CEDR

Conférence Européenne
des Directeurs des Routes

Conference of European
Directors of Roads

2023 Pan European Road Network Performance Report

CEDR Working Group Performance of Road Network

September 2024

Prepared by:	**CEDR WORKING GROUP PERFORMANCE (3.5)**	
Group leader	Jan Pettersson	Sweden
Group members	Lukas Kerbler	Austria
	Filip Nørholm	Denmark
	Vesa Mannisto	Finland
	Bernard Gyergyay	Germany
	Pier Paolo Cartolano	Italy
	Sandro La Monica	Italy
	Henk Heikoop	Netherlands
	Henrik Vold	Norway
	Laila Aanerød	Norway
	Ana Faria Burnier	Portugal
	Anton Svigelj	Slovenia
	Blaz Pokersnik	Slovenia
	Xalo Fernández Villarino	Spain
	Kenneth Natanaelsson	Sweden
	Yan Cerf	Switzerland
	Nurettin Cirakli	United Kingdom - England
Other contributors	Niels Groenen	Belgium - Flanders
	Mehis Leigri	Estonia
	Peter Schmitz	Germany
	G. Pétur Matthíasson	Iceland
	Cormac Synnott	Ireland
	Mārtiņš Dambergs	Latvia
	Paul Mangen	Luxembourg
	Peter Schout	Netherlands
	Kirsten Tegle Bryne	Norway
	Luis Gómez Diez-Madroñero	Spain

Approved by:	CEDR's EXECUTIVE BOARD on 19 September 2024
Edited and published by:	CEDR's Secretary General
CEDR report:	TR2024-02
ISBN:	979-10-93321-81-3

CONTENTS

EXECUTIVE SUMMARY

The 2023 report on the performance of the Pan European Road Network within participating CEDR countries is the eighth biennial report published by CEDR on this subject, along with the accompanying online web map. For consistency with previous versions the Pan European Road Network still mainly comprises the motorways and high-quality roads that form the TEN-T (Roads) network, and their equivalent strategic routes in non-EU countries, however it is envisaged that this will be extended to include strategic national roads of CEDR's members which do not always match those defined in the TEN-T network.

These reports support CEDR's Vision and strategic priorities, by presenting relevant road management and operational indicators on the performance of National Road Administrations that will enable benchmarking of road management activities across Europe for the benefit of NRAs, other stakeholders in the road industry and wider audiences beyond NRAs.

With 18 national road authorities (NRAs) providing data on a voluntary basis, the fact that this is the seventh biennial report illustrates the value that CEDR members attach to the information the report delivers and to its capacity to serve benchmarking purposes and to monitor the evolution of network performance over time. The report provides very detailed information on the structure and performance of the most important European strategic roads that is not available from other centralised information sources.

Data collected for this report are provided by NRAs directly, using CEDR's performance reporting framework. This framework comprises a common Location Referencing Model for the road network and a set of common definitions for base data that are used to calculate performance indicators.

The network covered by the 2023 report represents some of Europe's most heavily used and significant roads with nearly a quarter carrying more than 40,000 vehicles per day and more than 45% having a traffic density of more than 6,000 vehicles per day per lane. Heavy Goods Vehicles (HGVs) make up a significant proportion of this traffic with more than 15% of the total traffic comprising HGVs on 47% of the network. Overall, traffic density has gradually reduced since 2011 as NRAs have added capacity to their networks - 24% of network sections have planned capacity improvements – while the density of HGV traffic has remained broadly consistent since 2015.

Despite this level of demand, the rate of fatal accidents remains relatively low with an annual average across the network of approximately 2.5 fatal accidents per billion Vehicle Kms travelled on the network as a whole – reducing to 1.3 per billion Vehicle Kms on high-volume motorways - and these figures appear to have continued to gradually decline since 2015.

The ongoing support from CEDR members, and interest from third parties, shows that the Pan European Road Network Performance Report continues to be a useful analysis of the network at a European and national level. The report itself continues to evolve with new indicators being developed to support CEDR's strategic priorities including the Dublin Declaration and the Compass Challenges, as well as the parallel development of a new KPI report covering wider aspects of NRA performance.

1 INTRODUCTION

1.1 The Pan European Road Network

The national road authorities (NRAs) of CEDR are responsible for the management and operation of the majority of high-capacity and strategic roads across Europe. The current Pan European Road Network mostly comprises motorways and high-quality roads that are part of the European Union's TEN-T (Roads) network[1] and their equivalent strategic routes in non-EU countries, as well as some strategic national roads. These are strategically important roads that:

- play an important role in long-distance traffic
- bypass the main urban centres on the routes identified by the network
- provide interconnection with other modes of transport
- link landlocked and peripheral regions to central regions of Europe

This network of roads offers users a high, uniform, and continuous level of services, comfort, and safety. It also includes infrastructure for traffic management, user information, dealing with incidents and emergencies and electronic fee collection, such infrastructure being based on active cooperation between traffic management systems at European, national, and regional level and providers of travel and traffic information and value-added services.

To aid analysis of the performance of the PERN, in the 2023 report the network is categorised into the following 'family groups':

- Motorways with more than 4-lanes
- Motorways with 4-lanes or less
- Non-motorways

The various indicators are reported using these categories.

1.2 Background to the Report

CEDR has long recognised the need for high-quality, comparable information about the performance of the Pan European Road Network and has, therefore, undertaken work to develop a simple, low-cost performance reporting framework that could be used by all members to provide such data.

This framework comprises a common location referencing model[2] for the Pan European Road Network and a set of common definitions for base data that is used to calculate performance indicators. The performance reporting framework has been the basis of the biennial CEDR report on the performance of the Pan European Road Network since 2009. The benefit of this framework is that:

- all data is referenced to a common, stable location referencing model,
- all data is based on common data definitions, and
- data is provided directly by NRAs.

The framework therefore improves data quality and consistency and makes comparison of this information more meaningful.

The 2023 report is based on data covering the 12-month period up to 1st January 2023, with the exception of accident data which covers the five-year period 2018-2022.

[1] 'Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network'

[2] The methodology for the definition of the model is documented in the report '*TERN Location Referencing Model: Handbook & Implementation Guidance*' published by CEDR's Planning Working Group in 2008.

1.3 Purpose the Report

The 2023 Pan European Road Network Performance Report, and the associated online web map, is the eighth biennial report published by CEDR on the performance of the Pan European Road Network within CEDR participating countries. Since its inception, the scope of the report has evolved to include new aspects of network performance that reflect both CEDR's strategic priorities and matters of common interest amongst its members.

CEDR's intention in producing these reports is to establish a stable set of data with which to monitor trends and identify changes in the performance of the Pan European Road Network. As such, the report supports CEDR's vision by presenting relevant road management and operational indicators on the performance of National Road Administrations that will enable benchmarking of road management activities across Europe for the benefit of NRAs, other stakeholders in the road industry and wider audiences beyond NRAs.

1.4 Structure of the Report

The document is divided up into six main sections and six annexes.

Section 2 provides general information about the network, including whether it is part of the TEN-T network, and describes the general characteristics of the network in terms of road type, physical environment, number of lanes and planned capacity improvements.

Section 3 describes the network infrastructure and services including bridges, tunnels, use of hard shoulder running and intelligent transport systems (ITS), as well as rest areas and facilities for road users.

Section 4 describes the performance of the network, as a whole and at a national level, in terms of traffic flow, traffic density, proportion of HGVs, road transport mileage and fatal accident rate.

Section 6 provides an overall summary and conclusions.

Section 7 describes planned and potential future development of the report.

The methodology applied to the data collection process is described in **Annex 1**.

Annex 2 concludes the report by providing background information on key socio-economic indicators and on the national road network of each participating country together with a brief profile of the national road authority.

1.5 Online Web Map

GIS technology has long been valued as a means of enhancing communication and collaboration in decision-making, effectively managing resources and assets, enhancing the efficiency of workflows, and improving the accessibility of information to the public.

The development of web maps further increases the possibility of information-sharing as users do not need to purchase and install software and become GIS experts since they are made available through a regular web browser with a simple, user-friendly interface.

A GIS web map has been developed to support the visualisation of collected data and to give higher visibility to the performance reports. A screenshot of the online web map is provided in Figure 1.

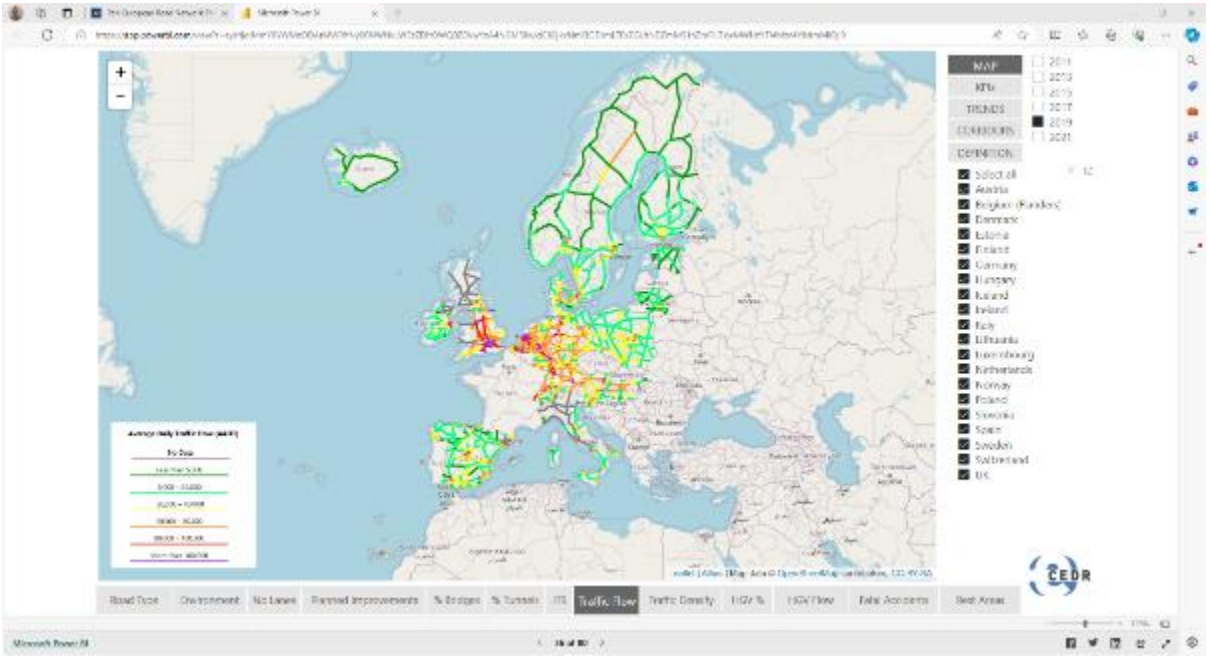


Figure 1 - CEDR Pan European Road Network Online Web Map

The web map displays the GIS layer of CEDR's logical network, in conformity with CEDR's Location Referencing Model, and allows for the visualisation of thematic maps showing road performance indicators at link level and for different years. It also supports graphical reporting of network level data, KPIs and trends.

The online web map is published on the CEDR website at https://www.cedr.eu/pan-european-road-network-performance-gis-web-map.

1.6 Participating Countries

In total, the following 18 countries voluntarily provided data for the 2023 report representing approximately 61,000km of Europe's most important strategic roads.

As far as data coverage is concerned, it should be noted that:

1. For Belgium, only the Flanders Agency for Roads and Traffic (AWV[3]) contributed to the 2023 report. Consequently, all Belgium (network and traffic) data in this report relate to Flanders region only.
2. For Italy, as in previous reports, only Anas[4] contributed to the 2023 report. Consequently, all Italy (network and traffic) data in this report relate to those parts of the TEN-T that are managed by Anas.
3. For the United Kingdom, only National Highways[5] contributed to the report. Consequently, all United Kingdom data relates only to those parts of the strategic road network in England that were part of the TEN-T prior to the UK's departure from the EU.
4. Portugal have indicated that they intend to participate in future reports.

More detailed background information about the participating countries is included in Annex 2.

[3] The Agency for Roads and Traffic (AWV) is an internal autonomous agency that manages about 7000 km of regional roads and motorways and about 6,700 km of cycle paths. The Agency wants to realise safe, smooth and sustainable mobility for all road users in Flanders.

[4] Anas S.p.A. is an Italian joint-stock company that deals with road infrastructure and manages the network of state roads and motorways of national interest. Since January 2018, it has been part of the Ferrovie dello Stato Italiane corporate group.

[5] National Highways, formerly the Highways Agency and later Highways England, is a government-owned company charged with operating, maintaining and improving motorways and major A roads in England.

2 ABOUT THE NETWORK

The current Pan European Road Network is shown in Figure 2 which includes TEN-T roads in CEDR members, as well as strategic roads in the United Kingdom and Switzerland.

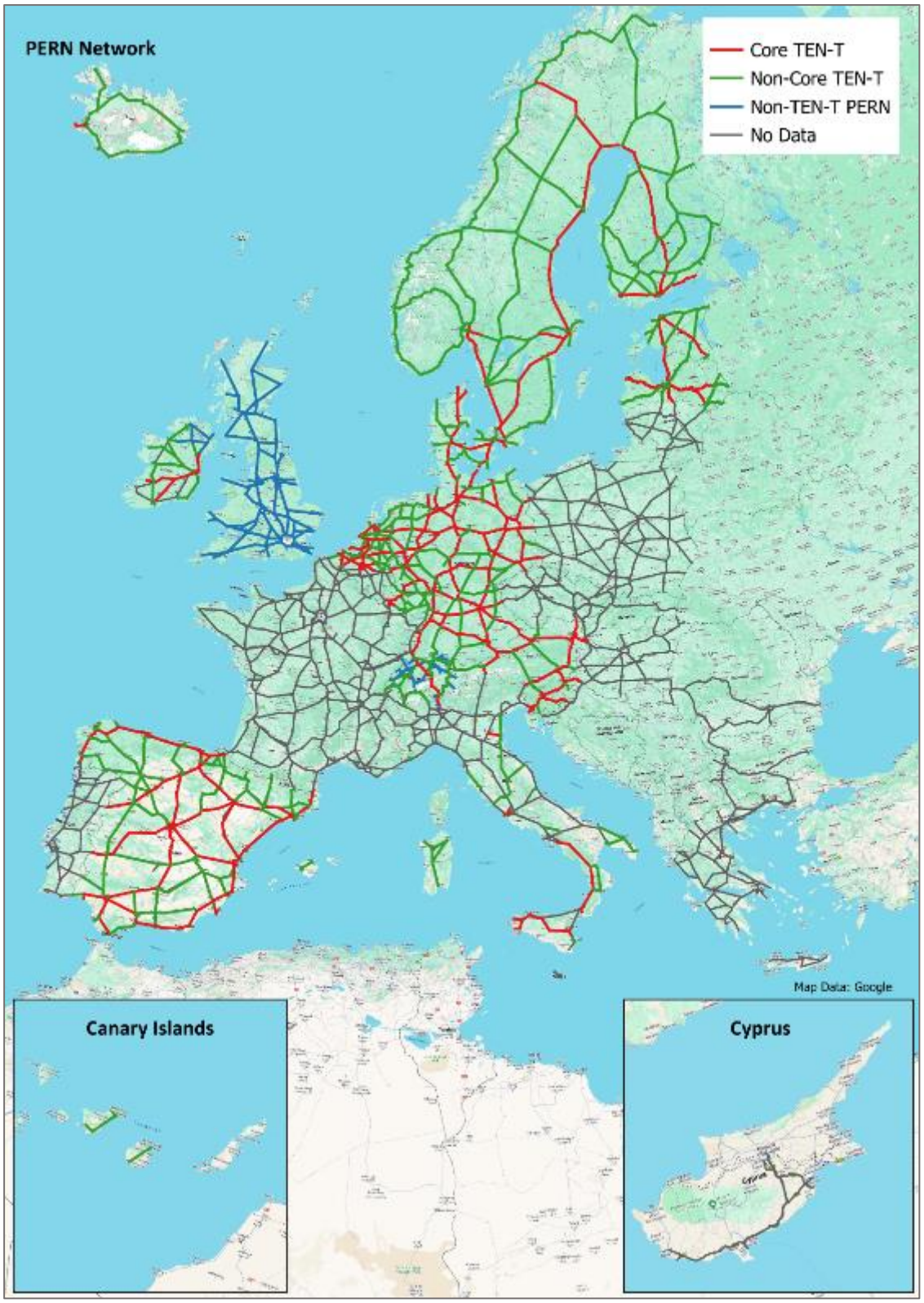


Figure 2 - The Pan European Road Network

2.1 TEN-T Network

The length of TEN-T Core and Non-Core Network in each of the participating countries, and the proportion of the Core and Non-Core Networks with respect to the Comprehensive Network, is shown in Figure 3. The percentages show the proportion of the network that is included in the Core Network in each country. In addition to the TEN-T network, in the 2023 report, Switzerland has included other strategic roads that are part of the PERN and it is expected that other countries will do the same in future reports. The strategic road network in the UK is no longer part of the TEN-T network.

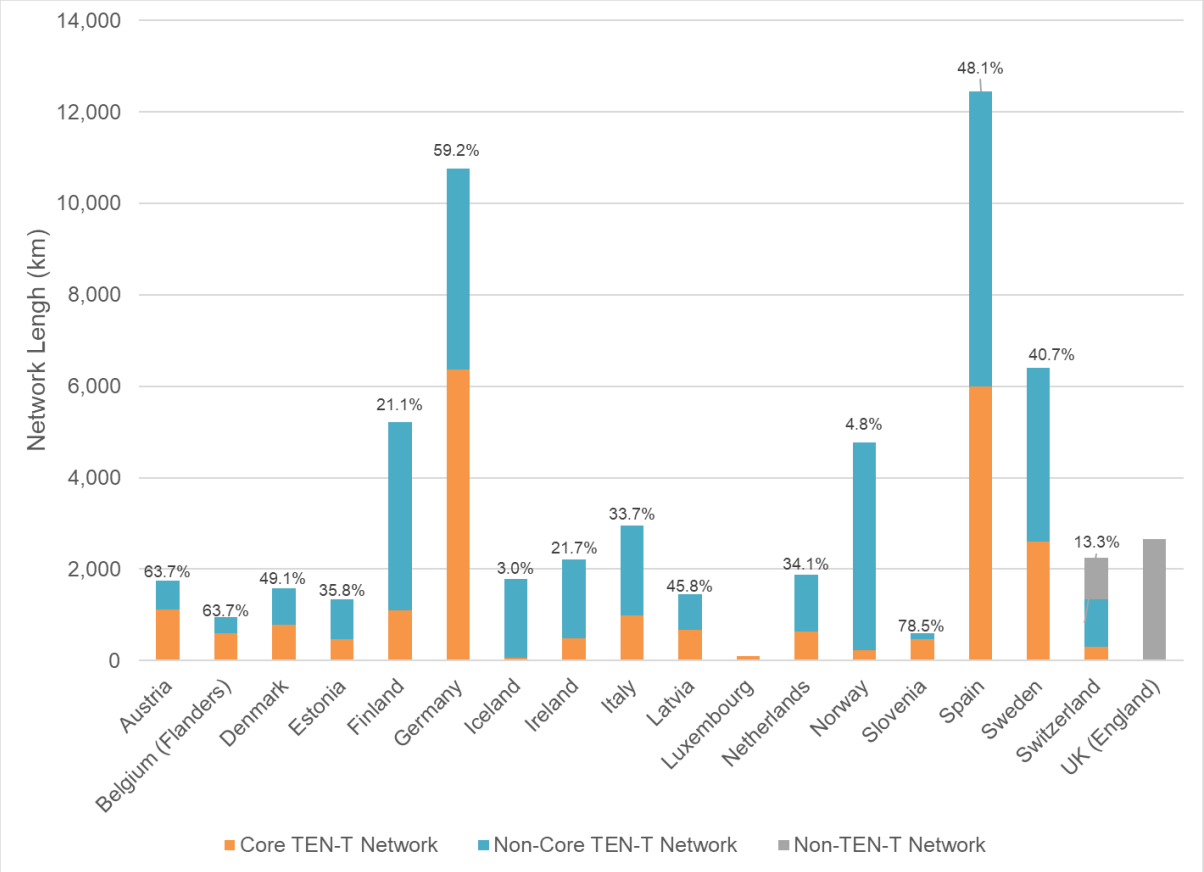


Figure 3 - Comparison of length of TEN-T (Core), TEN-T (Non-Core) and Non-TEN Sections

The countries with the greatest extent of TEN-T roads are Spain and Germany. Countries with the highest proportion of Core Network are Luxembourg (100%), Slovenia (79%), Austria and Belgium (Flanders) (both 64%) while Iceland (3%) and Norway (5%) have the lowest shares. However, it should be noted that there are only 90km of strategic roads in Luxembourg.

The correlation between the length of the PERN and the surface area of each participating country is shown in Figure 4. It can also be seen that most of the participating countries have a surface area of less than 100,000 km^2 and a network shorter than 2,200 km. The trend line clearly shows that the length of the network is proportionate to the size of the country.

Moreover, this figure shows how the countries form two groupings based on their surface area and length of network: bigger countries (i.e. those with a surface area greater than 200,000 km^2), which can be further broken down into countries with a relatively long network (above the trend line) and countries with a relatively short network compared to their surface area (below the trend line), and smaller countries (i.e. those with a surface area smaller than 100,000 km^2).

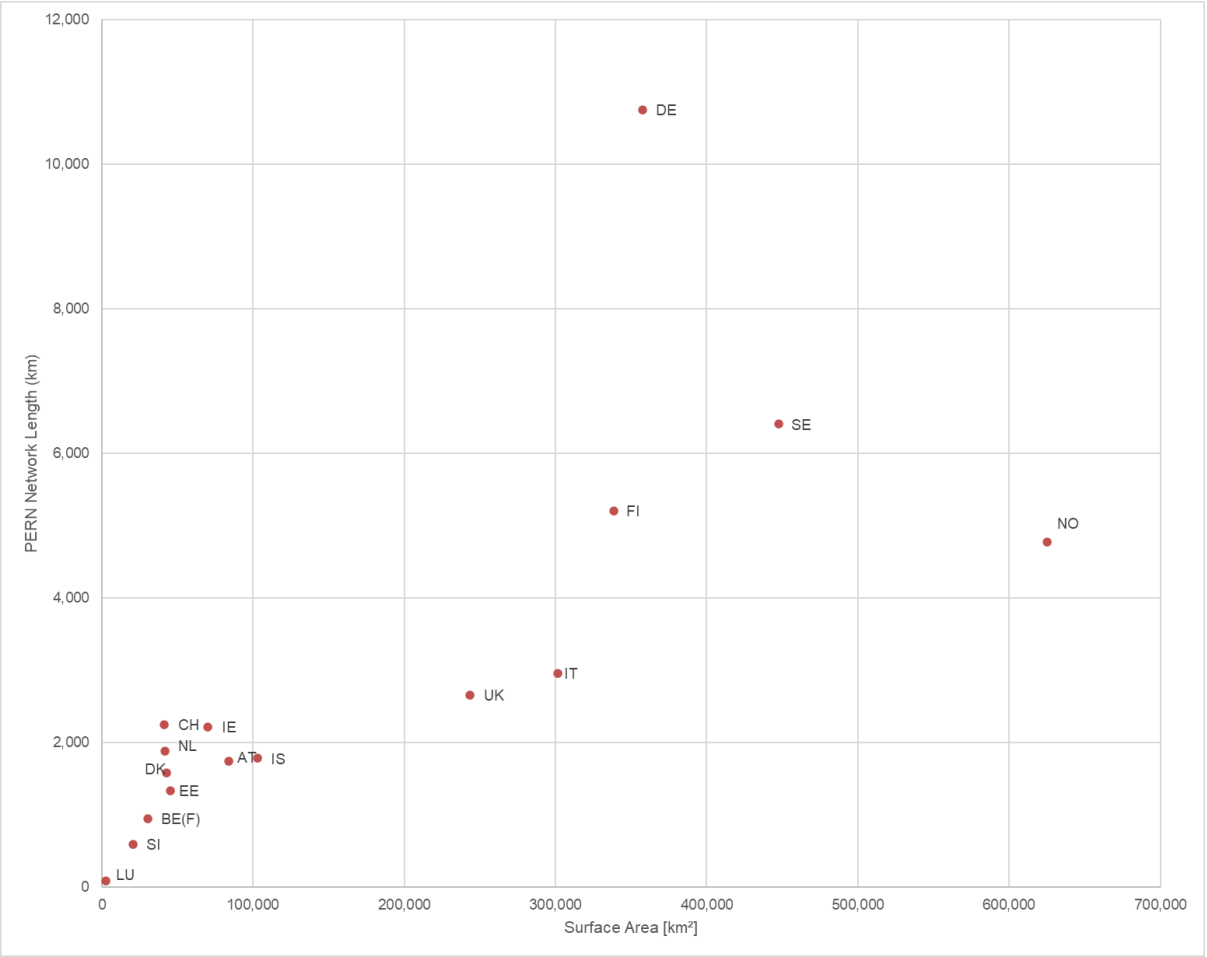


Figure 4 - Comparison of the length of the Pan European Road Network and the surface area of CEDR countries.

2.2 Road Type

The PERN network has been categorised as Motorway and Non-Motorway, with Motorways further categorised as those with more than 4-lanes (i.e. the busiest, most important routes) and those with 4-lanes or less (see below). These categories have been used as the basis for reporting on network performance.

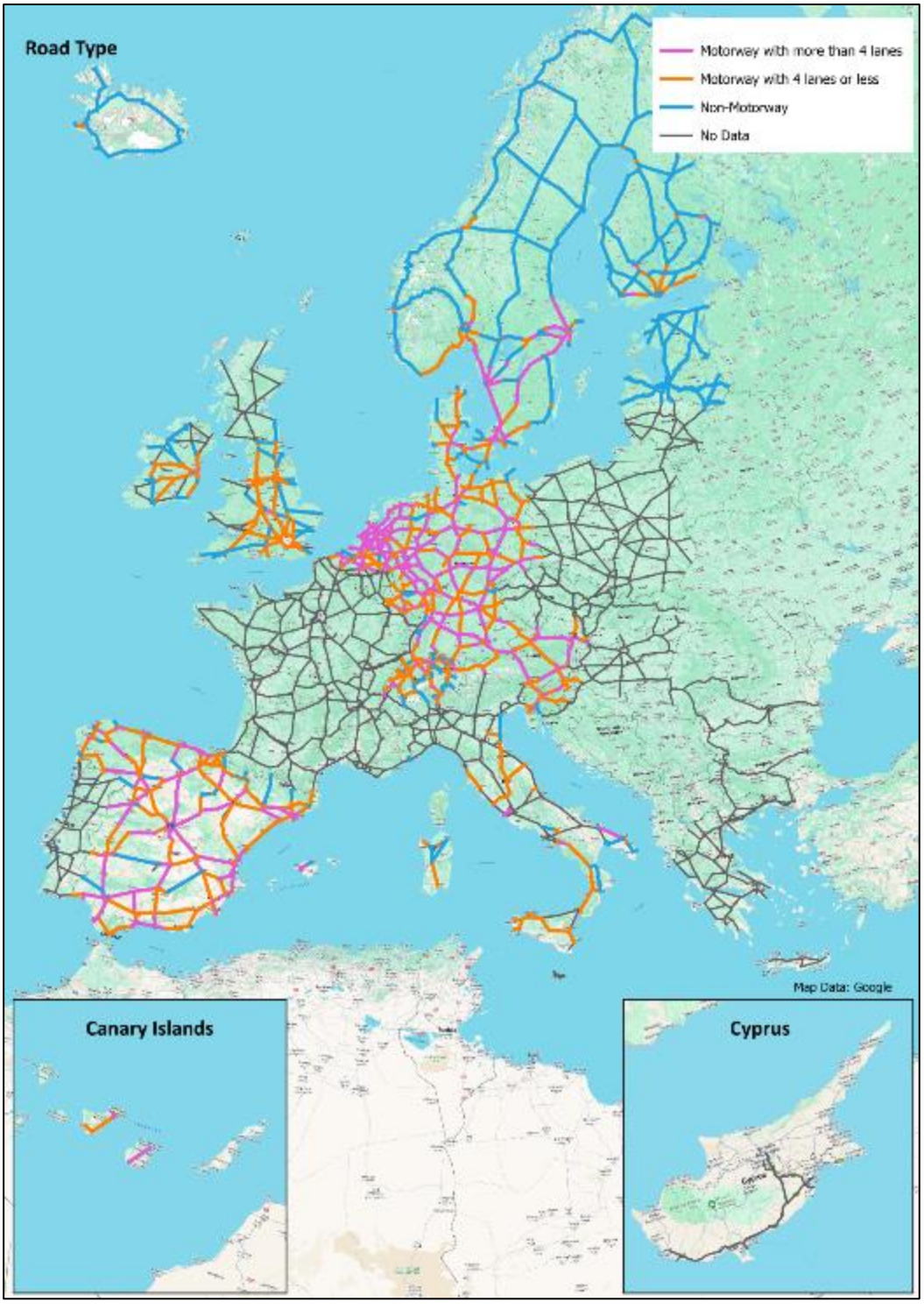


Figure 5 - Road Type

Given the importance of the Pan European Road Network in providing inter-urban connectivity at a European level, most of the network is motorway (62%) as indicated in Figure 6. Of the motorways, 56% have 4-lanes or fewer and 44% have more than 4-lanes.

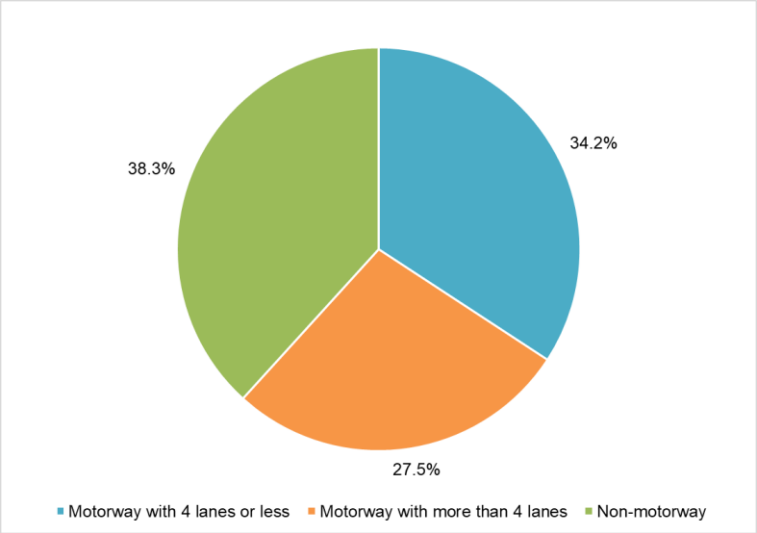


Figure 6 - Distribution of road types on the Pan European Road Network

The split between motorway and non-motorway roads at a national level is shown in Figure 7. In Austria, Luxembourg and the Netherlands, the PERN consists entirely of motorways. In contrast, in Estonia, Iceland and Latvia, the network is almost entirely made up of non-motorway roads.

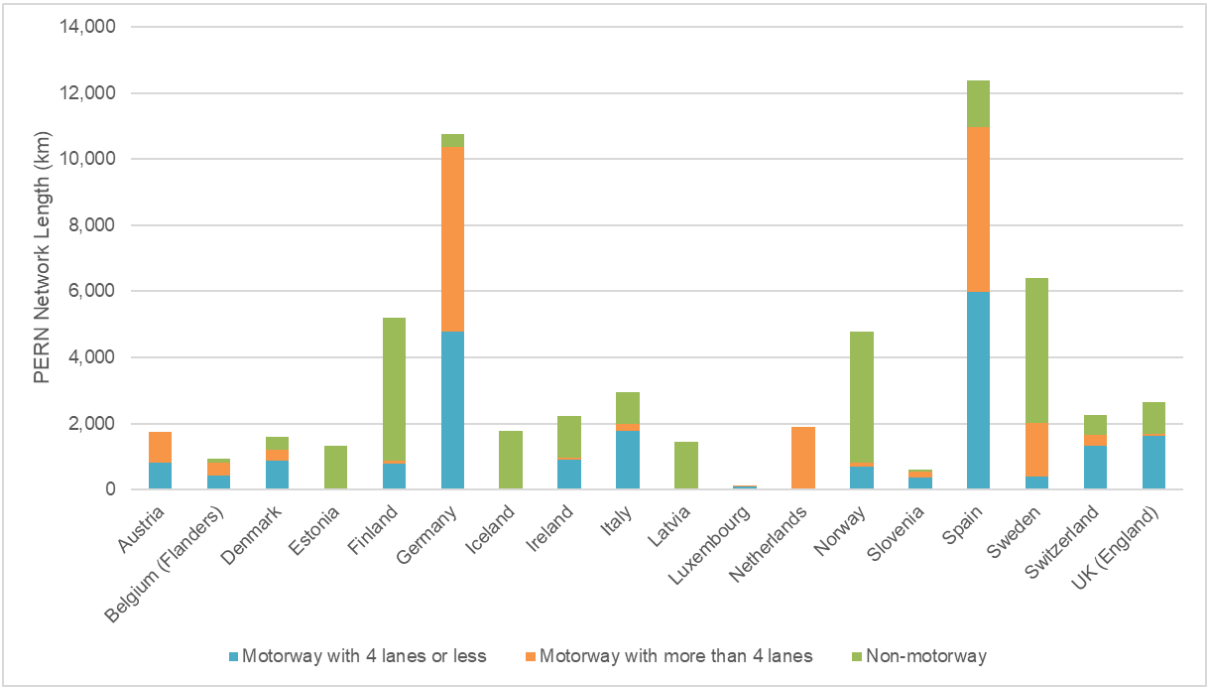


Figure 7 - Distribution of road types on the Pan European Road Network by country

The comparison between the composition of TEN-T Core and Comprehensive networks and non-TEN-T roads shown in Figure 8 indicates that the TEN-T Core Network is predominantly made up of motorways (86%) of which 48% has more than 4-lanes, while the Non-Core Network is more evenly split between motorways (46%) and non-motorways (54%). For the relatively small length on non-TEN-T roads included in the report, 61% are motorway of which on 2% have more than 4-lanes.

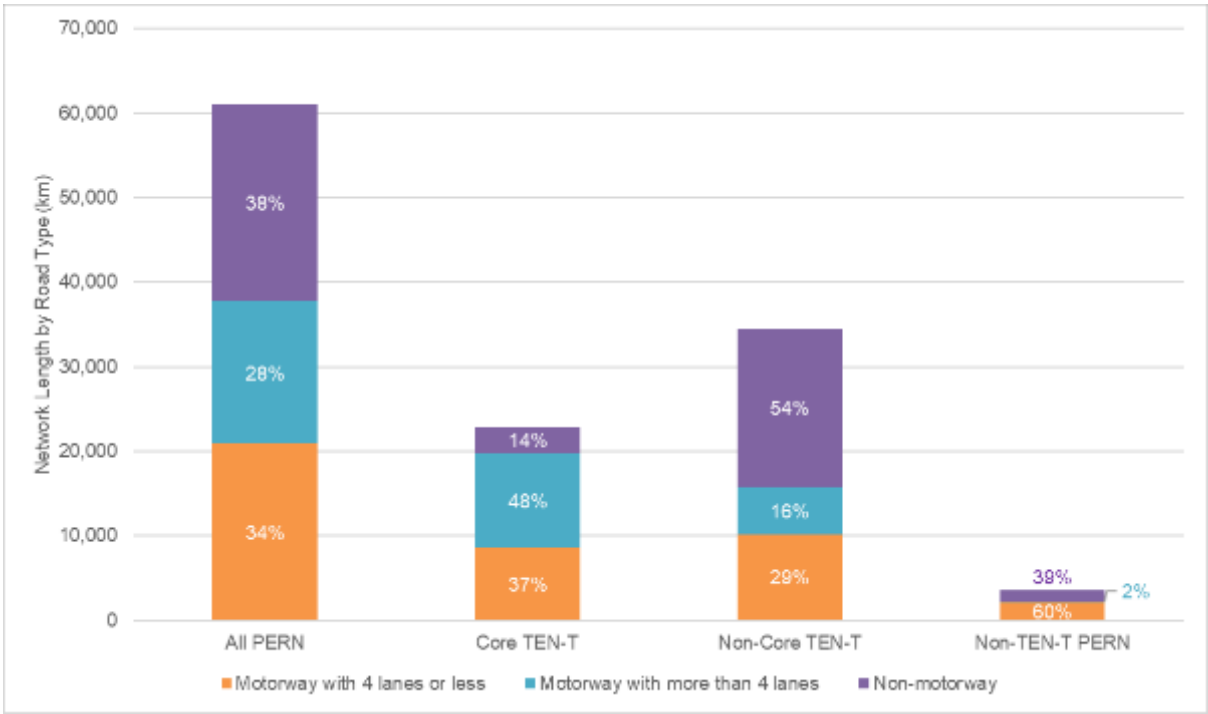


Figure 8 - Comparison of road types on the Comprehensive, Core and Non-Core networks

2.3 Physical Environment

The physical environment around the network has been categorised as ‘urban’ or ‘rural’ on the basis of local definitions as shown below.

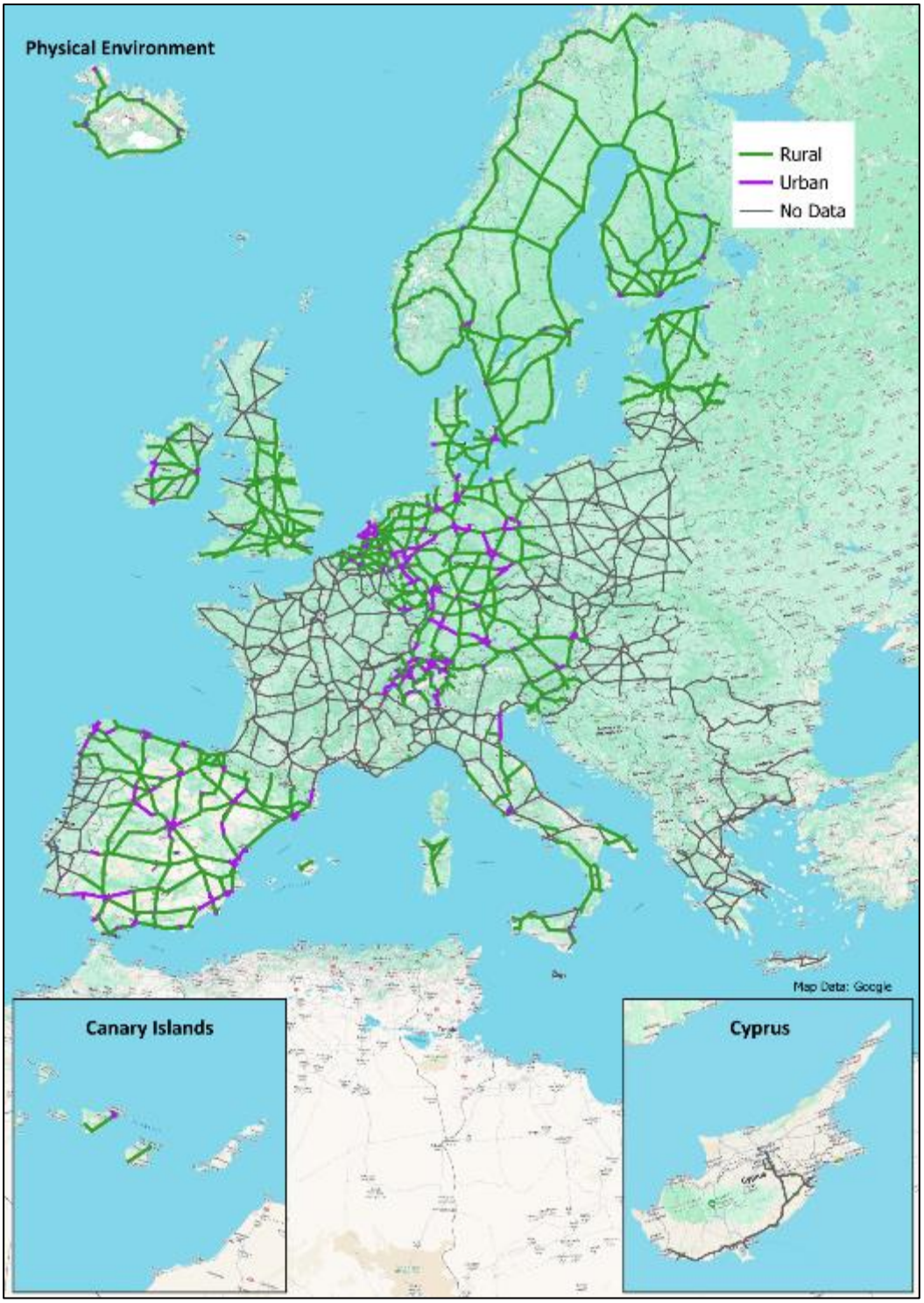


Figure 9 - Physical Environment

Figure 10 shows the physical environment around the Pan European Road Network. Again, not surprisingly given its purpose to facilitate inter-urban movement, 87% of the network is categorised as rural.

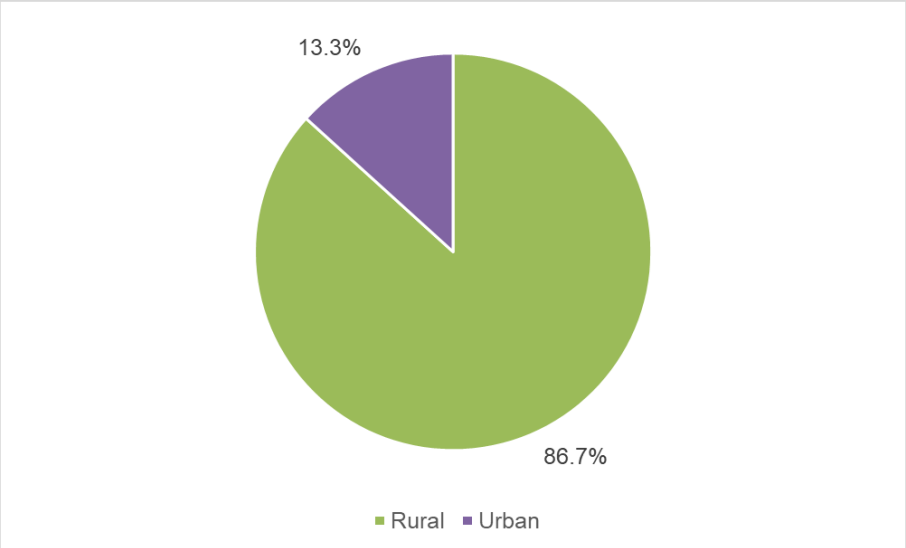


Figure 10 - Physical environment of the Pan European Road Network

2.4 Number of Lanes

The average number of lanes on the road sections comprising the Pan European Road Network provides an indication of the capacity of the network. The distribution of numbers of lanes is shown below.

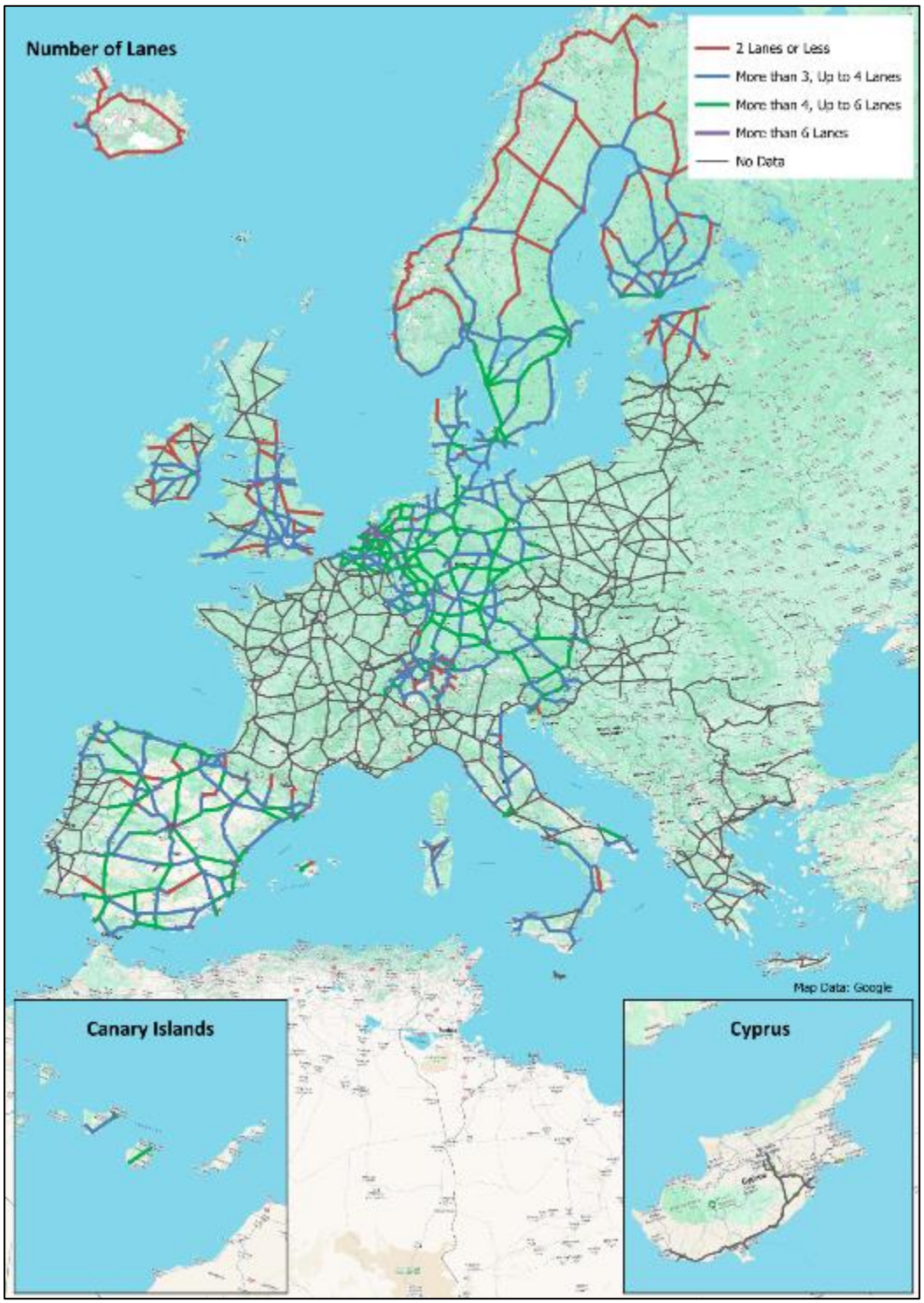


Figure 11 - Number of Lanes

Figure 12 shows that, amongst the participating countries, a relative majority (49%) of the PERN has between 2 and 4 lanes and 26% has more than 4 lanes, while 23% has 2 lanes or less. However, on the Core Network (which is predominantly motorway) 50% of the Core Network has more than 4 lanes and only 3% has less than 2 lanes.

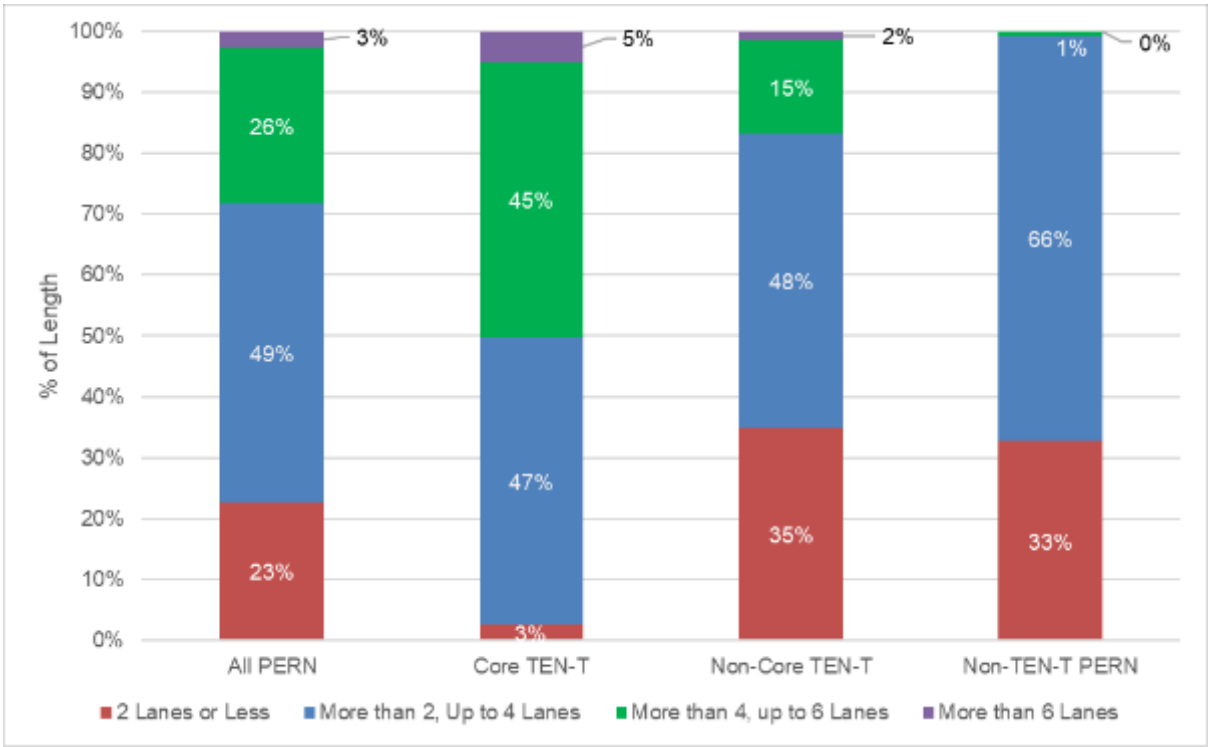


Figure 12 - Comparison of the number of lanes on the Comprehensive, Core and Non-Core networks

2.5 Planned Capacity Improvements

Participating countries provided information about any planned works to increase the capacity of the Pan European Road Network (see below). This is an indication that there are existing capacity issues, i.e. these parts of the network regularly experience congestion.

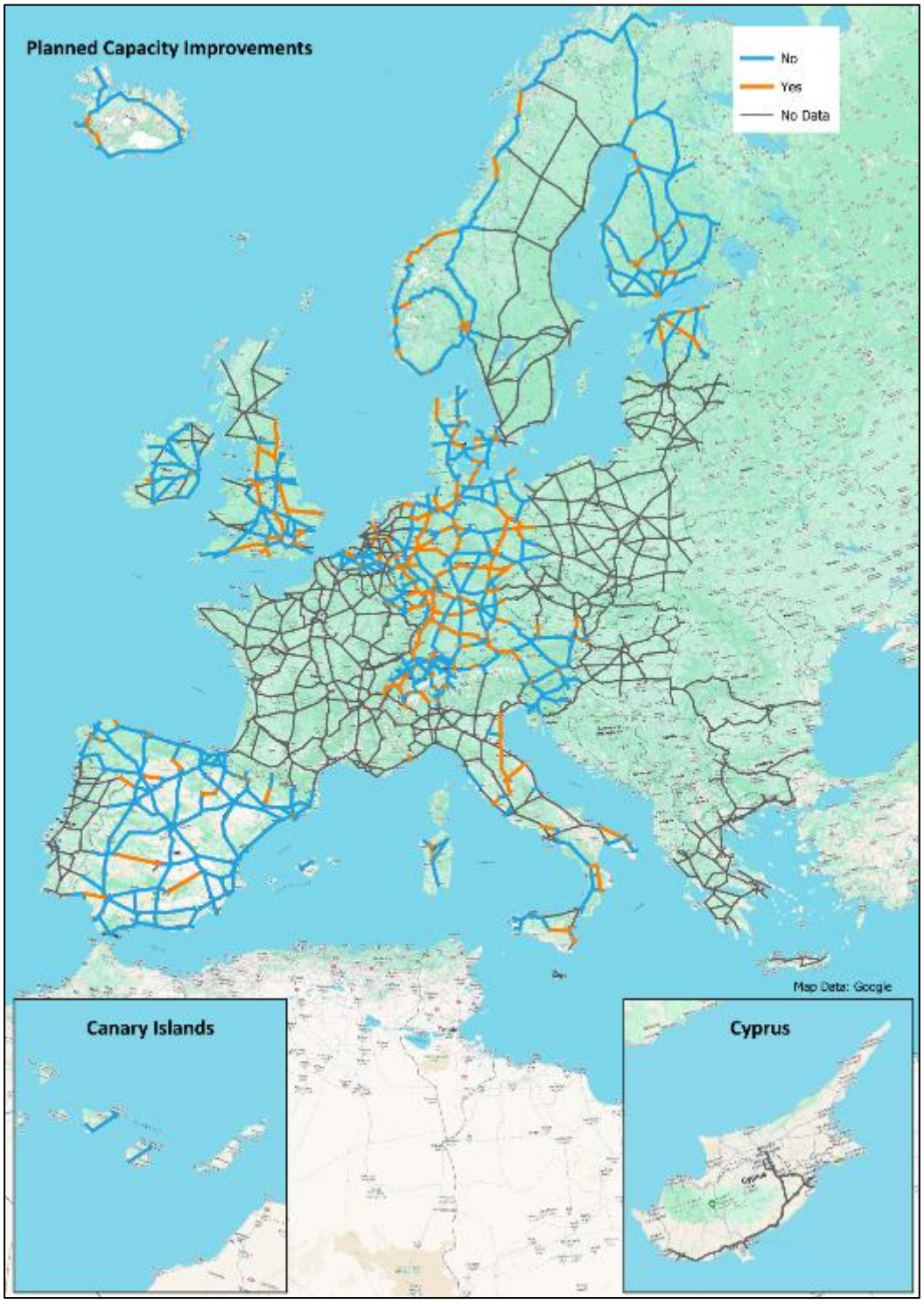


Figure 13 - Planned Capacity Improvements

Figure 14 shows that all countries that provided data[6] have planned capacity improvements ranging between 2% of sections (Slovenia) and more than 45% of sections (Germany).

On average, 24% of the sections that make up the Pan European Road Network are planned to receive capacity improvements.

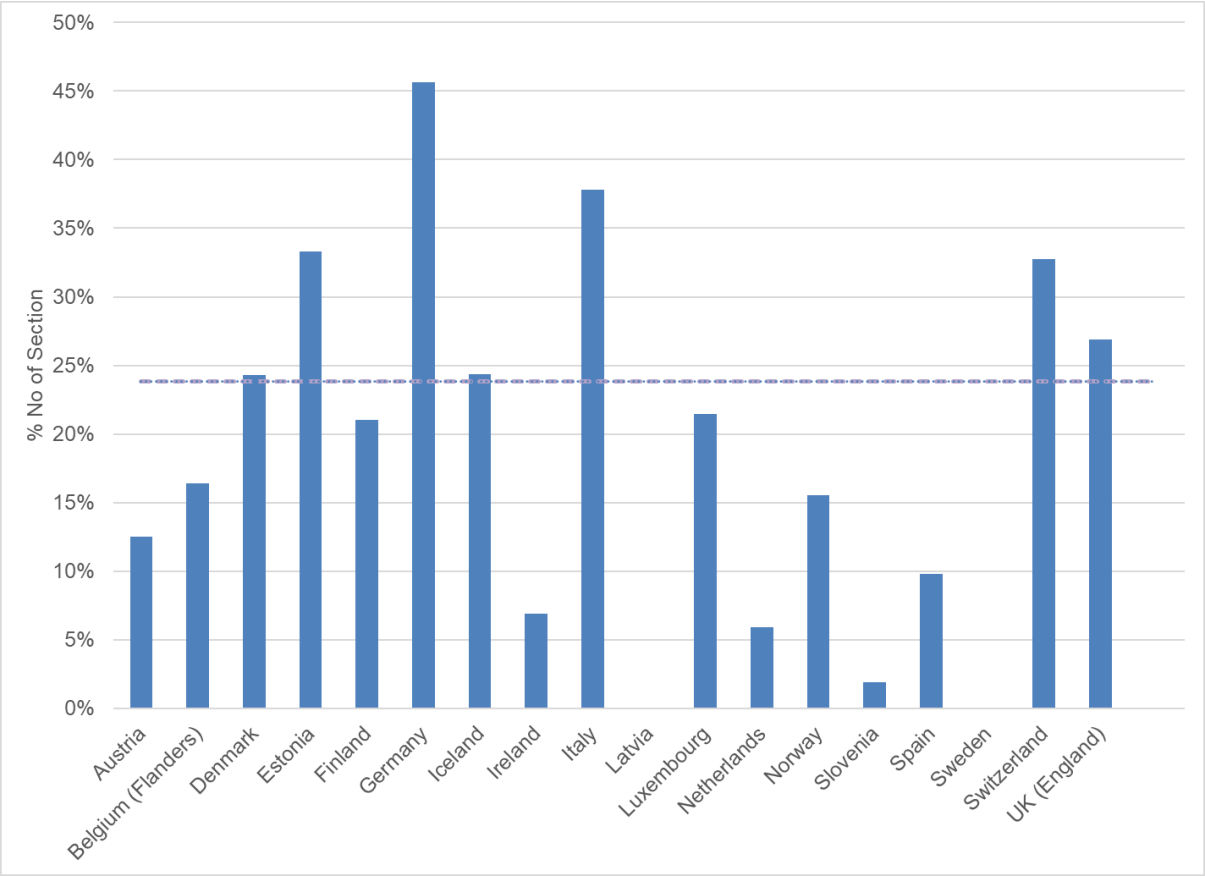


Figure 14 - Planned capacity improvements on the Pan European Road Network

[6] No data provided by Latvia or Sweden

3 NETWORK INFRASTRUCTURE AND SERVICES

3.1 Bridges

This indicator shows the proportion of the network length consisting of bridges longer than 100m.

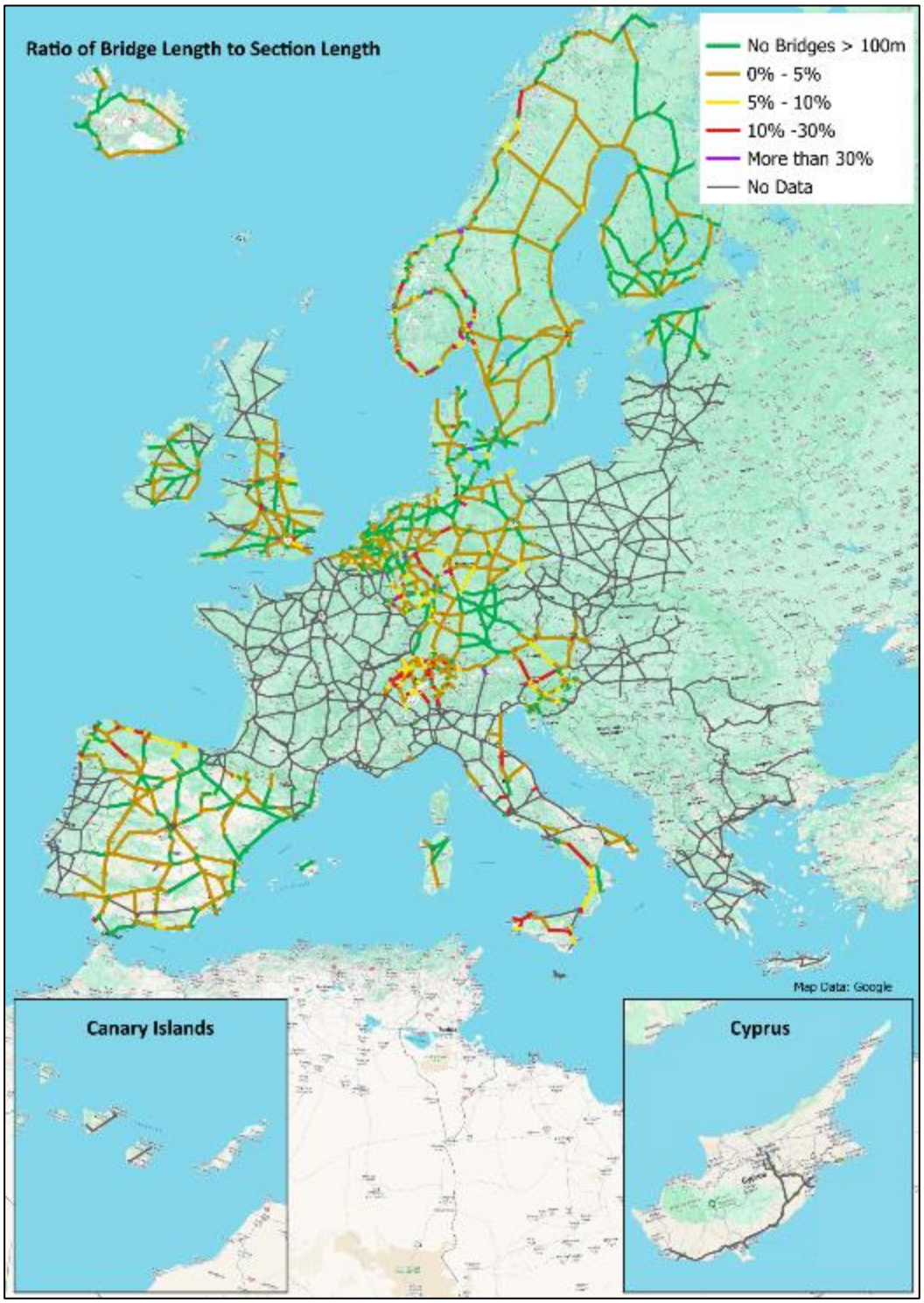


Figure 15 - Length of Bridges

As shown in Figure 16, the median length of network, where data was provided[7], consisting of bridges is 2.2%. However, there is considerable variability between individual countries with mountainous countries in particular (e.g. Austria, Italy, Norway, Slovenia and Switzerland) having between 4% and 8% of the network consisting of bridges. Conversely, less than 0.3% of the network in, Estonia, Iceland and Ireland is made up of bridges.

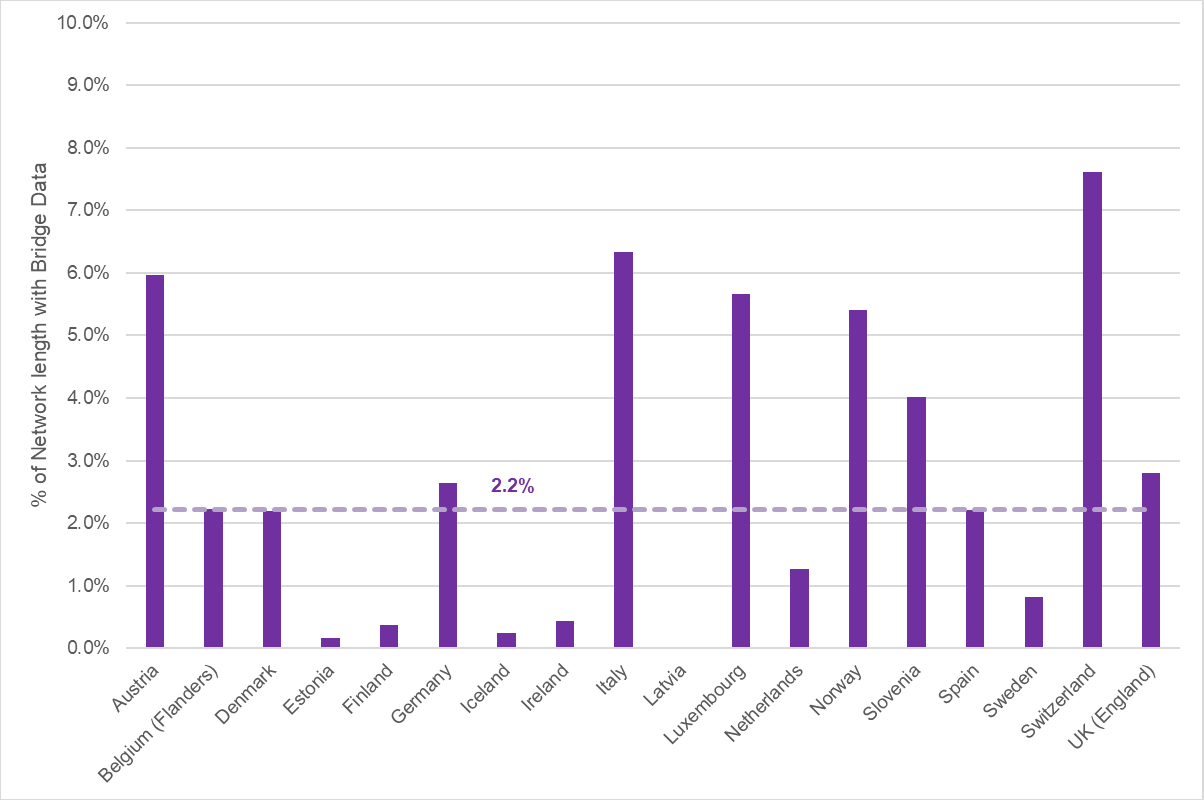


Figure 16 – Proportion of PERN Roads including Bridges

[7] No data provided by Latvia

3.2 Tunnels

This indicator shows the proportion of the network length that is made up of tunnels longer than 300m.

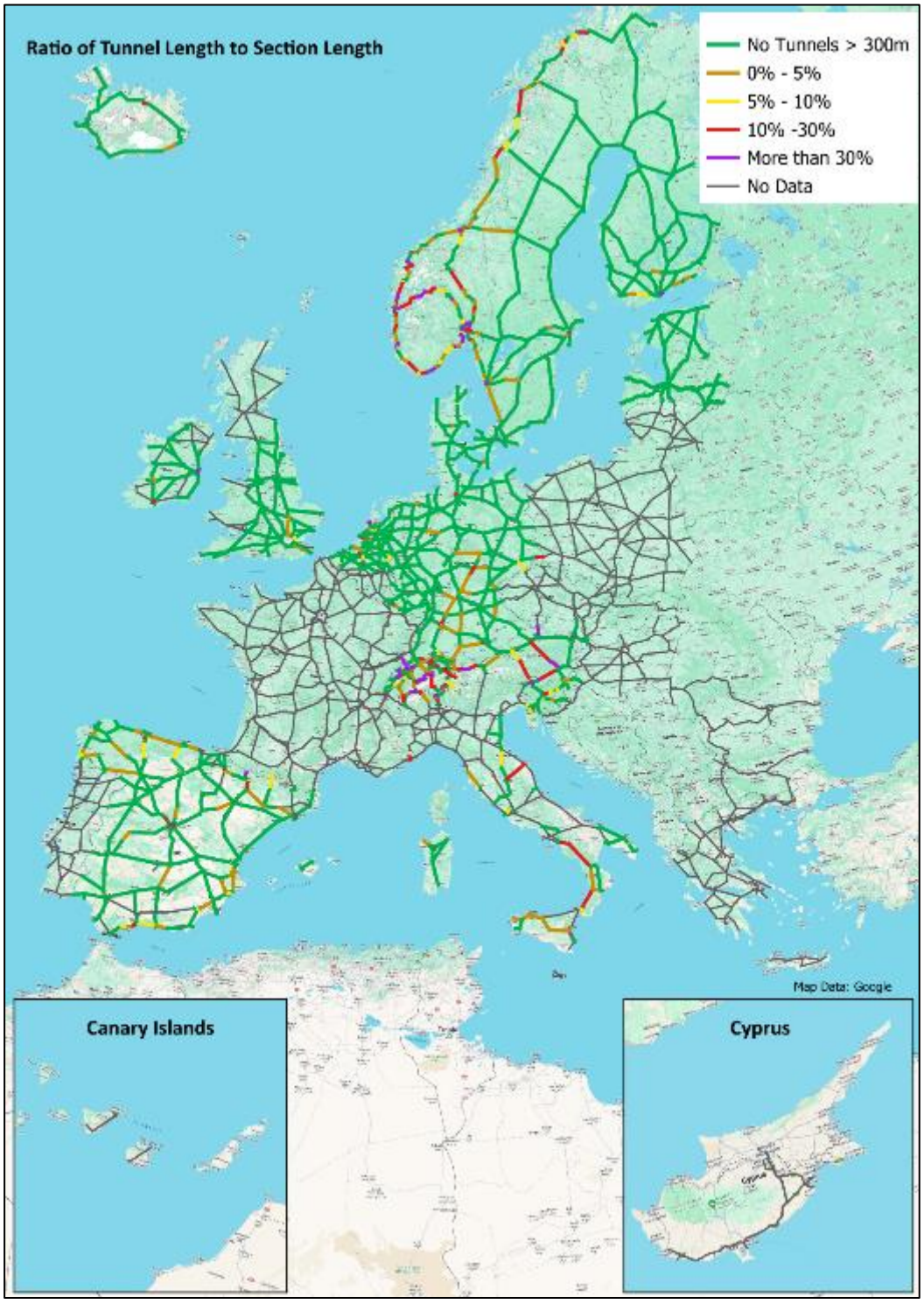


Figure 17 - Length of Tunnels

As shown in Figure 18, the median length of network, where data was provided, consisting of tunnels as less than 1%. As with bridges, there is considerable variability between individual countries with Austria, Norway and Switzerland having between 9% and 15% of the network by length consisting of tunnels. Conversely, tunnels make up less than 0.1% of the network in Estonia, Sweden and the UK.

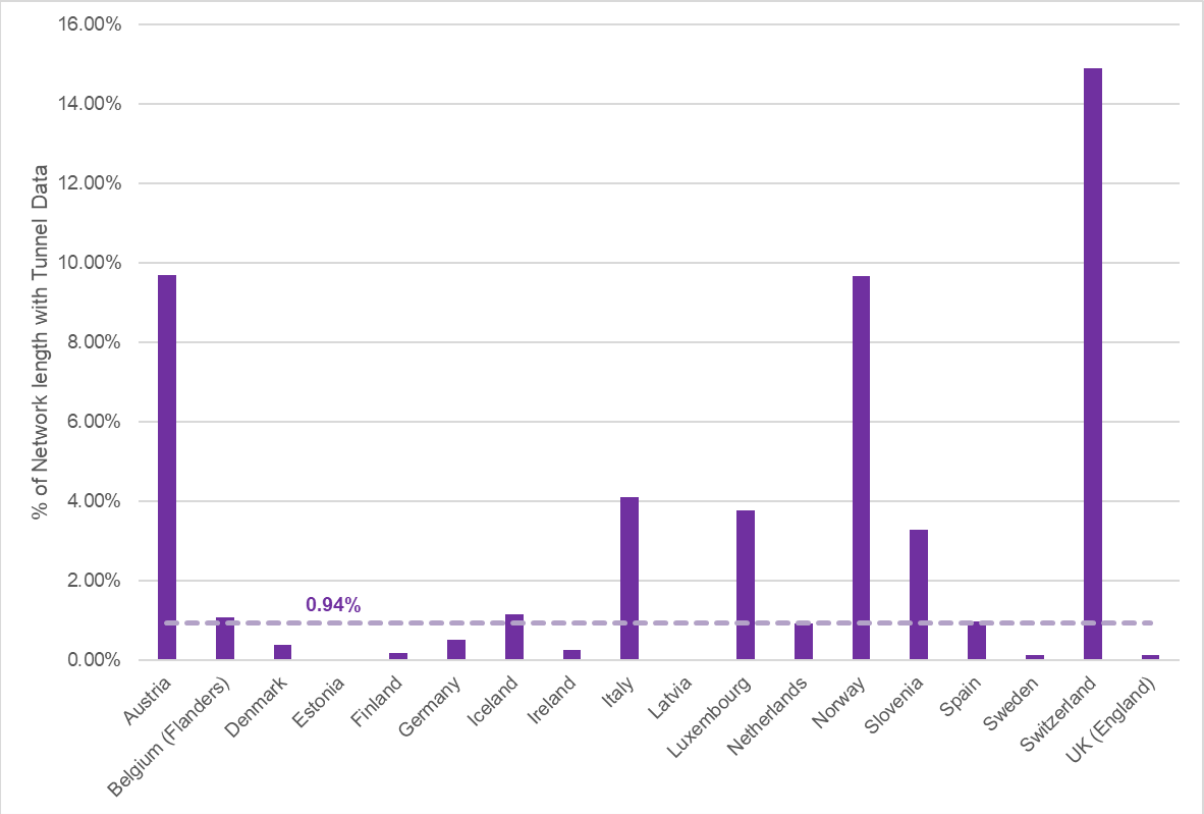


Figure 18 – Proportion of PERN including Tunnels

3.3 Hard Shoulder Running

A new indicator introduced in the 2023 report is the extent of hard shoulder running (HSR) on the PERN (see below). This is defined as the use of hard shoulders to carry traffic.

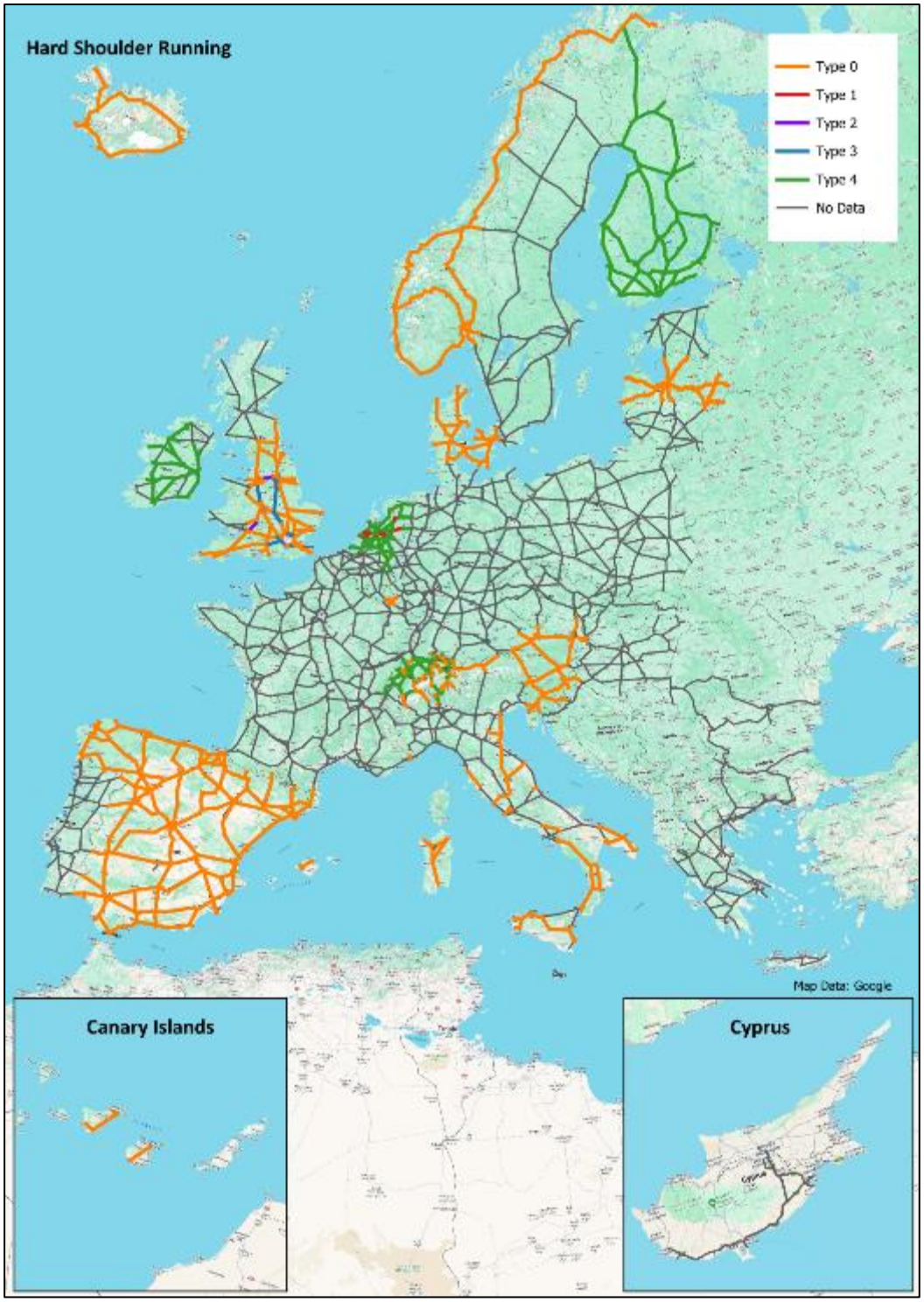


Figure 19 – Deployment of Types of Hard Shoulder Running

The different types of hard-shoulder running are shown in the table below.

Type 0	No Hard Shoulder Running
Type 1	Controlled Hard Shoulder Running (CHSR): In this system, the hard shoulder is opened for traffic during peak hours or heavy congestion. It is controlled by variable message signs and overhead gantries that indicate when the hard shoulder is available for use. The hard shoulder is only opened when traffic conditions require it, and otherwise, it remains closed.
Type 2	Dynamic Hard Shoulder Running (DHSR): Similar to CHSR, DHSR involves opening and closing the hard shoulder as needed. However, it is more dynamic and allows for more frequent changes in the status of the hard shoulder based on real-time traffic conditions. The opening and closing of the hard shoulder are controlled by sophisticated traffic management systems.
Type 3	All-Lane Running (ALR): In an all-lane running system, the hard shoulder is permanently converted into a full-time running lane. It is designed to be used as a regular traffic lane at all times, even during non-peak hours. Emergency refuge areas are provided at regular intervals for vehicles that encounter issues.
Type 4	Emergency Hard Shoulder Running (EHSR): Emergency Hard Shoulder Running is a system that opens the hard shoulder to traffic only during specific emergency situations, such as when there is a significant incident or road closure ahead. This is typically a temporary measure to alleviate traffic during specific incidents.

Figure 20 shows the overall distribution of HSR in the participating countries. This shows that, of the countries who provided data, HSR is not commonly used on the PERN. On the majority of the network (72%) there is no HSR while on 26% is HSR permitted during specific emergency situations. Other types of HSR, are used on less than 2% of the PERN. On motorways with more than 4-lanes, emergency hard shoulder running is employed on 22% of the network and controlled hard shoulder running is employed on 4% of the network. Dynamic hard shoulder running and All-lane running are only used on motorways with 4-lanes or less and here it is only on 3% of the network.

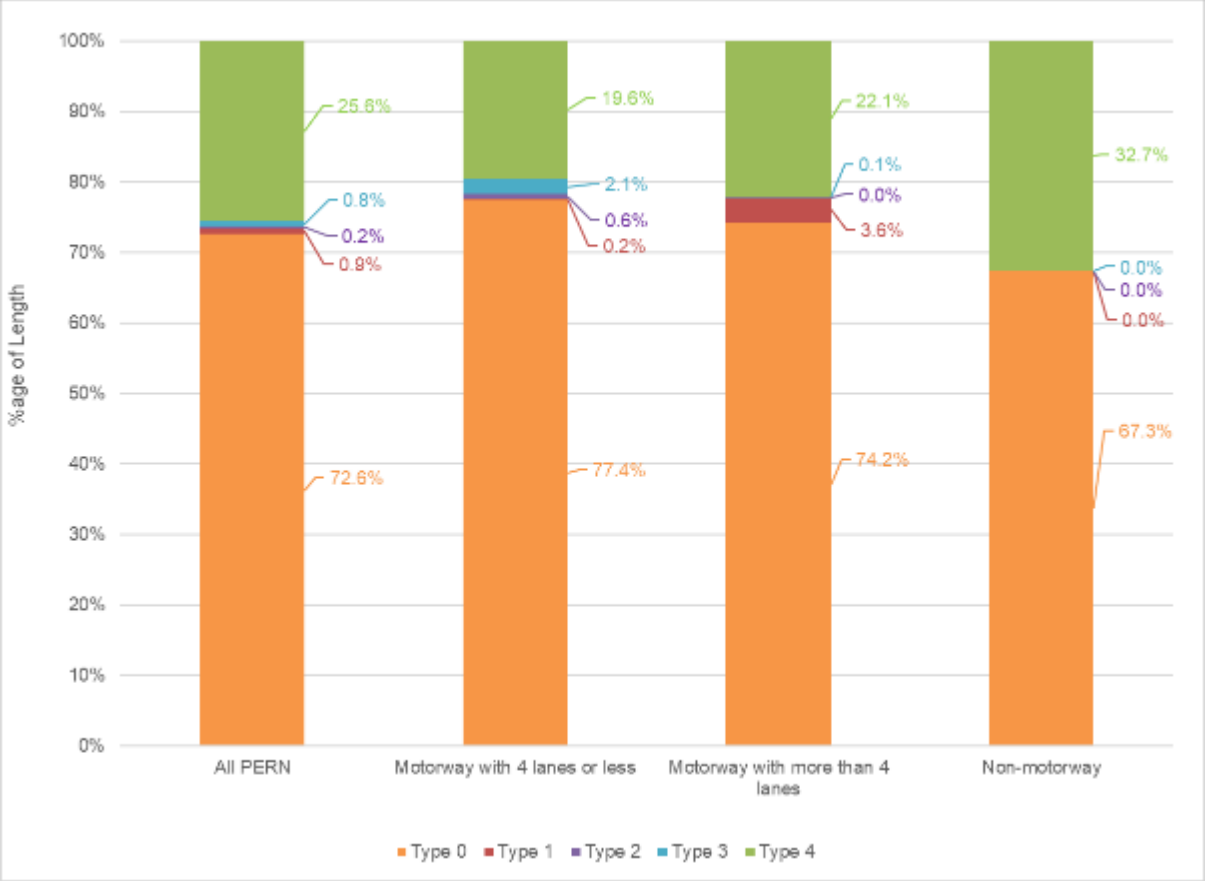


Figure 20 - Distribution of Hard Shoulder Running on PERN

Table 1 shows the national prevalence of hard shoulder running. This indicates that, of the countries that provided data[8], HSR is only used in Austria and Switzerland (Type 1 HSR on a small proportion of the network), Ireland, (Type 4 HSR across the whole network), Netherlands (mixture of Type 1 and Type 4 HSR) and UK(England) who are the only country who reported using Type 2 and Type 3 HSR (i.e. dynamic and permanent HSR).

[8] No data provided by Belgium (Flanders), Estonia, Germany, Sweden

Table 1 - Distribution of Hard Shoulder Running by level for each participating country

Country	Network Length (km)	Type 0 %	Type 1 %	Type 2 %	Type 3 %	Type 4 %	No Data %
Austria	1,748	99.3%	0.7%	0.0%	0.0%	0.0%	0.0%
Belgium (Flanders)	948	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Denmark	1,588	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Estonia	1,337	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Finland	5,210	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%
Germany	10,760	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Iceland	1,784	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Ireland	2,219	0.0%	0.0%	0.0%	0.0%	100.0%	0.0%
Italy	2,959	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Latvia	1,452	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Luxembourg	90	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Netherlands	1,886	0.0%	16.2%	0.0%	0.0%	83.8%	0.0%
Norway	4,779	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Slovenia	596	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Spain	12,444	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sweden	6,407	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Switzerland	2,252	26.2%	1.8%	0.0%	0.0%	72.0%	0.0%
UK (England)	2,662	83.8%	0.0%	3.5%	12.7%	0.0%	0.0%
Total (ex No data)	61,121	72.6%	0.9%	0.2%	0.8%	25.5%	-

3.5 Intelligent Transport Systems (ITS)

This indicator describes the deployment of Intelligent Transport Systems on the Pan European Road Network. (see below)

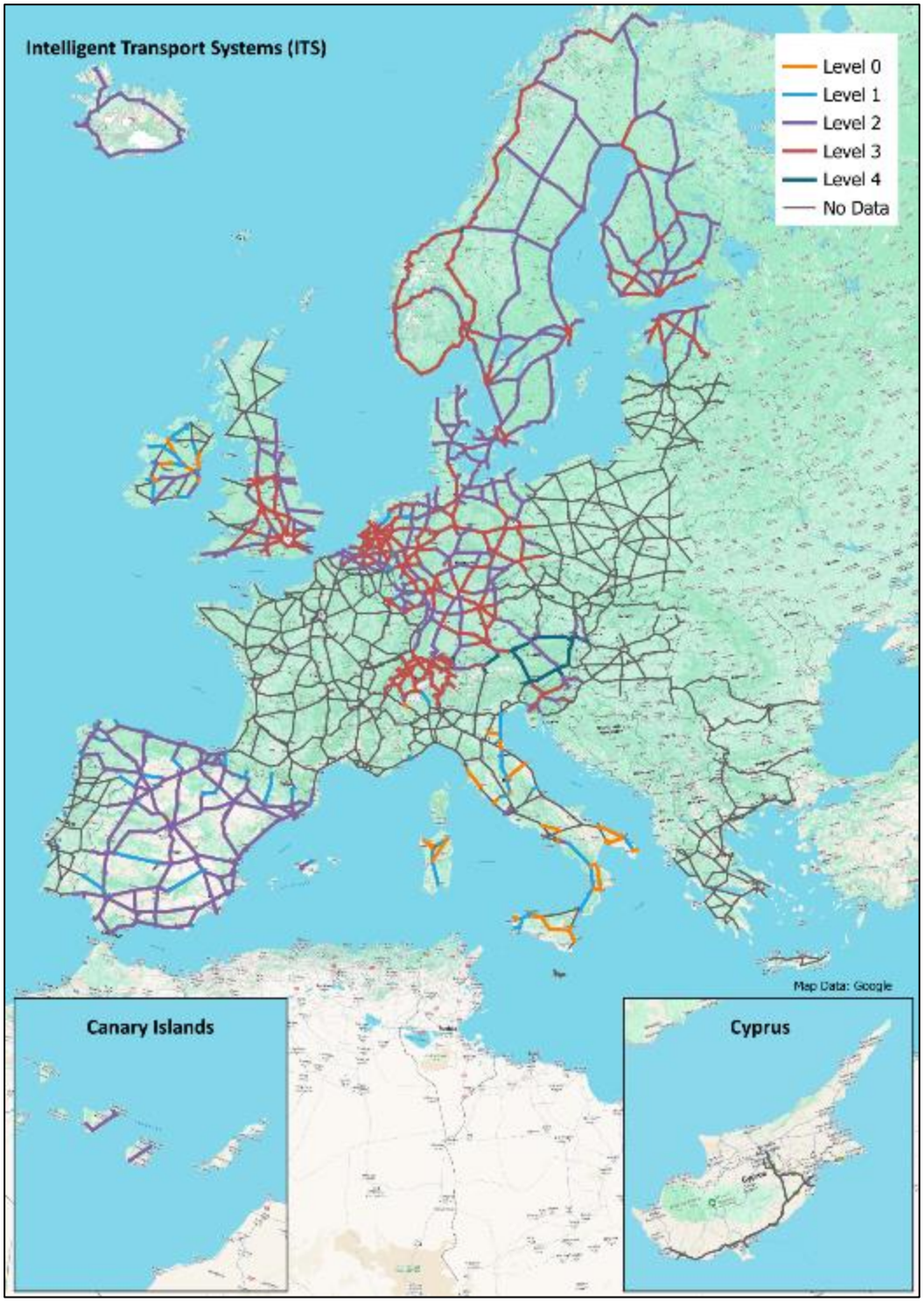


Figure 21 – Deployment of Types of Intelligent Transport Systems

The values show the proportion of the road network equipped with different levels of ITS. The levels range from Level 0 to Level 4 as shown below and are based on the EasyWay Deployment Guidelines:

Level 0	None
Level 1	Monitoring system (e.g. real-time data about traffic/weather conditions is collected by or on behalf of the road administration)
Level 2	Traffic information system (road administration passively manages the network e.g. information about traffic/weather conditions is provided to road users)
Level 3	Traffic management system (road administration actively manages the network e.g. variable speed limits, dynamic lane management, ramp metering)
Level 4	Cooperative ITS (i.e. vehicle-to-vehicle or infrastructure-to-vehicle information)

The distribution of these different levels of ITS is shown in Figure 22. This indicates that 59% of the PERN network is covered by Level 2 ITS while 29% is Level 3. 10% of the network has no ITS or only uses monitoring systems, at all while 2.0% has Level 4 (i.e. cooperative ITS). The greatest use of ITS technology is on motorways with more than 4-lanesthe Core TEN-T Network where 98% is Level 2 technology or above compared with 90% on the network as a whole.

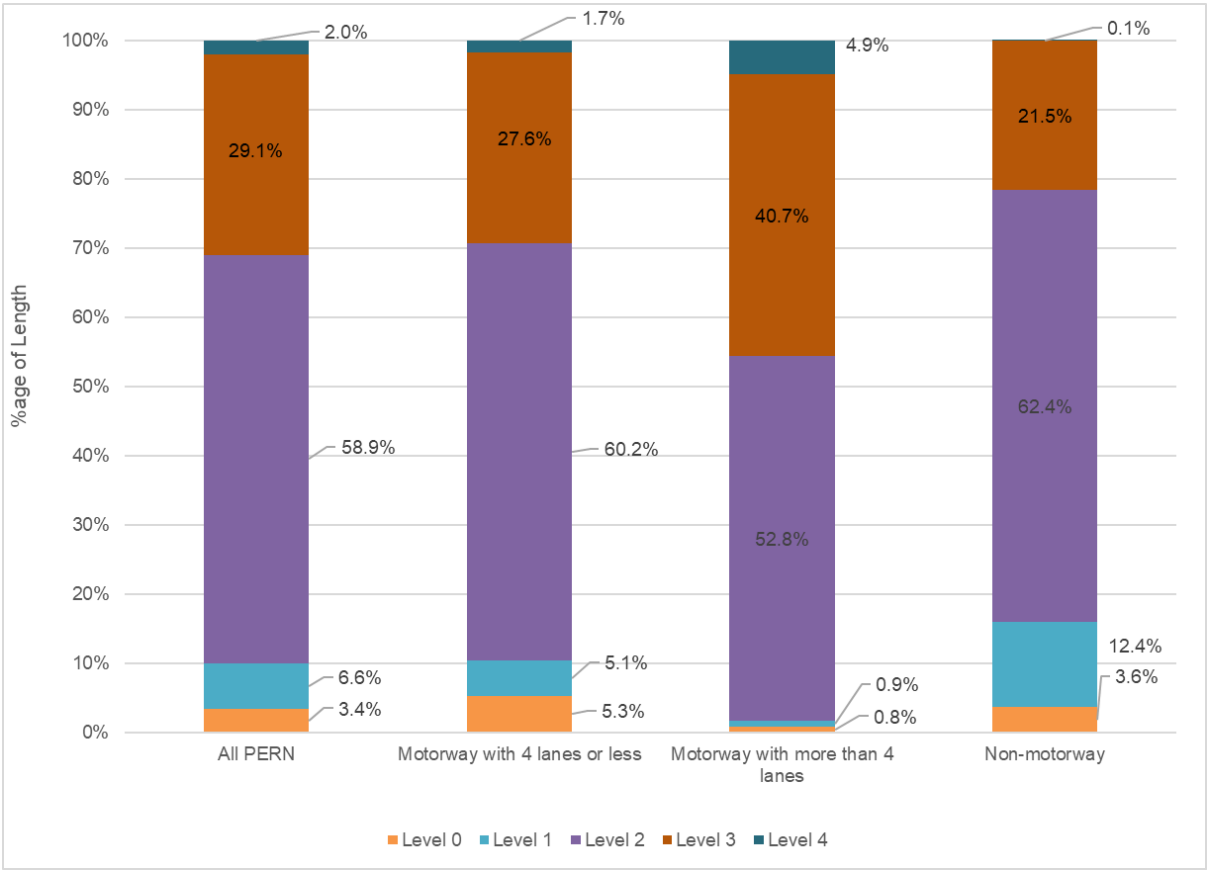


Figure 22 - Distribution of ITS on Comprehensive, Core and Non-Core Networks

Table 2 shows the distribution of ITS levels for each participating country[9]. This shows that the only countries reporting Level 4 ITS are Austria (68%) and Norway (0.4%). In addition, ten countries report Level 3 ITS on 25% of the network or more. The countries with the largest proportion of ITS at Level 1, or below, are Italy (95%), Ireland (70%) and Spain (12%).

Table 2 - Distribution of ITS by level for each participating country

Country	Network Length (km)	Level 0	Level 1	Level 2	Level 3	Level 4	No Data
		%	%	%	%	%	%
Austria	1,748	0.0%	0.0%	29.1%	3.1%	67.8%	0.0%
Belgium (Flanders)	948	0.0%	0.0%	66.1%	33.9%	0.0%	0.0%
Denmark	1,588	0.0%	0.0%	95.2%	4.8%	0.0%	0.0%
Estonia	1,337	0.0%	0.0%	47.9%	52.1%	0.0%	0.0%
Finland	5,210	0.0%	0.0%	75.5%	24.5%	0.0%	0.0%
Germany	10,760	0.0%	0.0%	49.9%	50.1%	0.0%	0.0%
Iceland	1,784	0.0%	0.0%	100.0%	0.0%	0.0%	0.0%
Ireland	2,219	23.1%	46.6%	30.3%	0.0%	0.0%	0.0%
Italy	2,959	51.3%	44.4%	4.4%	0.0%	0.0%	0.0%
Latvia	1,452	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%
Luxembourg	90	0.0%	5.8%	0.0%	94.2%	0.0%	0.0%
Netherlands	1,886	0.0%	7.7%	6.6%	85.6%	0.0%	0.0%
Norway	4,779	0.0%	0.0%	28.3%	71.3%	0.4%	0.0%
Slovenia	596	0.0%	0.0%	46.1%	53.9%	0.0%	0.0%
Spain	12,444	0.0%	11.5%	88.2%	0.3%	0.0%	0.0%
Sweden	6,407	0.0%	0.0%	92.4%	7.6%	0.0%	0.0%
Switzerland	2,252	0.0%	0.0%	3.2%	96.8%	0.0%	0.0%
UK (England)	2,662	0.0%	0.0%	48.2%	51.8%	0.0%	0.0%
Totals (ex No Data)	61,121	3.4%	6.3%	59.0%	29.0%	2.0%	-

[9] No data provided by Latvia

3.6 Rest Areas and Facilities for Road Users

This set of indicators is intended to provide a measure of the level of services provided to road users and comprises the frequency of rest areas, and the specific facilities they provide.

Frequency of Rest Areas

The map below shows the frequency of rest areas on the network (i.e. no. per 100km)

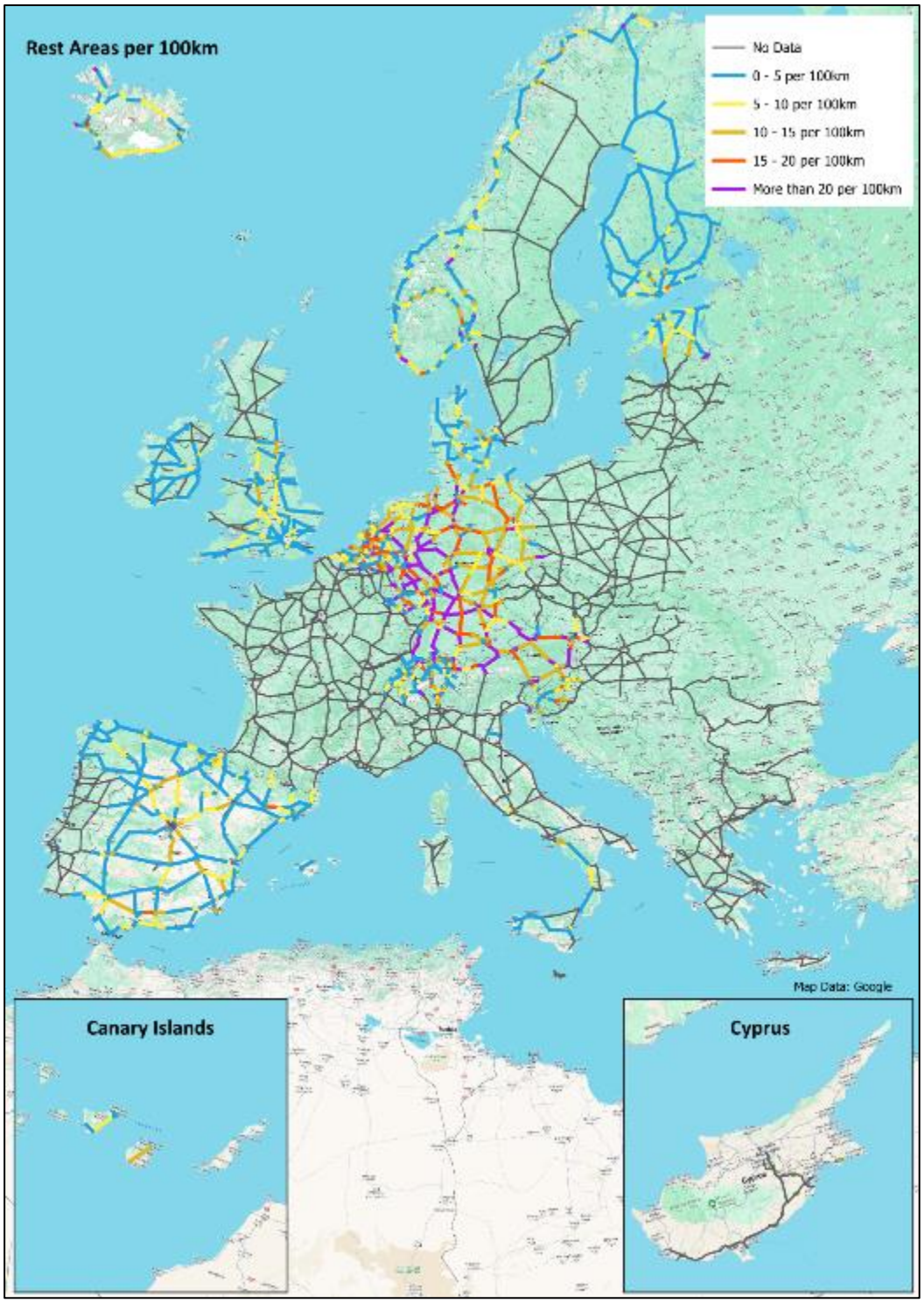


Figure 23 - Frequency of Rest Areas (No./100km)

Figure 24 shows that there is wide variation in the frequency of rest areas on the Pan European Road Network which ranged between 17 per 100km and 16 per 100km (Austria and Germany), and 1 per 100km (Ireland). On average, amongst the countries that were able to provide data[10], there are 7.3 per 100km or approximately one every 14km.

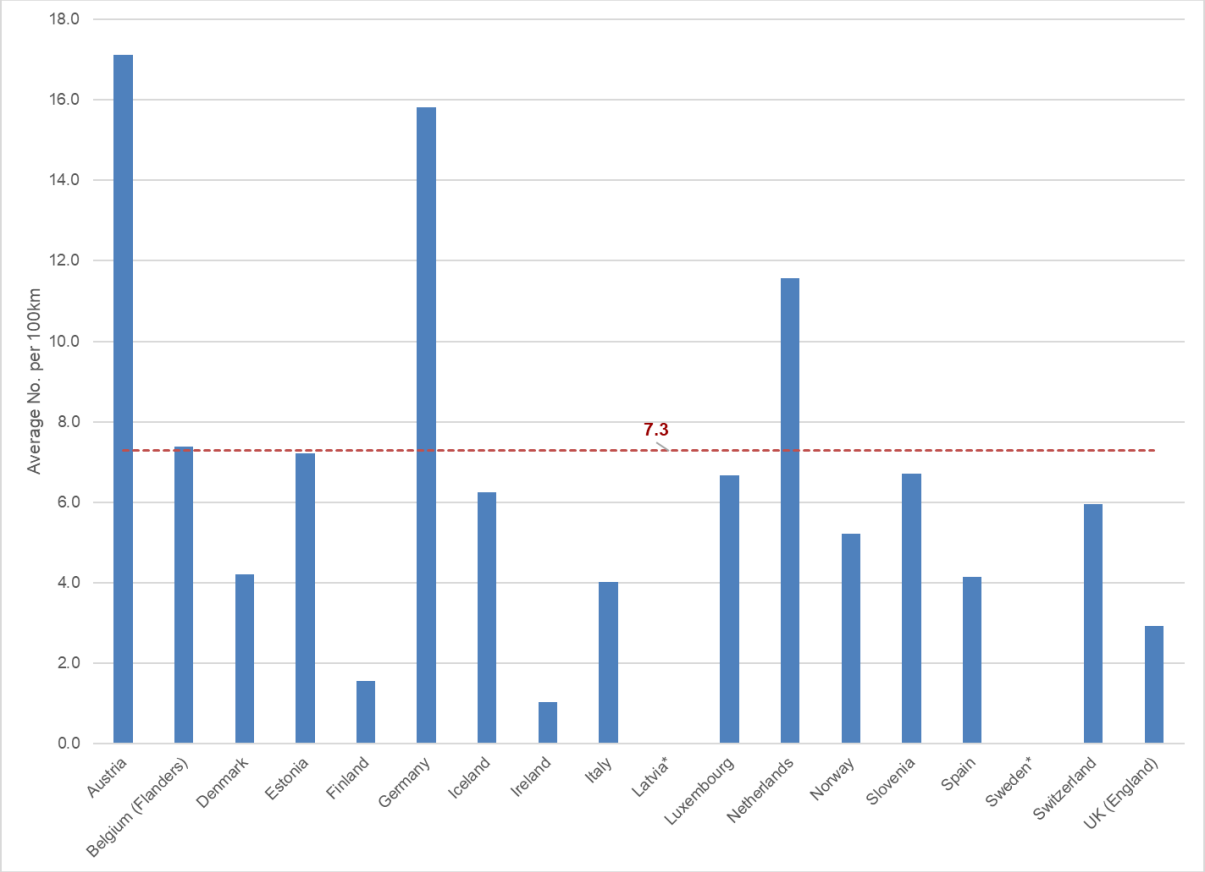


Figure 24 - Frequency of rest areas on national Pan European Roads

Figure 25 shows the proportion of rest areas with different types of facility in different counties. Of the countries that provided data, ten had dedicated parking areas for truck drivers at more than 95% of rest areas and the average across the network was 60%.

The countries with the highest proportion of rest areas with EV charging facilities were the UK (England), Ireland, Finland, Iceland and Luxembourg. On average across the network, 25% of rest areas had EV charging facilities.

The countries with the highest proportion of rest areas with refuelling facilities for alternative fuels were Belgium (Flanders), Ireland, Italy and Slovenia. On average across the network, 7% of rest areas had refuelling facilities for alternative fuels.

[10] No data provided by Latvia or Sweden (indicated with * on the graphs).

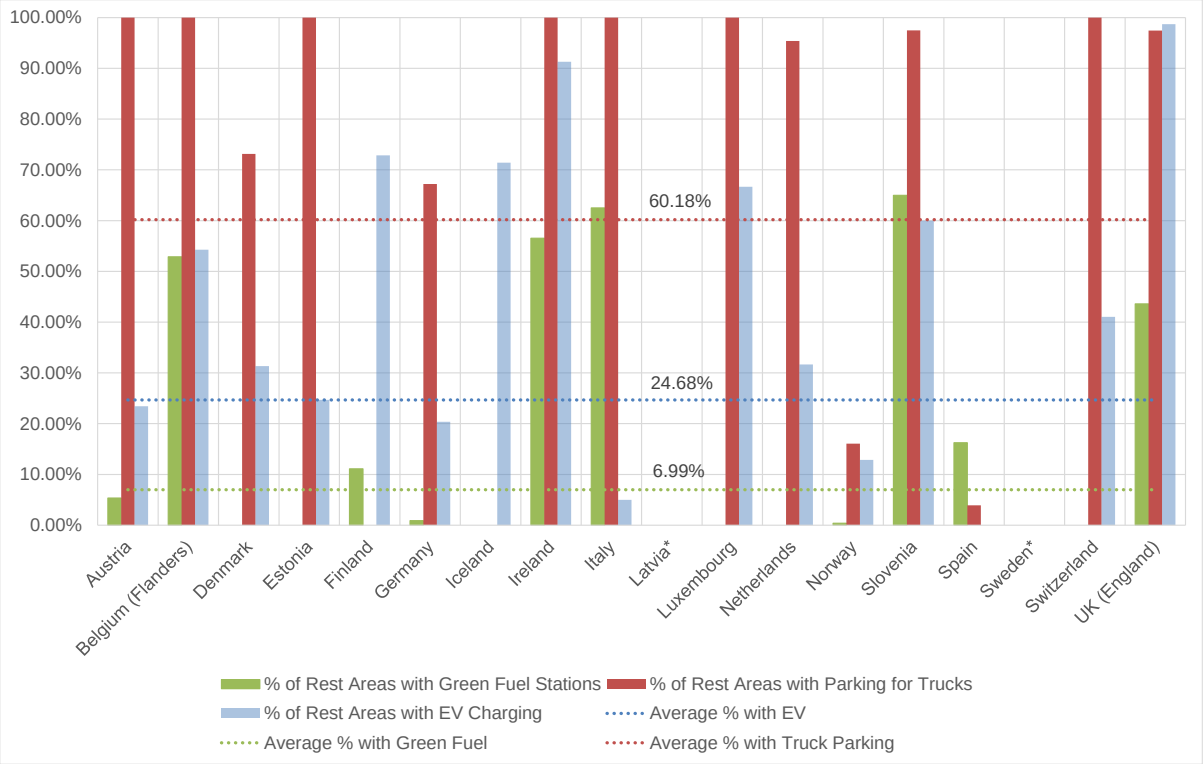


Figure 25 - Proportion of Rest Areas with Facilities for Road Users

Rest Areas with Dedicated Parking Areas for Truck Drivers

The map below shows the frequency of rest areas with dedicated rest areas for truck drivers on the network (i.e. no. per 100km).

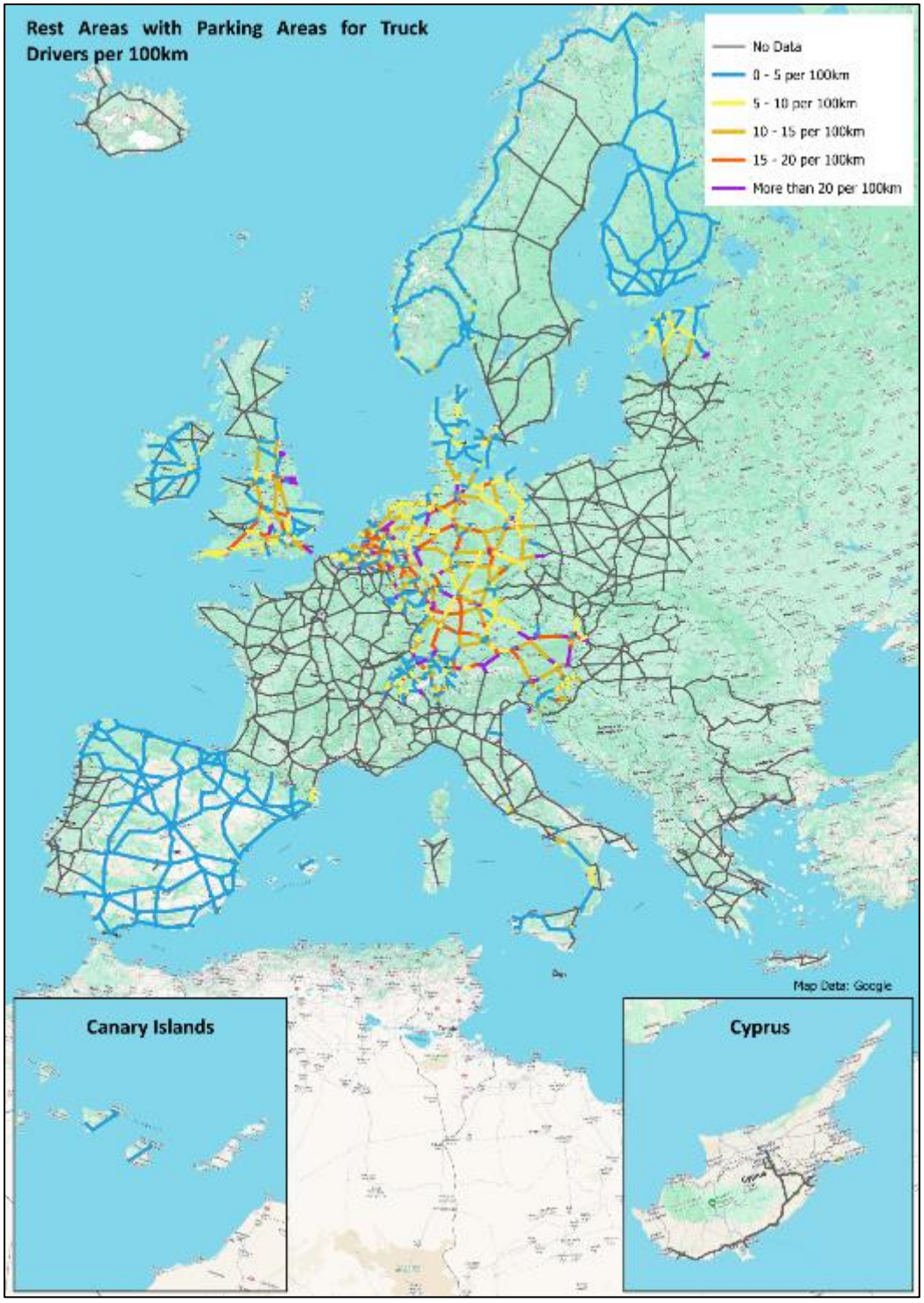


Figure 26 – Frequency of Rest Areas with Parking Areas for Truck Drivers (No./100km)

Figure 27 shows the frequency of rest areas with dedicated parking facilities for truck drivers. Again, there is wide variation with results ranging between 17 per 100km (Austria) to 0.2 per 100km (Spain). On average, amongst countries that were able to provide data[11], there are 4.5 per 100km or approximately one every 22km[12].

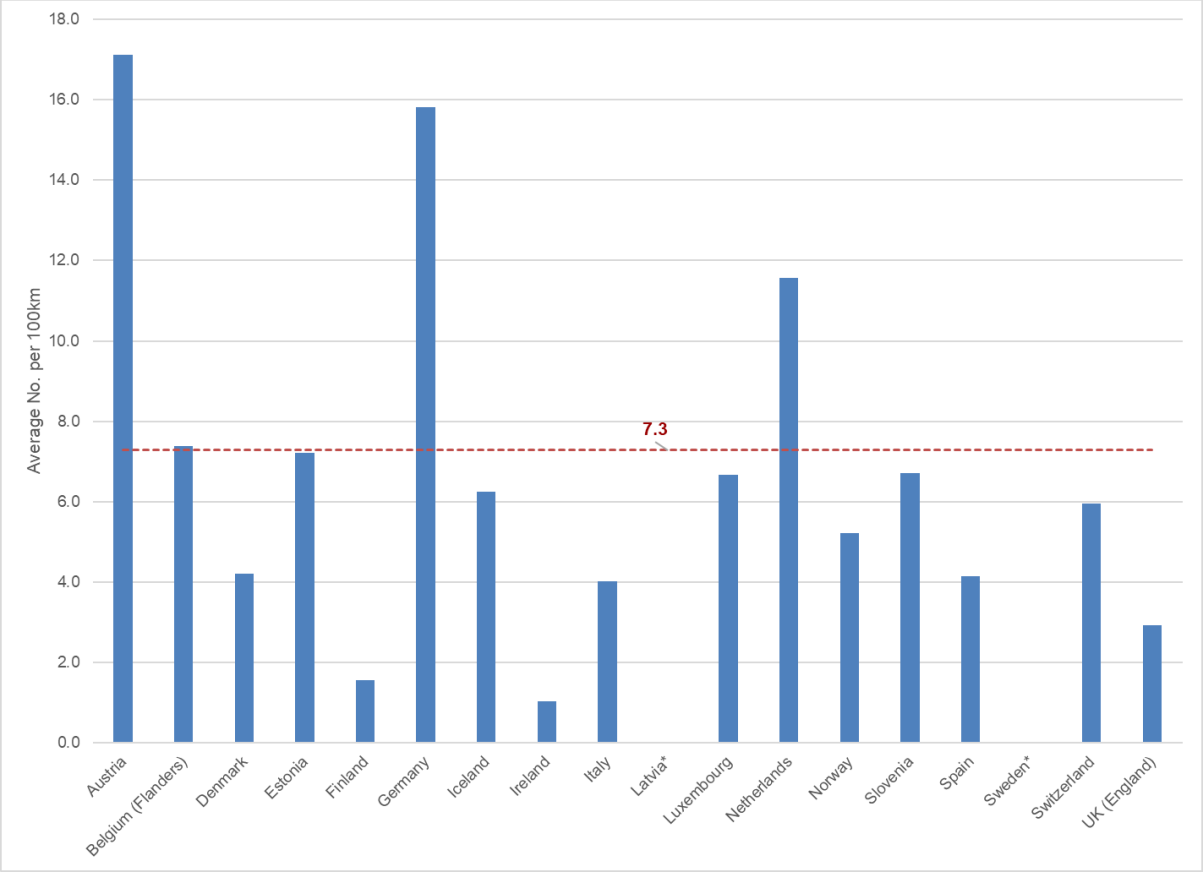


Figure 27 - Frequency of rest areas with parking facilities for truck drivers (No./100km)

[11] No data provided by Iceland, Latvia, or Sweden (indicated by * on the graph)

[12] The provided data values have been capped so that the number of rest areas with parking facilities for truck drivers on a section cannot exceed the number of areas on that section.

Rest Areas with Electric Vehicle Charging Facilities

The map below shows the frequency of rest areas with charging facilities for electric vehicles on the network (i.e. no. per 100km).

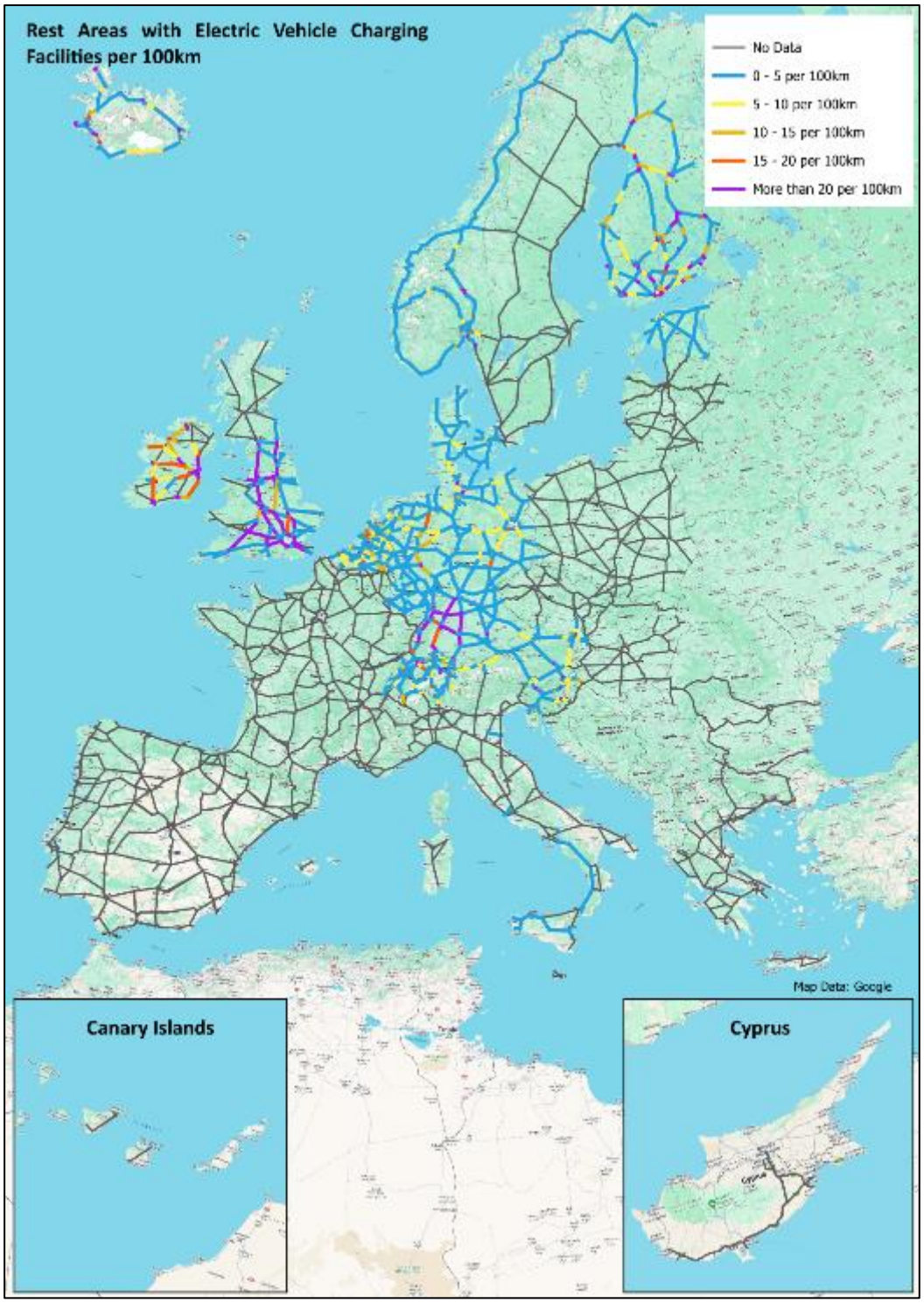


Figure 28 - Frequency of Rest Areas with EV Charging Facilities (No./100km)

Figure 29 shows the frequency of rest areas with charging facilities for electric vehicles. These ranged from more than 4 per 100km (Luxembourg, Iceland, Slovenia) to 0.2 per 100km (Italy). Amongst those countries that were able to provide data[13], the average frequency was 2.2 per 100km or approximately one every 45km[14].

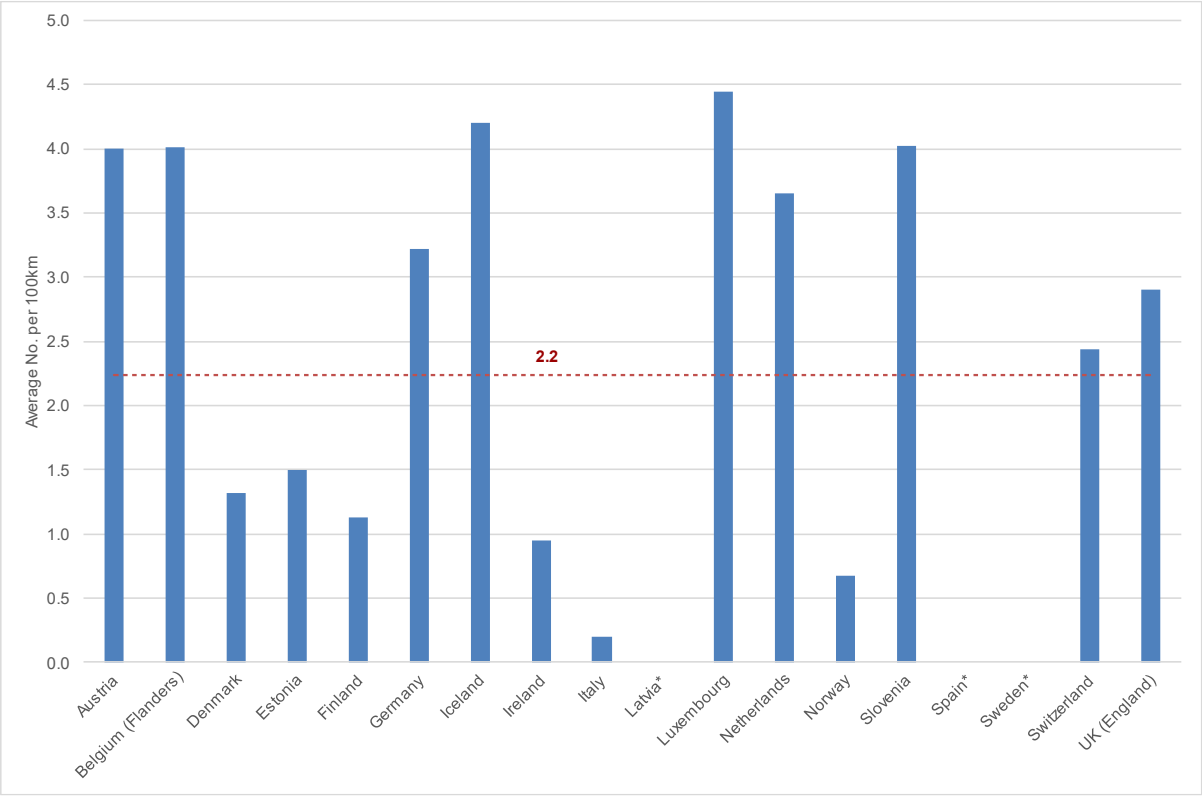


Figure 29 - Frequency of rest areas with charging facilities for electric vehicles (No./100km)

[13] No data provided by Latvia, Spain, Sweden (indicated by * on the graph).

[14] The provided data values have been capped so that the number of rest areas with EV charging facilities on a section cannot exceed the number of areas on that section.

Rest Areas with Alternative Fuel Refuelling Facilities

The map below shows the frequency of rest areas with alternative fuel refuelling facilities (e.g. CNP, LPG) on the network (i.e. no. per 100km).

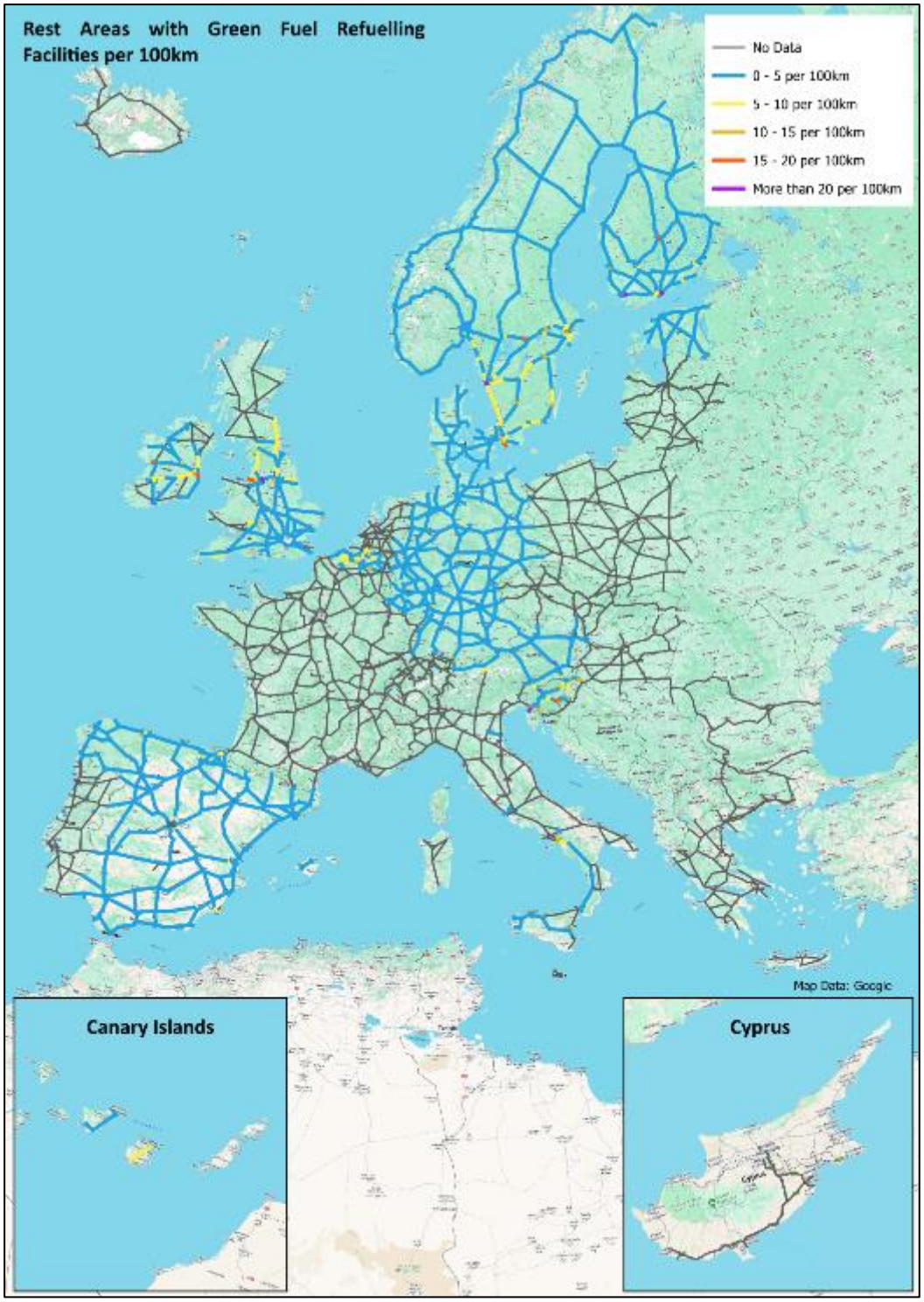


Figure 30 – Frequency of Rest Areas with Alternative Fuel Refuelling Facilities (No./100km)

Figure 31 shows the frequency of rest areas with refuelling facilities for alternative fuels such as CNG (Compressed Natural Gas) and/or LPG (Liquefied Petroleum Gas). Again, there is wide variation with results ranging from more than 4 per 100km (Slovenia) to less than 0.1 per 100km (Norway). The average frequency among countries that were able to provide data[15] was 0.8 per 100km or one every 125km[16].

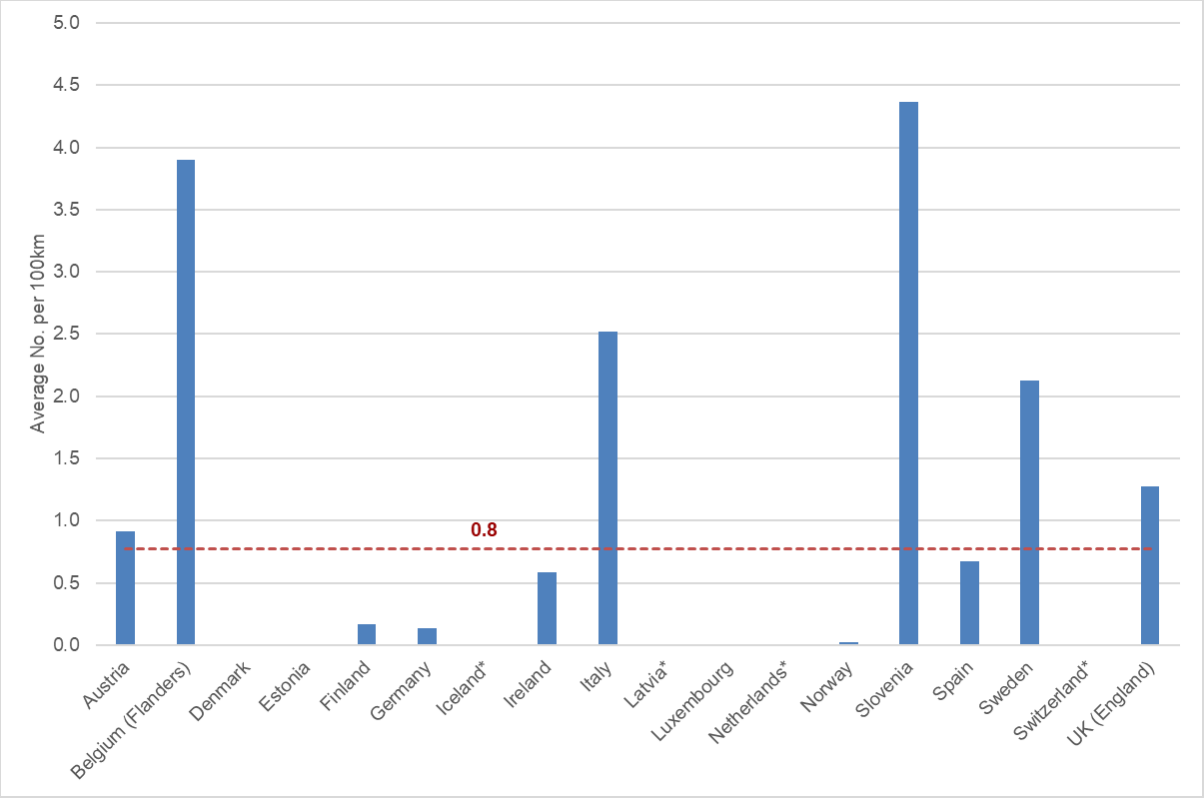


Figure 31 - Frequency of rest areas with alternative fuel refuelling facilities (No./100km)

[15] No data provided by Iceland, Latvia, Netherlands, Switzerland (indicated by * on the graph).

[16] The provided data values have been capped so that the number of rest areas with alternative fuel refuelling facilities on a section cannot exceed the number of areas on that section.

4 NETWORK PERFORMANCE

4.1 Average Traffic Flow

This indicator shows the average number of vehicles per day using a route expressed as the Annual Average Daily Traffic (AADT) (see below).

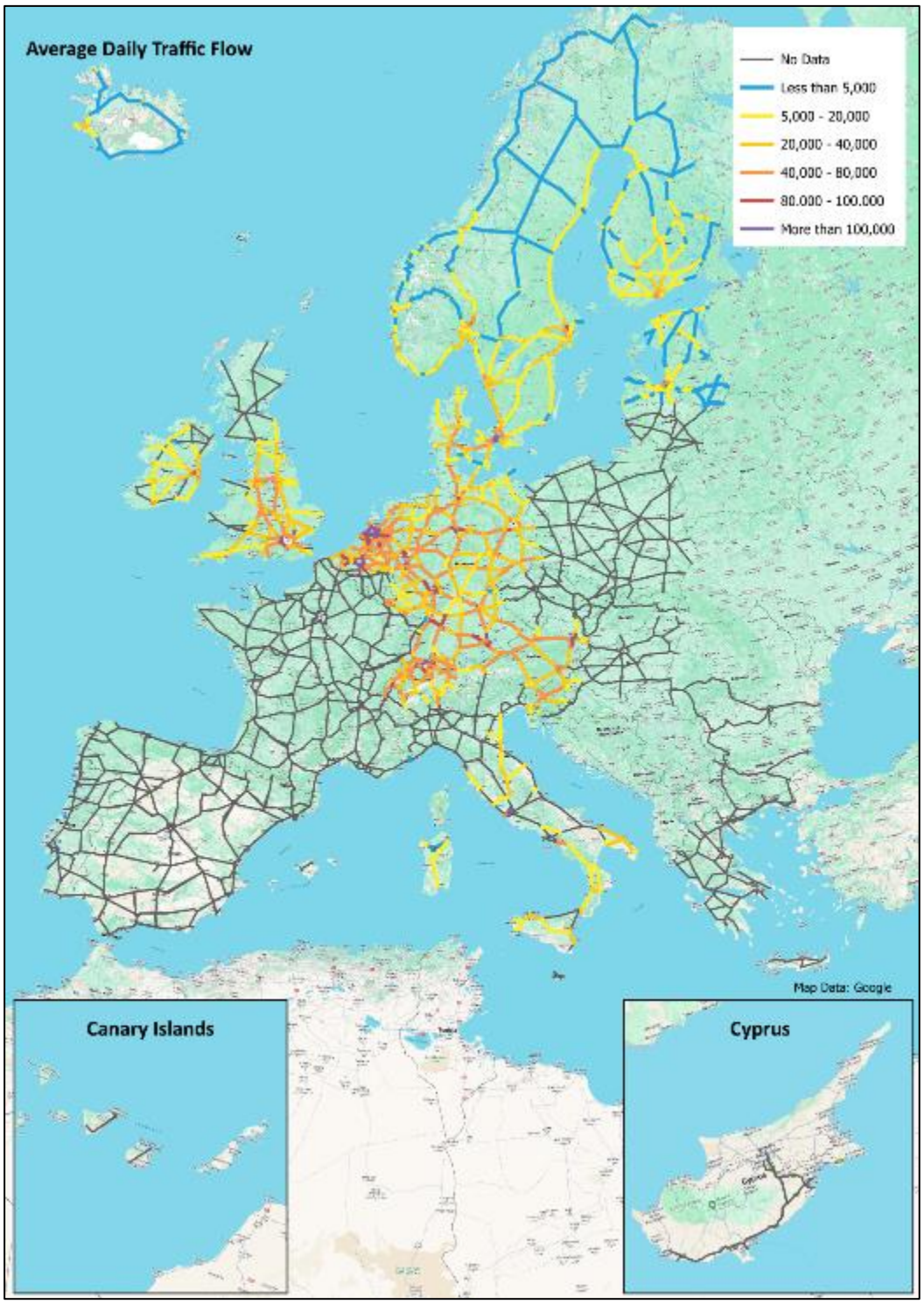


Figure 32 - Annual Average Daily Traffic Flow (AADT)

The values for traffic volumes have been grouped into bands to provide a better understanding of the performance of the roads. Figure 33 shows the distribution of Traffic Flow on the Pan European Road Network for which data is available. This shows that most of the network (54%) carries less than 20,000 vehicles per day and 22% of the network carries between 20,000 and 40,000 vehicles per day. 20% of the network carries between 40,000 and 80,000 vehicles per day and 4% carries more than 80,000 vehicles per day.

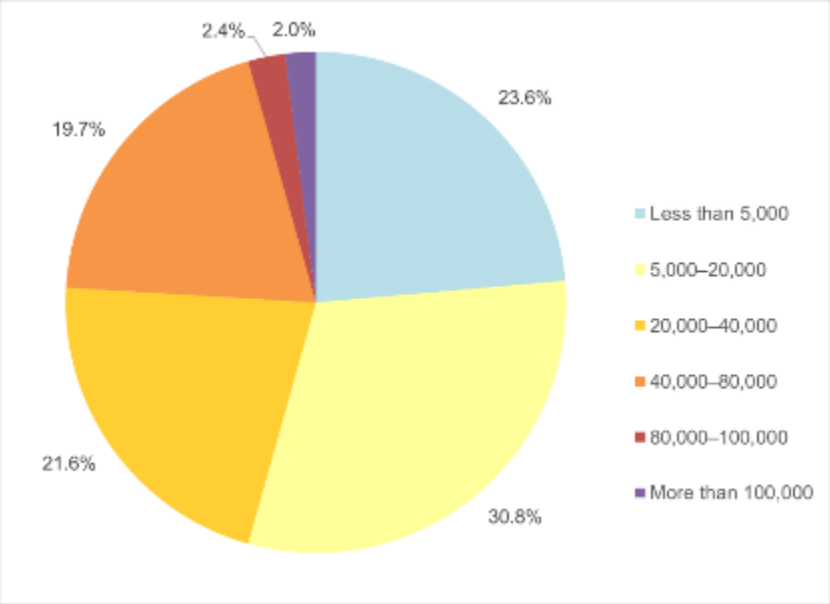


Figure 33 - Distribution of traffic flow on the Pan European Road Network

Figure 34 shows the distribution of the network length by Traffic Flow bands for each participating country[17]. This shows that the countries carrying the most traffic are Netherlands and Belgium (Flanders) with 19% and 17% of the network carrying more than 100,000 vehicles per day respectively.

Conversely, the countries with the least traffic are Iceland, Norway, Latvia, Estonia, Finland and Sweden, each with more than 40% of the network carrying fewer than 5,000 vehicles per day.

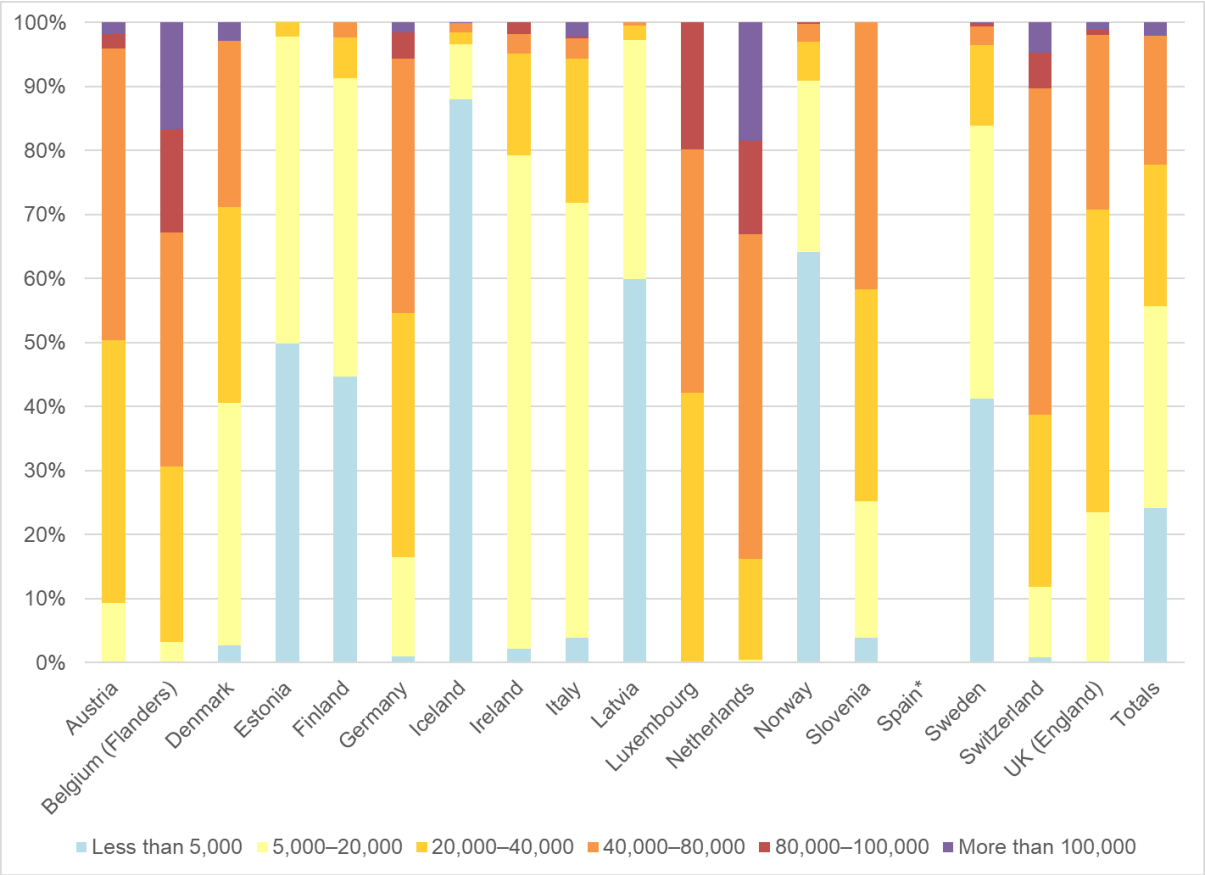


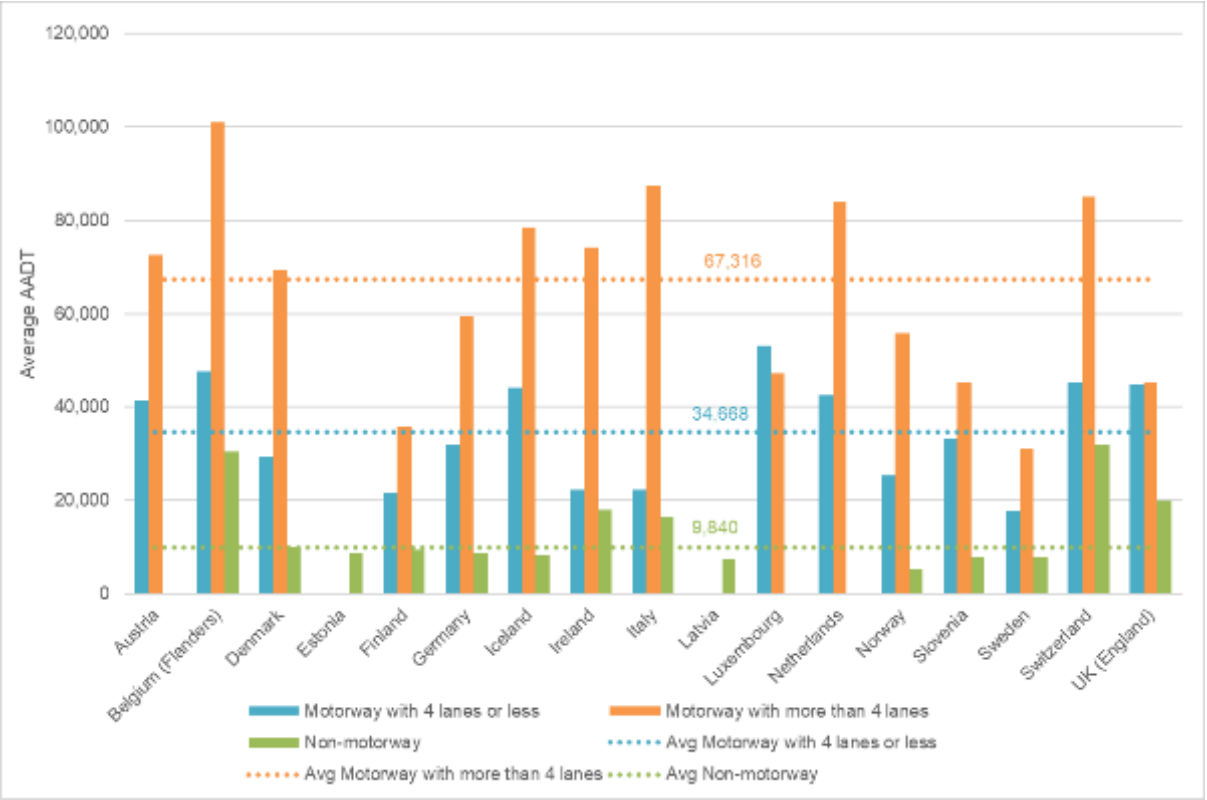
Figure 34 – National distribution of traffic flow (AADT)

[17] No data provided by Spain

Figure 35 shows the average value for AADT on the Pan European Road Network by country and road type. The indicator calculated as the length weighted average of the AADT values on the different logical sections.

The weighted average AADT for the whole network is 31,200 vehicles per day. On motorways with more than 4-lanes, the weighted average AADT is 67,300 vehicles per day, on motorways with 4-lanes or less, the average AAST is 34,700 vehicles per day and on non-motorways the average AADT is 9,800 vehicles per day.

As would be expected, the length weighted average AADT is substantially higher for motorways than for non-motorway roads in all countries.



(The network in Austria, Luxembourg and Netherlands consists only of motorways. The network in Estonia and Latvia consists only of non-motorway roads.)

Figure 35 – National average traffic flow by road type (AADT)

4.2 Traffic Density

Traffic Density is expressed as the average annual daily traffic per lane. By combining information on traffic flow and number of lanes, this indicator identifies the proportion of the Pan European Road Network which could experience congestion problems.

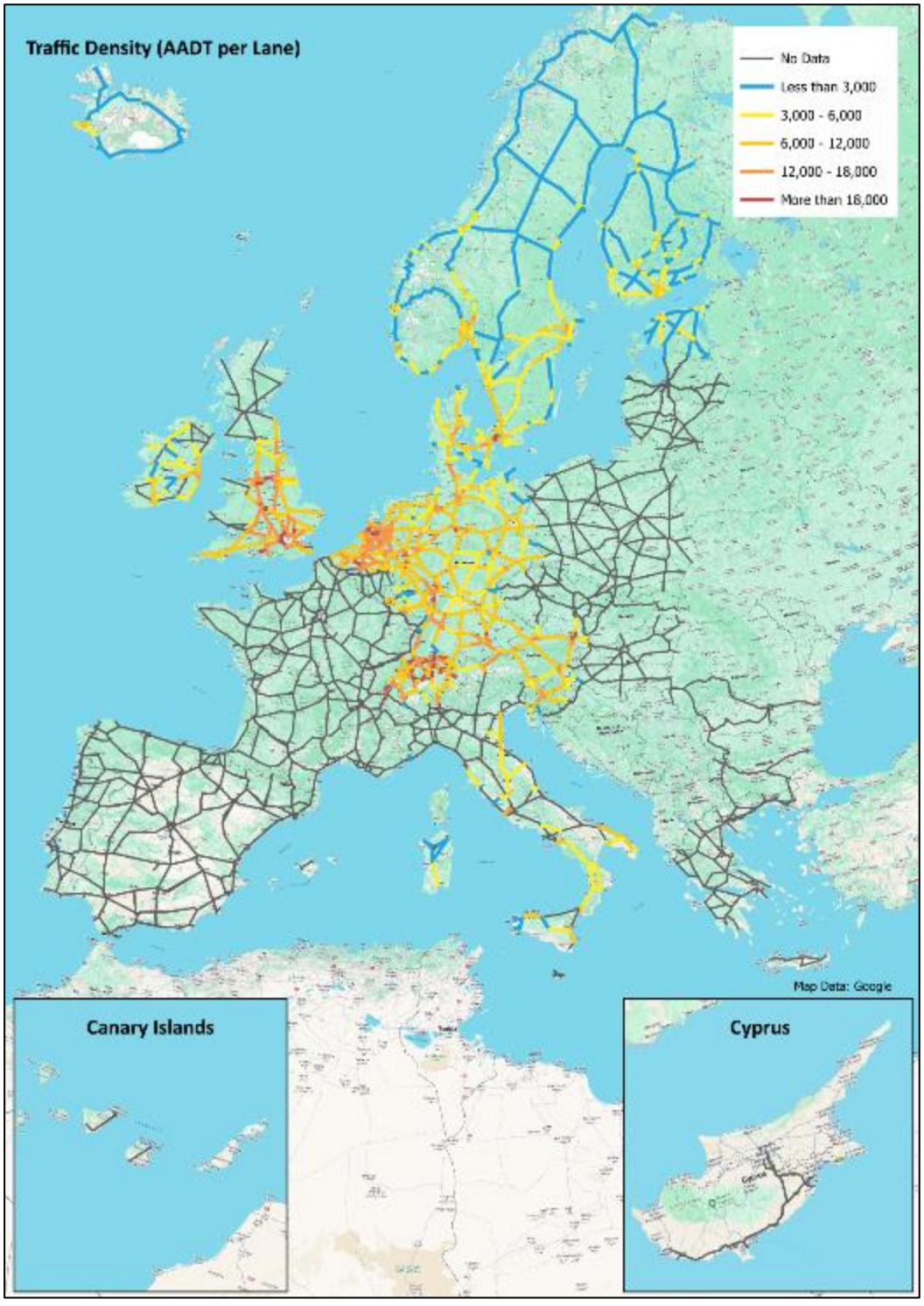


Figure 36 - Traffic Density

Figure 37 shows the overall distribution of Traffic Density on the Pan European Road Network. This indicates that 45% of the network carries more than 6,000 vehicles per day per lane and that 3% carries more than 18,000 vehicles per day per lane.

On motorways with more than 4-lanes, 84% has a traffic density of more than 6,000 vehicles per day per lane compared to 59% on motorways with 4-lanes or less and 31% on non-motorways. 69% of non-motorways carry less than 3,000 vehicles per day per lane.

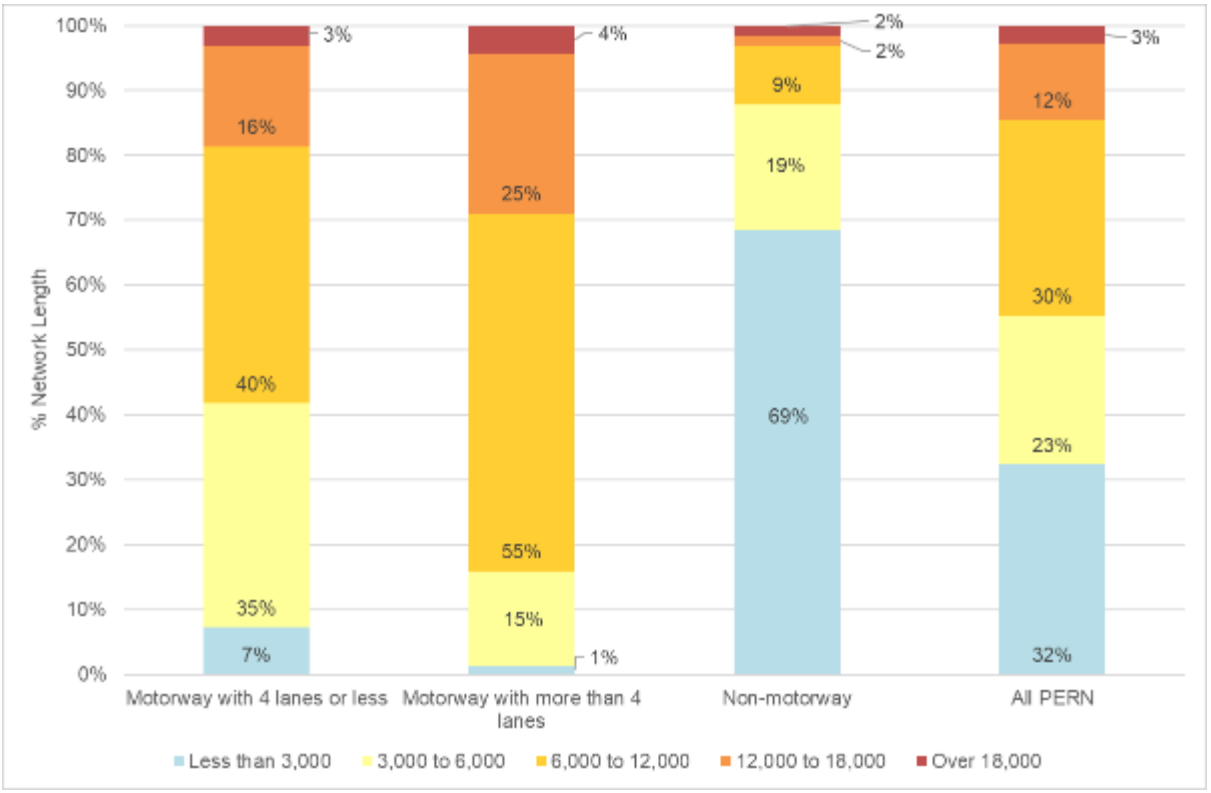


Figure 37 - Distribution of traffic density on the PERN (AADT/Lane)

Figure 38 shows the distribution of Traffic Density for each participating country[18]. It shows that the countries with the greatest average traffic density are Belgium (Flanders), Luxembourg, Switzerland and UK (England), each with more than 10% of the network carrying more than 18,000 vehicles per day per lane.

The countries with the lowest average traffic density Iceland, Norway and Finland, in each of which more than 70% of the network has an average traffic density of less than 3,000 vehicles per day per lane.

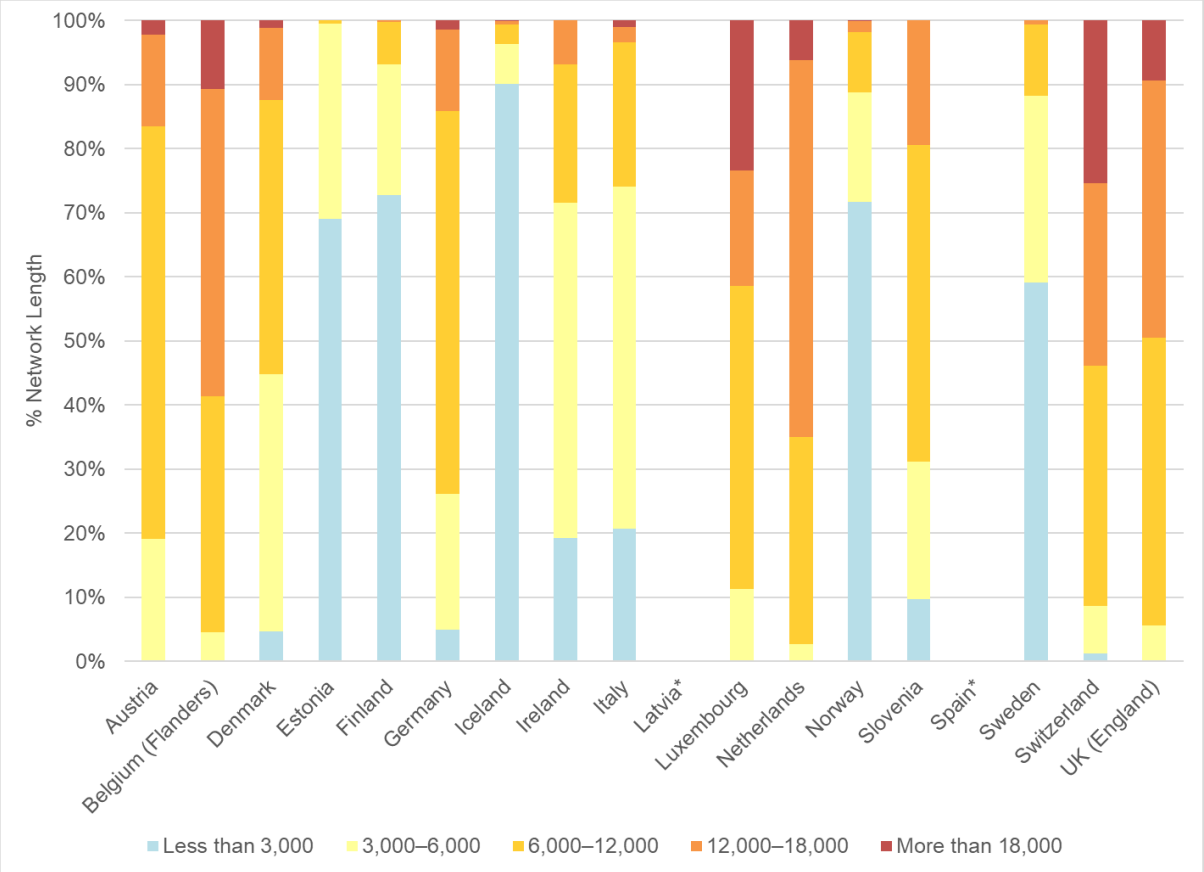


Figure 38 – National Distribution of traffic density (AADT/Lane)

[18] No data provided by Spain

Figure 39 compares the Traffic Density on the Pan European Road Network (calculated from data provided on the Annual Average Daily Traffic and Number of Lanes) to the national population (from Eurostat) for each participating country.

This shows most countries are in a cluster where the traffic density increases sharply with population. The exceptions are Luxembourg which has one of the highest levels of traffic yet also has the smallest population, and Italy, Germany and the UK which have relatively low levels of traffic density in relation to their population size compared with other countries. These differences may be a function of the length of network in these countries relative to size of their populations.

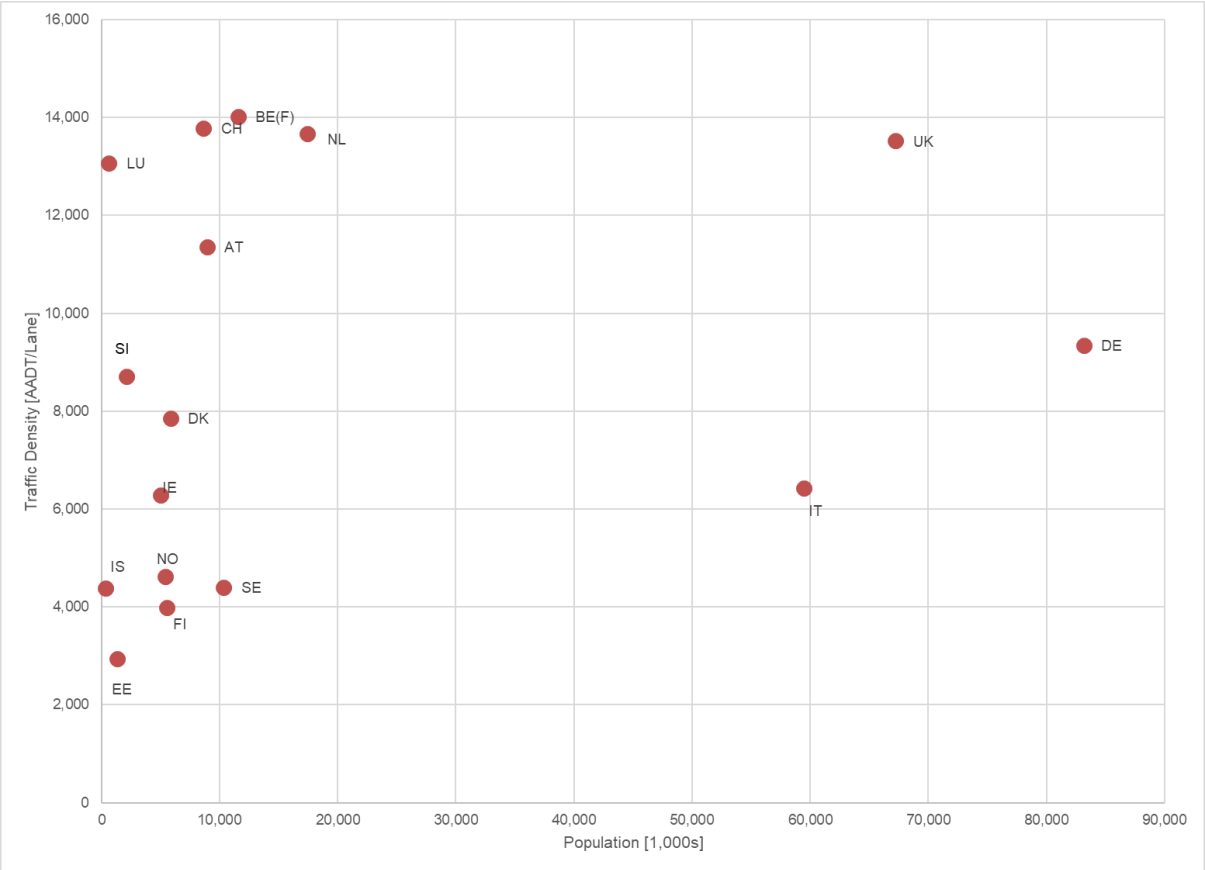


Figure 39 - Comparison of Population and Traffic Density

Figure 40 combines the surface area (y-axis), population (x-axis), and relative traffic density (size of the circles). It shows that the countries with the highest traffic density on their network in relation to their population and surface area are Luxembourg, Switzerland, Austria, Belgium (Flanders) and the Netherlands. and therefore, that the networks in these countries have the highest levels of demand.

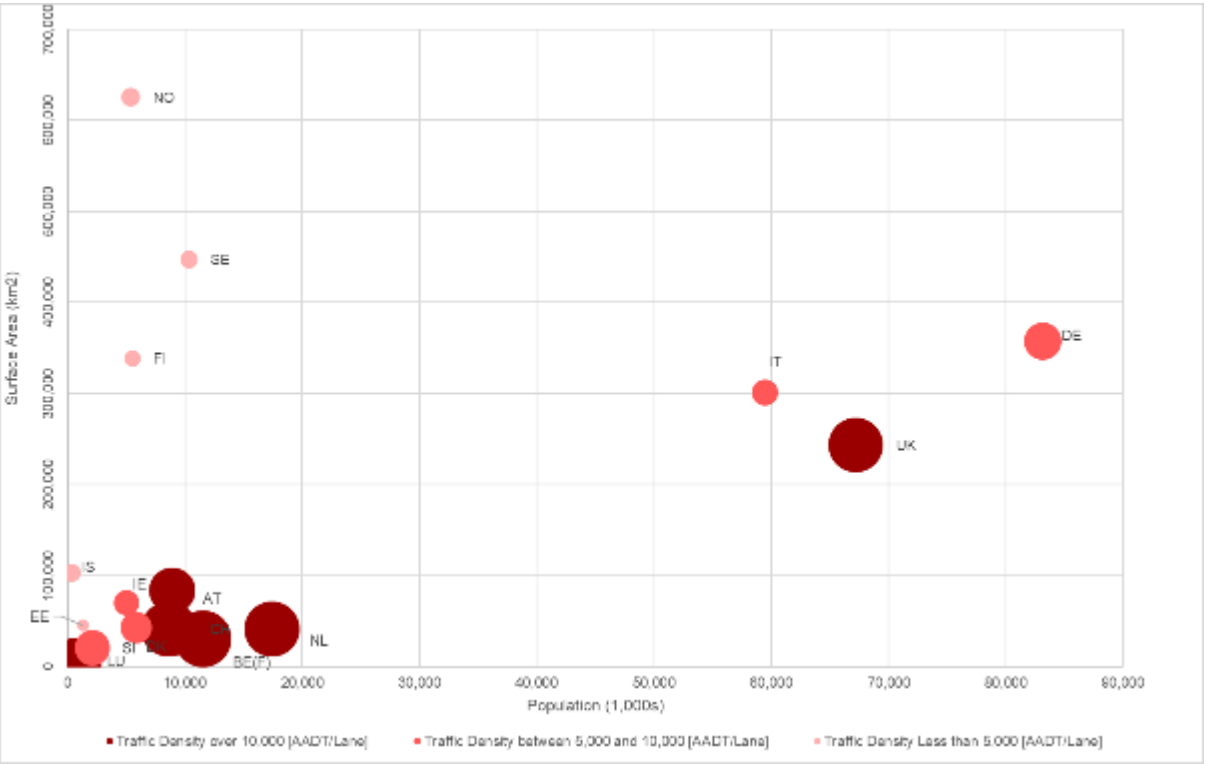


Figure 40: Traffic Density vs. Surface Area and Population

Figure 41 shows trends in traffic density on the network since 2011 for those countries that have provided data for each of the seven published reports since 2011[19]. This shows that traffic density has gradually reduced over this time, and there was a visible reduction in the 2021 figures due to the travel restrictions introduced in response to the Covid-19 pandemic.

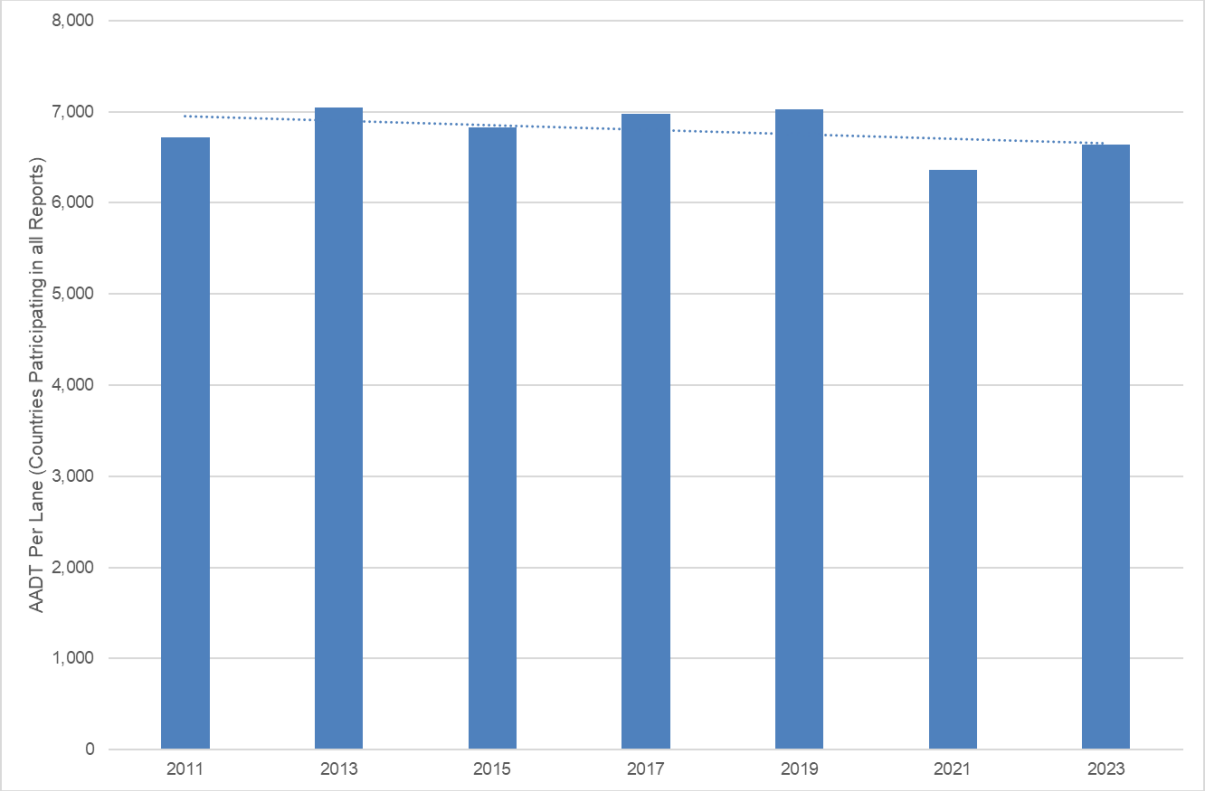


Figure 41 - Trends in traffic density on the Pan European Road Network since 2011 (only countries participating in all seven reports)

[19] That is Austria, Denmark, Estonia, Finland, Iceland, Ireland, Italy, Lithuania, Luxembourg, Norway, Slovenia, Sweden, and the UK.

4.3 Proportion of Heavy Good Vehicles

The proportion of traffic comprising heavy goods vehicles (HGVs) on the Pan European Road Network is shown below.

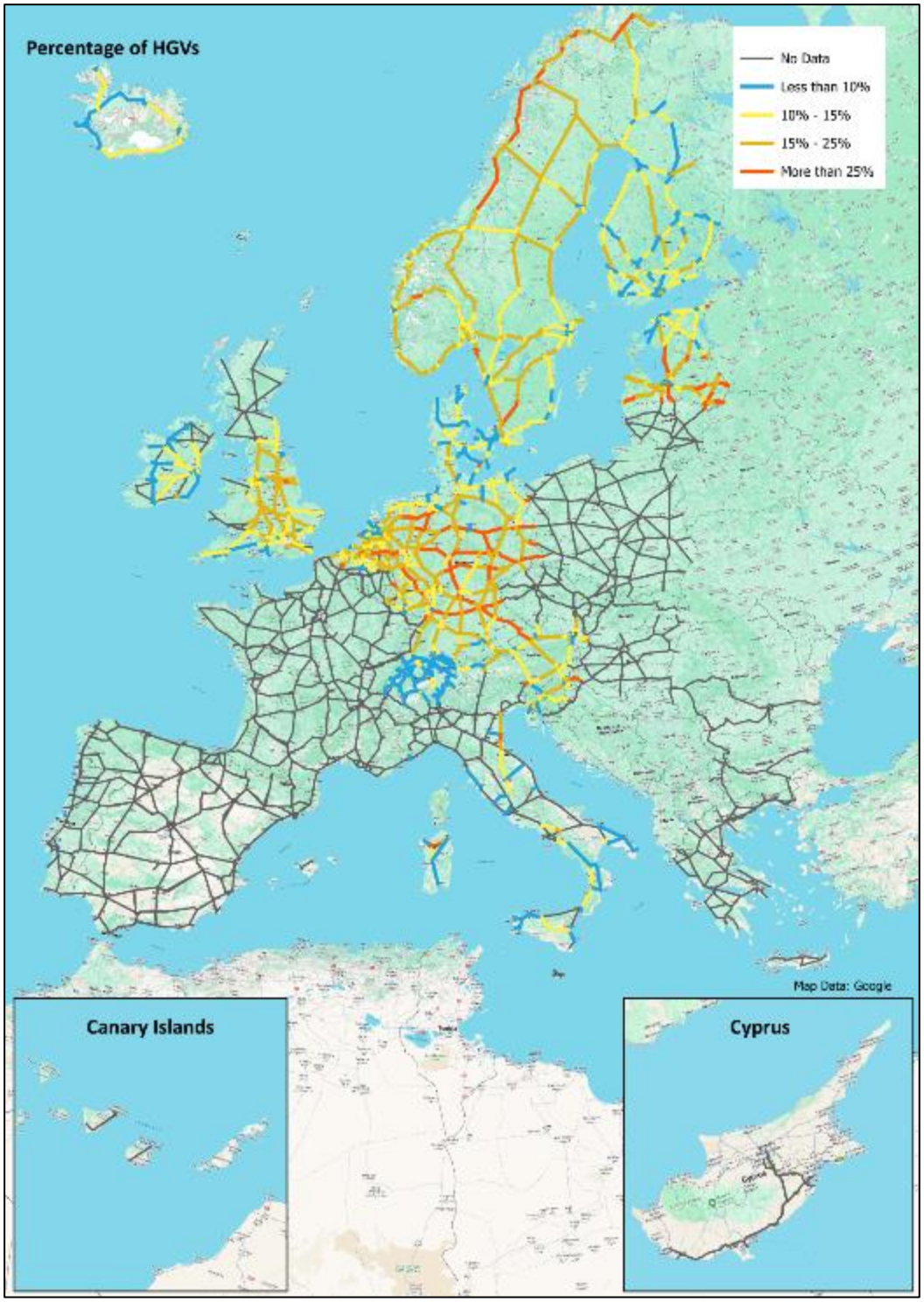


Figure 42 - Proportion of Traffic that is HGVs (%)

Figure 43 shows the overall proportion of HGV traffic on the Pan European Road Network where data is available. This indicates that HGVs make up more than 15% of total traffic on 47% of the network as a whole and that HGVs make up more than 25% of all traffic on 10% of the network.

On the motorways with more than 4 lanes, HGVs comprise more than 15% of the traffic on 60% of the network compared and on 15% of the network HGVs comprise more than 25% of all traffic.

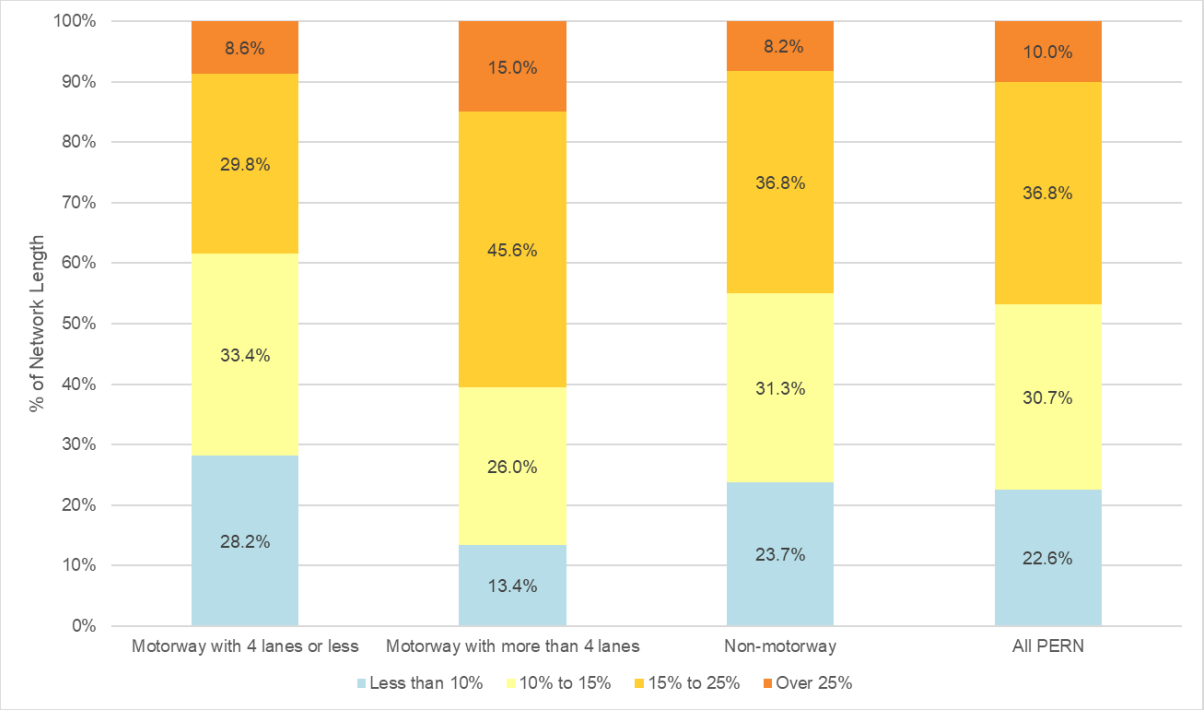


Figure 43 - Comparison of Proportion of HGV Traffic on the PERN

Figure 44 shows that countries with the highest proportion of HGVs on the Pan European Road Network are Latvia, Germany and Norway who each have more than 25% HGVs on at least 20% of the network. Conversely, the countries with the lowest proportion of HGVs on the Pan European Road Network are Switzerland, Ireland, and Italy where HGVs make up less than 10% of traffic on at least 60% of the network, however, the figures for Switzerland reflect the policy of transporting goods and goods-vehicles by train[20].

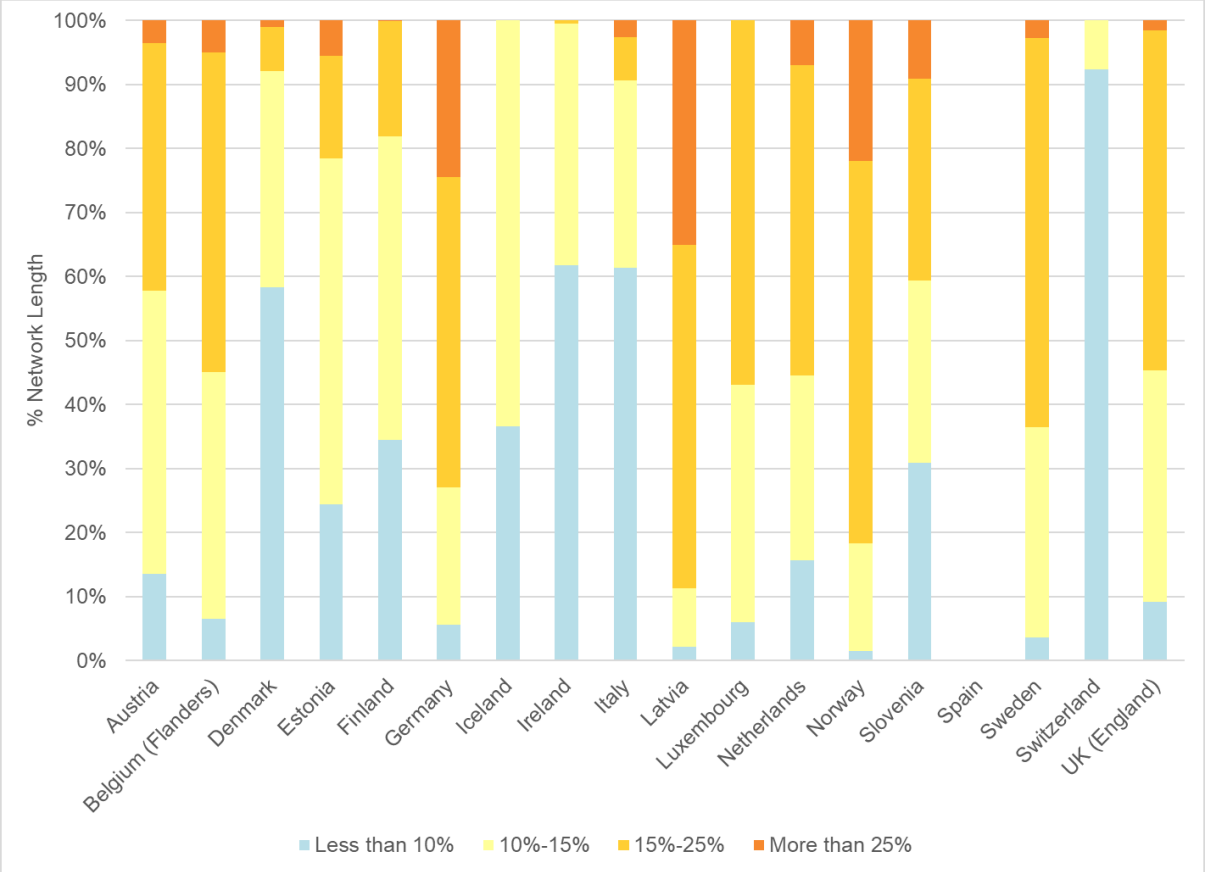


Figure 44 – National distribution of HGV traffic proportions on Pan European roads

[20] No data provided by Spain

4.4 Heavy Goods Vehicle Traffic Flow

The distribution of annual average daily HGV traffic flow is shown below.

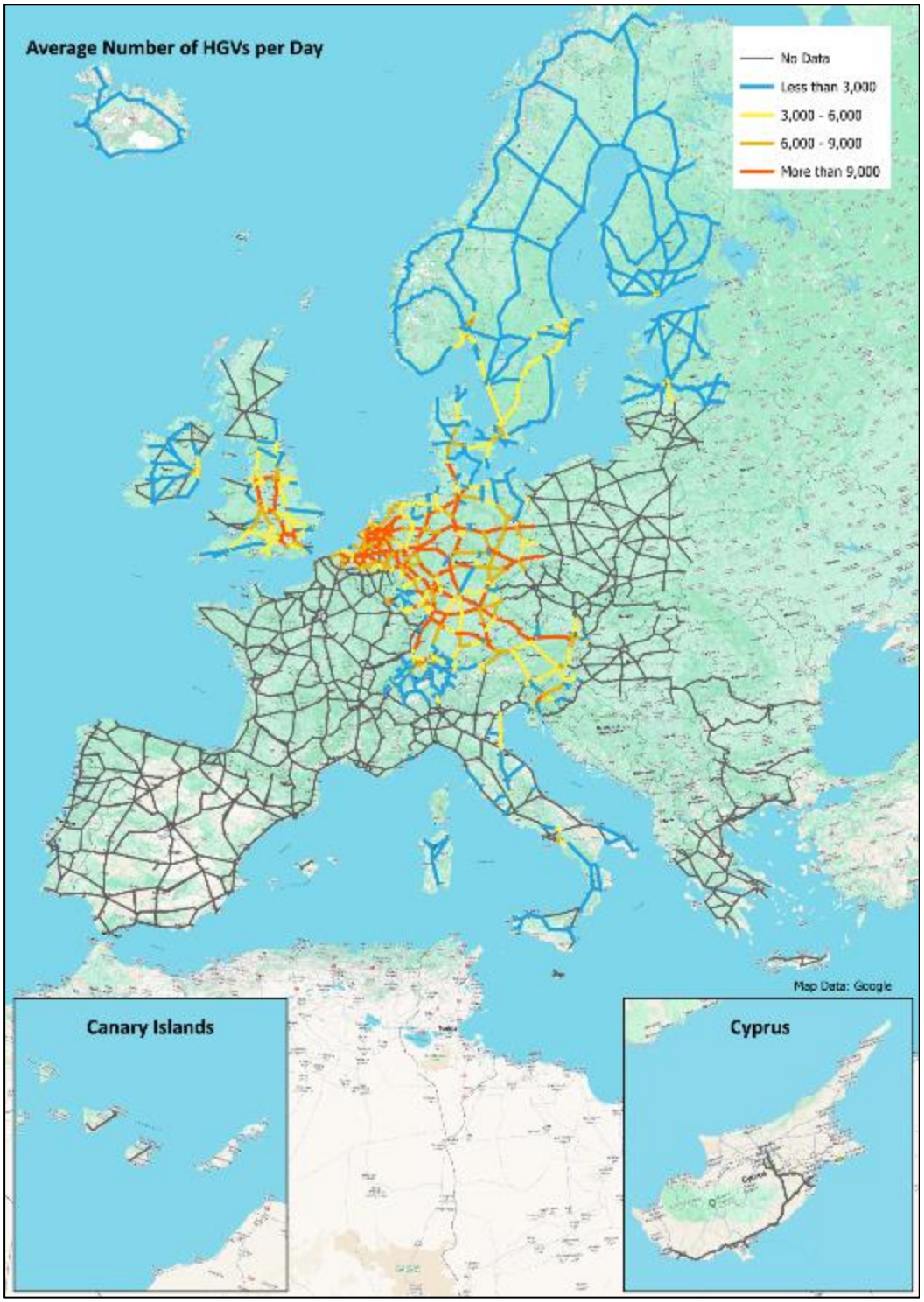


Figure 45 - HGV Traffic (AADT)

Figure 46 shows the overall distribution of HGV traffic on the Pan European Road Network. This indicates that the majority (60%) carries fewer than 3,000 HGVs per day, 26% carries between 3,000 and 9,000 vehicles per day and 14% carries more than 9,000 per day. On motorways with more than 4-lanes, 70% of the network carries more than 6,000 HGVs per day with 45% carrying more than 9,000 HGVs per day. On non-motorways, only4% of the network carries more than 3,000 HGVs per day.

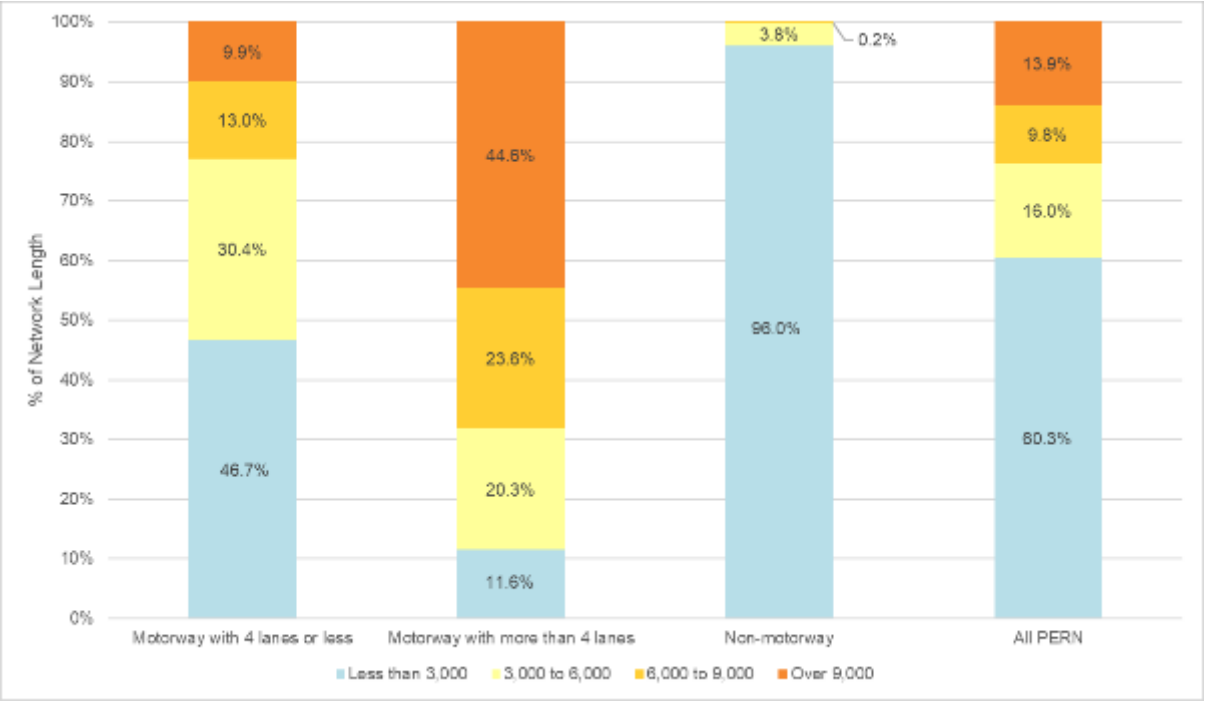


Figure 46 - Comparison of HGV flows on the PERN (AADT)

Figure 47 shows the weighted average values for Heavy Goods Vehicles traffic on the Comprehensive network. This shows that on motorways with more than 4-lanes, the average flow of HGVs is more than 9,100 vehicles per day. On motorways with 4-lanes or less, the average flow of HGVs is just over 4,300 vehicles per day while on non-motorways it is 1,200 HGVs per day.

There is a wide variation between individual countries with higher-than-average levels of HGV traffic on all types of motorway in Belgium (Flanders), Netherlands, Germany and the UK (England). Countries with relatively lower levels of HGV traffic are Estonia, Finland, Iceland, Latvia and Sweden.

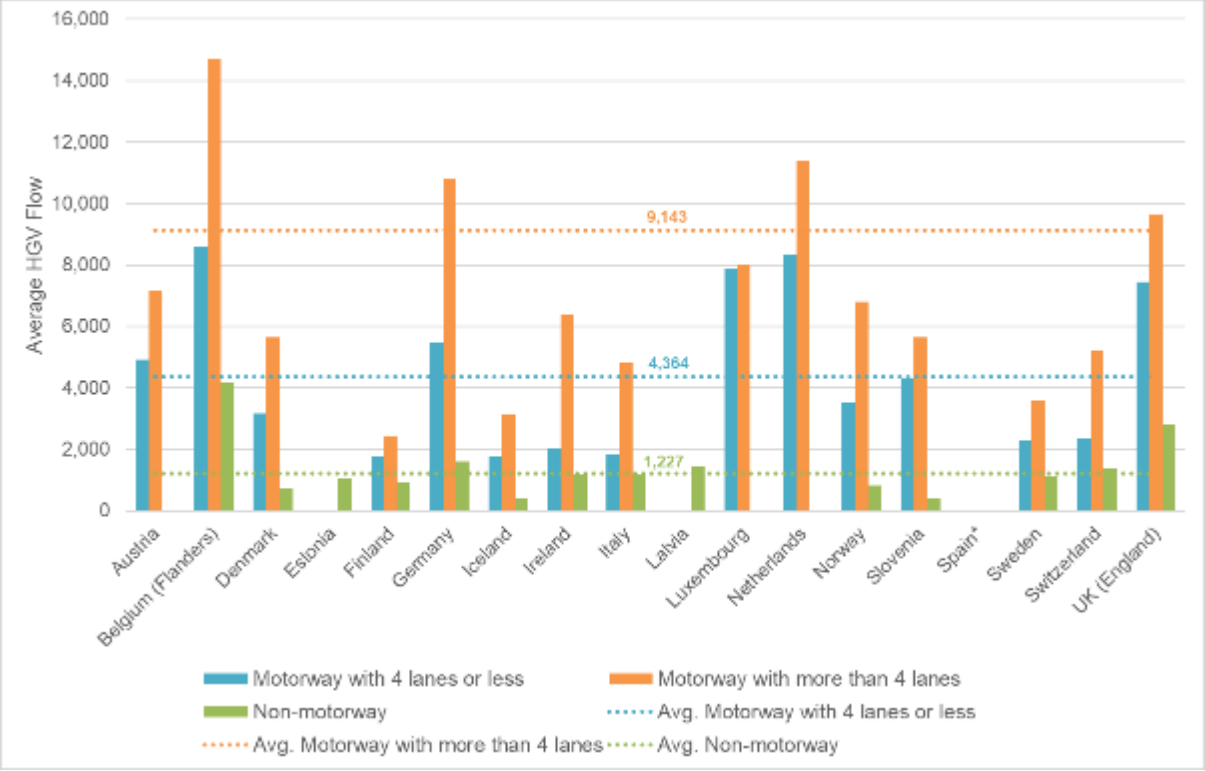


Figure 47 – National average HGV traffic flow by road type on PERN (AADT)

(The network in Austria, Luxembourg and Netherlands consists only of motorways. The network in Estonia consists only of non-motorway roads.)

Figure 48 shows the distribution of HGV traffic flow in bands as a proportion of network length. These figures were obtained by multiplying the number of total vehicles with the percentage of HGVs.

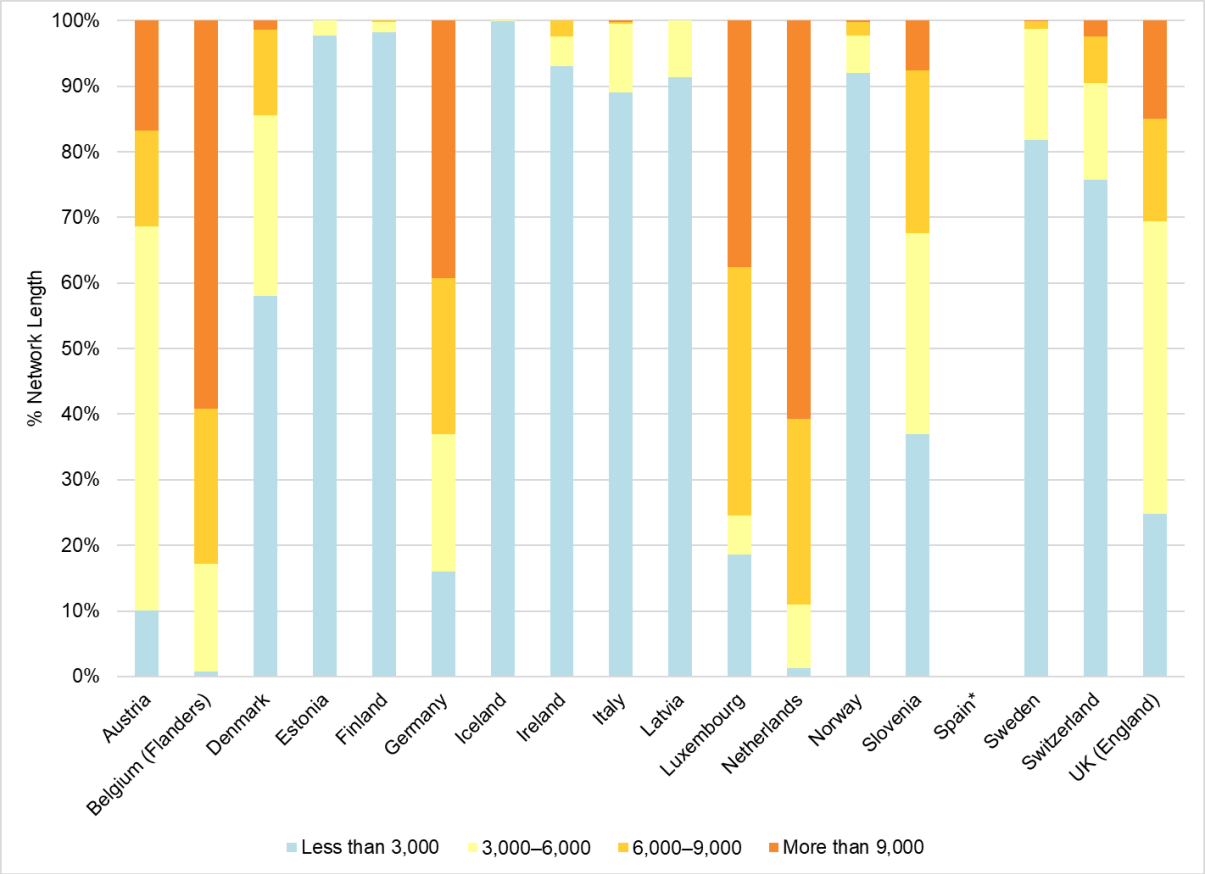


Figure 48 – National distribution of HGV traffic flow on Pan European roads

This shows that the countries with the highest volume of HGV traffic are Netherlands, Belgium (Flanders), Germany and Luxembourg in each of which more than 35% of the network carries more than 9,000 HGVs per day. Conversely the countries that carry the lowest volume of HGVs are Estonia, Finland and Iceland in each of which more than 95% of the network carries fewer than 3,000 HGVs per day[21].

[21] No data provided by Spain

Figure 49 shows trends in the average HGV traffic density since 2011 for those 14 countries that have provided data for each of the six published reports since 2011[22] . This shows that HGV traffic density has remained fairly constant since 2015.

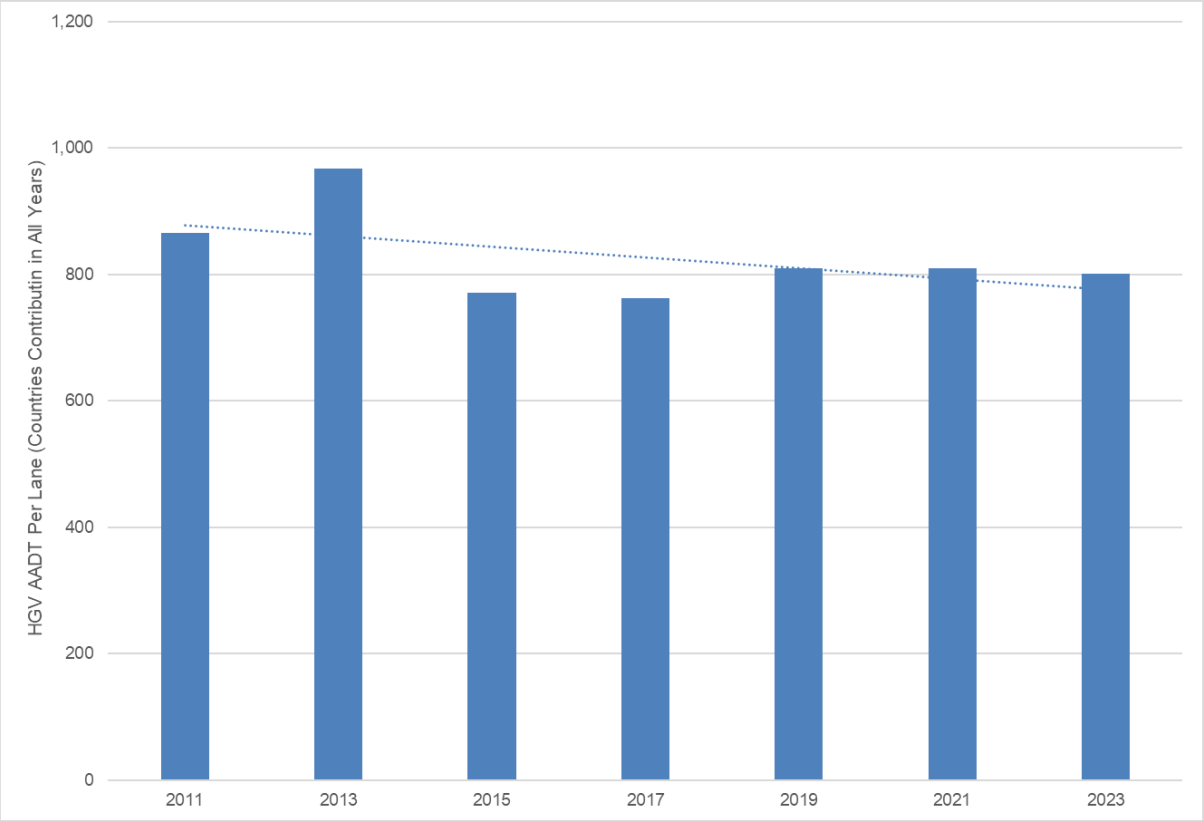


Figure 49 - Trends in HGV traffic on the PERN since 2011 (only countries participating in all six reports) (AADT)

[22] That is Austria, Denmark, Estonia, Finland, Iceland, Ireland, Italy, Lithuania, Luxembourg, Norway, Slovenia, Sweden, and the UK.

Figure 50 compares the trends in traffic density between HGVs and all traffic since 2011 for those countries that have participated in all seven reports[23]. This shows a gradual decline in both overall traffic density over the period and that HGV traffic density has remained fairly constant since 2015.

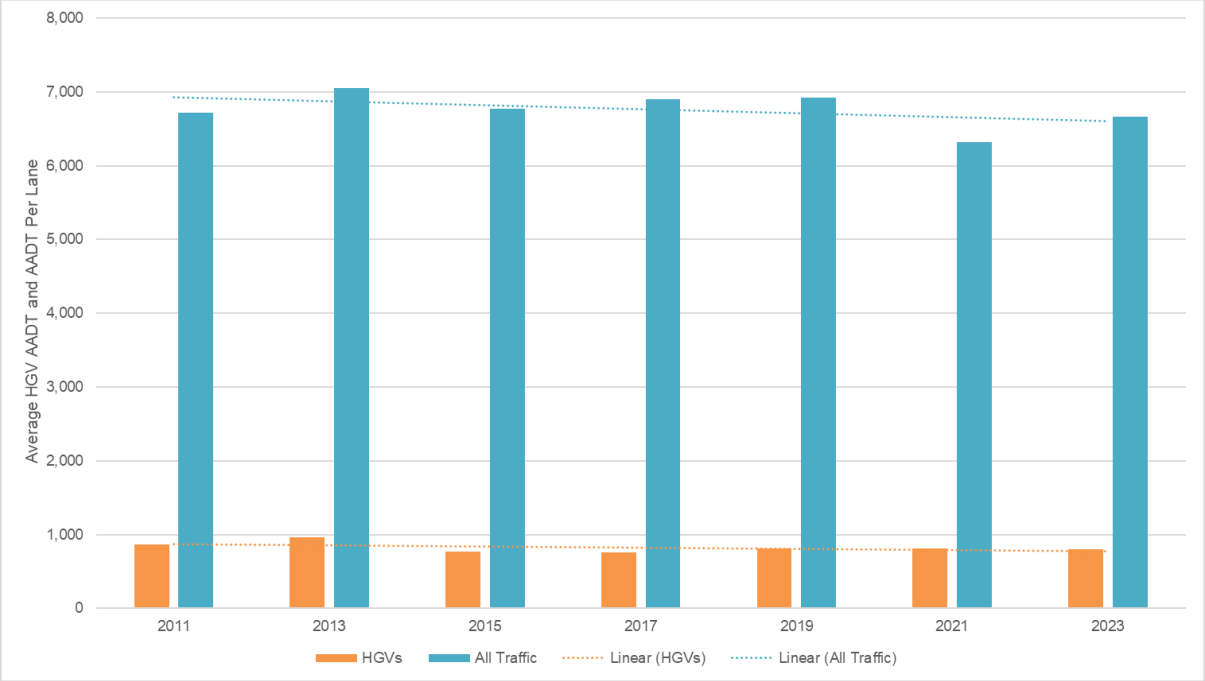


Figure 50 - Trends in HGV and All traffic on the PERN since 2011 (only countries participating in all six reports) (AADT/Lane)

[23] That is Austria, Denmark, Estonia, Finland, Iceland, Ireland, Italy, Lithuania, Luxembourg, Norway, Slovenia, Sweden, and the UK.

4.5 Road Transport Mileage

Road Transport Mileage shows the mileage travelled every year on the Pan European Road Network (expressed in terms of total vehicle kilometres per year) and provides a measure of the intensity of total transport activity. It is calculated by multiplying the Average Daily Traffic Flow value along a logical section by the length in km of the section.

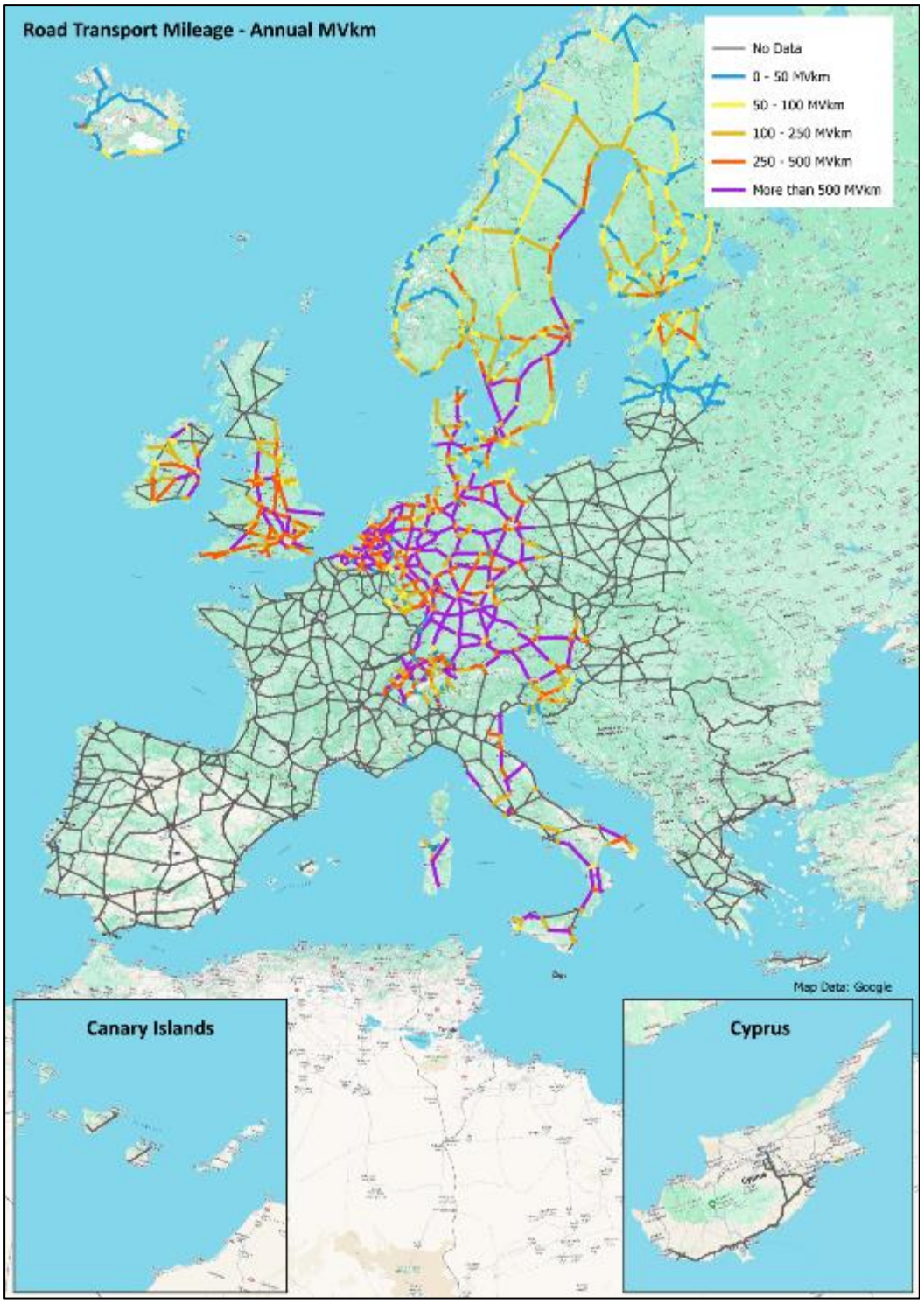


Figure 51 - Road Transport Mileage

Figure 52 shows the road transport mileage on the Pan European Road Network in each participating country. The average road transport mileage is 28 billion VehKm.

Germany has by far the highest figure (157 billion VehKm) followed by Netherlands and Switzerland. The countries with the lowest figures are Luxembourg, Iceland, Estonia and Latvia (all with less than 3 billion VehKm). However, as with other indicators, these figures depend on the characteristics of the sections selected to be part of the Pan European Road Network and on the size of the country[24].

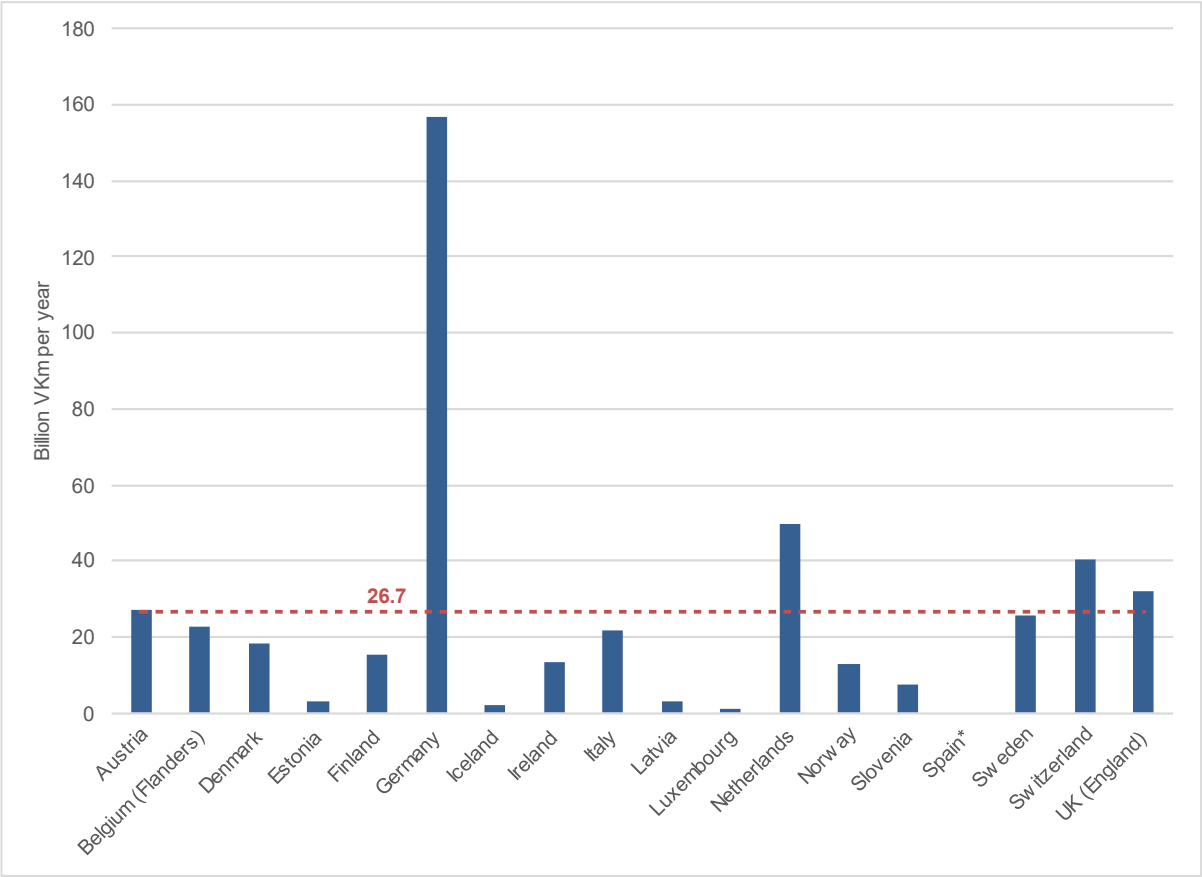


Figure 52 – National road transport mileage on PERN (BVehKm)

[24] No data provided by Spain (indicated by * on the graph).

4.6 Fatal Accident Rate

This indicator shows the annual average rate of fatal accidents over the five years 2019 to 2023 based on the road transport mileage (i.e. expressed as the number per billion VehKm). It should be noted that there is a relatively small number of accidents on the Pan European Road Network each year which makes this indicator sensitive to changes in the number of accidents from year to year.

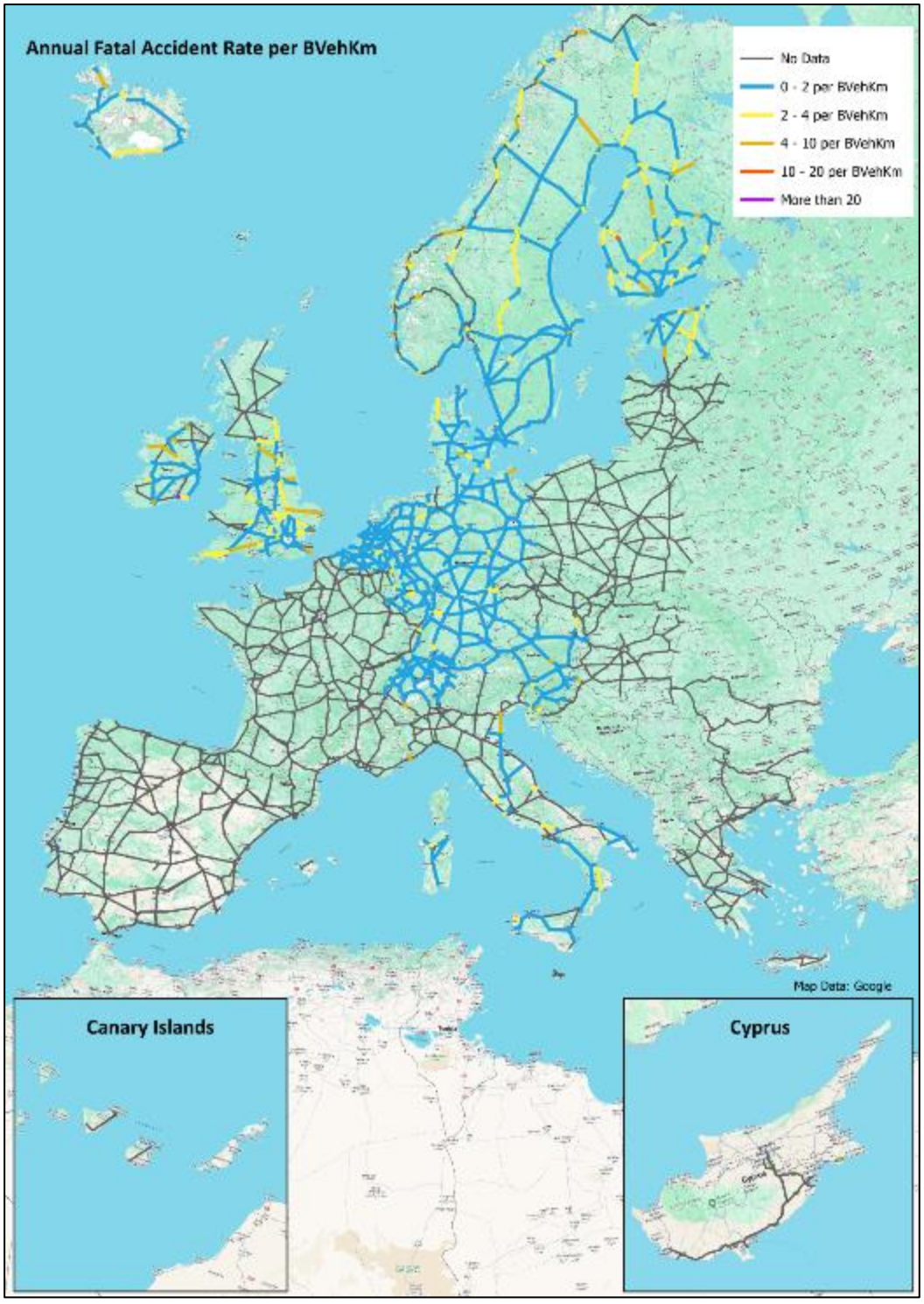


Figure 53 – Annual Average Fatal Accident Rate

Figure 54 compares the Average Fatal Accident Rates on different road types. This shows that while the average fatal accident rate on the PERN as a whole is 2.3 per billion VehKm, on motorways with more than 4-lanes the average is significantly lower at 1.3 fatal accidents per billion VehKm compared with 1.8 per billion VehKm on motorways with less than 4-lanes and 3.9 fatal accidents per billion VehKm on non-motorways.

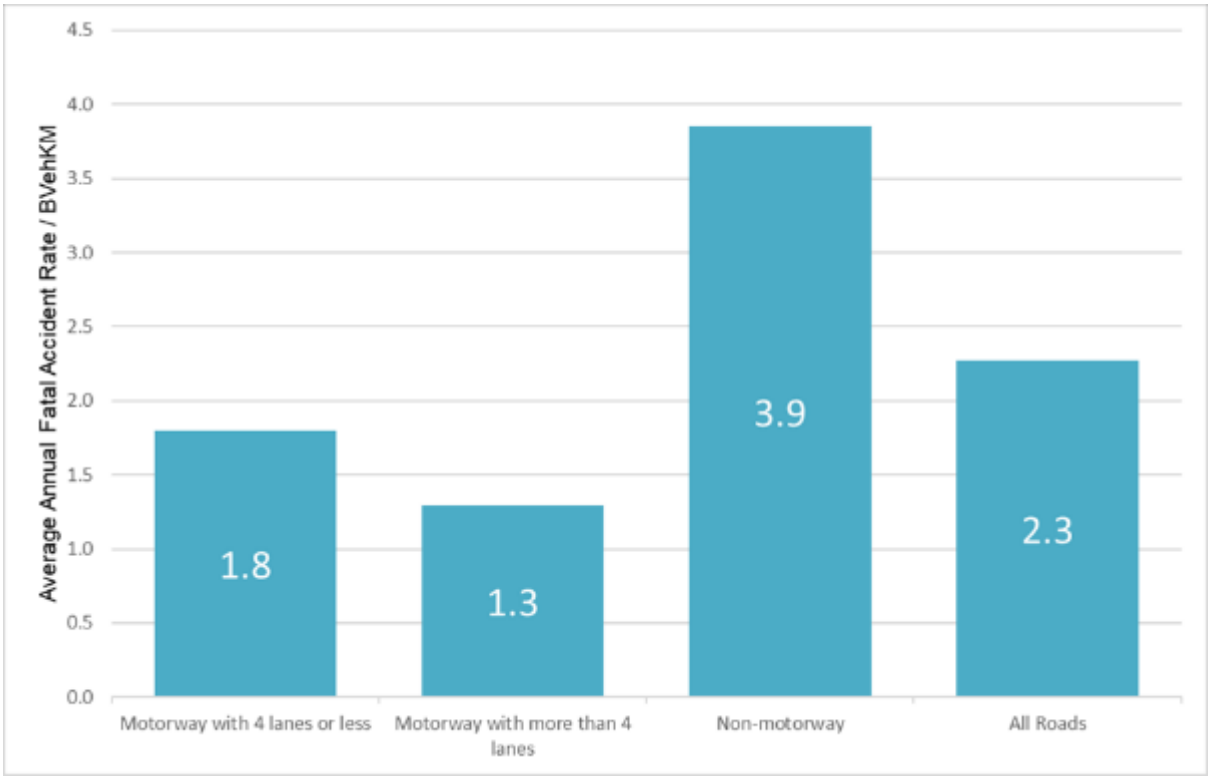
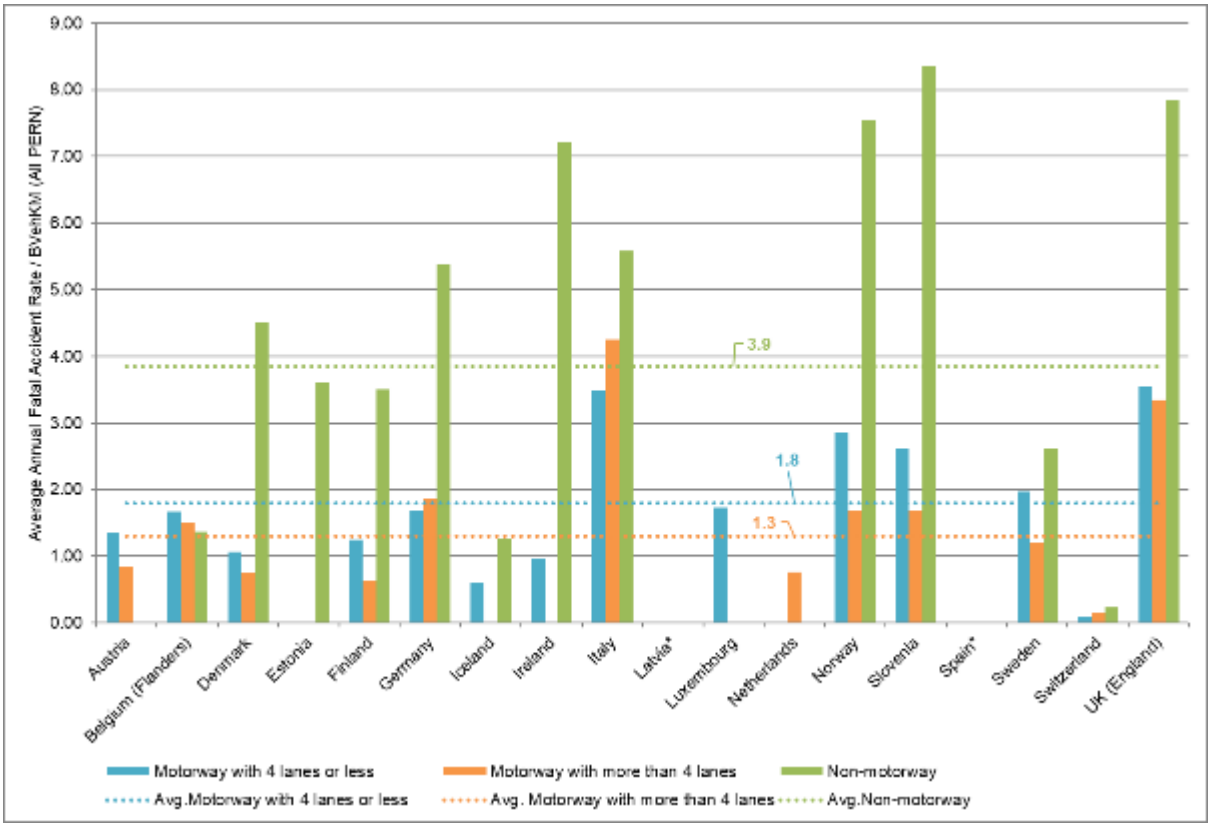


Figure 54 - Comparison of fatal accident rates on the PERN (No./BVehKm)

Figure 55 shows the distribution of Average Annual Fatal Accident Rate by country and road type. This shows that the average fatal accident rate on motorways with more than 4-lanes is 1.3 fatal accidents per billion VehKm which rises to 1.8 per billion VehKm on motorways with 4-lanes or less and rises again to 3.9 per billion VehKm on non-motorways.



(The network in Austria, Luxembourg and Netherlands consists only of motorways. The network in Estonia consists only of non-motorway roads.)

Figure 55 – National annual average fatal accident rate on PERN (No./BVehKm)

There is also significant variation between individual countries which, on motorways with more than 4-lanes, ranged between 4.3 per billion VehKm in Italy and zero per billion VehKm in Iceland, Ireland and Luxembourg. On motorways with 4-lanes or less, the figures ranges between 3.5 per billion VehKm in Italy and the UK (England) and zero in the Netherlands. On non-motorway roads, the national figures ranged between 8.4 per Billion VehKm in Slovenia to 0.3 per Billion VehKm in Switzerland[25].

[25] No data provided by Latvia or Spain (indicated by * on the graph).

Figure 56 shows trends in Annual Average Accident Rate on the comprehensive network since 2011 for those countries that have provided data for all seven reports. This shows that there has been a steady decline in the fatal accident rate overall. The reason for the step change between 2013 and 2015 is unclear but it should be noted that these are small numbers that are very sensitive to changes.

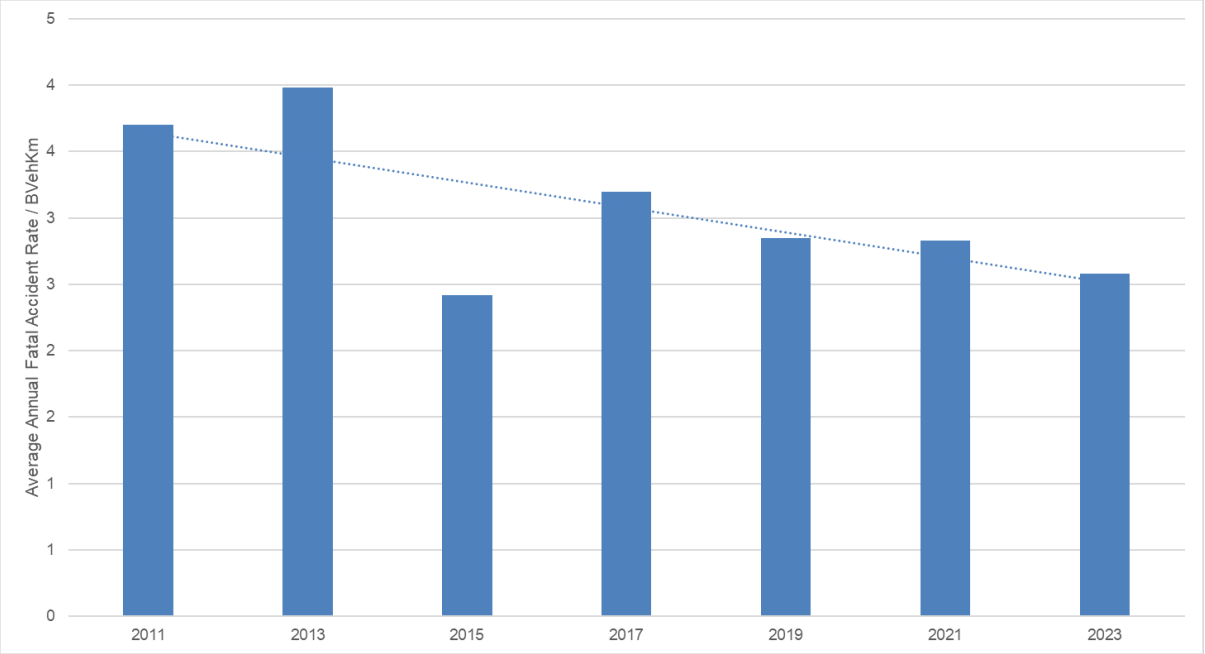


Figure 56 -Trends in fatal accident rate on the Pan European Road Network since 2011 (only countries participating in all seven reports) (No/BVehKm)

5 SUMMARY AND CONCLUSIONS

This is the seventh biennial report that CEDR has published on the performance of the Pan European Road Network since 2011. The 2023 report includes data from 18 CEDR members and covers more than 61,000km of the Pan European Road Network.

5.1 Summary of Key Findings

Section 2 of the report contains information on the general characteristics of the PERN. Data has been provided predominantly for TEN-T roads plus the strategic road networks in Switzerland and the UK (England). It is expected future reports will include more data from non-TEN-T roads.

Approximately 87% of the PERN is defined as rural and 62% is made up of motorways, of which 28% are high-volume roads with more than 4-lanes. This is likely to increase with capacity improvements planned for 24% of the network.

Section 3 covers network infrastructure and services. This shows that approximately 2% of the network consists of bridges more than 100m in length and that unsurprisingly these are predominantly in alpine countries. Meanwhile, less than 1% of the network comprises tunnels more than 300m in length and, again, these are predominantly in alpine counties and Norway.

For the first time, the report includes data on the extent of hard shoulder running (HSR) on the network which showed that this is not widely used currently, however on 26% of the network, HSR is employed in emergency situations. However, three countries reported using HSR at peak times and one country reported using dynamic HSR and all-lane running.

Similarly, the report looks at the extent and maturity of ITS on the network this shows that 59% of the network is covered by Level 2 ITS (i.e. traffic information systems) and 29% is Level 3 (i.e. actively managed), while just 3% of the network has no ITS at all. Currently, 2% has Level 4 (i.e. cooperative ITS).

The report also looks at the services and facilities provided to users. This includes rest areas with facilities for truck drivers and different types of refuelling or recharging facilities. This indicate that there are on average 7 rest areas per 100km on the PERN (one very 14km). There are on average 5 rest areas with facilities for truck drivers per 100km on the network as a whole: exceeding the guidance on having one safe and secure rest area for truck drivers approximately every 100km. There are on average 2 rest areas per 100km with charging facilities for electric vehicles and 1 rest areas per 100 km with refuelling facilities for Liquefied Petroleum Gas (LPG) and other alternative fuels.

Section 4 looks at the performance of the network in detail. In terms of traffic flow, 54% of the network carries less than 20,000 vehicles per day and 22% of the network carries between 20,000 and 40,000 vehicles per day. 20% of the network carries between 40,000 and 80,000 vehicles per day and 4% carries more than 80,000 vehicles per day. The average traffic flow on motorways with more than 4-lanes is 67,000 vehicles per day compared to 31,000 vehicles per day on the network as a whole.

Traffic density on the network is expressed as average annual daily traffic per lane. This shows that 45% of the network as a whole has a traffic density greater than 6,000 vehicles per day per lane compared with 84% of motorways with more than 4 lanes. Looking at trends in traffic density amongst the 15 countries that have provided data for all seven reports shows that traffic density has gradually reduced over this time, and there was a visible reduction in traffic demand in the 2021 figures due to the travel restrictions introduced in response to the Covid-19 pandemic.

Considering the number of HGVs on the network shows that HGVs make up more than 15% of total traffic on 47% of the network as a whole, whereas, on 60% of motorways with more than 4 lanes, HGVs

comprise more than 15% of the traffic. Looking at trends in HGV traffic density amongst the 15 countries that have provided data for all seven reports shows that HGV traffic density has remained fairly constant since 2015.

Road Transport Mileage shows that the average mileage travelled every year on the PERN is 28 billion VehKm per year.

Finally, the report considers annual average accident rate per billion VehKm. This shows that on the network as a whole, there are on average 2.3 fatal accidents per Billion VehKm. This varies between 1.3 per billion VehKm on motorways with more than 4-lanes and 3.9 per billion VehKm on non-motorways. Looking at trends in Annual Average Accident Rate on the network since 2011 for those countries that have provided data for all seven reports shows a steady decline over the period.

5.2 Conclusions

The continued support from CEDR members, and interest from third parties, shows that the Pan European Road Network Performance Report continues to provide a useful analysis of the network at a European and national level. Furthermore, the performance report continues to evolve with new indicators being developed including the prevalence of hard shoulder running.

The 2023 report shows that, over the long-term, traffic density on the network, while high, has gradually reduced as countries have added capacity to their networks. Meanwhile, the density of HGV traffic has remained fairly constant. Accident rates on the network remain low, particularly on high-volume motorways, and continue to decline.

6 FUTURE DEVELOPMENTS

6.1 New KPI Report

In parallel with the PERN performance report, WG Performance is developing a new report that focuses on the performance of individual NRAs in managing the network. The report will contain KPIs, supported by detailed performance indicators, covering the following themes:

- Safety
- Congestion
- Environment
- Finance
- Asset
- Customer

It is intended that the new report will supplement the Pan European Road Network Performance Report and Web GIS map tool and will allow NRAs to compare their performance and share good practice, thus supporting CEDR's mission to promote excellence in the management of roads.

6.2 Continued Development of Performance Indicators

Work will continue to develop new performance indicators for the Pan European Road Network in line with CEDR's strategic priorities, including those set out in the Dublin Declaration around the age and performance of critical infrastructure, and the Compass which defines the three strategic challenges facing CEDR members:

- Energy Transition
- Digital Transition
- Social Equity

Opportunities will also be sought to align the reporting with external initiatives, such as TENtec, in order to promote consistency and to improve efficiency in data reporting.

In addition, the Web GIS tool will continue to be developed to reflect the development of new indicators as well as to provide improved functionality.

ANNEX 1: METHODOLOGY AND DATA VALIDITY

Methodology

The Pan European Road Network Performance Report is based on a common location referencing model and common data definitions that have been developed by practitioners with an understanding of the data.

Data is provided directly by NRAs and is processed centrally to produce this report and the accompanying maps as described below:

1. Individual countries referenced their local networks into Logical Nodes and Sections using the Pan European Road Network Location Referencing System developed by CEDR Planning Working Group in 2008.
2. They then submitted their network and performance base data (including the geographical coordinates of each node) using a standard Excel spreadsheet and a set of base data definitions (see Annex 2) that they were provided with.
3. Once received, the data was checked, and errors were corrected in consultation with the individual countries.
4. The data was then systematised into a single Excel database and used for:
   - the analysis and the production of charts and tables; and
   - the production of maps in GIS ShapeFile format.

As this is now the seventh biennial report that CEDR has produced, the participating countries are familiar with the requirements and the process and data quality has improved.

ANNEX 2: COUNTRY BACKGROUND INFORMATION

National Statistics

Table 3 shows the length and performance of the Pan European Road Network calculated for the 18 participating countries based on the data delivered.

Table 3: Length and performance of the Pan European Road Network

Country	National statistics		Network length (km)[26]							Average Traffic		
	Population [1,000s]	Total area [km²]	PERN	TEN-T (Core)	TEN-T (non-Core)	Non-TEN	Motorway (Less than 4-lanes)	Motorway (more than 4-lanes)	Non-Motorway	Traffic Flow [AADT]	Traffic Density [AADT/Lane]	HGV [%]
AT	8,917	83,879	1,748	1,113	635	0	811	937	-	56,120	11,357	12.4%
BE (F)	11,544	30,530	948	604	344	0	417	403	128	73,094	14,018	16.3%
CH	8,637	41,290	2,252	299	1,034	919	1,333	328	591	50,010	13,588	5.3%
DE	83,161	357,580	10,760	6,375	4,385	0	4,793	5,579	388	46,641	9,346	18.4%
DK	5,831	42,920	1,588	779	809	0	864	341	383	34,700	7,857	9.3%
EE	1,329	45,340	1,337	478	858	0	-	-	1,337	8,711	2,945	13.2%
ES*	47,363	505,935	12,444	5,991	6,453	0	5,980	4,970	1,431	-	-	0.0%
FI	5,530	338,450	5,210	1,097	4,113	0	773	105	4,332	13,851	3,992	10.4%
IE	4,986	70,280	2,219	482	1,737	0	918	38	1,263	24,479	6,282	8.5%
IS	366	103,000	1,784	53	1,731	0	44	6	1,734	15,439	4,375	7.1%
IT	59,450	301,340	2,959	996	1,963	0	1,763	238	958	27,245	6,421	8.8%
LU	630	2,590	90	90	-	0	88	2	-	52,835	13,070	14.2%
LV	1,900	64,490	1,452	664	788	-	-	-	1,452	7,293	-	23.4%
NL	17,442	41,540	1,886	643	1,243	0	9	1,877		83,281	13,665	15.1%
NO	5,379	625,217	4,779	231	4,548	0	708	120	3,950	15,882	4,615	16.5%
SE	10,353	447,430	6,407	2,606	3,801	0	391	1,630	4,386	17,771	4,403	14.4%
SL	2,102	20,675	596	468	128	0	374	179	43	35,074	8,703	14.0%
UK (E)	67,215	243,610	2,662	-	-	2,662	1,632	49	981	38,082	13,520	16.4%
TOTAL / AVG	342,137	3,366,097	61,121	22,970	34,570	3,581	20,898	16,803	23,357	35,324	8,635	12%

Source: Eurostat, World Bank, CEDR data on Pan European Road Network

** - No Traffic Data Provided*

National Road Administration Profiles

The country factsheets provided below are based on information collected from different sources.

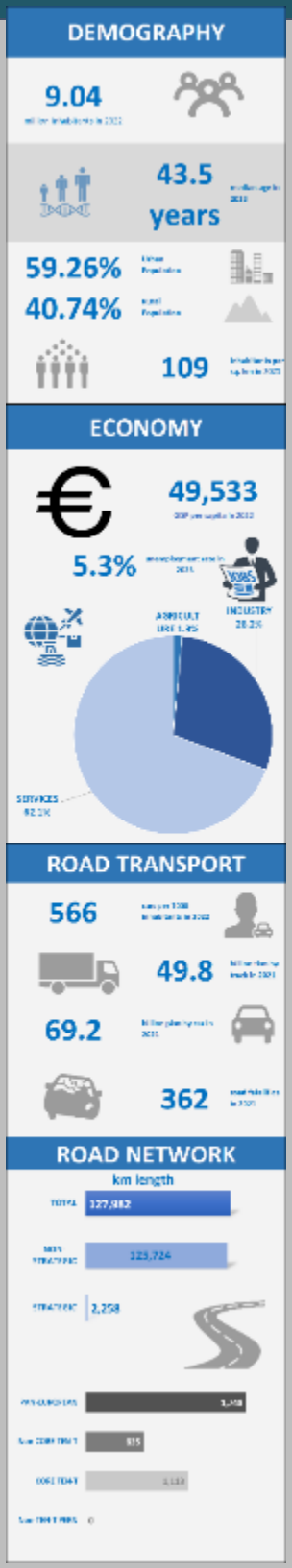
1. The description of the National Road Authorities has been provided by NRAs themselves to give an overview of their structure, responsibilities, and financing sources.
2. As far as possible, data provided in the infographics has been gleaned from centralised international data sources (i.e. EUROSTAT, World Bank) to get harmonised data for all member states and to avoid any problems regarding a lack of comparability.
3. Data on median age, GDP per capita, motorisation rate, road network length, road passengers' performance, road freight performance, and road fatalities have been sourced from EUROSTAT.
4. Data on total population, total area, urban and rural population and population ratio, population density, GDP composition and unemployment have been sourced from the World Bank.
5. Data on network length (Total, Non-Core, Core, Corridors) have been sourced from data provided by NRAs.

Table 4 gives detailed references and links to the sources of data.

Table 4: Data Sources for National Road Administration Profiles

Data Item	Year	Source
Total Population	2022	The World Bank
Total Area	2021	The World Bank
Median Age	2023	EuroStat (United Nations for UK)
Urban Population [1,000s]	2022	The World Bank
Urban Population Ratio (%)	2022	The World Bank
Rural Population [1,000s]	2022	The World Bank
Rural Population Ratio (%)	2022	The World Bank
Inhabitants per Sq.km	2021	The World Bank
GDP per Capita (€ per capita)	2022	The World Bank
% GDP by Sector	2022	The World Bank
Unemployment Rate	2023	The World Bank
Cars per 1000 Inhabitants	2022	EuroStat
Total Classified Road Length (km) (2017)	2022 (2017)	EuroStat (2017 data used for countries with no or incomplete 2022 data)
Non-Strategic Length (km)	2022 (2017)	EuroStat (2017 data used for countries with no or incomplete 2022 data)
Strategic Length (km)	2022 (2017)	EuroStat (2017 data used for countries with no or incomplete 2022 data)
PERN Network length (km)	2023	Network Data as supplied by NRAs
TEN-T Non-Core Network (km)	2023	Network Data as supplied by NRAs
TEN-T Core Network (km)	2023	Network Data as supplied by NRAs
Non-TEN-T PERN Network (km)	2023	Network Data as supplied by NRAs
Billion tkm by truck	2021	European Commission (2018 for UK).
Billion pkm by car	2021	European Commission
Road Fatalities	2021	European Commission

Austria



ASFINAG

General description

ASFINAG was founded in 1982 and is responsible for the management of the entire Austrian motorway network. The network consists of 2,249 km of motorways, more than 160 tunnels and more than 5,800 bridges (as of December 31st, 2023). ASFINAG's core tasks include motorway operation, maintenance, construction management and toll collection as well as traffic management. ASFINAG and its 3,200 employees are committed to provide responsible and long-term solutions by using new technologies and innovations to make Austria's motorways one of the safest and most modern in Europe. One of ASFINAG's top priorities is sustainable mobility, and this calls for continuous further development and innovation. For this reason, ASFINAG is involved in numerous research projects and is intensifying its cooperation with stakeholders on a national and international level. This involves a great variety of topics and challenges: From road automation and decarbonisation, to health and diversity, and on to climate protection and preserving biodiversity. For more information, visit www.asfinag.at/en

Responsibility

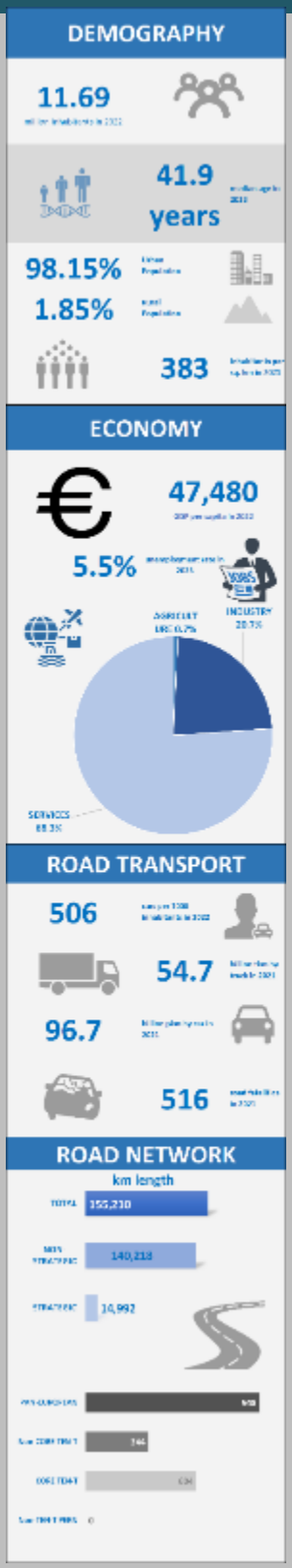
ASFINAG has a comprehensive area of responsibilities including:

- Operating, maintaining and expanding the existing network
- Fostering sustainable mobility and supporting the European Green Deal
- Managing traffic and ensuring safety on the roads
- Developing ITS and telematics services
- Toll collection
- Funding of investments in the road network

Financing

In 2023 ASFINAG invested a total of EUR 1.33 billion in the maintenance and construction of the road network. ASFINAG is solely user-financed and does not receive any subsidies. Its primary source of revenues are tolls, time-based for light vehicles and distance-based for heavy vehicles. Further, ASFINAG is a well-established issuer of bonds that is highly regarded on national and international financial markets. The bonds issued are provided with a guarantee by the Republic of Austria and receive the rating of Aa1 by Moody's and AA+ by Standard & Poor's. International financing activities are based on the ASFINAG European Medium Term Note Programme (EMTN), which is updated regularly and constitutes the legal framework for issues.

Belgium (Flanders)



Agentschap Wegen en Verkeer (AWV)

General description

The Agency for Roads and Traffic (Agentschap Wegen en Verkeer/AWV) is the Flemish road authority responsible for Flemish motorways and regional roads. It operates about 7,000 km of roads and 7,700 km of cycling paths.

The agency's mission is to ensure safe, smooth, and sustainable mobility for all road users in Flanders.

In total, the agency employs about 1,300 people. AWV is divided into four horizontal and six territorial divisions. The horizontal knowledge domains (road construction, traffic engineering, Flemish traffic control centre, and planning & coordination) work in a matrix structure and run horizontally through the territorial departments.

Head offices are in Brussels, the six territorial departments are situated in Antwerp, Ghent, Leuven, Hasselt, and Bruges.

Responsibility

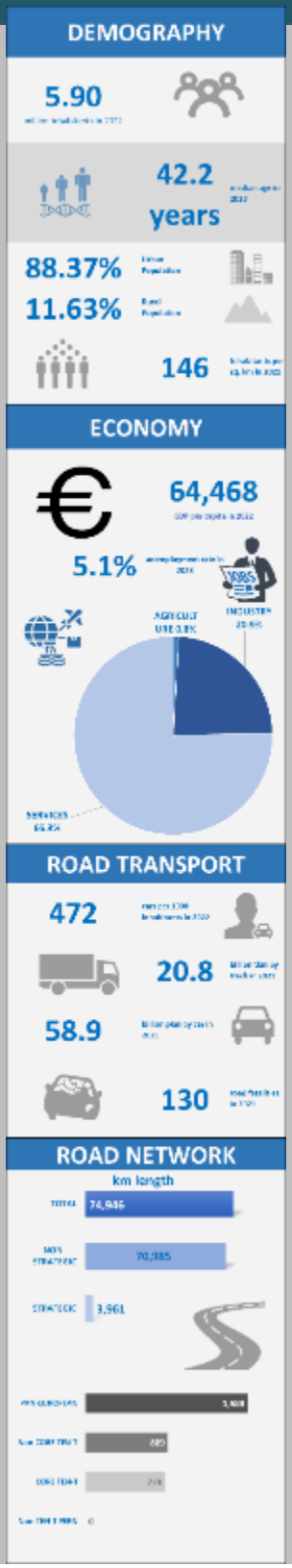
AWV is responsible for the design, construction, maintenance, and improvement of the road infrastructure (including bridges and electromechanics) that is assigned to it. AWV is also responsible for traffic management and the implementation of the mobility policy of the Flemish Government.

Financing

The total budget of AWV (€782 million) is distributed as follows: €470 million for investments, €170 million for maintenance, and the remainder for the cost of PPS constructions, operational costs, overheads, etc.

AWV is fully financed by the Flemish Government. €100 million of the total amount comes indirectly from road charging for lorries.

Denmark



Danish Road Directorate (DRD)

General description

The Danish Road Directorate plans, constructs and maintains the Danish national roads. This means motorways, dual carriageways, a large part of the regional roads and many of the bridges across the country. A total of 3,800 kilometres, which accumulate about half of the total traffic flow in Denmark.

DRD promotes a coherent road and transportation system, taking the surroundings into account and striving to ensure that people and goods reach their destinations easily and safely.

DRD is an agency under the Ministry of Transport with approximately 950 employees.

Responsibility

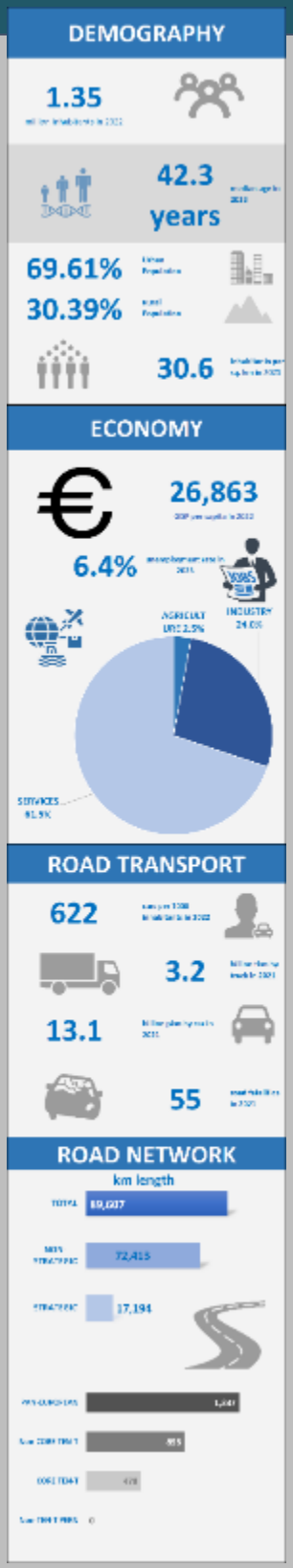
DRD is responsible for the national road network, and the main business areas are:

- **Planning**: the DRD conducts studies and plans in order to determine where new roads are to be built and where there is a need for increased traffic safety or capacity on the national road network.
- **Design and construction**: the DRD construct new roads, roundabouts, cycle paths, bridges, noise barriers, and develops the existing road network.
- **Traffic Management**: the DRD guides road users through traffic, for example via ITS, traffic information in various media or in event of accidents.
- **Maintenance**: the DRD operates and maintains the roads and the surrounding areas.

Financing

Except for some minor business areas, the activities of the DRD are in general financed by national funding. Budget for 2023: €520 million for construction, €230 million for maintenance including winter service, and €120 million for other services.

Estonia



Estonian Road Administration (ERA)

General description

The Estonian Road Administration (ERA) is a governmental agency who operates within the administrative area of the Ministry of Economic Affairs and Communications and executes state supervision, implements state policies and offers public services on the basis and to the extent prescribed by law. The governmental agency was established in 1918 and it has had several official names during more than 100 years.

Responsibility

The main responsibilities and functions of ERA are as follows:

- Road management and creation of conditions for safe traffic on national roads.
- Increasing traffic safety and reducing harmful environmental impact of vehicles.
- Management of road traffic and public transport.
- Organisation of state supervision over compliance with the requirements established by legislation regulating area of activity and applying enforcement powers of the state.
- Keeping state registers of roads, vehicles and public transport, maintaining the system of stationary automated speed cameras.
- Participation in development of legislation regulating area of activity and making proposals for amending and supplementing the legislation, participation in working out the terminology connected with area of activity.
- Participating in elaboration of policies, strategies and development plans and preparation and implementation of international projects in area of activity.
- Implementing state policies and development plans in area of activity

The management structure consists of 3 divisions:

- Division of Strategic Planning
- Division of Road Works
- Division of Traffic Safety and Public Transport

Approximately 530 employees work for ERA.

The Head Office is located in Tallinn. National road network is managed centrally by the Head Office though there are 4 state road regions in Estonia named by the weather arc: Northern, Eastern, Southern and Western region. A service bureau is located in each of 15 counties. The Traffic Management Centre is a unit of the entire organization and is located in Tallinn also.

ERA is a possessor of 16,608 km of national road network.

National road network includes 1 609 km (9.7%) of main roads, 2 405 km (14.5%) of basic roads, 12 480 km (75.1%) of secondary roads and 114 km (0.7%) of other connecting roads. 72% of those are paved roads and 28% gravel roads. The density of national roads is 366 km per 1,000 km²

Local governments are the owners of 24 000 km of local rural roads and streets.

Financing

The main sources for costs and investments for state roads and other areas of responsibility of ERA arise from state revenues and external resources.

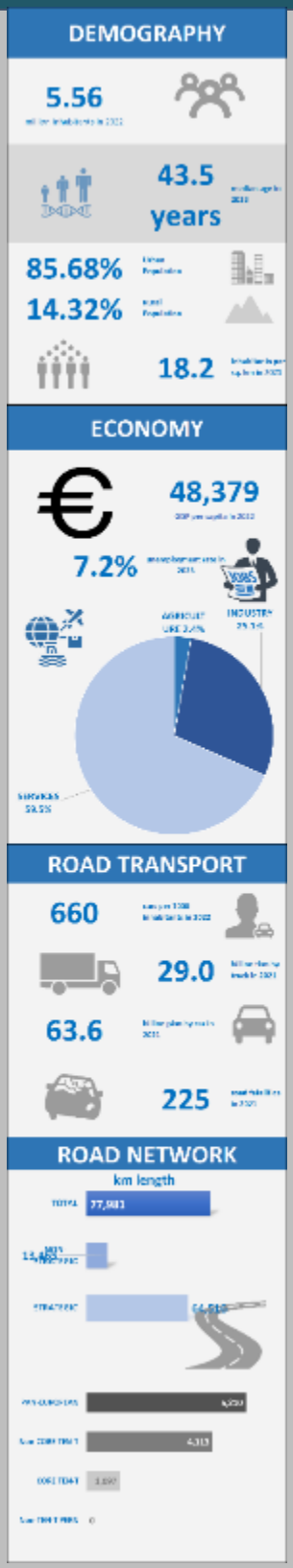
In 2018 the overall annual expenditure from the state budget was 300 million euros, including 65 million euros for operating costs, 179 million euros for investments and 56 million euros for public transport grants (bus, waterways and air).

External resources mainly consist of EU funds and revenues collected by ERA itself, which come from state fees and road user fees. 22 million euros from EU were invested into construction and reconstruction of national roads additionally to the state budget.

60%, i.e. 39 million euros of operating costs were used for maintenance of national roads.

In recent years ERA has made rather big investments to the e-service area in order to enhance efficiency and improve the quality of services.

Finland



Finnish Transport Infrastructure Agency (FTIA)

General description

Finnish Transport Infrastructure Agency (FTIA) is the Finnish Transport Administration, responsible for public roads, railways and waterways. The length of the public road network is about 83,000 km, including about 5,400 km of bicycle paths.

The mission of the FTIA is to make sure that the transport system works as a whole, which is a basic precondition for guaranteeing that society will function. The administration creates the prerequisites for ensuring that all transportation and travel is conducted in the best and safest way, regardless of where citizens live, with due consideration given to industries' needs, the environment and health.

The Finnish Transport Infrastructure Agency has approximately 850 employees, of which 420 work in the regional road centres. The Head Office is in Helsinki. There are nine regions for road keeping activities with regional centres (from south to north): Helsinki, Turku, Tampere, Kouvola, Kuopio, Jyväskylä, Vaasa, Oulu and Rovaniemi.

Responsibility

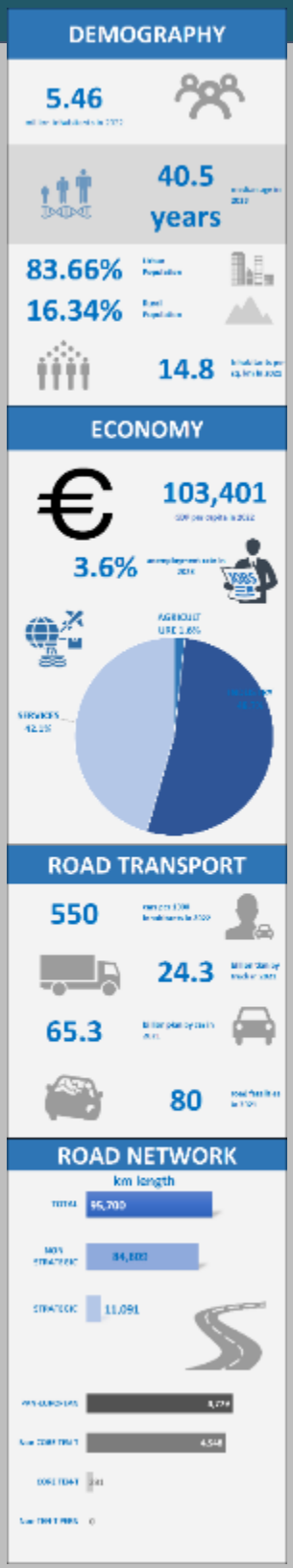
The main task of the Finnish Transport Infrastructure Agency is to be responsible for the long-term planning of the transport system for road, rail and waterways traffic, and for the construction, operation, and maintenance of state roads, waterways and railways.

The FTIA is a planning and procurement organisation, all road keeping and planning works, including traffic management have been outsourced to the private market since early 2000's.

Financing

Financing of FTIA activities is funded 100% from the state budget. The total budget in 2023 was 1,016 million euros in business volume, of which 266 million euros for investments and 750 million for operation, maintenance, and traffic control, including costs for the planning process, state joint-financing (e.g. for public transport), state subsidies for private roads, contracted traffic, and support for research and innovation in the transport area.

Norway



Norwegian Public Roads Administration (NPRA)

General description

Statens vegvesen is the Norwegian Public Roads Administration (NPRA). It is a government agency under the Ministry of Transport and Communications with approximately 4.800 employees, 38% of whom are women. It comprises the Directorate of Public Roads and six divisions: Operations and Maintenance, Construction, Transport and Society, Road users and vehicles, IT and Shared services. The NPRA has 72 Driver and Vehicle Licensing Offices and five Traffic Control Centres distributed across the county.

Responsibility

The agency has three roles: Road and Traffic Manager, Disciplines and Government Agencies.

The NPRA shall contribute to the national objectives of the government, which impose requirements for security, environment, and an efficient transportation system that is available to all. As a road and road traffic manager, the NPRA is road administration for the state on the national roads (10.600 km). This means that the NPRA is responsible for planning, developing, operating and maintaining these roads.

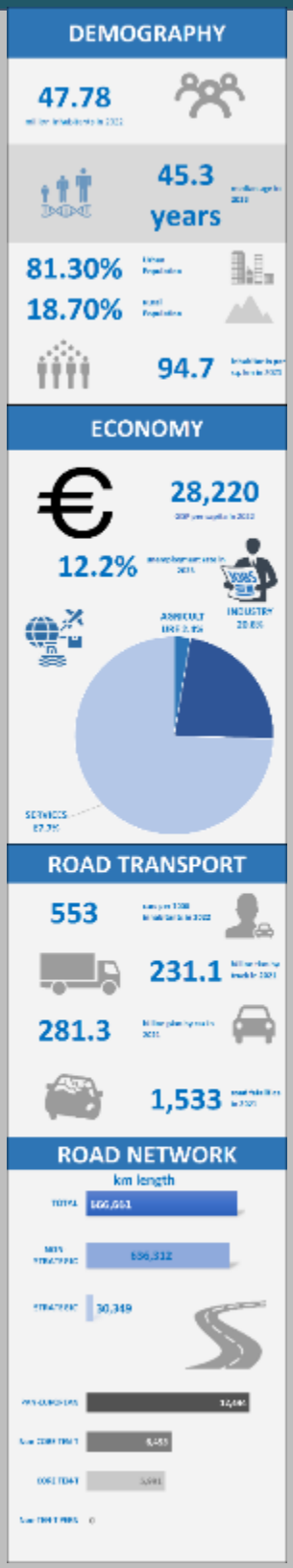
The agency is also responsible for national road ferries. As a specialist body, the NPRA is responsible for contributing to investigations, facts and proposals for the Ministry of Transport work on the National Transport Plan, the state budget and other parliamentary documents. The research and dissemination of results, the development of guidelines and guidance material and contact with relevant educational institutions is important in this context.

The NPRA is the authority responsible for vehicle controls, supervisory tasks and conducting driver tests. In several areas, the agency has the authority to develop and approve regulations and make decisions that apply to road users and vehicles. The NPRA has the authority to adopt regulations and norms in certain areas regarding public roads, and enforce laws, regulations and manuals regarding public roads.

Financing

The budget spending of the NPRA in 2022 was NOK 39 billion. NOK 31,7 billion came from government funds for national roads and was earmarked, among other things, as follows: Traffic and vehicle supervision (NOK 2,2 billion), Operation (NOK 4,2 billion), Maintenance (NOK 8,4 billion), Investment (NOK 13 billion), National ferries (NOK 2,8 billion), and Subsidies for county roads (NOK 1,6 billion).

Spain



General Directorate of Roads

General description

The General Directorate of Roads (DGC) of the Ministry of Transport, Mobility and Urban Agenda is the Spanish National Road Administration responsible for the management of the National Road Network ("Red de Carreteras del Estado", RCE), which represents 16% of the overall length and carries more than 52% of the total traffic (and more than 65% of the total of heavy good vehicles traffic) on the Spanish interurban network.

The DGC is organised in Central Services, located in Madrid, and Peripheral Services ("Demarcaciones de Carreteras"), which are the 15 territorial organisations depending on the DGC.

Central Services are organically organised in General Sub-directorates, according to the different stages of the infrastructure development. These sub-directorates are: Projects, Construction, Maintenance, Operation (including Road Safety), and Coordination (which includes economical management). Finally, there is a Technical Directorate, providing technical support for every service in the DGC.

The DGC has approximately 1,800 employees, 10% in Central Services and 90% in Peripheral Services.

Responsibility

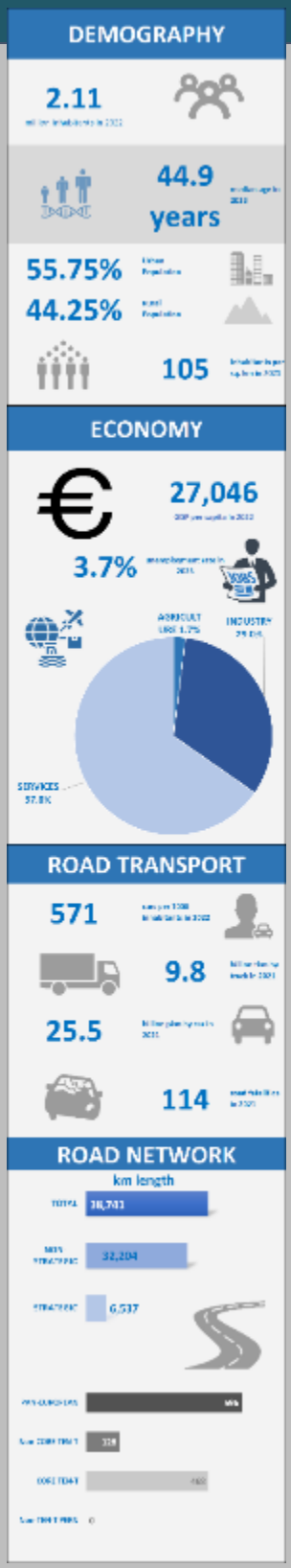
The DGC is responsible for planning, designing, constructing, maintaining, and operating the National Road Network, RCE. It is also responsible for road safety on this network. The General Directorate of Traffic of the Ministry of Home Affairs is the authority responsible for traffic management and regulation on all road networks in Spain. Environmental evaluation on the RCE is conducted in coordination with the Ministry for the Ecological Transition and the Demographic Challenge. The three appointed ministries are part of the National Government of Spain.

Other regional and local administrations are responsible for the management of other interurban road networks in Spain: Autonomous Communities for regional roads, Provincial Governments for provincial roads, and City Councils for local roads.

Financing

The 2022 budget for the National Road Network RCE is about €3.314 million, of which €1.123 million is earmarked for new infrastructures and €2.191 million for the maintenance and operation of the existing network, including investment on improvements on safety, noise impact reduction, environmental protection and tunnels.

Slovenia



Ministry of Infrastructure – Slovenian Infrastructure Agency

General description

As at 31 December 2022, Slovenia had almost 38,990 kilometres of public roads; 6,567 km of which were categorised as state (national) roads. Motorways and expressways are managed by Družba za avtoceste v Republiki Sloveniji (Motorway Company in the Republic of Slovenia – DARS), main and regional roads are managed by Direkcija Republike Slovenije za infrastrukturo (DRSI; Slovenian Infrastructure Agency – SIA), while the rest of the roads are managed by local communities. DARS and SIA have a joint Traffic information center in Dragomelj, which provides online information for users about conditions on national roads. 596 km of state roads belong to the TEN-T road network (553 km of motorways and 43 km of main roads), which represents 8,4% of the national road network. SIA maintains 43 km of TEN-T roads, which represents only 0.7% of national network under its control..

Responsibility

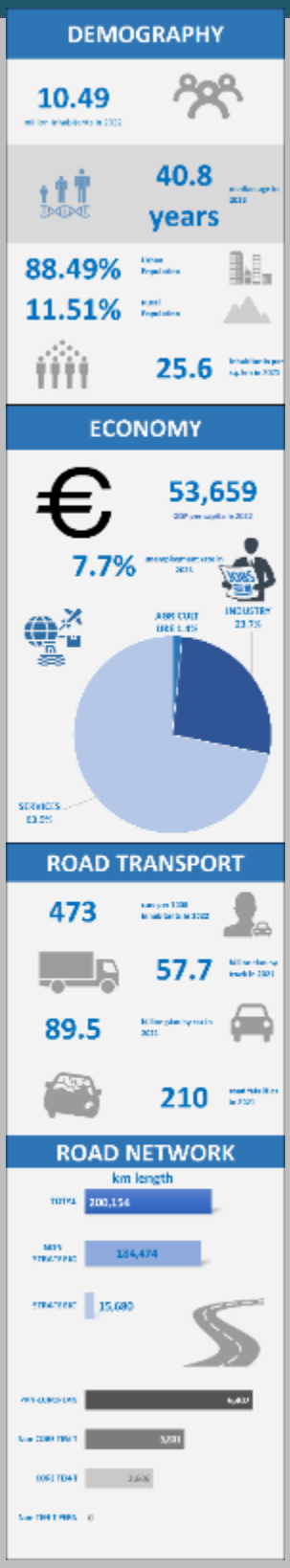
DARS is a joint-stock company that is 100% owned by the Republic of Slovenia. It is responsible for the motorways of Slovenia. The head office is in Celje and a branch office in Ljubljana. It has 1,256 employees. On the motorway network, there are nine big motorway centres and six small motorway centres. DARS mission is to ensure modern approaches to and responsibility for the environment, to optimise traffic flow, safety, and comfort on the Slovenian motorway network. Slovenia's main and regional roads are managed by SIA, a body within the Ministry of Infrastructure based in Ljubljana, which comprises the field of road and railway infrastructure. It has 122 employees (of which 89 work in the field of road infrastructure and 33 in the field of railway infrastructure). Mission: to ensure optimal management of available resources, protection, maintenance and construction of main and regional roads and the railway network in Slovenia, so that within the scope of its competencies, SIA contributes to the improvement of mobility, ensuring road safety, accessibility, usability, minimal burden on the natural and living environment, and coherence with the economic and spatial development of municipalities, regions, and the state.

Financing

Revenues of DARS are driven by tolls. Toll revenues have been accounting for a stable 92.8% of total revenues in the amount of € 479,56 million in 2022. In 2022, funding of DARS amounted to € 274.71 million (51.1 % for road construction and renovation, 19.8 % for routine maintenance, and 29.1 % for motorway management and administration).

SIA is financed from the state budget. The 2022 budget included € 384,40 million for road infrastructure (68,7% for road construction, 21,4% for the maintenance and management of roads, and 9,9 % for administration), and € 474,97 million for rail infrastructure.

Sweden



Trafikverket - Swedish Transport Administration

General description

Trafikverket is the Swedish Transport Administration. The mission of the Transport Administration is to make sure that the transport system works, which is a basic precondition for guaranteeing that society will function. The administration creates the prerequisites for ensuring that all transportation and travel is conducted in the best and safest way, regardless of where citizens live, with due consideration given to the environment and health.

The Transport Administration has approximately 6,600 employees. Many employees work in the following areas: traffic control work on the roads and railways, community planning and negotiation and survey work, IT- work, technical survey and development, survey, inspection and supervision work, shipping work, architectural and infrastructure design works, production planning and production management.

The Head Office is in Borlänge. There are six regions with regional centres: Kristianstad (South), Gothenburg (West), Eskilstuna (East), Stockholm (Stockholm), Gävle (Central) and Luleå (North).

Responsibility

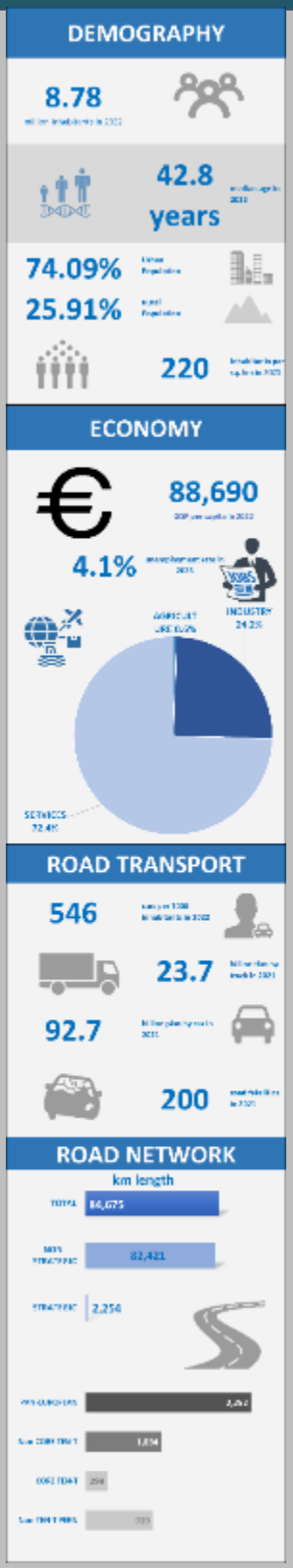
Trafikverket's main tasks are:

- to be responsible for the long-term planning of the transport system for road and rail traffic, shipping and aviation, and for the construction, operation, and maintenance of state roads and railways;
- to work for public passenger transport through the procurement of agreements and private aspects of state grants for the Swedish shipping industry.

Financing

SEK54 billion in business volume, of which some SEK23.5 billion for investments and about SEK19.5 billion for operation, maintenance, and traffic control. The remaining SEK11 billion includes costs for the planning process, state joint-financing (e.g. for public transport), state subsidies for private roads, contracted traffic, and support for research and innovation in the transport area.

Switzerland



FEDRO - Federal Roads Office

General description

The Federal Roads Office (FEDRO) was established in 1998 as Switzerland's federal authority responsible for road infrastructure and private road transport. It belongs to the Federal Department of the Environment, Transport, Energy and Communications (DETEC), and focuses on securing sustainable and safe mobility on the country's roads. The office creates the prerequisites for ensuring that roads are used for people and vehicles in the best and safest way, regardless where people live and gives due consideration to the environment and health. FEDRO is responsible for all strategic and operational duties required to fulfil this expectation.

FEDRO has approximately 650 employees. The Head Office is in Ittigen near Bern. The national road network is managed locally in the five regional centres (from West to East): Estavayer-Le-Lac, Thun, Zofingen, Winterthur, Bellinzona. The Traffic Management Centre is located in Emmen near Lucerne.

Responsibility

The main responsibilities and duties of FEDRO are:

- The construction, operation, and maintenance of the national road network (mainly motorways). The national road network is 2,250 km long. The TEN-T Network represents 60% of it.
- to ensure access by persons and vehicles to all roads in the country;
- to set traffic rules and regulations for road-related topics;
- to be the federal competence centre for motorised and not-motorised individual traffic.

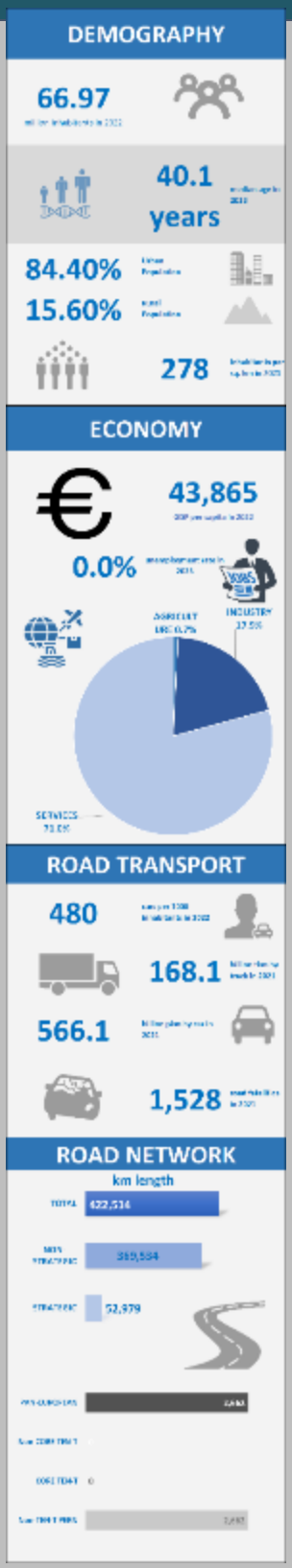
Financing

The current funding basis consists of:

- revenue from the oil tax on motor fuel (CHF3.5 billion),
- revenue provided by motorway stickers (CHF350 million)
- revenue from vehicles (CHF 370 million)
- Compensation provided by cantons regarding the national road network extension in year 2020

The overall annual expenditure of the administration is CHF4.35 billion, of which CHF2.9 billion is spent on operations, road network completion and the performance of maintenance work on the network and CHF400 million is invested on agglomeration projects. The rest of the budget includes state subsidies for main roads, multimodal transport investments, environmental protection, research, and administration.

United Kingdom (England)



National Highways

General description

National Highways is the government company which plans, designs, builds, operates and maintains England's motorways and major A roads. National Highways aim to provide all its customers with safe and reliable journeys, and to deliver a sustainable benefit to the environment.

National Highways has over 5,000 employees based in various locations around England. This includes a uniformed Traffic Officer Service who serve in control centres and patrol key areas of the network.

Responsibility

National Highways is responsible for motorways and major A roads (trunk roads) in England. These roads are referred to as the Strategic Road Network (SRN) and total around 4,300 miles. While this represents only 2 per cent of all roads in England by length, these roads carry a third of all traffic by mileage and two thirds of all heavy goods traffic.

National Highways is responsible for operating, maintaining, and improving the Strategic Road Network. SRN is essential to the growth, wellbeing and balance of the nation's economy.

National Highways does not manage all roads in Britain:

- Local roads are managed by the relevant local authority
- Scottish roads are managed by Transport Scotland
- Welsh roads are managed by the Welsh Assembly
- London roads are managed by Transport for London

Financing

National Highways' funding comes directly from government and is split between capital investment and operational expenditure. National Highways has five-year investment agreements.

Over the period 2020–2025, National Highways will deliver £27.4 billion[16] of investment on the strategic road network as described in the government's Road Investment strategy. This includes £20 billion of capital funding committed between 2020 and 2025 as set out in our Strategic Business Plan.

[16] The Spending review 2021 confirmed government's continued investment in strategic roads and National Highways plans to invest £24.1 billion across the second road period. In the spending review, National Highways' budgets were re-aligned to its latest delivery profile.

CEDR
Conférence Européenne
des Directeurs des Routes
Conference of European
Directors of Roads

Ref: CEDR REPORT: TR2024 - 02

ISBN: 979-10-93321-81-3

Conference of European Directors of Roads (CEDR)
Ave d'Auderghem 22-28
1040 Brussels, Belgium
Tel: +32 2771 2478
Email: information@cedr.eu
Website: http://www.cedr.eu