Collectif « Oui au train de nuit »
ouiautraindenuit.wordpress.com
ouitdn-contact @ framalistes.org

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One every 2 air passengers will benefit from night trains, if Europe invests

Half of Europe's air passengers fly on routes of 500-3000 km already interconnected by rail. If Europe invests, travellers will be able to choose the night train. And to cross Europe over 3000 km, the "train-of-2-nights" is an innovation to be reinvented. It is within reach: several countries already have direct trains running for 36 hours or more.

Summary: Night trains already have the potential to carry 100 million passengers per year on more than 350 night train lines. What is missing is a new generation of equipment: 700 night trains (10,000 carriages) need to be built. At the time of the European Year of Rail 2021 and the Green Deal, it is up to Europe to co-finance, with the Member States, the construction of this rolling stock and the regeneration of the tracks.

The rebirth of the night train

You may have heard about it recently: night trains are starting to make a comeback in Europe! You can once again travel from **Paris to Nice**, from **Stockholm to Berlin** or from **Bratislava to Split** in the comfort of your couchette... Demand for night trains is rising sharply in several European countries, with (before the health crisis) an increase in ridership of +10% in one year in Austria, +25% in Switzerland, and even +37% in Sweden. And by the end of 2022 new lines will be inaugurated: **Paris-Tarbes, Paris-Vienna, Zurich-Amsterdam, Ostend-Prague**...

The virtual disappearance of night trains was concomitant with the lack of rolling stock and its ageing. New equipment is therefore needed to revive the service and several countries have placed orders or are preparing to do so. Making the right choices raises the question of fleet sizing: **how much rolling stock will be needed to meet the demand for night train travel?** At a time when traffic has fallen to its lowest level at the end of the 2010s, it is necessary to assess the potential for growth in supply.

The French government's report about night trains has modelled a potential traffic of 5.6 million passengers per year in 2030 on 25 routes from France. This corresponds to a fleet of 600 new and 122 refurbished night coaches. The report indicates that more lines may be needed in the future. The modelling of the group “Oui au train de nuit” ("Yes to Night Trains") covers 30 lines with an estimated potential of 10 million passengers per year. An extrapolation on the basis of these models and existing fleets on other continents makes it possible to estimate an initial range of needs for the European Union between 5,000 and 20,000 coaches.

During the day, journeys of 800 to 1500 km require half a day or even a whole day by train. Today, most travellers therefore choose the plane (faster), the car or the night bus rather than the day train. The night train makes it possible **to travel 1,000 kilometres comfortably, without wasting a day, and allows travellers to reduce their carbon footprint**.

Part 1) Half of all air travel is achievable by night train

How much of Europe's air traffic could potentially be "shifted" to night trains? To answer this question, we looked at which of the 1.1 billion air passengers in Europe in 2019 flew on routes that are **feasible by train**, with a distance of **between 500 and 1500 kilometres**, which can therefore be covered in one night's travel. We consider that in the light of the European discussions on the Year of Rail 2021 and the Green Deal, the rail network – currently in a state of disrepair in many countries – can be regenerated during the 2020s to improve the reliability of the network and return it to a good standard in terms of journey times.

1.1 Of the top 30 air routes in Europe, 24 could be offered as night and day trains

To give an initial idea, the table below shows the 30 routes with the highest air traffic in 2019:

- **20 routes are possible by train with a journey of less than 1500 kilometres.** Of these 20 routes, only 2 are served by train in less than 3 hours, and the other **18 are suitable for night trains**, including 6 routes that already exist. Note that the Olso-Bergen and Oslo-Trondheim routes, although slightly less than 500 kilometres, are currently served by night trains.

- The Amsterdam-London route represents an intermediate situation, with a journey time of 3h52, but with only one direct train per day at present. There is a need for a significant increase in daytime train services. Given the high volume of air traffic, there is also a potential for night trains to complement the offer to arrive early at the destination or leave late in the evening. In addition, night trains could extend the line and also serve more distant destinations. Note that the Amsterdam-London link was part of the "Nightstar" project for night trains through the Channel Tunnel, which was abandoned in the 1990s.

- **4 other connections** are possible by train but are slightly longer than 1500 kilometres, and could therefore be served by long-distance trains over more than one night, or by night train + day train.

- 6 connections are inaccessible by land (in blue in the table). Some are already accessible by sea, by ferry. Combined train+ferry tickets should be studied for a number of routes. To go further, night ferries could be deployed, as they already exist for Sicily, or until recently on the Berlin-Malmö route. However, the present study focuses only on night trains by land, so links including a ferry are not included in the modal shift estimates.

Air route	Air passengers	Distance (by road)	Alternative by train ?
DUBLIN – LONDON	5 107 456	560 km including 120 km (3 hours) of ferry	NT + ferry to be studied
AMSTERDAM – LONDON	4 923 818	540 km	**NT and day trains needed**
LONDON – NEW YORK	3 892 047	–	Not accessible by rail
DUBAI – LONDON	3 630 407	6550 km	Not accessible by rail
BARCELONA – LONDON	3 410 771	1490 km	**NT needed**
EDINBURGH – LONDON	3 373 328	600 km	**NT already running**
PARIS – TOULOUSE	3 217 535	680 km	**NT already running**
NICE – PARIS	3 180 948	930 km	**NT already running**
LONDON – MADRID	3 145 546	1720 km	**2NT needed**
BARCELONA – MADRID	2 572 893	620 km	2h30 by direct train
GENEVA – LONDON	2 538 754	920 km	**NT needed**
BARCELONA – PARIS	2 510 172	1040 km	**NT needed**
LONDON – MILANO	2 503 983	1190 km	**NT needed**
MADRID – PARIS	2 470 682	1270 km	**NT needed**
LONDON – ROMA	2 389 653	1770 km	**2NT needed**
BELFAST – LONDON	2 373 766	750 km including 90 km (3 hours) of ferry	NT + ferry to be studied
GLASGOW – LONDON	2 307 866	640 km	**TdN already running**
LONDON – MALAGA	2 274 622	2240 km	**2NT needed**
BERLIN – FRANKFURT	2 248 247	540 km	**NT needed**
KOBENHAVN – LONDON	2 239 226	1380 km	**NT needed**
LISBOA – LONDON	2 198 806	2110 km	**2NT needed**
LONDON – PARIS	2 177 128	460 km	2h16 by direct train
BARCELONA – MAJORQUE	2 173 939	250 km	8h by ferry
OSLO – TRONDHEIM	2 103 929	490 km	**NT already running**
FRANKFURT – LONDON	2 068 250	770 km	**NT needed**
MILANO – PARIS	2 036 922	850 km	**NT needed**
PARIS – ROMA	2 035 274	1420 km	**NT needed**
BERGEN – OSLO	2 003 496	460 km	**NT already running**
BERLIN – LONDON	2 000 027	1100 km	**NT needed**
MADRID – MAJORQUE	1 995 104	720 km	13h by train+ferry

The 30 busiest air routes in Europe. "2NT needed" means that the route would be relevant for a "two-night train", with a journey taking longer than one night. For London-Madrid and London-Rome, one night and half a day would be sufficient, while a journey of around 24 hours would be needed for London-Malaga and London-Lisbon. Trains that run for two nights and a day already exist on the Paris-Moscow and Nice-Moscow lines, and in several countries in the European Union.

1.2 Methodology for the analysis of intra-European air traffic

The overview presented above for the first 30 air routes was continued for the other connections in Europe. Our study concerns **air passengers in 2019** (i.e., before the pandemic) to and from the **28 EU Member States** in 2019 (thus including the UK), as well as **Switzerland** and **Norway**. This includes flights from these countries to the other countries on the European continent (Turkey, Moldova, Ukraine, Belarus, Russia and the Balkans). The figures are taken from the Eurostat database.[1] Airports that serve the same city have been grouped together (e.g., Orly and Roissy, or different airports of London).

All **2618 air routes** with annual traffic of more than 100,000 passengers per year in the Eurostat database **were examined one by one**. These routes represent 85% of total air traffic. The figures for the remaining 15% were then extrapolated.

A preliminary screening was carried out to retain only those **routes where a rail service is possible, without building new infrastructure**. This excludes intercontinental flights and flights to islands, except those accessible by train such as Great Britain (via the tunnel) or Sicily (via the night ferry).

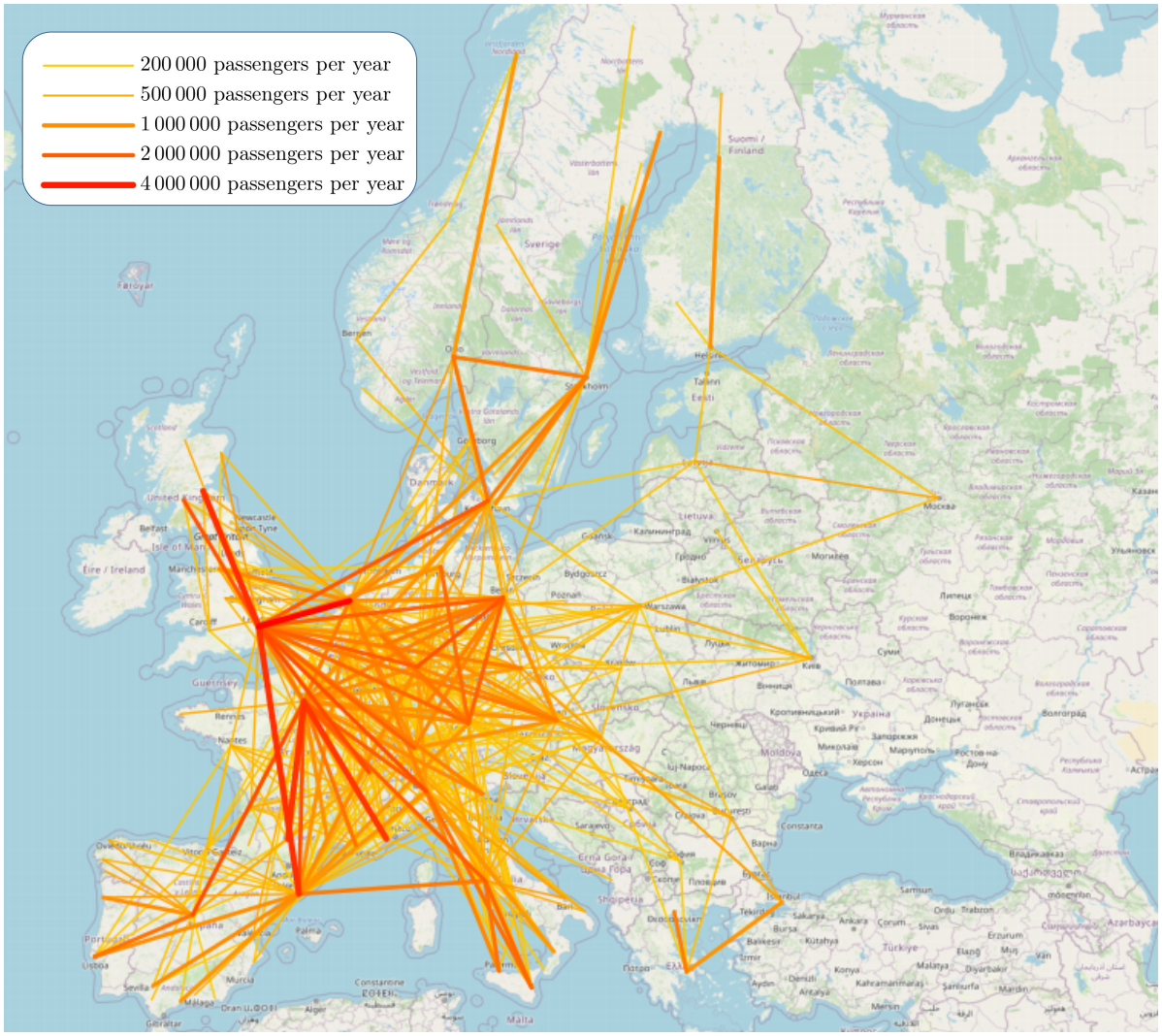
We then measured the **road distance** on each route, as rail distances are generally not known. The road distance was chosen because it is generally of the same order of magnitude. We then selected the routes for which the distance is **between 500 and 1500 km**, which corresponds to the relevance range of the night train (the French government's "TET" report indicates a relevance range "between 600 and 1500 km"). The minimum distance actually depends on the situation in each country. For example, there are night trains from Bucharest to Iasi (390 km), Sofia to Varna (440 km), London to Penzance (460 km), Oslo to Bergen (460 km), Oslo to Trondheim (490 km), Munich to Venice (520 km), and Paris to Rodez (660 km). Some routes of less than 500 km may therefore be relevant for night trains, but we have not included them in this study, which focuses on routes of more than 500 km.

We have also **excluded routes where there is a rail service in less than 3 hours** (which represents only a handful of routes, as we only consider routes over 500 kilometres). This does not mean that every route that takes more than 3 hours justifies a night train on its own, but these routes can for example be served by night trains that travel longer distances (e.g., Paris-Marseille, 3h02 journey time, is served by the Paris-Nice night train. Rome-Verona, 3h18 journey time, is served by the Rome-Bolzano night train. Frankfurt-Munich, 3h22, is served by the night train Amsterdam-Innsbruck). This complements the daytime offer with an overnight connection.

We have identified separately the air routes with a distance of **between 1500 and 3000** kilometres. These routes could be served by "two-night trains", which run for longer than one night, like the existing Paris-Moscow route. Section 1.5 is dedicated to these transcontinental trains.

1 The databases used can be found on https://ec.europa.eu/eurostat/web/main/data/database under the tab "Databases by subject", "Transport", "Air transport", "Air transport measures - passengers", "Details of air passenger transport by reporting countries and by route".

1.3 A rail alternative for 332 million air passengers flying on routes of 500 to 1500 km



Air traffic on the 500 to 1500km routes already interconnected by the rail network.
Only routes with more than 100,000 passengers per year are represented.
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Analysis of air traffic data shows that **332 million passengers** fly each year on journeys that would be feasible by train, with a journey length between 500 and 1500 kilometres and a current train journey time of more than 3 hours (and in reality often more than 6 hours). This represents **30% of the total number of air passengers departing from Europe**.

In fact, some of these air links correspond to existing night train lines (Edinburgh-London, Paris-Toulouse, Paris-Nice, Glasgow-London, Rome-Catania...) or lines which existed until recently (Paris-Barcelona, Paris-Madrid, Berlin-Frankfurt, Paris-Milan, Paris-Rome, Berlin-Munich, Hamburg-Munich...). It should be noted that existing night trains do not generally capture the full potential of the line: some current night trains offer limited capacity, with outdated equipment, often with insufficient marketing. There is therefore still considerable room for improvement even on lines already in service. On high-traffic lines, several trains could run each night (on Paris-Nice or Paris-Briançon, there have already been 5 trains per night during the peak period. Between Moscow and St Petersburg 10 trains run each night in each direction). On many routes, the night train is one of the few comfortable land-based alternatives that air travellers can switch to.

Air traffic on the 150 busiest routes with a rail alternative on a distance between 500 and 1500 km					
AMSTERDAM - LONDON	4 923 818	FRANKFURT - PARIS	1 041 167	BARI - MILANO	702 471
BARCELONA - LONDON	3 410 771	BARCELONA - FRANKFURT	1 034 776	HAMBURG - ZURICH	692 495
EDINBURGH - LONDON	3 373 328	MALMO - STOCKHOLM	1 022 957	BARCELONA - PORTO	692 323
PARIS - TOULOUSE	3 217 535	KOELN - MUENCHEN	1 016 952	FRANKFURT - ROMA	691 636
NICE - PARIS	3 180 948	MUENCHEN - PARIS	1 013 929	MADRID - VIGO	683 930
GENEVA - LONDON	2 538 754	DUESSELDORF - LONDON	1 007 994	MANCHESTER - PARIS	682 549
BARCELONA - PARIS	2 510 172	BARCELONA - LISBOA	1 007 823	A CORUNA - MADRID	680 075
LONDON - MILANO	2 503 983	AMSTERDAM - BERLIN	1 002 350	AMSTERDAM - EDINBURGH	679 751
MADRID - PARIS	2 470 682	MONTPELLIER - PARIS	989 364	FRANKFURT - KOBENHAVN	661 749
GLASGOW - LONDON	2 307 866	HAMBURG - LONDON	977 171	BARCELONA - ZURICH	657 412
BERLIN - FRANKFURT	2 248 247	AMSTERDAM - ZURICH	976 165	BALE-MULHOUSE - LONDON	656 006
KOBENHAVN - LONDON	2 239 226	MADRID - PORTO	969 917	BRUSSELS - MILANO	652 781
FRANKFURT - LONDON	2 068 250	AMSTERDAM - MUENCHEN	969 621	MOSCOW - RIGA	649 121
MILANO - PARIS	2 036 922	BERLIN - WIEN	964 575	BARCELONA - GENEVA	640 716
PARIS - ROMA	2 035 274	HELSINKI - OULU	956 481	BUCURESTI - WIEN	633 015
BERLIN - LONDON	2 000 027	BARCELONA - BRUSSELS	951 835	BIARRITZ - PARIS	630 784
LONDON - ZURICH	1 945 975	AMSTERDAM - WIEN	944 690	BERLIN - KOBENHAVN	626 242
BERLIN - MUENCHEN	1 934 021	PARIS - WIEN	943 528	LONDON - LYON	624 812
LONDON - MUENCHEN	1 834 133	WIEN - ZURICH	938 500	BARCELONA - BILBAO	622 601
CATANIA - ROMA	1 825 676	MILANO - NAPOLI	902 147	LONDON - MARSEILLE	613 595
HAMBURG - MUENCHEN	1 739 978	BARCELONA - MILANO	891 104	BRUSSELS - GENEVA	612 944
CATANIA - MILANO	1 661 246	ATHINAI - ISTANBUL	889 945	KYIV - WARSZAWA	606 363
PALERMO - ROMA	1 581 045	BARCELONA - MUENCHEN	889 024	FIRENZE - PARIS	583 332
MARSEILLE - PARIS	1 560 640	KOBENHAVN - PARIS	884 148	BORDEAUX - LYON	582 093
LISBOA - MADRID	1 558 355	AMSTERDAM - FRANKFURT	881 214	GENEVA - MADRID	580 777
DUESSELDORF - MUENCHEN	1 488 195	AMSTERDAM - STOCKHOLM	863 546	PARIS - VALENCIA	574 373
LONDON - NICE	1 481 143	STOCKHOLM - UMEA	860 528	KOELN - LONDON	569 340
KOBENHAVN - OSLO	1 474 740	BARCELONA - MALAGA	848 964	BREST - PARIS	561 265
BERLIN - KOELN	1 434 664	BODO - OSLO	837 428	LYON - NANTES	561 007
BARCELONA - ROMA	1 398 834	LAMEZIA TERME - MILANO	834 100	ROMA - WIEN	557 218
OSLO - STOCKHOLM	1 393 908	PARIS - PRAHA	814 522	STUTTGART - WIEN	555 010
KOBENHAVN - STOCKHOLM	1 388 834	FRANKFURT - MILANO	813 777	BUCURESTI - ISTANBUL	551 436
AMSTERDAM - PARIS	1 385 444	ABERDEEN - LONDON	796 772	BERGAMO - LONDON	548 885
LONDON - WIEN	1 353 676	BOLOGNA - LONDON	795 193	INVERNESS - LONDON	544 829
LONDON - PRAHA	1 333 907	DUESSELDORF - WIEN	769 975	HELSINKI - ROVANIEMI	543 618
ATHINAI - THESSALONIKI	1 332 856	ISTANBUL - PRAHA	764 696	HANNOVER - MUENCHEN	541 035
BERLIN - PARIS	1 286 962	BARI - ROMA	762 765	FRANKFURT - OSLO	538 745
LONDON - VENEZIA	1 257 056	AMSTERDAM - PRAHA	758 629	LONDON - LUXEMBOURG	526 913

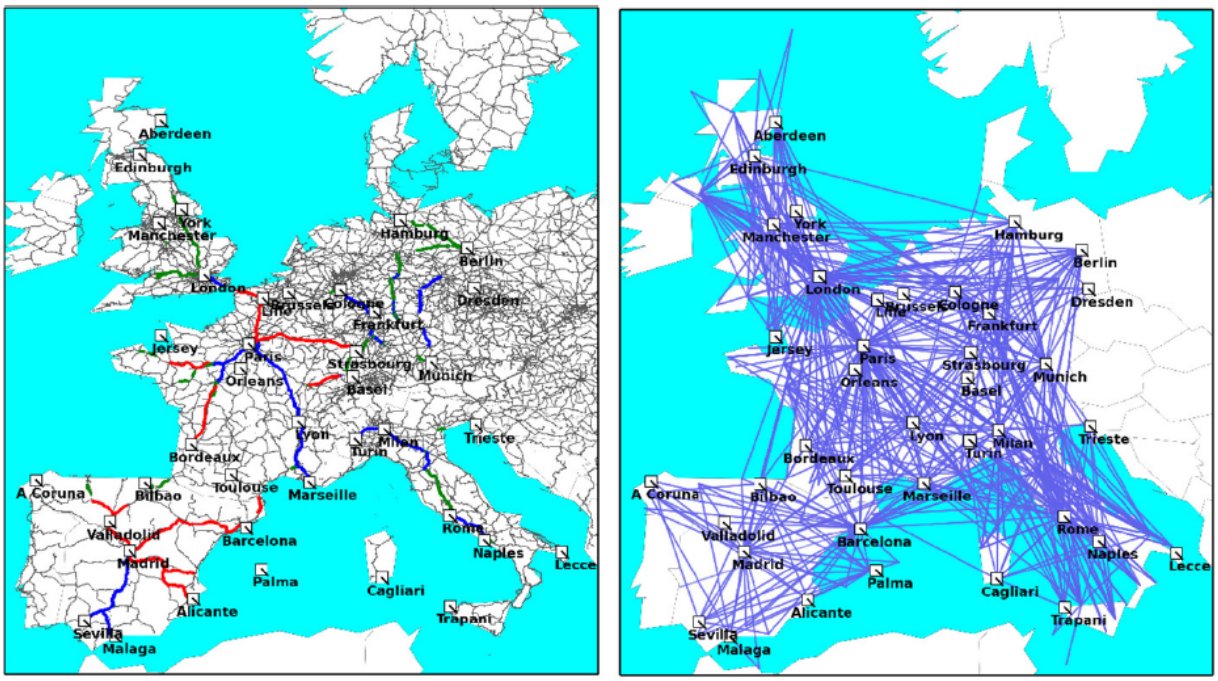
BERLIN - STUTTGART	1 234 419	DUESSELDORF - ZURICH	747 730	BRINDISI - ROMA	526 021
BERLIN - DUESSELDORF	1 233 084	HAMBURG - STUTTGART	736 825	FRANKFURT - PRAHA	525 429
AMSTERDAM - MILANO	1 208 310	BUDAPEST - FRANKFURT	723 792	FRANKFURT - WARSZAWA	521 464
BERLIN - ZURICH	1 164 242	PARIS - ZURICH	723 548	BERLIN - STOCKHOLM	515 087
MILANO - PALERMO	1 146 985	AMSTERDAM - OSLO	722 552	BARCELONA - VENEZIA	513 730
AMSTERDAM - KOBENHAVN	1 110 142	BRUSSELS - ROMA	719 974	KOBENHAVN - ZURICH	513 249
FRANKFURT - WIEN	1 108 109	MADRID - SANTIAGO	719 748	KOBENHAVN - MUENCHEN	512 372
PARIS - VENEZIA	1 092 903	HAMBURG - WIEN	718 406	AMSTERDAM - WARSZAWA	512 117
AMSTERDAM - MANCHESTER	1 067 379	MUENCHEN - ROMA	717 139	BERLIN - BRUSSELS	511 879
GENEVA - PARIS	1 059 146	LONDON - TOULOUSE	707 710	KYIV - WIEN	511 799
LULEA - STOCKHOLM	1 046 015	AMSTERDAM - GENEVA	705 771	FRANKFURT - MANCHESTER	510 202
BARCELONA - SEVILLA	1 045 029	AMSTERDAM - BIRMINGHAM	703 102	BORDEAUX - LONDON	509 889

1.4 Night trains are suitable for diffuse traffic

It could be argued that there is not enough potential on air routes with very little traffic to justify the introduction of night trains. But it should be recalled that **one night train can serve many cities** in the evenings and mornings, and thus aggregate diffuse traffic to form a full train. This is a considerable advantage for regional planning and for serving small towns. In comparison, the plane requires one line for each origin-destination.

Let's take the example of Toulon-Bordeaux: 8,000 air passengers per year may seem too few to propose a night train. But this route could be served by a Ventimiglia-Nice-Toulon-Marseille-Toulouse-Bordeaux night train, which would therefore also attract passengers from the air routes Marseille-Bordeaux (327,000 passengers per year), Nice-Bordeaux (259,000), Nice-Toulouse (116,000) and Marseille-Toulouse (56,000). And we can even go further by assembling **multi-branch trains**, as is the case on many night trains today. Thus, this Ventimiglia-Bordeaux could be coupled with another train Ventimiglia-Toulouse-Pau-Biarritz-San Sebastian, which would attract air passengers from Marseille-Biarritz (17,000 passengers per year), Nice-Biarritz (9,000), Marseille-Pau (7,000) and Nice-Pau (6,000). This study does not aim to detail all the desired night routes in Europe. However, in our previous study, the reader will find details of what the service could be in France with the introduction of 30 regular night train lines. Unlike the TGV, which makes few stops, night trains have the rare ability to bring together small streams to form large rivers…

This is also one of the reasons why night trains have an important role to play in the future: a study conducted by Eurocontrol has shown that the **High Speed network is made up of a small number of scattered lines that are not dense enough to compete with the diversity of existing air routes** (see graph below). The night train, on the other hand, responds to this problem, since it runs on the conventional network, which is much denser than the high-speed network. The night train therefore allows the creation of a wide variety of lines with multiple connections. Moreover, the night train is adapted to both high and low traffic levels, since it is operational from a single round trip per day, thanks to its optimised timetable which allows the passenger to have entire days before and after the journey. In comparison, daytime mobility needs to offer several daily schedules to be attractive.



HSR network (data source: OpenStreetMap)

Airport network (data source: Sabre Airline Solutions)

Source: X. Sun, Yu Zhang, S. Wandelt (2017), Air Transport vs . High Speed Rail : An Overview and Research Agenda (2017)

According to Eurocontrol, high-speed rail will not provide a fine network across the continent (although the conventional network shown in grey on the map does provide a dense network).

1.5 The "two-nights train", a rail alternative for 217 million air passengers flying over distances of 1500 to 3000 km

217 million passengers a year use air travel for journeys of 1,500 to 3,000 km for which a rail alternative is available. Distances of 2,000 to 3,000 km can rarely be reached by train, neither overnight nor in one day. However, they can be achieved in 36 hours (two nights and one day).

Such trains already exist on the **Paris-Moscow** (2800 km) and **Nice-Moscow** (3100 km) lines. In large countries the size of Europe, such as Russia, India, China, Australia, Canada and the United States, direct train journeys over several nights have never stopped. Europe is the exception, having left this mobility to almost disappear. Today there is a desire among many Europeans to be able to cross Europe by train. There is a demand and it would be strategic for the EU to launch at least one experiment to create some transcontinental train lines.

Europe is a small continent, and 36 hours would be enough to cross it from North to South and from East to West, once the rail network is regenerated. The longest journeys can be up to 4000 km, but they are rare: for example Lisbon-Bucharest or Lisbon-Riga. The vast majority of long journeys remain around 3000 km. For this study, journeys exceeding 3000 km have not been included in the modal shift estimates.

This renaissance of the **"two-nights train" (2NT)** as a means of continental travel is important for the **southern European countries** (notably Greece, Italy, Spain and Portugal) which are outlying and dependent on European tourism. Northern European tourists are increasingly interested in coming by train. These 2NT are also needed for the many **Eastern European** nationals who work in Western countries.

Air routes that can be served by train with between 1500 and 3000 km of travel.
Only routes with more than 200,000 passengers per year are represented.

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The EU wants to better balance taxation between aviation and land mobility. This action will need to be accompanied by the creation of **new night train lines so as not to leave citizens without travel solutions** in the face of the expected increase in air transport costs. This is also necessary so that peripheral countries are less dependent on aviation and may be able to accept a rebalancing of the intermodal competition framework between mobilities.

Such trains will offer intermediate stops ("cabotage"). Thus, passengers do not necessarily travel from one end to the other on a Paris-Moscow type train: thanks to stops in the most important cities, it can be used for Paris-Warsaw, Berlin-Minsk, Frankfurt-Warsaw, Poznan-Moscow, etc.

Air traffic on the 150 busiest routes with a rail alternative on a distance between 1500 and 3000 km					
LONDON - MADRID	3 145 546	FRANKFURT - STOCKHOLM	695 669	AMSTERDAM - BUCURESTI	480 700
LONDON - ROMA	2 389 653	MADRID - ZURICH	691 093	FRANKFURT - SOFIA	456 880
LONDON - MALAGA	2 274 622	GENEVA - PORTO	687 086	FRANKFURT - PORTO	451 774
LISBOA - LONDON	2 198 806	ISTANBUL - KOELN	686 679	LISBOA - MILANO	449 994
LISBOA - PARIS	1 988 777	BERLIN - MOSCOW	682 734	MUENCHEN - OSLO	447 572
ISTANBUL - LONDON	1 899 749	LONDON - MUGLA	668 086	BARCELONA - KOBENHAVN	444 467
ALICANTE - LONDON	1 782 539	PARIS - STOCKHOLM	661 589	KATOWICE - LONDON	442 461
BUDAPEST - LONDON	1 685 576	AMSTERDAM - MALAGA	656 305	BARCELONA - PRAHA	440 413
MADRID - ROMA	1 658 598	MOSCOW - PRAHA	649 551	ALICANTE - AMSTERDAM	436 539
LONDON - STOCKHOLM	1 610 771	BARCELONA - BERLIN	647 416	ROMA - WARSZAWA	431 199
FARO - LONDON	1 562 371	BARCELONA - WIEN	640 795	LONDON - VILNIUS	428 178
LONDON - WARSZAWA	1 392 222	BERLIN - MADRID	630 351	MILANO - MOSCOW	426 844
AMSTERDAM - BARCELONA	1 383 797	GENEVA - LISBOA	624 802	BUDAPEST - MOSCOW	420 625
LONDON - OSLO	1 383 319	ATHINAI - FRANKFURT	617 581	LONDON - MURCIA	419 936
HELSINKI - STOCKHOLM	1 380 137	ISTANBUL - ROMA	615 511	PARIS - SEVILLA	419 930
BUCURESTI - LONDON	1 373 470	AMSTERDAM - MOSCOW	613 052	ISTANBUL - MILANO	413 465
AMSTERDAM - ISTANBUL	1 371 763	BUCURESTI - ROMA	609 372	ALICANTE - BRUSSELS	412 673
ISTANBUL - PARIS	1 319 704	LONDON - RIGA	603 528	BARCELONA - NAPOLI	407 861
PARIS - PORTO	1 251 020	GDANSK - LONDON	591 374	ALICANTE - BIRMINGHAM	407 820
FRANKFURT - ISTANBUL	1 164 450	NAPOLI - PARIS	588 757	LONDON - SEVILLA	404 602
AMSTERDAM - MADRID	1 142 295	HELSINKI - MUENCHEN	587 552	KOBENHAVN - ROMA	404 277
DUESSELDORF - ISTANBUL	1 127 218	MALAGA - MANCHESTER	585 339	ALICANTE - EAST MIDLANDS	402 537
MADRID - MILANO	1 113 442	GOTEBORG - LONDON	578 821	STOCKHOLM - ZURICH	400 229
BRUSSELS - MADRID	1 085 434	LONDON - VALENCIA	572 966	BERGAMO - PALERMO	391 703
FRANKFURT - MADRID	1 068 776	HAMBURG - ISTANBUL	570 703	BURGAS - MOSCOW	389 459
AMSTERDAM - ROMA	1 047 972	BERLIN - HELSINKI	568 195	CLUJ NAPOCA - LONDON	389 320
AMSTERDAM - LISBOA	928 012	ISTANBUL - ZURICH	566 739	FRANKFURT - VALENCIA	383 724
LONDON - SOFIA	911 960	MADRID - WIEN	564 139	BUCURESTI - FRANKFURT	383 373
ATHINAI - PARIS	903 676	MUENCHEN - STOCKHOLM	558 200	BARCELONA - BUDAPEST	380 342
MADRID - MUENCHEN	900 689	BERLIN - ROMA	556 395	MOSCOW - ZURICH	377 940
KRAKOW - LONDON	887 959	MADRID - VENEZIA	555 020	ALICANTE - NEWCASTLE	376 971
LONDON - NAPOLI	880 562	PARIS - WARSZAWA	553 699	BERLIN - LISBOA	374 897
FRANKFURT - LISBOA	855 382	MOSCOW - WIEN	541 913	AMSTERDAM - VALENCIA	374 814
HELSINKI - KOBENHAVN	848 403	BRUSSELS - MALAGA	530 244	GENEVA - ISTANBUL	371 874
MOSCOW - PARIS	830 980	FRANKFURT - KYIV	527 139	BIRMINGHAM - MALAGA	370 590
ATHINAI - ROMA	824 701	FARO - MANCHESTER	526 440	AMSTERDAM - BERGEN	367 622
LONDON - PORTO	823 244	FRANKFURT - HELSINKI	526 437	LONDON - SPLIT	367 362
MALAGA - PARIS	802 944	HELSINKI - OSLO	523 227	ALICANTE - BRISTOL	366 924

MOSCOW - MUENCHEN	790 346	ATHINAI - MUENCHEN	522 862	BRUSSELS - STOCKHOLM	365 651
BERLIN - ISTANBUL	788 102	BUCURESTI - PARIS	514 211	BERGAMO - BUCURESTI	365 521
LONDON - PISA	782 648	OSLO - PARIS	513 603	ROMA - VALENCIA	365 453
BRUSSELS - LISBOA	773 096	BARCELONA - MANCHESTER	505 067	KOBENHAVN - MILANO	365 389
ISTANBUL - WIEN	743 172	LISBOA - MUENCHEN	500 750	ATHINAI - BERLIN	360 951
ALICANTE - MANCHESTER	742 153	AMSTERDAM - ATHINAI	499 925	KYIV - PARIS	360 491
AMSTERDAM - HELSINKI	723 056	ATHINAI - ZURICH	497 230	MANCHESTER - MUENCHEN	357 416
ISTANBUL - STUTTGART	719 270	ISTANBUL - KOBENHAVN	495 425	GIBRALTAR - LONDON	356 369
FRANKFURT - MOSCOW	718 413	DUESSELDORF - MOSCOW	495 310	ISTANBUL - LYON	354 656
LISBOA - ROMA	717 121	HELSINKI - PARIS	491 434	BARCELONA - STOCKHOLM	353 313
ISTANBUL - MUENCHEN	709 529	LISBOA - ZURICH	487 968	BRUSSELS - PORTO	348 128
LONDON - MOSCOW	706 800	DUESSELDORF - MADRID	486 106	BRISTOL - MALAGA	346 629

1.6 Night trains will be a possible alternative for one in two air passengers

In total, night trains could be offered as an alternative to 332 million passengers travelling between 500 and 1500 km and “two-nights trains” to 217 million passengers travelling between 1500 and 3000 km. This represents **549 million air passengers**, out of the 1.1 billion annual air passengers. **Half of the air traffic departing from Europe** appears to be potentially feasible by night train.

Out of this total, how many passengers would actually choose the night train? We propose below to evaluate the modal shift potential and the achievable traffic on night trains.

Part 2) 100 million passengers on night trains in 2030

2.1 Assessing the market share of night trains

Market share in 2010 (source : Négawatt)				
	Air	**Car**	**Train**	**Bus**
from 600 to 1499 km	16 %	57 %	22 %	4 %
1500 km or more	85 %	11 %	2 %	2 %

According to the Negawatt data for 2010 and the figures of the Commissariat Général au Développement Durable (CGDD) for 2016, the market share of air travel for distances of 500 to 1500 kilometres can be estimated at around 16% (the remainder being split between car, train and coach). On routes of 1500 to 3000 kilometres, the market share of air travel is estimated at around 75%. Precise databases are not available for all forms of mobility, which makes it impossible to carry out a detailed study of modal shift on road transport by origin-destination at European level. However, the market shares make it possible to estimate the total number of journeys, all modes combined, which are made on the identified links:

	Air traffic	Air market share	Total traffic all modes
Journeys with a rail alternative between 500 and 1500 km	332 000 000 journeys/year	16 %	2 075 000 000 journeys/year
Journeys with a rail alternative between 1500 and 3000 km	217 000 000 journeys/year	75 %	289 000 000 journeys/year

What is the modal share that could be captured by night trains on these routes? The French government's "TET" report quotes a **market share of 10-15%** that could be captured from air traffic. Our previous study on traffic potential from France showed that with an **average shift rate of 6%** from air and road to night trains, historical ridership figures are recovered.

Higher shift rates will be possible in the future. A survey by Germanwatch showed that **69% of Europeans want to travel by night train**. In a pool in France in 2021 with 49,432 people on the theme: *"How to act for a more responsible tourism in France"*, the idea of "*re-establishing long train journeys (such as crossing France) with modernised, safer sleeper trains*" was favoured (80% of votes in favour). The population is therefore ready for a modal shift, provided that an alternative transport offer is available and of good quality.

In addition, the EU and many member States wish to establish a level-playing field between aviation and land transport. At present, for a journey of 1500 km, low-cost air travel with tickets at €15 is cheaper even than car-pooling (about €100) and bus travel (also about €100). The night train is also one of the cheapest forms of ground transport, with tickets with reclining seats starting at €20 or €30. The night train will therefore be the first mobility to benefit from the rebalancing of competition between aviation and land transport.

2.2 Carrying 100 million passengers per year

In a scenario where the night train captures **5% of traffic** from all modes on journeys of 500 to 1500 kilometres, and **1%** of traffic on journeys of 1500 to 3000 kilometres, the traffic potential would amount to **107 million passengers** per year (see calculation in table below). With a market share of **10%** on routes of 500 to 1500 km and **2%** on routes of 1500 to 3000 km, the potential reaches **214 million passengers** per year. It should be noted that these market shares remain reasonable, and well below the levels targeted by the French “Négawatt” scenario, which aims for a modal share of 11% for trains on journeys of more than 1500 km by 2030, which will be mainly by night train, given the distances to be covered.

2.3 Build 10,000 to 20,000 night coaches with modern comfort

A traffic volume of 107 to 214 million passengers per year represents 293 000 to 586 000 passengers per day. With an average occupancy rate of 66%, and carriages with an average capacity of 45 beds/seats, this corresponds to a number of carriages between 9,000 and 18,000. For comparison, Russia has 7,000 carriages for a population of 140 million people (the EU with the UK, Switzerland and Norway have 530 million inhabitants). Adding reserve carriages and extra carriages due to the fact that passengers who travel 3,000 kilometres occupy their seats for more than 24 hours, we get **a need of 10,000 to 20,000 night train carriages**. This means about **700 to 1400 night trains** with 14 to 16 carriages.

	Traffic all modes	Scenario 1		Scenario 2	
500-1500 km	2 075 000 000 journ./year	5 %	104 000 000 journ./year	10 %	208 000 000 journ./year
1500-3000 km	289 000 000 journ./year	1 %	3 000 000 journ./year	2 %	6 000 000 journ./year
Total potential traffic in NT :		**107 000 000 journeys/year**		**214 000 000 journeys/year**	
Daily number of passengers :		**293 000 journeys/day**		**586 000 journeys/day**	
Number of coaches needed :		**10 000 coaches**		**20 000 coaches**	

2.4 More than 350 night train lines in Europe

It is difficult to put a figure on the number of existing night train lines because some night trains have a large number of cars, such as the Paris-Milan-Venice which carried 300 000 passengers per year, while other lines are divided into several branches to different destinations. In addition, some high-traffic routes could be served by several trains each night. To give an idea, a night train with 14 cars of 45 seats, 65% full, carries about 410 passengers. A traffic of 293,000 passengers per day therefore corresponds to **357 night train lines running daily in Europe** (i.e., 714 trains, assuming that one train runs each night in each direction on each line). For comparison, Europe currently has only several dozens of lines, mainly concentrated in the eastern half of the continent (see map below). The second scenario with 586,000 passengers per night would correspond to more than **714 night lines** (1428 trains running each night). For comparison, a thousand TGV and Intercity trains run every day in France alone.

Existing overnight trains in Europe in Winter 2020 (pre-pandemic). Source : http://rosnix.net/~per/tag/night-trains-map/

Thus, the night train lines that are currently being revived one by one in Europe are probably only the first step in a staircase that will remain far from reaching the ceiling: there is still a lot of room to increase traffic. For example, from France, the potential is not limited to links from Paris to regional capitals and the capitals of neighbouring countries. There is a need to better connect the regions with each other by numerous cross-country lines. It is also a question of connecting all the regions to Europe. For the moment, the French government's study on new night trains suggests international connections exclusively from Paris and not enough cross-country links to the West and North of France.

2.5 Job creation thanks to a European industrial project worth 20 billion euros

The number of night trains in Europe is insufficient and they are also ageing. The renaissance of night trains, with a quality offer, therefore implies building a new generation of 10,000 night coaches, which can be put into service before 2030. This represents an industrial project worth 20 billion euros (for an average price of about 2 million euros per carriage). To this should be added the construction of interoperable locomotives to cross Europe's borders more easily.

These figures correspond to Scenario 1 and there is potential for a higher increase in traffic. It should therefore be planned with the manufacturers that the orders can be extended in order to be able to manufacture additional coaches as soon as possible.

The equipment could be co-financed by the States and the EU through cooperation on a continental scale in order to have standardised European equipment. This has 3 advantages:

* The types of comfort are known and well identified by users, which contributes to the visibility of the offer and facilitates marketing.

* This will enable economies of scale to be made in the construction of the coaches.

* This will make it possible to interest equipment manufacturers by the volume of the project to be carried out.

2.6 Measuring only air traffic leads to a bias in favour of the major metropolises of Western European countries

Air traffic figures are biased in favour of **airport hubs**, which offer connecting opportunities to the whole world. Thus, on the two maps presented in sections 4 and 6, **the hubs of London, Paris and Amsterdam are over-represented**. It can also be seen that traffic is fairly concentrated on Western European countries.

Moreover, a certain number of travellers who fly into Paris may start their journey by train, car or air connection from another territory, sometimes several hundred kilometres away from the airport. To switch to the train, these travellers will not necessarily look for a departure from Paris, but rather from a station located as close as possible to their territory.

In order to build a European night train network and determine the relevant routes, it is therefore necessary not to rely solely on air traffic, which would lead to the development of links

centred on the major hubs already well served by air. **Road traffic** should also be taken into account, as it is probably more diffuse throughout the European territory. We do not have the necessary European road data, and this analysis could not be conducted here. It is simply necessary to expect greater demand than expected on cross-country routes, i.e., on routes outside the major cities, particularly between medium-sized towns.

One advantage of the night train is precisely its ability to serve many medium-sized towns in the evening and morning, thus **offering a much more refined service than air travel**. Night trains can thus respond to the lack of mobility by facilitating travel for people living in regions that are poorly connected today. On lines where there is little mobility today, there is therefore **a potential for traffic induced** by the introduction of night trains, which is also difficult to estimate.

Moreover, night trains are likely to lead to a **shift from more distant destinations by air** to closer destinations by night train (for example, one can imagine French tourists going to Spain or Italy if there are night trains, but who, if there are none, turn to air travel and come across a promotion for a trip to Dubai).

2.7 The emergency is to refine traffic estimates to plan the construction of the rolling stock

At present very few ambitious forecasts of night train traffic are put forward at European level. The figures presented here are therefore an unpublished estimate. This initial analysis needs to be refined by a more complete study. Quantifying the potential for night trains and the need for rolling stock is a current challenge in order to plan and size rolling stock orders as closely as possible to requirements.

A number of actors have resisted the revival of night trains for years. Today, night trains are still discredited and described, for example, as "a niche market". This delays the urgent investment, especially as the purchase of rolling stock takes 4 to 8 years and the current equipment is at the end of its life. A precise analysis is therefore urgently needed to gain years for the implementation of a coherent network on a continental scale (or rather to avoid wasting more time since such an investment should have been launched in the 2010s, when the existing equipment was already over 30 years old).

The first conclusions of this study should call on all stakeholders to refine this analysis through further studies and to contribute to the launch of a quality offer that will allow all Europeans to continue travelling across the continent with a reduced environmental impact.

European rail connectivity also involves the Balkans

Promoting land transport will encourage more cross-border cooperation between states and the EU. In particular, the EU cannot abandon the Balkans, as this would also isolate Bulgaria and Greece: many train journeys need to pass through the Belgrade rail hub, for example.

Moreover, many EU countries, including France, Spain and even Germany, suffer from under-investment in their rail networks. One of the EU's priorities for the next decade should therefore be **to regenerate the historic rail network** throughout the continent, with particular attention to the peripheral countries, and also looking beyond the EU's borders to cooperate with neighbouring countries.

Special attention must by given also to Ireland, e.g., by reinforcing ferry routes with through tickets with railways.

Bonus: details by country of air traffic substitutable by rail for journeys between 500 and 1500 km

The following table shows the distribution of flights for which a rail alternative between 500 and 1500 kilometres is possible, with a daytime train journey time of more than 3 hours. The figures are in thousands of passengers per year. For example, 1,652,000 people fly between mainland France (excluding Corsica) and Austria each year for distances between 500 and 1,500 kilometres (counting journeys in both directions).

There is significant **domestic traffic** within **Italy** (25 million air passengers per year substitutable by train between 500 and 1500 kilometres and more than 3 hours travel time), **France** (21 million), **Germany** (18 million), **Spain** (11 million), the **UK** (10 million) and **Sweden** (5 million).

	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK	TR	RU	Autres	Total
AT	0	554	557	1 447	0	0	6 935	584	0	177	0	0	1 772	82	0	0	1 916	0	147	158	0	1 114	0	455	0	746	0	0	82	2 136	0	0	1 547	19 032
BE		0	0	1 104	0	577	1 352	833	0	0	1 449	0	1 730	188	639	0	2 935	0	0	0	0	0	0	879	0	0	240	116	73	832	0	0	554	12 589
BG			0	0	0	186	305	0	0	279	0	0	0	0	0	0	256	0	0	0	0	0	0	146	0	0	0	0	118	0	187	0	557	1 898
CH				0	0	311	4 793	605	0	0	2 652	0	3 539	256	407	0	1 599	0	64	0	0	1 983	0	372	0	0	0	100	0	6 154	0	0	3 044	24 132
CY					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CZ						0	924	404	0	0	0	0	961	79	275	0	1 168	0	0	129	0	1 057	187	291	0	123	0	0	62	1 980	902	0	1 386	9 257
DE							18 110	3 048	75	0	3 591	0	8 600	1 402	2 329	0	9 671	24	385	343	0	4 005	1 429	4 136	0	968	1 308	196	0	14 259	0	0	15 357	83 210
DK								0	0	0	0	0	1 169	0	0	0	231	0	95	262	0	2 068	2 957	749	0	0	1 638	0	0	3 115	0	0	5 475	16 558
EE									0	0	0	0	0	0	0	0	0	106	0	0	0	0	0	225	0	0	0	0	0	0	0	144	75	513
EL										1 651	0	0	0	0	246	0	0	0	0	0	0	0	0	0	0	390	0	0	61	0	1 142	0	794	3 994
ES											11 116	0	10 783	0	0	0	5 608	0	134	0	0	455	0	0	5 581	0	0	0	0	4 597	0	0	7 691	42 860
FI												2 239	0	0	0	0	0	146	0	394	0	0	0	0	0	0	0	0	0	0	0	397	0	2 961
FR													20 871	284	867	0	9 351	0	176	0	0	4 339	0	0	1 147	0	0	119	38	8 612	0	0	28 553	69 335
HR														0	0	0	117	0	0	0	0	211	0	0	0	0	0	0	0	0	146	0	2 378	2 659
HU															0	0	1 185	0	0	0	0	885	0	370	0	160	0	0	0	0	380	0	4 974	7 416
IE																0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IT																	25 133	0	343	0	0	3 319	0	151	0	569	0	0	180	7 662	0	0	35 482	67 919
LT																		0	0	0	0	0	0	0	0	0	0	0	0	0	0	187	561	698
LU																			0	0	0	0	0	68	0	0	0	0	0	621	0	0	1 344	1 896
LV																				0	0	0	0	226	0	0	0	0	0	0	0	995	1 557	2 590
MT																					0	0	0	0	0	0	0	0	0	0	0	0	0	0
NL																						0	852	1 746	0	0	1 616	106	31	12 053	0	0	19 435	33 418
NO																							2 166	0	0	0	1 800	0	0	0	0	0	5 426	8 758
PL																								188	0	269	0	54	54	1 267	0	393	11 108	12 432
PT																									184	0	0	0	0	0	0	0	6 728	6 445
RO																										524	0	0	0	0	650	0	3 224	4 102
SE																											5 393	0	0	0	0	0	6 602	11 185
SI																												0	0	0	174	0	912	1 012
SK																													0	0	0	0	971	905
UK																														10 198	0	0	63 287	68 522
TR																																		3 340
RU																																		1 973
Autres																																		7 297
Total																																		310 037

Air routes with rail interconnection between 500 and 1500 kilometres with a train journey time of more than 3 hours (in thousand passengers per year)

As far as international journeys are concerned, the predominant routes are :

- **Germany - UK** (14 million),
- **Netherlands - UK** (12 million),
- **France - Spain** (11 million),
- **Germany - Italy** (10 million),
- **France - Italy** (9 million),
- **France - UK** (9 million),
- **France - Germany** (9 million),
- **Italy - UK** (8 million),
- **Germany - Austria** (7 million),
- **Switzerland - UK** (6 million),
- **Spain - Italy** (6 million),
- **Spain - Portugal** (6 million),
- **Switzerland - Germany** (5 million).

Details by country of air traffic substitutable by rail for routes of 1500 to 3000 kilometres:

	AT	BE	BG	CH	CY	CZ	DE	DK	EE	EL	ES	FI	FR	HR	HU	IE	IT	LT	LU	LV	MT	NL	NO	PL	PT	RO	SE	SI	SK	UK	TR	RU	Autres	Total
AT	0	0	0	0	0	0	0	0	55	388	1 804	229	0	0	0	0	127	0	0	0	0	0	204	0	396	0	389	0	0	138	876	639	0	4 891
BE		0	201	0	0	0	0	0	78	464	3 340	273	0	0	0	0	0	0	0	117	0	0	347	0	1 743	531	431	0	0	0	253	335	184	7 736
BG			0	0	0	0	808	0	0	0	422	51	147	0	0	0	265	0	0	0	0	327	0	126	0	0	0	0	0	1 428	0	778	201	4 044
CH				0	0	0	0	267	0	838	1 363	366	0	0	0	0	0	0	0	119	0	0	214	161	2 451	128	599	0	0	398	1 107	672	312	8 387
CY					0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
CZ						0	0	0	0	129	1 067	368	0	0	0	0	0	0	0	0	0	0	0	0	126	0	302	0	0	172	81	790	0	2 830
DE							0	0	331	3 331	7 965	2 365	0	89	0	0	1 782	268	0	443	0	0	528	0	4 103	833	2 064	0	0	1 270	9 555	4 438	2 325	38 872
DK								0	138	263	1 224	1 000	339	208	273	0	1 077	283	0	0	0	0	0	0	0	60	0	31	0	647	584	172	267	6 123
EE									0	0	0	0	0	0	0	0	65	0	0	0	0	96	150	0	0	0	340	0	0	174	82	0	602	1 408
EL										0	25	0	1 080	0	0	0	1 863	0	0	0	0	876	0	244	0	0	0	0	46	393	0	467	5 586	9 865
ES											0	0	1 789	175	841	0	7 185	148	211	157	0	6 246	305	629	0	597	562	0	99	20 981	241	0	17 211	53 076
FI												0	700	123	270	0	251	0	0	0	0	853	617	479	0	0	1 907	39	0	0	173	0	4 653	9 384
FR													0	145	0	0	1 403	109	0	172	0	0	850	1 022	6 495	1 074	1 187	0	0	367	2 962	1 392	4 895	20 582
HR														0	0	0	0	0	0	0	0	0	142	0	0	0	239	0	0	778	0	128	740	1 891
HU															0	0	140	0	0	0	0	57	0	0	0	0	262	0	0	2 526	0	496	1 384	4 537
IE																0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
IT																	789	343	0	93	0	1 990	352	1 001	2 371	1 834	428	0	0	6 744	2 140	1 901	15 034	32 654
LT																		0	0	0	0	47	308	0	0	0	188	0	0	1 075	0	0	1 151	2 583
LU																			0	0	0	0	0	0	825	0	0	0	0	0	0	0	211	966
LV																				0	0	190	328	0	0	0	307	0	0	712	0	0	1 101	2 459
MT																					0	0	0	0	0	0	0	0	0	0	0	0	0	0
NL																						0	1 251	0	2 492	668	0	0	0	0	1 981	917	11 165	17 225
NO																							0	1 689	0	0	0	0	0	2 388	0	147	5 595	9 157
PL																								0	0	0	1 092	0	0	5 285	194	0	5 351	11 117
PT																									0	0	0	0	0	8 530	0	0	21 001	27 537
RO																										0	99	0	0	3 262	0	0	5 724	8 472
SE																											0	0	0	2 950	134	167	10 608	12 923
SI																												0	0	268	0	90	69	398
SK																													0	790	0	107	145	972
UK																														0	3 028	833	62 591	61 964
TR																																		21 587
RU																																		13 490
Autres																																		5 515
Total																																		201 689

Air routes with rail interconnection between 1500 and 3000 kilometres (in thousands of passengers per year)

In this category, the top routes are :

- **Spain - UK** (21 million),
- **Germany - Turkey** (10 million),
- **Portugal - UK** (9 million),
- **Germany - Spain** (8 million),
- **Italy - Spain** (7 million),
- **Italy - UK** (7 million),
- **Spain - Netherlands** (6 million),

- **France - Portugal** (6 million),
- **Poland - UK** (5 million).

Notes:

The French government's report about new night trains was truncated during inter-ministerial discussions. The reader will benefit from reading the full report written by the Ministry of Transport.

Find here the 10 proposals of Yes to Night Trains for Europe.