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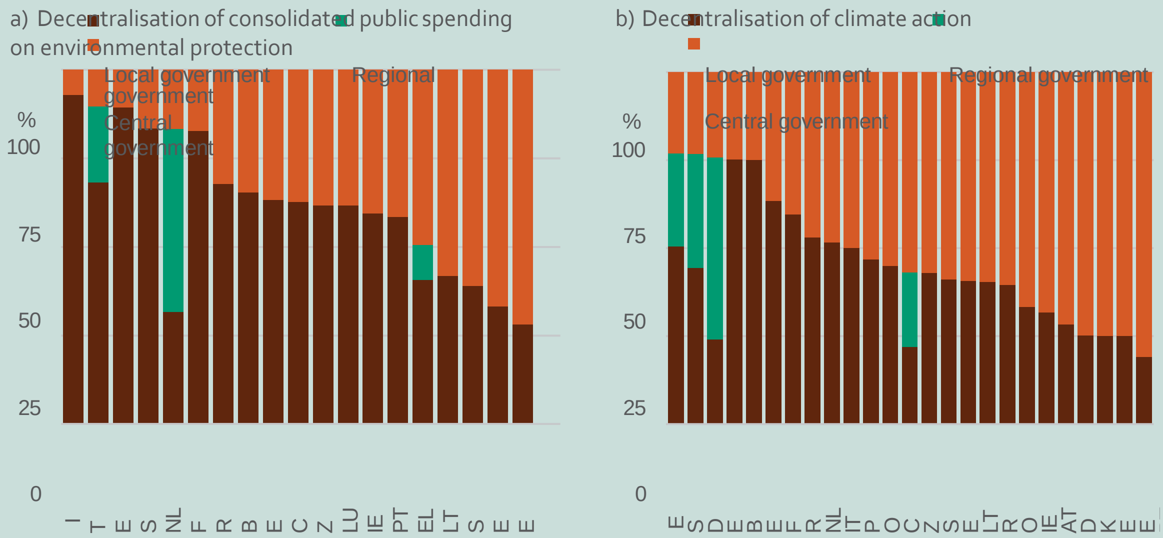
Box 4.4 Decentralisation of public spending on the green transition

Climate and environmental targets are commonly set at EU or national level, but sub-national gov- ernments are responsible for managing the green transition. The OECD has recently analysed fiscal federalism in respect of the ecological transition by collecting data on public spending on environmental protection and climate action by governance level[1]. Local authorities are largely responsible for public spending on environmental protection, particularly on waste and wastewater management. They are also responsible for a large share of public climate expenditure, though to a lesser extent. Sub-national governments in the EU accounted in 2019 for 66 % of climate-related public expenditure (1.7 % of GDP), but they face challenges, particularly smaller ones, in aligning with international green agendas because of capacity and political constraints. While ecological fiscal transfers offer a potential solution by linking grants to environmental protection, their use is lim- ited. Local governments, especially municipalities, also have a key role in galvanising public support for ecological transition policies through participatory processes.

Figure 4.9 Share of public spending on environmental protection (left) and climate action (right) by governance level for a sample of Member States, 2022



Note: Environmental protection includes wastewater treatment, waste management, pollution abatement and protection of biodiversity and landscape.
Source: OECD.

1 Dougherty and Montes Nebreda (2023).

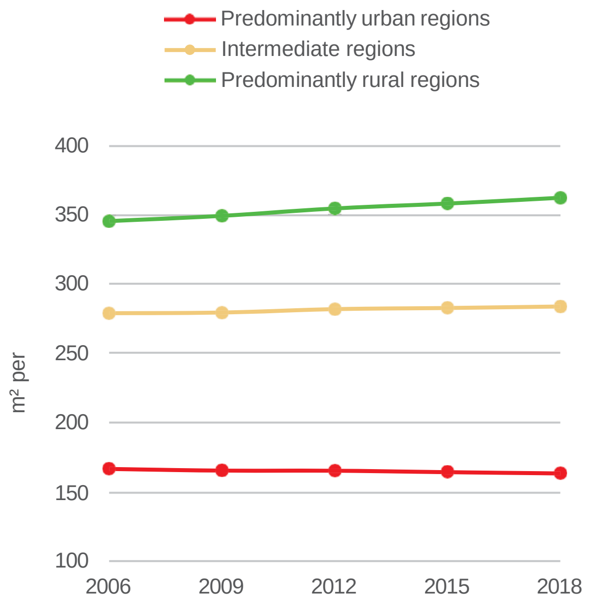
In several regions in Hungary, Slovakia and Po- land, this was the case for under 60 % of sites, but the minimum water quality requirement was met almost everywhere. Two thirds of the sam- pling stations, however, are in coastal areas, which typically have better water quality than sites in- land because of the more frequent renewal and greater self-purification capacity of water around the coasts[33].

1.1 Increasing soil-sealing and soil degradation

Population and economic growth increases de- mand for housing, infrastructure, and services. Growing built-up areas cover the soil with impervious surfaces, called soil-sealing, which is an important cause of soil degradation in the EU. Soil-sealing often affects fertile agricultural land,

33 EEA (2023c).

Figure 4.10 Built- up area trends in urban, intermediate and rural regions, 2006–2018



Source: EEA.

puts biodiversity at risk, and increases the risk of flooding and water scarcity. In places where the area of sealed soil expands faster than population, cities can spawl into the countryside. Sustainable land-use planning can minimise these impacts.

The extent of sealed soil is measured by map- ping imperviousness, which has been monitored since 2006 by the Copernicus land monitoring service[34]. In 2018, the latest year for which data are available, the total impervious surface area of the EU was 111 895 square kilometres (km^2) or 252 square metres per person, 3.4 % up from 2006 (see Map 4.10, which shows in dark brown the regions where soil-sealing increased by more than the EU average over the 12 years, as well as the regions most affected by soil degradation and so where rehabilitation is most needed).

Land in rural NUTS 3 regions areas is less efficiently used for development than in urban regions, in the sense that it involves a larger impervious area per person (Figure 4.10). In predominantly rural regions, impervious land per person amounted to an average of 362 square metres per person, an increase of 4.8 % from 2006. Impervious land per person also increased in intermediate regions, while in predom- inantly urban regions, where it is less than half that in rural ones, it declined. Urban areas tend to have taller, more densely concentrated buildings and less land used for roads per person, meaning that land is used more efficiently than in other regions.

Most of the increase in impervious area between 2006 and 2018, 1 655 km^2, occurred in interme- diate regions, while in rural regions, it increased by 1 002 km^2. As noted above, increasing soil-sealing, especially in rural areas, impairs the natural ability of soil to absorb and store rainwater. As a result, rainfall is more quickly converted into surface run- off, leading to rapid water flow that can overwhelm drainage systems and cause flooding. At the same time, the reduced infiltration of rainwater into the soil impairs the recharge of groundwater and can lead to water scarcity. To remedy this, land use needs to be made more efficient through better regulation, nature-based solutions (such as per- meable pavements, green roofs and green urban infrastructure) and natural drainage systems (such as streams, rivers and wetlands) preserved and re- stored in upstream areas. The latter play a crucial role in intercepting and dispersing surface run-off, preventing flooding and replenishing groundwater.

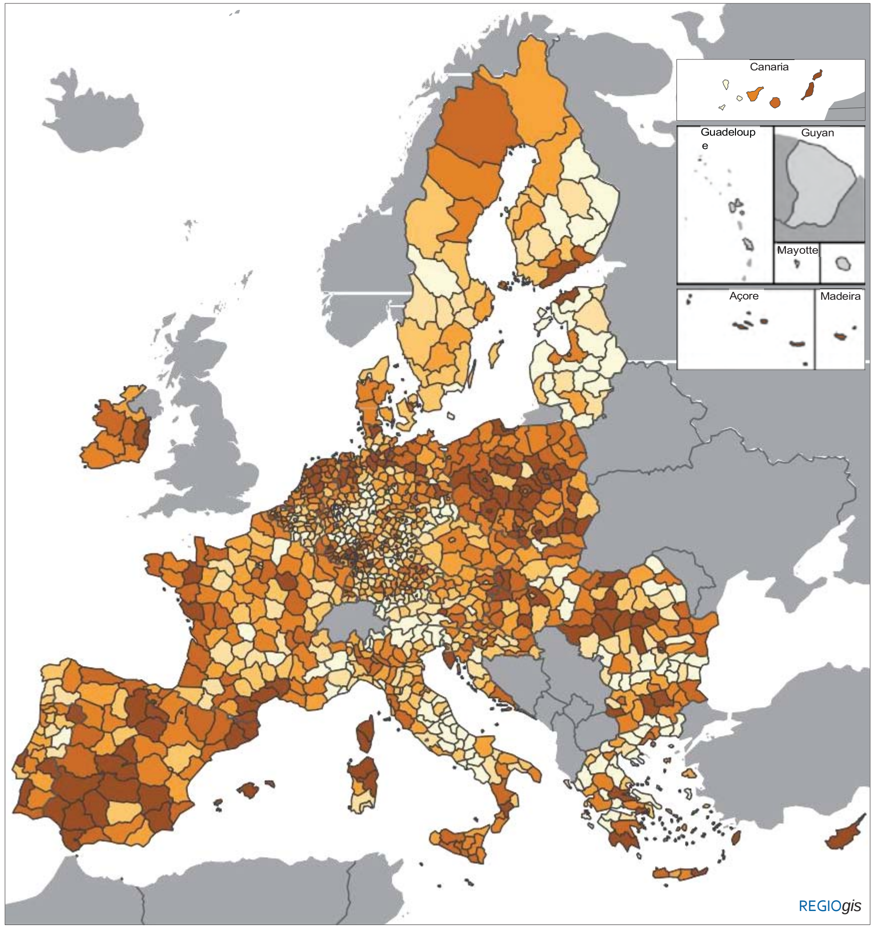
Next to soil-sealing, soil is also degraded through erosion, excessive use of nutrients, heavy-metal contamination and the loss of its biodiversity and organic carbon, which are more widespread.

2. Shift towards climate-neutral transport

Transport-related GHG emissions have continued to rise in the EU (as noted in Section 1.2 above). In 1 in 3 NUTS 2 regions, transport is currently the largest emitter of GHGs. The main options to de- carbonise transport are modal shift, for example to rail or active modes such as biking or walking, technological and operational measures to im- prove energy-efficiency, and a transition to zero- and low- emission energy carriers (i.e. electricity, advanced liquid biofuels and biogas, e-fuels and hydrogen). These options would often also have co-benefits for air quality.

34 The Copernicus land monitoring service is one of six services provided by Copernicus, which is part of the EU space programme.

Map 4.10 Change in imperviousness and soil degradation processes in NUTS 3 regions



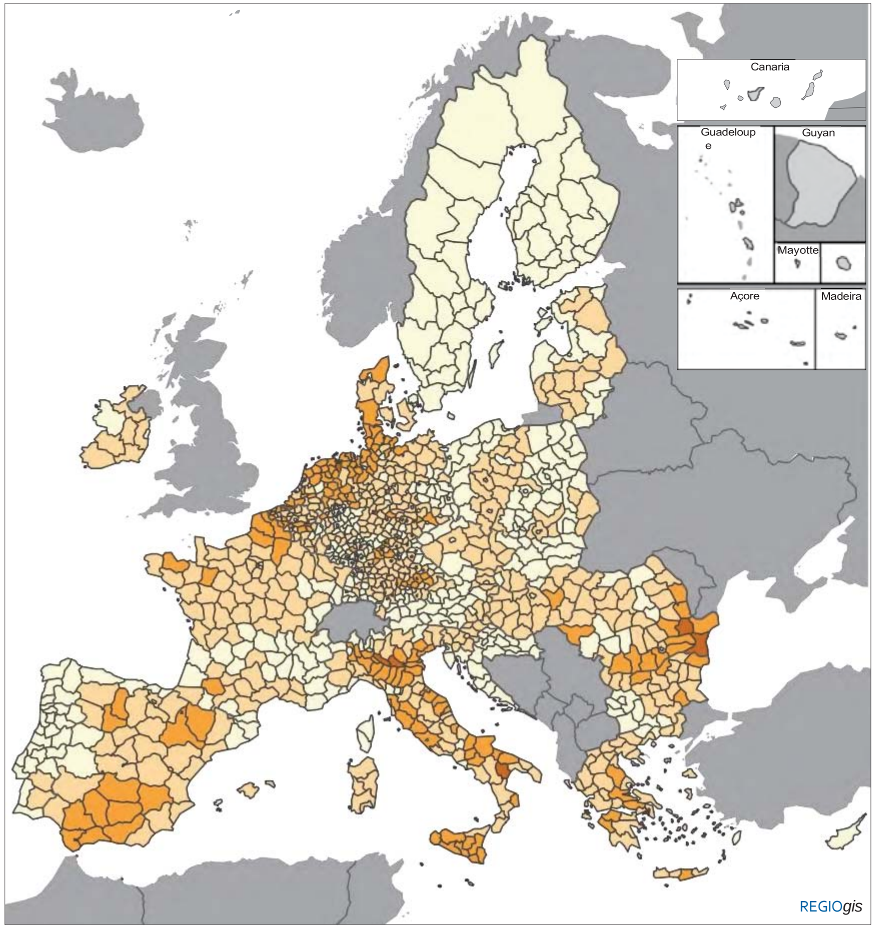
Change in imperviousness, 2006-2018

Total % change

- <= 1.5
- 1.5 – 2.0
- 2.0 – 2.5
- 2.5 – 3.0
- 3.0 – 4.0
- 4.0 – 5.0
- > 5.0
- no data

EU-27 = 3.4
Source: DG REGIO based on EEA harmonised imperviousness

0 500 km



Average number of soil degradation processes

Number

- <= 1
- 2 - 1
- 3 - 2
- > 3
- no data

Source:

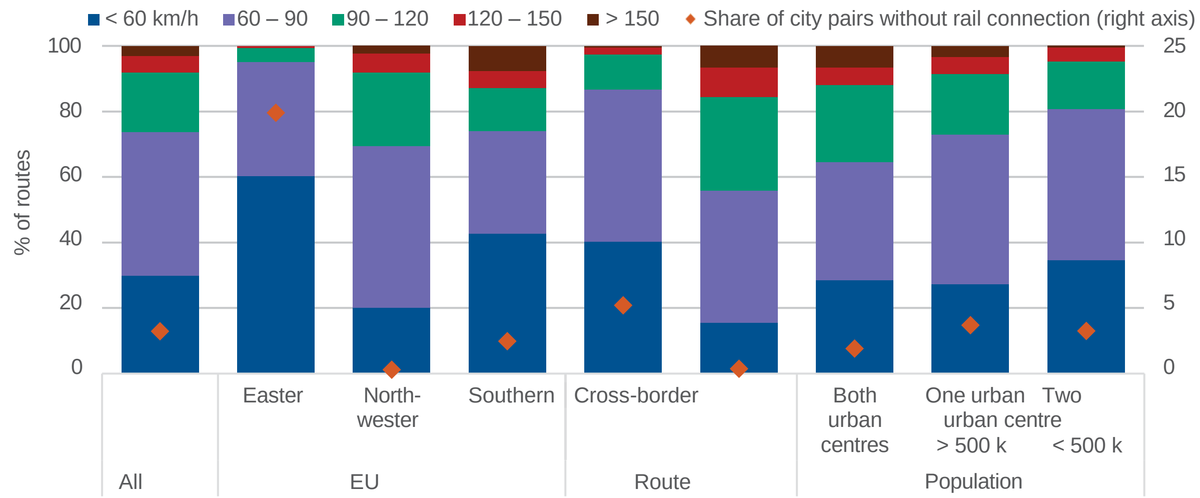
0 500 km

2.1 Rail speed between EU cities[35]

In 2021, the Commission proposed an action plan to boost long-distance and cross-border passen- ger rail services. This built on efforts by Member States to make connections between cities faster by managing capacity better, co-ordinating time- tabling, sharing rolling stock and improving infra- structure to stimulate new train services, including at night[36]. High-speed trains accounted for 31 % of total passenger-kilometres travelled by rail in the EU in 2019, in France and Spain close to 60 %[37]. However, over half of Member States do not have any high-speed railway lines at all. This section looks at the ability of high-speed rail to compete with short-haul flights in terms of travel time. It examines the speed of fast rail connections be- tween large EU cities and compares this with the time taken by air. It focuses on the 1 356 connec- tions between EU cities that are less than 500 km apart and have at least 200 000 inhabitants or are national capitals.

For most of the connections concerned, the straight-line speed[38] of the fastest train service[39] is low (Map 4.11). On only 3 % of the routes does the speed exceed 150 km per hour (km/h) (Fig- ure 4.11). The share is largest in the southern EU (7.6 %), where both Italy and Spain have a well de- veloped high-speed rail network. In the north-west- ern EU, the number of high-speed connections, which are mainly in France and Germany, is similar but their share is smaller. Because of higher pop- ulation density, the rail network is denser, consist- ing of more short-distance connections where rail speeds are lower. Nevertheless, the north-western EU has the largest share of rail connections faster than 90 km/h, and only a few city-pairs without a

Figure 4.11 Speed of rail connections between urban centres, including by broad geographical area, population size, and route type, 2019



Note: Only pairs of urban centres with at least 200 000 inhabitants located within 500 km of each other are included.
Source: DG REGIO.

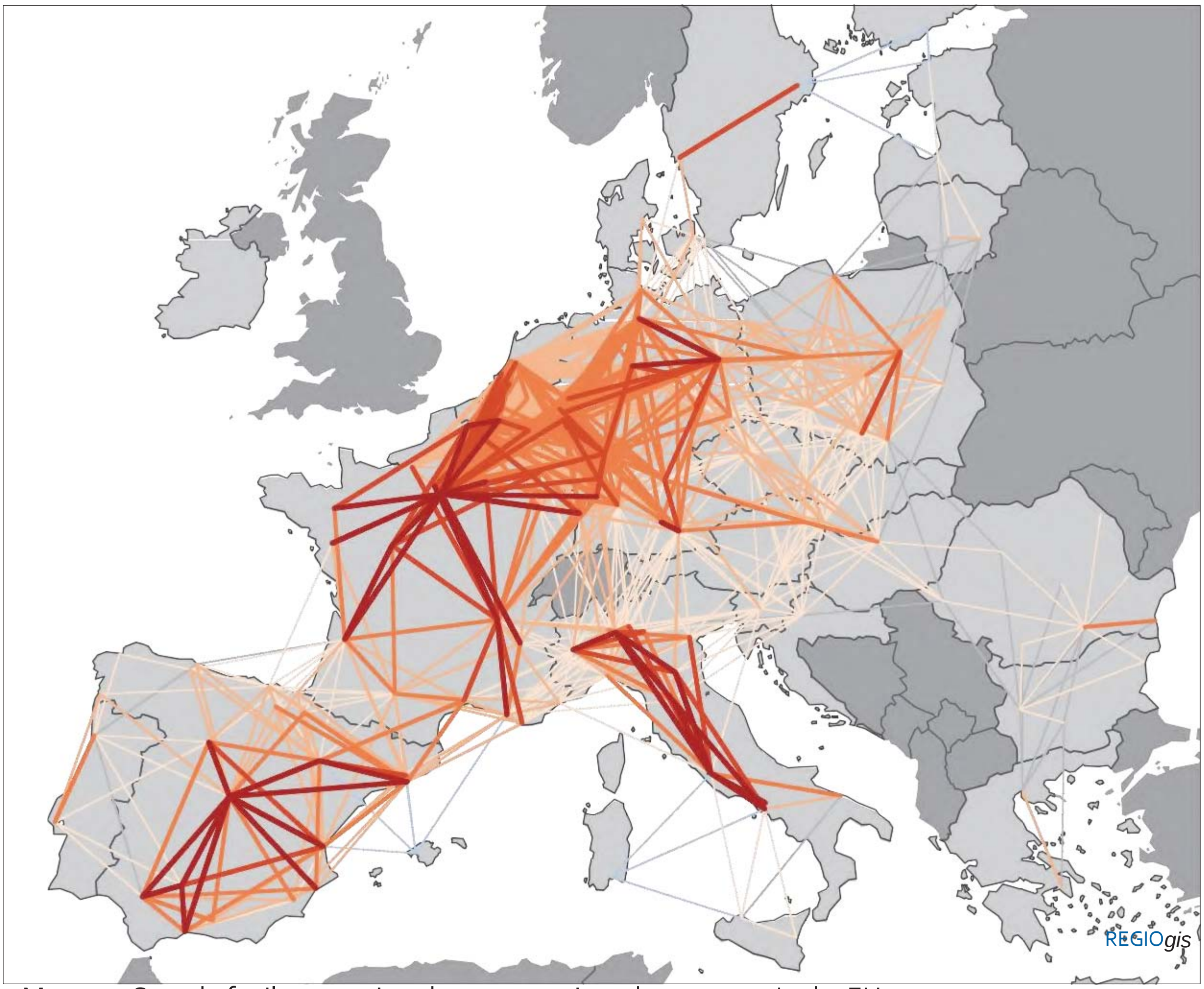
35 This section focuses on travel time and does not consider other aspects relevant to transport mode choices such as prices, comfort and safety Subsections 4.1-4.3 are largely based on Brons et al. (2023).

36 European Commission (2020).

37 This figure relates to all high-speed trains including tilting trains capable of travelling at 200 km/h, which do not necessarily require high- speed railway lines.

38 The straight-line speed used here is defined as the travel time between stations divided by the straight-line distance. Straight-line speeds are determined not only by the rail operating speed, but also by the time spent in transfers, and any detours needed. As such, straight- line speed is always lower than operating speed. Note that for the smaller set of routes considered in Section 3, information on the actual distances by rail and the time spent in transfer could be obtained, which enabled the actual train operating speeds and the other two com- ponents of straight-line speed to be disentangled (see also footnote 19).

39 The fastest service available for departure during a weekday between 6:00 and 20:00 in 2019.



Map 4.11 Speed of rail connections between major urban centres in the EU, 2019

km/h

- < 60
- 60 – 90
- 90 – 120
- 120 – 150
- >= 150
- no connection within 10 hours
- overseas*

Speeds are based on optimal travel time on a weekday relative to the straight-line distance. Only urban centres located within 500 km from each other were considered.
In addition, each pair of urban centres must contain an urban centre that has more than 500 000 inhabitants (or represents the national capital) and the other urban centre has to have at least 200 000 inhabitants.
*Overseas: links between city-pairs involving a sea crossing where neither a fixed railway link nor a train ferry is available.
Sources: DG REGIO, based on data from the International Union of Railways (UIC); national and regional rail operators; and JRC.

0 500 km

rail connection. The rail network is less developed in the eastern EU, with no connections with speeds above 150 km/h and a rail speed below 60 km/h on 60 % of routes, and with 1 out 5 five pairs of cities with at least 200 000 inhabitants without a rail connection.

Despite some progress towards technical inter-op- erability, rail travel across EU borders is still hin- dered by many obstacles. There are numerous gaps where national railways are not properly con- nected to each other[40]. Over 5 % of cross-border city-pairs lack a rail connection as against only 0.3 % of those in the same country[41]. Rail speeds on cross-border routes also tend to be lower than on domestic routes, around 40 % of cross-border routes having speeds of below 60 km/h compared with only 16 % on domestic routes. Moreover, on only 0.4 % of cross-border routes do rail speeds exceed 150 km/h.

The share of routes with speeds above 150 km/h is larger for those that connect large cities with populations of over 500 000 (7 %) than for routes between cities with populations of 200 000 to 500 000 (1 %) or between large and small cities (3 %). The difference is similar for the share of connections with speeds of over 90 km/h (36 % between large city-pairs and 19 % between small ones).

2.2 Comparing travel time of rail and flights between EU cities

Of the 1 365 connections between city-pairs, 297 are served by a direct flight[42]. Comparing the travel time of rail and air trips for each of these routes, for 68 of them the total travel time[43] by rail is shorter than that by air. The routes concerned are mainly between cities in the Netherlands, Belgium, Germany and France, both domestic and interna- tional (Map 4.12). While most connect capital cities, they also include connections between other cities. In addition, on some of the domestic routes in Spain, Italy and Poland, rail is faster, but these are all between the capital city and other major cities in the country. On 17 of the routes where rail is faster, the travel time advantage is as much as an hour or more. These routes are mainly in and between the Netherlands, Belgium, Germany and France, but they also include three domestic routes in Italy.

2.3 Why are some trips faster by rail than by air?

Rail trips are more likely to outperform flights on shorter-distance routes (Figure 4.13a). Air trips are, on average, faster than rail for distances of over 300 km, though there are still many routes over this distance where the reverse is the case. This indicates that rail has the potential to com- pete with aviation on relatively long distances, pro- viding that a sufficient train operating speed can be achieved (Figure 4.13b).

The total transfer time remains under an hour on almost all routes, with a few exceptions where transfer times are between one and two and a half hours (Figure 4.14a). As expected, trips are slower when the transfer times are longer. On all routes where the transfer time exceeds 30 minutes, rail travel is slower than air travel. The rail distance between city-pairs can be a lot longer than the distance 'as the crow flies'. Higher values for the detour factor are associated with longer relative travel time for rail (Figure 4.14b).

On cross-border routes, travelling by rail tends to be slower than on domestic routes by some 20 km/h on average (Table 4.2). The reasons in- clude a slightly larger detour factor, but mainly the longer transfer time of 3 times more, on average, than on domestic routes.

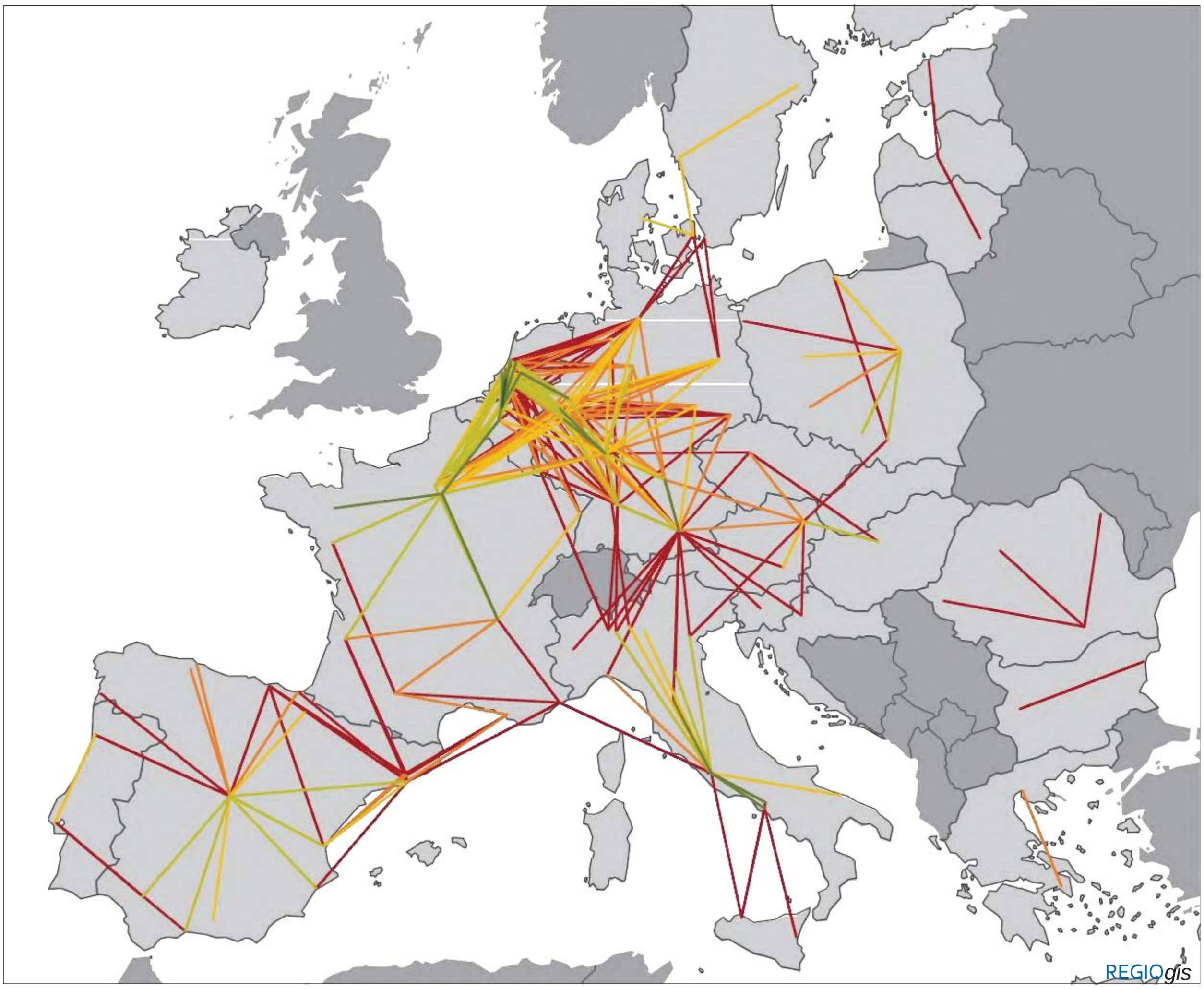
Accordingly, improvements in rail connections could focus on cross-border routes to reduce journey times.

40 Sippel et al. (2018).

41 It should be noted that these routes, whether cross-border or domestic, may be served by long-distance bus connections, which could be a reason for there being no rail connection.

42 Based on SABRE airline data, these routes involve 57 million passenger trips a year. The difference compared with the 102 million trips from Eurostat data is inter alia because the SABRE data apply a minimum city size and a minimum number of flights and passengers per day. Note that some of the passengers will be connecting to another flight.

43 The total travel time includes the out-of-vehicle time components (See Box 4.5).



Map 4.12 Travel time of a rail-based trip compared with a flight-based trip, 2019

Difference in hours

- <= -2
- -2 – -1
- -1 – 0
- 0 – 1
- 1 – 2
- > 2

Note: Negative values indicate that the rail-based trip is faster than the flight-based trip.
Sources: DG REGIO (based on data from UIC), national and regional rail operators, JRC, and Eurostat.

0 500 km

The same goes for routes in eastern Member States where train speeds are lower than in other parts of the EU and there are more missing connections. In north-western and southern Member States, al- most all cities are connected and rail trips tend to be faster. Nevertheless, for many routes, rail oper- ating speeds are still too low to offer an appealing alternative to air. Increasing these could persuade more people to take the train and so reduce the number of flights.