TICKET PRICES OF PLANES VS TRAINS – A EUROPE-WIDE ANALYSIS

How low-cost carriers destroy the climate while their unfair and aggressive pricing strategies go unchecked

CONTENTS

Introduction

Aviation is one of the world's most climate-damaging and inequitable industries. While only 1% of the world's population is responsible for more than half of global climate emissions from aviation, the consequences affect everyone around the world, from extreme weather events to pollution-related illnesses and disruption from noise.

Flying is the fastest growing source of transport-related greenhouse gas emissions in the EU. In the face of a looming climate emergency, action should be taken to curb this boom that is putting our future at risk. Yet, far from taking a responsible approach, EU institutions and national governments continue to subsidise climate change through giveaways to airlines and airports, while closing down railway stations and lines. As a result, air traffic in Europe is now returning to pre-pandemic levels. Ryanair was again Europe's most polluting airline in 2022, and emissions from Ryanair and Wizz Air last year exceeded those of 2019, making 2022 the year of their peak emissions.

One of the reasons people choose to fly rather than travel by train is price: why would anyone take the train from London to Barcelona and pay up to €384 when air tickets are available for the ridiculously low price of €12.99?

Citizens deserve to have access to a clean, efficient and affordable transport system that does not harm the climate, people and our planet.

Greenpeace has been calling for a fair pricing system for mobility in Europe for years, and has recently started promoting climate tickets. Affordability is a key step towards accessibility, this is why European citizens should have access to affordable and simple long-term tickets that are valid on all public transport in their country. These tickets would allow them to travel on all national trains and cross-border transport and, together with the phasing out of airline and airport subsidies, could start the much-needed shift from air to rail.

It is high time to make rail more affordable than flying across Europe.

By analysing 112 European routes and comparing air and rail fares on 9 different days for each route, this report shows the extent to which European citizens are being encouraged to fly. It also identifies the reasons for these outrageous price differences and proposes solutions to make rail competitive on all routes.

Key Findings

- In the majority (79 out of 112) of routes analysed, flights are less expensive than rail. Rail trips are on average twice as expensive as flights, despite the fact that the overall climate impact of flying can be over 80 times worse than taking a train.[1]

- On the 112 routes analysed, only 23 of them are (almost) always cheaper by train than by plane. And only half of them are decent train trips, the others having really bad or slow train connections, such as Tallinn–Riga and Warsaw–Ljubljana. 16 of these 23 routes are not served by low-cost carriers, such as Zurich–Vienna and Brussels–Hamburg, 6 of these 23 routes do not have any direct flight at all, such as Berlin–Prague and Ljubljana–Milan.

- With a train ticket costing up to 30 times the price of the flight for a trip on the same day, Barcelona–London is the route showing the highest price difference in this analysis. Some of the routes between major European cities, such as London–Bratislava (15.5 times), Budapest–Brussels (12.5 times), Madrid–Brussels (15 times), Valencia–Paris (12 times) or Rome-Vienna (10.2 times) show high price differences as well.

- Countries with the most expensive train tickets compared to flights are the UK, Spain, Belgium, France and Italy. Whereas in Central and Eastern Europe[2], trains are more often cheaper in relation to flights than in Western Europe. However, train frequency, speed, connections and services are usually worse than in western countries.

- Some really effective train routes such as Amsterdam–London, London–Edinburgh and Toulouse–Paris (4 to 4.5 hours by train each) are still among the Top4[3] most popular short-haul flights in Europe. On these routes, flights remain much cheaper.

- Low-cost carriers are all over Europe: they operate 79% of all routes analysed. For another 12% of the routes analysed, transfer flights operated by these companies are the cheapest flight option.

- These transfer flights are also by far the most polluting options, causing up to 10 times more greenhouse gas emissions than already polluting direct flights according to our calculations. This climate-wrecking practice suggests travellers go from Budapest to

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[1] The overall climate impact of flying can be over 80 times worse than taking a train. Planes emit on average 4.84 times more greenhouse gas emissions than trains according to data from the European Environment Agency, which is a conservative low estimate. Figures vary by country, railway company, route and type of train, and national data is available for most countries.

[2] Central and Eastern European (CEE) countries in this report refer to: Poland, the Baltic countries, Czech Republic, Slovakia, Hungary, Slovenia, Croatia, Romania and Bulgaria. Austria, despite being geographically part of this region, is not considered as CEE in this report.

[3] The Top3 flight is London–Barcelona (10h by train).

Paris via Bergamo, from Luxembourg to Milan via London, from Madrid to Zurich via Barcelona, or from Marseille to Berlin via Copenhagen.

- With their unfair and aggressive pricing strategies, easyJet, Ryanair, Wizz Air, Volotea and other low-cost airlines offer the lowest prices, and are in almost all cases cheaper than rail. They are frequently offering extremely low prices, obviously even below the costs for airport and ticket fees. The cheapest ticket found costs €9.99, and was sold by Ryanair.
- Rail trips are more expensive, the more different rail companies are involved in the trip, and the more separate tickets have to be bought for different parts of the trip. The price may also vary from one operator to another.
- Because less transfers and/or less different train operators are involved, night trains are often cheaper than day trains. But they remain usually more expensive than low-cost airlines[4].
- Some railway companies do not offer tickets for a longer period than 2 or 3 months in advance: CFR (Romania), VY (Norway), PKP (Poland)... This creates another advantage for airlines that always sell tickets for the period analysed.

Methodology in Brief

The intention of this report is to comprehensively compare prices of flights and trains on various routes throughout 27 European countries, to identify reasons for the price differences found and to propose solutions making rail competitive on all routes. Overall, 112 one-way routes were analysed. All routes were analysed for trips on 9 days each within 3 time perspectives:

- **Short-term:** a trip in 2, 4 and 7 days from the day of research
- **Mid-term:** a trip in exactly 1 month, and plus and minus 2 days from the day of research
- **Long-term:** a trip in exactly 4 months, and plus and minus 4 days from the day of research

All routes can "reasonably" be travelled by train, meaning within a day, or with a night train and connecting trains not exceeding 24 hours. Routes with a train connection under 4 hours were only included if availability and prices of flights indicate that these routes are widely used to travel from A to B (and not just used as part of a longer transfer flight).

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[4] Another study concluded that for some European routes, night trains are cheaper than planes if you are a family with children.

The routes were selected along the following criteria:

- The geographic focus of the research is the EU27 plus Switzerland, Norway and the United Kingdom, minus Malta, Cyprus and Ireland. All routes analysed are below 1,500 kms air distance (short-haul flights). All destinations have an international airport and a railway station.
- First priority: Routes between the capitals of the 27 countries and other European cities over 1 million inhabitants such as Barcelona, Milan or Hamburg. For capitals with reasonable rail connections to not more than 4 of these cities, all these routes were analysed. For capitals well connected with more than 4 of these cities, a selection of at least 4 routes was made to achieve a balanced geographic mix.
- Second priority: Most used short-haul flight routes with a train alternative including other cities, such as Edinburgh–London.
- Popular tourism destinations: Routes to/from other very popular tourist destinations, such as Venice, Nice, Split or Valencia.
- Night trains: Addition of some night train routes, such as Bratislava–Split, Stockholm–Narvik, or London–Inverness.
- For larger countries: domestic flights connecting cities which are crossing the country, and international routes from/to other cities to achieve a balanced geographic mix[5].
- For countries on the periphery of Europe or with just a few international rail links such as Portugal, Romania or the Baltic countries, the availability of routes that can be travelled both by plane and train was the decisive criterion.

For more methodological details, please see Annex I.

In total, 112 routes were analysed between April 25 and July 12, 2023: 94 cross-border and 18 domestic routes.

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[5] Such as Marseille, Toulouse, Salzburg, Gothenburg, Geneva, Bergen and Košice (SK).

The following table shows the number of routes per country. The number in brackets gives the number of domestic routes analysed.

Austria	12	Germany	31 (2)	Poland	6
Belgium	10	Greece	1 (1)	Portugal	3 (2)
Bulgaria	1	Hungary	6	Romania	4
Croatia	10	Italy	15 (1)	Slovakia	5
Czech Rep.	7	Latvia	1	Slovenia	4
Denmark	6	Lithuania	2	Spain	14 (3)
Estonia	1	Luxemburg	4	Sweden	8 (1)
Finland	1 (1)	Netherlands	8	Switzerland	7
France	20 (2)	Norway	7 (2)	UK	12 (3)

The following table shows the share of routes by direct air and rail connectivity. Routes served at least 2 times a week with a direct connection and for more than 3 months per year, either a flight or a (night) train, were counted as such.

Routes without direct flight, total	8
Routes without direct flight, but with direct train connection	4 (2 of them night trains)
Routes without direct flight and without direct train connection	4 (all involving Slovenia and Croatia)
Routes without direct train connection	64 (57%)

On data on the climate crisis impact of flights:

Most routes described were added with some figures for the impact on the climate crisis. For this, the following data was used.

- Flight passenger data for 2019 was taken out of the Greenpeace report "Train alternatives to short-haul flights in Europe", published in October 2021, and its corresponding, non-public data sheet. 2019 was the last normal year in European passenger transport, and 2023 levels are expected to be in the same dimension again.

- For routes not part of this report, 2022 passenger data were extracted from [Eurostat](). All route passenger figures are the total number of passengers on the route in both directions, counted as one-way trips, as defined in the Eurostat database as "passengers on board".
- Specific greenhouse gas emissions for routes were extracted from the [Atmosfair]() database. All emission data per passenger are given for a one-way trip.
- CO_2 emissions of trains: either the European average (33 grams per passenger and kilometre) was used as given by the [EEA](), or for some routes, the specific CO_2 emissions of railway operators were used, if known.
- Railway distances were estimated with the help of [Open Railway Map]() and Google Maps, since there is no public database with railway kilometres available.
- The CO_2 intensity of the national electricity mix was obtained from [Electricity Maps](). For the calculations, the average over the last 12 months was used.
- The number of inhabitants of cities was taken from Wikipedia. Car density was taken from statistics on Statista.

Disclaimer

Greenpeace has conducted this research with the described methodology to the best of its knowledge and belief, with the aim of providing as realistic a picture of the situation as possible. In total, thousands of prices were obtained from almost 100 different online ticketing shops for flights and rail. It is therefore possible that some individual data may not be 100% accurate. The following cases, in particular, might have been inadvertently excluded from the data gathering process:
- Flights of airlines which are only operated e.g. once a week, or during specific seasons.
- Train connections which are only operated e.g. once a week, or during specific seasons, especially trains from private railway companies which are not shown in timetables of regular railway companies.
- Some flight routes are operated by 5 or more airlines and even include different airports belonging to one city. In some cases, traditional airlines were not checked for all days, when low-cost carriers are obviously much cheaper on the first days analysed. Therefore, it cannot be excluded that an exceptionally low tariff of a traditional airline for a specific day was not included in the research.
- For some routes, there are dozens of train connections available. Some online ticket shops only show prices, after opening the connection and filling in some personal data. In such a case, it cannot be excluded that the cheapest train price for a day was missed since not each and any connection could be checked.

This is not an exhaustive analysis. The selection of routes was following the described methodology. However, in some cases, Greenpeace had to make a decision between cities with a certain low level of arbitrariness due to the multiple routes available. E.g., choosing Nice–Munich and Marseille–Berlin, and not Nice–Berlin and Marseille–Munich. Greenpeace is convinced that such decisions did not impact the overall findings of the report.

Last but not least Greenpeace cannot guarantee the absence of typos in the datasheet, especially with flight and train numbers. This is partly due to the fact that some travel data cannot be rechecked for past travel dates.

Overall Results

Average price of train tickets compared to flights

All routes for all 3 time perspectives	**200%** **(Twice as much as the flight)**
All routes, short-term bookings (within a week)	**189%** **(1.9 times as much as the flight)**
All routes, mid-term bookings (around a month in advance)	**246%** **(2.5 times as much as the flight)**
All routes, long-term bookings (around 4 months in advance)[6]	**180%** **(1.8 times as much as the flight)**

Train tickets cost on average twice the price of flight tickets. The relatively most expensive train tickets were found in the mid-term perspective, the relatively cheapest train tickets at the long-term bookings. A key reason for this is, that for many lines to, from, within and through Germany, the train tickets were cheapest with long-term bookings.

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[6] Some trips could not be analysed due to train tickets not available 4 months in advance.

Share of routes according to the number of trips where the train is cheaper

Status:	No. of routes	%
Train is cheaper on 8 or 9 out of 9 days[7]	23	21%
Train is cheaper on 6 or 7 out of 9 days	7	6%
Train is cheaper on 4 or 5 out of 9 days and less expensive on average	3	3%
Train is cheaper on 4 or 5 out of 9 days but more expensive on average	17	15%
Train is cheaper on 2 or 3 out of 9 days	16	14%
Train is cheaper on 0 or 1 out of 9 days	46	41%
Routes where the train is more expensive on average	79	71%

On many routes, the cheapest option between train and plane depends on the chosen day. However, if travellers are flexible and can move their trip to another day, the cheapest option is almost systematically a low-cost carrier.

Most expensive and cheapest countries for trains

The following table shows the average price[8] for train tickets compared to flights in countries for which at least 6 routes[9] were analysed. E.g. "4.04" means that the train tickets cost 4.04 times as much as the flight.

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[7] Some routes could not be analysed for all 9 trips. In these cases, the scale was used correspondingly.

[8] The average was calculated as the average of the average for the routes, not for individual trips.

[9] The average for countries with up to 5 routes analysed was not calculated, since this result would be too much influenced by single very expensive or very cheap train prices compared to flights.

UK	4.04	Denmark	1.58
Spain	3.86	Hungary	1.53
Belgium	2.60	Germany	1.51
France	2.59	Netherlands	1.51
Italy	2.54	Norway	1.35
Austria	2.12	Czech Rep.	1.35
Croatia	1.98	Sweden	1.32
Switzerland	1.69	Poland	0.52

10 most expensive train routes & trips compared to polluting flights on average

Route	Average train price compared to flights for the routes
	Multiples of the cost of the same journey by flight
Barcelona–London	10.3
Valencia–Paris	7.9
London–Bratislava	7.8
Madrid–Brussels	7.4
Marseille–London	6.7
Manchester–Cologne	4.9
London–Vienna	4.9
Milan–Prague	4.8
Budapest–Brussels	4.6
Marseille–Rome	4.5

10 biggest price differences for a trip on the same day

Trip on route	Time perspective	Train price compared to flights
		times as much as
Barcelona–London	short-term	29.6
London–Bratislava	short-term	15.4
Madrid–Brussels	mid-term	15.1
Budapest–Brussels	mid-term	12.5
Marseille–London	short-term	12.4
Valencia–Paris	mid-term	12.4
Manchester–Cologne	mid-term	12.4
Rome–Vienna	mid-term	10.2
Bratislava–Zagreb	short-term	9.5
Brussels–Vienna	long-term	9.4

Great train routes

Out of the 112 routes analysed, the train was found (almost) always cheaper on 23 routes (21%). Only 6 of these 23 routes are operated by low-cost carriers, and 6 of these routes do not have a direct flight at all. Out of these 23 routes, only 12 can be defined as great train routes, with more than 3 daily direct train connections (day and night trains for longer routes), a good average speed, reliable, (almost) always cheaper than a flight and usually not costing more than €150, as a higher price could motivate people to travel by car instead.

The following lines were identified as the "best train lines":

Berlin–Prague	Helsinki–Oulu *	Zurich–Vienna
Zurich–Berlin	Athens–Thessaloniki*	Warsaw–Berlin
Hamburg–Munich*	Košice–Prague	Prague–Budapest
Porto–Lisbon*	Madrid–Barcelona*	Trondheim–Oslo*

6 of these 12 lines are domestic connections (*) and only 6 are cross-border connections, limited to Germany, Switzerland, Austria and CEE countries. The analysis did not find any great international train connection in the UK, Spain, France, or Italy as defined above.

The following table shows the 6 out of 22 cheap train routes which are also operated by a low-cost airline:

Zurich–Berlin	easyJet	Madrid–Barcelona	Vueling
Hamburg–Munich	Eurowings	Prague–Budapest	Ryanair
Košice–Prague	Ryanair (4x week)	Trondheim–Oslo	Norwegian

Importance of low cost carriers

The following table shows the relevance of low-cost airlines for the 112 routes:

Number of routes directly operated by low-cost airlines	88	78.6%
Number of routes where low-cost airlines transfer flights are the cheapest flight option (at least on 2 trips)	13	11.6%
Routes with no low-cost airline flight option or flights where low-cost transfer flights were not found as the cheapest flight option for at least 2 trips	11	9.8%

The following airlines were considered low-cost airlines, in alphabetic order: Air Europa, easyJet, Eurowings, Ryanair, Norwegian, SkyExpress, Transavia, Volotea, Vueling, Wizz Air.

Airlines focusing on holiday flights were not considered low-cost airlines (Condor, Corendon Airlines, TUI).

Night trains

Night trains are the best option for eco-friendly train trips over longer distances. The analysis includes 26 (out of 112) routes, for which a train connection below 12 hours would not exist without a night train available. These routes are:

- Stockholm–Berlin
- London–Vienna
- London–Bratislava
- Nice–Munich
- Rome–Berlin
- Budapest–Brussels
- Budapest–Paris
- Warsaw–Ljubljana
- Ljubljana–Amsterdam
- Zagreb–Luxembourg
- Zagreb–Rome
- Amsterdam–Stockholm
- Oslo–Hamburg
- Bergen–Stockholm
- Stockholm–Narvik
- Bale–Zagreb
- Mulhouse–Zagreb
- Freiburg–Zagreb
- Vienna–Bucharest
- Vienna–Copenhagen
- Oslo–Bodø
- Milan–Prague
- Palermo–Turin
- Bratislava–Split
- Bucharest–Budapest
- Prag–Amsterdam

Night trains are often cheaper than day trains, especially when compared with high speed trains in France and Italy (TGV and FR trains), and because with night trains, less transfers and/or less different train operators are involved. This price analysis did only consider the cheapest option for night trains, which in most cases are seat carriages, or couchettes. Supplements for couchettes or sleepers can range from €10 to some hundred Euros. Compared to prices of low-cost airlines, night trains are rarely cheaper – no wonder, since airlines pay neither kerosene tax nor VAT, while railways on the other hand, have to pay energy taxes, VAT and high rail tolls in most countries.

This analysis also found many routes without a reasonable train connection. Some of them could be easily travelled with the introduction of a night train, such as:

- Madrid/Barcelona–Rome
- Athens–Sofia/Bucharest
- Tallinn/Riga–Warsaw/Berlin
- Berlin–Vilnius
- Oslo–Berlin
- Oslo–Amsterdam
- Lisbon–Madrid/Barcelona
- Sofia–Budapest/Vienna
- Sofia–Zagreb/Ljubljana
- Amsterdam–Madrid

Detailed Results per Country and Route

Austria

Overall situation

Austria is one of the countries where booking flights is dominantly cheaper than trains. On average, the train trips analysed from and to Austria cost more than 2 times as much as flights. Low-cost carriers using the Vienna Airport are offering extremely low prices: the third-lowest price found out of all 1008 trips analysed was a Ryanair flight to Warsaw for €12.99. Flights to or from Rome, Venice and Brussels were found for prices below €20. The most expensive train route for Austria is London–Vienna, where the train on average cost almost 5 times as much as the flight.

The routes from Vienna to Berlin and from Zurich to Vienna are the only ones out of 12 routes analysed where trains were found to be cheaper on all days analysed. Both of these routes are not operated by low-cost airlines. For the route from Berlin to Graz, the train was found cheaper on 5 out of 9 days. On the routes analysed from and to Italy, Romania and Poland, trains were occasionally cheaper than flights.

The Austrian railway company ÖBB and their international partners are offering a dense network of international day and night train connections. 7 of Vienna's 8 neighbouring capitals can be reached with direct connections - all except Liechtenstein's capital Vaduz, which has no railway station - as well as most regional centres, many of them several times a day. In addition there are direct train connections to Warsaw, Bucharest, Zagreb, Amsterdam, Brussels and Paris.

In 2021, Austria has introduced a country-wide climate ticket for a bit less than €3 per day. It is also valid on all long distance trains in Austria. Therefore holders of this ticket also pay less for cross-border train trips. E.g., a ticket from Vienna to Venice which costs €107.50 full-price at most,

only costs €41.20 for holders of the climate ticket. This would be cheaper than the flight on many days.

Greenpeace Austria activists installed a 13 metre long train in front of the Austrian Federal Chancellery to call for more trains. © Mitja Kobal /Greenpeace

Routes analysed from and to Austria

Vienna–Warsaw

Vienna–Warsaw is served daily with 3 direct train pairs, one of them a night train, and by 3 airlines, out of them Ryanair always offered the lowest prices starting from €12.99, one of the lowest flight prices found in this analysis. Only one short-term flight was offered for slightly more than €100. Despite train prices being also relatively low (below €72) and night trains partly available from €19.90 on, the train costs on average 140% of the flight. For long-term trips, only tickets for the night train operated by ÖBB were available, while the Polish railway company does not sell day trains tickets four months in advance.

> *Based on 2019 passenger numbers, fully replacing this flight by train would save around 28,000 tons of CO$_2$ per year, equivalent to the yearly*

> *emissions of more than 18,500 cars. This is approximately the car fleet size of Feldkirch.*

Salzburg–Cologne

Eurowings flies four times a week between Salzburg and Cologne, on the other days the airline flies to Düsseldorf which is very close to Cologne. There is one direct train connection, and numerous train connections with one transfer. The polluting flight was always cheaper than the train, with flight prices found from €59.99 on, while the train ticket was expensive, at €154.80 for all days analysed. On average, the train was almost twice as expensive as the flight.

> *A flight from Salzburg to Cologne causes 134 kg of harmful greenhouse gases per passenger. Since the train runs in its largest part in Germany with 100% renewable electricity, almost all emissions could be saved by shifting to rail. This saving would be equivalent to the CO_2 emissions of the consumption of 1,700 kWh of average Austrian electricity, enough to power a washing machine for up to 10 years.*
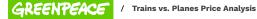
Vienna–Venice

Ryanair and Austrian Airlines (AUA) are flying daily from Vienna to Venice. There are also 3 direct train connections including a night train, the quickest train taking less than 8 hours. Ryanair is always cheaper than AUA, with prices below €22 on 4 out of the 9 days analysed. Since train prices are also starting low, at €28.30, trains were found cheaper on 3 days. On average, the train price is 140% of the flight price. The most expensive train ticket found cost €107.50. Holders of the Austrian climate ticket only would have to pay €41.20. Which is cheaper than the flight on the day analysed.

> *Based on 2019 passenger figures, 10,400 tons of CO_2 could be saved by shifting all passengers to rail. This is equivalent to the yearly emissions of around 7,000 cars. This is approximately the car fleet size of Sankt Veit an der Glan.*

Rome–Vienna

The 2 low-cost airlines Ryanair and Wizz Air, as well as Austrian Airlines fly between the Italian and the Austrian capitals. Flight prices are starting at €14.99. The best train connection is a direct night train. In summer 2023, the night train route to the north of Rome is interrupted due to construction work, so mid-term bookings require a high-speed train from

Rome to Bologna to board the night train there. This made the train trip even more expensive. On average, the train cost 3.3 times the polluting flight. The train was only cheaper for a short-term booking (€1.79 cheaper than the flight), and for a long-term booking, with a train ticket available for €28.40, the lowest possible price for this route.

> *In 2019, 558,000 people flew between Rome and Vienna. Shifting these flights fully to rail would save 52,000 tons of harmful greenhouse gas emissions. This is equivalent to the yearly emissions of 35,000 fossil fuelled cars, or approximately the car fleet size of the district of Leoben.*

Brussels–Vienna

Since 2019, the Austrian railway company ÖBB has been operating a night train between Brussels and Vienna 3 times a week. On the other days it is possible to use the night train from Cologne to Vienna. There are also good day connections with ICE trains linking the 2 cities in less than 10 hours and a half, with a change in Cologne or Frankfurt. The analysis found either the direct night train or the day trains the cheaper train option, while the night train option via Cologne was always more expensive. The night trains on this route are very popular, thus no very cheap night train ticket was available for the days analysed with prices between €111.90 and €149.70. On the other hand, Ryanair flies daily between the Belgian and the Austrian capital, with prices found from €15.75 on. Therefore, the polluting flight was cheaper on 8 out of the 9 days analysed, on average the train cost 3.3 times as much as the flight.

> *In 2019, almost 500,000 people flew between Brussels and Vienna. Shifting this flight completely to rail would save 54,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 36,000 fossil fuelled cars, or approximately the complete car fleet of the district of Villach-Land.*

Vienna–Berlin

There are only 2 direct trains between the Austrian and the German capitals, one of them a night train. In addition, during the day there are several train connections with one transfer, the quickest connection takes 8h16m. Austrian Airlines is the only airline with direct flights. The train is relatively affordable on this route and always cheaper than the polluting plane: on 8 out of 9 days analysed, the train ticket cost between €29.10 and

€63.40 with the night train having the lower prices for long-term bookings. Only with one short-term booking, the train cost more than €100.

Vienna–Copenhagen

Ryanair flies daily between Vienna and Copenhagen, which is always the cheapest but most polluting way to travel between the Austrian and Danish capitals. Flight prices start at €22.91. The best train connection is the night train to Hamburg, followed by an Intercity train to Copenhagen. The train is relatively expensive on this route, with an average cost of €163.36. Only on 1 out of 9 days analysed, the train was slightly cheaper than €100.

Berlin–Graz

Eurowings flies 5 times a week between Berlin and Graz. The lowest Eurowings price of all routes analysed was found on this connection: €33. On other days, either an Austrian Airlines flight to Vienna, with a codesharing train from Graz to Vienna, was found to be the cheapest flight, or with Eurowings via Mallorca. There is a direct day and a direct night train on this route, and several day connections with one transfer. Generally, the train is relatively affordable. On 7 out of 9 days, the train cost between €29.10 and €77.90, only on 2 short-term trips the price was a bit over €100. The cheapest train ticket was for the night train. Overall, the train was cheaper than the polluting flight on 5 out of 9 days spread over all time perspectives, including both days without direct Eurowings flight.

> *on the average Austrian electricity mix, the CO_2 savings would be equivalent to the consumption of 2,500 kWh of electricity, which is enough for a single household for a full year.*

Vienna–Bucharest

The 2 cities are connected daily by Austrian airlines and Ryanair. There is a daily night train operated by CFR which lasts 18h23m and is one of the longest night trains in Europe. The cheapest way for this route is Ryanair, with prices found starting from €35.99. On 2 out of 3 short-term bookings, the train was slightly cheaper, for all mid-term bookings Ryanair was the cheapest option. CFR is not selling train tickets 4 months in advance. Given Ryanair's long-term fares not exceeding €50.99, it can be assumed that the train would also be more expensive for long-term bookings, as the lowest train price found is €69.

> *In 2019, 634,000 people flew between Vienna and Bucharest. Shifting this flight to train would save 69,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 46,000 cars, or approximately the car fleet of the district of Südoststeiermark, the merger of the 2 former districts of Feldbach and Bad Radkersburg.*

Zurich–Vienna

The Swiss and the Austrian capitals are perfectly connected by train. There are 6 direct daily train pairs, one of them a night train. The day train takes 7h52m. By air, only the Lufthansa group connects the city. The train was always found cheaper than the plane, on average the train was more than 30% cheaper. Zurich–Vienna is one of the few perfect train routes analysed in this report.

> *Despite the perfect train connection, in 2019, 941,000 people flew between Zurich and Vienna making it Austria's sixth most popular short-haul-flight route. Banning this flight would save 75,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 50,000 fossil fuelled cars, almost the car fleet size of Klagenfurt.*

London–Vienna

Out of all routes from and to Austria, this one – the most used flight route from and to Austria – has the highest price difference between air and rail, with train tickets on average costing almost 5 times as much as the train. Wizz Air is flying daily, with low prices from €29 on. This train route can be

travelled with one change only in Brussels or Amsterdam. The highest train price found was €372.10. On 7 out of the 9 days, the Eurostar from London to Brussels was more expensive than the much longer section from Brussels or Amsterdam to Vienna.

> *In 2019, more than 1,350,000 passengers flew on this route. Shifting this flight to rail would save 197,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of around 27,000 Austrians, or of all people living in Klosterneuburg. Since the largest part of this route lies in Germany and Austria with 100% renewable electricity use, at least 90% of these emissions could be saved.*

Paris–Vienna

Since 2021, the most effective and greenest way to travel from Paris to Vienna is the direct night train. However, it runs only 3 times a week, and due its new popularity, the night train was already booked out on some days analysed. On days when the night train was available, it cost around half of day trains via Frankfurt or Zurich on other days. But even the relatively affordable night train was always clearly more expensive than a polluting flight by Ryanair and Transavia. Only on one short-term booking, when Ryanair was booked out, the night train was one third cheaper than the flight with Austrian Airlines. On average, the train cost 2.4 times as much as the polluting flight.

> *In 2019, more than 944,000 people flew between Paris and Vienna. Shifting this flight fully to rail would save around 122,000 tons of harmful greenhouse gases per year, equivalent to the yearly emissions of 81,000 fossil fuelled cars. This is approximately the car fleet size of the City of Salzburg.*

The Baltics (Estonia, Latvia, Lithuania)

Overall situation

The cross-border train network in the Baltic countries is currently extremely bad. You cannot cross the Latvian–Lithuanian border by train.

There is no direct train from Estonia to Latvia, only one daily train trip with a connection at the border station. A daily train pair runs from the Lithuanian capital of Vilnius to Warsaw and further on to Krakow. This train leaves Poland early in the morning, and returns late in the evening, making it impossible to reach Vilnius by train from any other place than Krakow or Warsaw without staying overnight there.

Therefore, only 3 Baltic routes could be analysed. The 3 Baltic countries together with Poland are currently working on a big rail infrastructure project, "Rail Baltica", which shall connect the 3 Baltic states and Poland by rail earliest from 2030 on.

Routes analysed within, from and to the Baltics

Vilnius–Krakow

The only daily train connection between Vilnius and the South Polish city of Krakow via Warsaw takes 12h28m for 740 kms. Due to the different track dimensions, a change of trains is needed at the border station but is offered without waiting time. Arrival time in Krakow is just before midnight, while the train in the other direction leaves at 4 a.m. Tickets for this train can only be purchased for less than a month in advance. There is no direct flight on this route, the shortest and also cheapest way is with the Polish state owned airline LOT via Warsaw. The train is cheap on this route at €30, short-term flights are very expensive, mid-term flights cost a bit more than €100. Considering the frequency and speed of the train, it is questionable whether many people would choose the train despite the low price.

> *A flight from Vilnius to Krakow causes 149 kg of harmful greenhouse gas emissions per passenger and trip. The 740 km long train trip causes only 24 kg of GHG, which is 84% less. With the average Lithuanian electricity mix, the savings are equivalent to running a fridge for 14 years.*

Vilnius–Warsaw

The only daily train connection between Vilnius and Warsaw takes 9h5m. Due to the different track dimensions, a change of trains is needed at the border station but is offered without waiting time. Tickets for this train can only be purchased for less than a month in advance. The Polish state owned airline LOT is the only airline with direct flights. On many days it is cheaper flying with Baltic Air via Riga. The train is cheap on this route at €25. The flights are starting at €114.58 which makes this route one of the most expensive direct flight routes among all 112 analysed. Despite the low

price, the frequency and speed of the train might be discouraging for people when the flight lasts just a bit more than one hour. In 2022, more than 215,000 flight passengers were counted on this route.

> *A flight from Vilnius to Warsaw causes 196 kg of harmful greenhouse gas emissions. Despite the high coal share in the Polish electricity mix, at least 60% of these emissions can be saved by shifting to rail. Therefore the rail frequency needs to be urgently improved between Poland and Lithuania.*

Tallinn–Riga

The only way to go from Tallinn to Riga by train is to take an Estonian local train to the border station of Varga, and to continue from there with a Latvian local train. With the current uncoordinated timetables, the only option is leaving Tallinn at 7:41 in the morning and arriving in Riga at 17:45, with a 4 hour stay at the border station – so the travel takes more than 10 hours for around 300 kms. The tickets have to be bought separately from the 2 railway operators and are only available for 10 days in advance. On both railway websites, the train schedule for the other country is not even shown. The price for the trains is very low, €17.34 for the Estonian part, and €5.22 for the Latvian section, but probably not relevant with this train "connection". Direct flights by Air Baltic are starting at €37.99.

> *A single flight from Tallinn to Riga causes 66 kg of harmful greenhouse gas emissions. Taking the 400 km long train route would save 80% of these emissions. The train connection between Estonia and Latvia urgently needs to be improved.*

Belgium

Overall situation

Belgium and its capital Brussels can be reached from the majority of European capitals by train within a day, or with a night train and a connection train, including Madrid, Rome, Stockholm and Zagreb. The main Brussels airport is mainly used by traditional airlines, while low-cost carriers use nearby Charleroi airport. Since almost all flights to and from Belgium go via Brussels, no other Belgian city was included in this analysis.

6 out of the 10 routes analysed for Brussels – London, Vienna, Madrid, Berlin, Prague and Budapest – are dominantly cheaper by plane. Ryanair flies 3 times a week from Bratislava, on these days the flight was much cheaper than rail. The remaining 3 routes are only flown by traditional airlines. On 2 of them, Copenhagen and Zurich, the train was found cheaper on around half of the days analysed. Brussels–Hamburg is the only route that was found cheaper by train on all days.

With a train ticket costing up to 15 times the price of the flight for a trip on the same day, Madrid–Brussels is the route with the fourth-highest price difference found in this analysis.

On average for all routes analysed for Belgium, the train costs 2.6 times as much as the flight. This is the third-highest train price compared to flights after the UK and Spain.

Routes analysed from and to Belgium

Brussels–Hamburg

The Lufthansa subsidiary Brussels airlines is the only airline flying directly between Brussels and Hamburg. The quickest train takes 6h26m, with an inevitable connection in Cologne. This route has a very high price variety, with trains ranging from only €29.90 to €178.90, and flights ranging from €62.61 to €272.21. The train was cheaper on all days analysed.

A single flight from Brussels to Hamburg causes 183 kg of CO_{2e} per passenger. Since German railways use 100% renewable electricity for their ICE trains in Germany, and Thalys reports a very low CO_2 emission per passenger[10], the train emissions are only a few percent of the flight on this route.

Brussels–Vienna

Since 2019, the Austrian railway company ÖBB has been operating a night train between Brussels and Vienna 3 times a week. On the other days it is possible to use the night train from Cologne to Vienna. There are also good day connections with ICE trains linking the 2 cities in less than 10 hours and a half, with a change in Cologne or Frankfurt. The analysis found either the direct night train or the day trains the cheaper train option, while the night train option via Cologne was always more expensive. The night trains on this route are very popular, thus no very cheap night train ticket was available for the days analysed with prices between €111.90 and €149.70. On the other hand, Ryanair flies daily between the Belgian and the Austrian capital, with

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[10] [8.5](#) gram CO_2/pkm

prices found from €15.75 on. Therefore, the polluting flight was cheaper on 8 out of the 9 days analysed, on average the train cost 3.3 times as much as the flight.

> *In 2019, almost 500,000 people flew between Brussels and Vienna. Shifting this flight completely to rail would save 54,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 36,000 fossil fuelled cars or approximately the car fleet of Ostende.*

Brussels–Zurich

As often on routes to Switzerland, Brussels–Zurich is only operated by traditional airlines. While the direct Lufthansa flight was the cheapest flight for mid- and long-term bookings, for short-term bookings even much more polluting transfer flights via Mallorca, the Greek island of Kos and Warsaw cost less than half of the direct flight. These 3 short-term flights were also cheaper than the train, while the train was cheaper on 5 out of 6 mid- and long term trips. All long-term train tickets for this 6h43m long trip with one transfer were available for €49.90.

> *A direct flight from Brussels to Zurich causes 157 kg of harmful greenhouse gases per person. A transfer flight via Greece causes almost 10 times as much as this, 1,059 kg. With the trains running mainly on renewable electricity on this route, almost all of these emissions could be saved.*

Bratislava–Brussels

Ryanair flies twice a week between Bratislava and Brussels. On other days, only transfer flights are available, either with Ryanair via Manchester, Rome or Corfu, or with Croatia Airlines via Zagreb. The best train connection is using the night train Vienna–Brussels on its operating days, on other days another change is needed in Bonn or Cologne. The cheapest option is by far Ryanair on its 2 direct flight days. On 2 days analysed, the costs for the train tickets are more than 550% of the airline tickets. Even the transfer flights with Ryanair via Manchester or Rome were found to be less than half price of the train, while causing even more than 100% more CO_2 emissions than direct flights. Only on 2 days, when the only flying option was with Croatia Airlines, and on another day with a Ryanair transfer flight via Corfu, did the train cost about a third of the price of the flight.

> *A single direct flight from Bratislava to Brussels causes 300 kg of harmful greenhouse gases per passenger. Using the 1,260 km long train*

> *route could save 87% of these emissions. This saving is equivalent to the consumption of 1,560 kWh of electricity (Belgian mix), enough to cook with an electric cooker for 2 years.*

London–Brussels

Brussels is the only capital analysed to which there is no direct low-cost carrier flight from London. Therefore direct flights are relatively expensive, and transfer flights e.g. with Ryanair via Denmark or Dublin are the cheapest but most polluting option on this route. The direct train takes slightly more than 2 hours and runs 10 times a day. However, the Eurostar is one of the most expensive trains found in this analysis, and cost around €100 on average on this short route, and cost almost double of the flight ticket. The cheapest flight found is a very polluting transfer flight with Ryanair via Denmark for €36.83. The Eurostar cost 2.7 times as much as this amount on the same day.

> *For obvious climate reasons, a flight with a 2 hour train alternative must be banned. It is causing 88 kg of harmful greenhouse gases per passenger and direction. A transfer flight from London to Brussels via Denmark is almost 6 times worse for the environment, and should also be banned for this route. A Eurostar trip on this route could save 92% of the airline's emissions.*

Madrid–Brussels

Madrid–Brussels is the most expensive train route analysed for Belgium with an average price of 7.4 times as much as the flight. Ryanair and the Spanish low-cost airline Air Europa fly daily. The train takes 14h38m and requires 2 transfers in Barcelona and Nimes. There is no night train available on this route. The train is always expensive on this route with an average price of €326.79. It is necessary to buy separate tickets from the Spanish and French railway companies. On 2 short-term days, the only train option from Barcelona to France was already booked out and a train trip was not possible on those days.

> *Madrid–Brussels is the most used short-haul flight route for Belgium. In 2019, almost 1.2 million people flew on this route. Shifting them to rail would save 179,000 tonnes of harmful greenhouse gases. This is equivalent to the yearly emissions of 119,000 cars, almost as many as the car fleet of Belgium's third largest city, Ghent.*

Berlin–Brussels

Ryanair and Brussels Airlines fly daily between Berlin and Brussels. A direct night train operated by the private company European Sleeper runs 3 times a week. Several day train options with one transfer also exist, lasting less than 7 hours. On all days analysed, the day train was cheaper than the night train, or not available. Despite train tickets starting low from €39.90, the polluting Ryanair flight was cheaper than the train on 8 out of 9 days. Only on one short-term trip, an even more polluting transfer flight with Finnair via Helsinki was the cheapest way. On average, the train cost 63% more than the plane on this route.

> *In 2019, 513,000 people flew between Berlin and Brussels. Shifting this flight fully to train would save 44,000 tons of harmful greenhouse gases, equivalent to almost 30,000 fossil fuelled cars. This is approximately the size of the car fleet of Roeselare.*

Copenhagen–Brussels

Only the traditional airlines SAS and Brussels Airlines fly between the Danish and the Belgian capitals. On 5 out of 9 days, even more polluting transfer flights were cheaper than direct flights, e.g. with Ryanair via Manchester or Finnair via Helsinki. The train takes at least 12h09m and requires 2 transfers in Hamburg and Cologne. As with many other train routes using Deutsche Bahn, the train was cheaper with all long-term bookings but more expensive with all short-term bookings. On average, trains and planes cost almost the same price on this route.

> *In 2019, almost 600,000 people flew between Copenhagen and Brussels. Shifting this flight to rail would save 57,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 38,000 fossil fuelled cars. This is approximately the car fleet of Kortrijk.*

Brussels–Prague

Ryanair and Brussels Airlines fly daily between the Belgian and the Czech capitals. The most effective train connection is an ICE to Frankfurt, followed by the night train to Prague. During the day, at least 2 train transfers are needed. The polluting flight was cheaper on 7 out of 9 days. On average, the train costs 53% more. Short-term tickets for this route were extremely expensive, the flight cost on average on the 2 short-term bookings €261.78, the train even €287.56.

> *In 2019, almost half a million passengers were flying between Brussels and Prague. Phasing out this flight would save around 40,000 tonnes of CO_2, as much as 26,000 cars emit in a year. This is approximately the car fleet size of Beveren.*

Budapest–Brussels

There are daily direct flights by the 2 low-cost airlines Ryanair and Wizz Air from the Hungarian capital Budapest to Brussels, in addition Brussels Airlines is operating on that route. Flights were found at really low prices from €20.37 on. The best train connection includes a night train, either from Budapest to Stuttgart or from Vienna to Brussels. The first one was always the cheapest train option found. The night train to Stuttgart was always affordable, with prices mostly between €29.90 and €59, but the ICEs or the TGV and Thalys from Stuttgart to Brussels via Frankfurt or Paris were double to 4 times as expensive as the the night train, except for the long-term bookings. Travelling by rail was systematically more expensive than travelling by air, costing on average 4.5 times as much. On one mid-term booking, the train cost 12.5 times as much as the flight.

> *A flight from Budapest to Brussels causes 421 kg of harmful greenhouse gas emissions per passenger. The 1,350 km long train trip could reduce these emissions by 90%. Based on the Belgian electricity mix, this saving is equivalent to the consumption of 2,270 kWh of electricity, enough for a single household for a full year.*

Bulgaria

Bulgaria is poorly connected by train with its neighbouring countries. The only all-year direct international rail connection is a daily night train from Sofia to Istanbul, for which it is not possible to buy online tickets. A direct train connection to Bucharest only exists from June to September. There is currently no train connection to Greece nor to Serbia. Therefore, the route to Bucharest is the only relevant international route within the scope of this analysis which can be travelled by plane and train. There are 2 domestic flights from Sofia to Varna and Burgas. Since the online ticket shop of the Bulgarian railway company is not showing pricing without a comprehensive registration, these routes could not be analysed. For these reasons, the only route analysed for Bulgaria is Bucharest–Sofia.

Bucharest–Sofia

Bucharest and Sofia are only directly connected by train from June to September. In the rest of the year, the 2 cities are only connected twice a day per train, with 2 transfers each, lasting more than 10 hours for not much more than 300kms. The Romanian airline Tarom as well as Bulgaria Air fly daily, Ryanair flies twice a week. On these 2 days, the flight is always cheaper than the train, with the lowest price found at €15.54. A train ticket costs around €34, which is always less than flights on non-Ryanair days. This route is a good example of how low train fares are important, but not enough if the quality of the rail service is very poor.

> *A single flight from Bucharest to Sofia causes 52 kg of harmful greenhouse gas emissions per passenger. By taking the 400 km long train route, around 75% of these emissions could be saved. Therefore the rail frequency and speed needs to be urgently improved between Romania and Bulgaria.*

Croatia

Overall situation

Croatia is connected by rail to all its neighbouring countries, but the frequency of international trains is very low. Only 2 daily direct train pairs stop by Slovenia's capital Ljubljana: one goes to Munich/Stuttgart, and the other one to Vienna. Another daily train pair goes to Budapest and Belgrade. Though, thanks to direct night trains to Zurich, Stuttgart, Budapest and Bratislava, and night trains reachable in Austria running to Italy, many countries and cities can be reasonably reached by train from Croatia. All 10 routes analysed from and to Croatia are including a night train. Night trains starting or ending in Croatia are relatively cheap, but connecting trains are often much more expensive, making flights cheaper than rail on many of such routes. E.g. for the Zagreb–Luxembourg route, the night train from Zagreb to Stuttgart was found for €29.20 on one day, but the connecting trains to Luxembourg cost €83.90.

Zagreb became a hub for Ryanair. 6 out of the 8 routes analysed are directly served by Ryanair, though some of them not daily. The cheapest flight of all 1008 trips analysed, was a Ryanair flight from Bratislava to Zagreb for €9.99. Extremely low prices were also found on all other Ryanair routes from and to Croatia. When a Ryanair flight is available, it is almost always the

cheapest option. But when Ryanair does not operate, the train is often the cheapest option.

The most expensive train route found in Croatia is the one from Zagreb to Rome. The flight is always cheaper and on average 3.5 times cheaper than the train trip.
On average for all routes analysed from and to Croatia, the train costs almost double compared to the polluting flight.

Routes analysed from and to Croatia

Bratislava–Split
The Croatian coastal city of Split is the only southern destination accessible by direct night train from Bratislava. There is no direct flight to Split. Transfer flights are possible either using Air Croatia via Zagreb or with Wizz Air and easyJet via London. Not surprisingly for a route within CEE, the train was cheaper on all the days analysed on this route. The cheap Wizz Air flights from Vienna (close to Bratislava) to Split were not taken into account in this analysis.

> *A single flight from Bratislava to Split via Zagreb causes 124 kg of harmful greenhouse gases per passenger. Using the 1,000 km long and winding train route could save 73% of these emissions. This CO_2 saving is equivalent to the consumption of 330 kWh of electricity (average Croatian mix), enough to run a fridge for 5 years.*

Zagreb–Prague
There is no direct flight nor a direct train connection between the Croatian and the Czech capitals. Since Zagreb has many Ryanair connections, on most days very polluting transfer flights with Ryanair via Rome, Bergamo and Paris were found to be the cheapest flights. Shorter transfer flights e.g. with Lufthansa via Munich were clearly more expensive. The best train connection would be the seasonal night train to Vienna followed by the Eurocity ("ÖBB Railjet") to Prague. But the night train is not running daily, and on all days analysed it was either not running or tickets were not available anymore. Instead of the night train, the 12h6m long day connection was analysed, which also runs with one change in Vienna. As for many other routes in Central and Eastern Europe, the train was mostly cheaper.

> *A flight from Zagreb to Prague via Rome causes 329 kg of harmful greenhouse gases per passenger, a flight via Paris causes even 615 kg, which is 86% more. The train, despite taking a complicated route via Ljubljana and Vienna, causes only 28 kg on this 850 km long route. Therefore, the train causes 95% less harmful emissions than a flight via Paris, or 91% less than a flight via Rome.*

Basel (CH)–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper only on 3 of the 9 days analysed, on average the train cost 2.3 times as much as the flight.

> *A single flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 950 km long train trip, 85% of these emissions could be saved.*

Mulhouse–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper only on 3 of the 9 days analysed, on average the train cost 2.8 times as much as the flight.

> *A single flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 980 km long train trip, 85% of these emissions could be saved.*

Freiburg(DE)–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper only on 4 of the 9 days analysed, but Ryanair did not fly on 3 of these days. On average the train cost 2.4 times as much as the flight.

> *A single flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 1,040 km long train trip, 84% of these emissions could be saved.*

Bratislava–Zagreb

Ryanair connects the Croatian and the Slovak capitals 3 times a week until the end of October, which is always the cheapest and polluting way on these days. On other days, the cheapest flights are even more polluting Ryanair transfer flights via Bergamo or Brussels. During summer time, there is a direct train connection every other day, otherwise a change in Vienna is required. The train ride takes at least 7h19m, which is quite long considering, with the train taking a complicated route via Ljubljana and being slow especially when passing Slovenia. This route was found to be the cheapest flight route of all 112 routes analysed, with prices starting from €9.99. On Ryanair direct flight days, the train is much more expensive: up to 9.5 times as much as the flight. On other days, the train was cheaper. On average, the train costs 4 times as much as the flight.

> *A direct flight from Bratislava to Zagreb causes 75 kg of harmful greenhouse gas emissions per passenger. Despite the complicated, 600 km long train route, 74% of these emissions could be saved by using the train. Based on the average Croatian electricity mix, these emissions are equivalent to the consumption of almost 200 kWh of electricity, enough to power a washing machine for up to 300 times.*

Zagreb–Rome

Although there is "only" one direct flight 4 days a week operated by Ryanair, flying is always clearly cheaper than taking the train on this route. Even transfer flights with Lufthansa via Munich, or with Ryanair and the Italian ITA via Naples are cheaper. Normally, a train trip from Zagreb to Rome only requires a change at Villach, Austria, to take the night train to Rome. However, due to construction works north of Rome during summer 2023, passengers have to leave the night train in Bologna and continue on an Italian high-speed train. The total travel time is 13h32m, the average train price found was 3.5 times as much as the flight, on one day it was almost 10 times as much.

> *A connecting flight from Zagreb to Rome via Munich causes double greenhouse gas emissions compared to a direct flight. A train ride can reduce GHG emissions on this route by around 60% compared to a direct flight (which is a bit less compared to other routes due to the train taking a long route via Austria).*

Zagreb–Luxembourg

Zagreb–Luxembourg is one of the few routes analysed without any direct connection. The best train route is a night train to Stuttgart, followed by 2 trains to Strasbourg and Luxembourg, with a total travel time of 18h35m. The cheapest flight route on most days is with Ryanair via London. This connection was found from €45.19 on. The train is cheaper on half of the days analysed, but on average, it costs 1.5 times as much as the polluting flight. On average, the train costs 1.5 times as much as the flight. On most days, the night train ticket was much cheaper than the tickets for the connecting trains from Stuttgart to Luxembourg. Long-term train tickets for the section from Stuttgart to Luxembourg were not available.

> *A connecting flight from Zagreb to Luxembourg via London causes around 550 kg of harmful greenhouse gas emissions per passenger. A train ride for the 1,110 kms causes only around 37 kg of GHG, which is 93% less than the flight. Based on the average Croatian electricity mix, the CO_2 savings would be equivalent to the consumption of 1,800 kWh of electricity, enough to power a 2-person household for a year.*

Zagreb–Munich

Ryanair is flying this route 2 to 3 times a week with extremely low prices found, starting from €15 on. Air Croatia is flying daily from Zagreb to Munich, but is clearly more expensive than Ryanair, and was never found to be the cheapest flight: on all days even more polluting transfer flights, mostly involving Wizz Air via Belgrade, were cheaper than the direct flight. There are 2 daily direct trains, one in the morning and a night train. The night train was always found cheaper than the day train. On average, the prices of trains and planes were found almost equal, with the train being cheaper on 6 out of 9 days analysed.

> *A single flight from Zagreb to Munich causes 136 kg of harmful greenhouse gas emissions per passenger. By using the train, at least 70% of these emissions could be saved.*

Munich–Split

During summer time, the German holiday airline Condor flies several times a week between Munich and Split, while Croatia Airlines and Lufthansa fly all year long. By train, all 3 possible routes include night trains, whether it is Vienna–Split[11], Budapest–Split or Munich–Zagreb. All of these routes require one transfer, but due to the slow average speed of Slovene and Croatian railways, the trip is considerably long with at least 22 hours.

For short-term booking, the polluting flight was clearly cheaper than the train, with the biggest price difference found at €309 (€89.99 vs €398.90). On the other hand, the train was much cheaper for all long-term bookings, with very low prices between €45 and €75, while the long-term flight cost between €124.60 and €160.36. On average, the train was 28% more expensive than the flight.

> *A flight from Munich to Split causes 190 kg of harmful greenhouse gas emissions per passenger. By using the train, even when taking the 1,400 km long way via Budapest, at least 70% of these emissions could be saved.*

Czech Republic

Overall situation

Due to the central location of the Czech Republic, many European countries and cities can be reached by reasonable train connections. All neighbouring countries are easily accessible by day and night trains, e.g. there are 11 direct trains a day to Vienna. Even Barcelona can be reached with a night train and connecting trains in less than 24 hours. Apart from 2 tiny airports in the Eastern Czech Republic, almost all flight traffic in Czechia goes via the Prague airport, which is also frequently used by the largest low-cost airlines.

The analysis of 7 routes into and out of the Czech Republic gives an extreme, contrasting picture. On 2 routes, flights are dominantly cheaper than the rail: these are routes to Western Europe (Brussels and Milan).
On 4 other routes, trains are almost always cheaper. 3 of them are within Central and Eastern Europe, namely to Budapest, Košice in Eastern Slovakia

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[11] The night train from Bratislava via Vienna to Split is only running during summer time.

and Zagreb. The train from Berlin to Prague was also found to be always cheaper than the flight, which is due to the unusual fact that there is no direct flight between the German and the Czech capitals (the analysis did not find any other neighbouring capital pair not directly connected by air, when the train takes longer than 4 hours). For the last route studied, Prague–Amsterdam, it depends on the day.

On average for all routes analysed for the Czech Republic, the train was found 35% more expensive than the flight.

Routes analysed from and to the Czech Republic

Berlin–Prague

Berlin and Prague are the only pair of neighbouring capitals without a direct flight and with a train distance of over 4 hours (the quickest train takes 4h25m). There are 6 daily direct train pairs. The cheapest transfer flight options would be Eurowings via Düsseldorf or the Polish LOT via Warsaw. Train tickets start from €29.90 and do not exceed €69.90 with short-term bookings. As with all train routes involving Germany, the price clearly decreases from short over mid to long term bookings. The cheapest flight found was for €129.99 and takes even a little longer than the train. So this route is practically one of the best train routes found in this analysis.

> **Using the 350 km long train route between Berlin and Prague causes less than 10 kg of greenhouse gases per person. Taking a transfer flight instead would cause at least 30 times as many harmful emissions.**

Košice (SK)–Prague

Despite Ryanair connecting the second biggest city in Slovakia situated in the East of the country, Košice, with Prague 4 times a week, the train was found cheaper on all days analysed. There are 5 direct train connections a day lasting 8h15m, one of them a night train. The day train operated by the private Czech company Regiojet was found to be the cheapest on all days, with prices between €20.90 and €39.90. The cheapest flight was found for €38.17. On days when Ryanair does not fly direct, the cheapest flights are 2 Ryanair flights via London, which are ten times more polluting than a direct flight on this route. Since these transfer flights via London are available from €57.29 on and the flight time (excluding check-in times etc.) is shorter than the train travel, it is unfortunately realistic that people would fly via London.

> *A direct flight from Košice to Prague causes 62 kg of harmful greenhouse gases per passenger. A flight from Košice to Prague via London causes 751 kg of greenhouse gases, which is 12 times more. The 705 km long train ride causes around 23 kg of GHG, which is 63% less than a direct flight, and 97% less than a transfer flight via London.*

Zagreb–Prague

There is no direct flight nor a direct train connection between the Croatian and the Czech capitals. Since Zagreb has many Ryanair connections, on most days very polluting transfer flights with Ryanair via Rome, Bergamo and Paris were found to be the cheapest flights. Shorter transfer flights e.g. with Lufthansa via Munich were clearly more expensive. The best train connection would be the seasonal night train to Vienna followed by the Eurocity ("ÖBB Railjet") to Prague. But the night train is not running daily, and on all days analysed it was either not running or tickets were not available anymore. Instead of the night train, the 12h6m long day connection was analysed, which also runs with one change in Vienna. As for many other routes in Central and Eastern Europe, the train was mostly cheaper.

> *A flight from Zagreb to Prague via Rome causes 329 kg of harmful greenhouse gases per passenger, a flight via Paris causes even 615 kg, which is 86% more. The train, despite taking a complicated route via Ljubljana and Vienna, causes only 28 kg on this 850 km long route. Therefore, the train causes 95% less harmful emissions than a flight via Paris, or 91% less than a flight via Rome.*

Milan–Prague

Milan–Prague is the most expensive train route analysed for the Czech Republic. The train is always more expensive, on average almost 5 times as much as the flight. Wizz Air is offering really low prices on this route, starting from €19.99 and not above €59.99 for a short-term booking. The best train connection is the night train to Vienna, and the connecting train to Prague. Only long-term train tickets were available below €100, but even on the cheapest train days, the flight cost less than half.

> *A single flight from Milan to Prague causes 185 kg of harmful greenhouse gas emissions. Despite the train taking a long 1,200 km route via Vienna, 78% of these emissions could be saved by using the train.*

Prague–Amsterdam

Prague–Amsterdam is daily operated by easyJet, except on Saturdays in the winter flight schedule. The best train connection is a train to Berlin, and the private European Sleeper to Amsterdam on its operating days, since the day train connections last longer than 12 hours. The train never costs much more than €100, but was found cheaper only on all 3 midterm journeys, and on one long-term trip when only KLM flies. On average, the train was 44% more expensive than the polluting flight.

> *In 2022, more than 500,000 people flew between Prague and the Netherlands, making this one of the most popular Czech short-haul flights. This route emits 116,000 tons of harmful greenhouse gases a year, 85% of which could be saved by shifting to rail – thus saving the equivalent of the annual emissions from 66,000 fossil fuel powered cars, which is approximately half of Ostrava's car fleet.*

Brussels–Prague

Ryanair and Brussels Airlines fly daily between the Belgian and the Czech capitals. The most effective train connection is an ICE to Frankfurt, followed by the night train to Prague. During the day, at least 2 train transfers are needed. The polluting flight was cheaper on 7 out of 9 days. On average, the train costs 53% more. Short-term tickets for this route were extremely expensive, the flight cost on average on the 2 short-term bookings €261.78, the train even €287.56.

> *In 2019, almost half a million passengers were flying between Brussels and Prague. Phasing out this flight would save around 40,000 tonnes of CO_2, as much as 26,000 cars emit in a year. This is approximately the car fleet size of Beveren.*

Prague–Budapest

As on some other routes in Central and Eastern Europe, the train is always cheaper than the plane on this route, despite Ryanair flying daily except Saturdays. Both the traditional Czech railway company CD as well as the private railway operator RegioJet have several train pairs per day with low prices between €21.13 and €32.77 and lasting around 6h45m. Long-term train tickets are not available. But considering the frequency of trains and the predictable price, it is less of a problem than e.g. on night train routes or on train routes with a large price range.

> **Despite the cheap train tickets, in 2022, 112,582 passengers were flying between the Czech and the Hungarian capitals, causing 14,400 tons of greenhouse gases, as much as 10,000 cars emit in a year. By banning this unnecessary short-haul flight, around 11,500 tons of GHG could be reduced.**

Denmark

Overall situation

Thanks to its quite central position in Europe, a long list of countries can be easily reached by train from Denmark. Even though the state of Denmark holds a minority ownership in the traditional SAS airline, Danish airports became quite popular among low-cost carriers such as Ryanair and easyJet with their aggressive pricing policy. 5 out of the 6 routes analysed are operated directly by low-cost carriers.

Overall, travelling from and to Denmark is comparably cheap. For all 6 routes analysed to or from Copenhagen, all to or from European capitals, train tickets are available for less than €100. Despite these acceptable train prices, polluting flights from Vienna and Berlin are almost always much cheaper than the train. On average, the train from Vienna costs 3.5 times as much as the flight, with 8 times as much as the maximum. For Denmark, the cheapest flight found is a Ryanair flight from Billund to Brussels for €15.35, which was part of the cheapest connecting flight for the London–Brussels route. A polluting Ryanair flight from Vienna was also extremely cheap with €22.91. The average train fare from Berlin was found to be 177% of the flight. There is no route analysed for Denmark where the train is always or mostly cheaper than the plane.

On average for all routes analysed for Denmark, the train was 58% more expensive than the flight.

Routes analysed from and to Denmark

Amsterdam–Copenhagen

Amsterdam and Copenhagen are connected daily by KLM, SAS and easyJet. The last one is always offering the lowest flight prices. A train ride requires at least 2 changes and takes at least 11 hours. As often with German trains, there is a large range in train costs, found from €56.90 to €209.90, with the

train being most expensive for short-term trips and cheapest for long-term trips. Flight prices were found a bit more stable, with the exception of one very expensive short-term flight. Overall, flights were found to be cheaper on 4 days, trains on 5 days. On average, trains were 6% more expensive than flights. But even on days when the train is cheaper, it is questionable whether many people will use it because of the complicated connection.

> *In 2019, more than 1.1 million people were flying on this route making it the 4th most used short-haul flights from and to Copenhagen with a train alternative. Calculated with European average emission data for planes and trains, shifting this connection fully to rail would save at least 88,000 tons of greenhouse gas emissions, equivalent to the yearly emissions of 59,000 fossil fueled cars. This is approximately the car fleet size of Aalborg. Considering that the route is mainly in Germany and the Netherlands where both railway companies use 100% renewable energy for its trains, the emission savings would be even clearly higher.*

Copenhagen–Stockholm

There are 6 direct train connections a day between the Danish and the Swedish capitals lasting a bit more than 5 hours. On the days of research, however, the direct train did not run due to construction works on some days, and on other days, the train with a transfer in Malmö was found cheaper. The air route is operated daily by the traditional airline SAS and the low-cost carrier Norwegian, with the last one always offering lower prices. On half of the days analysed, flying was cheaper. On average, the train was 1% more expensive. Long-term train tickets are not available, which is disadvantageous for rail over planes.

> *In 2019, almost 1.4 million people flew on this route making it the third most used short-haul flight from and to Denmark with a train alternative, after Copenhagen–London and Copenhagen–Oslo. Shifting this connection fully to rail would save at least 98,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of 65,000 fossil fueled cars. This is approximately the combined car fleets of Roskilde and Esbjerg.*

Vienna–Copenhagen

Ryanair flies daily between Vienna and Copenhagen, which is always the cheapest but most polluting way to travel between the Austrian and Danish capitals. Flight prices start at €22.91. The best train connection is the night train to Hamburg, followed by an Intercity train to Copenhagen. The train is

relatively expensive on this route, with an average cost of €163.36. Only on 1 out of 9 days analysed, the train was slightly cheaper than €100.

> *In 2019, 450,000 people flew between Vienna and Copenhagen. Shifting this flight completely to rail would save 45,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 30,000 fossil fuelled cars, or approximately the car fleet size of Vejle.*

Copenhagen–Oslo

The Danish and the Norwegian capitals are not well connected by train. There is a maximum of one train option per day with 2 transfers, and 2 more options with 3 transfers each. Most connections offered by the train time tables include buses. The train takes more than 10 hours, including a 90-minute waiting time at stations. In addition, train tickets are not available 4 months in advance, disadvantageous for rail over planes. 3 airlines fly this route: Norwegian, Wideroe and SAS which all were the cheapest on at least one day. The flight price is below €70 on 7 out of 9 days analysed. The plane was cheaper on all 3 short-term bookings, the train was cheaper on all 3 mid-term bookings. On average, the train was 16% more expensive than the polluting plane.

> *In 2019, 1,500,000 people flew between Copenhagen and Oslo making it the second most used short-haul flight route for Denmark with a train alternative. Shifting this flight completely to rail would save 93,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 62,000 fossil fuelled cars, or approximately the car fleet size of Aalborg.*

Copenhagen–Brussels

Only the traditional airlines SAS and Brussels Airlines fly to the Belgian capital. On 5 out of 9 days, even more polluting transfer flights were cheaper than direct flights, e.g. with Ryanair via Manchester or Finnair via Helsinki. The train takes at least 12h09m and requires 2 transfers in Hamburg and Cologne. As with many other train routes using Deutsche Bahn, the train was cheaper with all long-term bookings but more expensive with all short-term bookings. On average, trains and planes cost almost the same price on this route.

> *In 2019, almost 600,000 people flew between Copenhagen and Brussels. Shifting this flight to rail would save 57,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 38,000 fossil fuelled cars.*

Berlin–Copenhagen

5 airlines fly between Berlin and Copenhagen: SAS, Lufthansa, Norwegian, easyJet and Eurowings, with the last 2 ones always found to be the cheapest airlines and also always clearly cheaper than the eco-friendly train. Berlin and Copenhagen are well connected by train, with 7 day trains a day with one transfer in Hamburg, lasting 7h7m, and the night train from Berlin to Stockholm running via Copenhagen. For this analysis, only the quick day train was considered. There is a large difference in the price of trains on this route for the different time perspectives. Short-term train tickets cost €141.13 on average, mid-term €89.90 and long-term €49.90. But despite these quite cheap train tickets for long-term bookings, they were more than 50% more expensive than the polluting easyJet flights. On average for all 9 trips, the train was 77% more expensive than the flight.

In 2019, 629,000 people flew between Berlin and Copenhagen. Shifting this flight completely to rail would save 27,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 18,000 fossil fuelled cars, or approximately the car fleet size of Brøndby.

Finland

Due to geography and the geopolitical situation, there is currently no train connection leaving Finland, not even to Sweden. Trains in Finland operate frequently and are quick. Even the most northern city with a train station, Rovaniemi, can be reached within 8 hours from Helsinki. There is a network of domestic flights, all of them operated by Finnair, majority-owned by the Finnish state.

Helsinki–Oulu

In this report, the only route analysed is the domestic one from Helsinki to Oulu. The train was always found cheaper than the flight, with an average of 46% of the flight price. The cheapest train ticket found cost €17.90. Only one short-term train ticket cost close to €100, all other tickets were available for less than €50. Similar results are expected for other domestic routes, such as from Helsinki to Rovaniemi.

A single Finnair flight from Helsinki to Oulu causes 168 kg of climate damaging emissions per passenger. By taking the 650 km long train trip, 87% of these emissions could be saved. With the relatively low carbon intensity of the Finnish electricity mix, the savings are equivalent to around 3,500 kWh of electricity – which is approximately the annual consumption of an average 2-person household including electric warm water production.

France

Overall situation

France is one of the countries where booking flights is dominantly cheaper than trains. On 9 out of 10 international routes analysed to or from Paris, the plane is almost always or always cheaper than the train. On 17 of 20 routes analysed for France in total, the flight was dominantly cheaper, on other 2 routes the train was cheaper only on a few days, but more expensive on average. The only exception for France is the route Geneva–Paris, where the train was cheaper on 7 out of 9 days analysed.

On average, a train ticket for all routes for France cost 2.6 times as much as a flight. This is the 4th highest train price compared to flights for all countries analysed after the UK, Spain and Belgium. For Germany, the train cost factor is significantly lower at 1.5 times. With a train ticket costing more than 12 times the price of the flight for a trip on one day and on average almost 8 times as much, Valencia–Paris is the route with the highest price difference found for France. Only slightly lower train costs were found for Marseille–London.

The 2 domestic flights analysed were generally cheaper than the trains: on the most used flight route in France, Toulouse–Paris, the flight is cheaper on 6 out of 9 days analysed. Travelling from Bordeaux to Strasbourg is always cheaper by plane, except on Saturdays when there is no direct flight and on one more long-term trip. These two routes can be travelled by train in less than 6 hours.

The polluting flight was always significantly cheaper on routes to and from Spain, Italy, the UK, the Netherlands and Hungary.

While the eco-friendly train from Paris to Berlin was more expensive on all days, costing double on average, the trains were cheaper on some days on the other 2 routes analysed between France and Germany, Nice–Munich and Marseille–Berlin. For both of these routes, affordable day and night trains exist for large parts of the trips. Aside from that, Nice–Munich is the only analysed route for France without a direct low-cost airline flight, and Ryanair flies the Marseille–Berlin route only 4 times a week.

Greenpeace France cheers rail users in Gare du Nord, Paris, 2022.
©Claire Jaillard / Greenpeace

Routes analysed within, from and to France

Lyon–Madrid

Iberia and its low-cost subsidiary Vueling fly daily between Lyon and Madrid, and from September 2023 Volotea will fly twice a week. By train, only one change is required from mid-July from Friday to Monday with the new Spanish RENFE train service between Lyon and Barcelona. From autumn 2023, this train will run daily. On some days analysed, the TGV train from France to Barcelona was already sold out, and then 4 changes in total were needed. The polluting flight was cheaper on 8 out of 9 trips. Only one long-term trip using the new Spanish train was cheaper. On average, the train cost twice as much as the flight.

> *In 2022, 203,000 people flew between Lyon and Madrid, causing 61,000 tons of harmful greenhouse gases. Using the 1,250 km long train route could reduce these emissions by 86%.*

Paris–Milan

Both easyJet and Ryanair fly daily between Paris and Milan, and there is also a direct TGV train. On 8 out of 9 days analysed, the flight is cheaper, with prices between €25.99 and €79.25. The most expensive train ticket costs almost 3 times as much as a flight. Short-term train tickets are not available below €149. Only on a single day analysed, the train was found 16% cheaper.

> *In 2019, more than 2.1 million people flew on this route. Shifting to rail would save around 175,000 tons of CO_2, the equivalent of the annual emissions of more than 115,000 cars. This is approximately the complete car fleet of Lille.*

Paris–Berlin

EasyJet and Air France fly daily between Paris and Berlin, Transavia daily except Saturdays. easyJet was always the cheapest option on this route and also always cheaper than the greener train. There is no direct train connection, the trip requires at least one transfer. The cheapest flight ticket was available for €31.25, only one out of the 9 flights analysed cost a bit more than €100. Short-term train tickets were not available for less than €169.90, the most expensive ticket cost €323.70. Long-term train tickets are available for less than €80, but still all 3 of them are at least 55% more expensive than the flight.

Buying train tickets from Paris to Berlin can be much cheaper from the Deutsche Bahn than from SNCF for the same train connection (e.g. €206.60 versus €79). The easiest way from Paris to Berlin is the Thalys train from Paris to Cologne, but Thalys is not selling tickets for a longer period than 3 months in advance.

> *In 2019, around 1.3 million people flew between Paris and Berlin. Shifting to rail would save around 140,000 tons of CO_2, the equivalent of the annual emissions of more than 93,000 fossil fuelled cars, or approximately the emissions of all cars registered in Reims.*

Madrid–Paris

The flight was always found to be clearly cheaper on this route, the cheapest train was 61% more expensive than the flight, the most expensive train cost almost 4 times as much. The cheapest flights are offered by easyJet, Ryanair, Vueling and Transavia, who all fly directly between the 2 capitals. The train takes 10h18m, and requires one change at Barcelona. For one short-term trip, all trains were booked out.

In 2019, more than 2.5 million passengers were travelling on this route (both-way). Shifting to rail would save 302,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of 200,000 cars. This is more than the car fleet size of Nice.

Bordeaux–Strasbourg

Bordeaux–Strasbourg is one of the longest domestic flight routes in France. The Spanish low-cost airline Volotea flies daily except Saturdays on this route. On Saturdays, the cheapest transfer flight is also operated by Volotea and goes via Corsica. There is only one direct train connection per day, but hourly connections are available with a transfer in Paris. The quickest train connection takes only 4h52m. The train was only cheaper on the 2 Saturdays analysed and on one more long-term trip. On average, the train was 64% more expensive than the flight.

Despite the very good train connection, more than 130,000 people flew on this route in 2019, causing 34,000 tons of harmful greenhouse gases (265 kg per passenger). Banning this unnecessary short-haul flight and replacing it with the 950 km long train route could reduce these emissions by 84%.

Paris–Rome

As with most other routes between Europe's largest capitals, the climate-killing flight was cheaper on all days analysed. Low-cost airlines Wizz Air and Vueling are among those flying between the 2 capitals. There is no direct train between Paris and Rome, at least one transfer is needed in Milan or Torino. The minimum train travel time is 10h12m, there is no night train running between France and Italy. Flight tickets start low at €29.99. The cheapest train ticket cost €73.90, while all short-term train tickets cost more than €200, and all mid-term more than €100. On average, the train cost more than twice as much as the plane on this route.

> *In 2019, 2.25 million people flew between Paris and Rome (both-ways). Shifting this flight to rail would save 308,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 205,000 cars. This is almost the car fleet of Toulouse.*

Geneva–Paris

Geneva–Paris is the most popular route in Europe for private jets. For the more modest, the choice is between a polluting easyJet flight, or one of the 8 daily direct high-speed trains that take only 3h13m. This route was one of the few routes analysed where, despite being operated by easyJet, the train was mostly cheaper, with train ticket prices between €29.50 and €93.70.

> *Despite the perfect train connection, in 2019, 1,059,000 people flew between Geneva and Paris. Banning this flight would save 57,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 38,000 fossil fuelled cars, or approximately the complete car fleet of Cannes.*

Paris–London

As for all other large capitals analysed, the polluting flight from Paris to London was clearly cheaper on all days analysed, with the train costing more than twice as much on average. The 2 low-cost airlines easyJet and the Spanish Vueling always have the cheapest prices, traditional airlines such as Air France and British Airways were always more expensive. There are 16 daily and direct Eurostar train connections lasting 2h17m between Paris and London. The average flight price was low at €45.41. The cheapest Eurostar ticket was found for a long-term trip for €57, the most expensive train ticket even cost €132 for this quite short trip.

> *Despite the perfect train connections, in 2019, more than 2.1 million people flew between Paris and London. Banning this useless short-haul flight would save 98,000 tonnes of harmful greenhouse gases. This is equivalent to the yearly emissions of 65,000 fossil fuelled cars, or approximately to the complete car fleet of Perpignan.*

Toulouse–Paris

In 2019, Toulouse–Paris was the most used short-haul flight route in the EU, although the fact that there are 10 daily direct train connections, with the fastest one lasting only 4h21m. As on most French routes, a low-cost airline is dominating the market, in this case easyJet. The polluting flight was

found cheaper on 6 out of the 9 days analysed, with the train being 19% more expensive on average than the plane. The most expensive train ticket at €208.50 was found on a short-term booking, when all TGV high-speed trains from Toulouse to Paris were sold out already and an alternative train route with 3 transfers had to be booked.

In 2019, more than 3.2 million people flew between Toulouse and Paris, making it the EU's most used short-haul flight with a rail alternative. Banning this useless flight and shifting to rail would save 244,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 163,000 fossil fuelled cars, or approximately to the car fleet of Nantes.

Mulhouse–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper only on 3 of the 9 days analysed, on average the train cost 2.8 times as much as the flight.

A single flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 980 km long train trip, 85% of these emissions could be saved.

Budapest–Paris

There are daily direct flights by the 2 low-cost airlines Ryanair and Wizz Air between the Hungarian capital of Budapest and Paris, in addition Air France is operating on that route. The best train connection includes a night train, either from Budapest to Stuttgart or from Vienna to Paris. The former was always the cheapest train option found. The night train to Stuttgart was always affordable, with prices between €29.90 and €89, but the TGV or the ICE from Stuttgart to Paris was up to 3 times as expensive as the night train, resulting in the flight being always cheaper than the train. On one day, an even more polluting transfer flight with Ryanair via Bergamo, Italy, was available for less than half the price of the direct flight (€77.10 vs €162).

In 2022, 480,000 passengers were flying between the 2 cities, causing 179,000 tons of harmful greenhouse gas emissions. A train trip on this 1,480 km long route could save around 87% of these emissions. The saving is equivalent to the yearly emissions of 103,000 fossil fuelled cars.

Nice–Amsterdam

The 2 low-cost airlines easyJet and Transavia fly daily between Nice and Amsterdam with easyJet always the cheaper airline. The most effective train connection is the night train to Paris and the Thalys to Amsterdam. The polluting plane was always cheaper on this route, on average the train cost 1.8 times as much as the plane. On one mid-term trip, all trains were booked out, and for the Thalys tickets cannot be bought more than 4 months in advance.

In 2019, 480,000 passengers were flying between Nice and Amsterdam. Shifting these flights to rail would save at least 55,000 tonnes of harmful greenhouse gas emissions, equivalent to the yearly emissions of 37,000 fossil fuelled cars. This is approximately the car fleet size of Colmar.

Nice–Munich

The only airline directly flying between Nice and Munich is Lufthansa. On all 9 days analysed, transfer flights with other airlines were cheaper. On most days, Lufthansa low-cost subsidiary Eurowings was cheaper via Düsseldorf, Cologne or Hamburg. On one day, easyJet via London was the cheapest flight, on another day it was Wizz Air via Bucharest. The train trip from Nice to Munich includes a night train, either via Paris, or with one more transfer the night train from Genoa to Munich. The cheaper ticket depends on the time. The polluting flight cost half with the shortest booking, but was more expensive with the other 2 short term dates. The polluting flight was cheaper on all mid-term trips, while the train was cheaper on all long-term trips. On average, the train was 6% more expensive than the flight. A typical result for a long route which is not directly served by low-cost airlines.

A direct Lufthansa flight from Nice to Munich causes 198 kg of harmful greenhouse gases per passenger. A transfer flight via Hamburg causes more than 2.5 times as much as a direct flight. The 880 km long train trip causes 29kg of greenhouse gases, which is 85% less than a direct flight, and 94% less than a transfer flight via Hamburg.

Marseille–Berlin

During the summer period, Ryanair is the only airline flying 4 times a week between Marseille and Berlin. On other days, even more polluting flights via Italy or Switzerland were the cheapest flight options. The most efficient

train option runs via Karlsruhe and takes 12h21m. It is also possible to use one of the night trains Zurich-Berlin or Brussels-Berlin. The night train options were found more expensive than the day trains on this route. While ticket prices from the French Railway company SNCF were always much more expensive than the flight, ticket prices from Deutsche Bahn were found cheaper than the flight on 5 out of the 9 days analysed, among them all long-term trips. On average, the train was 11% more expensive than the flight.

> *A direct flight from Marseille to Berlin causes 353 kg of harmful greenhouse gases per passenger. The 1,600 km long train trip causes 53 kg of greenhouse gases, which is 85% less than a flight.*

Toulouse–Barcelona

Despite 3 daily and very fast train connections with the fastest of which takes only 3h42m, with a transfer in Narbonne, the Spanish low-cost airline Vueling started a direct flight on 3 days per week from July. The polluting flight is always clearly the cheapest option, even on days when a transfer flight via the Balearic Islands is needed. On average, the train cost 3.3 times as much as the flight and is not available below €109. The most expensive flight found cost €85.74.

> *A direct flight from Toulouse to Barcelona causes 57 kg of harmful greenhouse gases per passenger. A transfer flight via Palma de Mallorca causes 3.4 times as much as a direct flight. The 400 km long train trip causes 13 kg of greenhouse gases, which is 91% less than less than a transfer flight via Palma. The saved greenhouse gases are equivalent to 1,000 kWh of average French electricity — enough to power a fridge with a freezer compartment for 10 years.*

Paris–Venice

Both of the largest low-cost airlines, easyJet and Ryanair, fly daily from Paris to Venice. While easyJet uses the main airport of Venice, Ryanair flies to nearby Treviso. The best train connection lasts 9h44m with one transfer in Milan. Alternatively, the night trains from Stuttgart or Augsburg can be used for this route. For this analysis, all these train options were considered, and both day and night trains were found cheaper on different days. Long-term train tickets cost less than €84. However, the polluting flight was always much cheaper. The average price of a train ticket is more than twice the price of a flight.

Marseille–London

Marseille–London is one of the quickest and best long-distance train connections in Europe. The 1,300 km long train trip takes just 7h26m with only one change in Paris or Lille, and there are 9 train connections on most days. By air, the 2 cities are connected by both low-cost airlines easyJet and Ryanair. As with all other routes to the UK, the polluting flight is always clearly cheaper. On average, the train cost almost 7 times as much as the flight, on one day even more than 12 times as much. Flights are extremely cheap on this route, with an average price of €35.76, which would not be possible without the many subsidies these airlines receive.

Valencia–Paris

Like most other routes in Spain and France, this route is also daily operated by polluting low-cost airlines. In this case, it is the Spanish Vueling and the French Transavia fighting against each other with the lower prices. The train connection takes a bit more than 14 hours. While only one train transfer was required in June 2023, two transfers were required (in Madrid and Girona) in the summer and autumn of 2023. The polluting flight is always clearly cheaper than the greener train. Out of all 9 days analysed, the cheapest train compared to the flight cost 3.8 times as much as the flight, the most expensive train cost more than 12 times as much.

Marseille–Rome

Southern France and Italy are not well-connected by train: at least 2 changes are required on that route. On some days, it was possible to take

the night train from Turin to Rome, on other days a change in Paris was required; another option was a train trip with 3 transfers and regional trains along the Ligurian coast. By air, Ryanair flies daily on this route. The eco-friendly train was always more expensive than the flight, on average the train cost 4.5 times as much as the plane.

> **A flight from Marseille to Rome causes 189 kg of harmful greenhouse gases per passenger. The shortest train route via Nice with 920 km, causes only 30 kg of greenhouse gases per passenger.**

Paris–Vienna

Since 2021, the most effective and greenest way to travel from Paris to Vienna is the direct night train. However, it runs only 3 times a week, and due its new popularity, the night train was already booked out on some days analysed. On days when the night train was available, it cost around half of day trains via Frankfurt or Zurich on other days. But even the relatively affordable night train was always clearly more expensive than a polluting flight by Ryanair and Transavia. Only on one short-term booking, when Ryanair was booked out, the night train was one third cheaper than the flight with Austrian Airlines. On average, the train cost 2.4 times as much as the polluting flight.

> *In 2019, more than 944,000 people flew between Paris and Vienna. Shifting this flight fully to rail would save around 122,000 tons of harmful greenhouse gases per year, equivalent to the yearly emissions of 81,000 fossil fuelled cars. This is approximately the car fleet size of Grenoble.*

Germany

Overall situation

Germany, due to its central position in Europe and frequent international train connections to all its neighbouring countries, is connected to a lot of countries by reasonable train connections. From Berlin, only 5 other capitals analysed cannot be reached reasonably, namely Madrid, Lisbon, Oslo, Bucharest and Sofia. Barcelona can be reached from Southern and Western Germany, Bucharest could be reached by train from Munich. Tickets sold by Deutsche Bahn DB are generally cheaper than comparable

tickets e.g from the French railway operator SNCF, though there is often a huge price difference found between short-term and long-term bookings.

The German airports are not yet that dominated by low-cost airlines as eg. Italian, Spanish or UK airports. Eurowings as the German low-cost airline is present at all German airports analysed, but does not have as aggressive a pricing policy as easyJet or Ryanair.

The findings from the analysis of 31 routes within, from and to Germany are dependent on the corresponding countries:

- Taking a plane is always or almost always cheaper on routes analysed from and to Spain, Italy, UK, the Nordic countries and France (except Southern France where the train is cheaper on some days but more expensive on average).
- On longer routes from and to Central and Eastern European countries, trains and planes are cheaper on different days, depending on whether low-cost companies are operating or not. The cheapest prices of all trips analysed are generally flight tickets. On shorter routes, such as from Berlin to Prague and from Warsaw to Berlin, the train is always cheaper.
- When travelling from and to Switzerland, the train is almost always cheaper.
- The routes analysed to and from the BENELUX countries, and Austria gave a completely mixed picture, with the flight often cheaper on routes operated by Ryanair, easyJet or Eurowings.

On the domestic flight from Hamburg to Munich, the train was always cheaper, on the route from Stuttgart to Berlin the train was cheaper on 6 out of 9 days analysed. Germany is one of the few countries applying a much higher VAT rate for domestic flights than for trains (19% and 7% respectively), which helps the train being competitive. Without this taxing scheme, the flight from Stuttgart to Berlin would have been cheaper on one more trip.

Overall, on average on all routes analysed within, from and to Germany, train tickets were 51% more expensive than flights. The most expensive train route found for Germany is Manchester–Cologne: on average the train cost 5 times as much as the polluting flight.

A forest fire breaks out in Frohnsdorf, Brandenburg, Germany, June 2022.
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Routes analysed within, from and to Germany

Berlin–Prague

Berlin and Prague are the only pair of neighbouring capitals without a direct flight and with a train distance of over 4 hours (the quickest train takes 4h25m). There are 6 daily direct train pairs. The cheapest transfer flight options would be Eurowings via Düsseldorf or the Polish LOT via Warsaw. Train tickets start from €29.90 and do not exceed €69.90 with short-term bookings. As with all train routes involving Germany, the price clearly decreases from short over mid to long term bookings. The cheapest flight found was for €129.99 and takes even a little longer than the train. So this route is practically one of the best train routes found in this analysis.

> **Using the 350 km long train route between Berlin and Prague causes less than 10kg of greenhouse gases per person. Taking a transfer flight instead would cause at least 30 times as many harmful emissions.**

Zurich–Berlin

Lufthansa and easyJet fly daily between Zurich and Berlin. There are 5 direct train connections a day, one of them a night train. The fastest train takes 8h32m. The day connections were always cheaper than the night

train, and starting from €49.90. Very rare in this analysis, despite a daily presence of easyJet, the train was found cheaper on 8 out of the 9 days analysed.

> *In 2019, more than 1.1 million passengers were counted on this route. Shifting this route completely to rail would save 97,000 tons of harmful greenhouse gases, as much as the yearly emissions of 65,000 fossil fuelled cars. This is approximately the car fleet size of Wolfsburg.*

Budapest–Berlin

Ryanair flies daily on this route, Wizz Air 6 times a week. The railways offer 2 direct daily connections, a day and a night train with the day train taking 11h33m. Untypically for routes which are operated by low-cost carriers, the train was found cheaper on 6 out of the 9 days analysed. The day train was always cheaper on this route than the night train. Even on average, the train was 25% cheaper than the flight.

> *A flight from Budapest to Berlin causes 221 kg of harmful greenhouse gas emissions per passenger. The 880 km long train ride causes 29 kg of GHG, or 87% less than the flight.*

Brussels–Hamburg

The Lufthansa subsidiary Brussels airlines is the only airline directly flying between Brussels and Hamburg. The quickest train takes 6h26m, with an inevitable connection in Cologne. This route has a very high price variety, with trains ranging from only €29.90 to €178.90, and flights ranging from €62.61 to €272.21. The train was cheaper on all days analysed.

> *A single flight from Brussels to Hamburg causes 183 kg of CO_{2e} per passenger. Since German railways use 100% renewable electricity for their ICE trains in Germany, and Thalys reports a very low CO_2 emission per passenger[12], the train emissions are only a few percent of the flight on this route.*

Hamburg–Munich

Hamburg–Munich is the route analysed with most direct train connections: around 45 train pairs are running between the 2 cities in North and South Germany, the quickest train takes 5h56m. The train was always found

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[12] 8.5 gram CO_2/pkm

cheaper on this route, on average the train cost half of the Eurowings or Lufthansa flight. Considering the time and frequency of the train, from an environmental point of view, the flight between Hamburg and Munich has to be banned.

> *Despite the perfect train connection, in 2022, 1,039,000 people flew between Hamburg and Munich, causing 161,000 tons of harmful greenhouse gas emissions. This is equivalent to the yearly emissions of 107,000 fossil fuelled cars, or approximately the complete car fleet of Kassel.*

Naples–Düsseldorf/Cologne

The low-cost subsidiary of Lufthansa, Eurowings, flies daily between Naples and Düsseldorf, which is near Cologne and has a much larger airport. However, on all mid-term bookings, even more polluting transfer flights with even cheaper low-cost carriers such as Ryanair and Wizz Air via Venice or Bergamo were much cheaper than direct flights. The best day train takes 14h17m with 2 transfers in Milan and Frankfurt. Alternatively, the night train from Bologna to Munich could be used, but was more expensive than the day train on the days analysed. Long-term train tickets were not available. The polluting flight was cheaper on all days analysed, with the train costing almost 3 times as much as the flight.

> *A flight from Naples to Düsseldorf causes 381 kg of harmful greenhouse gases per passenger. The 1,650 km long train trip could save 86% of these emissions. Based on the average German CO_2 intensity for electricity, the savings are equivalent to power a fridge with a freezer compartment for almost 10 years.*

Paris–Berlin

EasyJet and Air France fly daily between Paris and Berlin, Transavia daily except Saturdays. easyJet was always the cheapest option on this route and also always cheaper than the greener train. There is no direct train connection, the trip requires at least one transfer. The cheapest flight ticket was available for €31.25, only one out of the 9 flights analysed cost a bit more than €100. Short-term train tickets were not available for less than €169.90, the most expensive ticket cost €323.70. Long-term train tickets are available for less than €80, but still all 3 of them are at least 55% more expensive than the flight.

Buying train tickets from Paris to Berlin can be much cheaper from the Deutsche Bahn than from SNCF for the same train connection (e.g. €206.60 versus €79). The easiest way from Paris to Berlin is the Thalys train from Paris to Cologne, but Thalys is not selling tickets for a longer period than 3 months in advance.

> *In 2019, around 1.3 million people flew between Paris and Berlin. Shifting to rail would save around 140,000 tons of CO_2, the equivalent of the annual emissions of more than 93,000 fossil fuelled cars, or approximately the emissions of all cars registered in Potsdam.*

Munich–Gothenburg

The only direct connection between the Bavarian capital and the second largest Swedish city is with Lufthansa. On 8 out of the 9 days, an even more polluting transfer flight was much cheaper than a direct flight. In most cases, the German low-cost carrier Eurowings was the cheapest with a transfer flight via Düsseldorf. A train trip takes 16h27m and requires two transfers in Hamburg and Copenhagen. Long-term train tickets are not available for this route. The polluting flight was cheaper on 5 out of the 6 days analysed. The most expensive train ticket was found for a short-term booking at €469.39.

> *A direct flight from Munich to Gothenburg causes 310 kg of harmful greenhouse gases per passenger. Since the train runs in its largest part in Germany and Sweden with 100% renewable electricity, at least 95% of these emissions could be saved by shifting to rail.*

Salzburg–Cologne

Eurowings flies four times a week between Salzburg and Cologne, on the other days the airline flies to Düsseldorf which is very close to Cologne. There is one direct train connection, and numerous train connections with one transfer. The polluting flight was always cheaper than the train, with flight prices found from €59.99 on, while the train ticket was expensive, at €154.80 for all days analysed. On average, the train was almost twice as expensive as the flight.

> *A flight from Salzburg to Cologne causes 134 kg of harmful greenhouse gases per passenger. Since the train runs in its largest part in Germany with 100% renewable electricity, almost all emissions could be saved by shifting to rail. This saving would be equivalent to the CO_2 emissions of*

Manchester–Cologne

Ryanair flies 5 to 6 times a week from Manchester to Cologne, on most other days an even more polluting transfer flight via Dublin was the cheapest option. The flight was always much cheaper on this route than the eco-friendly train. On average, a train ticket costs almost 5 times as much as a plane ticket – on no other route analysed for Germany did the train cost more on average. On 2 mid-term bookings, the train price was more than 10 times as much. The train trip takes only 7h40m and requires transfers in London and Brussels, with travel options every 2 hours.

In 2022, more than 71,000 passengers were flying between Manchester and Cologne, causing more than 15,000 tonnes of harmful greenhouse gas emissions. The 920 km long train trip causes only one seventh of harmful emissions.

Timișoara(RO)–Munich

Timișoara, located in South–West Romania, and Munich are connected by 3 daily Lufthansa flights, Wizz Air is flying 3 times a week. This high demand can be explained by the number of expats from this area. Unlike most of the other routes analysed, there is no significant price difference between Lufthansa and Wizz Air, with Lufthansa prices starting at €64.20. By train, one transfer in Budapest is required. The trip takes 13h28m and it is necessary to purchase 2 separate tickets to and from Budapest. The train is more expensive than the polluting flight on 5 out of 9 trips analysed. On average, the train is also slightly more expensive. During the research, huge price differences were found on this route among the railway operators: for the exact same train from Budapest to Munich, the Hungarian railway company MAV charged €36, the German railway company DB €89.90 and the Austrian railway company ÖBB €144.10.

A single flight from Timișoara to Munich causes 265 kg of harmful greenhouse gases per passenger. Using the 960 km long train could save 88% of these emissions. This saving is equivalent to the consumption of 660 kWh of electricity (average German mix), enough to power a fridge for more than 10 years.

Vienna–Berlin

There are only 2 direct trains between the Austrian and the German capitals, one of them a night train. In addition, during the day there are several train connections with one transfer, the quickest connection takes 8h16m. The Lufthansa subsidiary Austrian Airlines is the only airline with direct flights. The train is relatively affordable on this route and always cheaper than the polluting plane: on 8 out of 9 days analysed, the train ticket cost between €29.10 and €63.40 with the night train having the lower prices for long-term bookings. Only with one short-term booking, the train cost more than €100.

> *Despite the good and affordable train connections, in 2019, 967,000 people flew between Vienna and Berlin. Shifting these flights completely to rail would save 64,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 43,000 fossil fuelled cars, or approximately the car fleet of Bayreuth.*

Berlin–Graz

Eurowings flies 5 times a week between Berlin and the second largest Austrian city, Graz. The lowest Eurowings price of all routes analysed was found on this connection: €33. On other days, either an Austrian Airlines flight to Vienna, with a codesharing train from Graz to Vienna, was found to be the cheapest flight, or with Eurowings via Mallorca. There is a direct day and a direct night train on this route, and several day connections with one transfer. Generally, the train is relatively affordable. On 7 out of 9 days, the train cost between €29.10 and €77.90, only on 2 short-term trips the price was a bit over €100. The cheapest train ticket was for the night train. Overall, the train was cheaper than the polluting flight on 5 out of 9 days spread over all time perspectives, including both days without direct Eurowings flight.

> *A flight from Berlin to Graz causes 199 kg of harmful greenhouse gases per passenger. Since both the German and the Austrian railway companies are using 100% renewable electricity for the trains on this route, almost all these emissions could be saved by using the train. Based on the average German electricity mix, running a fridge would cause the same CO_2 emissions in around ten years.*

Freiburg–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper on 4 of the 9 days analysed, but Ryanair did not fly on 3 of these days. On average the train cost 2.4 times as much as the flight.

> *A single **flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 1,040 km long train trip, 84% of these emissions could be saved.***

Stockholm–Berlin

The best way to travel by train between Stockholm and Berlin is taking one of the 2 night trains which are relatively new and operated by the Swedish state railway company SJ and the private railway company Snälltåget respectively. The best way to travel by train between Stockholm and Berlin is taking one of the 2 night trains which are relatively new and operated by the Swedish railway company. By air, 4 airlines are competing – easyJet, Eurowings, Norwegian and SAS. All of them were found the cheapest at least once, even SAS. Tickets for the night train cannot be bought 4 months in advance, which is disadvantageous for rail. On one day, both night trains were booked out already, therefore only 5 days could be analysed. The train was cheaper on 3 of them, but on average the train was 20% more expensive than the polluting flight.

> *In 2019, 516,000 people flew between Stockholm and Berlin. Shifting these flights to rail would save 49,000 tons of harmful greenhouse gases, as much as the annual emissions of 33,000 fossil fuelled cars. This is approximately the car fleet size of Plauen.*

Oslo–Hamburg

Due to poor train connections from Norway to Denmark, Hamburg is the furthest large foreign city that can be reasonably reached by train from Oslo. The best rail trip with only one transfer takes 22h39m, and uses the night train from Stockholm to Berlin on the section from Södertälje to Hamburg. Södertälje can be reached directly from Oslo by Intercity train. There are some faster train connections, with more changes, or including a bus. On air, the 2 low-cost airlines Norwegian and Eurowings are competing. Except for one day, the polluting flight was always cheaper than the train.

Tickets for the night train cannot be bought 4 months in advance, which is disadvantageous for rail. On one day, both night trains were booked out already, therefore only 5 days could be analysed. On one mid-term trip, the train cost 8 times as much as the flight, and was also the most expensive train ticket of all routes analysed, at €666.47 resulting from the single-bed sleeper as the only ticket category available for this day.

> *A single flight from Oslo to Hamburg causes 245 kg of harmful greenhouse gases per passenger. The 1,440 km long train trip could save around 72% of these emissions. This saving is equivalent to the consumption of 800 kWh of gas, enough to cook on a gas cooker for a full year.*

Berlin–Brussels

Ryanair and Brussels Airlines fly daily between Berlin and Brussels. A direct night train operated by the private company European Sleeper runs 3 times a week. Several day train options with one transfer also exist, lasting less than 7 hours. On all days analysed, the day train was cheaper than the night train, or not available. Despite train tickets starting low from €39.90, the polluting Ryanair flight was cheaper than the train on 8 out of 9 days. Only on one short-term trip, an even more polluting transfer flight with Finnair via Helsinki was the cheapest way. On average, the train cost 63% more than the plane on this route.

> *In 2019, 513,000 people flew between Berlin and Brussels. Shifting this flight fully to train would save 44,000 tons of harmful greenhouse gases, equivalent to almost 30,000 fossil fuelled cars. This is approximately the car fleet size of Görlitz.*

Berlin–Copenhagen

5 airlines fly between Berlin and Copenhagen: SAS, Lufthansa, Norwegian, easyJet and Eurowings, with the last 2 ones always found to be the cheapest airlines and also always clearly cheaper than the eco-friendly train. Berlin and Copenhagen are well connected by train, with 7 day trains a day with one transfer in Hamburg, lasting 7h7m, and the night train from Berlin to Stockholm running via Copenhagen. For this analysis, only the quick day train was considered. There is a large difference in the price of trains on this route for the different time perspectives. Short-term train tickets cost €141.13 on average, mid-term €89.90 and long-term €49.90. But despite these quite cheap train tickets for long-term bookings, they were

more than 50% more expensive than the polluting easyJet flights. On average for all 9 trips, the train was 77% more expensive than the flight.

> *In 2019, 629,000 people flew between Berlin and Copenhagen. Shifting this flight completely to rail would save 27,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 18,000 fossil fuelled cars, or approximately the car fleet size of Crailsheim.*

Warsaw–Berlin

By air, the Polish and the German capital are only directly connected by the state owned Polish airline LOT. A one-way ticket is not available for less than €132.15. On most days, cheaper transfer flights with low-cost carriers via Riga, Bologna or Copenhagen are available, starting from €55.66. The train connection is good with 5 daily direct train pairs lasting a bit less than 6 hours. Like for many other routes in Central and Eastern European countries, the train was found cheaper on all days, with a range from €27.90 to €49.90. Long-term train tickets are not available for this route.

> *A single flight from Warsaw to Berlin causes 332 kg of harmful greenhouse gas emissions per passenger. Despite the high coal share in the Polish electricity mix, at least 70% of these emissions can be saved by shifting to rail. In Germany, with the average electricity mix, running a fridge for more than 10 years causes the same amount of climate-damaging emissions.*

Zagreb–Munich

Ryanair is flying this route 2 to 3 times a week with extremely low prices found, starting from €15 on. Air Croatia is flying daily from Zagreb to Munich, but is clearly more expensive than Ryanair, and was never found to be the cheapest flight: on all days even more polluting transfer flights, mostly involving Wizz Air via Belgrade, were cheaper than the direct flight. There are 2 daily direct trains, one in the morning and a night train. The night train was always found cheaper than the day train. On average, the prices of trains and planes were found almost equal, with the train being cheaper on 6 out of 9 days analysed.

> *A single flight from Zagreb to Munich causes 136 kg of harmful greenhouse gas emissions per passenger. By using the train, at least 70% of these emissions could be saved.*

Ljubljana–Hamburg

There is no direct connection on this route, neither by rail nor by air. The train includes a night train, either from Munich or to Augsburg, and the quickest connection takes 16h14m. On 4 out of 9 days analysed, the flight was cheaper, with the cheapest price of all 9 days analysed at €104 via Belgrade. The cheapest train ticket was found for €136.60. On average the train was 1% cheaper.

> *A flight from Ljubljana to Hamburg via Belgrade causes 505 kg of harmful greenhouse gas emissions per passenger. A train ride could reduce these emissions by 92%.[13] Based on the German electricity mix, the saving is equivalent to the consumption of 1,300 kWh of electricity, enough to power a single household for half a year.*

Rome–Berlin

The air market between the Italian and the German capital is shared by the 2 low-cost airlines Ryanair and easyJet, no traditional airline flies this route anymore. In normal times, the best train connection is the night train from Rome to Munich, followed by an ICE to Berlin. However, due to construction works during summer 2023, the night train does not run between Rome and Bologna. Therefore for short- and mid-term trips, boarding the night train was only possible in Bologna. For long-term trips, the night train ticket was not yet available, so the 14h26m day connection via Bologna and Munich was considered. The flight was always clearly cheaper than the train, on average the train cost 2.6 times as much as the flight. It can be assumed that this route would be between €18.90 and €54.90 cheaper without the night train interruption (no separate high speed ticket from Rome to Bologna needed). But this would not change the fact that low-cost airlines with their aggressive prices are always cheaper on this route.

> *In 2019, 560,000 passengers were flying between Rome and Berlin. Shifting these flights to rail could save 79,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 53,000 fossil fuelled cars. This is approximately the size of the car fleet in Hanau.*

Berlin–Amsterdam

easyJet and KLM fly daily between the German and the Dutch capitals with easyJet always the cheaper airline. On most days there are 6 daily train pairs, and 3 times a week the private "European Sleeper". The quickest day

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[13] 1200 km, 33 gram GHG/pkm = 40 kg of GHG per rail passenger

train lasts 6h16m. On average, the train was 38% more expensive than the polluting flight, with the lowest flight ticket costing €39.22. For all long-term trips, the flight was cheaper, while the train was cheaper on the 3 short-term trips and on one mid-term day. The night train was cheaper than the day train on its operating days.

In 2019, despite the brilliant rail connections, a bit more than 1 million passengers were flying between Berlin and Amsterdam. Shifting these flights to rail would save at least 79,000 tonnes of harmful greenhouse gas emissions, equivalent to the yearly emissions of 53,000 fossil fuelled cars. This is approximately the car fleet size of Kaiserslautern.

Hamburg–Luxembourg

Luxembourg's national airline Luxair flies daily to Hamburg. Quite unusual, there are no cheaper transfer flights by low-cost airlines available on this route. The best train takes 7h38m, and requires one change in Koblenz, Germany. Deutsche Bahn is always selling quite affordable tickets for this route, ranging from €24.90 to €88.90 which is always cheaper than using the polluting flight.

A flight from Hamburg to Luxembourg causes 165 kg of harmful greenhouse gas emissions per passenger. As the train runs mainly in Germany, using 100% renewable electricity, almost all the emissions could be saved by using the train. Based on the average German electricity mix, the savings on a one-way flight on this route is equivalent to the average electricity consumption of a fridge for around 8 years.

Cologne–Barcelona

The 2 low-cost carriers Eurowings and Ryanair are both daily flying from Cologne to Barcelona with Ryanair always the cheaper airline. The best train connection is the Thalys high speed train to Paris, followed by a TGV to Barcelona. The trip takes 12h41m. It also would be possible to start around midnight with the night train to Basel, but then 2 more transfers would be needed. That's why this option was not considered in this analysis. On one short-term trip, the trains from France to Barcelona were already sold out, and for one long-term trip, the Thalys tickets were not yet available. The polluting flight was always cheaper than the train, on average the train cost more than 3 times as much as the flight, making this route one of the most expensive train routes analysed for Germany.

> *A Ryanair flight from Cologne to Barcelona causes 305 kg of harmful greenhouse gas emissions per passenger. The 1,600 km long train trip causes only 53 kg of GHG, which is 82% less. The saved CO_2 emissions (252 kg) are equivalent to the emissions for the production of 1,180 kWh of electricity in Germany. This amount is enough for an average household to cook for more than 2 years.*

Stuttgart–Berlin

Eurowings and Lufthansa fly several times a day on this route, and there are 13 direct train connections a day, the fastest of which is 5h30m. Price differences found were rather moderate, with the train cheaper on 6 out of the 9 days analysed. As on many other Deutsche Bahn routes, the train gets much cheaper the earliest the ticket is bought. Short-term tickets cost €103.90 on average, midterm €78.56 and long-term €28.56. The cheapest long-term rail ticket cost only €19.90.

> *Despite the attractive rail offer, more than 1.2 million passengers were flying between Stuttgart and Berlin in 2019. This caused 204,000 tonnes of harmful greenhouse gases, equivalent to the annual emissions of 136,000 fossil fuelled cars. This is approximately the car fleet size of Mönchengladbach. Almost all of these climate damaging emissions could be saved by using Deutsche Bahn with its 100% renewable electricity use.*

Cologne–Venice

The German low-cost airline Eurowings flies daily, and Ryanair 3 times a week from Cologne to Venice. The quickest train takes 12h36m and requires one transfer in Munich. Alternatively, the night train from Cologne to Basel could be used. Due to 2 more transfers in Lugano and Milan, the night train was not considered for this route. As with all other routes between Germany and Italy, the climate damaging flight was almost always cheaper. The cheapest flight on all routes from and to Germany was found on this route, at €19.99. Only on one long-term trip, the train was €24 cheaper than the flight - following the usual pricing system of Deutsche Bahn with the high average price difference between short- and long-term trips (€145.56 and €57.23). On average, the train cost 2.2 times as much as the polluting flight.

> *A flight from Cologne to Venice causes 173 kg of harmful greenhouse gases per passenger. The 1,100 km long and relatively complicated train route could save at least 80% of these emissions. Based on the average*

Berlin–London

There are several polluting flights per day by Ryanair and easyJet on this route, with Ryanair being 5 out of 9 times the cheapest and easyJet 4 times the cheapest. The best train connection is the private European Sleeper to Brussels, followed by the Eurostar to London. Alternatively, there are some day train connections with minimum 2 transfers and lasting around 11 hours. The night train was always cheaper than the day trains, though it does not run every day but only every other day. This means that for this route, the research date for the night train trip can be either the day of departure or the day of arrival. As with all other routes analysed to and from the UK, the polluting flight was always cheaper, with average train ticket prices costing 2.3 times as much as flight tickets. Since the night train to Brussels is relatively affordable with prices mostly below €100, the average train price is less compared to most other UK routes, but the absolute average price difference is significant with €108.89.

Nice–Munich

The only airline directly flying between Nice and Munich is Lufthansa. On all 9 days analysed, transfer flights with other airlines were cheaper. On most days, Lufthansa low-cost subsidiary Eurowings was cheaper via Düsseldorf, Cologne or Hamburg. On one day, easyJet via London was the cheapest flight, on another day it was Wizz Air via Bucharest. The train trip from Nice to Munich includes a night train, either via Paris, or with one more transfer the night train from Genoa to Munich. The cheaper ticket depends on the time. The polluting flight cost half with the shortest booking, but was more expensive with the other 2 short term dates. The polluting flight was cheaper on all mid-term trips, while the train was cheaper on all long-term trips. On average, the train was 6% more expensive than the flight. A typical result for a long route which is not directly served by low-cost airlines.

> *greenhouse gases per passenger. A transfer flight via Hamburg causes more than 2.5 times as much as a direct flight. The 880 km long train trip causes 29kg of greenhouse gases, which is 85% less than a direct flight, and 94% less than a transfer flight via Hamburg.*

Marseille–Berlin

During the summer period, Ryanair is the only airline flying 4 times a week between Marseille and Berlin. On other days, even more polluting flights via Italy or Switzerland were the cheapest flight options. The most efficient train option runs via Karlsruhe and takes 12h21m. While ticket prices from the French Railway company SNCF were always much more expensive than the flight, ticket prices from Deutsche Bahn were found cheaper than the flight on 5 out of the 9 days analysed, among them all long-term trips. On average, the train was 11% more expensive than the flight.

> *A direct flight from Marseille to Berlin causes 353 kg of harmful greenhouse gases per passenger. The 1,600 km long train trip causes 53 kg of greenhouse gases, which is 85% less than a flight.*

Munich–Split

During summer time, the German holiday airline Condor flies several times a week between Munich and the Croatian coastal city of Split, while Croatia Airlines and Lufthansa fly all year long. By train, all 3 possible routes include night trains, whether it is Vienna–Split[14], Budapest–Split or Munich–Zagreb. All of these routes require one transfer, but due to the slow average speed of Slovene and Croatian railways, the trip is considerably long with at least 22 hours.

For short-term booking, the polluting flight was clearly cheaper than the train, with the biggest price difference found at €309 (€89.99 vs €398.90). On the other hand, the train was much cheaper for all long-term bookings, with very low prices between €45 and €75, while the long-term flight cost between €124.60 and €160.36. On average, the train was 28% more expensive than the flight.

> *A flight from Munich to Split, the Croatian coast, causes 190 kg of harmful greenhouse gas emissions per passenger. By using the train, even when taking the 1,400 km long way via Budapest, at least 70% of these emissions could be saved.*

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[14] The night train from Bratislava to Split via Vienna is only running during summer time.

Greece

In 2019, all international train connections to and from Greece, including the ones to Sofia and Bucharest, have been [suspended](#) until further notice. The only domestic route which can be travelled either by plane or train is Athens–Thessaloniki. It is served by many direct flights and trains daily, and the train is always cheaper with an average of 74% of the flight price. The Greek railway system needs massive investments to be able to replace more than one flight connection in the future.

Charred remains of a house left standing after a forest fire in Attica, Greece in 2018
© Constantinos Stathias / Greenpeace

In 2019, Athens–Thessaloniki was the 4th most used intra-EU flight route with more than 2.6 million passengers. Phasing out this short-haul flight would save around 105,000 tonnes of CO_2, as much as the annual emissions of 70,000 cars. This is approximately the combined car fleets of the 2 islands of Corfu and Zakyntos.

Hungary

Overall situation

Hungary is the home country of Wizz Air, one of the airlines with the most aggressive pricing policies. Wizz Air is flying to dozens of destinations from Budapest, the same is valid for Ryanair. In addition, easyJet flies to London and Switzerland. The dominance of low-cost carriers in Budapest is partly due to the fact that, in 2012, the former Hungarian flag carrier MALEV went bankrupt. Flight prices are the lowest on routes which are operated by both of these low-cost airlines, e.g. Paris and Brussels.

By rail, Hungary is well-connected to many countries. There are even 18 train pairs to Vienna a day, allowing you to travel on all night trains starting there in all directions. The Hungarian railway company MAV also offers some night train connections from Budapest, including Zurich, Stuttgart and Romania.

On routes analysed to Brussels and Paris, the polluting flight was almost always found cheaper, with a price difference going up to 12.5 times as much as for the train ticket from Budapest to Brussels. On days with a direct Ryanair connection, the Venice–Budapest route is clearly cheaper by plane. On the other hand, it is cheaper to travel by train on routes within Central and Eastern European countries, namely to Bucharest and Prague, as well as to Berlin (most of this route is in CEE).
Besides Budapest, the only other international airport in Hungary is in Debrecen. Since there are only a few departures per day, no route was analysed from or to there.

On average for all routes analysed for Hungary, the train was 53% more expensive than the flight.

Routes analysed from and to Hungary

Budapest–Berlin

Ryanair is flying daily on this route, Wizz Air 6 times a week. The railways offer 2 direct daily connections, a day and a night train with the day train taking 11h33m. Untypically for routes which are operated by low-cost carriers, the train was found cheaper on 6 out of the 9 days analysed. The day train was always cheaper on this route than the night train. Even on average, the train was 25% cheaper than the flight.

> *A flight from Budapest to Berlin causes 221 kg of harmful greenhouse gas emissions per passenger. The 880 km long train ride causes 29 kg of GHG, or 87% less than the flight.*

Bucharest–Budapest

There are 2 daily night train pairs between the cities operated by the Romanian state owned railway company CFR. By air, the Romanian state owned TAROM flies daily, the Romanian regional airline Air Connect flies twice a week. Since train tickets do not cost more than €37.62, the train is always cheaper on this route. Long-term train tickets are not available for this route.

> *A flight from Bucharest to Budapest causes 190 kg of harmful greenhouse gases per passenger. Using the 950 km long train could save 83% of these emissions. This saving is equivalent to the consumption of 680 kWh of electricity (Hungarian mix), enough to run a fridge for more than 10 years.*

Venice–Budapest

Ryanair is flying 3 times a week on this route, with prices found from €20.99 on. On 2 other days analysed, Ryanair transfer flights via London and Nuremberg were cheaper than the train, on 4 out of the 9 days analysed the train was slightly cheaper (biggest price advantage for the train found was €12.28). The quickest train takes almost 11 hours, a change in Vienna is always required. From Venice to Vienna, there are some day and night train connections. The day train was always cheaper than the night train connection. On average, the train was 25% more expensive than the flight. All prices found were below €100.

> *A flight from Venice to Budapest causes 183 kg of harmful greenhouse gas emissions per passenger. The 850 km long train ride causes 28 kg of GHG, or 85% less than the transfer flight.*

Prague–Budapest

As on some other routes in Central and Eastern Europe, the train is always cheaper than the plane on this route, despite Ryanair flying daily except Saturdays. Both the traditional Czech railway company CD as well as the private railway operator RegioJet have several train pairs per day with low prices between €21.13 and €32.77 and lasting around 6h45m. Long-term train tickets are not available. But considering the frequency of trains and

the predictable price, it is less of a problem than e.g. on night train routes or on train routes with a large price range.

> **Despite the cheap train tickets, in 2022, 112,582 passengers were flying between the Czech and the Hungarian capitals, causing 14,400 tons of greenhouse gases, as much as 10,000 cars emit in a year. By banning this unnecessary short-haul flight, around 11,500 tons of GHG could be reduced.**

Budapest–Paris

There are daily direct flights by the 2 low-cost airlines Ryanair and Wizz Air from Budapest to Paris, in addition Air France is operating on that route. The best train connection includes a night train, either from Budapest to Stuttgart or from Vienna to Paris. The former was always the cheapest train option found. The night train to Stuttgart was always affordable, with prices between €29.90 and €89, but the TGV or the ICE from Stuttgart to Paris was up to 3 times as expensive as the night train, resulting in the flight being always cheaper than the train. On one day, an even more polluting transfer flight with Ryanair via Bergamo, Italy, was available for less than half the price of the direct flight (€77.10 vs €162).

> *In 2022, 480,000 passengers were flying between the 2 cities, causing 179,000 tons of harmful greenhouse gas emissions. A train trip on this 1,480 km long route could save around 87% of these emissions. The saving is equivalent to the yearly emissions of 103,000 fossil fuelled cars. This is approximately the car fleet size of Debrecen.*

Budapest–Brussels

There are daily direct flights by the 2 low-cost airlines Ryanair and Wizz Air from Budapest to Brussels, in addition Brussels Airlines is operating on that route. Flights were found at really low prices from €20.37 on. The best train connection includes a night train, either from Budapest to Stuttgart or from Vienna to Brussels. The first one was always the cheapest train option found. The night train to Stuttgart was always affordable, with prices mostly between €29.90 and €59, but the ICEs or the TGV and Thalys from Stuttgart to Brussels via Frankfurt or Paris were double to 4 times as expensive as the the night train, except for the long-term bookings. Travelling by rail was systematically more expensive than travelling by air, costing on average 4.5 times as much. On one mid-term booking, the train cost 12.5 times as much as the flight.

> *A flight from Budapest to Brussels causes 421 kg of harmful greenhouse gas emissions per passenger. The 1,350 km long train trip could reduce these emissions by 90%. Based on the Hungarian electricity mix, this saving is equivalent to the consumption of 1,700 kWh of electricity, enough for a single household for around 10 months.*

Italy

Overall situation

With the recent collapse of the former Italian airline ALITALIA, Italy became a paradise for low-cost airlines. They operate 14 out of the 15 routes analysed. Surprisingly, even some major routes such as Rome–Berlin are no longer served by traditional airlines.

Thanks to a well-functioning high-speed rail network and some domestic night trains, many countries are reasonably accessible by train, even from the south of the country. There are frequent international train connections to Switzerland and Austria, continuing to France and Germany. There is no direct train from Genoa to Nice along the Ligurian coast, but frequent train connections with changes in Ventimiglia. Italy is poorly connected by train to Slovenia, with only one train pair per day from Trieste to Ljubljana. The best train connections from Italy to Slovenia usually take the long route via Austria.

On 13 out of the 15 routes analysed, flights were always or almost always cheaper, including the domestic route from Palermo to Turin with the flight cheaper on 7 out of 9 trips analysed. On another route, Venice–Budapest, the train was cheaper on 4 out of 9 days and more expensive on average. The only exception is the route from Ljubljana to Milan. Here the train was always found cheaper, due to the fact that there are no direct flights between these cities.

On average, for all the routes analysed for Italy, the train costs 2.5 times as much as the flight.

Water withdrawal causes cracks in the dry riverbed during the drought at Basilicata in the South of Italy, in 2018 © Giuseppe Lanotte / Greenpeace

Routes analysed within, from and to Italy

Ljubljana–Milan

Ljubljana–Milan is one of the few routes analysed without any direct connection, and it is also one of the few routes which cannot be travelled with low-cost carriers. Typical flight routes are Air France via Paris or LOT via Warsaw. The fastest train route requires 2 changes, in Trieste and Venice, and takes 8h28. In October, the fastest train connection lasts one more hour and goes via Villach, Austria. The train was found to be always cheaper on this route, making it the only route analysed for Italy where the train was cheaper.

> *A flight from Ljubljana to Milan via Paris causes 496 kg of harmful greenhouse gas emissions per passenger, a flight via Warsaw even 615 kg. The 500 km long train ride causes 16.5 kg of GHG, or 97% less than the transfer flight via Paris.*

Naples–Düsseldorf/Cologne

The German low-cost subsidiary of Lufthansa, Eurowings, flies daily between Naples and Düsseldorf, which is near Cologne and has a much larger airport. However, on all mid-term bookings, even more polluting

transfer flights with even cheaper low-cost carriers such as Ryanair and Wizz Air via Venice or Bergamo were much cheaper than direct flights. The best day train takes 14h17m with 2 transfers in Milan and Frankfurt. Alternatively, the night train from Bologna to Munich could be used, but was more expensive than the day train on the days analysed. Long-term train tickets were not available. The polluting flight was cheaper on all days analysed, with the train costing almost 3 times as much as the flight.

> *A flight from Naples to Düsseldorf causes 381 kg of harmful greenhouse gases per passenger. The 1,650 km long train trip could save 86% of these emissions. Based on the average Italian CO_2 intensity for electricity, the savings are equivalent to power a fridge with a freezer compartment for around 12 years.*

Paris–Milan

Both easyJet and Ryanair fly daily between Paris and Milan, and there is also a direct TGV train. On 8 out of 9 days analysed, the flight is cheaper, with prices between €25.99 and €79.25. The most expensive train ticket costs almost 3 times as much as a flight. Short-term train tickets are not available below €149. Only on a single day analysed, the train was found 16% cheaper.

> *In 2019, more than 2.1 million people flew on this route. Shifting to rail would save around 175,000 tons of CO_2, the equivalent of the annual emissions of more than 115,000 cars. This is approximately the complete car fleet of Messina.*

Paris–Rome

As with most other routes between Europe's largest capitals, the climate-killing flight was cheaper on all days analysed. Low-cost airlines Wizz Air and Vueling are among those flying between the 2 capitals. There is no direct train between Paris and Rome, at least one transfer is needed in Milan or Torino. The minimum train travel time is 10h12m, there is no night train running between France and Italy. Flight tickets start low at €29.99. The cheapest train ticket cost €73.90, while all short-term train tickets cost more than €200, and all mid-term more than €100. On average, the train cost twice as much as the plane on this route.

> *In 2019, 2.25 million people flew between Paris and Rome (both-ways). Shifting this flight to rail would save 308,000 tons of harmful greenhouse*

gases, equivalent to the yearly emissions of 205,000 cars. This is approximately the car fleet of Bari.

Palermo–Turin

Palermo–Turin is one the longest possible train trips in Italy with a length of almost 1,600 km. There are 2 reasonable options, either taking the night train from Palermo to Florence, or the night train from Salerno to Turin. The fastest train trip takes 21h10m. As on many other Italian routes, Ryanair and Volotea fly on this route, with Ryanair always the cheaper airline. Except for 2 long–term trips, the polluting flight was always cheaper. On average, the train cost more than twice as much as the plane.

In 2019, 279,000 people flew between Palermo and Turin causing 233 kg of harmful greenhouse gases per passenger. Using the train can reduce these emissions by 77%. It is a bit lower than on most other routes due to the much longer train trip compared to the flight over the sea, but still significant.

Venice–Budapest

Ryanair is flying 3 times a week on this route, with prices found from €20.99 on. On 2 other days analysed, Ryanair transfer flights via London and Nuremberg were cheaper than the train, on 4 out of the 9 days analysed the train was slightly cheaper (biggest price advantage for the train found was €12.28). The quickest train takes almost 11 hours, a change in Vienna is always required. From Venice to Vienna, there are some day and night train connections. The day train was always cheaper than the night train connection. On average, the train was 25% more expensive than the flight. All prices found were below €100.

A flight from Venice to Budapest causes 183 kg of harmful greenhouse gas emissions per passenger. The 850 km long train ride causes 28 kg of GHG, or 85% less than the transfer flight.

Flooding in Venice from high sea levels in 2019 © Roberto Silvino / Greenpeace

Milan–Prague

The train is always more expensive on the route from Milan to Prague, on average almost 5 times as much as the flight. Wizz Air is offering low prices on this route, starting from €19.99 and not above €59.99 for a short-term booking. The best train connection is the night train to Vienna, and the connecting train to Prague. Only long-term train tickets were available below €100, but even on the cheapest train days, the flight cost less than half.

> **A single flight from Milan to Prague causes 185 kg of harmful greenhouse gas emissions. Despite the train taking a long 1,200 km route via Vienna, 78% of these emissions could be saved by using the train.**

Vienna–Venice

Ryanair and Austrian Airlines (AUA) are flying daily from Vienna to Venice. There are also 3 direct train connections including a night train, the quickest train taking less than 8 hours. Ryanair is always cheaper than AUA, with prices below €22 on 4 out of the 9 days analysed. Since train prices are also starting low, at €28.30, trains were found cheaper on 3 days. On average, the train price is 140% of the flight price. The most expensive train ticket found cost €107.50.

Based on 2019 passenger figures, 10,400 tons of CO$_2$ could be saved by shifting all passengers to rail. This is equivalent to the yearly emissions of around 7,000 cars.

Rome–Vienna

The 2 low-cost airlines Ryanair and Wizz Air, as well as Austrian Airlines fly between the Italian and the Austrian capitals. Flight prices are starting at €14.99. The best train connection is a direct night train. In summer 2023, the night train route to the north of Rome is interrupted due to construction work, so mid-term bookings require a high-speed train from Rome to Bologna to board the night train there. This made the train trip even more expensive. On average, the train cost 3.3 times as much as the polluting flight. The train was only cheaper for a short-term booking (€1.79 cheaper than the flight), and for a long-term booking, with a train ticket available for €28.40, the lowest possible price for this route.

In 2019, 558,000 people flew between Rome and Vienna. Shifting these flights fully to rail would save 52,000 tons of harmful greenhouse gas emissions. This is equivalent to the yearly emissions of 35,000 fossil fuelled cars, or approximately the car fleet of Lamezia Terme.

Zagreb–Rome

Although there is "only" one direct flight 4 days a week operated by Ryanair, flying is always clearly cheaper than taking the train on this route. Even transfer flights with Lufthansa via Munich, or with Ryanair and the Italian ITA via Naples are cheaper. Normally, a train trip from Zagreb to Rome only requires a change at Villach, Austria, to take the night train to Rome. However, due to construction works north of Rome during summer 2023, passengers have to leave the night train in Bologna and continue on an Italian high-speed train. The total travel time is 13h32m, the average train price found was 3.5 times as much as the flight, on one day it was almost 10 times as much.

A connecting flight from Zagreb to Rome via Munich causes double greenhouse gas emissions compared to a direct flight. A train ride can reduce GHG emissions on this route by around 60% compared to a direct flight (which is a bit less compared to other routes due to the train taking a long route via Austria).

Rome–Berlin

The air market between the Italian and the German capital is shared by the 2 low-cost airlines Ryanair and easyJet, no traditional airline flies this route anymore. In normal times, the best train connection is the night train from Rome to Munich, followed by an ICE to Berlin. However, due to construction works during summer 2023, the night train does not run between Rome and Bologna. Therefore for short- and mid-term trips, boarding the night train was only possible in Bologna. For long-term trips, the night train ticket was not yet available, so the 14h26m day connection via Bologna and Munich was considered. The flight was always clearly cheaper than the train, on average the train cost 2.6 times as much as the flight. It can be assumed that this route would be between €18.90 and €54.90 cheaper without the night train interruption (no separate high speed ticket from Rome to Bologna needed). But this would not change the fact that low-cost airlines with their aggressive prices are always cheaper on this route.

> *In 2019, 560,000 passengers were flying between Rome and Berlin. Shifting these flights to rail could save 79,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 53,000 fossil fuelled cars. This is approximately the size of the car fleet in Vicenza.*

Luxembourg–Milan

Very unusual for an airport belonging to a very small city, 4 airlines fly this route: Luxair, ITA Airways, Ryanair and easyJet. The 2 low-cost airlines always have the cheapest direct flight prices starting from €15.49, but do not fly every day. When the low-cost airlines do not fly directly, a transfer flight with Ryanair via London is cheaper than the direct Luxair flight. The best train option takes 7h26m and requires 2 transfers in Mulhouse and Basel. On all days analysed, the polluting flight was cheaper than the train. On average the train cost almost 3 times as much as the flight.

> *In 2022, 215,000 passengers flew between Luxembourg and Milan. Shifting these flights to rail would save at least 31,000 tonnes of harmful greenhouse gas emissions, equivalent to the yearly emissions of 21,000 fossil fuelled cars. This is approximately the car fleet size of Sassuolo.*

Cologne–Venice

The German low-cost airline Eurowings flies daily, and Ryanair 3 times a week from Cologne to Venice. The quickest train takes 12h36m and requires one transfer in Munich. Alternatively, the night train from Cologne to Basel

could be used. Due to 2 more transfers in Lugano and Milan, the night train was not considered for this route. As with all other routes between Germany and Italy, the climate damaging flight was almost always cheaper. The cheapest flight on all routes from and to Germany was found on this route, at €19.99. Only on one long-term trip, the train was €24 cheaper than the flight - following the usual pricing system of Deutsche Bahn with the high average price difference between short- and long-term trips (€145.56 and €57.23). On average, the train cost 2.2 times as much as the polluting flight.

> *A flight from Cologne to Venice causes 173 kg of harmful greenhouse gases per passenger. The 1,100 km long and relatively complicated train route could save at least 80% of these emissions. Based on the average North Italian electricity mix, the emissions saved are equivalent to 510 kWh, enough to power a fridge for around 8 years.*

Paris–Venice

Both of the largest low-cost airlines, easyJet and Ryanair, fly daily from Paris to Venice. While easyJet uses the main airport of Venice, Ryanair flies to nearby Treviso. The best train connection lasts 9h44m with one transfer in Milan. Alternatively, the night trains from Stuttgart or Augsburg can be used for this route. For this analysis, all these train options were considered, and both day and night trains were found cheaper on different days. Long-term train tickets cost less than €84. However, the polluting flight was always much cheaper. The average price of a train ticket is more than twice the price of a flight.

> *In 2019, more than 1.2 million people flew between Paris and Venice. Shifting this flight fully to rail would save more than 127,000 tons of harmful greenhouse gases per year, equivalent to the yearly emissions of 85,000 fossil fuelled cars. This is approximately the car fleet of Parma.*

Marseille–Rome

Southern France and Italy are not well-connected by train: at least 2 changes are required on that route. On some days, it was possible to take the night train from Turin to Rome, on other days a change in Paris was required; another option was a train trip with 3 transfers and regional trains along the Ligurian coast. By air, Ryanair flies daily on this route. The eco-friendly train was always more expensive than the flight, on average the train cost 4.5 times as much as the plane.

> **A flight from Marseille to Rome causes 189 kg of harmful greenhouse gases per passenger. The shortest train route via Nice with 920 km, causes only 30 kg of greenhouse gases per passenger.**

Luxembourg

Overall situation

The Luxembourg airport Findel is unusually large for the size of the country. Clearly larger countries such as Slovakia, Slovenia or Estonia have much smaller airports. The majority state-owned airline Luxair flies to 16 countries analysed in this report. Luxembourg also became quite popular for low-cost airlines such as Ryanair and easyJet. Therefore, in quite some cases, even more polluting transfer flights, e.g. via London, were found to be cheaper than direct Luxair flights.

By rail, most of the cities analysed can be reasonably reached. Direct train connections are limited to Brussels and Paris, but many regional trains connect well to the high-speed rail network and night trains in neighbouring countries.

On 2 out of the 4 routes analysed, Luxembourg–Barcelona and Luxembourg–Milan, flights were always clearly cheaper than trains. The most expensive train route analysed is the one to Barcelona, with trains costing on average more than 3 times as much as the flight. The average train cost to Milan was only slightly lower. On the route from Zagreb, a route without any direct flight, the train was cheaper on half of the days analysed, but, on average, nearly 50% more expensive. The only route cheaper by train than by plane is Hamburg–Luxembourg: only Luxair flies this route, and there are no realistic cheaper and even more polluting transfer flights available on the days analysed.

Routes analysed from and to Luxembourg

Luxembourg–Barcelona

Luxair flies daily on this route, Ryanair 5 times a week. On its operating days, Ryanair was always cheaper. The most efficient climate-friendly train trip requires one transfer in Paris and lasts 11h15m. On one short-term trip, the trains from France to Barcelona were booked out. Even though the polluting flight is relatively expensive on this route, on average at €125.73,

the greener train was always clearly more expensive. On average the train cost more than 3 times as much as the polluting flight.

> *In 2022, 124,000 passengers flew between Luxembourg and Barcelona causing 38,000 tons of harmful greenhouse gases. Shifting these flights to rail would save 83% of these emissions, equivalent to the yearly emissions of 21,000 fossil fuelled cars. This is approximately the car fleet size of the second largest town in Luxembourg, Esch.*

Zagreb–Luxembourg

Zagreb–Luxembourg is one of the few routes analysed without any direct connection. The best train route is a night train to Stuttgart, followed by 2 trains to Strasbourg and Luxembourg, with a total travel time of 18h35m. The cheapest flight route on most days is with Ryanair via London. This connection was found from €45.19 on. The train is cheaper on half of the days analysed, but on average, it costs 1.5 times as much as the polluting flight. On most days, the night train ticket was much cheaper than the tickets for the connecting trains from Stuttgart to Luxembourg. Long-term train tickets for the section from Stuttgart to Luxembourg were not available.

> *A connecting flight from Zagreb to Luxembourg via London causes around 550 kg of harmful greenhouse gas emissions per passenger. A train ride for the 1,110 kms causes only around 37 kg of GHG, which is 93% less than the flight. Based on the average mix in Luxembourg, the CO_2 saving is equivalent to the consumption of 2,000 kWh electricity, enough to power a 2-person household for a year.*

Luxembourg–Milan

Very unusual for an airport belonging to a very small city, 4 airlines fly this route: Luxair, ITA Airways, Ryanair and easyJet. The 2 low-cost airlines always have the cheapest direct flight prices starting from €15.49, but do not fly every day. When the low-cost airlines do not fly directly, a transfer flight with Ryanair via London is cheaper than the direct Luxair flight. The best train option takes 7h26m and requires 2 transfers in Mulhouse and Basel. On all days analysed, the polluting flight was cheaper than the train. On average the train cost almost 3 times as much as the flight.

> *In 2022, 215,000 passengers flew between Luxembourg and Milan.*

> *Shifting these flights to rail would save at least 31,000 tonnes of harmful greenhouse gas emissions, equivalent to the yearly emissions of 21,000 fossil fuelled cars. This is approximately the car fleet size of the second largest town in Luxembourg, Esch.*

Hamburg–Luxembourg

Luxembourg's national airline Luxair flies daily to Hamburg. Quite unusual, there are no cheaper transfer flights by low-cost airlines available on this route. The best train takes 7h38m, and requires one change in Koblenz, Germany. Deutsche Bahn is always selling quite affordable tickets for this route, ranging from €25.90 to €88.90 which is always cheaper than using the polluting flight.

> *A flight from Hamburg to Luxembourg causes 165 kg of harmful greenhouse gas emissions per passenger. As the train runs mainly in Germany, using 100% renewable electricity, almost all the emissions could be saved by using the train. Based on the average Luxembourg electricity mix, the savings on a one-way flight on this route is equivalent to the average electricity consumption of a fridge with a freezer compartment in 8 years.*

Netherlands

Overall situation

The Netherlands is home to the EU's largest airport, Amsterdam-Schiphol. Outside the UK, Schiphol is the largest base for the low-cost airline easyJet, which operates with direct flights on 5 of the 8 routes analysed. Another route is operated directly by another low-cost carrier, Norwegian.

The Netherlands has excellent rail links with its neighbouring countries. There are even direct train connections to London, Zurich and Vienna, the latter two with overnight trains. There is also now a night train to Berlin 3 nights a week. As a result, most of the countries analysed can be reached from the Netherlands within a reasonable time by train.

On the routes analysed to and from the Netherlands, the train was never found systematically cheaper than the polluting option, i.e. the plane. On

average for all 8 routes analysed, the train costs 1.5 times the price of the polluting flight.

On 3 out of 8 routes analysed, the flight was dominantly cheaper, namely from/to London, Nice and Stockholm, with Nice–Amsterdam being the most expensive train route found for the Netherlands, and a train ticket costing on average 3 times as much as the polluting flight.

On 4 other routes, namely from/to Copenhagen, Prague, Ljubljana and Berlin, the train was cheaper on some days, but more expensive on average. Only one route was found cheaper by train most of the time: Amsterdam–Warsaw, and also at a lower average price.

Most of the trips where the train was found cheaper were long-term trips involving Deutsche Bahn – e.g. all long-term trips from Amsterdam to Copenhagen were cheaper by train than by plane, while all short-term trips were more expensive with the climate-friendly train.

EasyJet flight takes off from Schiphol Airport, Amsterdam. ©Marten van Dijl/Greenpeace

Routes analysed from and to the Netherlands

Amsterdam–London
Amsterdam–London is Europe's most used short-haul flight route, despite the fact that there are 4 daily direct train connections lasting only 4 hours.

easyJet flies 15 times a day on this route. The Eurostar train was almost always found to be more expensive than the polluting flight, with prices up to €333. Only with one long-term booking, the train was €0.42 cheaper. On average, the train cost almost double than the plane.

> *In 2019, more than 4.7 million passengers were travelling this route by air (both-ways). Banning this useless and very polluting short-haul flight route would save more than 216,000 tonnes of CO_2 per year, as much as the annual emissions of around 144,000 fossil fuelled cars. This is approximately the car fleet size in Groningen.*

Amsterdam–Copenhagen

Amsterdam and Copenhagen are connected daily by KLM, SAS and easyJet. The last one is always offering the lowest flight prices. A train ride requires at least 2 changes and takes at least 11 hours. As often with German trains, there is a large range in train costs, found from €56.90 to €209.90, with the train being most expensive for short-term trips and cheapest for long-term trips. Flight prices were found a bit more stable, with the exception of one very expensive short-term flight. Overall, flights were found to be cheaper on 4 days, trains on 5 days. On average, trains were 6% more expensive than flights. But even on days when the train is cheaper, it is questionable whether many people will use it because of the complicated connection.

> *In 2019, more than 1.1 million people were flying on this route making it to one of the most used short-haul flights from and to Copenhagen. Calculated with European average emission data for planes and trains, shifting this connection fully to rail would save at least 88,000 tons of greenhouse gas emissions, equivalent to the yearly emissions of 59,000 fossil fueled cars. This is approximately the car fleet size of Maastricht. Considering that the route is mainly in Germany and the Netherlands where both railway companies use 100% renewable energy for its trains, the emission savings would be even clearly higher.*

Amsterdam–Warsaw

The train connection between the Dutch and the Polish capitals could be better. The best daily connection takes 13h31m and includes 2 transfers. 3 times a week, the night train between Amsterdam and Berlin can be used. Direct flights are operated by the Polish state airline LOT and KLM only. Typically for such cases, much cheaper and even more polluting transfer flights were found, most of them using easyJet and Ryanair via London. The polluting flight was cheaper on 2 out of 3 short-term trips. The train was

cheaper on all 3 mid-term trips. Train tickets for most trains to Poland cannot be bought 4 months in advance, which is disadvantageous for trains over planes.

A direct flight from Amsterdam to Warsaw causes 362 kg of harmful greenhouse gases per passenger. A transfer flight via London causes 38% more. Using the 1,200 km long train trip could save 92% of these harmful emissions of the transfer flight.

Prague–Amsterdam

Prague–Amsterdam is daily operated by easyJet, except on Saturdays in the winter flight schedule. The best train connection is a train to Berlin, and the private European Sleeper to Amsterdam on its operating days, since the day train connections last longer than 12 hours. The train never costs much more than €100, but was found cheaper only on all 3 midterm journeys, and on one long-term trip when only KLM flies. On average, the train was 44% more expensive than the polluting flight.

In 2022, more than 500,000 people flew between Prague and the Netherlands, making this one of the most popular Czech short-haul flights. This route emits 116,000 tons of harmful greenhouse gases a year, 85% of which could be saved by shifting to rail – thus saving the equivalent of the annual emissions from 66,000 fossil fuel powered cars, which is approximately half of Ostrava´s car fleet.

Amsterdam–Stockholm

On air, this route is served by Norwegian, SAS and KLM. The only reasonable train connection lasts longer than 17 hours, with 2 changes including the night train from Hamburg to Stockholm. On average, the train costs 2.5 times as much as the flight, with prices up to €686, due to the sleeper being the only category available on the night train. Only on 2 days analysed the trains were slightly cheaper, by €0.48 and €10.70. On one day analysed, all night train options were sold out.

In 2019, more than 860,000 passengers were travelling this route by air. Shifting this route completely to rail, would save more than 120,000 tonnes of CO$_2$ per year, as much as the annual emissions of around 80,000 fossil fuelled cars. This is approximately the car fleet size of 's-Hertogenbosch.

Ljubljana–Amsterdam

The French Transavia flies 4 times a week from Ljubljana to Amsterdam, on other days the cheapest flights are via London with Wizz Air or easyJet. A train ride requires 2 changes, either at Villach and Munich and a night train, or a night train to Stuttgart and then 2 ICE trains. The flight was cheaper on 4 out of the 9 days analysed, on average the train was found to be 15% more expensive. The cheapest flight found was a flight via London for €56.82.

> *A flight from Ljubljana to Amsterdam via London–Luton causes 50% more greenhouse gas emissions than a direct flight, and at least ten times more than the train.*

Berlin–Amsterdam

EasyJet and KLM fly daily between the German and the Dutch capitals with easyJet always the cheaper airline. On most days there are 6 daily train pairs, and 3 times a week the private "European Sleeper". The quickest day train lasts 6h16m. On average, the train was 38% more expensive than the polluting flight, with the lowest flight ticket costing €39.22. For all long-term trips, the flight was cheaper, while the train was cheaper on the 3 short-term trips and on one mid-term day. The night train was cheaper than the day train on its operating days.

> *In 2019, despite the brilliant rail connections, a bit more than 1 million passengers were flying between Berlin and Amsterdam. Shifting these flights to rail would save at least 79,000 tonnes of harmful greenhouse gas emissions, equivalent to the yearly emissions of 53,000 fossil fuelled cars. This is approximately the car fleet size of Deventer.*

Nice–Amsterdam

The 2 low-cost airlines easyJet and Transavia fly daily between Nice and Amsterdam with easyJet always the cheaper airline. The most effective train connection is the night train to Paris and the Thalys to Amsterdam. The polluting plane was always cheaper on this route, on average the train cost 1.8 times as much as the plane. On one mid-term trip, all trains were booked out, and for the Thalys tickets cannot be bought more than 4 months in advance.

> *In 2019, 480,000 passengers were flying between Nice and Amsterdam.*

Norway

Overall situation

Norway has a quite dense rail network with frequent connections in the more populated south, while a main train line connects the south with the north up to Bodø, also served by night trains. The northernmost city accessible by rail is Narvik, but it can only be reached via Sweden. Reasonable international train connections are relatively rare and limited to Sweden, Denmark and the very north of Germany. There are only 4 daily direct train connections to Stockholm, while going to Copenhagen requires at least one change. Berlin cannot be reached from Oslo with a reasonable train connection although it is as far away from Oslo as from Stockholm (that has direct night train connections to Germany's capital). The Norwegian railway company does not sell long-term tickets, which is disadvantageous for rail. Long-term tickets could therefore not be analysed except for Stockholm-Narvik, which is operated by the Swedish railway company.

The flight market is mainly dominated by the private low-cost airline Norwegian and by Scandinavian Airline Systems (SAS). Out of the 7 routes analysed, 2 are always cheaper by train. These are the routes from Trondheim to Oslo and from Stockholm to Narvik. While the first one is the most used short-haul flight route for Norway, the second one has no direct flight. On 2 routes, the plane is (almost) always cheaper, namely Oslo–Hamburg and Bergen–Stockholm. On the trips to the other Scandinavian capitals, it depends on the day, though on average, the train price to Stockholm is 110% and from Copenhagen 116% of the flight. The domestic night train route Oslo–Bodø showed only a 3% difference in the average costs.

On average for all routes analysed for Norway, the train is 35% more expensive than the polluting flight.

Routes analysed within, from and to Norway

Oslo–Stockholm

There are only 2 daily direct train pairs between the Norwegian and the Swedish capital lasting around 7 hours, while there are at least 16 daily direct flights by Norwegian, SAS and a bit surprisingly, by Ethiopian Airlines. The last one even offered the cheapest flight on 2 thirds of the days analysed. Long-term train tickets are not available therefore only 6 days could be analysed. On half of these days, the flight was up to 36% cheaper. On half of the other days, the train was slightly cheaper with a price advantage of €0.45, €1.13 and €7.18. On average, the train price was 110% of the flight price.

> *In 2019, more than 1.4 million passengers were travelling this route by air. Shifting this route completely to rail would save more than 70,000 tonnes of CO_2 per year, as much as the emissions of around 45,000 fossil fuelled cars. This is approximately the car fleets of Tromsø and Bodø combined.*

Oslo–Bodø(NO)

Bodø is the final stop of the train line running north through Norway. From Oslo, the 3 train options per day take between 17 and 19 hours, including a night train, either to or from Trondheim. Of the 9 days selected, 3 could not be analysed because long-term train tickets are not sold, and 1 day was partly covered by a replacement bus resulting in a trip of more than 24 hours. As most flight routes in Norway, this one is operated by Norwegian and SAS, with Norwegian being the cheaper airline on 8 out of the 9 days analysed. From the 5 days with trains and planes available, flights were cheaper on 3 days. The average price was almost the same with rail 3% more expensive. The train price is relatively stable, ranging from €140 to €210.

> *A single flight from Oslo to Bodø causes 231 kg of harmful greenhouse gas emissions per passenger. Even though the train route from Trondheim to Bodø runs on diesel[15], about 70% of these emissions could be saved by travelling by train.*

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[15] *The train route from Oslo to Bodø is around 1,200 km long. Diesel trains emit around 50g of GHG per passenger kilometre, which results in around 60 kg of GHG per person for this trip (note: the actual emissions are probably lower, as the train is likely to run on electricity between Oslo and Trondheim).*

Bergen–Stockholm

The polluting flight was always cheaper than the train on this quite long route from the Norwegian west coast to Stockholm. In most cases, the low-cost airline Norwegian was the cheapest airline. The best train connection is a night train from Bergen to Oslo, followed by an Intercity train to Stockholm, and takes 14h14m. On average, the greener train cost 1.7 times as much as the flight. Long-term tickets are not available for Norwegian trains, which is disadvantageous over planes.

> *A flight from Bergen to Stockholm causes 229 kg of harmful greenhouse gases per passenger. Using the 990 km long train trip could save around 85% of these emissions.*

Stockholm–Narvik

Narvik is the northernmost town in Norway accessible by train, though the only train line to Narvik enters from Sweden without direct train connections to places further South. There is a direct night train from Stockholm running to Narvik, taking 18h25m. There is no direct flight on this route, all flight connections to Narvik go via Oslo. The train was always cheaper than the flight on this route. On 2 mid-term days, the train was already booked out.

> *A single flight from Stockholm via Oslo to Narvik causes 408 kg of harmful greenhouse gas emissions per passenger. By taking the 1,400 km long train trip, almost all these emissions could be saved since the Swedish railways are running fully on renewable electricity and even the last part of the route to Narvik is electrified. The saved CO_2 emissions are approximately equivalent to cooking on a gas cooker for 2 to 3 years.*

Copenhagen–Oslo

The Danish and the Norwegian capitals are not well connected by train. There is a maximum of one train option per day with 2 transfers, and 2 more options with 3 transfers each. Most connections offered by the train time tables include buses. The train takes more than 10 hours, including a 90-minute waiting time at stations. In addition, train tickets are not available 4 months in advance, disadvantageous for rail over planes. 3 airlines fly this route: Norwegian, Wideroe and SAS which all were the cheapest on at least one day. The flight price is below €70 on 7 out of 9 days analysed. The plane was cheaper on all 3 short-term bookings, the

train was cheaper on all 3 mid-term bookings. On average, the train was 16% more expensive than the polluting plane.

> *In 2019, 1,500,000 people flew between Copenhagen and Oslo making it the most used international short-haul flight route for Denmark with a train alternative. Shifting this flight completely to rail would save 93,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 62,000 fossil fuelled cars, or approximately the car fleet size of Fredrikstad.*

Oslo–Hamburg

Due to poor train connections from Norway to Denmark, Hamburg is the furthest foreign city that can be reasonably reached by train from Oslo. The best rail trip with only one transfer takes 22h39m, and uses the night train from Stockholm to Berlin on the section from Södertälje to Hamburg. Södertälje can be reached directly from Oslo by Intercity train. There are some faster train connections, with more changes, or including a bus. On air, the 2 low-cost airlines Norwegian and Eurowings are competing. Tickets for the night train cannot be bought 4 months in advance, which is disadvantageous for rail. On one day, both night trains were booked out already, therefore only 5 days could be analysed. Except for one day, the polluting flight was always cheaper than the train. On one mid-term trip, the train cost 8 times as much as the flight, and was also the most expensive train ticket of all routes analysed, at €666.47 resulting from the single-bed sleeper as the only ticket category available for this day.

> *A single flight from Oslo to Hamburg causes 245 kg of harmful greenhouse gases per passenger. The 1,440 km long train trip could save around 72% of these emissions. This saving is equivalent to the consumption of 800 kWh of gas, enough to cook on a gas cooker for a full year.*

Trondheim–Oslo

Trondheim–Oslo is the most used short-haul flight route for Norway with a train alternative. There are 6 direct train connections a day, one of them a night train. The fastest day train takes 6h39m. As on most air routes in Norway, Norwegian and SAS compete with each other. In addition, the regional carrier Wideroe also operates on the route. Despite the presence of a low-cost airline, the train was always cheaper than the flight. All 3 mid-term trips cost the same for train and plane (€64.57 and €69.45).

Though the price advantage of the train is not high (13%), this route belongs to the great train routes found in this analysis.

> In 2019, 2,106,000 people flew between Trondheim and Oslo, making it the most-used short-haul flight route for Norway with a train alternative. This is more than 25% more passengers than on Norway's most used international flight route, the one to Copenhhagen. Banning the useless flight from Trondheim to Oslo would save 110,000 tonnes of greenhouse gases a year. This is equivalent to the yearly emissions of 74,000 fossil fuelled cars, which is not much less than all fossil fuelled cars in Trondheim.

Poland

Overall situation

International rail connections from and to Poland are relatively good and many countries and cities can be reasonably reached. There are direct train connections to all neighbouring EU capitals. The most efficient one is Warsaw–Berlin with 5 train pairs a day. The connection to Lithuania is the only poor one, with only one train crossing the border per day. Trains in Poland, as in most Central and Eastern European countries, are generally rather cheap. Compared to other CEE countries such as Slovakia or Hungary, the Polish aviation sector is not yet dominated by low-cost airlines. Ryanair is operating on 13 Polish airports, but flies only on 1 out of the 6 routes analysed from and to Poland, namely from Vienna to Warsaw.

On all CEE train routes analysed from and to Poland, the train was always cheaper than flights. But on some of these routes, the train frequency and speed is very low, especially on the routes to Lithuania and Slovenia. On the route operated by Ryanair, Vienna–Warsaw, the train is 40% more expensive on average. Ryanair is offering extremely low prices on this route, starting from €12.99. On the route from Amsterdam to Warsaw, operated by KLM and the Polish state airline LOT only, the train is always cheaper than the direct flight, but even more polluting transfer flights with low-cost carriers via London do exist and are partly cheaper than the train.

The Polish railway company does not sell tickets for trains 4 months in advance. Long-term prices for routes to and from Poland could only be

obtained when a train from another railway operator was available (such as the night train from Vienna).

Biebrza National Park near Warsaw, on fire in 2020 © Rafal Wojczal/Greenpeace

Routes analysed from and to Poland

<u>Vienna–Warsaw</u>

Vienna–Warsaw is served daily with 3 direct train pairs, one of them a night train, and by 3 airlines, out of them Ryanair always offered the lowest prices starting from €12.99, one of the lowest flight prices found in this analysis. Only one short-term flight was offered for slightly more than €100. Despite train prices being also relatively low (below €72) and night trains partly available from €19.90 on, the train costs on average 140% of the flight. For long-term trips, only tickets for the night train operated by the Austrian railway company ÖBB were available, while the Polish railway company PKP does not sell day trains tickets four months in advance.

Based on 2019 passenger numbers, fully replacing this flight by train would save around 28,000 tons of CO_2 per year, equivalent to the yearly emissions of more than 18,500 cars. This is approximately the car fleet size of Świnoujście.

Amsterdam–Warsaw

The train connection between the Dutch and the Polish capitals could be better. The best daily connection takes 13h31m and includes 2 transfers. 3 times a week, the night train between Amsterdam and Berlin can be used. Direct flights are operated by the Polish state airline LOT and KLM only. Typically for such cases, much cheaper and even more polluting transfer flights were found, most of them using easyJet and Ryanair via London. The polluting flight was cheaper on 2 out of 3 short-term trips. The train was cheaper on all 3 mid-term trips. Train tickets for most trains to Poland cannot be bought 4 months in advance, which is disadvantageous for trains over planes.

> *A direct flight from Amsterdam to Warsaw causes 362 kg of harmful greenhouse gases per passenger. A transfer flight via London causes 38% more. Using the 1,200 km long train trip could save 92% of these harmful emissions of the transfer flight.*

Vilnius–Krakow

The only daily train connection between Vilnius and the South Polish city of Krakow via Warsaw takes 12h28m for 740 kms. Due to the different track dimensions, a change of trains is needed at the border station but is offered without waiting time. Arrival time in Krakow is just before midnight, while the train in the other direction leaves at 4 a.m. Tickets for this train can only be purchased for less than a month in advance. There is no direct flight on this route, the shortest and also cheapest way is with the Polish state owned airline LOT via Warsaw. The train is cheap on this route at €30, short-term flights are very expensive, mid-term flights cost a bit more than €100. Considering the frequency and speed of the train, it is questionable whether many people would choose the train despite the low price.

> *A flight from Vilnius to Krakow causes 149 kg of harmful greenhouse gas emissions per passenger and trip. The 740 km long train trip causes only 24 kg of GHG, which is 84% less. With the average, very carbon intensive Polish electricity mix, the savings are equivalent to running a fridge for 3 years.*

Warsaw–Berlin

By air, the Polish and the German capitals are only directly connected by the state owned Polish airline LOT. A one-way ticket is not available for less

than €132.15. On most days, cheaper transfer flights with low-cost carriers via Riga, Bologna or Copenhagen are available, starting from €55.66. The train connection is good with 5 daily direct train pairs lasting a bit less than 6 hours. Like for many other routes in Central and Eastern European countries, the train was found cheaper on all days, with a range from €27.90 to €49.90. Long-term train tickets are not available for this route.

> *A single flight from Warsaw to Berlin causes 332 kg of harmful greenhouse gas emissions per passenger. Despite the high coal share in the Polish electricity mix, at least 70% of these emissions can be saved by shifting to rail. In Poland, running a fridge for around 6 years produces the same amount of climate-damaging emissions.*

Vilnius–Warsaw

The only daily train connection between Vilnius and Warsaw takes 9h5m. Due to the different track dimensions, a change of trains is needed at the border station but is offered without waiting time. Tickets for this train can only be purchased for less than a month in advance. The Polish state owned airline LOT is the only airline with direct flights. On many days it is cheaper flying with Baltic Air via Riga. The train is cheap on this route at €25. The flights are starting at €114.58 which makes this route one of the most expensive direct flight routes among all 112 analysed. Despite the low price, the frequency and speed of the train might be discouraging for people when the flight lasts just a bit more than one hour. In 2022, more than 215,000 flight passengers were counted on this route.

> *A flight from Vilnius to Warsaw causes 196 kg of harmful greenhouse gas emissions. Despite the high coal share in the Polish electricity mix, at least 60% of these emissions can be saved by shifting to rail. Therefore the rail frequency needs to be urgently improved between Poland and Lithuania.*

Warsaw–Ljubljana

As with other routes within Central and Eastern European countries, the train is always cheaper than the plane. Only the Polish state airline LOT flies daily. One-way-tickets do not cost less than €128.67, while the most expensive train ticket costs €93.80. Unusually, there are no connection flights with low-cost carriers on this route. The best train connection is the

night train from Warsaw to Graz, Austria, and the Eurocity to Ljubljana and the trip takes 18h23m, considerably long for less than 1,100 km.

> *A flight from Warsaw to Ljubljana causes 273 kg of harmful greenhouse gas emissions per passenger. The 1,100 km long train ride causes 36 kg of GHG, which is 87% less than the flight.*

Portugal

Overall situation

Portugal is extremely badly connected by train to other countries. The only train connection to Spain runs only twice a day from Porto to Vigo in North-West Spain. Therefore Madrid is the furthest distance that can reasonably be reached by train from Porto. Travelling from Lisbon to Madrid by train is not possible on the same day, as it would involve stopovers in Porto and Vigo. Except for the shorter domestic route from Porto to Lisbon, the flights were always found to be much cheaper. The Portuguese railway company CP does not sell tickets for a longer period than 2 months in advance, and tickets to Spain need to be bought from the Spanish railway operator.

Routes analysed within, from and to Portugal

Porto–Lisbon

Porto–Lisbon is the only route analysed involving Portugal, where the train is cheaper than the plane and lasts only a bit less than 3 hours. In contrast to the other routes, this one is not served by a low-cost carrier but only by the traditional Portuguese airline TAP. There are hourly train connections available, train prices ranging from €15.50 to €25.25, while the flight always costs €37.46.

> *A single flight from Porto to Lisbon causes 57 kg of harmful greenhouse gases per passenger. Banning this useless short-haul flight route and replacing it with the 320 km long train could save around 81% of these emissions. This saving is equivalent to the consumption of 200 kWh of electricity (Portuguese mix), enough to operate a fridge for up to 4 years.*

Porto–Faro

This route from North to South Portugal is operated by 3 daily Ryanair flights. Ryanair is offering low prices on this route, with prices found from €19.21 to €32.85. The train, taking 5h51m, is always more expensive on this route, the average train price is 70% more expensive than the flight.

> *A single flight from Porto to Faro causes 150 kg of harmful greenhouse gases per passenger. Banning this useless short-haul flight route and replacing it with the 550 km long train could save 88% of these emissions. This saving is equivalent to the consumption of 850 kWh of electricity (Portuguese mix), enough for cooking on an electric stove for a full year.*

Porto–Madrid

Due to the poor train connections between Portugal and Spain, Porto–Madrid is the only international route for Portugal that could be analysed. While there are 3 low-cost carriers, namely Ryanair, easyJet and Air Europa, with direct flights, there is no direct train connection between Porto and Madrid: a change in Vigo is needed. As a result, this train trip takes at least 9h23m for just 420 km of air distance, and 2 separate tickets must be purchased from the Spanish railway company RENFE for the sections to and from Vigo. This route has the lowest average flight price of all routes analysed (€21.88), while the average train price is almost 3 times as much as this amount (€59.14).

> *In 2019, almost 1 million passengers were travelling between Porto and Madrid. Shifting this flight completely to train would save about 50,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of around 33,000 fossil fuelled cars. This is approximately the car fleet size of Viseu.*

Romania

Overall situation

Romania's train network is dense, cheap but old and slow. The only permanent direct connections with other countries are the routes to Budapest and on to Vienna, served by 2 night trains a day, and some other cross-border trains. From early June until early October, there is a direct

night train from Bucharest to Istanbul, and only from June to September a day train to Bulgaria's capital of Sofia.

For the routes Vienna–Bucharest and Bucharest–Sofia, the cheapest Ryanair fares are cheaper than the cheapest rail fares. The train is always cheaper to Budapest – a route which is not operated by low-cost airlines.

There are many domestic flight routes in Romania. Generally, the train is cheaper than domestic flights, but a trip crossing the country may easily take longer than 12 hours.

Routes analysed from and to Romania

Bucharest–Budapest

There are 2 daily night train pairs between the cities operated by the Romanian state owned railway company CFR. By air, the Romanian state owned TAROM flies daily, the local carrier Air Connect flies twice a week. Since train tickets do not cost more than €37.62, the train is always cheaper on this route. Long-term train tickets are not sold by CFR.

> *A flight from Bucharest to Budapest causes 190 kg of harmful greenhouse gases per passenger. Using the 950 km long train could save 83% of these emissions. This saving is equivalent to the consumption of 580 kWh of electricity (Romanian mix), enough to run a fridge for up to 10 years.*

Timișoara-Munich

Timișoara, located in South–West Romania, and Munich are connected by 3 daily Lufthansa flights, Wizz Air is flying 3 times a week. This high demand can be explained by the number of expats from this area. Unlike most of the other routes analysed, there is no significant price difference between Lufthansa and Wizz Air, with Lufthansa prices starting at €64.20. By train, one transfer in Budapest is required. The trip takes 13h28m and it is necessary to purchase 2 separate tickets to and from Budapest. The train is more expensive than the polluting flight on 5 out of 9 trips analysed. On average, the train is also slightly more expensive. During the research, huge price differences were found on this route among the railway operators: for the exact same train from Budapest to Munich, the Hungarian railway company MAV charged €36, the German railway company DB €89.90 and the Austrian railway company ÖBB €144.10.

> *A single flight from Timișoara to Munich causes 265 kg of harmful greenhouse gases per passenger. Using the 960 km long train could save 88% of these emissions. This saving is equivalent to the consumption of 860 kWh of electricity (Romanian mix), enough to cook on an electric stove for a full year.*

Vienna–Bucharest

The 2 cities are connected daily by Austrian airlines and Ryanair. There is a daily night train operated by CFR which lasts 18h23m and is one of the longest night trains in Europe. The cheapest way for this route is Ryanair, with prices found starting from €35.99. On 2 out of 3 short-term bookings, the train was slightly cheaper, for all mid-term bookings Ryanair was the cheapest option. CFR is not selling train tickets 4 months in advance. Given Ryanair's long-term fares not exceeding €50.99, it can be assumed that the train would also be more expensive for long-term bookings, as the lowest train price found is €69.

> *In 2019, 634,000 people flew between Vienna and Bucharest. Shifting this flight to train would save 69,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 46,000 cars, or approximately to the complete car fleet of Târgu Mureș.*

Bucharest–Sofia

Bucharest and Sofia are only directly connected by train from June to September. For the rest of the year, the 2 cities are only connected twice a day per train, with 2 transfers each, lasting more than 10 hours for not much more than 300kms. The Romanian airline Tarom as well as Bulgaria Air fly daily, Ryanair flies twice a week. On these 2 days, the flight is always cheaper than the train, with the lowest price found at €15.54. A train ticket costs around €34, which is always less than flights on non-Ryanair days. This route is a good example of how low train fares are important, but not enough if the quality of the rail service is very poor.

> *A single flight from Bucharest to Sofia causes 52 kg of harmful greenhouse gas emissions per passenger. By taking the 400 km long train route, around 75% of these emissions could be saved. Therefore the rail frequency and speed needs to be urgently improved between Romania and Bulgaria.*

Slovakia

Overall situation

Due to the proximity to Vienna, Bratislava and other places in Western Slovakia are well-connected by train to many different countries. There is also a quite good train connection to Eastern Slovakia. The airport in Bratislava is small, with more than 80% of all regular flights operated by Ryanair to 22 destinations; except for one Wizz Air flight to London, the remaining flights are almost exclusively heading to holiday destinations such as Turkey and Egypt. None of these destinations except London are served daily. This leads to the unique situation that routes served by Ryanair are mostly very cheap on its operating days and expensive on other days, especially when transfer flights involve traditional airlines. The flight route from Bratislava to Zagreb was found to be the one with the lowest price of all routes analysed, with €9.99. The flight to Brussels was available from €22.09.

In total, 5 routes from and to Slovakia were analysed. On 3 routes, the train was very expensive, with a train ticket costing almost 8 times of the flight ticket price for London, almost 4 times for Zagreb, and 3.3 times for Brussels. On the other 2 routes, Bratislava–Split and Košice–Prague, the train was always cheaper.

In addition to these routes, all routes analysed for Vienna can be applied to Bratislava, by simply adding a maximum of €10.30 for a train ticket between the 2 capitals. There are 2 train pairs per hour running, lasting around 1 hour.

Routes analysed from and to Slovakia

Bratislava–Brussels

Ryanair flies twice a week between Bratislava and Brussels. On other days, only transfer flights are available, either with Ryanair via Manchester, Rome or Corfu, or with Croatia Airlines via Zagreb. The best train connection is using the night train Vienna–Brussels on its operating days, on other days another change is needed in Bonn or Cologne. The cheapest option is by far Ryanair on its 2 direct flight days. On 2 days analysed, the costs for the train tickets are more than 550% of the airline tickets. Even the transfer flights with Ryanair via Manchester or Rome were found to be less than half price of the train, while causing even more than 100% more CO_2 emissions

than direct flights. Only on 2 days, when the only flying option was with Croatia Airlines, and on another day with a Ryanair transfer flight via Corfu, did the train cost about a third of the price of the flight.

> *A single direct flight from Bratislava to Brussels causes 300 kg of harmful greenhouse gases per passenger. Using the 1,260 km long train route could save 87% of these emissions. This saving is equivalent to the consumption of 1,370 kWh of electricity (Slovak mix), enough to cook with an electric cooker for one and a half years.*

Bratislava–Split

The Croatian coastal city of Split is the only southern destination accessible by direct night train from Bratislava. There is no direct flight to Split. Transfer flights are possible either using Air Croatia via Zagreb or with Wizz Air and easyJet via London. Not surprisingly for a route within CEE, the train was cheaper on all the days analysed on this route. The cheap Wizz Air flights from Vienna (close to Bratislava), to Split were not taken into account in this analysis.

> *A single flight from Bratislava to Split via Zagreb causes 124 kg of harmful greenhouse gases per passenger. Using the 1,000 km long and winding train route could save 73% of these emissions. This CO_2 saving is equivalent to the consumption of 475 kWh of electricity (Slovak mix), enough to run a fridge for 6 years.*

Košice–Prague

Despite Ryanair connecting Košice with Prague 4 times a week, the train was found cheaper on all days analysed. There are 5 direct train connections a day lasting 8h15m, one of them a night train. The day train operated by the private Czech company Regiojet was found to be the cheapest on all days, with prices between €20.90 and €39.90. The cheapest flight was found for €38.17. On days when Ryanair does not fly direct, the cheapest flights are 2 Ryanair flights via London, which are ten times more polluting than a direct flight on this route. Since these transfer flights via London are available from €57.29 on and the flight time (excluding check-in times etc.) is shorter than the train travel, it is unfortunately realistic that people would fly via London. Of all the routes analysed for Slovakia, this is the only one where the train is always cheaper than Ryanair.

> *A direct flight from Košice to Prague causes 62 kg of harmful greenhouse*

Bratislava–Zagreb

Ryanair connects the Croatian and the Slovak capitals 3 times a week until the end of October, which is always the cheapest and polluting way on these days. On other days, the cheapest flights are even more polluting Ryanair transfer flights via Bergamo or Brussels. During summer time, there is a direct train connection every other day, otherwise a change in Vienna is required. The train ride takes at least 7h19m, which is quite long considering, with the train taking a complicated route via Ljubljana and being slow especially when passing Slovenia. This route was found to be the cheapest flight route of all 112 routes analysed, with prices starting from €9.99. On Ryanair direct flight days, the train is much more expensive: up to 9.5 times as much as the flight. On other days, the train was cheaper. On average, the train costs 4 times as much as the flight.

A direct flight from Bratislava to Zagreb causes 75 kg of harmful greenhouse gas emissions per passenger. Despite the complicated, 600 km long train route, 74% of these emissions could be saved by using the train. Based on the average Slovak electricity mix, these emissions are equivalent to the consumption of almost 310 kWh of electricity, enough to power a washing machine for up to 450 times.

London–Bratislava

The Slovak capital Bratislava is a popular destination for UK party tourists, enjoying good and, compared to the UK, cheap beer, food and night club entry prices. This is presumably the reason why London is the only (!) destination which can be reached daily from Bratislava airport. Ryanair and Wizz Air are offering extremely low prices on this route starting from just £ 12.99 (€15). With beer prices at less than €3 in Bratislava, and around €8 in London, the return on investment in the flight is recouped after the 4th beer. The return flight can be paid for through savings on the cost of dinner.

The train connection from London to Bratislava is quite good for the long distance. You need to take the Eurostar to Brussels (or Amsterdam), then the night train to Vienna, and a 1 hour connection train to Bratislava. The

price of the train is however not fair at all. On 3 of the 9 days analysed, the train price was found higher than €350. For long-term bookings only the train was found for €139.90. On average, train fares are at 780% of airfares, with the largest difference being 15.5 times. It is the third most expensive train route out of all 112 routes analysed.

> *In 2022, more than 160,000 people were flying on this route, making it the most used flight route in Slovakia for regular flights, and emitting around 61,000 tonnes of greenhouse gases, as much as 40,000 cars per year. Since the largest part of this train route goes through Germany and Austria with 100% renewable electricity, at least 85% of these harmful emissions could be saved by shifting to rail.*

Slovenia

Overall situation

Slovenia is connected by rail to all its neighbouring countries, but the frequency and speed of international trains is very low. There are only 2 daily direct train pairs to Croatia's capital of Zagreb, 2 train pairs to Germany, Budapest and Vienna, and a single direct connection to Trieste in Italy. However, thanks to direct night trains to Zurich, Stuttgart and Bratislava, and night trains from Austria running to Italy or Poland, many countries and cities are reasonably accessible by train from Slovenia.

The Ljubljana airport is very small, and serves more as a regional airport dominated by transfer flights to larger airports. Except for London and Amsterdam, the latter only on one day a week, no city can be reached with low-cost carriers.

The most expensive train route found was the one from Ljubljana to Amsterdam, with the Transavia direct flight on Saturdays being the cheapest option. On some other days, the train was cheaper. The route to Hamburg is mostly more expensive by train when polluting transfer flights are operated by or involving low-cost airlines such as easyJet via London or Wizz Air via Belgrade. On the 2 routes from Warsaw and to Milan, the train was always cheaper – but it is really slow.

Routes analysed from and to Slovenia

Ljubljana–Milan

Ljubljana–Milan is one of the few routes analysed without any direct connection, and it is also one of the few routes which cannot be travelled with low-cost carriers. Typical flight routes are Air France via Paris or LOT via Warsaw. The fastest train route requires 2 changes, in Trieste and Venice, and takes 8h28. In October, the fastest train connection lasts one more hour and goes via Villach, Austria. The train was found to be always cheaper on this route.

> *A flight from Ljubljana to Milan via Paris causes 496 kg of harmful greenhouse gas emissions per passenger, a flight via Warsaw even 615 kg. The 500 km long train ride causes 16.5 kg of GHG, or 97% less than the transfer flight via Paris.*

Ljubljana–Amsterdam

The French Transavia flies 4 times a week from Ljubljana to Amsterdam, on other days the cheapest flights are via London with Wizz Air or easyJet. A train ride requires 2 changes, either at Villach and Munich and a night train, or a night train to Stuttgart and then 2 ICE trains. The flight was cheaper on 4 out of the 9 days analysed, on average the train was found to be 15% more expensive. The cheapest flight found was a flight via London for €56.82.

> *A flight from Ljubljana to Amsterdam via London–Luton causes 50% more greenhouse gas emissions than a direct flight, and at least ten times more than the train.*

Ljubljana–Hamburg

There is no direct connection on this route, neither by rail nor by air. The train includes a night train, either to or from Bavaria and the quickest connection takes 16h14m. On 4 out of 9 days analysed, the flight was cheaper, with the cheapest price of all 9 days analysed at €104 via Belgrade. The cheapest train ticket was found for €136.60. On average the train was 1% cheaper.

> *A flight from Ljubljana to Hamburg via Belgrade causes 505 kg of harmful greenhouse gas emissions per passenger. A train ride could reduce these*

> *emissions by 92%.[16] Based on the Slovene electricity mix, the saving is equivalent to the consumption of 1,800 kWh of electricity, enough to power a single household for almost a year.*

Warsaw–Ljubljana

As with other routes within Central and Eastern European countries, the train is always cheaper than the plane. Only the Polish state airline LOT flies daily. One-way-tickets do not cost less than €128.67, while the most expensive train ticket costs €93.80. Unusually, there are no connection flights with low-cost carriers on this route. The best train connection is the night train from Warsaw to Graz, Austria, and the Eurocity to Ljubljana and the trip takes 18h23m, considerably long for less than 1,100 km.

> *A flight from Warsaw to Ljubljana causes 273 kg of harmful greenhouse gas emissions per passenger. The 1,100 km long train ride causes 36 kg of GHG, which is 87% less than the flight.*

Spain

Overall situation

On 13 out of 14 routes analysed within, from and to Spain, the cheapest option is always or almost always the most harmful one: the plane. In Spain, even domestic flights are systematically cheaper than the train. The only exception found was the route from Madrid to Barcelona. Of all the countries analysed, Spain has the highest density of low-cost airlines. They operate all routes analysed within, from and to the country. Besides Ryanair and easyJet, among others, the 3 Spanish low-cost airlines Vueling, Volotea and Air Europa have a strong presence. Wizz Air also flies from and to Spain.

On average for all routes analysed for Spain, the train cost almost 4 times as much as the polluting plane. Spain has the second-largest price difference between rail and air, after the UK.

International train connections from and to Spain are rather rare. There is only one train connection with 2 pairs per day going from Vigo to Porto in

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[16] 1200 km, 33 gram GHG/pkm = 40 kg of GHG per rail passenger

Northern Portugal; Lisbon cannot be reasonably reached from Madrid by train.

From July 2023 on, the number of trains between Spain and France increased from 2 to 4 per day, as RENFE opened additional routes from Barcelona to Marseille and from Madrid to Lyon. For research dates before July, the only 2 trains in the past were partly already sold out or extremely expensive. These 4 train connections cross the border on the Mediterranean route, but there is still no cross-border train connection on the Atlantic coast line, making it very complicated and long to travel, for example, from Bilbao to Bordeaux.

A train trip from Madrid to Rome would take more than 24 hours, without any night train option. Generally, there is currently no night train running to Spain, though a new connection from Zurich to Barcelona is planned for 2024.

Trains in Spain have a high variety of prices, e.g. on the route from Madrid to Barcelona, tickets were found from €14 to €107.35.[17] Trains to and from France especially, or passing France, were found very expensive – using the French TGV high-speed trains is needed to reach Spain in a reasonable time. 2 tickets to Zurich cost more than €500, the highest price of all tickets analysed. The most expensive train route found in this analysis is the route from Barcelona to London. The train cost on average more than 10 times as much as the flight and almost 30 times as much for a short-term trip (Ryanair flight: €12.99, train: €384).

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[17] The highest amount was found as part of the Madrid-Zurich route, which requires taking an early morning train.

Drought exposes the Huerva riverbed in Mezalocha, Spain, 2017.
© Pedro Armestre/Greenpeace

Routes analysed within, from and to Spain

Lyon–Madrid

Iberia and its low-cost subsidiary Vueling fly daily between Lyon and Madrid, from September 2023 on, Volotea flies twice a week. By train, from mid-July on from Friday to Monday, with the new Spanish RENFE train service between Lyon and Barcelona, only one change is required. From autumn 2023 on, this train will run daily. On some days analysed, the TGV train from France to Barcelona was already sold out, and then 4 changes in total were needed. The polluting flight was cheaper on 8 out of 9 trips. Only one long-term trip using the new Spanish train was cheaper. On average, the train cost twice as much as the flight.

> *In 2022, 203,000 people flew between Lyon and Madrid, causing 61,000 tons of harmful greenhouse gases. Using the 1,250 km long train route could reduce these emissions by 86%.*

Luxembourg–Barcelona

Luxembourg's national airline Luxair flies daily on this route, Ryanair 5 times a week. On its operating days, Ryanair was always cheaper. The most efficient climate-friendly train trip requires one transfer in Paris and lasts

11h15m. On one short-term trip, the trains from France to Barcelona were booked out. Even though the polluting flight is relatively expensive on this route, on average at €125.73, the greener train was always clearly more expensive. On average the train cost more than 3 times as much as the polluting flight.

> *In 2022, 124,000 passengers flew between Luxembourg and Barcelona causing 38,000 tons of harmful greenhouse gases. Shifting these flights to rail would save 83% of these emissions, equivalent to the yearly emissions of 21,000 fossil fuelled cars. This is approximately the car fleet size of Soria.*

Bilbao–Málaga

The train from Bilbao to Málaga, lasting 9h12m with a change in Madrid, was found to cost always more than the polluting flight. On average the train costs 3.1 times the price of the flight. The 2 Spanish low cost airlines Volotea and Vueling are both offering really low prices on this route, with prices starting from €13.99 on and not exceeding €51.39. Long-term train tickets for this route were not available from RENFE.

> *A direct flight from Bilbao to Málaga causes 172 kg of harmful greenhouse gas emissions per passenger. Using the train on this 900 km long route can save 83% of these emissions. Based on the average Spanish electricity mix, this saving is equivalent to the consumption of 860 kWh of electricity, enough to cook on an electric stove for a whole year.*

A Coruña–Barcelona

Vueling flies daily between A Coruña and Barcelona. The fastest train journey lasts 7h14, and requires a transfer in Madrid. There is a direct train connection only during summer, 4 times a week. The train was only cheaper on one short-term booking, on all other days the flight was cheaper. On another short-term booking, an even more polluting transfer flight via Madrid was found the cheapest option. On average the train was 28% more expensive than the flight.

> *A direct flight from A Coruña to Barcelona causes 236 kg of harmful greenhouse gas emissions per passenger. Using the train on this 1,000 km long route can save 86% of these emissions. Based on the average Spanish electricity mix, this saving is equivalent to the consumption of*

> **1,120 kWh of electricity, enough to produce warm water with an electric boiler for a person for 1 to 2 years.**

Madrid–Paris

The flight was always found to be clearly cheaper on this route, the cheapest train was 61% more expensive than the flight, the most expensive train cost almost 4 times as much. The cheapest flights are offered by easyJet, Ryanair, Vueling and Transavia, who all fly directly between the 2 capitals. The train takes 10h18m, and requires one change at Barcelona. For one short-term trip, all trains were booked out.

> **In 2019, more than 2.5 million passengers were travelling on this route (both-way). Shifting to rail would save 302,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of 200,000 cars. This is approximately the car fleet size of Palma.**

Porto–Madrid

Due to the poor train connections between Portugal and Spain, Porto–Madrid is the only international route between Spain and Portugal that could be analysed. While there are 3 low-cost carriers, namely Ryanair, easyJet and Air Europa, with direct flights, there is no direct train connection between Porto and Madrid: a change in Vigo is needed. As a result, this train trip takes at least 9h23m for just 420 km of air distance, and 2 separate tickets must be purchased from RENFE for the sections to and from Vigo. This route has the lowest average flight price of all routes analysed (€21.88), while the average train price is almost 3 times as much as this amount (€59.14).

> **In 2019, almost 1 million passengers were travelling between Porto and Madrid. Shifting this flight completely to train would save about 50,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of around 33,000 fossil fuelled cars. This is approximately the car fleet size of Irun.**

Geneva–Barcelona

EasyJet as well as the Spanish low-cost airline Vueling are flying between Geneva and Barcelona. The quickest train trip with 2 transfers takes around 8 hours, a train trip with only one transfer takes 11h25m due to a 4 hours waiting time in Valence. The polluting flight was always clearly cheaper on

this route, with indecently low prices found starting from €25.99. On average, the train cost 2.7 times as much as the polluting flight.

> *In 2019, 638,000 people flew between Geneva and Barcelona. Shifting this flight to rail would save 52,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 35,000 fossil fuelled cars, or more than the complete car fleet of Torremolinos.*

Barcelona–London

Barcelona–London is the most expensive train route out of all routes analysed. On average, the train cost more than 10 times as much as the polluting flight. On one day, the train even cost 30 times as much. 3 low-cost airlines fly between the 2 cities, Ryanair, easyJet and the Spanish Vueling, with prices starting extremely low at €12.99. Also the most expensive flight ticket found – €80.60 – is much cheaper compared to most other routes. The train route can be travelled with one transfer, and takes 10h57m – which is very quick considering that the route is 1,500 km long. Though, the train ticket was not available for less than €300, making this route also one of the most expensive routes in absolute amounts. Long-term train tickets are not available for this route.

> *In 2019, 3.36 million people flew between Barcelona and London, making it the 3rd most used short-haul flight in Europe with a rail alternative. Shifting these flights to rail would save 461,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 303,000 cars, approximately the car fleet size of Malaga.*

Madrid–Barcelona

There are numerous direct train services between Madrid and Barcelona, operated by RENFE, the private company Aryo as well as by the French SNCF subsidiary OUIGO, with the fastest ones taking only 2h40m. Despite this great train service, Iberia, Vueling and AirEuropa fly around 15 times a day on this route. Train ticket prices are low on this route, mid- and long-term tickets were found for €14. This route is one of few where the eco-friendly train is quick, runs often and is always cheaper than the plane.

> *Despite the perfect train service, in 2019 almost 2.6 million people flew on this route making it the EU's 5th most used short-haul flight with a train alternative. Banning this completely useless flight would save*

Madrid–Brussels

Madrid–Brussels is an expensive train route with an average price of 7.4 times as much as the flight. Ryanair and Air Europa fly daily. The train takes 14h38m and requires 2 transfers in Barcelona and Nimes. There is no night train available on this route. The train is always expensive on this route with an average price of €326.79. It is necessary to buy separate tickets from the Spanish and French railway companies. On 2 short-term days, the only train option from Barcelona to France was already booked out and a train trip was not possible on those days.

In 2019, almost 1.2 million people flew on this route. Shifting them to rail would save 179,000 tonnes of harmful greenhouse gases. This is equivalent to the yearly emissions of 119,000 cars, almost as many as the complete car fleet of A Coruña.

Madrid–Zurich

This is the longest train route analysed for Spain. The train takes 15h26m, with 2 transfers in Barcelona and Paris. There is no night train available on this route, but a direct connection from Barcelona to Zurich will be re-introduced in 2024. People who want to use the climate-friendly option have to invest a lot of time, but also a lot of money: the train is on average 4 times more expensive than the plane, and has been found more expensive on all days surveyed. The biggest price difference between rail and plane was €371.72, which is one of the biggest differences of all 112 routes analysed. The 2 Spanish low-cost carriers Vueling and AIr Europa are flying daily on this route, and are responsible for the lowest prices. On 2 days, an even more polluting transfer flight with Vueling via Barcelona was cheaper than a direct flight.

In 2022, 484,000 passengers were flying on this route, emitting 150,000 tonnes of harmful greenhouse gases. Despite the long train via Paris compared to the air distance, 2,250 km and 1,250 km respectively), around 75% of these GHG emissions could be saved by shifting to rail. The savings would be equivalent to the yearly emissions of 75,000 cars, as much as approximately the car fleet of Badajoz.

Cologne–Barcelona

The 2 low-cost carriers Eurowings and Ryanair are both daily flying from the West German city Cologne to Barcelona with Ryanair always the cheaper airline. The best train connection is the Thalys high speed train to Paris, followed by a TGV to Barcelona. The trip takes 12h41m. It also would be possible to start around midnight with the night train to Basel, but then 2 more transfers would be needed. That's why this option was not considered in this analysis. On one short-term trip, the trains from France to Barcelona were already sold out, and for one long-term trip, the Thalys tickets were not yet available. The polluting flight was always cheaper than the train, on average the train cost more than 3 times as much as the flight.

A Ryanair flight from Cologne to Barcelona causes 305 kg of harmful greenhouse gas emissions per passenger. The 1,600 km long train trip causes only 53 kg of GHG, which is 82% less. The saved CO_2 emissions (252 kg) are equivalent to the emissions for the production of 1,400 kWh of electricity in Germany. This amount is enough for an average household to cook for more than 2 years.

Toulouse–Barcelona

Despite 3 daily and very quick train connections with the quickest one lasting only 3h42m, with a transfer in Narbonne, the Spanish low-cost airline Vueling has started a direct flight on 3 days per week from July on. The polluting flight is always clearly the cheapest option, even on days where a transfer flight via the Balearic Islands is needed. On average, the train cost 3.3 times as much as the flight and is not available below €109. The most expensive flight found was for €85.74.

A direct flight from Toulouse to Barcelona causes 57 kg of harmful greenhouse gases per passenger. A transfer flight via Palma de Mallorca causes 3.4 times as much as a direct flight. The 400 km long train trip causes 13 kg of greenhouse gases, which is 91% less than less than a transfer flight via Palma. The saved greenhouse gases are equivalent to 240 kWh of average Spanish electricity — enough to power a fridge for around 4 years.

Valencia–Paris

Like most other routes in Spain and France, this route is also daily operated by polluting low-cost airlines. In this case, it is the Spanish Vueling and the French Transavia fighting against each other with the lower prices. The train connection takes a bit more than 14 hours. While only one train transfer

was required in June 2023, two transfers were required (in Madrid and Girona) in the summer and autumn of 2023. The polluting flight is always clearly cheaper than the greener train. Out of all 9 days analysed, the cheapest train compared to the flight cost 3.8 times as much as the flight, the most expensive train cost more than 12 times as much.

> *In 2019, more than 570,000 people flew between Valencia and Paris. Shifting this flight fully to rail would save around 75,000 tons of harmful greenhouse gases per year, equivalent to the yearly emissions of 50,000 fossil fuelled cars. This is more than the car fleet of Santiago de Compostela.*

Sweden

Overall situation

The Swedish railway company SJ belongs to the progressive ones in Europe, e.g. by reinvesting in night trains and using 100% renewable electricity. There is a dense and quick network throughout the country and to Copenhagen, and thanks to brand-new night train connections from Stockholm to Berlin (Germany), the Netherlands and some parts of its neighbouring countries can be reached by rail. Train connections to Norway are less frequent, with 2 train pairs per day to Oslo and a few other connections. There is currently no active rail connection to Finland.

The Swedish air market is dominated by SAS and the low-cost airline Norwegian, with a certain presence of Ryanair, easyJet and Eurowings. Out of the 8 routes analysed, only Stockholm-Narvik was always found cheaper by train – a route with a direct night train, but no direct flight. On 2 routes the flight is almost always cheaper, and on 5 routes it depends on the day of travel. On 4 out of these 5 routes, the cheapest offer was by low-cost carriers. On the last route, Oslo–Stockholm, the lowest train price was found to be €0.49 lower than the cheapest flight.

On the domestic flight analysed, Gothenburg–Stockholm, the flight was cheaper on 5 out of 9 days analysed, with Ryanair extremely low prices starting from €12.85 on, the second-cheapest flight price of all 112 routes analysed. As well as being terrible for the climate, this flight is particularly useless as there are 28 pairs of trains a day on this route, some of which take less than 3 hours.

The fares of the Swedish railway company are more predictable than e.g. the French, Italian, German or Spanish ones. The maximum price difference for a day train route between the cheapest and the most expensive ticket was "only" around 70%, for the night train to the north it was only 22%. The rail fare for routes in France, Germany, Spain or Italy can be over 4 times the cheapest fare available on expensive days.

Routes analysed within, from and to Sweden

Oslo–Stockholm

There are only 2 daily direct train pairs between the Norwegian and the Swedish capital lasting around 7 hours, while there are at least 16 daily direct flights by Norwegian, SAS and a bit surprisingly, by Ethiopian Airlines. The last one even offered the cheapest flight on 2 thirds of the days analysed. Train tickets are only available 60 days in advance therefore only 6 days could be analysed. On half of these days, the flight was up to 36% cheaper. On half of the other days, the train was slightly cheaper with a price advantage of €0.45, €1.13 and €7.18. On average, the train price was 110% of the flight price.

> *In 2019, more than 1.4 million passengers were travelling this route by air. Shifting this route completely to rail would save more than 70,000 tonnes of CO_2 per year, as much as the emissions of around 45,000 fossil fuelled cars. This is approximately the car fleet of Norrköping.*

Munich–Gothenburg

The only direct connection between the Bavarian capital and the second largest Swedish city is with Lufthansa. On 8 out of the 9 days, an even more polluting transfer flight was much cheaper than a direct flight. In most cases, the German low-cost carrier Eurowings was the cheapest with a transfer flight via Düsseldorf. A train trip takes 16h27m and requires two transfers in Hamburg and Copenhagen. Long-term train tickets are not available for this route. The polluting flight was cheaper on 5 out of the 6 days analysed. The most expensive train ticket was found for a short-term booking at €469.39.

> *A direct flight from Munich to Gothenburg causes 310 kg of harmful greenhouse gases per passenger. Since the train runs in its largest part in Germany and Sweden with 100% renewable electricity, at least 95% of these emissions could be saved by shifting to rail.*

Copenhagen–Stockholm

There are 6 direct train connections a day between the Danish and the Swedish capitals lasting a bit more than 5 hours. On the days of research, however, the direct train did not run due to construction works on some days, and on other days, the train with a transfer in Malmö was found cheaper. The air route is operated daily by the traditional airline SAS and the low-cost carrier Norwegian, with the last one always offering lower prices. On half of the days analysed, flying was cheaper. On average, the train was 1% more expensive. Long-term train tickets are not available, which is disadvantageous for rail over planes.

> *In 2019, almost 1.4 million people flew on this route making it the second most used short-haul flight from and to SwedenIn 2019, making it the third most used short-haul flight from and to Sweden with a train alternative, after Stockholm–London and Stockholm–Oslo. Shifting this connection fully to rail would save at least 98,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emissions of 65,000 fossil fueled cars. This is almost as much as the car fleet size of Örebro.*

Bergen–Stockholm

The polluting flight was always cheaper than the train on this quite long route from the Norwegian west coast to Stockholm. In most cases, the low-cost airline Norwegian was the cheapest airline. The best train connection is a night train from Bergen to Oslo, followed by an Intercity train to Stockholm, and takes 14h14m. On average, the greener train cost 1.7 times as much as the flight. Long-term tickets are not available for Norwegian trains, which is disadvantageous over planes.

> *A flight from Bergen to Stockholm causes 229 kg of harmful greenhouse gases per passenger. Using the 990 km long train trip could save around 85% of these emissions.*

Stockholm–Narvik (NO)

Narvik is the northernmost town in Norway accessible by train, though the only train line to Narvik enters from Sweden without direct train connections to places further South. There is a direct night train from Stockholm running to Narvik, taking 18h25m. There is no direct flight on this route, all flight connections to Narvik go via Oslo. The train was always cheaper than the flight on this route. On 2 mid-term days, the train was already booked out.

> *A single flight from Stockholm via Oslo to Narvik causes 408 kg of harmful greenhouse gas emissions per passenger. By taking the 1,400 km long train trip, almost all these emissions could be saved since the Swedish railways are running fully on renewable electricity and even the last part of the route to Narvik is electrified. The saved CO_2 emissions are approximately equivalent to cooking on a gas cooker for 2 to 3 years.*

Stockholm–Berlin

The best way to travel by train between Stockholm and Berlin is taking one of the 2 night trains which are relatively new and operated by the Swedish state railway company SJ and the private railway company Snälltåget respectively. By air, 4 airlines are competing – easyJet, Eurowings, Norwegian and SAS. All of them were found the cheapest at least once, even SAS. Tickets for the night train cannot be bought 4 months in advance, which is disadvantageous for rail. On one day, both night trains were booked out already, therefore only 5 days could be analysed. The train was cheaper on 3 of them, but on average the train was 20% more expensive than the polluting flight.

> *In 2019, 516,000 people flew between Stockholm and Berlin. Shifting these flights to rail would save 49,000 tons of harmful greenhouse gases, as much as the annual emissions of 33,000 fossil fuelled cars. This is approximately the car fleet size of Halmstad.*

Amsterdam–Stockholm

On air, this route is served by Norwegian, SAS and KLM. The only reasonable train connection lasts longer than 17 hours, with 2 changes including the night train from Hamburg to Stockholm. On average, the train costs 2.5 times as much as the flight, with prices up to €686, due to the sleeper being the only category available on the night train. Only on 2 days analysed the trains were slightly cheaper, by €0.48 and €10.70. On one day analysed, all night train options were sold out.

> *In 2019, more than 860,000 passengers were travelling this route by air. Shifting this route completely to rail, would save more than 120,000 tonnes of CO_2 per year, as much as the annual emissions of around 80,000 fossil fuelled cars. This is more than the car fleet size of Uppsala.*

Gothenburg–Stockholm

Despite the 28 (!) daily train pairs on this route, the fastest of which takes just 2h53m, there are also several daily polluting flights between Sweden's 2 largest cities. One of the operators, Ryanair, is offering indecently low prices on this route, starting from €12.85. This is the second lowest price of all flights analysed – and this in Sweden, a country known for its high prices. The train was only cheaper on the 3 long-term bookings and on one midterm booking. In most cases, only the early morning train leaving at 5:39 was cheaper than the flight. On average, the train was 15% more expensive than the plane.

> *Despite the perfect train service, 455,000 passengers flew between Gothenburg and Stockholm in 2022. This useless flight is causing 56,000 tons of harmful greenhouse gas emissions, equivalent to the yearly emission of 37,000 cars. Banning this flight route would almost eliminate these emissions, since the Swedish railways use 100% renewable electricity.*

Switzerland

Overall situation

Thanks to its central location in Europe and to the high quality of the Swiss railways, almost all countries analysed can be reasonably reached by train from Switzerland. There are also night trains from Zurich, e.g. to Berlin, Amsterdam, Vienna/Budapest and Ljubljana/Zagreb. Out of all countries analysed, Switzerland has the lowest share of low-cost airlines. Ryanair is not flying to Switzerland at all, easyJet only flies a very few routes from Zurich and some more from Geneva, 2 Spanish low-cost carriers fly to Spain and Wizz Air covers 2 routes from Geneva.

The analysis of 7 routes shows a diverse picture. On both routes analysed to and from Spain, the flight was clearly cheaper, with the most expensive day train tickets of all routes analysed being Madrid–Zurich, costing more than €500. On the routes to Berlin and Vienna, the train is almost always cheaper.

On the other 3 routes analysed, the cheapest price depends on the day: on the Basel–Zagreb route, the flight is clearly cheaper on days with a direct low-cost flight, while the train is clearly cheaper on the other days. On the Brussels–Zurich route, the train is cheaper than the plane with long-term

bookings and more expensive with short-term bookings. The Geneva–Paris route is an exemption: it is daily operated by easyJet, but the train is cheaper on 7 out of 9 days.

On average for all routes analysed for Switzerland, the train was 70% more expensive than the flight.

Routes analysed from and to Switzerland

Zurich–Berlin

Zurich–Berlin is one of the few easyJet routes from and to Switzerland. In addition, Lufthansa flies this route. There are 5 direct train connections a day, one of them a night train. The fastest train takes 8h32m. The day connections were always cheaper than the night train, and starting from €49.90. Very rare in this analysis, despite a daily presence of easyJet, the train was found cheaper on 8 out of the 9 days analysed.

> *In 2019, more than 1.1 million passengers were counted on this route. Shifting this route completely to rail would save 97,000 tons of harmful greenhouse gases, as much as the yearly emissions of 65,000 fossil fuelled cars. This is approximately the car fleet size of Bern.*

Geneva–Paris

Geneva–Paris is the most popular route in Europe for private jets. For the more modest, the choice is between a polluting easyJet flight, or one of the 8 daily direct high-speed trains that take only 3h13m. This route was one of the few routes analysed where, despite being operated by easyJet, the train was mostly cheaper, with train ticket prices between €29.50 and €93.70.

> *Despite the perfect train connection, in 2019, 1,059,000 people flew between Geneva and Paris. Banning this flight would save 57,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 38,000 fossil fuelled cars, or approximately the complete car fleet of Sankt Gallen.*

Brussels–Zurich

As often on routes to Switzerland, Brussels–Zurich is only operated by traditional airlines. While the direct Lufthansa flight was the cheapest flight for mid- and long-term bookings, for short-term bookings even much more polluting transfer flights via Mallorca, the Greek island of Kos and Warsaw cost less than half of the direct flight. These 3 short-term flights were also

cheaper than the train, while the train was cheaper on 5 out of 6 mid- and long term trips. All long-term train tickets for this 6h43m long trip with one transfer were available for €49.90.

A direct flight from Brussels to Zurich causes 157 kg of harmful greenhouse gases per person. A transfer flight via Greece causes almost 10 times as much as this, 1,059 kg. With the trains running mainly on renewable electricity on this route, almost all of these emissions could be saved.

Geneva–Barcelona

EasyJet as well as the Spanish low-cost airline Vueling are flying between Geneva and Barcelona. The quickest train trip with 2 transfers takes around 8 hours, a train trip with only one transfer takes 11h25m due to a 4 hours waiting time in Valence. The polluting flight was always clearly cheaper on this route, with indecently low prices found starting from €25.99. On average, the train cost 2.7 times as much as the polluting flight.

In 2019, 638,000 people flew between Geneva and Barcelona. Shifting this flight to rail would save 52,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 35,000 fossil fuelled cars, or more than the complete car fleet of Lugano.

Basel–Zagreb

Ryanair flies 4 times a week between Zagreb and the EuroAirport (between Basel, Mulhouse and Freiburg) at an average price of €40.29. On other days, the cheapest flights were even more polluting transfer flights with easyJet and Air Croatia via Split. The best train connection is a train to Zurich and the night train to Zagreb. The train was cheaper only on 3 of the 9 days analysed, on average the train cost 2.3 times as much as the flight.

A single flight from the EuroAirport to Zagreb causes 212 kg of harmful greenhouse gas emissions per passenger. By using the 950 km long train trip, 85% of these emissions could be saved.

Zurich–Vienna

The Swiss and the Austrian capitals are perfectly connected by train. There are 6 direct daily train pairs, one of them a night train. The day train takes 7h52m. By air, only the Lufthansa group connects the city. The train was always found cheaper than the plane, on average the train was more than

30% cheaper. Zurich–Vienna is one of the few perfect train routes analysed in this report.

> *Despite the perfect train connection, in 2019, 941,000 people flew between Zurich and Vienna. Banning this flight would save 75,000 tons of harmful greenhouse gases. This is equivalent to the yearly emissions of 50,000 fossil fuelled cars, or more than the complete car fleet of Luzern.*

Madrid–Zurich

This is the longest train route analysed for Switzerland. The train takes 15h26m, with 2 transfers in Barcelona and Paris. There is no night train available on this route, though at least a direct connection from Barcelona to Zurich will be re-introduced in 2024. People who want to use the climate-friendly option have to invest a lot of time, but also a lot of money: the train is on average 4 times more expensive than the plane, and has been found more expensive on all days surveyed. The biggest price difference between rail and plane was €371.72, which is one of the biggest differences of all 112 routes analysed. The 2 Spanish low-cost carriers Vueling and AIr Europa are flying daily on this route, and are responsible for the lowest prices. On 2 days, an even more polluting transfer flight with Vueling via Barcelona was cheaper than a direct flight.

> *In 2022, 484,000 passengers were flying on this route, emitting 150,000 tonnes of harmful greenhouse gases. Despite the long train via Paris compared to the air distance, 2,250 km and 1,250 km respectively), around 75% of these GHG emissions could be saved by shifting to rail. The savings would be equivalent to the yearly emissions of 75,000 cars, as much as approximately the car fleet of Lausanne.*

United Kingdom

Overall situation

The UK has become a hotspot for climate-wrecking low-cost carriers. EasyJet and Ryanair fly from London to all other capitals part of this analysis, except to Brussels, which can be reached by train from London in 2 hours. In many cases, transfer flights via the UK with Ryanair and easyJet were also found the cheapest way for quite some routes, such as

Amsterdam–Warsaw or Venice–Budapest. Even for London–Brussels, transfer flights with Ryanair via Denmark were found at a quarter of the price of the train. These ridiculous transfer flights involving huge detours can cause up to 3 times the emissions of a direct flight, while the train often causes more than 97% fewer emissions on these routes.

Thanks to the Eurostar tunnel, the UK is well-connected by rail to many countries and cities. Even Barcelona and Rome can be reached within a day, and with 1 and 2 changes respectively only. From all train routes analysed, the Eurostar showed the highest prices.

On all 9 international routes analysed, the flight is always clearly cheaper, except for London–Brussels where the train is cheaper for 2 out of 9 trips. The most expensive train route found in this analysis is the route from Barcelona to London. The train costs on average more than 10 times the price of a flight, and nearly 30 times more on a short-term trip (Ryanair flight: €12.99, train: €384).

The Edinburgh–London route, which in 2019 was the second most used flight route in Europe, is systematically cheaper by plane; the same is valid for the night train route from London to Inverness in Scotland. Glasgow–London is the only domestic route where the train is cheaper on 2 out of 6 days analysed. But on average, the train is twice as expensive as the polluting flight on this route.

Activists in Edinburgh Airport in 2007 offered passengers Climate Tickets to switch to the train. Greenpeace has called attention to the unfair advantage flying has over train travel for decades. © Richard Stanton/Greenpeace

Routes analysed within, from and to the UK

Amsterdam–London

Amsterdam–London is Europe's most used short-haul flight route, despite the fact that there are 4 daily direct train connections lasting only 4 hours. easyJet flies 15 times a day on this route. The Eurostar train was almost always found to be more expensive than the polluting flight, with prices up to €333. Only with one long-term booking, the train was €0.42 cheaper. On average, the train cost almost double than the plane.

> *In 2019, more than 4.7 million passengers were travelling this route by air (both-ways). Banning this useless and very polluting short-haul flight route would save more than 216,000 tonnes of CO_2 per year, as much as the annual emissions of around 144,000 fossil fuelled cars. This is approximately the car fleet size in Newcastle.*

Glasgow–London

There are countless direct train connections between Glasgow and London, with the quickest train taking 4h34m. On most days, easyJet flies more than 10 times a day on this route. Both train and flight prices have a wide range, flights between £18.49 and £108.99, and trains between £37 and £83.70. The flight was clearly cheaper on all short-term bookings, while the train was cheaper on 2 out of 3 mid-term trips. Train tickets cannot be purchased 4 months in advance in the UK, which is disadvantageous for rail over planes. On average, the train cost twice as much as the flight.

In 2019, 2.3 million passengers were travelling this route by air (both ways). Banning this useless short-haul flight route would save 173,000 tonnes of CO_2 per year, as much as the yearly emissions of around 115,000 fossil fuelled cars. This is approximately the car fleet size of Luton.

Paris–London

As for all other large capitals analysed, the polluting flight from Paris to London was clearly cheaper on all days analysed, with the train costing more than twice as much on average. The 2 low-cost airlines easyJet and the Spanish Vueling always have the cheapest prices, traditional airlines such as Air France and British Airways were always more expensive. There are 16 daily and direct Eurostar train connections lasting 2h17m between Paris and London. The average flight price was low at €45.41. The cheapest Eurostar ticket was found for a long-term trip for €57, the most expensive train ticket even cost €132 for this quite short trip.

Despite the perfect train connections, in 2019, more than 2.1 million people flew between Paris and London. Banning this useless short-haul flight would save 98,000 tonnes of harmful greenhouse gases. This is equivalent to the yearly emissions of 65,000 fossil fuelled cars, or approximately the complete car fleet of Exeter.

Manchester–Cologne

Ryanair flies 5 to 6 times a week from Manchester to Cologne, on most other days an even more polluting transfer flight via Dublin was the cheapest option. The flight was always much cheaper on this route than the eco-friendly train. On average, a train ticket costs almost 5 times as much as a plane ticket. On 2 mid-term bookings, the train price was more than 10 times as much. The train trip takes only 7h40m and requires transfers in London and Brussels, with travel options every 2 hours.

> *In 2022, more than 71,000 passengers were flying between Manchester and Cologne, causing more than 15,000 tonnes of harmful greenhouse gas emissions. The 920 km long train trip causes only one seventh of harmful emissions.*

Edinburgh–London

Edinburgh–London is Europe's 2nd most used short-haul flight route with a train alternative, despite the fact that there are countless direct train connections, with the fastest one lasting only a bit more than 4 hours. Ryanair and easyJet are frequently flying, and are always cheaper than the greener train, with very low prices starting at £14.99. On average, the train is 60% more expensive than the plane.

> *In 2019, 3.4 million passengers were travelling this route by air. Banning this useless short-haul flight route would save 244,000 tonnes of CO_2 per year. This is approximately equivalent to the yearly emissions of the complete car fleet of Belfast.*

Barcelona–London

Barcelona–London is the most expensive train route out of all routes analysed. On average, the train cost more than 10 times as much as the polluting flight. On one day, the train even cost 30 times as much. 3 low-cost airlines fly between the 2 cities, Ryanair, easyJet and the Spanish Vueling, with prices starting extremely low at €12.99. Also the most expensive flight ticket found – €80.60 – is much cheaper compared to most other routes. The train route can be travelled with one transfer, and takes 10h57m – which is very quick considering that the route is 1,500 km long. Though, the train ticket was not available for less than €300, making this route also one of the most expensive routes in absolute amounts. Long-term train tickets are not available for this route.

> *In 2019, 3.36 million people flew between Barcelona and London, making it the 3rd most used short-haul flight in Europe with a rail alternative. Shifting these flights to rail would save 461,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of 303,000 cars, approximately the car fleet size of Glasgow.*

London–Brussels

Brussels is the only capital analysed to which there is no direct low-cost carrier flight from London. Therefore direct flights are relatively expensive, and transfer flights e.g. with Ryanair via Denmark or Dublin are the cheapest but most polluting option on this route. The direct train takes slightly more than 2 hours and runs 10 times a day. However, the Eurostar is one of the most expensive trains found in this analysis. It cost around €100 on average on this short route, and cost almost twice as much as a flight ticket. The cheapest flight found is a very polluting transfer flight with Ryanair via Denmark for €36.83. The Eurostar cost 2.7 times as much as this amount on the same day.

> *For obvious climate reasons, a flight with a 2 hour train alternative must be banned. It is causing 88 kg of harmful greenhouse gases per passenger and direction. A transfer flight from London to Brussels via Denmark is almost 6 times worse for the environment, and should also be banned for this route. A Eurostar trip on this route could save <u>92%</u> of the airline's emissions.*

London–Bratislava

The Slovak capital Bratislava is a popular destination for UK party tourists, enjoying good and, compared to the UK, cheap beer, food and night club entry prices. This is presumably the reason why London is the only (!) destination which can be reached daily from Bratislava airport. Ryanair and Wizz Air are offering extremely low prices on this route starting from just £12.99 (€15). With beer prices at less than €3 in Bratislava, and around €8 in London, the return on investment in the flight is recouped after the 4th beer. The return flight can be paid for through savings on the cost of dinner.

The train connection from London to Bratislava is quite good for the long distance. You need to take the Eurostar to Brussels (or Amsterdam), then the night train to Vienna, and a 1 hour connection train to Bratislava. The price of the train is however not fair at all. On 3 of the 9 days analysed, the train price was found higher than €350. For long-term bookings only the train was found for €139.90. On average, train fares are at 780% of airfares, with the largest difference being 15.5 times. It is the third most expensive train route out of all 112 routes analysed.

> *In 2022, more than 160,000 people were flying on this route, making it the*

> *most used flight route in Slovakia for regular flights, and emitting around 61,000 tonnes of greenhouse gases, as much as 40,000 cars per year. Since the largest part of this train route goes through Germany and Austria with 100% renewable electricity, at least 85% of these harmful emissions could be saved by shifting to rail.*

London–Vienna

As on almost all other routes from and to the UK, the polluting flight was always clearly cheaper than the train. On average, the train cost almost 5 times as much as the plane. On one midterm booking, the train cost 9 times as much. 4 airlines fly daily on this route, which is Austria's most used short-haul flight route: British Airways, Austrian Airlines (Lufthansa), Ryanair and Wizz Air. The last one was always the cheapest, with prices starting from €29.02 on. By climate-friendly rail, only one transfer is needed, either in Brussels or Amsterdam for the night train to Vienna.

> *In 2019, more than 1,350,000 passengers flew on this route. Shifting this flight to rail would save 197,000 tons of harmful greenhouse gases, equivalent to the yearly emissions of around 38,000 people living in the UK. Since the largest part of this route lies in Germany and Austria with 100% renewable electricity use by their railway companies, at least 90% of these emissions could be saved.*

London–Inverness

London–Inverness is the longest possible night train route in the UK, taking 11h30m. The fastest day trains on this route last a bit more than 8 hours. British Airways and easyJet fly this route daily, with easyJet always found cheaper. Except on 2 short term bookings where the night train was booked out already, the night train was the cheapest train option on this route. The polluting easyJet flight was cheaper on 8 out of 9 days analysed, with the train costing almost double of the flight on average.

> *An easyJet flight from London to Inverness causes 154 kg of harmful greenhouse gases per passenger. Taking the train on this 900 km long route could save around 80% of these emissions. Based on the average UK electricity mix, the CO_2 saving is equivalent to the consumption of 680 kWh of electricity, enough for cooking on an electric stove for a year.*

Berlin–London

There are several polluting flights per day by Ryanair and easyJet on this route, with Ryanair being 5 out of 9 times the cheapest and easyJet 4 times the cheapest. The best train connection is the private European Sleeper to Brussels, followed by the Eurostar to London. Alternatively, there are some day train connections with minimum 2 transfers and lasting around 11 hours. The night train was always cheaper than the day trains, though it does not run every day but only every other day. This means that for this route, the research date for the night train trip can be either the day of departure or the day of arrival. As with all other routes analysed to and from the UK, the polluting flight was always cheaper, with average train ticket prices costing 2.3 times as much as flight tickets. Since the night train to Brussels is relatively affordable with prices mostly below €100, the average train price is less compared to most other UK routes, but the absolute average price difference is significant with €108.89.

> *In 2019, a bit more than 2 million people flew on the route Berlin–London. Shifting this route to rail would save 237,000 tons of harmful greenhouse gases. This is as much as the yearly emissions of 158,000 fossil fuelled cars, more than the complete car fleet of Newcastle.*

Marseille–London

Marseille–London is one of the quickest and best long-distance train connections in Europe. The 1,300 km long train trip takes just 7h26m with only one change in Paris or Lille, and there are 9 train connections on most days. By air, the 2 cities are connected by both low-cost airlines easyJet and Ryanair. As with all other routes to the UK, the polluting flight is always clearly cheaper. On average, the train cost almost 7 times as much as the flight, on one day even more than 12 times as much. Flights are extremely cheap on this route, with an average price of €35.76, which would not be possible without the many subsidies these airlines receive.

> *In 2019, more than 610,000 people flew between Paris and Marseille. Shifting this flight fully to rail would save around 78,000 tons of harmful greenhouse gases per year, equivalent to the yearly emissions of 52,000 fossil fuelled cars. This is approximately the car fleet of Bath.*

An Unfair Regulatory Playing Field

With trains on average twice as expensive as planes and one route costing up to 30 times as much for a same-day trip, it is clear that citizens are being encouraged to fly across Europe. Trains are often too expensive, but planes are sometimes outrageously cheap. One explanation is the unfair pricing systems that favour air travel over rail: while airlines pay neither kerosene tax nor VAT on international flights and benefit from subsidies paid with taxpayers money, railways have to pay energy taxes, VAT and high rail tolls in most countries.

Transport and Environment estimated that in 2022 in Europe (EU27+UK), the fuel tax and ETS exemptions amounted to €20.5 billion and VAT exemption to €18.8 billion, partially offset by €5.0 billion in revenues from aviation ticket taxes. The total European tax gap, which is the difference between what would have been raised in a no-exemption scenario and the amount of money raised by air travel pricing, amounted to €34.2 billion in 2022.

Why low-cost carriers are cheaper

Working conditions reduced to the legal minimum, multiplying extra costs, subsidies from local authorities… low-cost airlines have exploited every loophole and trick in the book to be as competitive as possible. At the expense of the planet and the climate, but also of workers and customers. Here is a non-exhaustive list of reasons why low-cost airlines sell cheaper tickets:

- The **number of staff** is reduced to the legally required minimum. Any service staff is not available anymore.
- **Lower salaries**. Low-cost carriers pay lower salaries and offer worse working conditions than traditional airlines. This gets especially obvious, when traditional airlines get smaller or bankrupt, and low-cost carriers take over their staff.
- **Freelancers instead of employed staff.** Especially pilots have to found their own one-(wo)man company and sell their services as "contractors".
- **Loopholes in labour laws**. Low-cost carriers love to employ their staff in countries with lower labour laws, such as in Malta.

- **No worker's representation.** Often, low-cost carriers do everything to [prevent organised workers' representation](#), such as workers councils, from being created.
- **Less corporate taxes.** Complicated corporate structures and/or registrations in low-tax countries such as [Malta](#) and [Ireland](#) reduce the need to pay taxes on profits.
- **Low compensation.** If a flight is seriously delayed, all airlines are obliged to pay compensation. Low-cost carriers try to [escape](#) from this compensation, or try to keep them low by linking to the low base price of the ticket.
- **No liability for transfer flights.** Low-cost carriers do not sell transfer flights. If passengers book a transfer flight, these are officially 2 separate flights: if the first flight is delayed and passengers miss the second flight, it is [fully at the risk of passengers](#). In contrast to this, traditional airlines have to take responsibility for missed transfer flights, and pay compensation and/or arrange re-bookings and/or hotel accommodation.
- **Subsidies.** Low-cost carriers are benefiting more from lower airport fees and/or refunds on some airports than traditional airlines. Especially [incentives](#) for new routes from an airport are mainly designed for low-cost carriers, which are typically flying to small airports near large airports, which are considered new destinations (Paris–Beauvais, Frankfurt–Hahn…)**.** There are [cases](#) where low-cost carriers receive direct subsidies for flying on some (low-used) routes, and [cases](#) where they get subsidies for the "development" of regions.
- **Limited inclusion.** Only online check-in is included. If people due to age, [disability](#) or other reasons are not able to use online-check-ins, an extra fee is applied that is often higher than the ticket price.
- **Costs for additional services.** For each and every additional service, the customer will have to pay an additional fee.
- **Zero tolerance for inconsequential mistakes.** If a passenger by mistake comes with a luggage a bit heavier than allowed, the fees for the luggage can be a multiple of the ticket price.
- **Maximise profits.** Low-cost airlines generally focus on very profitable routes and seasons. E.g Ryanair is only flying to the Greek island of Corfu from May to October, while Aegean airlines flies there daily to offer a service for the local population. The same scheme can be found for routes e.g. to Ibiza in Spain, where only traditional airlines such as Iberia fly off-season.

Aviation worker in Frankfurt am Main Airport.

Conclusions

Despite its terrible impact on the climate, flying remains an option for many European citizens, and this is no surprise: thanks to the outrageous subsidies that airlines benefit from, they can offer unreasonably low prices – low-cost airlines are at the forefront with their aggressive pricing strategies. But these cheap tickets come at a high cost to the planet and its inhabitants, including their employees, airport neighbours, customers, people affected by extreme weather events or biodiversity in general.

This unfair regulatory playing field for travel is undermining Europe's railways, exploiting workers and polluting the planet, all to the benefit of airlines: it is time to reverse the trend.

The analysis also revealed other problems, such as the difficulty of booking cross-border train tickets, with prices varying depending on the operator, the unavailability of train tickets more than a few months in advance for some companies, and the need to book several tickets with different operators, which again highlights the need for a simpler ticketing system.

Greenpeace is calling on national governments to introduce climate tickets, affordable and simple long-term tickets valid on all public transport in a country or defined region, including all trains and cross-border transport. Climate tickets can be financed through windfall taxes, the phasing out of environmentally harmful subsidies, or a fair tax system based on CO_2 emissions. In parallel, subsidies to airlines and airports must end, starting with the phasing out of kerosene tax exemptions.

Greenpeace Demands

Demands for fair pricing of flights and trains

- Introduce national, simple and affordable climate tickets including the domestic section of cross-border train connection (as this is already the case with the Austrian climate ticket)
- In countries which have implemented climate tickets, mutually recognise and integrate systems together so one can access public transport with a simple and single ticket across borders
- Introduce a European wide ticket valid for all means of public transport, more affordable and simpler than the Interrail pass, rail subscription/monthly ticket modelled on the highly successful national climate tickets in Germany, Austria, Hungary, Slovenia, etc.
- Phase out the VAT exemptions on flight tickets and the kerosene tax exemption
- Make rail more affordable, starting with reducing/skipping VAT on train tickets, family fares and social fares for low income travellers
- Reduce or skip track access charges for trains
- Improve workers' rights (employment forms, contractual arrangements, union relations, collective bargaining, work-life balance, etc.) and prevent tax optimisation, especially by low cost airlines
- End any subsidies for airports and airlines
- Introduce flight ticket taxes to cover the climate and environmental impact of air travel
- Investigations by national competent authorities with regard to unfair commercial practices and predatory pricing practised in passenger air transport.

Other demands to help shift from air to rail

- Ban of all airlines' advertisements
- Ban of [short-haul flights](#) with a reasonable train alternative
- Expand the Interrail [French](#)–[German initiative](#) and offer a cheap / free ticket to all European youth

Demands for the improvement of rail

- Selling tickets for long-distance trains a longer period in advance
- Accepting online tickets in all countries and by all railways companies
- Same prices/offers for the same trip in all operators' ticket shops
- Introduce an integrated EU-wide ticketing and payment system to make it easier for passengers to book a train journey involving different operators and make it mandatory for rail companies to sell through tickets to protect passenger rights
- Unified train timetable information system
- More direct connections, starting with the reintroduction of lines which were closed in the past (such as the night trains Paris–Venice, Hendaye(F)–Lisbon, Athens–Bucharest…)
- Introduce new and more rail connections between all countries where tracks exist (esp. Greece, Portugal, Lithuania–Latvia)
- Massive investments to upgrade and modernise the rail infrastructure, increase the capacity of the rail networks, and make rail faster especially in Central and Eastern European countries

Annex I: Details of the Methodology

- The geographic focus of the research is the EU27 plus CH, NO, UK, minus Malta, Cyprus and Ireland.
- All routes analysed are below 1,500 km air distance (short-haul flights).
- All destinations have an international airport and a railway station.
- The selected routes represent a mix of geography, and include both typical business and leisure destinations. Main and regional airports were included. The routes include direct flight and direct rail connections, routes which have only one kind of direct connection, and routes without any direct connection (the last one is rare).
- The trips can be done either with trains & flights arriving on the same day (not later than 1 a.m. of the following day), or with night trains[18] including needed connection trains, not exceeding a total travel time of 24 hours (and without boarding or changing between 1 and 4.30 a.m.). For night train connections, the given date is the departure, except when this night train was not available, the date is the arrival date. In the report, train connections under these definitions were described as "reasonable".
- Routes with a train travel time below 4 hours were excluded, if flights are dominantly transfer flights (such as Budapest–Vienna). Routes under 4 hours were included, if due to the flight ticket prices, this route is obviously also frequently used for a trip between the 2 cities (such as London–Brussels).
- Prices were taken only from official airline & railway operator websites. If one ticket for a route operated by more than one railway operator can be bought, the price was usually taken from the website of the railway operator from the departure country (e.g. the price for Brussels–Hamburg was taken from SNCB), or from the railway operator who is able to sell one ticket.[19] When the price appeared unreasonably high, the price was also checked from the other involved railway operators (e.g. for Venice–Budapest, prices from

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[18] A night train is defined as a train with sleepers and/or couchettes, though for the price analysis, supplements for couchettes and sleepers are not included if the train includes normal wagons.
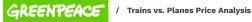
[19] E.g, for the route from Naples to Düsseldorf, only ÖBB is selling a ticket for the complete route, not Trenitalia or Deutsche Bahn.

Trenitalia, ÖBB and MAV were checked). It was not possible to always check all railway operators selling tickets for the route.

- Greenpeace always chose the cheapest available ticket option (2nd class, economy class, no extra reservations, no luggage fees, non-refundable tickets, etc.). Discount cards, individual subscriptions and long-term tickets were not taken into consideration.

- All routes were analysed for a one-way trip within 2, 4 and 7 days, within a month (exactly one month and plus and minus 2 days), and within 4 months (exactly one month, and plus 4, and minus 4 days) – this selection is ensuring a mix of weekdays.

- Only flights were considered, which included at the maximum one transfer. Also train routes were limited to a maximum of one more change than needed. (If there is a direct train, only 1 transfer was considered, if there is one transfer required, 2 transfers were considered at the most; Except, if trains on the direct routes were not available, routes with more transfers were considered.)

- If the day train connection takes longer than 12 hours, and if a night train is available, the night train was the first choice for this analysis. If the day train connection takes less than 8 hours, and if a night train is available, the day train was the first choice for this analysis.

- Transfer flights were only researched if the direct flight cost above €80. Generally, transfer connections were only considered if they were at least 10% cheaper than the direct one.

- For flights, all airports "belonging to one city" were considered (e.g. Brussels airport and Charleroi).

Annex II: Sources and links

The following table includes the main sources that were used to obtain data on ticket prices.

Country	Railway companies	Airlines[20]
Austria	https://shop.oebbtickets.at/de/ticket https://westbahn.at/en/	https://www.austrian.com/at/en/homepage https://www.corendonairlines.com/
Belgium	https://www.b-europe.com/EN	https://www.brusselsairlines.com/at/en/homep

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[20] The airlines and railway companies are listed according to their home base, or in cases, their home country is not part of the research, the airline was listed under the country of departure (e.g. Air Serbia under Romania).

	https://www.thalys.com/de/de	age https://www.tuifly.be/en
Bulgaria	https://www.bdz.bg/en	https://www.air.bg/en
Croatia	https://www.hzpp.hr/	https://www.croatiaairlines.com/
Czech Rep.	https://www.cd.cz/en/ https://regiojet.com/	https://www.csa.cz/cz-en/
Denmark	https://www.dsb.dk/en/	
Estonia	https://elron.ee/en	
Finland	https://www.vr.fi/en	https://www.finnair.com/at-en
France	https://www.sncf-connect.com/en-en/	https://wwws.airfrance.fr/en https://www.transavia.com/en-EU/home/
Germany	https://www.bahn.com/en	https://shop.lufthansa.com/booking/ https://www.eurowings.com/at.html https://www.condor.com/eu
Greece	https://www.hellenictrain.gr/en/ticket-purchase	https://www.skyexpress.gr/en https://www.olympicair.com/en/
Hungary	https://jegy.mav.hu/	https://Wizzair.com/en-gb#/
Italy	https://www.trenitalia.com/en.html	https://www.ita-airways.com/fr_fr/
Latvia	https://www.ldz.lv/en	https://www.airbaltic.com/
Lithuania	https://ltglink.lt/en	
Luxembourg	https://www.cfl.lu/en-gb	https://www.luxair.lu/en
Netherlands	https://www.nsinternational.com/en https://www.europeansleeper.eu/en	https://www.klm.com/
Norway	https://www.vy.no/en	https://www.norwegian.com/uk/ https://www.wideroe.no/en https://www.flygbra.se/en https://www.ethiopianairlines.com/fr
Poland	https://www.intercity.pl/en/	https://www.lot.com/nl/en
Portugal	https://www.cp.pt/passageiros/en	https://www.flytap.com/en-at/
Romania	https://mersultrenurilor.infofer.ro/en-GB/Itineraries	https://www.tarom.ro/en https://air-connect.com/en https://www.airserbia.com/en/
Slovakia	https://www.zssk.sk/en/	
Slovenia	https://potniski.sz.si/en/	

Spain	https://www.renfe.com/es/en https://iryo.eu/en/booking https://www.ouigo.com/es/en	https://tickets.vueling.com/ScheduleSelectNew.aspx https://www.iberia.com/es/?language=en https://www.volotea.com/en/ https://www.aireuropa.com/ot/en/home
Sweden	https://www.sj.se/	https://www.flysas.com/en/
Switzerland	https://www.sbb.ch/en/timetable.html	https://www.swiss.com/at/en/homepage
UK	https://www.nationalrail.co.uk/tickets-railcards-and-offers/buying-a-ticket/ https://www.eurostar.com/rw-en https://www.sleeper.scot/	https://www.ryanair.com/de/de https://www.easyjet.com/en https://www.aerlingus.com/html/en-AT/home.html https://www.britishairways.com/travel/home/public/en_at/

Annex III: Dataset

The dataset we compiled for this report can be viewed online at this link.