Comments
Tourist Class seat		None	36 seats per carriage (2 + 2 seats in each row)
First Class seat "Preferente")		None	26 seats per carriage (2 + 1 seats in each row) 20 seats per carriage with lie-flat "Super Reclining" seats similar to airline business class seats (Only on the newest Trenhotel rolling stock used between Barcelona and Vigo)
Tourist Class	4	Washbasin	Beds may be sold separately to passengers of the same sex
First Class ("Preferente")	2	Washbasin and WC	
Grand Class	2	Shower and WC en suite	

Source: Trenhotel, Steer Davies Gleave analysis.

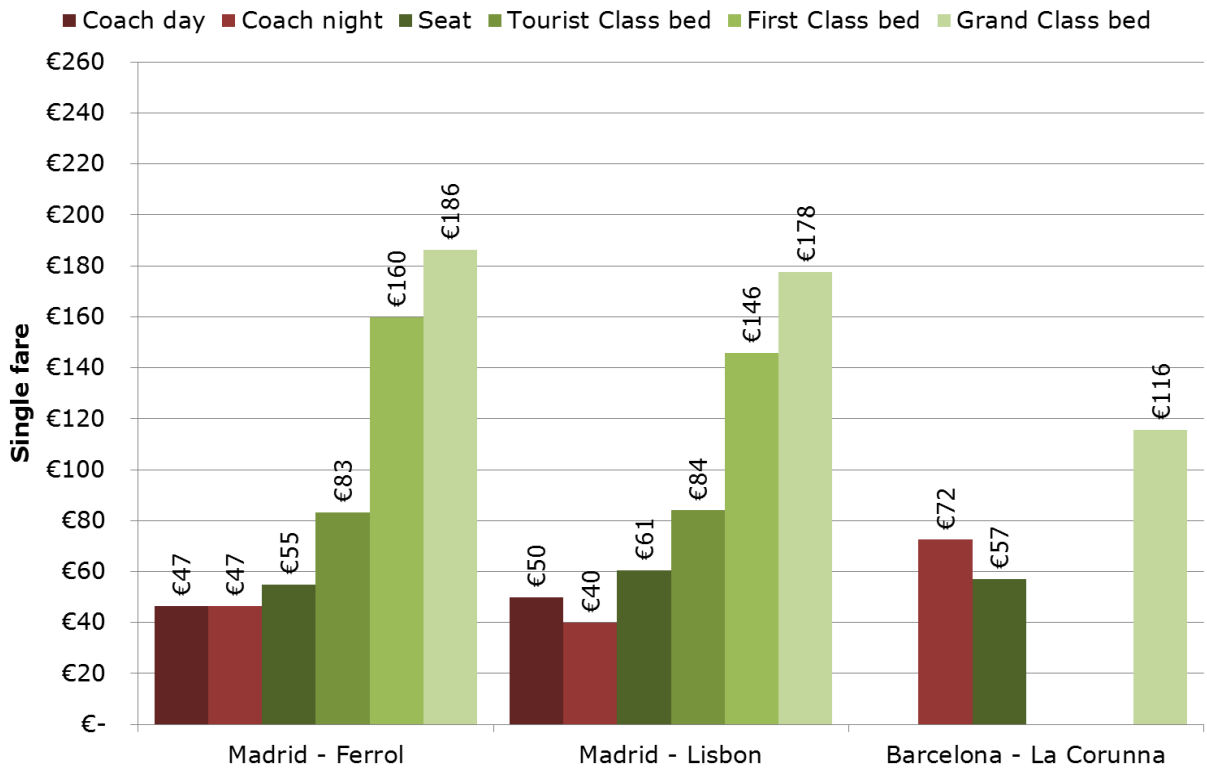
The newest Trenhotel rolling stock, used between Barcelona and Vigo, operates at up to 220 km/h on either standard or Spanish gauge track. Each train comprises 20 vehicles: 10 Grand Class sleeping vehicles, 8 "Super Reclining" seating vehicles, a cafeteria car and a dining car. Capacity is 235 spaces (99 beds, including one adapted for PRMs, and 136 seats).

Figure 51: Renfe Trenhotel: sample fares three months ahead



Source: ALSA, Renfe.
Note: the only Trenhotel fare we found for Barcelona-La Corunna was for a Grand Class bed, six weeks ahead.

Figure 52: Renfe Trenhotel: sample fares one day ahead



Source: ALSA, Renfe.
Note: the only Trenhotel fare we found for Barcelona-La Corunna was for a Grand Class bed.

Figure 51 and Figure 52 above show the lowest prices we were able to find for midweek travel, three months ahead[81] and one day ahead, on Trenhotel and competing ALSA coaches.

From Madrid to Ferrol, no promotional fares were available. Seats on the night train (€55) appeared to be price-competitive with ALSA's night fares (€47), but ALSA offered much lower day fares (€17).

From Madrid to Lisbon, promotional fares made Trenhotel seats (€24) and beds (€34) were price-competitive with ALSA's night coaches (€23), but there were no day coaches, and promotional fares were not available for First (Preferente) and Grand Class.

From Barcelona to La Corunna, the promotional fare for a Trenhotel night train seat (€57) was cheaper than a night coach fare (€72).

Compared to other case studies, it appears that Renfe makes only limited use of yield management on Trenhotel services.

[81] Tickets for the route from Barcelona to La Corunna three months ahead were not available at the time of our search on 12 January 2017, so on that route the Figures show fares for the latest date then available, 28 February 2017.

ANNEX H: CASE STUDY: INTERCITÉS DE NUIT (FRANCE)

Introduction

From 2004 to 2012, French national rail operator SNCF operated night trains under the brand "Corail Lunéa" but in 2012 this was rebranded "Intercités de Nuit". Current services form part of the national PSO contract ("Trains d'Équilibre du Territoire", TET) signed in December 2010. The service suffered from a number of disadvantages, which tended to result in a lower quality than some other services:

- The fleet is old (Corail coaches date from 1975-1989) and has a low remaining life.
- The fleet's many vehicle types had only been partly modernised over the period 2004-2007, when only €5 million was spent on 250 vehicles, or €20,000 per vehicle.
- Part of the fleet was sold at the end of 2007.
- There is a lack of restaurant or bar coaches.

Table 27 shows how the recent history of the services has been one of gradual withdrawal.

Table 27: SNCF Intercités de Nuit: main service changes (2008-2016)

Year	Month	Change or proposal
2008		Withdrawal between Reims and Nice.
2009		Withdrawal between Lille and Nice. Shortening of Quimper-Lyon-Geneva route to Quimper-Lyon.
2010		Withdrawal between Nantes and Nice and Quimper and Lyon. Shortening of Paris-Nice-Ventimiglia route to Paris-Nice.
2011		Merger of Paris-Dax-Hendaye and Paris-Dax-Tarbes trains.
2012		Withdrawal of Irun-Tarbes-Lyon-Geneva and Irun-Nice.
2014		Withdrawal between Paris and Lûchon.
2014	October	Withdrawal of a range of services including Paris-St Gervais, Paris-Bourg-Saint-Maurice, Paris-Cerbère and Strasbourg-Nice. Merger of Paris-Toulouse/Rodez and Paris-Latour-de-Carol routes.
2017	July	Withdrawal between Paris and Tarbes/Hendaye.
	October	Withdrawal between Paris and Nice.

Source: SNCF, trade press, Steer Davies Gleave analysis.

Figure 53 shows the night network operated in 2015.

Figure 53: SNCF Intercités de Nuit: network (2015)

Source: SNCF.
Note: further Intercités de Nuit night train service reductions during 2016 and 2017 are described in the text.

In February 2016, the Secretary of State for Transport announced the end of the financing of six of the eight night routes represented in Figure 53, to be followed by a call for expressions of interest to operate any or all of the services[82]. The deadline for responses was originally set for 31 May 2016 and then extended to 24 June 2016.

On 21 July 2016, the Ministry of Ecology, Sustainable Development and Energy published an official note on the Government's Roadmap for the future of TET[83], reporting that no expressions of interest had been received and announcing two decisions.

[82] SNCF Annual Report 2015.
[83] Ministère de l'Environnement, de l'Énergie et de la Mer, Mise en œuvre de la feuille de route du Gouvernement pour un nouvel avenir des Trains d'Equilibre du Territoire, 21 July 2016.

First, daily operation would be retained on only three routes where there was no adequate alternative transport. One will operate from Paris to Rodez during the week, with an extension to Albi (not shown on Figure 53) at weekends. The others will operate from Paris to Latour-de-Carol and to Briançon. Rolling stock operating on these routes would be modernised to provide the levels of comfort which passengers would expect.

Second, all other Intercités de Nuit were deemed to serve territories which either already had good alternatives or would soon receive them as a result of new high-speed lines (Lignes à Grande Vitesse (LGVs)). These night trains would no longer be funded and would be withdrawn from 1 October 2016, with two exceptions which will remain open slightly longer:

- Services between Paris and Hendaye line will be maintained until July 2017, when the new LGV Sud Europe Atlantique (LGV SEA, or LGV Sud-Ouest) is planned to open.
- Services between Paris and Nice will be maintained until the end of summer 2017 and closed from October 2017.

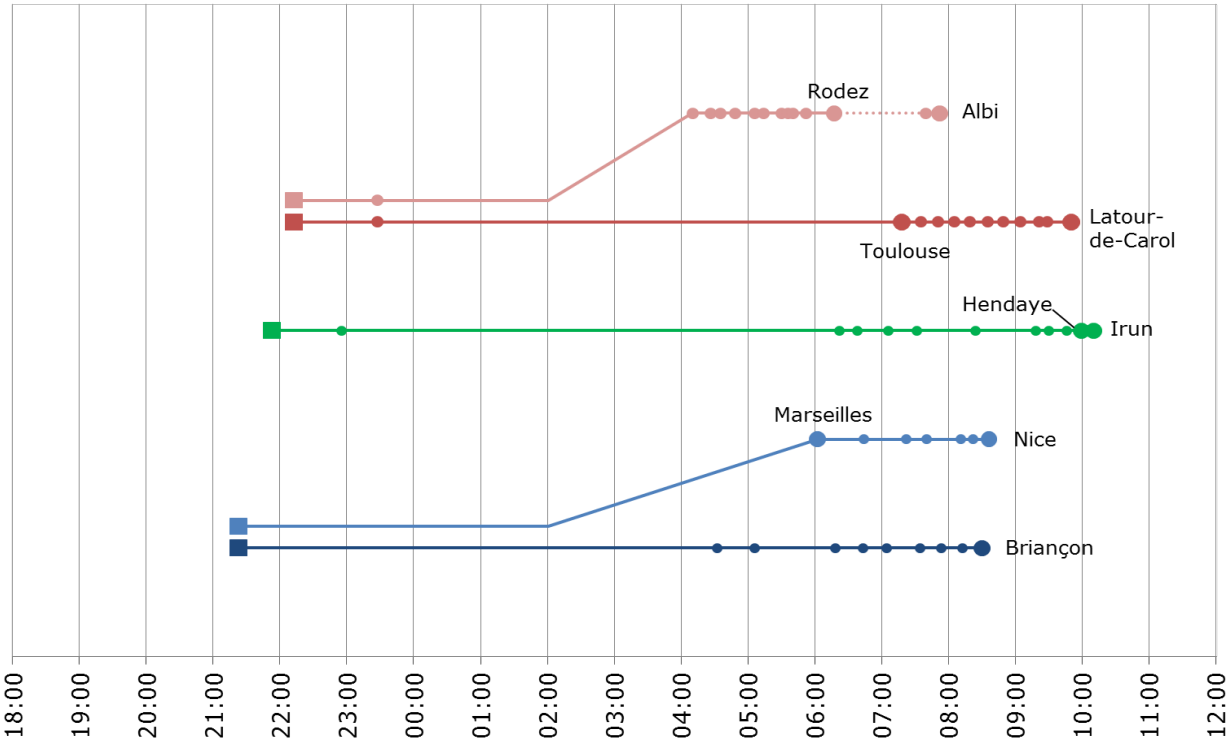
The Ministry confirmed that offers to take over any of the lines would still be considered.

Operating patterns

We examined operating patterns for the timetable from December 2016 to June 2017, shown in Figure 54 and Figure 55 below. One peculiarity is that the service to Hendaye continues to Irún, in Spain, in the southbound direction but starts at Hendaye in the northbound direction. This may be intended to maximise the chance for passengers to board and go to sleep without further interruption.

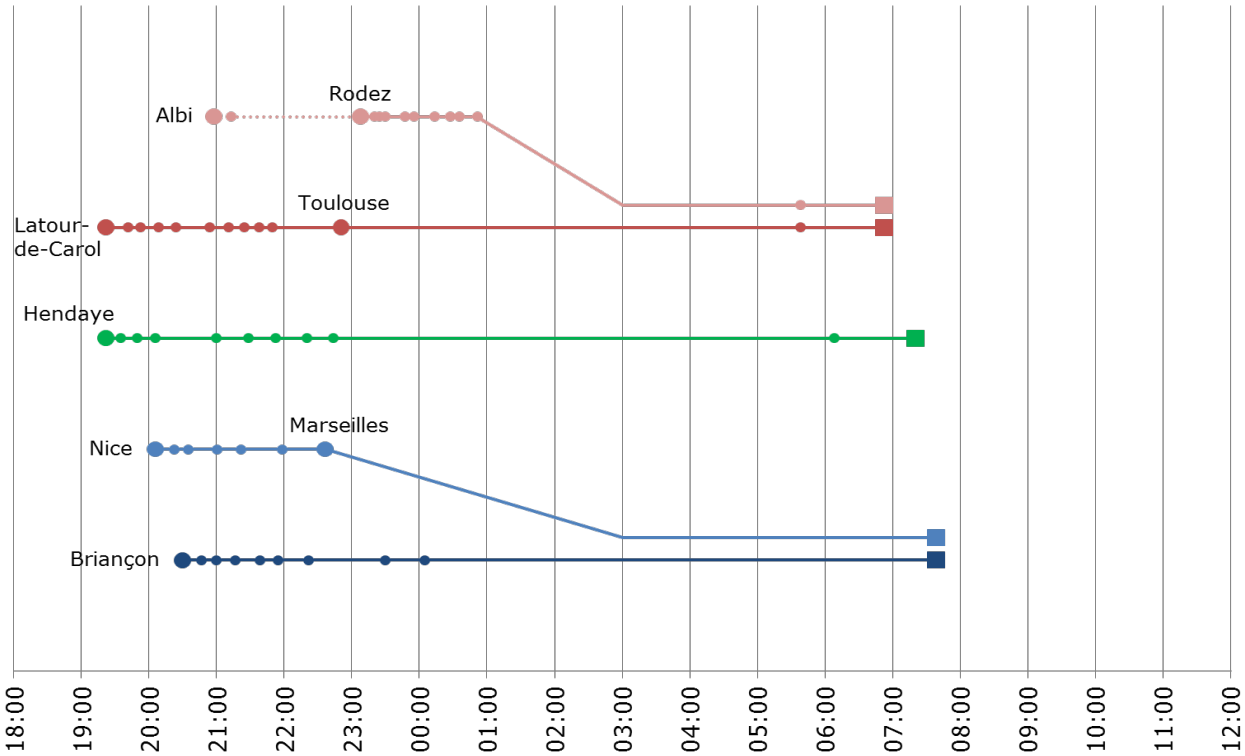
One constraint on northbound services is the commercial need for the night trains to reach Paris early in the morning (both arrive before 08:00), which results in earlier departures towards Paris than from Paris.

Figure 54: SNCF Intercités de Nuit: typical operating patterns from Paris (2017)



Source: SNCF, European Rail Timetable, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Paris is represented by a square marker.

Figure 55: SNCF Intercités de Nuit: typical operating patterns to Paris (2016)

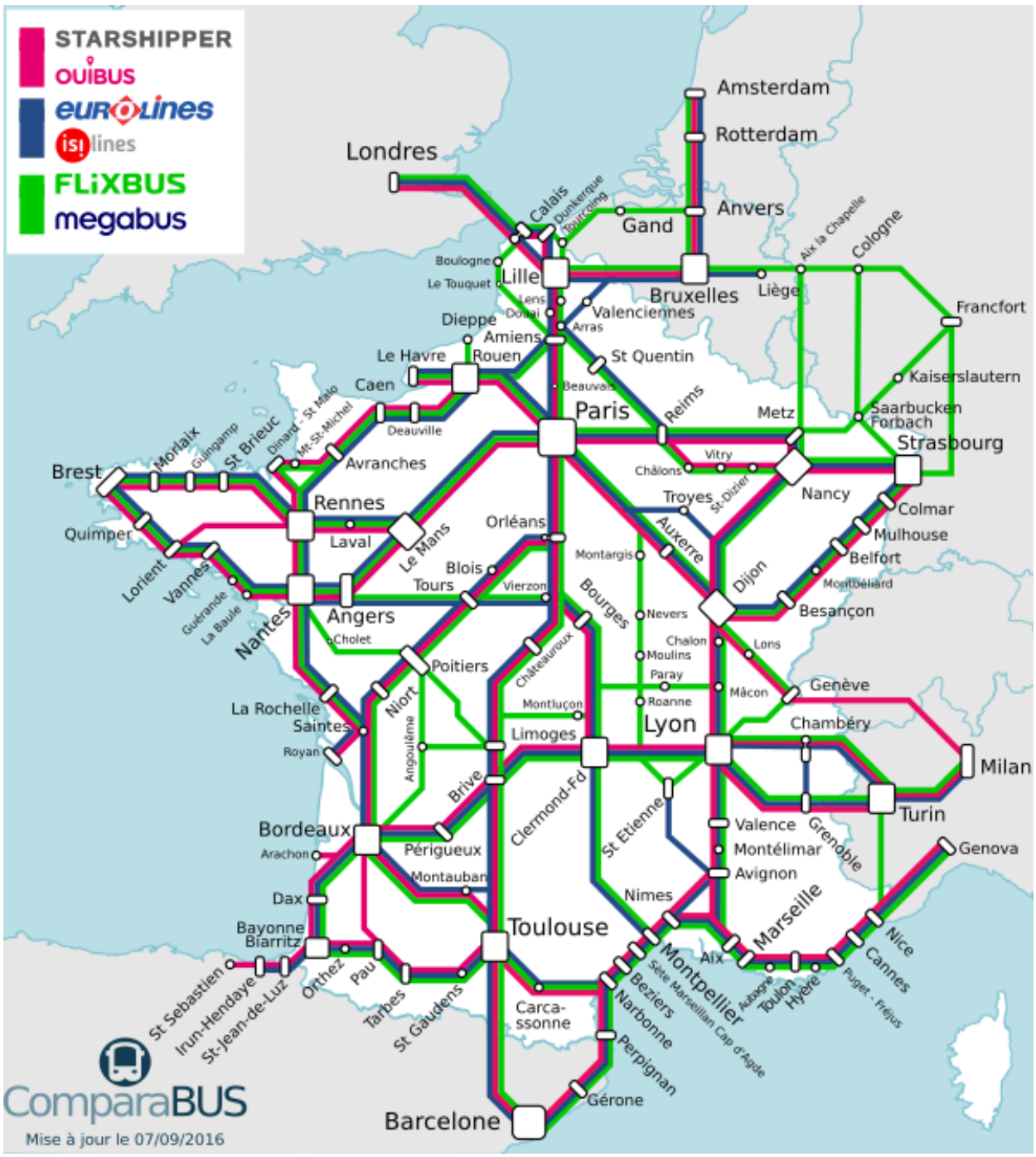


Source: SNCF, European Rail Timetable, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Paris is represented by a square marker.

Competition from coach services following their liberalisation in 2015

Coach travel in France was liberalised in August 2015. Since then a number of operators have built up extensive networks, as shown in Figure 56.

Figure 56: SNCF Intercités de Nuit: competing long-distance coaches (2016)



Source: ComparaBus.

Soon after the opening of the market, five groups quickly built large domestic networks:

- Eurolines and Isilines (Transdev Group, France);
- FlixBus (an independent transport services company, Germany);
- Megabus (Stagecoach Group, United Kingdom);

- Starshipper (French coach network "Réunir"); and
- Ouibus (SNCF Group, France).

In 2016, these five networks effectively consolidated into three. FlixBus acquired Megabus's commercial activities in continental Europe, and Starshipper made a strategic alliance to provide services under the Ouibus brand under a ten-year franchise contract.

The French regulator Arafer (Autorité de régulation des activités ferroviaires et routières, Regulatory authority for rail and road activities) carried out a detailed review of the emerging sector in 2016 and found that:

- By June 2016, ten months after liberalisation, the number of routes operated had risen from 41 to 257 and the number of cities served had risen from 62 to 208.
- 59% of services were radial from Paris, but these represented only 14% of the routes, with the remainder being orbital. This left few potential corridors in which a night train could be operated without parallel coach competition.
- Operators competed on 23% of the network carrying 86% of the passengers, but half of the cities on the networks were served by a single operator.
- FlixBus connected 54% of the pairs of cities which are connected by direct services, Eurolines/Isilines connected 37% and Ouibus connected 23%.
- The average route connected five cities spaced 140 kilometres apart.
- The 10 busiest routes represented 40% of total demand.

Accommodation and pricing

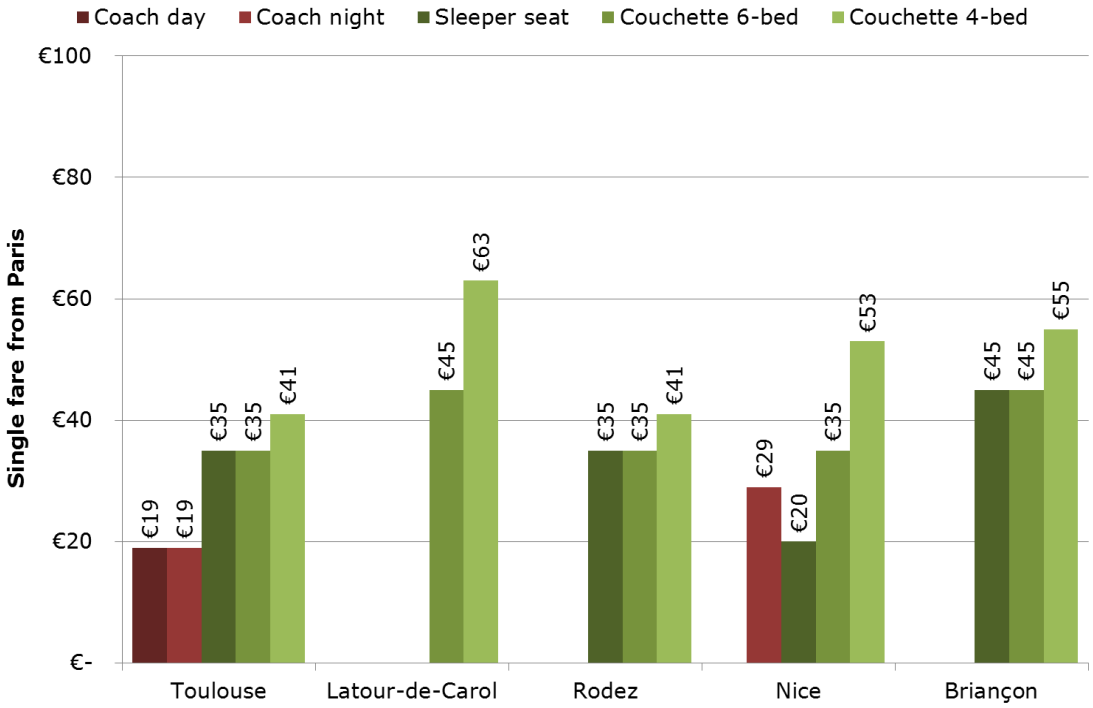
Intercités de Nuit offers three classes of travel: reclining seat, Standard Class 6-bed couchette and First Class 4-bed couchette.

We examined the price competition to Intercités de Nuit from parallel FlixBus and Eurolines services, for bookings three months ahead and one day ahead, as shown in Figure 57 and Figure 58.

Compared with other case studies, where night train fares can reach €200, fares in France booked only one day ahead are relatively low, with the highest fare we identified being only €82, in a First Class couchette between Paris and Nice.

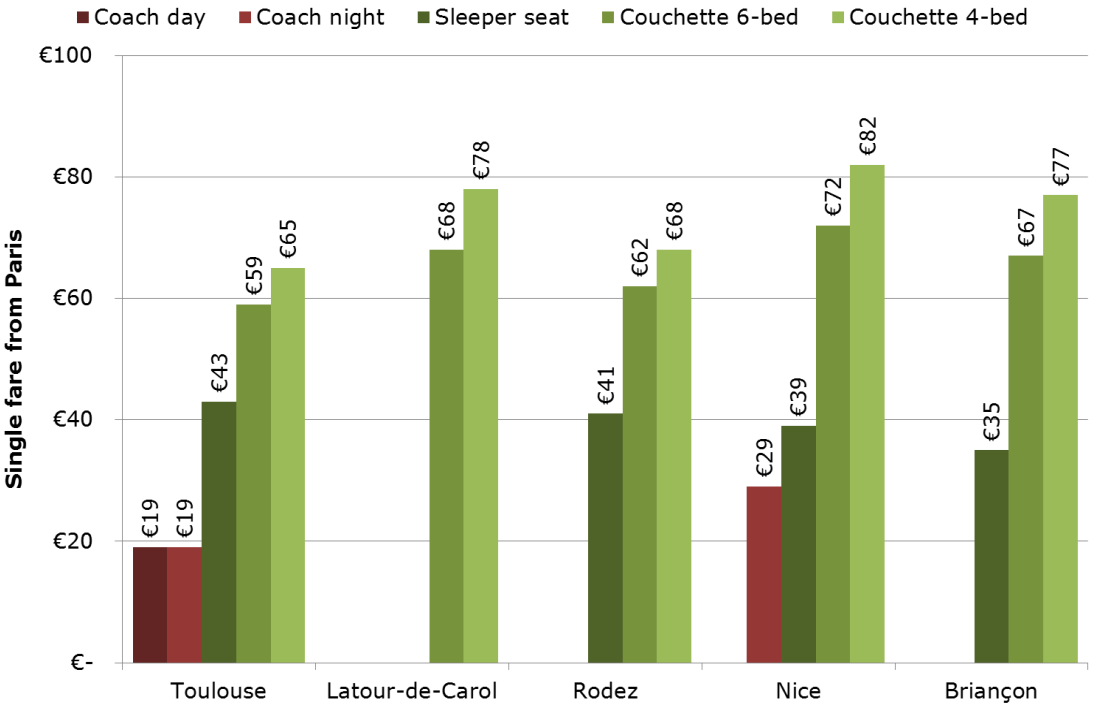
However, Intercités de Nuit faces competition from day and night coaches on some routes, with fares as low as €19 between Paris and Toulouse, booked one day ahead.

Figure 57: SNCF Intercités de Nuit: sample fares three months ahead



Source: SNCF and (where available) FlixBus, Eurolines.

Figure 58: SNCF Intercités de Nuit: sample fares one day ahead



Source: SNCF and (where available) FlixBus, Eurolines.

Passenger data

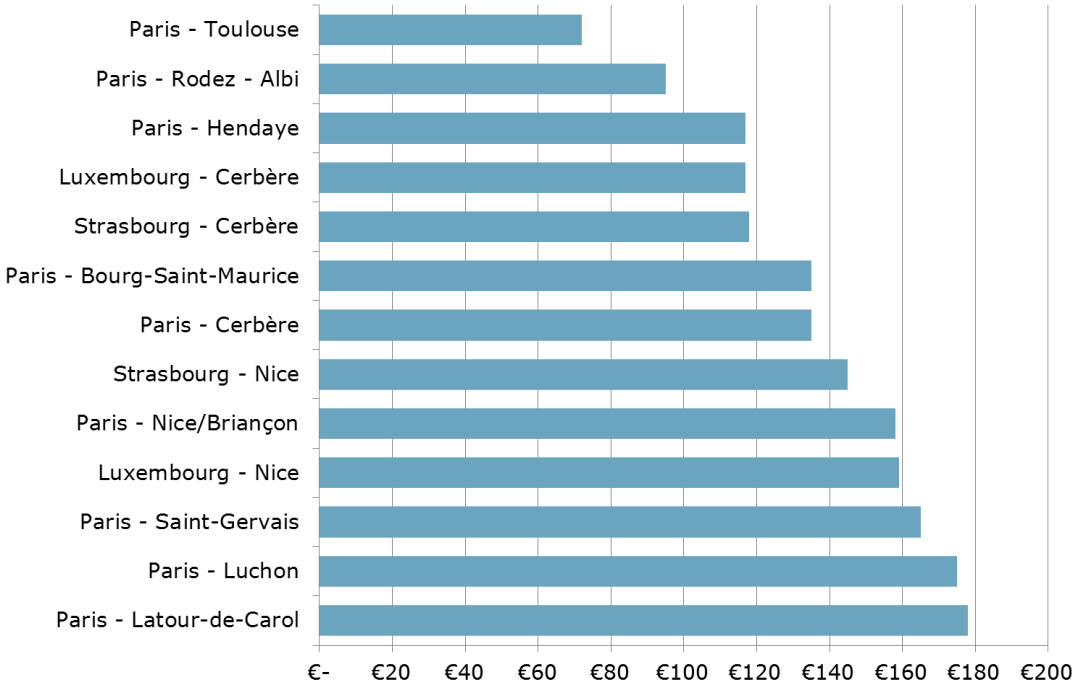
TET reported a total of 33.9 million trips in 2013 on TET services, of which 1.2 million were overnight trips on Intercités de Nuit[84].

[84] Commission "TET d'Avenir", TET: Agir pour l'Avenir, May 2015.

Financial data

In the note on the Government's July 2016 Roadmap for the future of TET, the Ministry of Ecology, Sustainable Development and Energy outlined a range of evidence to explain why the economic model of night trains was no longer viable. The Ministry underlined that Intercités de Nuit carried only 3% of TET passengers, but accounted for 25% of the TET deficit, and average subsidy per passenger was over €100. Figure 59 shows the average level of subsidy per passenger by route in 2013.

Figure 59: SNCF Intercités de Nuit: public subsidy per passenger (2013)



Source: Commission "TET d'Avenir", TET: Agir pour l'Avenir, May 2015.

The Inspection Générale des Finances and the Conseil General de l'Environnement et du Développement Durable reported[85] that the closure of six night train routes will allow a €35 million reduction of the deficit from 2017, with a €93 million cost saving offset by a loss of €58 million in revenues, implying a cost recovery ratio of just over 60%.

Future developments

From July 2016, SNCF carried out a three-month trial of operating RZD sleeping cars from Russia as a night train service between Paris and Nice. We understand that the aim was to see how customers would react to sleeping cars, instead of the couchettes on other services, with a view to possible future collaboration between the operators[86]. We have not identified the results of the trial or any proposals to introduce the service permanently.

Unless the private sector proposes to reopen the services which have recently been closed, or to introduce new ones, this means that only three domestic night train routes will remain at the end of 2017. One will operate from Paris to Rodez during the week, with an extension to Albi at weekends. The other will operate from Paris to Latour-de-Carol and to Briançon.

[85] Jean-François Verdier, Christian Assailly, David Genet, Audit des comptes de l'activité intercités de SNCF mobilités dans le cadre de la préparation de la prochaine convention d'exploitation des trains d'équilibre du territoire (TET), Inspection Générale des Finances, Conseil General de l'Environnement et du Développement Durable, July 2016.

ANNEX I: CASE STUDY: TRAINOSE (GREECE)

Introduction

TrainOSE, the national railway of Greece, operates two international and one international night trains routes:

- One, the "Hellas Express", operates between Salonica (Thessaloniki), Skopje (in the former Yugoslav Republic of Macedonia) and Belgrade (in Serbia), in cooperation with Serbian railways.
- Another operates between Salonica, Sofia (in Bulgaria) and Bucharest (in Romania), in cooperation with Bulgarian Railways (BDZ). TrainOSE reported that this service operated in summer 2016, but it does not appear in the relevant European Rail Timetable (ERT).
- TrainOSE also operates a domestic night train service between Salonica and Athens, although we have not been able to confirm that this still provides night accommodation.

These points show that, for TrainOSE at least, there are inconsistencies between information printed in the ERT and information available from the operator and other websites.

Operating patterns

Figure 60 shows the operating patterns of the international services in 2016.

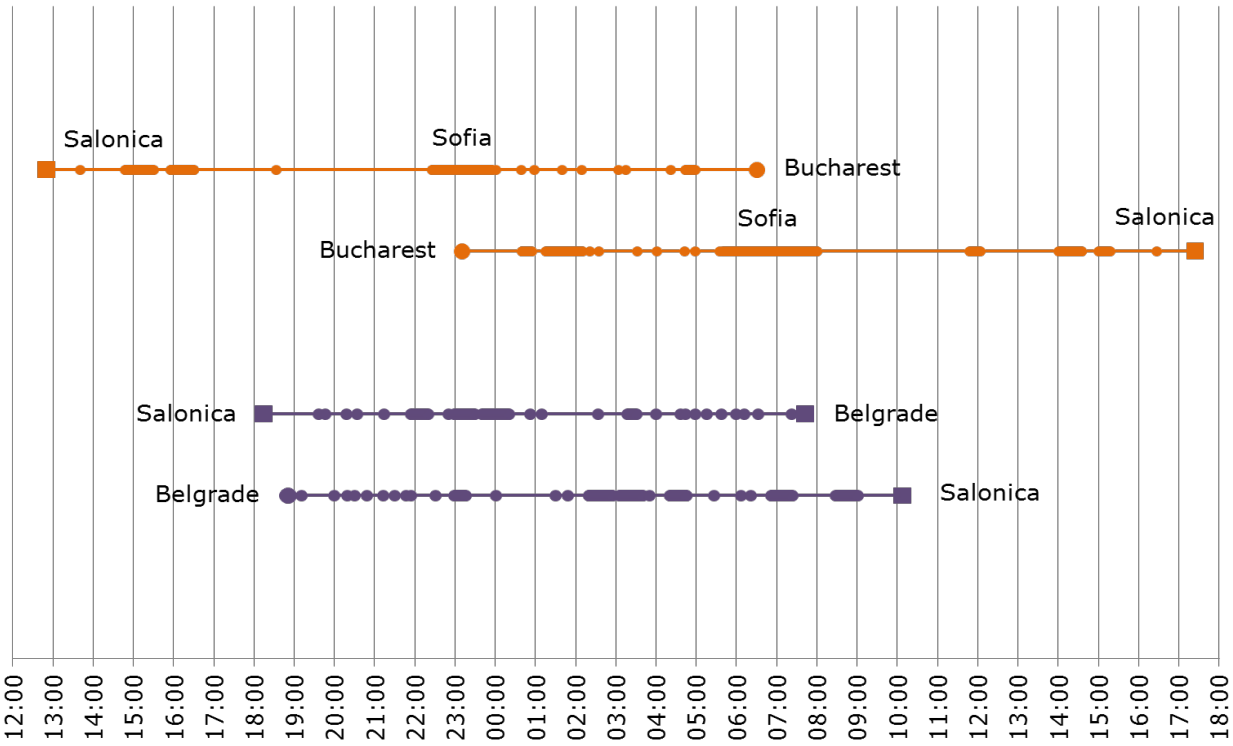
Accommodation and pricing

International services include couchettes and sleeping compartments, but on the "Hellas Express" to Belgrade (in Serbia), sleeping compartments are only provided in summer.

Figure 61 shows sample fares on TrainOSE night trains and coach services, booked one day ahead. TrainOSE's fares appear to be fixed with no variation with time or booking or yield management.

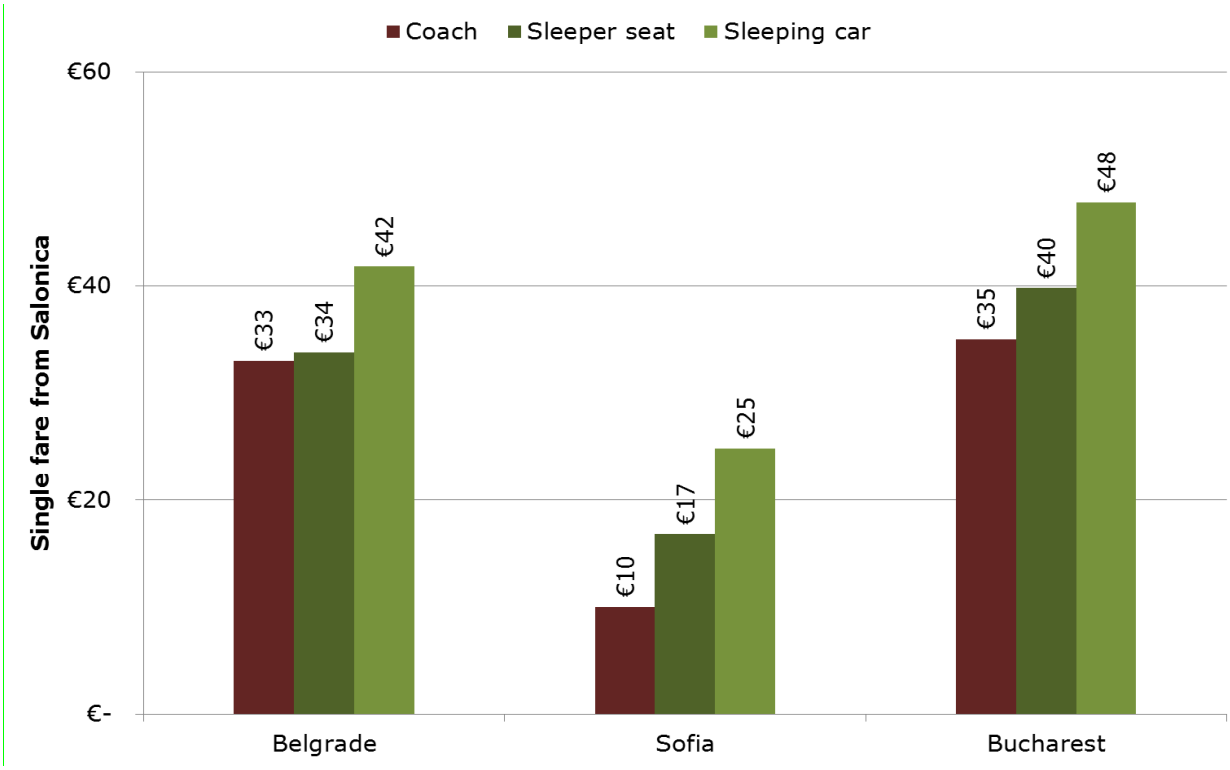
[86] From Rail Passion, a French website.

Figure 60: TrainOSE: operating patterns of international services (2016)



Source: TrainOSE, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Salonica is represented by a square marker. All trains make an extended stop in one or more intermediate stations.

Figure 61: TrainOSE: sample fares one day ahead



Source: TrainOSE, Rome2Rio.

ANNEX J: CASE STUDY: PKP INTERCITY NIGHT (POLAND)

Introduction

Polskie Koleje Państwowe SA (Polish State Railways) (PKP) is the national rail operator of Poland. PKP operates night trains in Poland as part of the Intercity long-distance services, using a total fleet of 102 vehicles in 2015[87].

Operating patterns

Figure 62 and Figure 63 show the operating patterns of domestic night trains from December 2016. Night train journey times are typically 20% higher than those of conventional day trains and 40% higher than those of the fastest trains, capable of 250 km/h.

Poland is also served by a wide range of international night trains operating on both standard and Russian broad gauge networks:

- Standard gauge services connect Warsaw, Krakow and Katowice with the Czech Republic (Prague), Austria (Vienna), Slovakia (Bratislava) and Hungary (Budapest).
- Standard gauge services connect Warsaw with Kiev in the Ukraine, and connect Breslau (Wrocław) and Krakow with Lviv in the Ukraine, with onward connections to Kiev.
- Gauge-changing services operate to Belarus (Brest, Minsk, Grodno) and Russia (Moscow).

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.

Accommodation and pricing

Night trains in Poland typically provide both couchettes and sleeping compartments:

- Couchettes offer a choice of mixed-sex 4- or 6-person compartments. Each berth has a pillow, blanket and clean sheets, but passengers must make their own bed.
- Sleeping cars are available with 3, 2 or 1 berth and are single-sex only.

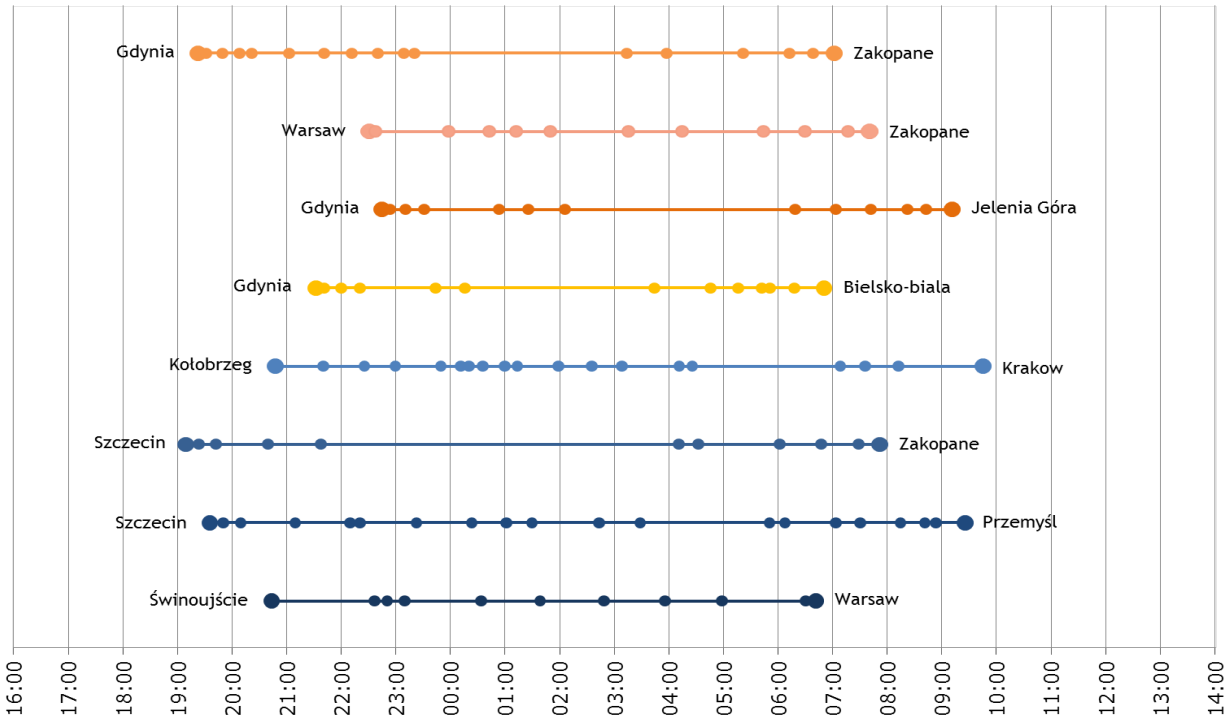
Second Class rail tickets can be used in 3- and 2-bed sleeping compartments, but a First Class ticket is required to travel in a 1-berth compartment. Sleeping compartments currently provide a mirror and washbasin. A refurbishment is in progress, but we have not identified what changes are proposed.

PKP Intercity Night services can only be booked two months ahead. Figure 64 and Figure 65 show the lowest fares we were able to find two months and 1-5 days ahead on Polskibus

[87] Poland Transport statistics.

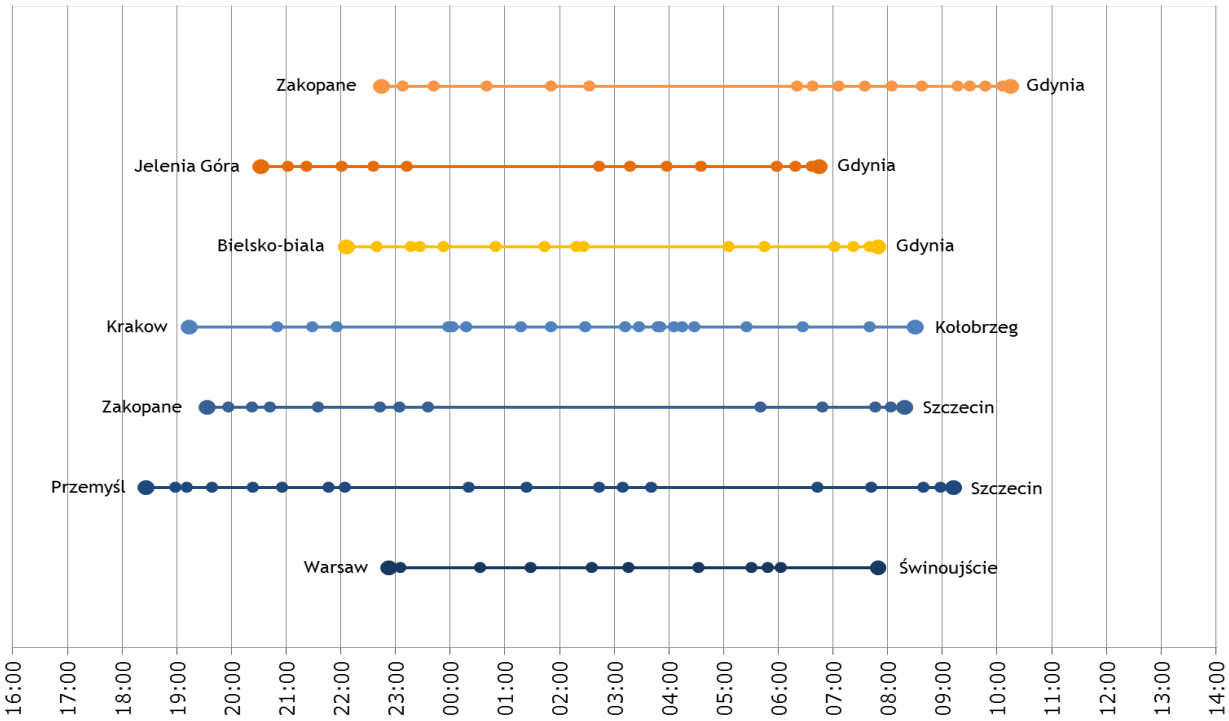
coaches and night trains. Coach fares on many routes were as low as €3-6, compared with seats on night trains starting from €14. Some fares were higher if booked only 5 days ahead.

Figure 62: PKP Intercity Night: typical operating patterns, southbound (2017)



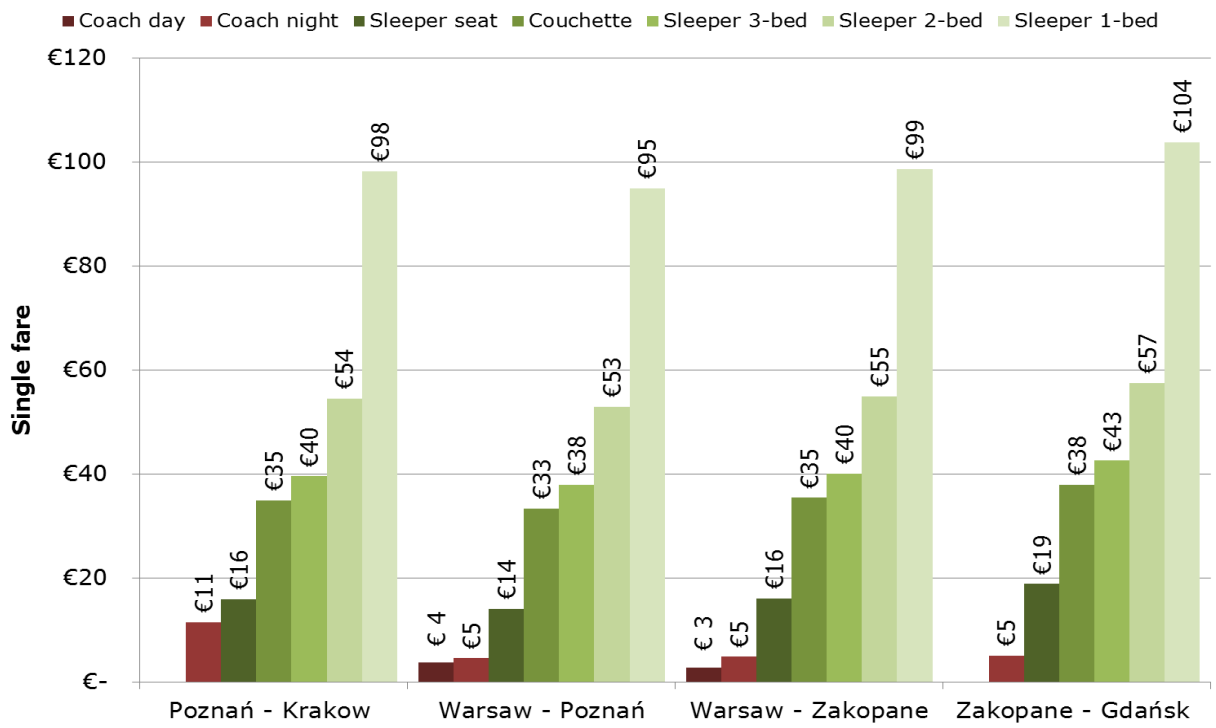
Source: European Rail Timetable (Winter 2016/2017 Edition), Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points.

Figure 63: PKP Intercity Night: typical operating patterns, northbound (2016)



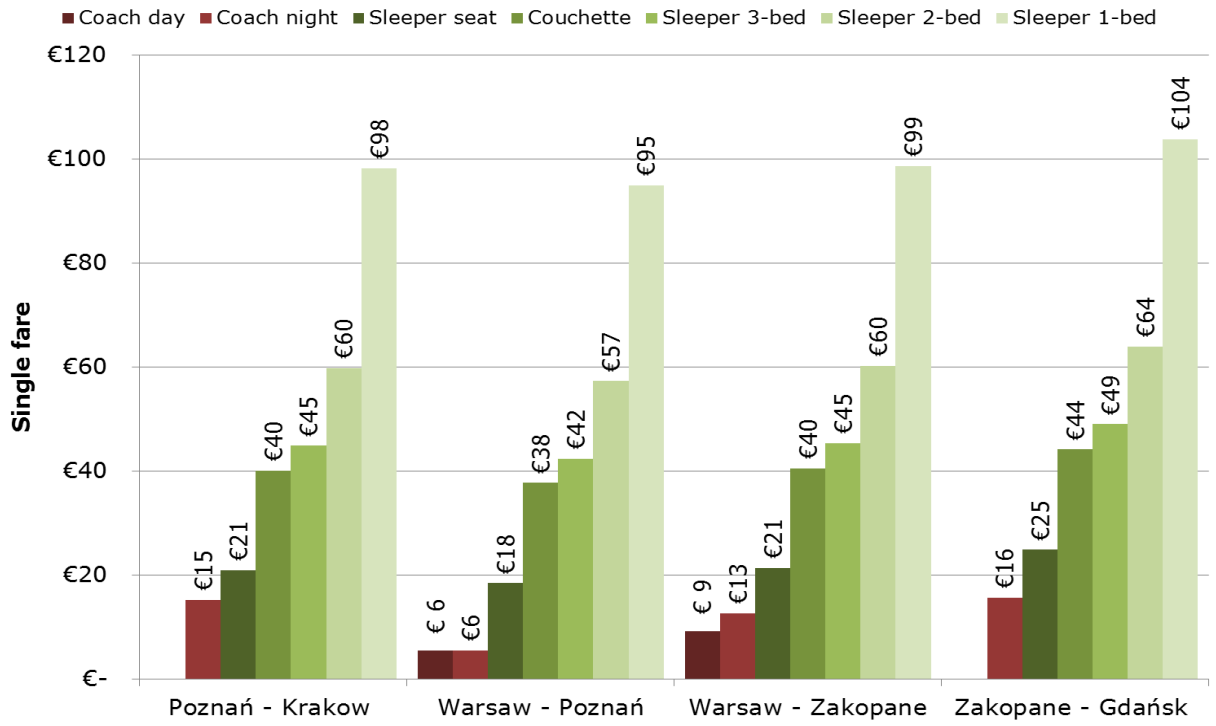
Source: European Timetable (Winter 2016/2017 Edition), Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points.

Figure 64: PKP Intercity Night: sample fares two months ahead



Source: www.booking.polrail.com, Polskibus.
Note: www.booking.polrail.com allows booking from 5 days to 2 months ahead.
Note: all fares are two months ahead.

Figure 65: PKP Intercity Night: sample fares five days ahead



Source: www.booking.polrail.com, Polskibus.
Note: www.booking.polrail.com allows booking from 5 days to 2 months ahead.
Note: PKP fares are five days ahead and Polskibus fare are one day ahead.

ANNEX K: CASE STUDY: RZD (RUSSIA)

Introduction

This case study summarises service patterns in Russia, with a focus on services in Europe between Moscow (and to a lesser extent Saint Petersburg) and the EU. Russian national railway RZD is not subject to the regime, required by Article 3 of Regulation (EC) No 1370/2007, whereby the award of either an exclusive right or compensation (subsidy) must be supported by a PSC[88].

RZD's service patterns are complex: some trains are seasonal, not all train run every day, and journey times vary by direction. A further complication is that timetables are expressed in Moscow time, which can be up to five hours different from local time at some stations.

Many trains run only on odd or even dates, rather than specific days of the week, with two specific consequences:

- The timetable normally only repeats every fortnight, rather than every week.
- Trains may be omitted or added around the end of a month with 31 or 29 days.

Fares vary by time of year, with higher prices at peak times. Tickets may often be bought online and printed at home (Seat 61).

Table 28 summarises the night trains operated to and from Moscow. With the exception of services to Riga in Latvia, these services carry sleeping cars but not couchettes.

In 2016, services between the Russian broad gauge network and the standard gauge network of Western Europe, connected by a bogie exchange at Brest in Belarus, included:

- Three nights a week, a train operates to Sofia in Bulgaria taking over 48 hours through eight countries via Minsk in Belarus, Warsaw in Poland, Břeclav in the Czech Republic, Bratislava in Slovakia, Budapest in Hungary and Belgrade in Serbia. This service was introduced in December 2015, using an extended route which avoids the Ukraine, but appears to be discontinued from December 2016 (European Rail Timetable (ERT)).
- Two trains per night week operate to and from Warsaw in Poland. These trains continue and split after the Poland/Czech Republic border to serve Prague in the Czech Republic and Vienna in Austria. This service appears to be discontinued from December 2016 (ERT).
- Three nights a week, the Trans-European Express connects Moscow with Warsaw (Poland), Berlin and Frankfurt (Germany), and Strasbourg and Paris (France). This train is timed as taking two nights and a day, with travel in Poland and Germany by day. This service has been reduced to one night per week from December 2016 (ERT).
- One night a week, a train connects Moscow with Nice in France through nine countries via Minsk (Belarus), Warsaw (Poland), Vienna, Salzburg and Innsbruck (Austria), Bolzano, Verona, Milan and Genova (Italy) and Monaco. The whole journey takes almost 48 hours, travelling Thursday morning to Saturday morning westbound and Saturday evening to Monday evening eastbound.

[88] "*Where a competent authority decides to grant the operator of its choice an exclusive right and/or compensation, of whatever nature, in return for the discharge of public service obligations, it shall do so within the framework of a public service contract.*" This is discussed further in Section 4.3.

Table 28: RZD: night trains from Moscow within Europe (2016)

		Russian gauge						Standard gauge via Minsk											Comments
Days per week	Journey time (hours)	Saint Petersburg, Russia	Helsinki, Finland	Tallinn, Estonia	Riga, Latvia	Vilnius, Lithuania	Minsk, Brest, Belarus	Warsaw, Poland	Berlin, Frankfurt, Germany	Strasbourg, Paris, France	Bratislava, Slovakia	Budapest, Hungary	Sofia, Bulgaria	Prague, Czech Republic	Vienna, Salzburg, Austria	Verona, Milan, Italy	Monaco	Nice, France	
7	8	●																	Two luxury trains: Grand Express, and Krasnaya Strela. Also overnight trains in day stock.
6	15	●	●																Luxury train: Lev Tolstoi, overnight in Russia, day train in Finland.
7	16	●		●															Sleeping cars: overnight in Russia, day train in Estonia.
7	16				●														Sleeping cars: Latvijas Ekspresis.
0						-													Two overnight trains in day stock, en route to Kaliningrad.
3	52						●	●	●	●									Luxury train: Trans-European Express to Paris. Also overnight trains in day stock.
3	36						●	●			●	●	●						Sleeping cars, via Warsaw, Bratislava and Belgrade.
2	27						●	●						●	●				Sleeping cars: splits in Czech Republic to Prague and Vienna.
1	48						●	●							●	●	●	●	Luxury train.

Source: European Rail Timetable (January 2016 Edition), Steer Davies Gleave analysis.

Services also radiate from Moscow on the Russian broad gauge network to Helsinki in Finland, Tallinn in Estonia, Riga in Latvia, Vilnius in Lithuania (en route to Kaliningrad) and Minsk in Belarus.

Within Russia, there is a dense service between Moscow and Saint Petersburg, which are now connected by "Sapsan"[89] day trains with a fastest non-stop journey time of 3 hours 40 minutes (Train 752AJ). A number of trains travel overnight, with a journey time of 8-9 hours, but most offer only day stock with no night accommodation. The exceptions are:

- The Lev Tolstoi, operating every night except Saturday, and every night during the summer months, between Moscow and Saint Petersburg and as a day service to Helsinki, and the Krasnaya Strela. Both offer First and Second Class sleeping cars and First Class sleeping cars with ensuites.
- The Grand Express offering only First Class sleeping cars with ensuites, sofa, air conditioning, TV, DVD and WiFi.

Future developments

In December 2016, following tests in Germany, RZD introduced a new night service between Moscow and Berlin using three variable gauge Talgo trainsets, equipped to operate at 200 km/h with passive tilt. Variable gauge running gear and an automatic gauge-changer, installed at Brest in Belarus in 2015, allow gauge change from 1520 millimetres to 1435 millimetres in 20 minutes, compared to over an hour for a bogie exchange. This enables a reduction in journey time of 4½ hours, to just over 20 hours. The 20-car train formations comprise five Second Class sleeping cars, four First Class sleeping cars, five VIP Class with showers and baths, two First Class seating cars, a buffet car and a dining car and two "technical cars" (Global Rail News, IRJ). These services, operating under the name Strizh (Swift), call at nine intermediate stations in Russia, Belarus, Poland and Germany (IRJ). Initial services depart from Moscow on Saturdays and Sundays and return from Berlin on Sundays and Mondays.

The introduction of passive tilt, and more rapid bogie exchange, has the potential to shorten journey times, although applying the same technology to day trains, where possible, may reduce the value and viability of distinct night services. We examined the potential implication of a further reduction of journey time of 4½ hours on the overall journey between Moscow and Paris:

- Eastbound, the 2016 timings were a departure at 18:58 and an arrival at 11:01. A 4½-hour reduction would allow a later evening departure and/or an earlier morning arrival.
- In the westbound direction, the 2016 timings were a departure at 22:15 and an arrival at 09:33. Unless the journey time was artificially extended, a 4½-hour reduction would mean departure after midnight and/or arrival before 07:00. These might not be commercially attractive, and it might instead become more attractive to retime the night-day-night train as a day-night-day train, leaving Moscow at (say) 09:00 and reaching Paris at 16:00.

In practice, Moscow to Paris service timings will remain unchanged in 2017, except to adjust for summer time, from March 26 to October 28, in the EU but not in Belarus or Russia (European Rail Timetable).

[89] Sapsan (Peregrine Falcon) is the brand name of RZD services operated by 250 km/h high-speed trains.

ANNEX L: CASE STUDY: CFR CĂLĂTORI (ROMANIA)

Introduction

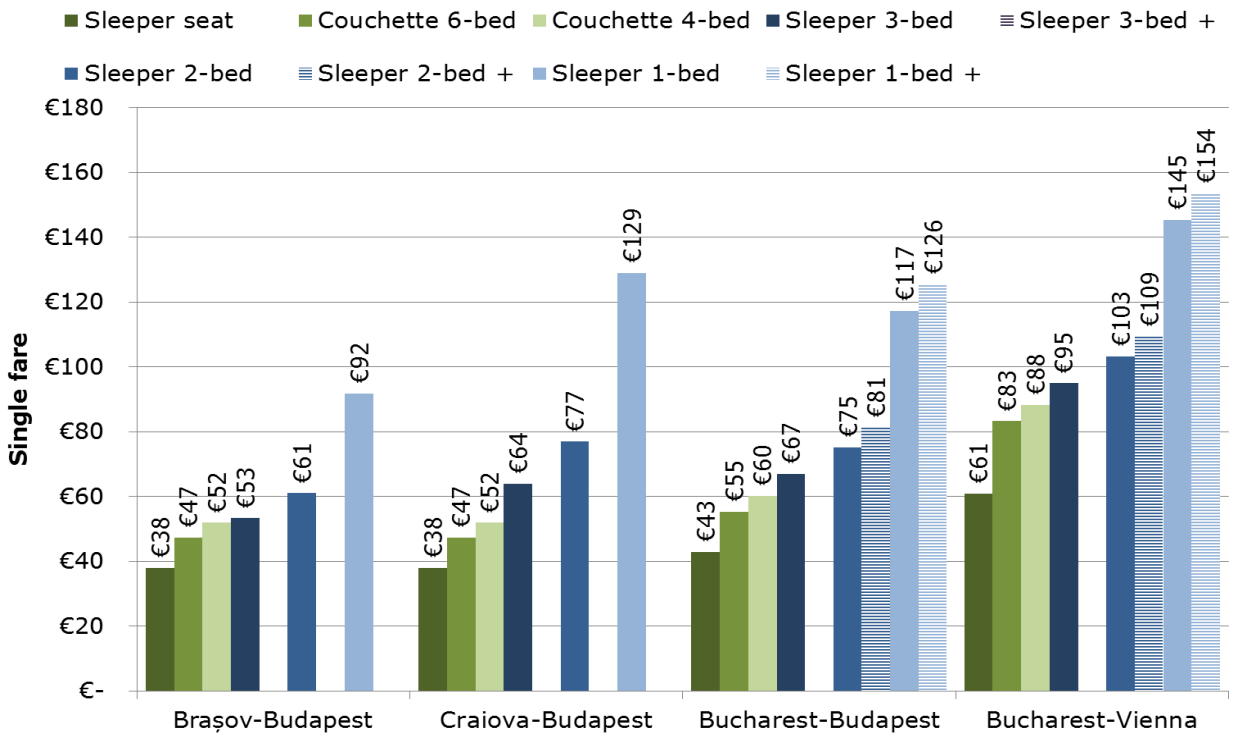
Railways in Romania generally have a maximum operating speed of 120 km/h, so that average speeds are low and many interurban journeys are long enough for a night train.

CFR Călători operates a range of day and night trains connecting the capital, Bucharest, with other major centres. We understand that services are provided under a single national PSO, and there is no requirement for CFR Călători to identify either the costs or the revenues of night trains within the overall package of services provided.

Accommodation and pricing

CFR Călători provides a range of accommodation similar to that provided by ÖBB Nightjet, with the exception that there are no 3-bed sleeper compartments with showers. Its website lists single and return fares between Romania, Budapest in Hungary and Vienna in Austria.

Figure 66: CFR Călători: sample fares



Source: CFR Călători.
Note: "+" includes shower and WC en suite.

Future developments

Railway Gazette International (RGI) has reported that, on 9 February 2017, operator Astra Trans Carpatic began an open access night train service which will operate in both directions daily between Arad to Bucharest Nord station via Sighişoara and Braşov. Each train has one First Class seating coach, three couchette cars and two sleeping cars. Ticket sales are initially on board but will be available online, with fares varying from €24 for a First Class seat to €54 in a sleeping car.

ANNEX M: CASE STUDIES OUTSIDE EUROPE

Introduction

In addition to the detailed case studies of night train operations within Europe, we have drawn on desk research and in-house data to identify issues from other night train operators which may be relevant to services within the EU. We deal in turn with:

- VIA Rail (Canada);
- Amtrak (USA);
- Australia;
- China;
- India;
- Japan; and
- KTZ (Kazakhstan).

Table 29 summarises the VIA Rail and Amtrak services, which we discuss first.

Table 29: VIA Rail and Amtrak: summary of services

Type of route	VIA Rail (Canada)	Amtrak (USA)
Core commercial corridor	Windsor-Quebec corridor	Northeast Corridor (735 kilometres)
Supported services	Regional and remote services	State-supported corridors (130-1200 kilometres)
Long-distance services	Two supported long-distance named routes, "The Canadian" and "The Ocean"	Supported routes (over 1,200 kilometres, serving remote settlements at low frequency)

Source: VIA Rail Annual Reports, discussions with Amtrak.

VIA Rail (Canada)

VIA Rail is an independent Crown corporation (government-owned enterprise) mandated to provide intercity passenger services in Canada, in three service groups, broadly comparable to those offered by the USA's Amtrak, as shown in table 29 andFigure 67.

VIA Rail's 2015 Annual Report stated that "In Western and Eastern Canada, VIA Rail's trains attract travellers from around the world and support Canada's tourism industry. "The Canadian", VIA Rail's Western transcontinental train, provides service between Vancouver and Toronto. In Eastern Canada, "The Ocean" runs between Montréal and Halifax."

- The Canadian (also called Le Canadien) covers 4,466 kilometres in around 80 hours each way (average 56 km/h), three times per week at peak times and twice per week off-peak.
- The Ocean (formerly the Ocean Limited) covers 1,346 kilometres in around 22 hours each way (average 61 km/h). Until 1981, services were daily but the train now runs three times a week.

Figure 67: VIA Rail: network (2016)

Source: VIA Rail.

These two long-distance routes carry 4% of VIA Rail's passengers but, because of the long average journey length, contribute around 19% of total passenger revenues. VIA Rail's Annual Reports for the years 2015 and 2013 (the earliest available on a directly comparable basis) provide itemised financial information on the two trains:

- In 2013, the trains carried 175,000 passengers at a cost of C$143 million (€100 million), earning revenues of C$55 million (€38 million). This was equivalent to 39% cost-recovery, or a subsidy of C$501 (€351) per passenger.
- In 2015, the trains carried 170,000 passengers at a cost of C$146 million (€102 million), earning revenues of C$62 million (€43 million). This was equivalent to 42% cost-recovery, or a subsidy of C$496 (€347) per passenger.

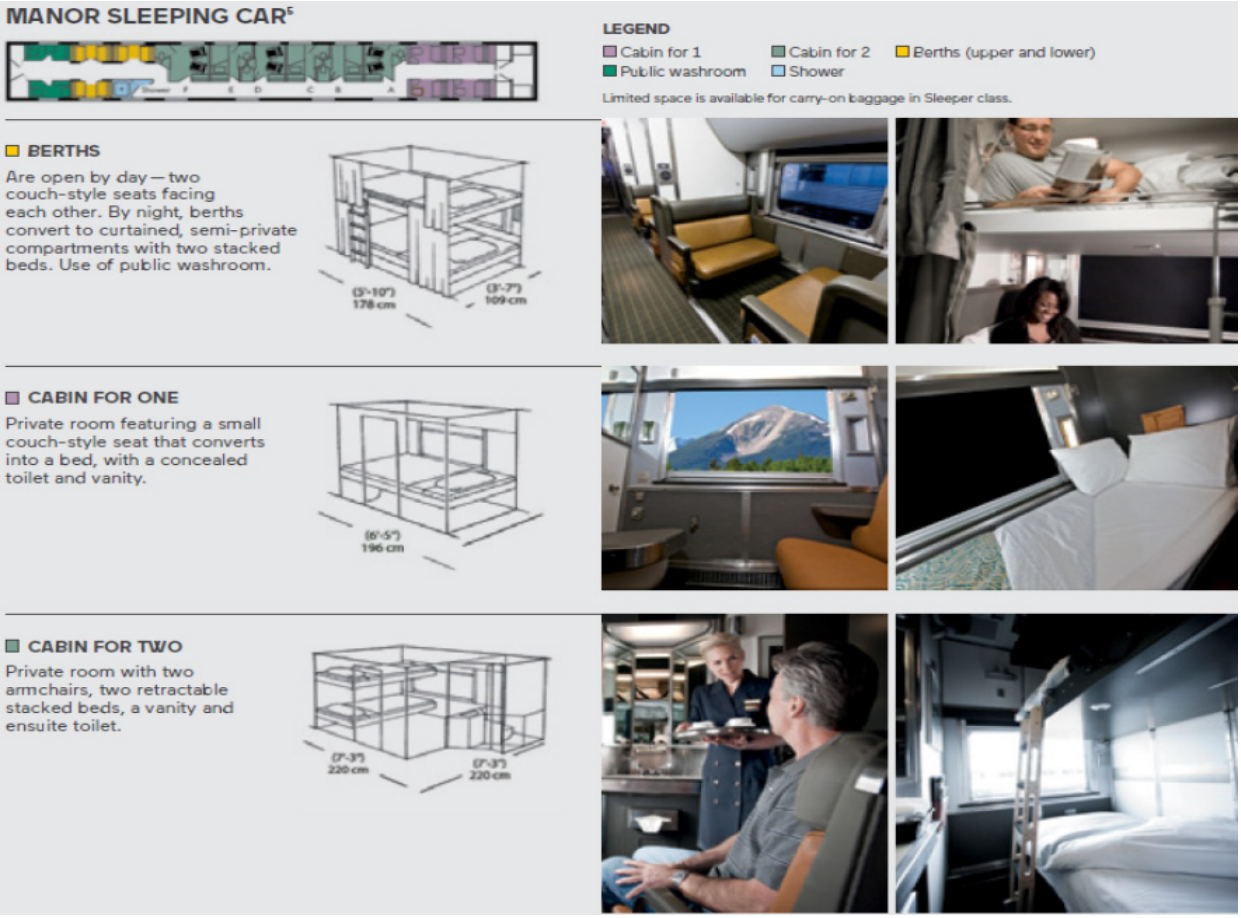
The overall change between 2013 and 2015 is a reduction in passenger numbers offset by higher revenues per passenger (C$365, or €255, per passenger) to provide a small reduction in subsidy per passenger. We understand from earlier discussions with VIA Rail that some of the improvement in performance has been attributed to the introduction of seasonal timetables and to improvements in demand and yield management.

Overnight accommodation on the long-distance services includes berths, cabins for one, and cabins for two with a WC (but not shower) en suite, all provided in a single vehicle, as shown in Figure 68. Two cabins for two can be linked to produce a suite, which can accommodate up to four people.

We understand from previous interviews with VIA Rail that almost all of the rail infrastructure used by The Canadian and The Ocean is owned by other operators, principally Canadian National (CN) and Canadian Pacific (CP). VIA Rail has commercial agreements to access their infrastructure, but it can be difficult for it to secure favourable timings for its trains, or to do so sufficiently in advance to be able to market its timetables effectively. We have not identified the extent to which this constrains its services or the operational or commercial attractiveness of the timetables.

In addition, VIA Rail's service planning changes typically consider incremental changes to the existing schedule, rather than major changes in service pattern. This partly reflects the fact that almost all population, and interurban movement, in Canada, lies on a single corridor between Vancouver and Halifax, as shown in Figure 67.

Figure 68: VIA Rail: accommodation



Source: VIA Rail.

Amtrak (USA)

Amtrak has three operational business lines, summarised with the comparable Canadian services in Table 29 above.

On its long-distance services, Amtrak provides a "blended" product mix serving both tourists, including relatively luxurious services and accommodation, and regional transport needs, focusing on more basic requirements for shorter-distance journeys. This reflects some aspects of the way that night trains in Sweden and within Scotland also provide short-distance services for relatively local and commuter travel.

Our examination of Amtrak focused on the way in which services were specified or funded by either commercial or social means, as we summarise inTable 30. Amtrak monitors the effect of service changes to inform its marketing and customer experience planning:

- It assessed in advance the potential demand for the provision of a Business Class service, in addition to coach and sleeper, on some long-distance routes. After this was implemented, research was carried out on passenger opinions on the new Class (similar to the trial of RZD sleeping cars between Paris and Nice in France).
- It reviewed the role of the checked baggage service, traditionally offered on Amtrak trains. For a three-month period, Amtrak asked passengers on trains with this service whether they used it, and the likely impact on their travel behaviour if it was removed. This information informed subsequent decisions on whether to expand or reduce the checked baggage service.

Table 30: Amtrak: examples of business and service initiatives

Type of change	Purpose	Potential initiators				
		Amtrak	Railroads	States (DoTs)	City mayors or authorities	Federal mandate
Timetable adjustments	Improve resource utilisation	●				
	Adjust around other services	●	●			
	Improve financial performance	●		●		
	Better alignment to demand	●		●		
	Shorter journey time	●		●		
Service features	Improve financial performance	●		●		
	Increase capacity to meet demand	●		●		
	Add features, equipment or services	●		●		
	Remove features, equipment, services	●		●		
Reduce frequency	Improve financial performance	●		●		
Increase frequency	Improve financial performance	●		●		
	Stimulate demand growth	●		●		
	Exploit enhanced infrastructure capacity	●		●		
Remove station stops	Improve financial performance	●		●		
	Replace with a different service	●		●		
Add station stops	Add services at an existing station			●	●	
	Add services at a new station			●	●	
	Improve connections to other transport			●	●	
	Improve a community's access to rail			●	●	
Introduce a new route	Improve a community's access to rail			●		●
	Expand network and demand			●		●
Withdraw from an existing route	Poor infrastructure condition	●	●			
	Poor financial performance	●		●		
	Need to operate within the available Federal or State funding	●		●		●

Source: discussions with Amtrak.
Note: DoTs are (State) Departments of Transportation.

On 17 March 2017, the International Railway Journal (IRJ) reported that the Trump administration's proposed 2017 budget "terminates federal support for Amtrak long-distance train services". If implemented, this could mean the end of all Amtrak long-

distance services including the remaining sleeper services, unless the States were able and willing to support these services.

Australia

A number of long-distance trains with sleeping accommodation operate in Australia, although many cater primarily for the tourism market rather than for domestic travel.

Interstate rail services: commercial

A private operator, Great Southern Rail, operates long-distance tourist services from Sydney in New South Wales to Perth in Western Australia via Adelaide in South Australia (4,350 kilometres in 4 days and 3 nights each way, "The Indian Pacific") and from Adelaide to Alice Springs and Darwin in the Northern Territory (2,979 kilometres, "The Ghan"). However, fares range from A$619 (€430) between Alice Springs and Darwin in the low season in "Gold service" to A$4,359 (€3,050) between Sydney and Perth in "Platinum service", compared to domestic air fares typically under A$300 (€210) between any two points if booked sufficiently in advance.

Until July 2016 the Australian federal government paid a subsidy to Great Southern Rail to provide heavily-discounted concession fares on The Indian Pacific and The Ghan. The subsidy also covered the provision on The Indian Pacific of an Economy Class coach, with associated Economy Class fares, to provide connectivity to and between remote towns, notably from Broken Hill to Sydney (in New South Wales) and Adelaide (in South Australia).

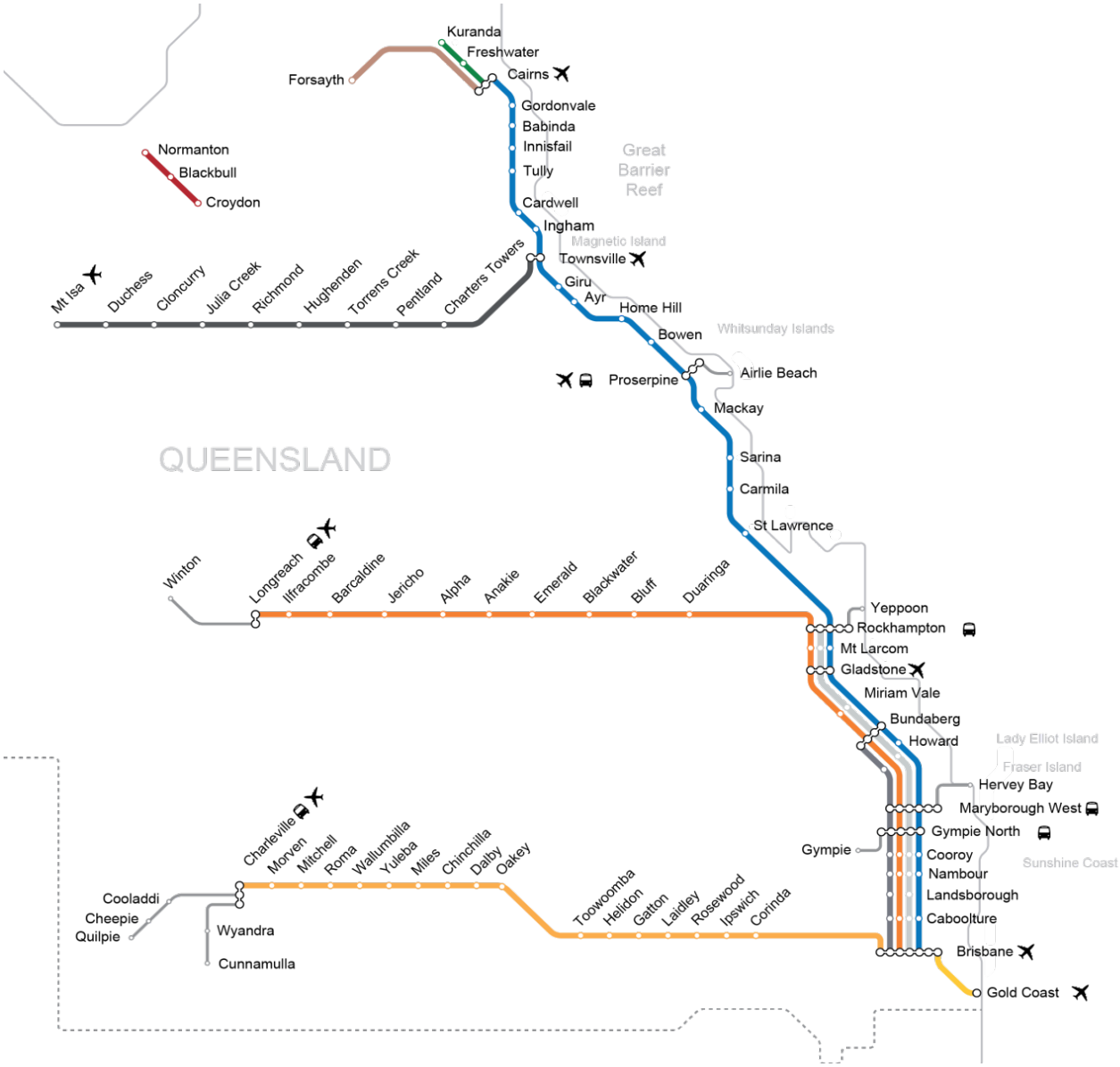
Queensland: subsidised

The train most similar to a European night train is probably "The Spirit of Queensland", using 160 km/h stock, which operates five days a week each way between Cairns in Queensland and the state capital of Brisbane[90]. The advertised distance is 1,681 kilometres, slightly more than from Stockholm in Sweden to Narvik in Norway (please see Figure 23 in Annex D on SJ Nattåg in Sweden) with a journey time of 24 hours. Accommodation is either "Premium Economy" seats (1050 millimetre pitch[91], with 225 millimetre entertainment screen) or Rail Beds, similar to a lie-flat airline Business Class seat, with at-seat service. Showers and toilets are provided in the end of each carriage.

[90] One of our team observed the punctual departure of this train from Cairns at 09:00 on 30 December 2016, with an apparent load factor of around 25%.

[91] Pitch is the distance between each row of seats.

Figure 69: Queensland Rail: network



Source: Queensland Rail, "The Spirit of Queensland" (blue) operates between Cairns and Brisbane.
Note: most long-distance services do not operate every day.

As with services in Sweden and, to a lesser extent, Scotland in the United Kingdom, The Spirit of Queensland connects Brisbane with a series of coastal communities – Gympie, Bundaberg, Gladstone, Rockhampton, Mackay, Proserpine, Townsville and Cairns – between which there are limited or no flights. However, there are multi-stop flights from Brisbane calling at Rockhampton, Mackay (neither airport is shown on Figure 69), Townsville and Cairns, making it possible to fly between some communities.

As Figure 70 shows:

- Northbound, the train is effectively an evening train from Brisbane, a night train from Gladstone to Proserpine (22:07-06:02), and then a morning train to Cairns.
- Southbound, the train is effectively a day train from Cairns, a night train from to St Lawrence to Gympie (22:20-06:09), and a morning train to Brisbane, arriving 09:20.

Figure 71 shows how the Spirit of Queensland does not offer passengers long uninterrupted breaks between stations, although in both directions the longest break, of over two hours between Rockhampton and St Lawrence, does occur over midnight.

Figure 70: Queensland Rail: Spirit of Queensland timetable (2017)

Brisbane to Cairns
Northbound

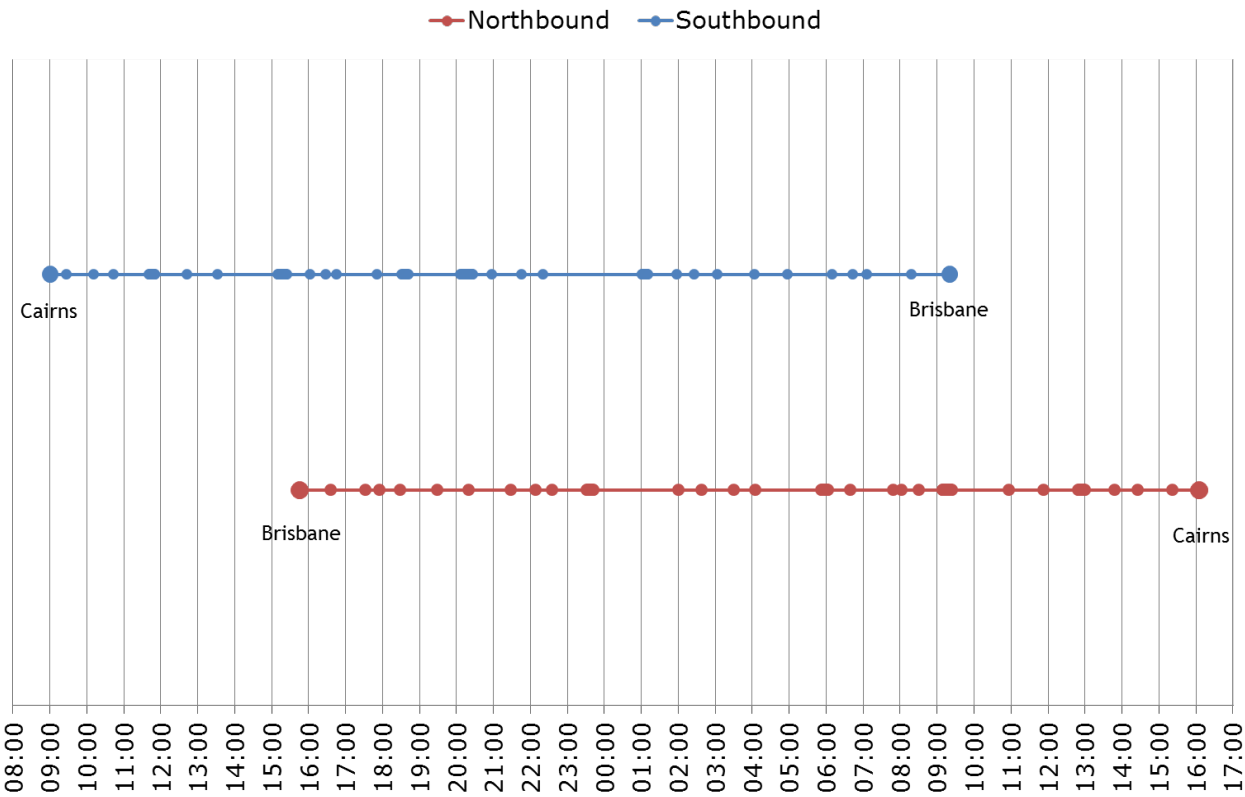
Departing	Mon, Tues, Wed, Fri & Sat
Brisbane (Roma St)	3.45 pm
Caboolture	4.35 pm
Nambour	5.31 pm
Cooroy ˆ	5.54 pm
Gympie North	6.28 pm
Maryborough West	7.28 pm
Bundaberg	8.19 pm
Miriam Vale ˆ	9.27 pm
Gladstone	10.07 pm
Mt Larcom ˆ	10.34 pm
Rockhampton *arrive*	11.31 pm
Rockhampton	11.41 pm
	Tue, Wed, Thu, Sat & Sun
St Lawrence ˆ	2.00am
Carmila ˆ	2.37am
Sarina ˆ	3.30am
Mackay *arrive*	4.04am
Mackay	4.24am
Proserpine *arrive*	5.52am
Proserpine	6.02am
Bowen ˆ	6.39am
Home Hill ˆ	7.48am
Ayr	8.02am
Giru ˆ	8.30am
Townsville *arrive*	9.08am
Townsville	9.23 am
Ingham ˆ	10.56am
Cardwell ˆ	11.52am
Tully ˆ *arrive*	12.49pm
Tully ˆ	12.59pm
Innisfail	1.48pm
Babinda ˆ	2.25pm
Gordonvale ˆ	3.21pm
Cairns *arrive*	4.05pm
Arriving	**Tue, Wed, Thu, Sat & Sun**

Cairns to Brisbane
Southbound

Departing	Mon, Wed, Thu, Fri, & Sun
Cairns	9.00 am
Gordonvale ˆ	9.26 am
Babinda ˆ	10.10 am
Innisfail	10.43 am
Tully ˆ *arrive*	11.40 am
Tully ˆ	11.50 am
Cardwell ˆ	12.42 pm
Ingham ˆ	1.31 pm
Townsville *arrive*	3.09 pm
Townsville	3.24 pm
Giru ˆ	4.01 pm
Ayr	4.27 pm
Home Hill ˆ	4.44 pm
Bowen ˆ	5.50 pm
Proserpine *arrive*	6.31 pm
Proserpine	6.41 pm
Mackay *arrive*	8.06 pm
Mackay	8.26 pm
Sarina ˆ	8.57 pm
Carmila ˆ	9.45 pm
St Lawrence ˆ	10.20 pm
	Tue, Thu, Fri, Sat, & Mon
Rockhampton *arrive*	1.00 am
Rockhampton	1.10 am
Mt Larcom ˆ	1.57 am
Gladstone	2.25 am
Miriam Vale ˆ	3.03 am
Bundaberg	4.03 am
Maryborough West	4.57 am
Gympie North	6.09 am
Cooroy ˆ	6.42 am
Nambour ˆ	7.05 am
Caboolture	8.17 am
Brisbane (Roma St) *arrive*	9.20 am
Arriving	**Tue, Thu, Fri, Sat & Mon**

Source: Queensland Rail.

Figure 71: Queensland Rail: Spirit of Queensland operating pattern (2017)



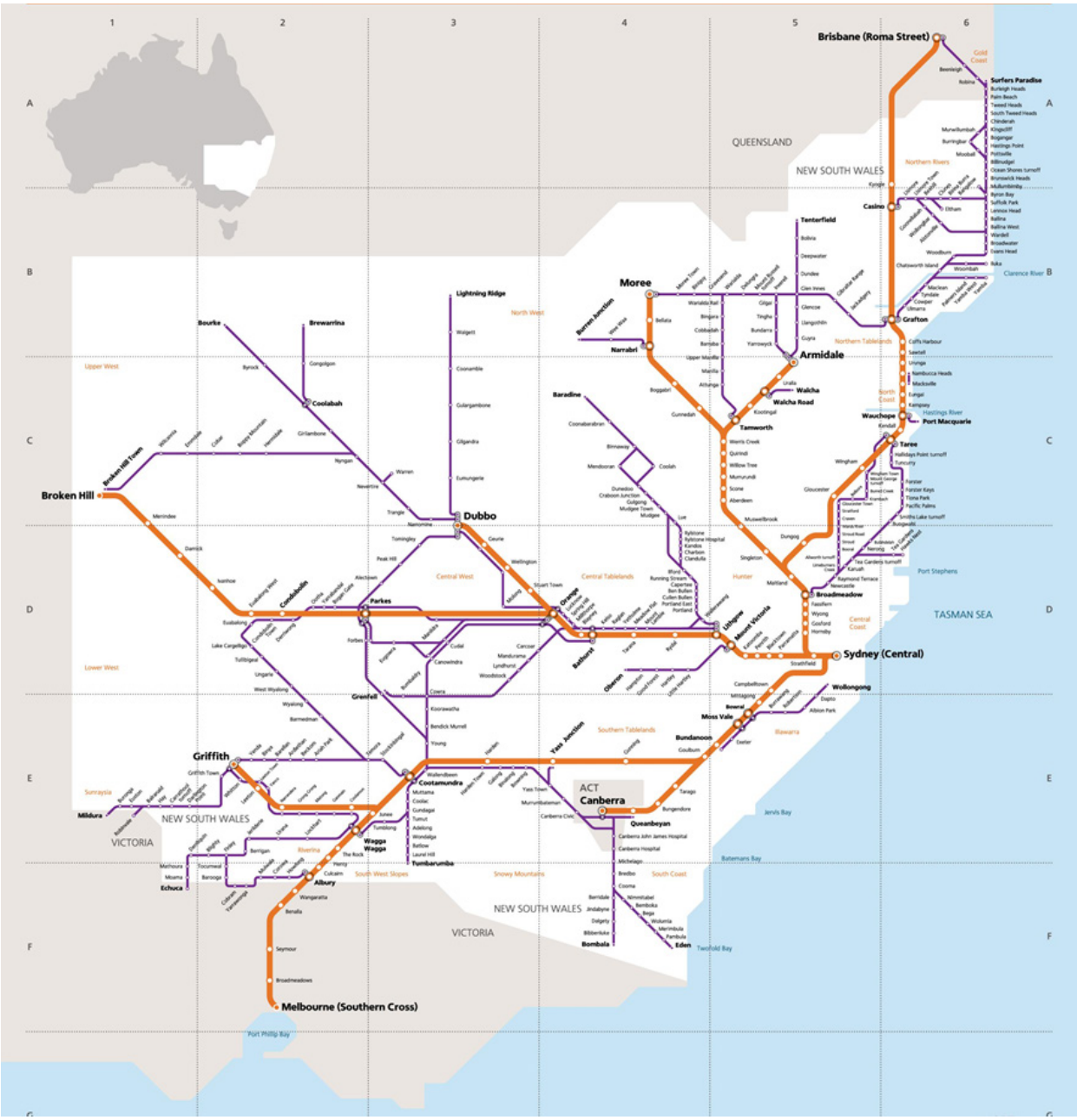
Source: Queensland Rail, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points.

We found a range of low short distance rail fares, such as A$15 (€10.50) to travel the 27 kilometres between Cairns and Gordonvale. We found rail fares from Cairns to Brisbane of A$389.25 (€272) in a Rail Bed and A$221.40 (€155) in a Premium Economy seat, booking four weeks ahead. Flights from Cairns to Brisbane taking just over 2 hours were available for as little as A$185 (€130), both four weeks ahead and one day ahead. It is possible that the Spirit of Queensland attracts few passengers between cities with frequent and cheap air connections, and that most passengers are travelling between other points, but we have seen no data on passenger origins and destinations.

New South Wales: subsidised

New South Wales (NSW) also has a network of rail and bus services, shown in Figure 72.

Figure 72: NSW TrainLink: network (2017)



Source: NSW TrainLink.
Note: broad (orange) lines are rail, narrow (purple) lines are coach.

There are night trains from Sydney to Melbourne (in Victoria) and Brisbane (in Queensland), but New South Wales has no internal night trains. Even day rail travel is highly-subsidised, with passenger revenue covering less than 20% of costs. Passenger surveys show that over 80% of "regional" (outside the capital, Sydney) passenger travel is for leisure purposes, with an average journey length of 360 kilometres. This is comparable with the distance between some of the larger towns served by the Spirit of Queensland.

Night trains between Sydney and either Melbourne or Brisbane have basic sleeping facilities: each sleeping compartment contains two beds and shares a shower and a WC with the adjacent compartment. For a trial booking from Sydney on 15 March 2017, three months ahead, we were offered fares to both Melbourne and Brisbane of A$91:18 (€64) for an Economy seat and A$128.30 (€90) for a First Class seat on day or night trains, and A$216.30 (€151) for a sleeper space on the night train. We found air fares from Sydney

that day for as low as A$53 (€37) to Melbourne airport, or A$41 (€29) to nearby Avalon airport, if booked further in advance.

One of the complexities of operating night trains between Sydney and both Melbourne and Brisbane is the need to negotiate suitable train paths with three different track operators: the Sydney to Melbourne operator deals with Sydney Trains (in the Sydney Metropolitan area), The Australian Rail Track Corporation (ARTC) (in New South Wales and Victoria regional areas) and VicTrack (in the Melbourne Metropolitan areas).

We understand that one of the constraints faced is limited track capacity on the largely single track network, including into Sydney Central station, due to the density of passenger and freight services within the Metropolitan area. NSW regional trains are not allowed to make AM or PM peak arrivals or departures at Sydney Central, as no paths are available in those periods. Capacity issues also heavily constrain arrival and departure times at Brisbane Roma Street and Melbourne Southern Cross. The northbound night train from Sydney to Brisbane reaches Roma Street at 03:53 and departs at 04:55 as a southbound day train from Brisbane to Sydney.

China

Introduction

China has the world's second-longest railway network (after the USA) and the world's longest high-speed network. Night trains are still relatively common, particularly between major cities in the east of the country, with demand peaks around the Chinese New Year and other festivities. They operate on all the major interurban conventional lines and on some high-speed lines. The Chinese high-speed and night train networks are both continuing to expand[92].

Operating patterns

Figure 73 shows the principal night train routes in China.

[92] UIC-Study Night trains 2.0, UIC and DB (2013).

Figure 73: China: principal night train routes (2012)

Source: UIC-Study Night trains 2.0, UIC and DB (2013).

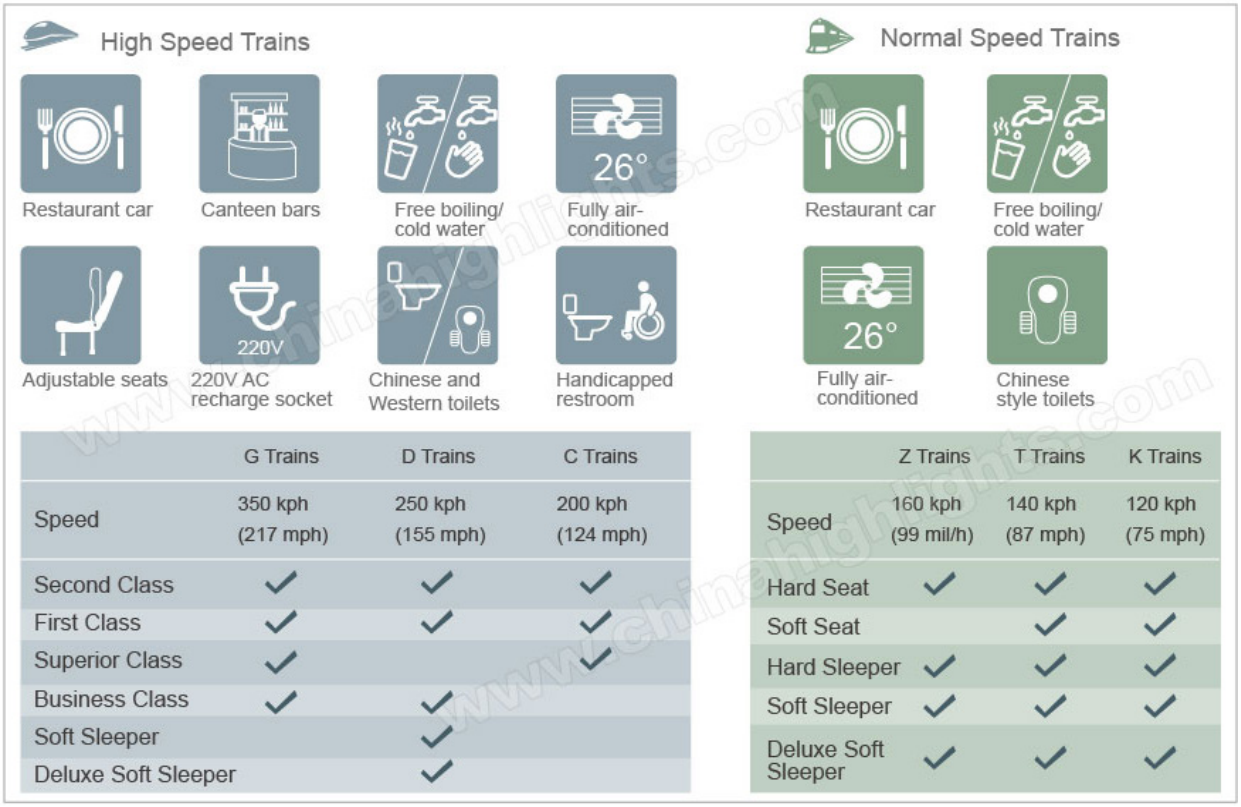
Accommodation and pricing

Four different types of conventional and high-speed night train, D, Z, T and K, operate in China, as illustrated in Figure 74 and summarised in Figure 75.

Figure 74: China: example of hard sleeper "dormitory" accommodation

Source: China Tibet Train Travel & Tours.

Figure 75: China: summary of night train accommodation



	G Trains	D Trains	C Trains
Speed	350 kph (217 mph)	250 kph (155 mph)	200 kph (124 mph)
Second Class	✓	✓	✓
First Class	✓	✓	✓
Superior Class	✓		✓
Business Class	✓	✓	
Soft Sleeper		✓	
Deluxe Soft Sleeper		✓	

	Z Trains	T Trains	K Trains
Speed	160 kph (99 mil/h)	140 kph (87 mph)	120 kph (75 mph)
Hard Seat	✓	✓	✓
Soft Seat		✓	✓
Hard Sleeper	✓	✓	✓
Soft Sleeper	✓	✓	✓
Deluxe Soft Sleeper	✓	✓	✓

Source: China Highlights.

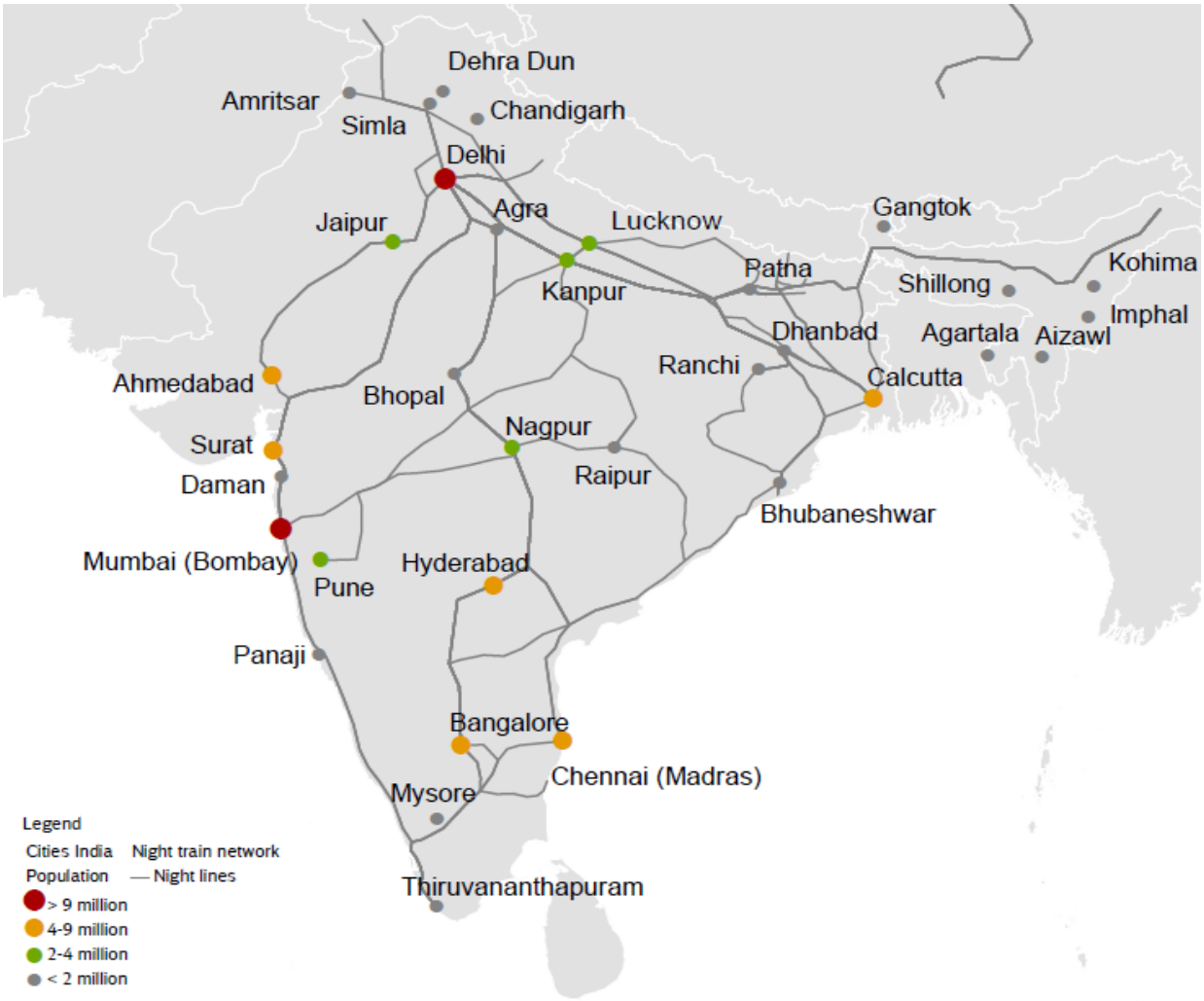
India

Introduction

The Indian rail system is both growing and becoming more congested. The Ministry of Railways reports that, since 1951, the network has grown by 23% but passenger numbers have grown by 540%, including suburban services. This has led to a decline in passenger satisfaction[93]. Long-distance day and night trains remain common for a number of reasons including the long distances between urban centres, a relatively slow rail network, socioeconomic structure, and the low pricing of rail travel relative to car and air. Passenger demand is described as including tourism, business and pilgrimage[94]. Indian Railways has promoted tourist initiatives such as package tours including cruise trains on popular tourist and pilgrimage circuits, often involving multi-day train journeys with overnight travel[95].

[93] Indian Railways Lifeline of the Nation, Government of India, Ministry of Railways, 2015.
[94] UIC-Study Night trains 2.0, UIC and DB (2013).
[95] These include steam-operated hill trains running on the Mountain Railways of India, a UNESCO World Heritage Site.

Figure 76: India: principal night train routes (2012)



Source: UIC-Study Night trains 2.0, UIC and DB (2013).

Night trains in India run regularly on the majority of the main railway routes. Overnight services are operated by several train types (mainly classified based on their speed).

Accommodation

A wide range of accommodation is available, from basic dormitory-style accommodation with unglazed windows to air-conditioned First Class accommodation, with a corresponding wide variation in the number of spaces per vehicle.

Future developments

The Economic Times, a newspaper, has reported that the Indian Ministry of Railways and the Indian Railways have planned investment of €118 billion, in some cases by Public Private Partnerships (PPPs) or in collaboration with foreign governments. The main developments relate to electrification, upgrades to existing lines and new high-speed lines, and improved quality on board and at stations.

Some expansion of night train services is also planned for 2017:

- Humsafar Express trains, which provide 3-berth air-conditioned sleeping cars, will increase in number from 6 to 22.

- Udaya Express, a new train, will be introduced, using fully air-conditioned double-decker stock to provide limited stop services, including on overnight routes.

Indian Railways' Vision 2020, published in December 2009, reports an intention to increase line speeds to reduce journey times on some very long-distance connections between major cities. This is expected to allow some services which currently last both a day and a night to become overnight services[96]. This contrasts with practice in Europe, where higher line speeds have generally resulted in night trains being withdrawn.

Japan

Introduction

Japan has historically had a wide network of night trains, enabling travellers to arrive in other cities by early morning, and this was considered to boost the economic development of the regions they connected[97]. However, services have declined recently, for a number of reasons.

First, the development of the Japanese high-speed Shinkansen network has reduced journey times, and generally offers both faster journeys and lower fares than night trains[98].

Second, coach and air competition, especially low-cost carriers, has eroded the night train market.

Third, affordable hotels have become more common and cheaper. Hotel chains are established across the whole country and have reduced the need for overnight travel.

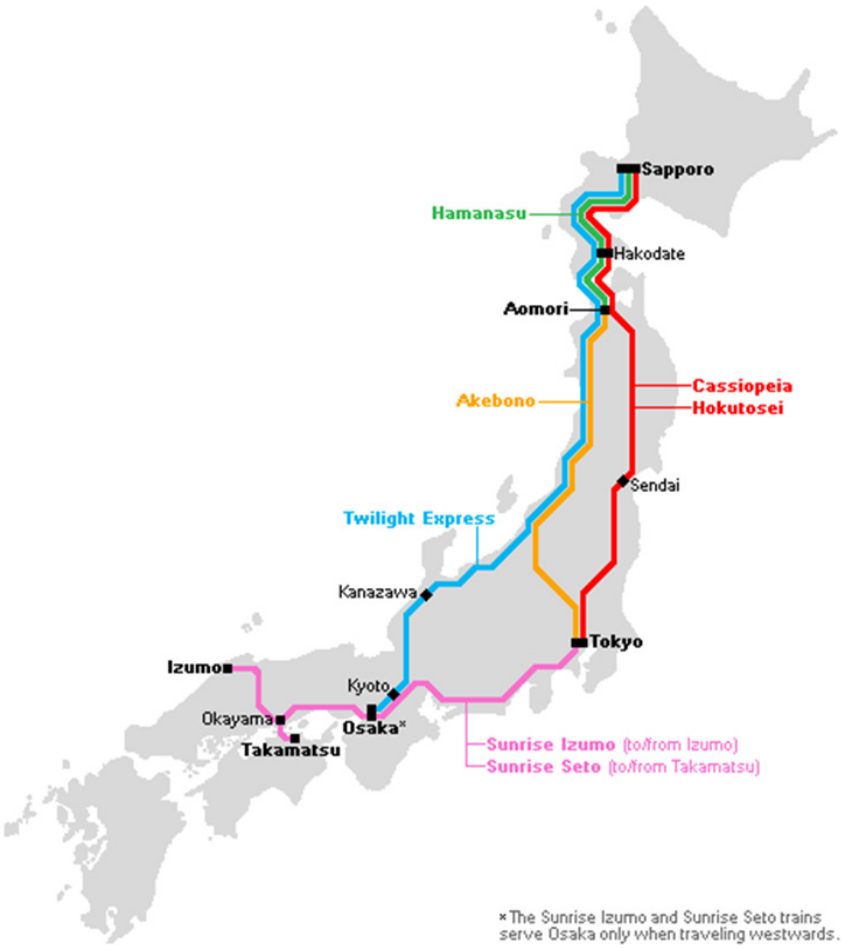
Fourth, the Japan Railway Company was transformed into a holding company, with regional railway operating companies[99]. One consequence is that each regional company offers services over shorter distances, reducing the scope for "internal" overnight services[100]. This appears similar to some of the practical difficulties associated with specifying, funding or operating cross-border rail services in Europe.

Operating patterns

By 2014, Japan's year-round night train network had declined to six routes shown in Figure 77. By 2016, all services to Sapporo, at the northern end of the network, had been withdrawn, as shown in Table 31.

[96] Indian Railways Vision 2020, Government of India, Ministry of Railways, December 2009.
[97] A Way for Activating Overnight Trains in Japan based on "Stakeholder Approach", Ryoji Otsuka, Shohoku College (2014).
[98] UIC-Study Night trains 2.0, UIC and DB (2013).
[99] The regional companies all operate using brand names beginning with JR. For example, Central Japan Railway Company is branded JR Central, or JRC, and its website is http://jr-central.co.jp/.
[100] A Way for Activating Overnight Trains in Japan based on "Stakeholder Approach", Ryoji Otsuka, Shohoku College (2014).

Figure 77: Japan: night train network (2014)



Source: Japan Guide.
Note: the "Akebono" operated only at limited times of year.

Table 31: Japan: overnight trains (2014 and 2016)

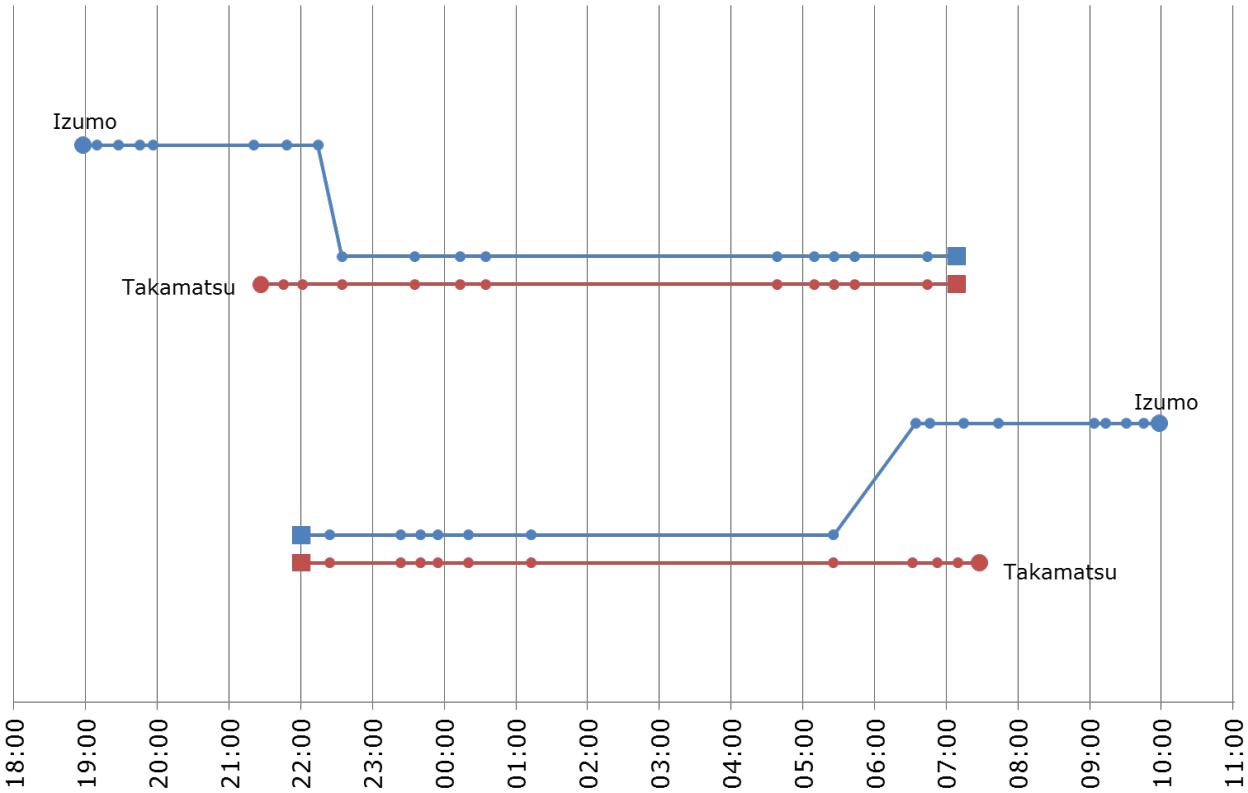
Operating company	Train	Route	Opened	Closed
JR East, JR Hokkaido	Hokutosei	Sapporo to Ueno (Tokyo)	1988	August 2015
	Cassiopeia	Sapporo to Ueno (Tokyo)	1999	March 2016
	Hamanasu	Sapporo to Aomori	1988	March 2016
JR East, JR Hokkaido, JR West	Twilight Express	Sapporo to Osaka	1989	March 2016
JR East, JR Central, JR West, JR Shikoku	Sunrise Izumo	Tokyo to Izumo-shi	1998	Still operating
	Sunrise Seto	Tokyo to Takamatsu		

Source: various, Steer Davies Gleave analysis.

As of 2016, the only remaining regular overnight line is the Sunrise service connecting Tokyo and Izumo ("Sunrise Izumo") in the Shimane Prefecture (950 kilometres) and Takamatsu ("Sunrise Seto") in the Kagawa Prefecture on the island of Shikoku (800 kilometres).

The service operates as a 14-car train from Tokyo to Okayama, where it splits into two 7-car portions to the final destinations. The overall operating pattern is shown in Figure 78.

Figure 78: Japan: night trains operating pattern (2016)



Source: Osaka Station, Steer Davies Gleave analysis.
Note: large round markers represent major destinations and small round markers represent other calling points. On each service, Tokyo is represented by a square marker.

Competition from coach services

Overnight coach operators have increased levels of services and introduced a strongly differentiated accommodation offer: one innovation is the introduction of private compartments, shown in Figure 79.

In the example shown, a luxury coach operated by Nisho-Nippon Railroad Co, in addition to reclining seats, has four compartments with a massage seat, 190 centimetres by 80 centimetres (comparable to long haul airline Business Class) reclining almost to a flat position. The compartment also provides a tablet computer, power socket and air purifier and adjustable lighting. This coach operates a service between Fukuoka and Tokyo, leaving at 19:00 and arriving at 09:00. The private compartments normally sell out faster than the reclining seats, despite a price premium of 25-30%.

Figure 79: Japan: private compartments on overnight coaches

Source: Japan Times.

Accommodation and pricing

The Sunrise Izumo and Sunrise Seto offer a range of accommodation including basic seating and single and twin compartments, all fitted within a double-decker vehicle. The basic Nobi Nobi seat, shown in Figure 80, provides distinctively Japanese accommodation with sufficient space and headroom for passengers to sleep or sit.

Figure 80: Japan: Nobi Nobi seat

Source: JPRail.com.

The Sunrise Izumo and Sunrise Seto may be useful for passengers in the highly congested Osaka-Tokyo corridor and to connect the capital to the areas west of Osaka. However, over the period since 2014, the focus of the provision of Japanese night trains has shifted to tourism, with a contraction of the scheduled nigh train network and expansion of multi-day excursion train services.

Future developments

From October 2013, Kyushu Railway Company (JR Kyushu) has been operating a deluxe sleeping car tourist excursion train, the "Seven Stars in Kyushu", from a base at Hakata station. This provides 2-4 day circular tours of Kyushu through seven prefectures. From 2017, the Seven Stars brand will extend to two further excursion trains:

- The "Twilight Express Mizukaze", on order by JR West, with a capacity for 30 passengers, will be used on excursions in the Keihanshin, Sanin, and Sanyo regions of western Japan.
- The E001 series branded "Train Suite Shiki-shima", a hybrid electric/diesel train on order by JR East, will be used for excursion in North-East of Japan.

KTZ (Kazakhstan)

Introduction

Kazakhstan has two major cities: Almaty, the dominant city, and Astana, the new political capital. Activity is split between the two, which are 970 kilometres apart. There are two night trains each way every day, and the faster has a journey time of around 12½ hours (European Rail Timetable). Arguably, Almaty and Astana, like Moscow and Saint Petersburg in Russia, represent the "ideal" national market for sleeper services: two major but complementary cities, at a distance suitable for connection by overnight trains. In comparison, in most other countries, with multiple cities separated by varying distances, it may be harder for sleeper services to remain relevant except in limited markets.

Future Developments

Tulpar-Talgo, a local joint venture of Spanish manufacturer Talgo, has produced a new fleet of 3,200 millimetre wide coaches as a development of an earlier 2,950 millimetre wide fleet supplied by Talgo to KTZ. The new coaches are in Tourist and Grand Class versions, with electric wheelchair lifts, showers and accessible toilets. They have been tested at 200 km/h and were introduced into services on 11 December 2016[101]. On 23 March 2017, Railway Gazette International (RGI) reported that international services to from Almaty to Tashkent, the capital of Uzbekistan, had been introduced the previous day. The twice-weekly services take 16 hours for the 964 kilometre journey, with five intermediate stops. Three classes of accommodation are provided:

- Tourist Class with four berths;
- Business Class with two beds and a washbasin; and
- Grand Class with two beds and a shower and WC en suite.

[101] On 28 February 2017, the International Railway Journal (IRJ) reported that more stock had been ordered.

ANNEX N: KEY EVIDENCE, ANALYSIS AND IMPLICATIONS

The structure of this research study

In this research study, we provide a brief history and state of play of the passenger night train sector in Europe, the challenges it faces, financial and environmental aspects of the sector, and whether night trains are a viable option in the long term.

The study is structured as follows:

- Chapter 1 describes the operation of night trains including the types of accommodation provided, their service patterns and reliability.
- Chapter 2 describes the decline in the provision of night train services and summarises the patterns of provision and regulation across Europe.
- Chapter 3 describes the demand for night trains and the evidence available on passenger numbers and passenger characteristics.
- Chapter 4 assesses the current viability of night trains, considering in turn their costs, revenues, income from subsidies, the impact of infrastructure charges, and their practical viability.
- Chapter 5 assesses the future challenges to night trains including competition from day trains, airlines and coaches and other factors.
- Chapter 6 assesses the scope for various actors to respond to these challenges, listing possible responses, identifying good practice, and assessing the implications for the long term and the consequences of withdrawal.
- Chapter 7 examines the case for subsidising night trains, considering their potential benefits for employment, modal shift, the environment, road congestion and noise, whether they are treated consistently and fairly compared to other modes, and the effectiveness of Public Service Obligations (PSOs) and competitive tendering.
- Chapter 8 presents our conclusions and a number of recommendations on monitoring the market and reviewing infrastructure charges, the regulation of different modes, and the mechanisms for providing subsidies.

The study addresses a number of research questions to perform three distinct functions: description, assessment, and recommendation. This report broadly follows this structure:

- Chapters 1 (operations), 2 (services) and 3 (demand) describe the current situation.
- Chapters 4 (viability), 5 (challenges) and 6 (scope to respond) assess the situation.
- Chapter 7 examines the case for subsidy and Chapter 8 presents conclusions and recommendations.

Approach

Only limited information is available on railway operations, usage and revenue specific to passenger night trains. Specifically:

- At the EU or European level, little or no aggregate information on sleeper services is available[102].

[102] For example, neither Eurostat nor ERADIS contains useful information for the purpose of the study.

- At the level of individual operators, information on the demand, costs and revenues of passenger night trains, either collectively or individually, may not be separately identified by management[103].

We carried out desk research on night trains in Europe and elsewhere, but concluded that the principal credible source of data required to answer the research questions was the operators and funders of passenger night trains, and in particular those who have carried out recent studies of their own networks.

Case studies

We have included cases studies from a good cross-section of EU Member States (large and small, north and south, east and west) and from non-EU countries.

In practice, we found that the most data, particularly financial data, was available in:

- Germany, where DB closed its remaining City Night Line services in December 2016;
- Austria, where ÖBB took over some of these services to expand its Nightjet network;
- Sweden, which has detailed studies of supported night trains north of Stockholm;
- The United Kingdom, where there is a specific PSC for night trains to and from Scotland;
- France, where we found information on the effective subsidy per passenger; and
- Canada, where VIA Rail provides detailed financial reports on its night trains.

In particular:

- In May 2016, Trafikverket in Sweden published its detailed study of its subsidised night trains.
- Also in May 2016, the Commission "TET d'Avenir" in France published data on the levels of subsidy to Intercités de Nuit.
- In August 2016, the National Rail Passenger Service and the Office of Rail and Road in the United Kingdom began to publish information on The Caledonian Sleeper.

Much of the quantitative data on night train costs, revenues and passengers in this report is therefore necessarily derived from these few sources, none of which would have been available if this study had taken place a year earlier.

Other case studies, where we could only identify information on timetables, accommodation and fares on night trains and competing modes, were necessarily less detailed.

Interviews

In addition to the case studies, we planned and carried out a number of interviews focusing, as set out above, on funders and operators of passenger night trains, and in particular those who have carried out recent studies of their own networks. In the event we found that, while interviewees were rarely able to provide us quantified operational or financial data, they provided a range of insights into funding, planning, marketing and operating night trains within an evolving competitive environment.

The full list of case studies and interviews carried out is shown in Table 32 overleaf.

[103] An exception is Trafikverket's detailed analysis of Sweden's remaining services, Nattågstrafik 2013-2021.

Table 32: Case studies and interviews

Contact	State and operator and/or interviewee(s)	Case study proposed	Interview proposed	Other data available	Annex
Europe	Germany: DB City Night Line	●	●	●●●	B
	Austria: ÖBB Nightjet, SCHIG	●	● ●	●●●	C
	Sweden: Trafikverket, SJ Nattåg	●	●	●●●	D
	United Kingdom: Transport Scotland, The Caledonian Sleeper	●	● ●	●●●	E
	Italy: Trenitalia Intercity Notte	●	●	●●●	F
	Spain: Renfe Trenhotel	●	×	●●	G
	France: SNCF Intercités de Nuit	●	×	●●	H
	Greece: TrainOSE	●	×	●	I
	Poland: PKP Intercity	●	×	●	J
	Russia: RZD	●		●	K
	Romania: CFR Călători			●	L
Other services	Canada: VIA Rail			●●●	M
	USA: Amtrak	●	●	●●	
	Australia: Great Southern Rail, Queensland Rail, NSW TrainLink	●	●	●●	
	China: China Railway Corporation	●		●●	
	India: Indian Railways	●		●●	
	Japan: Sunrise Express	●		●●	
	Kazakhstan: KTZ			●	
Other bodies	European Commission		●		
	CER		●		

Source: summary of content of this report.
Note: × implies an interview was proposed and sought but not achieved.

Exchange rates

For simplicity and consistency, throughout this report we assumed the indicative exchange rates shown in Table 33.

Table 33: Exchange rates assumed in this study

State	Sweden	Australia	Canada	United Kingdom
Currency	Kronor (SEK)	Dollar (AUD)	Dollar (CAD)	Pound (GBP)
Exchange rate	SEK 1 = €0.10	$1 = €0.70	$1=€0.70	£1 = €1.25

Source: European Central Bank, rounded by Steer Davies Gleave.

Definitions

For the purposes of this research study, we defined a passenger night train as "*A passenger night train is any train consisting partly or wholly of rolling stock dedicated to, or reconfigured for, overnight travel*".

Our approach focused on timetable analysis, desk research and case studies on night trains in Europe and elsewhere, and interviews with night train operators and their funders (listed in Table 32).

The operation of night trains

We devised a working categorisation of the hours of operation of night trains (summarised in Table 1 in Section 1.1). An "idealised" night train might run non-stop from after 22:00 to before 08:00 and allow passengers to sleep for 8 hours or more, but this is rare, as shown in the analyses of operating patterns in the case studies. Many night trains run for up to 16 hours in the time between the end of one working day and the beginning of the next. Some continue for several days, alternating between "night" and "day" modes. Many passengers on these night trains therefore travel only by day.

Night trains usually include several types of accommodation such as "day" seating, reclining seats, couchettes, and sleeping compartments without or with en-suite facilities. Provision for Persons with Reduced Mobility (PRM) is common (illustrated, with examples from outside Europe, in Table 2 in Section 1.2). As on long-haul aircraft, better accommodation requires progressively more space per passenger (illustrated, for Germany's DB City Night Line stock, in Figure 1 and Figure 2 in Section 1.2).

Night trains are normally slower than the equivalent day trains (illustrated in Figure 3 in Sectio 1.5), either to provide sufficient time for sleep, to allow for splitting and joining to serve multiple destinations, or to fit around freight trains or network congestion. Access to infrastructure can be difficult at city centre stations, particularly in the morning peak period. Some night trains have been withdrawn due to lack of infrastructure capacity, but stakeholders generally reported that they are reliable and punctual. Longer journey times, and trains which only run on some days, mean less productive rolling stock and staff.

The provision of night train services

Time-series data on measures such as train-kilometres or passenger-kilometres are not available specifically for night trains, but we found examples of service withdrawals completed since 1980 and service withdrawals planned for 2017 (please see Table 4 in Sectio 2.1). Domestic night trains now operate in only 11 EU Member States, whether as part of a national Public Service Obligation (PSO), a PSO specific to night trains, or

commercially. International night trains currently serve or pass through 18 Member States, three of which are only connected by night trains to Russia (please see Table 5 in Section 2.2).

Night trains which are operated on a clearly-commercial basis appear to be restricted to:

- a corridor including SJ's Stockholm to Malmo service in Sweden; and
- the large area of central Europe covered by Austria's ÖBB Nightjet network radiating from Vienna to Germany, Poland, the Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Italy and Switzerland (please see Figure 5 in Section 2.4).

Flights between Vienna and many of the cities served by these night trains are infrequent or inconvenient (please see Figure 19 and Figure 20 in Annex C on ÖBB Nightjet in Austria) and, in Austria, domestic competition from coach operators is tightly regulated. This may improve the commercial viability of night trains in Austria.

The current viability of night trains

Night trains have higher costs per passenger space than day trains:

- rolling stock is more complex, built in smaller volumes and carries fewer passengers per vehicle;
- staff are typically required to work overnight and away from home; and
- additional services such as shunting, bed-making and laundry are needed (please see Table 8 in Section 4.1).

Night trains are large, with 200 passenger spaces or more (please see case study in Annex B on DB City Night Line in Germany), compared with competing small aircraft or coaches, which can be used to offer many more services with the same total capacity.

Even where financial information for night trains is available, their viability may be difficult to assess and may require management judgement (please see Table 9 in Section 4.4). If night trains are withdrawn, some of their ticket revenue may be retained, because passengers would change to day trains, and some of their costs may still be incurred, because some parts of the service might have to be provided under a PSO. The underlying infrastructure cost may be no more than €2 per train-kilometre (please see Table 11 in Section 4.5), but many infrastructure managers apply "mark-ups" which can form a significant part of operating costs (for the legislative basis for mark-ups, please see Table 10 in Section 4.5). Apparent costs also depend on the accounting treatment of rolling stock: services which appear viable with fully-depreciated rolling stock may not be affordable with new stock built to current standards.

Where subsidies specific to night trains can be identified, the apparent subsidy per passenger ranges from €20 in Sweden to €100 per passenger for trains recently withdrawn in France (please see Figure 8 in Section 4.3).

The future challenges to night trains

The use of night trains for business travel appears to be in decline, although the best accommodation with the highest fares on some trains appears to be sold out first. The use of night trains is dominated by leisure travel, a growing proportion of which may be by passengers visiting friends and relatives, for whom the night train may offer no savings in hotel costs. Changing social norms, and rising expectations, mean that passengers are less willing to sleep with strangers, or without direct access to a toilet or an opportunity to shower or bath. Night trains also face growing competition from other modes.

European high-speed lines have been built to provide faster and more frequent day trains, which may take demand away from night trains. However, they have rarely been used to allow night trains to connect more remote points, as has occurred in China and India. We examined a proposal for a "Very Long Distance Night Train" (VLDNT) operating up to 2,000 kilometres on high-speed lines, but it is not clear who in Europe would be willing to fund a fleet of as few as two high-speed night trains to enter an untested market. Analysis of Eurostat data shows that half of all rail travel between Member States is via the Channel Tunnel between France and the United Kingdom, the Oresund bridge between Denmark and Sweden, or the Perpignan-Figueres link between France and Spain, all of which have opened since 1990 and none of which are used by night trains.

Airline liberalisation has led to the growth of low-cost airlines within Europe. They may not focus on dense business markets, but have led to a fall in real fares, and extensive yield management, and provide many more connections than can be offered by night trains. They not only compete with night trains but also connect points that night trains do not.

International coach services were liberalised in 2011, and since 2013 three large Member States (Germany, Italy and France) have liberalised their domestic services (please see Table 14 in Section 5.1). Many coach operators provide overnight services (please see Table 15 in Section 5.1), and most night train services in Germany and France have since been withdrawn (please see Figure 14 in Annex B on DB City Night Line in Germany, Table 27 and Figure 53 in Annex H on Intercités de Nuit in France). Overnight coach fares often undercut even the cheapest seats on night trains.

Many night train networks may now be too small for there to be market awareness of them ("visibility") except to regular and local passengers. Several operate with fewer than 100 vehicles of several types and increasing age. The EU-wide average annual requirement for new stock may be only two trains, varying between four track gauges and many vehicle types. Manufacturers may charge high prices for such small orders of replacement vehicles.

The sector's scope to respond

The EU plays only a limited role in relation to night trains: setting the overall regulatory framework, including for rail infrastructure charges, and investing in infrastructure.

The Member States could require infrastructure managers to reduce infrastructure charges, or could subsidise night trains in recognition of their benefits, as occurs in (at least) Austria, Sweden, the United Kingdom and France. However, parliamentary debates in 1983 (in the United Kingdom) and 2016 (in Germany) rejected the idea that any long-distance services should be subsidised.

The operators of night train services generally appear to manage them well. Cross-border operation, and changes of locomotives and crew, are long-established. The past practice of allocating blocks of tickets to each railway for sale through stations is declining. Best practice appears to be:

- to offer a range of accommodation and the opportunity to pay more for exclusive use of a compartment;
- to use yield management to maximise revenue from the capacity available; and
- to sell through a single (multilingual) website.

However, some operators appear to offer only a small range of accommodation at fixed low fares, probably to meet an inflexible national PSO.

The Trans-European Transport Network (TEN-T) core network corridors may be of some help to night trains, where they provide additional capacity, but major new international

links appear not to have attracted night train services, and high-speed lines appear to have contributed to their decline.

Private sector companies act as subcontractors to night train operators, operates some luxury night train services, and provide a range of information, reservation and travel websites. However, unlike the airline industry the night train sector has not developed either a standardised set of product or a standard tool for describing and selling them. It may be increasingly difficult to persuade the private sector to sell or to market a declining range of night train services.

We conclude that night trains may continue to decline as rolling stock needs replacing, new high-speed rail infrastructure improves the competitiveness of day trains, and if more coach services are liberalised. The replacement of night train services by coaches may mean passenger inconvenience and staff redeployment, but the overall effect on employment is unclear.

The case for subsidising night trains

There is no clear case that night trains are less environmentally damaging that other rail or road transport. Evidence from a range of sources is summarised in Table 17 in Section 7.3. Night trains appear to have higher direct CO_2 emissions per passenger-kilometre than coaches and day trains. Even if all trains were powered wholly by renewable energy, night train rolling stock would still have more embedded CO_2 per passenger space than day train rolling stock.

There is no clear evidence of unfair competition between modes, given the difficulty of defining whether any individual passenger has been subsidised.

There is no clear evidence of unfair competition, given the difficulty, with the wide range of different fares charged, and operating costs which are largely fixed in the short term, of defining whether any individual passenger has been subsidised.

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