



North Sea Mediterranean



Third Work Plan of the
European Coordinator
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Abbreviations

BE	Belgium
CEF	Connecting Europe Facility
CNC	Core Network Corridor
CNG	Compressed Natural Gas
CO ₂	Carbon Dioxide
COMEXT	Intra- and extra-European trade database
Compr.	Comprehensive
cp.	Compared to
DG-MOVE	European Commission – Directorate General for Mobility and Transport
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
ESTAT	Eurostat
ETIS	European Transport policy Information System
EU	European Union
EV	Electric Vehicle
FR	France
GDP	Gross Domestic Product
GIS	Geographic information systems
GVA	Gross Value Added
H ₂	Hydrogen
IE	Ireland
IM	Infrastructure Manager
ITS	Intelligent Transportation System
IWT	Inland Waterway Transport
KPI	Key Performance Indicator
km	Kilometres
km ²	Square kilometres
LGV	Ligne à Grande Vitesse
LNG	Liquefied Natural Gas
LU	Luxembourg
m	Metres
NL	The Netherlands
NS-MED	North-Sea Mediterranean
NUTS	Nomenclature of territorial units for statistics
O/D	Origin / Destination
OMCGIS	Open Method of Co-ordination of Geographic information systems
PKM	Passenger Kilometre
PP	Priority Project
RIS	River Information Services
RFC	Rail Freight Corridor
RRT	Rail–Road Terminal
SESAR	Single European Sky ATM Research Programme



SMSR	Saône-Moselle, Saône-Rhine (waterway connections)
TEN-T	Trans-European Transport Network
TEU	Twenty-foot equivalent unit (container)
TKM	Tonne Kilometre
TMS	Transport Market Study
UIC	International Union of Railways
UK	United Kingdom
UNECE	United Nations Economic Commission for Europe
WP	Work Plan
ZARA	Zeebrugge, Antwerp, Rotterdam, Amsterdam

1. Towards the North Sea Mediterranean corridor updated Work Plan

The transformation of the European transport system into a coherent network requires a combination of initiatives at all levels and for each transport mode, contributing to sustainable economic growth and jobs. As restricting mobility is not considered to be an option, the implementation of this network should increase the efficiency of transport in Europe, through global reductions of external and internal costs and increasing use of more sustainable transport.

A way to broaden the perspective is to regard the corridor in terms of its economic functions, such as promoting trade, development and sustainability through the provision of “better” services and by connecting centres of activity, i.e. territorial cohesion.

1.1 Introduction

The North Sea Mediterranean corridor is a multimodal corridor stretching from Glasgow, Edinburgh and Belfast in the north to Cork in the west, Paris and Lille in the centre, Marseille in the south, extending northeast through Luxembourg, Belgium and the Netherlands towards Amsterdam. It covers six Member States, namely Belgium, Ireland, France, Luxembourg, the Netherlands and the United Kingdom, as well as leading to the Swiss and German borders in Basel.

The NSMED corridor is characterised by high levels of activity today, high concentrations of transport volumes relative to Europe as a whole, and high growth potential. In turn, this translates into high potential impacts and user benefits, to be achieved in part by making more optimal use of the multimodal infrastructure.

Market analysis indicates that there is substantial absolute growth expected within the North Sea Mediterranean corridor, linked to the attractiveness of the major cities, and the faster-than-average growth in long-distance traffic, related to ports and airports. This picture is also reflected in the 2016 EU Reference Scenario for energy, transport, and climate change.

The study of the corridor shows that economically and demographically there has been a clustering of economic activity within the centre of the corridor, creating population growth around the major cities, and transport growth, related closely to the establishment of global hubs at the major container ports and airports. At the same time, the northern and western sections of the corridor connect some of the most peripheral areas of Europe to the economic core.

The corridor network has good infrastructure, developed over a long period, including some major success stories such as the Eurostar/Thalys high-speed rail network, but high demand, and in certain cases, ageing infrastructure lead to persistent levels of

congestion and a long list of bottlenecks. Renewal and modernisation are recurring themes.

The North Sea Mediterranean corridor is the only TEN-T corridor to be affected by the UK's decision to leave the European Union. Negotiations are ongoing to determine the terms of the UK's withdrawal, including border and land-bridge arrangements, which will have major implications for Ireland and trade and transport flows to and from continental Europe.

It is therefore crucial that the integrity of the North-Sea Mediterranean corridor is maintained and that the investment programme is strengthened in order to address present-day issues, which are closely linked with the long term development of the European economy, employment and trade with the rest of the world.

For the work plan, a full list of projects has been drawn up and updated. Given the size of all the investments required for the corridor, it is necessary to prioritise the projects that can guarantee the quickest positive results and impact for the corridor, taking into account all the wider elements.

1.2 Road map to setting up the Third Work Plan

The aim of this work plan, in keeping with the objectives of TEN-T Regulation 1315/2013/EU, is to provide an analysis of multimodal transport on the corridor, and to propose a strategy for the removal of physical, technical, operational and administrative barriers between and within transport modes and for the enhancement of efficient multimodal transport and services. This has been achieved through the co-operation of members of the corridor forum.

In overview, a number of focal points have been identified:

High dependence on road transport and under-utilisation of other modes

There is under-utilisation of water-based transport and rail on the corridor, and therefore high potential for achieving greater balance and efficiency across modes. It is necessary for the corridor to focus on the development of long distance waterway and rail corridors, supported by new technology and the application of common technical standards. It is nevertheless important to recognise that for some Member States such as Ireland and the UK, long distance rail and/or inland waterways are not an option.

It can be concluded, that the degree to which demographic and economic clustering stimulates transport volume growth creates a high potential risk for the efficiency of the corridor in the long term, as it is still highly dependent upon road transport for inland transport.

Seaports as hubs are leading the development of multimodal distribution. This process needs to be supported by equivalent capacities in inland logistics hubs, and frequent multimodal services.

Port forecasts within the corridor typically indicate expectations of throughput increasing by 50% or even 100% by 2030, with the container sector growing the fastest. Available national forecasts suggest that corridor port throughput has the potential to increase by an additional 1 billion cargo tonnes, of which around 60% would be distributed inland via the hinterland networks belonging to the corridor.

If all ports can achieve hinterland modal shares similar to the best performing ports in the corridor, much of the expected growth can be absorbed by multimodal transport services.

The critical issue is not only related to maritime port capacity but also to their location and connection with their hinterland. Therefore, the logistics chain between production and consumption sites should be reinforced, in particular through the development of the inland port and rail terminal platforms.

In the North and the West of the corridor, where accessibility from the island regions is the critical issue, there is a need to develop Motorways of the Sea, and to improve hinterland connections at the seaports, especially in light of Brexit.

To solve these issues, projects such as the Ringaskiddy road connection in Cork and the Alexandra Basin development in Dublin should be encouraged as well as major cross-border projects such as the Ghent-Terneuzen lock, Seine-Scheldt project, the investments required to improve the rail connection to the ports of Zeebrugge and Antwerp, and cross border rail freight services. For Ireland, the sea is the major cross-border section and Motorways of the sea will be an important part in ensuring connectivity to mainland Europe.

Greening of Transport

The TEN-T Issues Papers, announced in 2016 and developed in 2017, focus inter alia on the greening of transport of the TEN-T network, in terms of infrastructure, and services available.

Several recommendations based on the latest innovative experiences that contribute to the greening in transport are happening on the NSMED corridor, such as the development of networks of re-charging points for passenger EVs along motorways, and also freight initiatives such as the project Connect2LNG, which is promoting the use of LNG for road freight transport.

Following the publication of the TEN-T Issues Papers (June 2016), a set of innovative flagship projects are now being developed, including two for the NSMED corridor. One will address the availability of alternative fuels within the corridor, coordinating the deployment of electrical charging points, LNG, CNG and hydrogen along the corridor in

combination with the North-sea Baltic and Atlantic corridors, making it possible for alternative fuels to be used for longer distance and cross-border transport, ensuring interoperability of technologies. Moreover, the Causeway Study in Ireland is looking at CNG fast refill stations for HGVs.

Urban nodes are also being targeted for an innovative flagship project. The aim will be to develop measures for improving accessibility to multi-modal freight facilities within cities across the corridor, and thus contributing to the use of sea, (light) rail and inland waterway transport between urban nodes.

ERTMS

On 5 January 2017 the European Commission adopted the Implementing Regulation (EU) 2017/6 on European Rail Traffic Management System European Deployment Plan (ERTMS EDP) that replaces the previous deployment plan of 2009. The reviewed ERTMS EDP adapts the geographical scope of deployment to the TEN-T Regulation, and sets new targets for ERTMS deployment on core network corridors (CNCs) until 2023. These target dates are firm commitments made by Member States and infrastructure managers during the consultation and negotiations, led by Mr Vinck, European ERTMS Coordinator, between 2014 and 2016.

In 2023, the ERTMS European Deployment Plan will be updated again setting out the precise implementation dates for the remaining part of the Corridors between 2024 and 2030. The ERTMS Coordinator proposed this two-step approach for defining the consistent deployment of CNCs by 2030, which was appreciated by all affected stakeholders. This approach ensures that the reviewed EDP sets out more realistic dates and therefore it can serve as the basis for business planning of railway undertakings.

The deployment of an interoperable Single European Rail Area is facing numerous barriers. An important step forward was the adoption of the ERTMS Deployment Action Plan¹. It defines the actions to remove all identified obstacles with the responsible parties in the frame of well-defined timelines. This Action Plan is the last step in a thorough analysis of the ERTMS deployment in the European Union, followed by detailed negotiations with the Member States and the rail sector, including their commitment in terms of actions and execution times.

For rail, there is significant work to be done to achieve TEN-T compliance and to address all of the issues identified by RFC. ERTMS deployment is currently low, but it is feasible to achieve interoperability on the corridor “C” sections between The Netherlands, Belgium, Luxembourg, France and the Swiss border, by 2020.

¹ Commission Staff Working Document SWD(2017) 375 final “Delivering an effective and interoperable European Rail Traffic Management System (ERTMS) – the way ahead”, adopted on 14 November 2017

It is therefore recommended that the first priority for the deployment of ERTMS within the corridor is to develop the corridor “C” route, by undertaking the necessary actions identified in The Netherlands, Belgium, and in France (Longuyon to Basel).

A number of projects like the ERTMS deployment for the sections Antwerp, Namur and Luxembourg as well as Longuyon-Basel and Rotterdam-Antwerp should therefore be taken into consideration as soon as possible. Since the major part of the Longuyon–Basel line will be finalised by 2020, this corridor could play the role of booster of the interoperable railway network in Europe.

Specific Corridor Aims

Several main issues exist on the North Sea Mediterranean Corridor:

- the establishment of the Seine-Scheldt inland waterway network, stretching from Paris towards the south and from Dunkirk, the Netherlands and Belgium towards the north;
- hinterland connections of ports and major works on several sea ports to develop maritime interconnections and maintain efficiency; good examples are provided by the ports of Cork and Dublin in Ireland, which are developing their port facilities to accommodate deeper drafted ships and last mile connections to road hinterland connections.
- upgrade of various cross-border rail connections, such as the rail route between Brussels, Luxembourg, Strasbourg and Basel to secure competitiveness with road.
- the removal of the rail capacity bottlenecks found in and around many of the urban nodes, e.g. Lyon and Brussels.
- the development of inland ports, such as the Paris Seine Métropole multimodal platform, in order to promote modal shift, help mitigate urban congestion and optimise urban logistics.
- the need to reduce the relative peripherality of the northern and western regions of the corridor through, in particular, enhanced Motorways of the Sea connections and improved hinterland connections for ports and also continued support for aviation connectivity through SESAR.
- the need to ensure the continuity of the corridor through its maritime component, both in terms of the port infrastructure and facilities, and also in operational terms through efficient multimodal logistics chains involving maritime legs.
- impact of Brexit.

In this way, the development of the North Sea Mediterranean Corridor goes further than the extension of transport infrastructure. It creates new linkages between Member States, has the potential to generate tangible benefit to the infrastructure investments, by securing cross-border and interregional cooperation, and thereby aims at coordinated approaches and implementation.

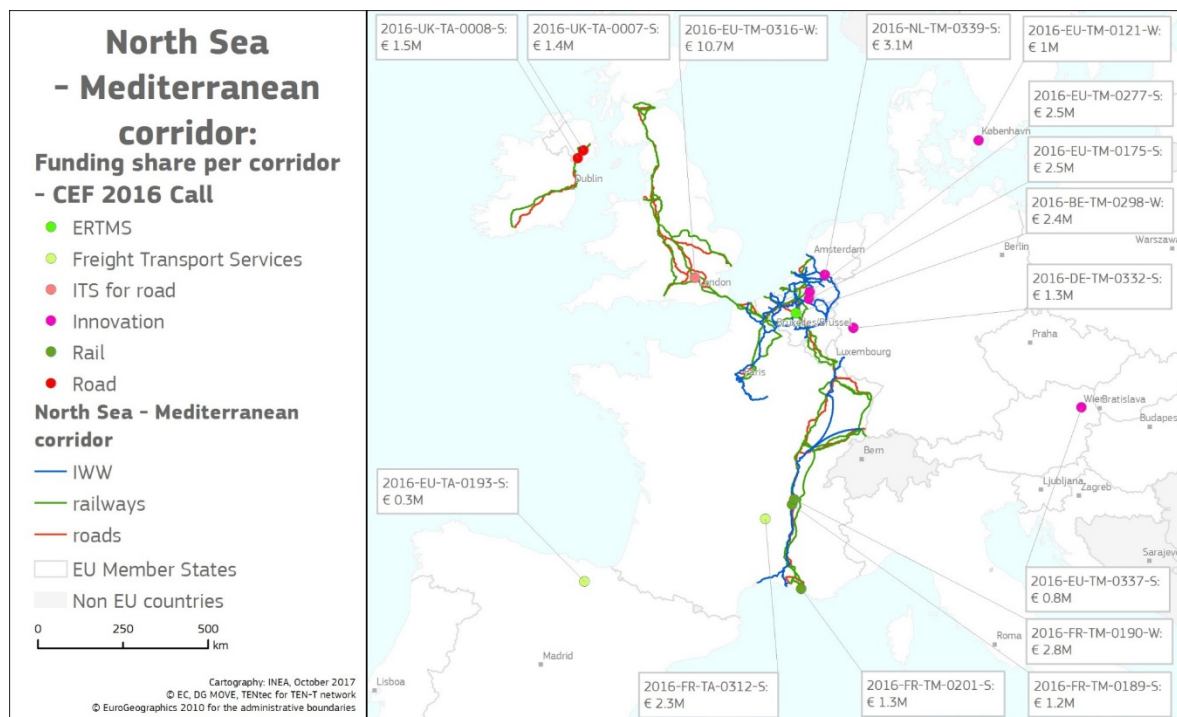
1.3 Funding achieved through Connecting Europe Facility

The EU has sought to encourage the implementation of projects by providing co-funding through three calls for proposals under the Connecting Europe Facility (CEF) in 2014, 2015 and 2016. The 2014 Call for Proposals provided a total of €1.6 billion for 34 projects located on the North Sea Mediterranean Corridor. Many of the projects that were co-funded were those highlighted in the 2014 Work Plan, including the Canal Seine Nord (as the core project in the broader Seine-Scheldt project) and other major inland waterway projects, railway capacity improvements, ERTMS deployment and investment in port infrastructure and hinterland connections in the corridor's northern and western periphery.

The 2015 CEF funding round, results for which were published in July 2016, provided an additional estimated €0.2 billion for projects located on the Corridor. While the focus of the 2015 call was on projects located in the Cohesion countries, there was also a particular emphasis on projects that will implement technological innovations, including ERTMS, SESAR/The Single Sky and RIS. Although there were relatively fewer projects, they are important in the broader context of information-oriented transport policies.

In 2017, the results were published from the 2016 CEF Transport Calls. Fifteen projects totalling €34.9 million of EU funding were selected in the North Sea Mediterranean corridor, covering areas such as ERTMS, innovation, ITS, road and rail (see Figure 1).

Figure 1: NSMED Funding share of CEF 2016 Call



Source: INEA



In February 2017, the CEF Blending call was announced with the first cut-off date for submissions in July 2017 and the second one in April 2018. A total of 65 eligible proposals have been received by the first cut-off date, amongst which, 15 on the North Sea Mediterranean corridor. A further €1.35bn is available in this call for projects.

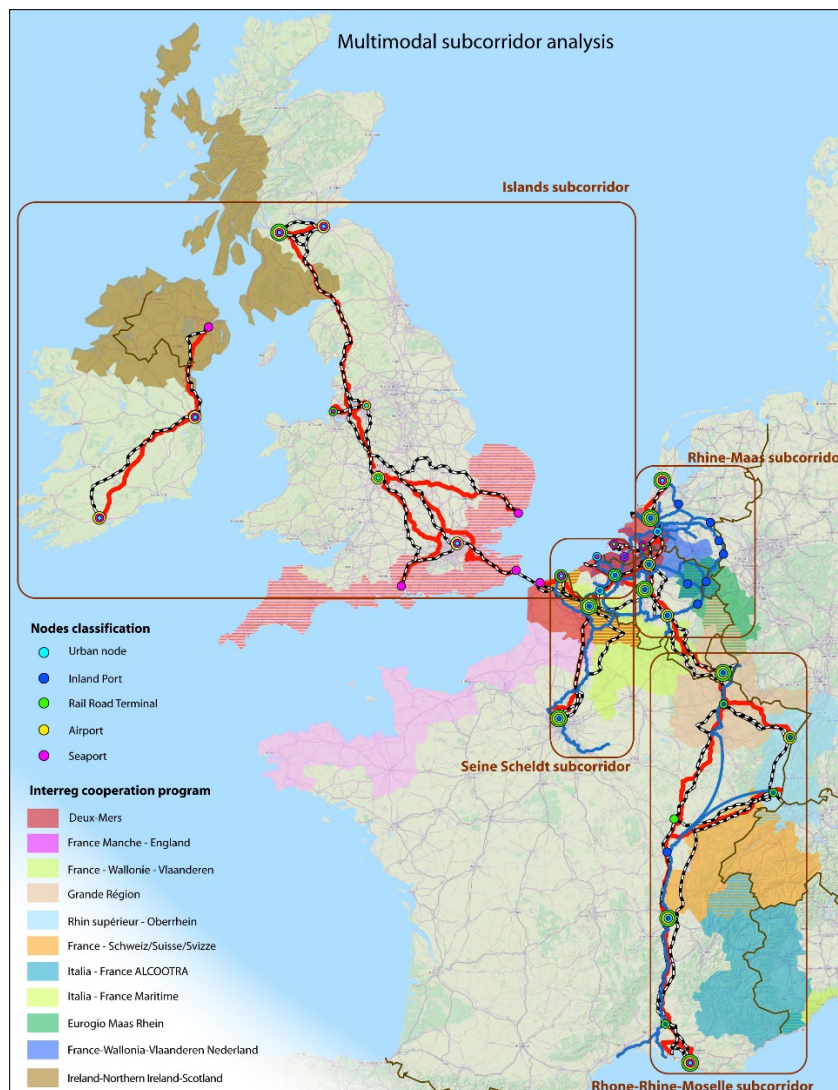
2. Characteristics of the North Sea Mediterranean Corridor

2.1 Alignment

The North Sea Mediterranean core network corridor (NSMED CNC) stretches from Glasgow, Edinburgh and Belfast in the north to Cork in the west, Paris and Lille in the centre, Marseille in the south, and extends northeast through Luxembourg, Belgium and the Netherlands towards Amsterdam. It covers six Member States, namely Belgium, Ireland, France, Luxembourg, The Netherlands and the United Kingdom, as well as leading to the Swiss and German borders in Basel.

It can be analysed as a set of four sub-corridors, loosely based on its maritime and waterway geography.

Figure 2: Alignment of North Sea Mediterranean Corridor



2.2 Compliance with the technical infrastructure parameters of the TEN-T guidelines in 2017

Regulation 1315/2013 provides, inter alia, technical requirements for the core network infrastructure, across all transport modes.

2.2.1 Railway network and rail/road terminals

There are precise technical interoperability requirements for rail set out within the TEN-T Regulation which apply to the majority of NSMED sections, but exclude the non-standard gauge Irish railway network which is considered an “isolated network” and exempt from the interoperability requirements.

Train Length – Currently France, the Netherlands and Luxembourg allow 740m freight trains along the North-Sea Mediterranean Corridor. In Belgium, the length of goods trains is limited in principle to 740m inclusive of traction units, but the Infrastructure Manager’s agreement must always be sought for any train longer than 650m. In practice, for the NSMED corridor, trains are frequently limited to 650m during peak (daytime) hours, and in order to increase train length, it is necessary to increase the number of sidings designed for 740m trains. In the mainland United Kingdom, 775m freight trains are allowed on parts of the West Coast Main Line between London and the North West, and on the high-speed line (HS1) between London and the Channel Tunnel. Fifty percent of the United Kingdom corridor sections are below the 740m standard, 20% are above the standard, whilst for the remaining 30%, the train length restrictions were unknown. In Northern Ireland (United Kingdom) and in the Republic of Ireland all sections are below 740m, but as they are classified in TEN-T as “isolated networks” they are exempt from this requirement.

Track Gauge – all corridor sections use standard 1435mm gauge, with the exception of those in the Republic of Ireland and Northern Ireland where 1600mm broad gauge is used; as “isolated networks” these sections are exempted from the requirement.

Electrification – the continental branches of the rail corridor are, with the exception of a few “last mile” connections, fully electrified. However, interoperability issues still arise owing to the use of different voltages. France uses 25kV mainly in the North, and 1.5kV on most lines south of Dijon. Luxembourg uses 25kV electrification. Belgium uses 3kV on most corridor sections and 25 kV on others such as the high-speed lines and the “Athus-Meuse” line, the southern part of RFC North Sea Mediterranean connected to France and Luxembourg. In the next years other major parts of the Brussels – Luxembourg axis will also be equipped with 25kV. The Netherlands uses 1.5kV as standard, but most of the high-speed line, and the Rotterdam port railway, which are the backbone of the North-Sea Mediterranean Corridor in the Netherlands use 25kV. In the United Kingdom, around a third of the corridor network is not electrified, and a further 160km uses third-rail electrification rather than an overhead power supply. In the Republic of Ireland and Northern Ireland, the railway network is

not electrified, but these sections are exempt from this requirement as they are part of an isolated network.

Line Speed – all of the Member States allow line speeds of 100km/h or more, for the majority of sections within the corridor. In the United Kingdom (not including Northern Ireland), 68% of the corridor has line speeds over 100km/h, and for the remainder, line speeds typically vary from 64 km/h (40 miles/hour) to 170 km/h.

Axle Loads – France, Belgium, Luxembourg, The Netherlands and the United Kingdom (not including Northern Ireland), with minor exceptions, such as the 16km link between Paris Nord and Gonesse, do allow axle loads of 22.5 tonnes. In Ireland, the weight limit is 18.8 tonnes. This parameter only applies to links where freight trains are operated.

Signalling - The compliance issue, which stands out in NSMED, is the extent to which ERTMS has been implemented on the corridor (see Commission Regulation 2017/6). Luxembourg, the Netherlands and Belgium have either implemented ERTMS in full or in part, but the United Kingdom and France have yet to deploy ERTMS on the corridor sections. However, plans are being made in France for ERTMS deployment taking into account system obsolescence, and the French corridor sections from Longuyon to Basel, will be amongst the first to be upgraded nationally. In Belgium, a program for the full deployment of ETCS on all railway lines has been initiated which shall be completed by 2022. The Netherlands has a national programme for the deployment of ERTMS, in which the corridor section between Kijfhoek, Roosendaal and the Belgian border will be completed by 2024. The current outlook is therefore that there will be a continuous stretch of ERTMS equipped rail from Rotterdam to Basel by the mid 2020s. Ireland is exempt from this requirement.

2.2.2 Road

Technical requirements for road refer mainly to safety and sustainability issues, as well as the implementation of interoperable tolling schemes where applicable.

Road Standard – Core links are required to be either motorways or express roads. In the North-Sea Mediterranean Corridor, virtually all of the core links comply with this standard, but there are certain last mile connections to seaports, including Zeebrugge and Cork, where current road standards are not adequate for the level of traffic. The new A11 road has been operational since September 2017 as one of the elements in the solution for the missing last mile connection in Zeebrugge. The N28 road for Cork is included in Ireland's National Development Plan.

Secure Parking Areas – The availability of secure parking has been determined from the European Truck Parking Area Label certification system and IRU TransPark map. Parking facilities have been classified according to the facilities they provide. Ireland, the United Kingdom, the Netherlands and France have parking areas at the required distances along the Corridor, some of which have security guards, fencing,

floodlighting and security cameras. In the Netherlands, the cross-border parking at Duiven, Venlo and Hazeldonk are EU label certified. However, further work is likely to be required in the United Kingdom and Ireland to enhance provision for safe and secure parking for heavy goods vehicles with, for example, security fencing and CCTV. In Belgium there are a large number of parking areas, and several have been certified by the EU Label Project, including Kruishoutem (both sides), Kalken (1), Vorselaar (2), Wetteren (2), Minderhout (1) and Total Wanlin Houyet (one side). In Luxembourg, six parking areas are listed, but none has IRU ratings. In light of security concerns, the adequacy of parking areas and security measures in ports such as Zeebrugge, Dunkerque and Calais is being reviewed. In the Netherlands, the Port of Rotterdam is developing several secure truck parking areas.

Availability of Clean Fuels - In Belgium there are a growing number of stations providing clean fuels such as LNG and electric charging, including fuelling stations for trucks in Kallo and in Veurne. At least seven clean fuel stations are planned for construction. The Flemish and Brussels government, together with the Netherlands have launched a first cross-border so-called grant scheme under the project BENEFIC, to boost and accelerate the implementation of alternative fuel infrastructure. France, Ireland, The Netherlands and the United Kingdom all have LPG stations. In the United Kingdom there are six stations providing LNG between Glasgow and Dover. The CEF project, H2Benelux is carrying out a pilot deployment of eight hydrogen-refuelling stations in Luxembourg, Belgium and the Netherlands across three Core Network Corridors. The foreseen initiatives will have to comply with the Commissions new policy on e-charging, LNG, CNG, hydro energy as mentioned in Directive on the deployment of alternative fuels infrastructure. The transposition of the Directive requires Member States to develop national policy frameworks for the market development of alternative fuels and associated infrastructure.

Use of Tolls – France has an established system in which tolls are paid for the majority of corridor motorway links. Belgium introduced a road pricing system for lorries in April 2016, with charges depending upon a vehicle's registered weight, its EURO class, and the type of road used. The system requires the use of an on-board unit (OBU). For the Netherlands, toll fees are currently under study. Luxembourg is also considering introducing a distance based tolling system. In the United Kingdom, the Dartford Crossing on the M25 is also tolled, which is an important link for international traffic bypassing London towards Dover and there are tolls on some sections of the motorway network in Ireland. Interoperability of tolling systems on the whole corridor as well as EU-wide remains a challenge.

2.2.3 Ports

Seaports are required to offer rail connections by 2030, and if relevant, waterway connections. In addition, they should offer clean fuels and promote Motorways of the Sea (MoS).

Rail Connections – in Belgium, France and the Netherlands all core seaports have functioning direct rail connections. In the United Kingdom, there are two ports, Dover and Belfast without rail connections. Dover faces physical constraints in bringing a rail connection to the main Eastern Docks and, although there was an active connection to Dover's Western Docks related to a train ferry service (now closed), there are likely to be costly enhancements required to railway tunnels to the west of Dover to allow competitive intermodal rail freight services to operate to and from the port. In addition, Dover's existing unit load traffic is almost entirely fast-moving driver accompanied RORO traffic, which would not transfer to rail. For through Channel Tunnel intermodal rail freight services, there is, in any case, spare capacity on the same geographic axis via the Channel Tunnel between Folkestone and Calais. Belfast has a railway line that would require significant levels of investment in order to serve Belfast Port, and currently, the last mile access to Belfast Port is a bottleneck. Warrenpoint Port is also on the corridor, and its accessibility is of equal significance in regional terms. In Ireland, the rail connection to Cork is not currently in use and would require investment to bring it back into use as a working rail freight line. Although Shannon Foynes is currently not on the Corridor itself, it is a core port and therefore plays an important role in the interconnections with both rail and Motorways of the Sea. Shannon Foynes is Ireland's largest bulk port and it is undertaking a study funded under CEF to review upgrading its rail connections.

Waterway Connections – are only required for seaports in Continental countries. The Netherlands and most Belgian ports have waterway connections of CEMT IV or (usually) higher. In France, Dunkerque and Fos-sur-Mer both have waterway connections of CEMT IV or higher. Calais is accessed via the CEMT class I Calais-St-Omer canal, but given the traffic profile, which is mainly RORO, there is no immediate case for upgrade. Marseille, which is the Eastern part of the Marseille/Fos core node, does not have direct inland waterway access, but logistics activities mainly take place in Fos-sur-Mer, which has access to the River Rhône. In the north of France, the Seine-Scheldt project has the potential to generate significant growth in inland waterway traffic in this branch of the corridor at the network level, and to increase the share of waterway transport at connected seaports.

Clean Fuels - Several corridor ports in France, Belgium and the Netherlands are developing LNG bunkering facilities, with the potential to serve maritime, inland waterway and road sectors. In the corridor ports, these are at different stages of development. Bunkering by truck has been available at e.g. Antwerp and Rotterdam since 2011/12. Since 2013, LNG has been used for inland waterway barges at Rotterdam and Amsterdam. A broader range of LNG bunkering facilities are available for maritime vessels from Rotterdam, Antwerp and Zeebrugge among others, while North Sea Port is examining possibilities in its ports. An LNG bunkering vessel is operating from Zeebrugge. Furthermore, a broader alternative energy hub is planned in the port of Antwerp. Finally, the Port of Dunkerque is working on future LNG bunkering facilities, which would be set up next to the new LNG terminal. The inland

port of Liège examines the possibility to implement an LNG service station in “Liège Triligiport”.

2.2.4 Inland Waterways

The four continental countries within the North-Sea Mediterranean Corridor all have well-developed inland waterway networks. There are no waterway links on the core network in the TEN-T Regulation for either the United Kingdom or Ireland.

In the Netherlands, the cross-border waterways related to the North Sea Mediterranean corridor are all classed as at least CEMT V. National waterways (new waterways and upgrades) are now designed according to the CEMT Vb (e.g. the Meuse) or CEMT IV (e.g. Zuid Willemsvaart) classification and are all in compliance with the TEN-T standard. TEN-T compliance regarding air-draught permits vessels with two layers of containers. However, Dutch waterways are now designed (for new waterways and upgrades) to CEMT Va specification, with 3.5 metres draught and clearance for four containers (9.1m). On international routes, CEMT Vb, and a minimum of 7m air draught (three containers) are required as the European standard.

Due to the high concentration of transport volumes around the Dutch and Flemish ports, priority should therefore be given to further developing the waterway connections between France and Belgium/the Netherlands: in the east via the Meuse and in the west via the Seine-Scheldt network. To ensure good connections from the south to the ports of Rotterdam/Amsterdam and to the German waterway corridors, attention must also be paid to the northern part of the corridor.

In addition, freight volumes via Rotterdam and Amsterdam linking up with the inland waterway network of the North Sea Baltic and Rhine Alpine corridors have grown in recent years and that trend is expected to continue over the years to come. Despite measures already being taken as part of the “Better Use” programme to optimise the Volkerak, Kreekrak and Krammer locks, it will still be necessary after 2020 to expand the lock systems which will require major investments. With regard to the eastern waterway network, improvements of the navigability of the river Meuse, which connects Namur, Liège, Venlo-Venray and Nijmegen still need to be done. Moreover, Venlo, which offers a multimodal connection with the North Sea Baltic and the Rhine Alpine, situated on the rail lines between Rotterdam and Germany/Italy and with IWW connections with ports in Belgium and Germany, will need to significantly expand its existing rail and barge transfer points. A similar situation exists in Moerdijk in relation to multimodal connections with the North Sea Baltic and Rhine Alpine corridors.

In Luxembourg, the only core waterway network connection is the CEMT V Moselle, which connects to the Rhine at Koblenz, and for a short distance towards Metz in France. This route is part of the Rhine Alpine Corridor, but the ability to move goods from Luxembourg via the Rhine/Moselle waterway route to the Dutch and Flemish ports clearly helps to relieve traffic from one of the congested regions of the NSMED corridor.

In Belgium, there are a few short stretches of waterway in the corridor, which limit vessel size below CEMT IV. This applies for example to the Bossuit-Kortrijk Canal, where 25% of the total length does not yet meet the criteria and also to a part of the Bocholt-Herentals Canal. Moreover, in the Upper Sea Scheldt it is difficult to navigate with Class IV ships, due to the tide. The Brussels-Charleroi canal is listed as a Class IV waterway but its current equipment is less than optimal for shipping with Class IV ships. Works are ongoing to improve this section: work on the Luttre bridge, modernization of locks between Seneffe and Charleroi and rehabilitation of the "Incline plane of Ronquières". National waterways are now designed to Class Va and Vb. The upgrading of the Seine-Scheldt network to Class Vb will take place along two main axes: (1) Class Vb via the Borderlys and the Lys rivers between the French border and the town of Deinze, the diverting canal of the Lys, the canal from Ghent to Ostend and the Ring Canal around Ghent as far as the canal from Ghent to Terneuzen and (2) Class V via the Upper Scheldt from the French border with Wallonia, the connection to the Ring Canal around Ghent and the Upper Sea Scheldt to Antwerp. This implies that some bridges on the axes have to be elevated and that the locks have to be modified. The heavily used Albert Canal also faces gauge and capacity issues. Bridge heights vary between 6.7m and 9.1m (or higher due to natural circumstances), but there is an ongoing programme aiming to lift all bridges in Flanders to 9.1 m (four layers of containers) and waterway widening on one problematic section by 2022. The programme has received and continues to receive EU funding (€74 million under CEF 2014 call and €27 million under CEF Blending call 2017). Concerning the Port of Zeebrugge, the capacity of the waterway connection between the port and the Seine-Scheldt connection (at Ghent) also has to be addressed in order to ensure reliable waterway access from this core seaport to the hinterland and to expand inland waterway traffic flows from Zeebrugge which are currently below their potential. Concerning the North Sea Port, construction of a new lock in Terneuzen has started; this project has received €48 million under CEF 2014 call. In Wallonia, additionally to the upgrading of the river Lys to Class Vb (Crossing of Comines), the Upper-Scheldt will be upgraded to Class V (Crossing of Tournai and modernization of the weirs of Kain and Hérinnes) and the "Dorsale Wallonne" between Pommeroeul and Namur to Class Va (locks, curves and equipment). The reopening of the cross-border Canal Pommeroeul-Condé will also contribute to the upgrading of the waterway network. The Meuse basin will be upgraded and modernized to Class Vb / VIb to ensure it continues to operate safely, in particular with the modernization of the Ampsin-Neuville lock. The projects in Wallonia encompass the adaptation of bridge heights, the safety and continuity of the traffic (NICT, weirs, etc.) and multimodal connections, including port infrastructure such as quays and platforms. In the framework of a European project funded by the CEF, a network of AIS base stations has been deployed along main Walloon inland waterways.

In France, all currently defined inland waterways within the corridor are either CEMT class IV (8% of the total length) or V (92% of the total length), hence complying with TEN-T standards. However, the three main waterway basins, the Seine/Oise, the Rhône/Saône, and the Escaut are inter-connected with CEMT II or lower grade links in

the comprehensive network, meaning that they are effectively cut off from one another. Furthermore, only 64% of the corridor waterways satisfy the criterion for minimum height under bridges. In the Northern part of France, most links do have a 5.25m height under bridges. This is the case for the Dunkerque-Valenciennes canal, the Deûle, the Haut-Escaut. On the Oise, the height under bridges is also limited to 5.25 metres; in Paris, the Seine has a limited height of 5.15 meters. With the Seine-Scheldt network, higher air clearance is planned on the Seine-Nord-Europe Canal in order to permit proper interoperability, especially for container vessels. The future Canal Seine-Nord Europe that is the major missing link for the European inland waterway network is expected to match the same standards as the rest of the Seine-Scheldt global project. Much of the Saône waterway is limited to 4.40m.

Locks are an important limiting factor for inland waterway transport, in terms of both vessel sizes and the ability of the transport system to handle greater throughputs. Following the TEN-T regulation, the EU is developing the concept of good navigational status to allow better monitoring of waterway reliability and capacity.

2.2.5 Airports

There are altogether 15 core airport nodes along the North Sea Mediterranean Corridor, including several, e.g. London and Paris, consisting of more than one distinct airport. The Regulation requires that core airports have to be connected by rail, except where physical constraints prevent such a connection.

Road Connections – all core airports in the corridor have high quality road connections.

Rail Connections – According to Article 41 of the TEN-T Regulation, dealing with nodes of the core network, the main airports indicated in the Part 2 of Annex II must be connected with the railway and road transport infrastructure by 2050 except where physical constraints prevent such connection. Airports without rail, tram or metro connections are Liège, Lille, Dublin, Cork, Luxembourg, Rotterdam-The Hague, London-Luton, and Glasgow. Of these, Dublin, London-Luton and Glasgow are the most significant in terms of passenger numbers. In the UK, London Luton, is near a railway station (about 2km), and uses a shuttle bus service to connect the airport to the station. In 2016, Luton has announced plans to build a mass passenger transit system, which will connect the airport to the main railway station, expected to be in operation by 2020. Glasgow is around 1 km away from a suburban railway station (Paisley) with a bus service to connect the airport to that station. There are also shuttle bus services from the airport to Glasgow's main rail stations (8 km.). In Ireland, a light rail connection will provide by 2027 a link to Dublin Airport, offering interchange with other rail, DART Expansion, light rail and bus services. Luxembourg currently uses a shuttle bus service to connect the airport to the main railway station. A tram connection will be available by 2020/21.

For air cargo, rail connectivity at airports can also be beneficial. An initiative called the Euro Carex project was launched in 2006. This project is a cooperation between different European airports, including Liege Airport for Wallonia-Belgium, and proposes to encourage modal shift for airfreight currently transported by trucks and short or medium-haul planes to high-speed trains.

2.3 Progress of corridor development

Although certain delays have occurred in 2017 related to the key Seine-Scheldt project, there have been many new initiatives launched, and successes realised. A number of examples, organised by corridor branch, illustrating the broad range of success stories within the corridor are outlined below.

2.3.1 North-West maritime regions

Port of Dover (UK)

A Traffic Management Improvement (TMI) Project was implemented at the Eastern Docks of the Port of Dover between 2012 and 2015. The initiative was co-financed by the European Union under the TEN-T programme. The aim of the TMI was to improve the resilience of the port operations and, in particular, to help manage the throughput of traffic within the port and reduce congestion on the external road network. This was achieved by developing a new holding area with a capacity of up to 220 freight vehicles, which equates to almost 4 kilometres of traffic. As Dover is an extremely busy roll-on roll-off port, handling some 2.6 million heavy goods vehicles and 2.2 million passenger cars in 2016, the project was carried out in phases to ensure that the port could continue to operate efficiently during the construction period. The phases involved the demolition of some structures, civil engineering and paving works, refurbishment of existing buildings and the installation of a remotely controlled variable message signage system within the port.

Felixstowe – Nuneaton Rail Route (UK)

The 'Ipswich Chord' rail link was opened to freight in 2014, allowing a direct connection between the Midlands and the Port of Felixstowe. The scheme cost about €71 million (co-financed with a contribution of €13 million from the TEN-T) and is 1.2km in length, connecting the East Suffolk Line with the Great Eastern Main Line to Nuneaton. The Ipswich Chord allows up to 24 intermodal freight train paths per day to use the tracks in each direction between Ipswich and Peterborough.

Prior to the completion of the Ipswich Chord, trains were forced to make a diversion on the busy Great Eastern Main Line via London or turn around in sidings north of Ipswich Goods yard to use an alternative route to access the line to Peterborough and the Midlands.

Rail network electrification (UK)

Electrification allows for faster, cleaner and more reliable journeys. As part of their Railway Upgrade Plan, Network Rail is working with stakeholders to deliver significant electrification projects across the UK. While some of these electrification projects are not on the alignment of the North Sea Mediterranean Corridor, there are two areas on the corridor where electrification projects have been completed, namely:

- **North West Electrification:** The route between Liverpool and Manchester has been electrified at a cost of €194 million and this has reduced the journey time to only 30 minutes. The work was completed in 2015. Further routes are being electrified in the North West region, namely the Preston- Manchester route and Manchester Victoria to Stalybridge (due to be completed by December 2017) and Preston to Blackpool (due for completion by early 2018).
- **The Edinburgh – Glasgow Improvement Project (EGIP),** which is designed to improve the rail links on several routes between Scotland's two largest cities at a total estimated cost of €914 million and reduce the fastest journey time to just over 40 minutes. The Glasgow - Cumbernauld electrification has been completed and other routes have been gauged cleared to allow for electrification.

Port of Cork: Ringaskiddy Redevelopment (Ireland)

The Port of Cork is making progress in redeveloping the existing port facilities at Ringaskiddy, which will allow the port to overcome physical constraints in handling larger vessels, allowing the port to be competitive and future proofed. The redevelopment will include a new container terminal, road improvements and a new public pier. In 2017 project funding arrangements were finalised, a preferred contractor was identified through a tender process, and it is expected that construction will commence in 2018. The project program indicates the Port Terminal commencing operations in 2020. Initially, the timeline for development had the new container terminal as coming into operation in October/November 2018, however the permitted development has been altered and the Port of Cork is now seeking consultants to carry out an Environmental Impact Statement.

Port of Dublin: The Alexandra Basin Redevelopment (Ireland)

The redevelopment of the Alexandra Basin will consist of deepening the harbour basin and channel to accommodate larger sea going vessels, constructing 3km of quay walls and conservation of the port's Victorian industrial harbour. The alterations to the port are to allow it to be served by larger vessels and be more competitive. Deepening of the harbour basin would also allow easier access for cruise vessels, which at present have to reverse into the port. Construction of the Cross Berth Quay commenced in November 2016 and is proceeding.

2.3.2 Seine-Scheldt regions

Projects in Northern France

The **Port of Calais** is located on the North Sea-Mediterranean corridor. The Dover-Calais route is the maritime core connection between the UK and the Republic of Ireland with the continent through France and therefore supports and reinforces connectivity between different corridors.

Port of Calais traffic amounts to 10 million passengers, 2 million trucks and 41.5 million tonnes of cargo per year. The existing infrastructure in both ports of Calais and Dover is insufficient to deal with traffic growth and increasing size of vessels on this route. Project Calais 2015 foresees the construction of new infrastructure and equipment in the Port of Calais to improve its long-term capacity, including breakwater and protection works, dredging and embankments, Ro-Ro berth enhancement, new Ro-Ro and cross-Channel platforms, creation of a new rail junction and environmental measures.

Figure 3: Port of Calais



The project company “Société des Ports du Détroit” was established in 2015 to finance, build and operate the port for 50 years. The project is estimated at 863 million euros, of which 270 million euros of public funding (98.6 million euros from European Commission). European funding comes from the Connecting Europe Facility (CEF) and Motorways of the Sea (MoS) programme.

Works started in September 2016 and are planned to end in December 2020.

The **Seine-Nord Europe (SNE) canal** (106 kilometres length – 6 locks) is the main French part of the European Seine-Scheldt project, which consists of the construction of a wide-gauge inland waterway link between France, Belgium and the Netherlands in

order to provide an operational link between seaports and inland ports of the west of France and of Europe. It will remove a major bottleneck for inland waterway transport on the North Sea Mediterranean core network corridor.

The SNE canal will create a network effect for the entire Seine-Scheldt scope through logistics and industrial platforms and thanks to the multimodal approach with the other modes of transport (rail, road, etc.) within the framework of the European multimodal Corridor Policy.

In May 2017, the project company, “Société du Canal Seine Nord Europe” was established. It is a partnership between the French State and local authorities.

The global cost of the SNE canal is estimated at 4.5 billion euros with a European co-financing of 40%. The remaining funding needs is shared between the French State and the local authorities involved in the project.

In France, the Seine-Scheldt project also includes operations on the Seine river, the Oise river, and in the Hauts-de-France region, so as to upgrade the connections with the Seine-Nord Europe canal and the whole waterway network. In addition to the two cross-borders projects of upgrading the Lys river and restoring navigability of the Condé-Pommeroeul Canal, these operations include MAGEO on the Oise river, aiming at widening and deepening the river, the Pont de Mours re-building, and the upgrading of several locks in Hauts-de-France and on the Seine river downstream Paris (such as Quesnoy, Deûle, Méricourt, Bougival).

Seine-Scheldt projects in Wallonia

Figure 4: Seine Scheldt in Wallonia (2017, SPW)

The adjacent figure (Figure 4) shows the location of projects from the Walloon part of Seine-Scheldt project, whose works are in progress.

On the Scheldt River, new weirs are being built in Kain and Hérissonnes (no. 2), while works aiming to modernise the crossing of Tournai city to ECMT class V (no. 3) have recently started.

Projects that consist in upgrading the Lys River (no. 1) and restoring navigability of the Condé-Pommeroeul Canal (no. 4) are cross-border issues. The first project (Lys River) involves Wallonia (SPW), Flanders (W&Z) and France (VNF). Each authority is responsible for a well-defined section and corresponding projects. Socio-economic studies have been carried out and some works have already started in Belgium. The second project (Condé-Pommeroeul Canal) involves Wallonia (SPW) and



France (VNF). The Dredging works of this canal have recently started and the opening of the waterway is expected in 2020.

Seine-Scheldt projects in Flanders

In Flanders, the Seine-Scheldt project runs mainly via the River Lys and the Ring Canal around Ghent to the Ghent-Terneuzen Canal. As shown in the Figure 5 below, Seine-Scheldt projects mainly consist in adjusting the waterway to the class Vb by building new locks, raising or re-building bridges with low height clearance, widening and deepening the river.

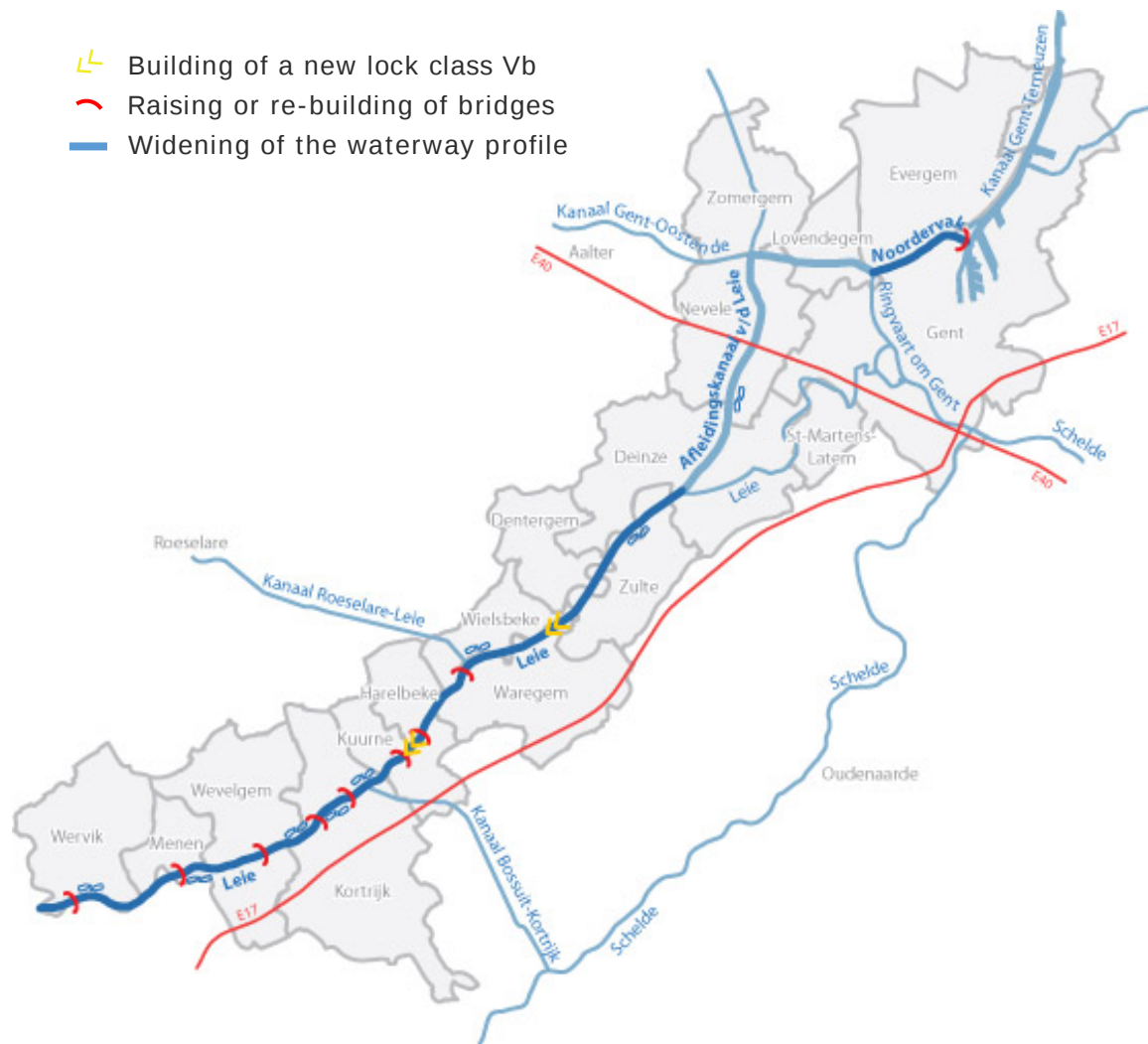


Figure 5: Main works to be done in Flanders in the framework of the Seine-Scheldt project (2017, Waterwegen en Zeekanaal)

On the Lys, some projects have already been completed, namely the construction of a new 7m-high bridge in Wervik, the widening of curves in Deinze, Nevele, and the

building of new quay walls in Evergem and Ghent. In Harelbeke, the construction of the new lock class Vb has been finalized. The construction of the new class Vb lock in Sint-Baafs-Vijve is also underway since April 2017.

The project which consists in building a new Va connection between the Lys river and the Bossuit-Kotrijk Canal in Kortrijk is being studied. The start of construction of a new bridge in Wielsbeke is planned for mid-2019. On the Canal Roeselare-Lys, the works for the construction of a 7m-high bridge in Ingelmunster have also started in April 2017.

Separately from the Seine-Scheldt project, actions are ongoing to improve access to North Sea Port (Ghent and Terneuzen). On the border between Belgium and the Netherlands, the construction work of the new lock complex in Terneuzen has started in 2017. This should be operational in 2022. The study is ongoing as regards the optimization of cross-border rail link between Ghent and Terneuzen.

ETCS deployment on the cross-border area between Belgium – Luxembourg and France

CFL Infrastructure and *SNCF Réseau* simultaneously put in service ETCS on both sides of the border on 17 October 2016 on the *Bettembourg - Thionville - Uckange* section. Since the service started in December 2016, commercial passenger trains are running daily on this section, exclusively in ETCS. The possibility is also available for freight trains whose locomotives are equipped and authorized.

In December 2016, the border section Aubange (BE) – Rodange (LUX) became operational.

The complete commissioning of the Mont Saint-Martin - Aubange - Rodange triangle between Belgium, Luxembourg and France followed then on 3 March 2017.

The implementation of ETCS on these border points represents an important symbolic step in the deployment of the European control and command system on the Antwerp-Basel route, one of the main axes of Rail Freight Corridor North Sea – Mediterranean and was made possible thanks to co-financing by the European Union.

2.3.3 Rhine / Maas / Meuse regions

The **Maaswerken** in the Netherlands is an ongoing effort, consisting of multiple projects. Of the **Grensmaas**, 3 out of 11 projects have been completed, improving the navigation conditions for IWW. The **Zandmaas** and **Maasroute** have also completed projects with results on bridge height, widening river bends, construction of weirs and general improvement of the CEMT class.

The **Zuid-Willemsvaart** is located on the corridor. The waterway is an alternative route from the Maas/Meuse to Maastricht and Belgium. Now however it is not entirely accessible for commercial CEMT class IV vessels. The first big step to upgrade the

canal was performed in 2014 by the opening of the Máximakanaal and the completion of dredging works of the Zuid-Willemsvaart from the Máximakanaal to the inland port of Veghel.

The **A4 road** in the Netherlands between Delft and Rotterdam has been opened, including the Ketheltunnel. The completed actions as well as the upgrading of the A29 road create more road transport options and reduce congestion in the Den Haag – Delft – Rotterdam area of the corridor and further south.

On the highway along the port of Rotterdam the **A15 Botlekbridge** has been completed in 2016. The road is the main artery for the port of Rotterdam and for local traffic. The road section itself has been completed with more lanes for road traffic. The bridge has been newly constructed to allow ships to pass with more ease. This reduces waiting times at the bridge and improves the inland waterway safety.

In Rotterdam, the **Breeddiep** project has been completed. This project was needed to increase IWW safety and to increase capacity for both barge and sea vessels. The Breeddiep is located on a waterway shared by barge and sea vessels. About 50,000 IWW barges pass this point, every year. Redirecting (part of) the harbour rail line via the Theemwegtracé brings extra capacity and reliability for rail freight.

In order to increase the competitiveness of IWT, the Albert Canal is being modernized. Sixty-two bridges will be raised to 9,1m under bridge clearance. At bridge height the passage of the Albert Canal is too narrow, a problem that is adapted at the same time when lifting the. Thirty-one bridges have already been adjusted. The goal is to adjust all bridges by 2022.

New locks in the Meuse basin (Lanaye, Ivoz-Ramet, Ampsin-Neuville), deepening of the Meuse River (Flémalle-Seraing) and new inland port in Liège (Trilogiport)

Two new locks have been recently built in the Meuse basin, i.e. in Lanaye and in Ivoz-Ramet. The lock complex of **Lanaye** (at least two locks in use) is located at the junction between the Albert Canal (20 km downstream from Liège city) and the Meuse River in The Netherlands (6 km upstream from Maastricht city). Inaugurated in November 2015, the new lock of Lanaye – which is 225 meters long and 25 meters large – now allows 9000 tons convoys (ECMT class VIb) to transit between the Albert Canal in Belgium and the Meuse River in The Netherlands - instead of 2000 tons ships previously. The lock complex of **Ivoz-Ramet** (at least two locks in use) is situated on the Meuse River, at about 10 km upstream from Liège city. Like Lanaye lock, the new lock in Ivoz-Ramet (225 m x 25 m), inaugurated in September 2015, improves the waterway gauge from ECMT class Va to VIb (9000 tons convoys). Eventually, a third lock complex is planned to be renewed on the Meuse; this is in **Ampsin-Neuville**, at only 14 km upstream from Ivoz-Ramet lock. Two new bigger locks (ECMT class VIb and Vb) will replace the existing ones (class Va and II). While still in the planning

stage, a socio-economic study has been carried out and validated the need and importance of this project; the construction works should start in 2018.

These new locks have removed or will **remove major bottlenecks** on the inland waterways network in the Rhine-Meuse region, given the evolution of freight traffic expected in Europe in the next years. New lock of Lanaye has particularly improved the interconnection between the Meuse basin, the Rhine basin, and the Northern seaports. Initially, the projects of new locks addressed three issues, specific to the inland waterways transport. First, the new lock would improve the **gauge** of the waterway: in the case of Lanaye, larger ships or convoys can now navigate on the Juliana Canal (NL) and reach the Rhine basin and the Northern seaports from Lanaye and the Albert Canal (BE) and inversely. Concerning the adjacent locks of Ivoz-Ramet and Ampsin-Neuville, larger ships will be able to navigate up to Namur when the new locks in Ampsin-Neuville will be constructed.

Yet, the use of larger units enables higher volume transport and consequently lower unit transport cost and a better competitiveness of the IWT mode. Secondly, enlarging locks aims to improve the inland waterways network **capacity** to absorb the expected ships traffic growth on the rivers and canals. Yet, in the case of insufficient network capacity, ships transit time from one port to another could grow in proportion to their waiting times at locks. Third, the construction of new locks aims to improve the **reliability** of the IWT mode, which is closely linked to the physical condition of the inland waterways and locks structure. Locks breakdowns and consequently interruption of navigation are likely to be rarer when locks structure is new. Moreover, building a new lock close to the older one (double or multiple lock chambers) ensures the availability of the lock when one of the chamber fails or needs to be fixed.

Another project related to the inland waterway gauge improvement in the Meuse region is the **deepening of the river** between Namur and Flémalle, downstream the lock of Ivoz-Ramet. This project aims to improve the loaded draft of the ships or convoys to 3.40m instead of 3.00m currently, and is very important because the Flémalle-Seraing section is the last one with draught restriction on the Meuse River. A socio-economic study has been carried out and validated the relevance of the project; deepening works started in 2017.

Located on the Albert Canal, in Hermalle-sous-Argenteau, between Liège and Lanaye, the new tri-modal platform “**Trilogiport**” was inaugurated in November 2015. This inland port is participating in the Walloon inland waterways network modernisation. Its goal is to increase the market share of IWT and support the economic development of the region. Trilogiport's specialisation is the container traffic. The “Trilogiport” platform could be extended by the development of a new port area in Chertal.

2.3.4 Rhone-Rhine-Moselle regions

The East High Speed line (LGV Est) in France

The **East High Speed line**, 406 km, connects Vaires-sur-Marne (near Paris) to Vendenheim (south of Alsace). It is intended to improve communication between Paris (and the regions of North, West and South-West France) and, on the other hand, the North-East of France, Germany, Switzerland and Luxembourg.

Figure 6: High speed line East



The HSL was built in two phases to spread costs. The first section of the rail line is 300 km long and connects Vaires-sur-Marne to Baudrecourt (Moselle). It has been in operation since June 2007. The second section is 106 km long. Works began in the summer of 2010 and full commissioning was completed on July 2016.

Figure 7: High speed line East, phase 2



Source: SNCF RESEAU

The global cost of the HSL East is estimated at 3.125 billion euros with a European co-financing of 10.2% (320 million €). The remaining funding needs was shared between the local authorities and the Grand Duchy of Luxembourg (it was the first case of a French HSL financed by a foreign state).

The best travel time between Paris and Strasbourg went from 4 h to 2h17 with the first phase and then fell to 1h46 in the second phase.

The Rhin-Rhône high speed rail line (LGV Rhin Rhône), 1st phase of the East branch (LGV Est) in France

The Rhine-Rhone HSL project is composed of 3 branches, which combine the following relations:

- East-West between Ile-de-France, Burgundy, Franche-Comté, Southern Alsace and Swiss,
- North-South between Germany, northern Switzerland and eastern France on the one hand, the Valley
- The Rhone and the Mediterranean Arc on the other.

The eastern branch of the Rhine-Rhone high-speed line is located between the Dijon agglomeration (Genlis) and Mulhouse (Lutterbach). It is divided into two phases:

- The first phase (illustrated in light green on the following figure) corresponding to the line from Villers-les-Pots to Petit-Croix ie 140 km, was commissioned in December 2011.

- The second phase (shown in dark green in the following figure) corresponds, on the one hand, to the west section from Genlis to Villers-les-Pots (15 km) and on the other hand to the eastern section from Petit-Croix in Lutterbach (35 km).

Figure 8: High speed line Rhin-Rhône



The total cost of the Rhine-Rhone HSL East branch is 2.4 billion euros for 140 km, with a European co-financing of €200 million. The cost of the Rhine-Rhone HSL East branch 2nd phase is €1.16 billion.

In 2013, the Commission “Mobilité 21” has decided to postpone the realisation of the west and the south branches after 2050. On 1 February 2018, the Infrastructure Orientation Council has confirmed this recommendation. For the Rhine-Rhône HSL east branch 2nd phase, it concluded to postpone the project after 2038.

3. Transport market analysis

In overview, the North Sea Mediterranean corridor covers a large number of the most economically active cities and regions in Europe, and includes many of Europe's largest gateway ports and airports. It has a clearly defined central area (London-Paris-Brussels-Amsterdam), connected via the corridor branches to the more peripheral regions.

Analysis of the corridor shows high levels of activity, with freight flows amounting to 131 billion tonne-kilometres carried on the inland sections of the corridor. These are heavily concentrated within the central part of the corridor, meaning Southeast England, Northeast France, Belgium (especially the Flemish region) and the Netherlands.

3.1 Results of the multimodal transport market study

Volumes in the corridor represent a disproportionately high share of EU28 volumes. For example, total throughput in the 21 NSMED core network ports corridor countries was 1.276 billion tonnes in 2014, over 30% of the EU28 total. Corridor (core network) ports handle both short-sea and deep-sea traffics. They handled 32.743 million TEUs in 2014, and 34.6 million passengers.

Airports in the corridor handle 7.87 million tonnes (55% of EU28 air cargo) and 410 million passengers (46% of EU28 air passengers). Port traffic is growing at a rate of 1-2% per annum since 2010, and airport traffic is growing at around 4% per annum for both passengers and freight.

Inland port traffic has been measured at 479 million tonnes in 2014. This is also a considerable figure. However, most of this volume is accounted for by the barge terminals in Rotterdam, Antwerp and Amsterdam (around 304 million tonnes collectively). This is largely maritime-related cargo moving towards the German hinterland via the Rhine, and therefore being transported out of the corridor. The terminals further inland, i.e. those along the Maas/Meuse, the Seine or the Rhone are typically each handling between one and ten million tonnes per annum. There is therefore a degree of imbalance between the volumes being loaded onto waterway services at the coast, and the throughputs of the corridor's inland ports.

Whereas total traffic volumes are relatively stable within the corridor, it is clear that volumes through ports and airports are at a high level in this corridor and still growing.

Examination of the trends in freight traffic (national basis for all six NSMED member States) shows the dominant position of road transport, and a stable position in terms of traffic growth. A similar analysis of passenger traffic also shows a dominant road sector, but positive trends for rail and high speed rail services.

Market analysis indicates that although headline activity indicators such as population and economic growth are at modest levels for the EU as a whole, there is substantial absolute growth expected within the North Sea - Mediterranean Corridor, linked to the attractiveness of the major cities, and the faster-than-average growth in long-distance traffic, especially inter-continental container traffic with East Asia which feeds directly into the corridor's networks.

In this context, it means shipping lines are bringing the largest volumes of containers into the range of ports between Le Havre and Hamburg on the continental side and between Southampton and Felixstowe on the United Kingdom side. Parallels can be found in the aviation sector too, where volumes are heavily concentrated upon London Heathrow, Paris CDG and Amsterdam Schiphol.

The degree to which demographic and economic clustering stimulates transport volume growth creates a high potential risk for the corridor, which is still highly dependent upon road transport for inland transport. However, the majority of the corridor's core seaports are actively developing facilities and programmes to develop multimodal hinterland networks, and there is sufficient critical mass of cargo to make this feasible. Such initiatives need to be helped by providing the necessary rail and waterway networks to raise the shares of these inland modes to levels observed, for example in the parallel corridor between the Dutch and Flemish ports and the German Ruhr area.

In the continental part of the corridor, attention must therefore focus on improving rail and waterway transport. For waterways, market shares in the corridor are around 11% of total transport, and not increasing. Moreover, volumes are heavily concentrated on sections leading towards the Rhine, so there is a need to develop other branches of the network. Routes on the Maas/Meuse, the Albert Canal, the Scheldt/Escaut, including the Canal Seine Nord Europe, and Leie/Lys waterways still require upgrades to remove bottlenecks, and the French waterway basins along the Seine, Oise, Marne, and Saône/Rhône are essentially cut off from the Dutch and Belgian networks. Forecasts related to the Seine-Scheldt project indicate flows of up to 13 million tonnes per annum on the upgraded waterway sections by 2030², and associated growth on the connecting sections, especially in the direction of Ghent and Antwerp.

In the case of rail freight, even though modal share is around 11%, levels are decreasing and cross-border volumes are low inside the corridor, especially when compared against national volumes (mainly in France and UK) or on parallel routes e.g. from Germany or between the Alpine countries. Rail Freight Corridor statistics show cross-border flows of around 22 million tonnes per annum, mainly between Belgium and France.

In order to build up volumes, there is a particular need:

² VNF Presentation, Corridor Working Group, Paris, 9/03/2016.

- to address rail bottlenecks in France e.g. Lyon, Lille, Metz, Strasbourg, Mulhouse and Paris,
- to solve loading gauge problems in order to allow the two main axes (Paris-Amsterdam, and Marseille-Luxembourg-North Sea as well as Rotterdam-Antwerp-Basel) to reach their full potential.
- to achieve, in practice, the technically feasible 740m train length in Belgium for a greater number of train paths.

In future, it is expected that rail traffic related to Spain will develop on the Atlantic corridor, transiting France via Paris and entering the North Sea Mediterranean corridor in the North East of France. Of the 50 million tonnes of freight crossing the French/Spanish border, almost half is in transit through France going to Paris, Lyon and Lille. Most of this is long distance road transport.

The majority of studies indicate that with the implementation of UIC gauge in Spain, the number of direct intermodal services between Spain and northern Europe will increase significantly, including new flows towards Paris, Lille, and Benelux countries. Even with a hypothesis of 15% to 20% market for rail, which is low considering the distances involved, and in relation to EU policy, this can generate significant growth, especially for intermodal services. A prerequisite will be the connection of terminals and services, necessitating a multimodal approach across both Atlantic and North Sea Mediterranean corridors.

In contrast to the situation on the Continent, the market issues in Ireland and regions of the United Kingdom, including Northern Ireland, focus on peripherality, cohesion and accessibility. In Ireland, the development of the public transport system, in particular the DART Expansion programme and its sub-projects will contribute towards alleviating the isolated nature of Ireland's economy. The DART Expansion programme will substantially improve connectivity, linkages and integration within the national railway network and with Northern Ireland.

Ireland and Northern Ireland depend largely upon short-sea container services for trade with continental Europe and via hubs to the rest of the world, and upon ferry services for trade with Great Britain and the continent. Unlike many regions in the corridor, Ireland and Northern Ireland depend on feeder, rather than direct deep-sea container services, to connect its ports to global container networks, so improving inland (primarily road and, in some limited cases, rail) and maritime (including Motorways of the Sea) access to core ports is therefore a first step towards achieving greater cohesion. Beyond this, a potential opportunity exists for greater cohesion by enabling Ireland and Northern Ireland to build up a greater range of maritime services for intra-European and global trade. The outcome of the Brexit negotiations and the impact of Brexit on Ireland's peripherality will also be important in this context. A key means of meeting these challenges will be the improvement of transport connectivity within the Island of Ireland and also to meet growing trade requirements, and Ireland's international connectivity through ports and airports.

For the mainland United Kingdom, issues of accessibility and cohesion are also important, but to a lesser degree because of the high density of economic activity especially around London and the South East. Traffic analysis shows that there has been a strong trend for transport flows with the continent to become concentrated on the North-Sea Mediterranean Corridor links via the Short Straits between Kent and the Nord Pas de Calais region. Apart from the notable exception of Eurostar passenger rail services, most of this growth has led to greater numbers of lorries and cars using long distance motorway connections, via the M25 around London and bottlenecks such as the Dartford Crossing, to reach the port of Dover and the Eurotunnel terminal (near Folkestone). Both the Dover-Calais and Dover-Dunkirk routes suffer from road congestion in France due to security issues related to migrants seeking to access the United Kingdom from France, the Netherlands and Belgium.

There is a need therefore to avoid over-reliance on the Dover-Calais Short Straits link, the need to improve supply chain resilience and signals the need for longer term solutions such as boosting North Sea routes (United Kingdom East Coast to the Netherlands and Belgium), rebuilding customer confidence in Channel Tunnel rail, and the consideration of measures to add capacity to the Thames road crossings.

In the United Kingdom container sector, which covers both global and European connections, growth has focused around the two main ports of Felixstowe and Southampton. In addition, a new container port has been developed at London Gateway on the Thames. These factors have tended to draw traffic towards the southeast corner of Great Britain. However, the Port of Liverpool, with a more central location in Great Britain on the west coast, has opened a new container terminal in 2016 with the objective of securing additional traffic via a container port in the north of England. Such initiatives play an important role in shifting inland traffic from congested parts of the corridor.

3.2 Capacity issues along the North Sea Mediterranean Corridor by 2030

Road

Achieving efficiency and sustainability within the transport networks of the North Sea Mediterranean corridor depends to a large extent upon managing the supply/demand balance. However, as demonstrated, the corridor contains regions of high economic activity and high population density, which have been growing faster than the European average. In the transport sector, greater international interconnectivity has focused growth around the major gateway ports and airports, most of which are located within the central part of the corridor. In 2014, critical road congestion issues were identified in and around Antwerp, Brussels, Paris, Strasbourg, Lille, Lyon, Marseille, Dublin, Cork, Amsterdam, Rotterdam, London (M25), Birmingham and Manchester, meaning that the corridor is punctuated by capacity constraints at all the major nodes.

National studies in the six corridor Member States predict that total population (national basis) will grow by 19 million persons (2010-2030), but given recent patterns, it is expected that more than half of this growth (11-12 million) will occur in or around London, Paris, Brussels, Lille, Antwerp and the Randstad, thereby reinforcing the clustering effect around the central regions of the corridor. In London alone, population is expected to grow from 8.6 to 10 million by 2031³, or by the size of Birmingham and Glasgow combined. This has major implications, especially on personal travel, and the demands placed on the transport network for short-distance personal travel.

Economic agglomeration and clustering around the centre of the corridor not only leads to restricted mobility within these regions but also reduces accessibility from more peripheral areas which need to bypass these central urban areas to reach other European markets. The pressing need to expand capacity for short-distance personal transport on road and rail can have a detrimental effect on road and rail capacity for long-distance freight transport services, which are also drawn towards these main urban centres. As demonstrated during the 2016 working group in Paris, competition for urban space even affects the development of capacity for inland waterway transport because of the shortage of suitable waterside sites available for terminals. Similar issues can be found in maritime nodes, especially ports in large urban areas such as Amsterdam, Antwerp and Dublin where urban development limits land availability and restricts traffic between the ports and the strategic transport network.

Key elements of the work-plan are therefore related to the alleviation of bottlenecks, especially in urban areas, expanding multimodal opportunities, and improving network usage and end-to-end corridor efficiency, through ICT.

Rail Capacity

For the continental rail networks, RFC North Sea Mediterranean has identified bottlenecks⁴ in circumstances where capacity restrictions lead to problems in creating new rail paths for cross-border trains. These are found in Antwerp, Zeebrugge, Lille, Paris, Luxembourg, Metz, Strasbourg, Mulhouse and Lyon.

In Antwerp, which is one of the largest cargo centres in Europe, and a key gateway node for the NSMED corridor, all of the trains from the port use one main line, shared with passenger services, to access the hinterland. Several projects have therefore been established by Infrabel to make Antwerp more accessible for freight trains. Moreover, capacity issues exist on an important axis from the port of Zeebrugge to Ghent. Rail investments are foreseen on this axis to separate freight trains to/from the port of Zeebrugge and the passenger trains.

³ Transport for London, Annual Report, 2014/15.

⁴ RFC North Sea Mediterranean, Book V, Implementation Plan, 2017 Timetable. P20.

For passenger trains there is an important capacity bottleneck at the Brussels north-south junction due to competition for paths between HSL, national trains and regional trains. A feasibility study, co-funded by the CEF, is currently being conducted to identify one (or more) preferred solution(s) to remove this major bottleneck.

In Lille, which is a focal point on both the Paris-Antwerp and Calais-Metz axes, much of the rail freight reaching the node needs to bypass the city, but currently the Paris-Antwerp traffic passes through a single point in the city centre, intermingled with passenger services. Although not part of the core network, the double-track Lille-Metz rail line (Artère Nord-Est) has extra capacity and is electrified. It is currently part of the alignment of the Rail Freight Corridor North Sea Mediterranean and offers additional capacity to the core network corridor routes. Similarly, the discontinuity along the freight lines forming the NSMED CNC rail corridor between Brussels and Paris means that capacity along certain non-CNC sections is also highly relevant for achieving continued growth on these important cross-border routes. Achieving a closer fit between the core network and rail freight corridor alignments is especially important in this branch of the network.

As one of the main traffic hubs on the French network, the Lyon railway junction is of crucial importance in the management of all European, national and regional freight and passenger traffic flows that pass through or converge on this location and the Lyon bottleneck is, along with the Parisian one, the biggest bottleneck on the French rail network and one of the most significant in the European network. The main North-South French axis runs through the middle of the city where over 10 lines converge with large regional train traffic and very limited available capacity. Two projects aim at solving the Lyon node issue: works on the existing network aiming to increase reliability, security and capacity on the one hand, and a new bypass of the city dedicated to freight trains.

Strasbourg is also highlighted as a capacity bottleneck for RFC cross-border train paths. The lines from Luxembourg, Metz and Germany all converge on Strasbourg from the north. Between Strasbourg and Basel there is just one line, and within Strasbourg, freight and passenger trains run on the same lines. A number of projects between Metz, Strasbourg and Mulhouse have been planned by SNCF Réseau to improve traffic flow and reliability.

In the UK, there is a general shortage of capacity on the rail network for freight traffic, but particularly on the southern sections of the West Coast Main Line (WCML) and on the Felixstowe branch line for access to and from the deep sea container port. On the WCML more capacity should be freed up eventually by the construction of the new high speed line from London to Birmingham and Crewe and then on to Manchester (HS2) if the capacity on the conventional routes is not taken up by additional passenger services.

In Ireland, rail freight will continue to be only a small percent of freight traffic because of distances and nature of goods.

Waterborne Transport

While rail and road capacity issues tend to reflect traffic growth, capacity limitations for the waterway sector relate to the vessel sizes that can be used, the reliability of the network, and capacity through inland terminals. Increasing the number of routes in the corridor for which high-capacity vessels can be used reliably, helps the sector to compete, and thereby improves the overall capacity of the corridor across all modes. With the extension of the waterway corridor towards Paris, capacity issues around the Schelde and Meuse/Maas routes will become more prominent.

One of the aims for the corridor work-plan is therefore to establish a network of high capacity waterways within the corridor, capable of boosting the sector on branches which currently do not have significant traffic. A large number of co-ordinated upgrades have therefore been identified in the Work Plan project list, which are aimed at solving local bottlenecks such as fairway enlargement, the raising of bridge heights, and the enlargement of locks.

Two specific capacity bottlenecks affecting existing traffic are the Terneuzen (Westerschelde) and the Volkerak lock systems in the Southwest Delta of the Netherlands. Terneuzen is an important access point for seagoing and inland waterway vessels, including, in future, the connections via the upgraded Seine-Nord link to Paris. The Volkerak lock system, which lies between Rotterdam and Antwerp is part of the most heavily used waterway connections in Europe, and a potential bottleneck for the future.

Further inland, a series of bottlenecks has also been identified on the Walloon network that need to be addressed in order to permit CEMT class V operation. This will be done through the upgrade of the Scheldt waterway (Crossing of Tournai and Kain and Hérinnes locks), the reopening of the cross-border Pommeroeul-Condé canal as well as the upgrade of the “Dorsale Wallonne” to Class Va (locks, curves and equipment) and the Ampsin-Neuville lock on the river Meuse.

4. The North Sea Mediterranean CNC projects to be realised by 2030

4.1 General Overview

In 2017, the North Sea Mediterranean corridor list⁵ consists of **350 projects** distributed as follows across transport modes and corridor Member States:

Table 1: Distribution of NSMED projects by mode of transport (number)

	Aviation	Maritime	MOS	IWW	Rail	Road	Multimodal	Innovation	Total
Belgium	3	8	5	35	16	12	4	8	91
France		16		70	32	7	22		147
Ireland		7			12	6		2	27
Luxembourg					6	3			9
Netherlands	1	7	2	11	16	11	3	2	53
UK		1			10	9	3		23
Total	4	39	7	116	92	48	32	12	350

These projects collectively account for **€70.849 billion**, for the projects where estimated costs are available.

Table 2: Distribution of NSMED project costs by mode of transport (€m)

	Aviation	Maritime	MOS	IWW	Rail	Road	Multimodal	Innovation	Total
Belgium	155	1,295	74	2,067	3,235	5,706	1	249	12,783
France		1,634		7,412	16,024	252	2,699		28,021
Ireland		969			4,266	574		40	5,849
Luxembourg					2,178				2,178
Netherlands		1,446	76	1,641	3,801	8,864	223	39	16,089
UK		134			3,543	2,116	135		5,928
Total	155	5,478	151	11,119	33,048	17,512	3,058	329	70,849

In the 2017 list, almost half of this total investment relates to rail projects, followed by road (25%) and IWW (16%).

Out of the total sum of €70bn, around €2 billion relates to projects that have already been completed before 2017, and €3bn is for projects, which will be completed this year. Between 2018 and 2030 the total investment, related to known projects with known timescales, will sum up to €44 billion.

⁵ Including completed projects, projects which are overlapping with other corridors (in some cases occurring close to but not inside the corridor), and (currently) inactive projects.

After 2030, the investment allocated so far is €5 billion.

An additional €15 billion investment relates to projects still being developed, for which the start/end dates are not yet known. The majority of these have uncertain start and completion dates.

As the table below shows, the majority of the projects, in terms of investment, will occur between 2020 and 2030, around €35 billion.

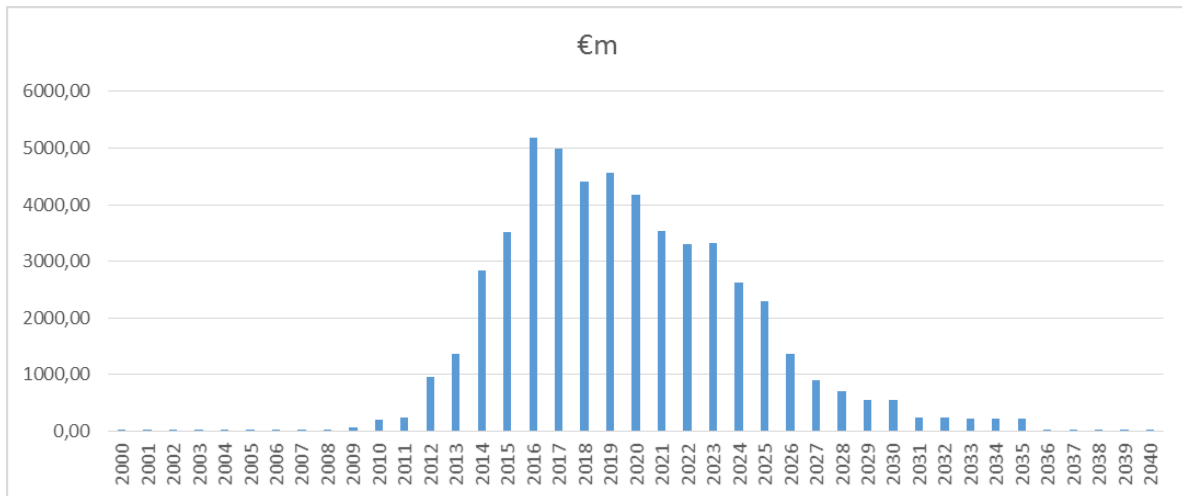
Table 3: Number of NSMED projects by start and finish dates

Start/End Years	Unknown	Pre 2017	2017-2018	2019-2020	2021-2025	2026-2030	2031-2050	TOTAL
Unknown	96	3	1	1	2	7	-	110
Pre 2017	10	22	42	54	43	5	5	181
2017-2018	3	-	1	20	9	2	-	35
2019-2020	4	1	-	3	8	1	-	17
2021-2025	-	-	-	-	3	4	-	7
2026-2030	-	-	-	-	-	-	-	-
2031-2050	-	-	-	-	-	-	-	-
TOTAL	113	26	44	78	65	19	5	350

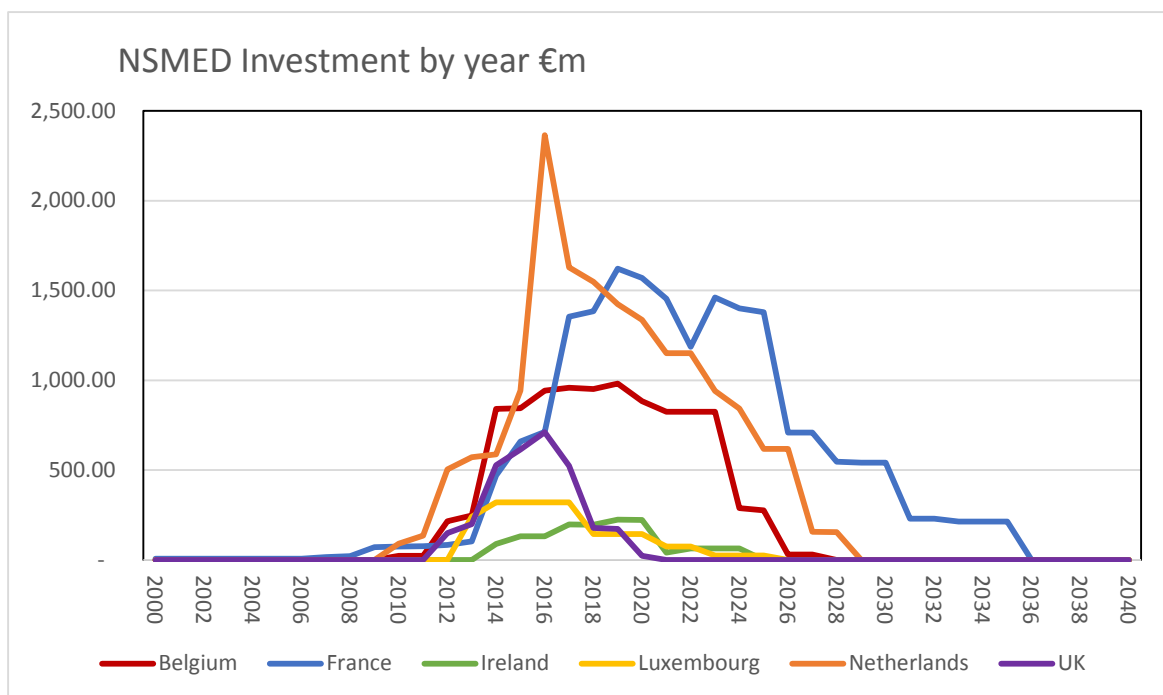
Table 4: Value of NSMED projects, by start and finish dates

Start/End Years	Unknown	Pre 2017	2017-2018	2019-2020	2021-2025	2026-2030	2031-2050	TOTAL
Unknown	14,978	186	165	1,580	12	168	-	17,089
Pre 2017	839	2,363	3,216	5,820	12,755	7,287	5,077	37,357
2017-2018	80	-	1	1,129	8,113	1,866	-	11,189
2019-2020	60	4	-	9	1,608	95	-	1,776
2021-2025	-	-	-	-	224	3,214	-	3,438
2026-2030	-	-	-	-	-	-	-	-
2031-2050	-	-	-	-	-	-	-	-
TOTAL	15,958	2,553	3,382	8,538	22,712	12,630	5,077	70,849

The figure below presents a distribution of the investments per year, based on a linear division of project costs by the years when the projects should run.

Figure 9: Distribution of investments per year within the NSMED corridor⁶

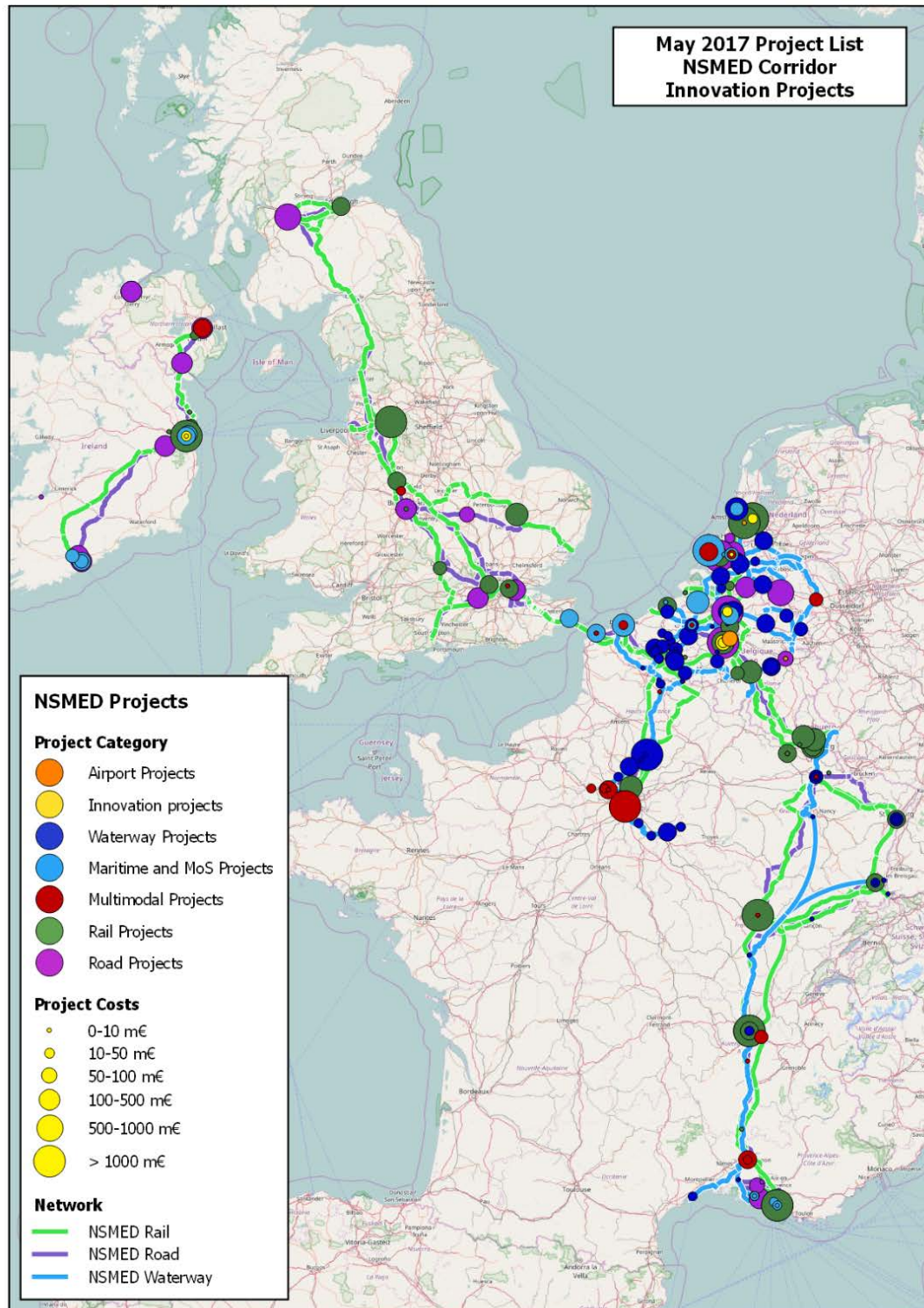
These investments can also be analysed per Member State.

Figure 10: Investment (€m) per year, per Member State

In the figure below (Figure 11), the 350 projects are presented by transport mode and plotted according to their location within the corridor. It shows distinct patterns of investment across the different branches of the corridor.

⁶ Information presented in the graphic

Figure 11: Overview of NSMED Corridor Projects



4.2 Analysis per mode

4.2.1 Rail and Rail-Road Terminals, including ERTMS deployment plan

Rail projects are primarily found at the major urban nodes, which are key bottlenecks for long distance freight and passenger traffic. In the South, there are major projects planned in Marseille and Lyon, to improve rail capacity along the Rhone valley. A series of investments are being coordinated on the stretch between Luxembourg, Namur and Brussels, improving capacity between Mulhouse/Basel, Strasbourg and the northern range seaports. Similar investments, including ERTMS upgrades are being undertaken between Amsterdam, Rotterdam and Antwerp. Important investments are also undertaken to improve the rail access to the port of Zeebrugge. In the UK there are upgrades related to the Felixstowe-Nuneaton and Southampton-Birmingham lines, both of which are important hinterland connections for the largest UK container ports and on the West Coast Main Line. The Northern Hub project, centred on Manchester also involves major upgrades in terms of capacity and electrification. In Ireland, the major rail projects are centred on Dublin, which is the main hub for North-South passenger traffic. The role of rail freight transport in Ireland is under review but it will remain a small percentage of overall freight traffic. Funding has been received under CEF for a study into the feasibility of reopening and upgrading a rail freight line from Limerick to Shannon Foynes Port.

Multimodal projects generally refer to logistics platforms and intermodal terminals. These are the points of interconnection between freight modes, and therefore a crucial element in the strategy to develop truly multimodal networks. These are especially prominent in French cities including Paris, Lyon and Avignon, and along the Maas/Meuse branch of the corridor, e.g. Venlo. Developments in Paris include the Seine-Metropole projects, related to the Seine-Scheldt connection. Small-scale investments are also foreseen in the marshalling yards of multimodal platforms in order to receive and treat long freight trains (>740m).

4.2.2 IWW and inland ports, including RIS deployment plan

Inland waterway projects are generally focused around Paris-Lille, Lille-Antwerp-Amsterdam, and the Maas/Meuse branch. These investments reflect the new potential being offered through the development of new high-capacity routes between the Seine and Rhine/Maas/Scheldt basins. Key projects include the French and Belgian parts of the Seine-Scheldt network and the new lock at Terneuzen, which together exceed €8 billion.

4.2.3 Maritime ports and motorways of the sea

Maritime projects are primarily located amongst the continental northern-range projects between Calais and Amsterdam, and in Ireland, indicating the importance of the gateway and interconnecting roles played by the maritime sector in the NSMED corridor. Following the 2014 CEF Call, large port projects were financed in Calais,

Dublin and Cork, along with the BRIDGE project connecting Dover and Calais. In 2016, the Breeddiep project (part of the Rotterdam Mainport development) was undertaken, widening the waterway from 75m to 300m to increase capacity for (mainly) inland waterway vessels. In the coming years, capacity extensions at the Port of Dunkirk could be undertaken, while Motorways of the Sea connections are likely to play a more important role for Ireland's connectivity.

4.2.4 Road transport, including ITS deployment

Road projects are primarily addressing congestion issues within some of the central regions, including Antwerp, Brussels, Amsterdam and Rotterdam and increasing the capacity of motorways in the corridor countries. These projects reflect the growth of traffic through the largest seaports and airports as well as population growth in the corridor's largest conurbations. In Ireland, where rail currently plays a minor role in freight transport, and where there are no commercial waterways, road projects are essential for maintaining accessibility to and from the seaports.

The most prominent projects concerning road infrastructure are:

- road upgrade A1/A6/A9 Schiphol - Amsterdam – Almere
- ring of Antwerp upgrade (Oosterweel connection)
- optimization of the Brussels Ring road

4.2.5 Airports

Airport and innovation categories are relatively few in number, but between 2016 and 2017, their number has increased from 8 to 16, all located in Belgium, the Netherlands or Ireland. The largest project in these categories is the already completed Diabolo project improving access to Brussels airport by rail. Some further investments are being made to improve the connection of the Diabolo infrastructure to Mechelen and Antwerp.

4.3 Urban nodes in the CNC

The analysis of the urban nodes looked at physical and technical barriers to the full development and functioning of the corridor. More specifically, the main objective was to identify the main urban node characteristics and bottlenecks that affect the functioning of the corridor and the development of greater intermodality.

Both, Regulation 1315/2013, Article 30 and 41 and the Issue Paper “Urban nodes / mobility”, address the urban nodes issue from the EC side. According to Regulation (EU) N° 1315/2013, an urban node is defined as “an urban area where the transport infrastructure of the trans-European transport network, such as ports including passenger terminals, airports, railway stations, logistic platforms and freight terminals located in and around an urban area, is connected with other parts of that infrastructure and with the infrastructure for regional and local traffic”.

The overall aim of the urban nodes network development is to ensure the interconnection of passenger and freight transport between all transport modes involved. Seamless connection between long distance and regional/urban traffic/urban freight last mile deliveries should be also guaranteed in the urban nodes and should not be a bottleneck.

Arising from this analysis, there is a new initiative to develop an urban nodes innovative flagship project to develop concrete measures for improving the accessibility of key multimodal freight facilities within major cities of the NSMED corridor.

5. Future challenges

In common with the other eight CNCs, the NSMED corridor is pursuing its goals in terms of bringing forward investments to contribute toward its goals of cohesion, efficiency and sustainability. These objectives have been reinforced through the adoption of the TEN-T issue papers, which broaden the scope from infrastructure towards policy initiatives such as multimodality, innovation, and urban transport.

5.1 How do we identify the critical issues?

Cross-border issues

One of the foremost issues to be addressed is the need to link the two main French waterway basins, the Seine/Oise and the Escaut via high-capacity, CEMT IV or higher class routes. The missing link, the Seine-Nord-Europe Canal is the main component of the Seine-Scheldt project. Upon completion, it will link the Seine Basin with the northern-western waterway network of the Benelux countries and will encourage modal shift to inland waterway on the whole corridor.

The most advanced project is the Seine-Scheldt, with its main component, the Seine-Nord-Europe Canal. In 2015 it was announced that the Seine Scheldt 2020⁷ project would be the major recipient of CEF funding (to a value of €980 million) within the NSMED corridor.

In the Seine-Scheldt project, two cross-border sections have been identified: Lys and Pommeroeul-Condé Canal.

⁷ 2014-EU-TM-0373-M

Seine-Scheldt Missing Link

Figure 12: Location of Canal Seine-Nord Europe



The map (Figure 13) shows how all the seaports in the range between Dunkerque and Amsterdam are connected to a dense network of rivers, canals, and associated inland ports and industrial areas. The Seine-Scheldt project aims to extend this network by completing the link between Paris and Belgium, thus also giving access to the Oise and Seine Rivers, as far as the port of Le Havre, and the Atlantic Corridor.

Solving this missing link also has implications for the connecting waterways. Capacity constraints exist, for example, on the Albert Canal, the main waterway of Belgium linking the Scheldt and the Port of Antwerp with the Port of Liege and the Meuse; bridge clearance needs to be harmonised to allow the passage of four layers of containers, lock capacity at Wijnegem (where the canal reaches the outskirts of Antwerp) needs to be improved and a navigation bottleneck in a section outside Antwerp needs to be removed. In 2015, the CEF provided some €74 million of funding for the lifting of bridges and an upgrade to Class VIb of a 9km section of the Albert Canal and recently another €27 million co-funding has been reserved under the CEF Blending decision. Furthermore, the Bossuit-Kortrijk Canal, the Upper Sea Scheldt and the Brussels-Charleroi Canal still need to be upgraded to Class IV or Va. Finally, the quality of the waterway connection between the Port of Zeebrugge and the Seine-Scheldt also needs to be addressed.

Ghent-Terneuzen Canal Bottleneck

Related to this, there is an important bottleneck at the locks that allow access to the Ghent-Terneuzen Canal, and important cross-border link between Belgium and the Netherlands.

The canal is accessible through a lock complex situated in Terneuzen on Dutch territory, consisting of three locks chambers: one lock large enough for maritime navigation and two inland navigation locks. Due to the increase of inland navigation traffic at the lock complex, the maritime lock is also used for inland vessels. By replacing one of the smaller locks with a new bigger maritime lock, the existing locks can be used for maritime and inland navigation, thereby increasing capacity and reducing waiting time for both types of vessel.

In particular, for inland vessels, improved capacity at the lock compound in Terneuzen will be increasingly important, as the canal is part of the Seine – Scheldt network. In 2015, it was announced that the New Lock Terneuzen project would be co-funded from CEF, with a grant value of €48 million.

Brussels-Luxembourg railway axis

Cross-border issues relating to other modes of transport have also been identified along the North Sea Mediterranean corridor.

The speed limitation on the Brussels-Luxembourg axis is considered as a bottleneck for passenger rail transport. A second issue on this section concerns specifically the passage to a modern 25 kV AC electrical power supply system. This passage, which is also a condition for the increase in speed, must be realised in a coordinated way on both sides of the border in order to guarantee the interoperability on this axis.

Related short-sea transport issues

While cross-border inland waterway transport offers great potential for modal shift and increased freight capacity in the central part of the corridor, short sea shipping has significant potential to increase accessibility to the centre from the more peripheral regions of the corridor. For the regions in question, especially in Ireland, Northern Ireland, Scotland and Northern England, lack of accessibility is seen as a barrier towards economic development and cohesion.

Accessibility to more peripheral regions by means of short sea shipping remains an issue on the corridor, but Dublin and Cork have launched projects to enhance their maritime access and Belfast and Cork have projects to enhance 'last mile' access by road. This will however require further consideration in the context of the UK leaving the EU and the impact on the integrity of the corridor. The focus in the North West of England is, now, more on improving 'last mile' access by road and rail to Liverpool.

Port hinterland connections

In the continental ports, inland waterway connections are used largely for moving seaborne traffic inland. However, rail connections are less well developed, and there are serious issues of road congestion for most ports in their immediate catchment areas.

The Belgian ports of Antwerpen, Ghent and Zeebrugge face a number of connectivity and capacity issues. In Antwerp, several rail projects improving the last-mile connections and enhancing the capacity of the shunting yard are expected to be achieved by 2023. Investments are also foreseen to separate passenger trains and freight trains to/from the port of Zeebrugge. For the two major United Kingdom container ports of Felixstowe and Southampton, inland rail links need to be improved by removing remaining bottlenecks on the main hinterland rail routes to the West Coast Main Line on the corridor. In Ireland and Northern Ireland, core and comprehensive road connections inland are paramount, allowing the heavy goods traffic generated by the ports to bypass the immediate urban areas in order to reach the motorway network.

Interoperability constraints

In terms of rail transport, the difference of electrification systems between the countries of the corridor, in particular in the Benelux area, it constitutes a key issue. Belgium uses 3 kV and 25 kV on some lines, but a large part of the Brussels to Luxembourg axis is planned to be equipped with 25 kV and this electrification system is already in use for the major cross-border lines between France, Belgium, Luxembourg and the Netherlands.

In the United Kingdom, a significant part of the corridor is not electrified, and where it is electrified, different voltages may be used. Between London and the Channel Tunnel for example, the HS1 (high speed, mainly passenger) line uses an overhead 25kV power supply, while the conventional line uses third rail 650/750v DC.

Regarding signalling, ERTMS deployment aims to foster interoperability, facilitate increased capacity and improve safety and security. However, deployment is still at a low level on the corridor. The pace of ERTMS implementation differs depending on the country, creating possible future gaps in the deployment of ERTMS.

The ERTMS section of the Work Plan for the Corridor will be further developed in cooperation with the European Coordinator for ERTMS in his own Work Plan. The detailed planning for the first step began in 2015. The remaining sections (to be completed between 2020 and 2030) have been subject to discussion and detailed planning in 2016.

Regarding road transport, differences in road haulage regulations between the various countries of the corridor (in terms of the hours when vehicles can use the networks)

currently lead to congestion and saturation at parking areas at the borders. This is a critical issue for the corridor that will need to be addressed and linked to other related issues such as Intelligent Transport Services and alternative fuels.

For inland waterways, it is important to highlight that the standardisation of infrastructure, especially in relation to maximum allowable ship dimensions is advantageous in terms of realising the sector's full potential. Standard lock characteristics as well as at nodes such as inland ports and seaports help to improve user friendliness for barge operators.

Intermodality constraints

Improved connectivity of seaports, inland ports and airports to European rail and road networks is crucial to exploit fully the potential for multi-modal transport within the corridor. Substantial growth in inland intermodal transport is expected for the future because of forecast growth in port volumes, which will require enhanced capacities from container transshipment terminals. Throughout the corridor, there is a need to match the growth in port-related traffic with the available capacities at inland ports and road/rail terminals, to improve last mile access to urban freight facilities, and to build up the supply of regular intermodal services.

From a freight market point of view, there are two different segments for intermodal transport. The first is the maritime market along the Northern Range concentrated around Benelux and the southern range ports along the western Mediterranean coast with Marseille or Sète in France and with the Spanish ports. The second is the continental market of north-south exchanges over long and even very long distances, towards the Paris region, the UK, and towards Mediterranean countries of the EU including exchanges between Spain and Northern Europe, where there are currently very low modal shares for rail and waterway (less than 5%). This potential has been clearly identified in the evaluation of the Montpellier/Perpignan rail project, as well as in Ferrmed, Amsterdam-Marseille, and Climat projects, all co-financed by EU.

In the continental branches of the corridor, intermodal cross-border volumes by rail are still remarkably low, in comparison to the adjacent Rhine-Alpine corridor, and in comparison to national rail volumes. Container services by inland waterway tend to be concentrated around Rotterdam and Antwerp, primarily oriented towards the Rhine. More potential can be realised by developing a landscape of rail and waterway connected inland ports along the axis of the Maas/Meuse. This area, between Nijmegen and Liège is well located for European distribution centres handling containerised imports.

Cross-border rail needs are focused on improving the cross-border routes between the Netherlands, Belgium, Luxembourg and France, creating a fully TEN-T compliant freight and passenger corridor from the Randstad region via Brussels to Luxembourg, Strasbourg and Basel. Towards this aim, the adoption of ERTMS signalling, the

removal of bottlenecks such as the North-South link in Brussels, and the upgrade of the passenger line to Luxembourg and Strasbourg (EuroCap Rail) are necessary.

With the extension of standard gauge rail routes inside the Iberian Peninsula, greater potential will be realised for services connecting Spain towards Paris and the NSMED corridor towards the UK, Belgium and the Netherlands. Rolling motorway projects are also being developed on French cross-border routes.

In the United Kingdom Strategic Rail Freight Interchanges (rail-connected distribution parks) are crucial commercial developments that are supported by the UK Government in its National Networks National Policy statement; these allow for the efficient inland movement of freight to and from ports and for the growth in domestic intermodal traffic, but there is a lack of existing SRFI capacity in, in particular, the London/South East area. In addition, there is a risk that the general lack of network capacity in the UK may discourage developers from bringing forward and developing SRFI schemes.

Between the United Kingdom and France, only the HS1 route is included on the corridor through Kent from the Channel Tunnel to London and it is most likely that capacity for freight services on the corridor will be limited to night-time services. However, the conventional route through Kent, which has sufficient capacity for freight services, is included on the North Sea Mediterranean Rail Freight Corridor; it will therefore be necessary to assess the interoperability issues related to loading gauge and power supply on this line, in order to achieve the full potential for increased cross-border rail freight between France and the United Kingdom. This important rail link should be considered for inclusion in the core network corridor.

5.2 Technical compliance maps

Figure 14 shows the extent of expected compliance with TEN-T standards for the rail network by 2030, regarding:

- line speed,
- axle load,
- track gauge and
- electrification

The map shows that many sections of the rail network either are already compliant or there are projects that are being implemented to move towards compliance by 2030. The main exception is the route between the deep-sea container port of Felixstowe and the West Coast Main Line at Nuneaton in the UK, for which there are no current plans for full electrification by 2030.

The map also highlights the capacity bottlenecks on the rail network close to many of the major cities in the North Sea Mediterranean corridor and issues in relation to line speeds.

Figure 14: Status of rail network towards 2030

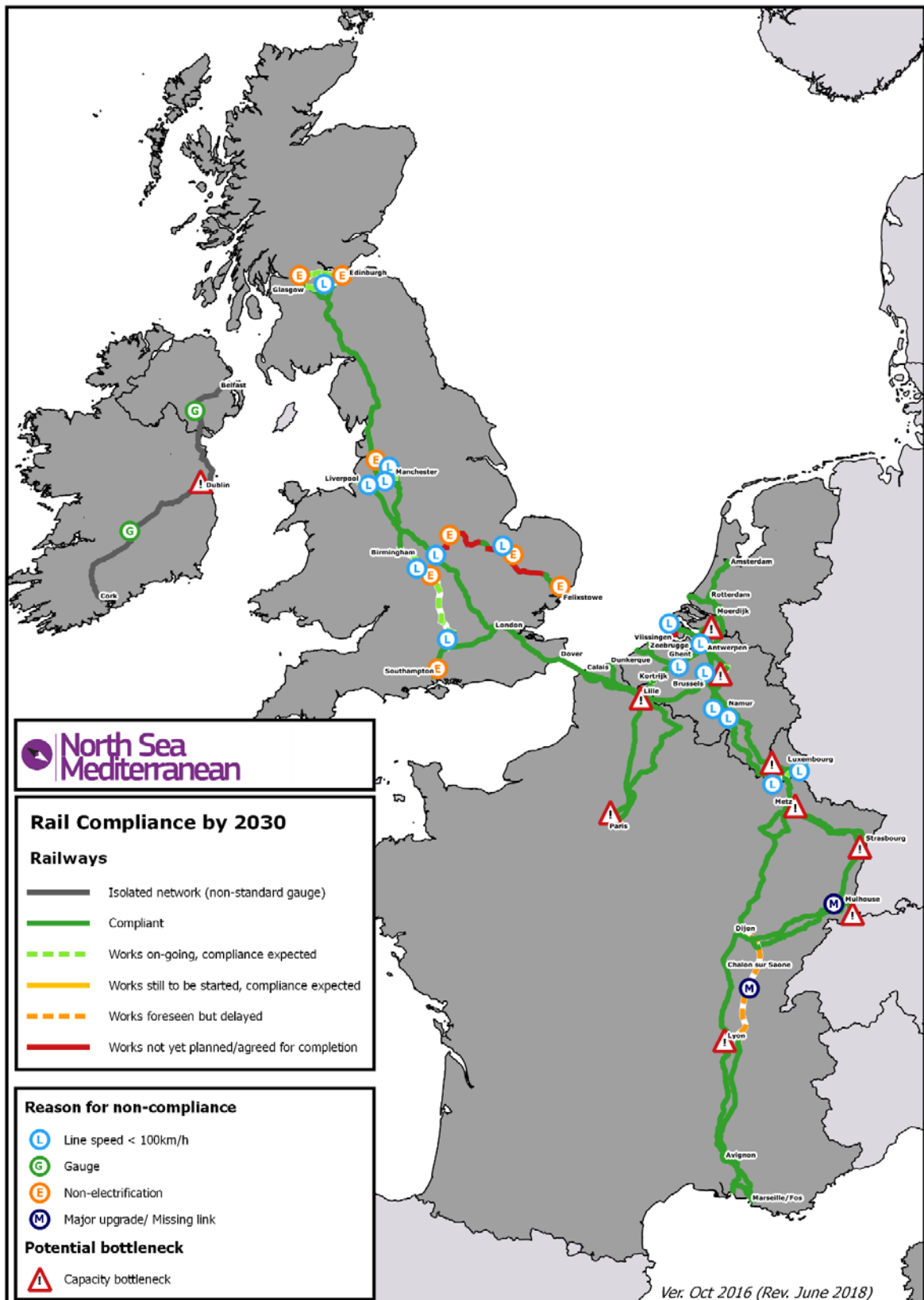


Figure 14 shows the extent of expected compliance with TEN-T standards for the inland waterway network by 2030, regarding:

- CEMT class IV or higher,
- 5.25m bridge height and
- 2.5m available draught.

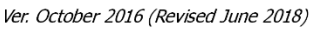
Major projects (amongst which missing links), and potential capacity bottlenecks are highlighted as well.

This map includes waterway sections for three corridors, the NSMED, the Rhine Alpine, and the Atlantic, so stretches of the Seine and the Rhine are included here.

The map shows that most sections of the network are already compliant or that there are projects being implemented to ensure compliance by 2030. Although there are plans to solve some of the missing links, and remove many bottlenecks, some non-compliant sections remain, such as on the Seine in Paris, which has bridge height limitations, and there are no current plans to achieve compliance here by 2030. The TEN-T core network and the NSMED corridor also include the Saône-Moselle and Saône-Rhine missing links that could potentially extend the range of waterway connections for the corridor, by bridging the gap between the northern and southern river basins. These and their regional significance have been discussed at the most recent working group for regions, held in Metz and Strasbourg.

In practice, a large part of the NSMED waterway network is being developed to accommodate vessels of CEMT Va or Vb standard. While CEMT IV capacity is sufficient for TEN-T compliance, in reality higher capacities are necessitated by the ambitions of the Work Plan. Higher technical targets for waterways are incorporated in the proposed corridor-specific KPIs. These KPIs are CEMTS Class V and VI as well as permissible height under bridges of 7m and 9.10m respectively.

Figure 15: Status of inland waterway network, towards 2030



5.3 Persisting bottlenecks

By comparing the current set of work plan investments to the technical analyses of the network, the maps above suggest that a number of capacity-related and technical interoperability bottlenecks will persist beyond 2030. For waterway transport, the situation is exacerbated by the lack of resilience on e.g. the upper Rhine to climate change. For rail, the lack of by-passes around major cities and lack of capacity close to key nodes such as ports remains a key issue.

In-depth analysis of sub-corridors

As shown in the Figure 2, the North Sea – Mediterranean (NSMed) Corridor is very extensive and can be subdivided into four multimodal sub-corridors, based on its maritime and waterway geography:

- The Islands sub-corridor
- The Rhine-Maas sub-corridor
- The Seine-Scheldt sub-corridor
- The Rhone-Rhine-Moselle sub-corridor.

Indeed, recent studies on the NSMED corridor have shown the benefit of identifying these sub-corridors because of its length/geographic extension and its multimodal aspect, resulting from the fact that the corridor includes most of the Western European fluvial basins.

In order to analyse in detail the factors behind the most persistent bottlenecks, it would be judicious to conduct similar studies to the ones which were undertaken for the “Upper Rhine, a connected corridor” project. The latter, subsidised by the European Commission, was undertaken by estimating transport demand and analysing capacity and intermodal/multimodal connectivity levels of the main inland ports located in the Upper Rhine region. Realised on a supra-national scale, that kind of study allows for the identification of projects to be jointly implemented by a panel of infrastructure managers, and for the assessment of all potential complementarities between ports and transport modes in a region. To be successful, these studies must be led by an inland port authority or a consortium unanimously approved by all the stakeholders. As a result, recommendations for implementing projects (of infrastructures or operating systems) are suggested to improve sub-corridors performance.

The sub-corridors studies would enable, at an appropriate spatial scale, the identification of issues specific to different geographical entities and their existing and potential synergies, and the way of addressing them favourably. It would also allow to group complementary projects into an individual one.

Notably one can mention the Seine-Scheldt network synergies generated by Canal Seine-Nord Europe, challenges specific to the Brexit within the Island sub-corridor

impacting the entire corridor, or the Trilogiport project and the modernisation of the inland waterways to the class Vb within the Rhine-Maas sub-corridor.

Concretely, this would entail investigating the existing transport demand and offer, evaluating residual capacities, analysing bottlenecks and missing links and assessing how the latter affects the multimodal performances of the sub-corridors. Thus, it would support the European vision with the aim of implementing the Core Network Corridor in a bottom-up approach.

5.4 Persisting administrative and operational barriers

In 2015, the European Commission carried out an exploratory study, published in December 2016, assessing the efficiency of permitting procedures in relation to TEN-T core network projects, in particular waterborne and cross-border projects. This project identified barriers in the regulatory and administrative processes that affect the effective and efficient planning and implementation of TEN-T core network projects.

The study identified situations where the successful implementation of cross-border projects was being delayed by the need to follow multiple assessments, meaning that planning procedures were more complex than in the case of national projects, thus lengthening the planning process.

It concerns several areas, notably the environmental assessments (in extreme cases multiple procedures involving different authorities) as well as the public procurement phase (in particular complex national legal frameworks, absence of time limits for decision-making and long review procedures to challenge the award decision). The implementation of large cross-border infrastructure projects is considered slow as it generally exceeds ten years from early planning to construction, as evidenced by the exploratory study. In some cases, projects are not sufficiently well prepared and encounter delays due to suboptimal arrangements to coordinate processes at national level. This then leads to a reluctance of private investors to become involved in infrastructure projects due to delays and uncertainties in the regulatory framework.

An impact assessment study is now underway looking for measures to help streamline the planning process for cross-border projects of common interest.

6. Infrastructure implementation by 2030 and the environmental, socio-economic effects

6.1 What has still to be done

In common with the other eight CNCs, the NSMED corridor is pursuing its goals in terms of bringing forward investments to contribute toward its goals of cohesion, efficiency and sustainability. These objectives have been reinforced through the adoption of the TEN-T issue papers, which broaden the scope from infrastructure towards policy initiatives such as multimodality, innovation, and urban transport.

Corridor priorities are derived from the strategic objectives set out in the TEN-T regulation, including cohesion, efficiency and sustainability.

Table 5: Overview of corridor strategic priorities

TEN-T Objectives	Drivers	Specific Objectives
Cohesion	Access from periphery to centre Cross-border interoperability Urban growth absorbing capacity – creating bottlenecks	Improve level of service for longer distance links. Facilitate last mile access to seaports and airports. Adopt TEN-T standards in corridor, subject to need. Integrate cross border initiatives e.g. RFC2.
Efficiency	High degree of road and rail congestion Lack of inland transshipment points. Inadequate network capacity around ports and inland ports.	Increase use of interoperable telematics technology. Develop network of inland terminals – logistical hubs. Develop greater range of combined transport services via rail and waterway.
Sustainability	Suboptimal use of sea, waterway and rail modes. Limited availability and use of clean fuels.	Develop greater range of combined transport services via rail and waterway. Increase inland modal shares for rail and IWT at seaports, and rail at airports. Extend access to clean fuel at core nodes.

However, shorter-term priorities focus upon the new opportunities afforded by the Seine-Scheldt waterway connection and more immediate aspects including seaport accessibility (with a specific focus on the effects of Brexit), ERTMS deployment (NL, BE, LU, FR), the development of inland ports and road-rail terminals, and innovation.

Brexit

In addition to these technical and market-related goals, the NSMED corridor faces a challenge arising through the uncertainty surrounding the outcomes of Brexit.

The citizens of the United Kingdom voted in a referendum on 23 June 2016 to leave the European Union. The North Sea Mediterranean Corridor is the only TEN-T corridor that includes the UK and is of strategic importance to the whole of the EU, particularly as it provides a land bridge route between the continental mainland and Ireland. In addition, the corridor includes links across the land border between part of the UK (Northern Ireland) and the Republic of Ireland (ROI). In March 2017, the UK Government sent a letter to the President of the European Council under Article 50 of the Treaties confirming the UK's intention to leave the EU by March 2019. Negotiations between the UK and the EU on the terms of Brexit are in progress.

The implications of Brexit for the North Sea Mediterranean Corridor are difficult to assess at this point and will depend on the results of the negotiations. It is noted that when the UK leaves the EU the UK's borders with the EU will become external borders. Changes to border arrangements will affect how those borders operate, though it is too soon to evaluate the full impact. Nevertheless, additional customs checks would have serious negative effects for all other countries involved in North Sea - Mediterranean corridor.

Given the degree of integration between the ROI and UK economies - and particularly the Northern Irish economy - and the ROI's location on the periphery of the EU and 'beyond' Great Britain, the ROI will be the EU Member State most affected by Brexit.

Given the economic importance of the land-bridge route from Ireland across the UK to France, it may be appropriate to invest in port facilities in Ireland that facilitate trade flows directly with the rest of the EU in order to by-pass the UK. This would mean developing new short sea shipping (or Motorways of the Sea) services between ports such as Dublin, Rosslare, Waterford, Cork and possibly Shannon Foynes and other ports in the Atlantic Arc, France and Benelux.

Development of long-distance rail links

On the continental side there is a new opportunity developing for rail freight to compete with sea and air-cargo services using the Silk Road routes across Russia to China. Rail has a cost advantage over air cargo and a speed advantage over maritime, creating a niche opportunity. Over the last three years, Silk Road rail traffic has increased from around 25,000 TEU in 2014 to around 145,000 TEU in 2016 and UIC forecast traffic potential approaching 1 million TEU by 2030.

In Europe, there are initiatives, such as that created by the FERRMED organisation, to develop capacity in order to realise the potential of this potentially large new market for unitised freight services. FERRMED is promoting investment in the “Great Axis” connecting parts of the NSMED corridor to the MED corridor in Marseille and the NS-BALTIC corridor in the East via Germany and Poland.

FERRMED has developed technical standards for rail which incorporate key elements of the TEN-T standards such as electrification and axle loads, but which go further by specifying the vertical clearance or loading gauge (UIC-C), and which also include the ambitions to standardise the electrical voltage at 25,000V, as well as increasing the maximum train length to 1,500 metres, or double the TEN-T maximum. For long distance rail transport, achieving greater train length is a key factor in reducing the transport cost per TEU/km.

For the NSMED corridor, the most relevant rail sections are the ones forming the North-South link from Rotterdam and Antwerp, across Belgium and Luxembourg and then South via Metz, Dijon and Lyon to Marseille, where it connects to the Mediterranean corridor and towards Spain. Benefits to the NSMED regions potentially arise in many ways, due to the growth potential for rail on both the Eastwards link to the Silk Road, and the southern link to Spain where rail opportunities can arise through harmonising the track gauge to 1435mm. These are both large markets for the corridor regions, where currently rail share is very low. Developing frequent services on this route can benefit the NSMED seaports connected by it, and facilitate trade amongst the regions.

6.2 Innovation deployment

Innovative projects refer to project, which involve the use of new technologies improving in some manner parts of the current transport system. Different categories of possible innovation projects have been identified matching with the criteria and requirements set in Articles 31, 32, 33 of Regulation (EU) 1315/2013 and with the findings and recommendations foreseen in the following Issue Papers elaborated by the European Coordinators in 2016.

Overall, 335 projects have been evaluated on their contribution to innovation, of which 67 projects are seen as innovative. The total investments for these projects amount to 10.9 billion euros on the NSMED corridor.

Of the 67 innovative projects, the large majority (57) have been categorised as catch-up innovation, while five are incremental and three are categorised as radical innovation. The former have usually been successfully implemented in another region or country, while the incremental and radical innovation projects set new standards for the next decades.

Corridor innovation projects are 95% transferable. Transferable means applying the same innovation solution in another location. Projects on the NSMED are 37% scalable, with most being related to transport digitalisation. Scalable means applying the solution in a new field, or that the project has multiplier effects.

By analysing the factors that either enable or potentially block innovative projects implementation, it was concluded that funding is the most relevant aspect. In particular, lack of sufficient public funding support is seen as the most common barrier, found in almost half of the innovative projects. Existing public/private funding for real implementation of innovation ideas, on the other hand, proves to be an important enabler.

6.3 Impacts on jobs and growth

Based on a guideline developed by M-Five, KombiConsult and HACON each of the nine CNC undertook an analysis of the growth stimulated by the implementation of their corridor as well as of the job-years then created. The methodology of this analysis was following the approach developed and applied in the study on the *Cost of Non-Completion of the TEN-T*⁸. Core of the method are (1) multipliers that have been derived by M-Five and provided to the CNC together with the guidelines and (2) the most recent project list as of May 2017 of each of the CNC.

The results of the growth and jobs analysis is divided into two categories:

- Impact of an **individual CNC**: these results refer to the growth and job impact of each CNC individually. The individual CNC numbers should not be aggregated, as this would include double counting due to the overlaps of a number of projects between the CNC.
- Impact of the **nine CNC together**: to generate these results each CNC only included the projects contained in their project list for which the corridor Consortium is responsible to fill in and update the data on a specific project.

The following tables summarize the results of each category for all nine CNCs. Table 6 presents the impact of each CNC. Planned investments of corridors over the period 2016 to 2030 are in the range between €43.6 billion for the Atlantic CNC (ATL) and €191 billion for the Scandinavian-Mediterranean CNC (SCM). These investments would stimulate a growth of GDP of between 356 billion € (OEM) and 1,468 billion € (SCM)

⁸ Schade W., Krail M., Hartwig J., Walther C., Sutter D., Killer M., Maibach M., Gomez-Sanchez J., Hitscherich K. (2015): "Cost of non-completion of the TEN-T". Study on behalf of the European Commission DG MOVE, Karlsruhe, Germany.

by the different CNC. The number of jobs created measured in job-years would be in the range between 1,068,000 and 4,176,000 per corridor.

Table 6: Investment, growth, and job impact of individual CNC – including overlaps

2016 to 2030	Unit	ATL	BAC	MED	NSB	NSMED	OEM	RALP	RHD	SCM
Investment	bn €2015	43.6	74.5	102.8	96.0	52.4	69.9	99.6	87.7	191.0
GDP created	bn €2015	419	535	622	715	356	517	743	725	1,468
JOB-years created	x1000	1,092	1,566	1,967	2,061	1,068	1,494	2,139	2,002	4,176

The above table shows each corridor in 'isolation', so projects, which are included in more than one corridor, are counted in all of the corridors where they occur. For NSMED, the estimated €52.4 investment designated for the years 2016-2030 is predicted (via multipliers) to generate €356bn GDP and 1.1 million job years over the fourteen year period.

Methodology

M-Five consultants carried out an analysis of the growth and jobs impact of the corridor applying a multiplier methodology based on the findings of the study *Cost of non-completion of the TEN-T*⁹. For the analysis, projects from the project list (as of May 2017) are classified into three mutually exclusive categories:

- Cross-border projects.
- Innovation projects.
- Other projects.

The three categories also present a hierarchy. If a project is marked in the project list as cross-border it is assigned to that category. If not, it is checked to see if it belonged to an innovation category. If not, it will be assigned to the default category as "other projects". A fixed proportion (assumed to be 10%) of rail and ERTMS projects are counted as innovation projects and the remainder as other projects.

Projects completed before the end of 2016 were excluded from the analysis. For each of the three categories the investments were aggregated for the period 2016 until 2030.

These were the investment figures to which the multipliers presented in Table 7 have been applied to estimate the total growth and job impacts of the corridor over the period 2016 to 2030. Specific multipliers for cross-border projects and innovation projects were applied, while average multipliers is applied to all other projects.

⁹ Schade W., Krail M., Hartwig J., Walther C., Sutter D., Killer M., Maibach M., Gomez-Sanchez J., Hitscherich K. (2015): "Cost of non-completion of the TEN-T". Study on behalf of the European Commission DG MOVE, Karlsruhe, Germany.

Table 7: Multipliers used for the growth and jobs analysis derived from the study of Cost of non-completion of the TEN-T (2015)

	Type of investment			
Categories	Average	Cross-border	Innovation	Unit of measurement
GDP-Multiplier	4.35	16.8	17.7	bn€-GDP / bn€-INV
JOB-Multiplier	16,300	37,000	38,700	FTE-JobY / bn€-INV

The projects for which cost estimates are available and that are planned to be implemented over the period 2016 until 2030 amount to an investment of 52.4 billion €₂₀₁₅. The implementation of these projects will lead to an increase of GDP over the period 2016 until 2030 of 356 billion €₂₀₁₅ in total. Further benefits will occur also after the year 2030.

The investments will also stimulate additional employment. The direct, indirect and induced job effects of these projects will amount to 1.068 million additional job-years created over the period 2016 to 2030. It can be expected that also after 2030 further job-years will be created by the projects.

6.4 Modal shift and impact to decarbonisation and climate change adaptation

A set of reference forecasts for the NSMED corridor have been constructed, based upon the results of the DG-ENER/DG-MOVE/DG-CLIMA Reference forecasts, as published in 2016¹⁰. These provide a reference forecast for traffic growth and impacts for the corridor, as context for the work plan.

The EU Reference forecast essentially predicts a gradual growth in demographic, economic and transport activity, but with decoupling of energy consumption and CO2 emission factors. The NSMED Member States account for a relatively high share of this activity (around 35% of the EU28 total), but with slightly lower rates of average passenger traffic growth, but with slightly higher rates of freight traffic growth.

The traffic set for the NSMED corridor has been determined using a network model to estimate the corridor shares per MS and per mode of transport. Overall, the corridor is estimated to account for 7% of national-level passenger-kms, and 17% of freight-kms, with around 11% of energy demand (for transport), and 11% of CO2 emissions (from transport).

Below, the results for 2015 and 2030 are set out, indicating passenger kms, freight tonne kms, and vehicle kms.

¹⁰ <https://ec.europa.eu/energy/en/data-analysis/energy-modelling>

Table 8: NSMED Corridor Traffic 2015

Traffic	Current situation: 2015				
	Passenger	Freight	Pax. Veh.	Freight Veh.	Total Veh.
	bpkm	btkm	pvkm	fvkm	vkm
Road	98.13	72.27	66.76	6.87	73.63
Rail	21.72	27.30	0.11	0.05	0.17
IWT		50.28		0.11	0.11
Maritime					
Aviation	51.34				
TOTAL	171.19	149.85	66.87	7.03	73.90

Table 9: NSMED Corridor Traffic 2030

Traffic	2030 Situation -EU reference				
	Passenger	Freight	Pax. Veh.	Freight Veh.	Total Veh.
	bpkm	btkm	pvkm	fvkm	vkm
Road	111.81	94.27	76.06	8.96	85.02
Rail	26.36	40.21	0.14	0.08	0.22
IWT		60.00		0.13	0.13
Maritime					
Aviation	70.53				
TOTAL	208.69	194.48	76.19	9.17	85.37

Passenger traffic is dominated by road and aviation, whereas freight is more equally balanced other modes.

Passenger traffic is forecast to increase from 171 billion pkm today to 208 billion pkm by 2030 (road, rail and aviation). Road and aviation account for almost 90% of the total, and the fastest growing sector is forecast to be aviation (at 2.1% per annum).

Freight traffic is forecast to increase from 149 billion tkm today to 194 billion tkm by 2030 (road, rail, and inland waterway). Road has 48% share of corridor traffic, but rail is forecast to grow at the fastest rate (2.6% per annum).

Results showing impacts in terms of CO₂ emissions are shown below, for 2015 and 2030, including the implied emission factor ratios (grams of CO₂ per passenger km, grams of CO₂ per freight tonne km).

Table 10: NSMED Corridor GHG Emissions 2015

GHG	Current situation: 2015				
	Passenger	Freight	Passenger	Freight	Total
	MT of CO ₂ eq	MT of CO ₂ eq	gCO ₂ /pkm	gCO ₂ /tkm	MT of CO ₂ eq
Road	11.12	9.80	113.35	135.58	20.92
Rail	0.58	0.40	26.68	14.67	0.98
IWT		1.04		20.64	1.04
Maritime					

Aviation	18.50				18.50
TOTAL	30.20	11.24			41.44

Table 11: NSMED Corridor GHG Emissions 2030

GHG	2030 Situation -EU reference				
	Passenger	Freight	Passenger	Freight	Total
	MT of CO2 eq	MT of CO2 eq	gCO2/pkm	gCO2/tkm	MT of CO2 eq
Road	9.16	10.36	81.89	109.85	19.51
Rail	0.65	0.48	24.58	11.90	1.13
IWT		1.19		19.83	1.19
Maritime					
Aviation	18.74				18.74
TOTAL	28.54	12.02			40.56

Energy efficiency is forecast to increase over the 2015-2030 time period, and emission factors are estimated to fall. Total GHG emissions are expected to fall from 41.4 million tonnes of CO2 equivalent to 40.6 million tonnes across the selected traffic flows, by 2030, although they are expected to increase again to 43.22 million tonnes by 2050 due to further traffic growth. Most of the 2030 decrease in CO2 is attributable to greater efficiency in the passenger road sector, where relatively low expected growth is outweighed by increases in efficiency. In the freight sectors and in aviation, traffic growth outweighs efficiency gains.

6.5 Infrastructure funding, innovative financial instruments and financial sustainability of projects

The development of Core Network Corridors requires, inter alia, a critical mass of investment to take place within a short time framework; therefore, a careful examination of the potential financial sources has to accompany the corridor planning. Some key criteria to be appraised are reported in this section of the Work Plan.

The projects to be developed can be ranked in three different categories from the point of view of funding and financing needs:

i) Revenue generating projects

For several revenue generating projects "closer to the market" in terms of development or service provision, a substantial component of the project funding can come from own resources and financing resources gathered by the project promoters on the market. The private investors would need to recover their initial costs of capital and receive a reward for the risk born.

The project may look for conventional lending from public and private banks, alternative financing from institutional investors and at financial instruments for

instance to cope with the unbalances of cash-flow during its construction and ramp-up phase until a sustainable flow of revenues is secured, and also to address particular risks and market failures, and to secure lending with long maturity. Financial instruments could be provided in the form of credit enhancing and guarantees.

ii) Long-term, infrastructure projects

Hard-infrastructure, greenfield, risky, long-term projects such as the majority of cross-border railway connections as well as inland waterways navigability improvements but also road and rail projects in peripheral and isolated parts of the corridor, might require substantial public support through public funding, even if innovative approaches can apply to project development and/or to specific components of the investment. Public funding can be structured in different ways such as lump sum subsidy, fiscal incentives, operational deficit coverage and availability payment schemes.

iii) Intermediate cases

In a variety of intermediate cases, the project will require a more limited funding component in order to reinforce its financial viability – these projects could be supported through a blending of funding and financing.

In this respect, beside the national budget, the funding contribution can effectively come from the EU centralized managed funds, such as the Connecting Europe Facility (CEF) and from decentralized managed funds such as the European Structural and Investment Funds (ESIF) while the financing resources may come from the EU financial instruments, such as the CEF Debt Instruments and financial products available under the European Fund for Strategic Investment (EFSI).

For all these three different categories of projects the public intervention with the different degree of intensity is justified on the ground that these projects of high socio-economic and EU added value, substantially address overall public service obligations, suboptimal investment level, market failures and distortion due to externalities (positive, for the projects supported, including in terms of strategic added-value, and negative for competing modes), and therefore calls for the transfer of resources.

When considering the project funding structure in a comprehensive and multimodal setting, earmarking of revenues and cross-financing solutions as well as applying "polluter-pays" and "user-pays" principles ought to be duly explored.

A project can be fully developed through project financing if the revenue stream (secured by public and/or private funding), exceeds the investment and operational costs (CAPEX, OPEX). Such an approach calls for a careful risk sharing between the Member States and private partners.

Notwithstanding the project self-financing potential linked to user fees, a cautious and innovative approach aimed at exploiting the project life-cycle and define clear responsibilities and risk sharing between project promoters, sponsors and implementing bodies is more and more needed to deliver projects on time, cost and quality and to fully exploit the potential, while minimising future liabilities on public budgets.

A pre-condition for project financing is a conducive regulatory and legal environment, in order to set the incentives right to enhance the public and private sector involvement in the delivery of infrastructure investment.

It is worth highlighting the following projects along the corridor supported through innovative financial instruments, for their potential for cross-fertilization.

Currently the NSMED project list consists of a wide variety of actions, many of which are already underway with definite funding secured, primarily through national programmes. In addition, a total of €1.8 million is being invested in NSMED projects via the CEF calls 2014 - 2017. Cohesion funding is not available in the NSMED regions. More than half of the CEF money in NSMED has been allocated to the **development of the Seine-Scheldt network** (€979m), while other projects typically receive 40% or 20% of the recommended eligible costs, meaning that in many cases, they receive less than 10% of their total project costs as direct EU grants. For the near future, there will be even greater reliance upon national funds, private income streams and loans.

Two recent examples are the **port infrastructure projects in Calais and Dublin**. These are two major ports, both with public ownership, but with reliable revenue streams to offset or partially offset their investment costs. However, the investments being planned are large in relation to their normal activities, with expected payback lifetimes beyond that which could normally be covered by commercial loans. Moreover, there are broader economic and environmental benefits associated with these projects. In Calais, a Special Purpose Vehicle (a corporate structure dedicated to achieving specific goals, i.e. the construction of Calais Port 2015) was set up to finance the project. Out of a total investment of €862 million, the bulk of the finance (€502m) was secured through a 40-year bond issued by an institutional investor, with the rest covered by junior debt and public funding. Out of €270m public funding, €100m was provided by the French State, €71.5 by the Region, with the remaining €98 million allocated as a grant from the EU CEF fund.

In Dublin, an investment of €227 million for the Alexandra Basin Redevelopment was achieved through a combination of an EIB loan (44%), retained funds (24%), other bank loans (22%) and a CEF grant (10%). Thus, even in cases where there are high levels of national and regional support, and where the beneficiaries have strong and predictable revenue streams, grant funding has still been necessary to complete the financing requirements, owing to the long-term nature of these projects. In many other circumstances, there are insufficient direct revenue streams associated with

proposed projects to permit blending of financing sources in this manner. Different governance structures across different modes of transport can potentially lead to situations where it is difficult to balance investments across the network as a whole. Self-contained projects within ports may be viable, but there may be greater difficulty in achieving the equally important hinterland connections.

Within the NSMED Corridor, a screening exercise on the project list has categorised around **75 projects**, which have revenue streams, **or potential for revenue generation**, and which might therefore be feasible for development through innovative financial instruments. In general, these are investments in seaports, airports, and other nodes such as inland ports and logistics platforms, where investors are able to recover costs through user charges. Schemes to supply alternative fuels also fall into this category of projects with potential direct revenue streams. However, because of the wide variety of circumstances, in terms of project histories, national programmes, the uncertainty over the nature of future availability of EU grant funding, and the broad range of financing schemes that might be considered innovative, individual projects are not itemised.

7. Innovative Flagship Projects

One of the opportunities offered by the corridor approach is for the rollout and deployment of innovation. With the June 2016 TEN-T Issues Papers, the EC has specified five policy areas, and introduced the concept of flagship projects as mechanisms for co-ordinating and applying innovation in transport.

In overview, these five areas are multi-modality and efficient freight logistics, intelligent transport systems, innovation and clean fuel infrastructure, urban nodes, and cooperation with third countries.

Each corridor is to include at least one flagship project, addressing one of the five topics. Flagship projects will build on the topics of the issues papers and take up bottom-up initiatives or projects that are driven, top-down, by transport policy objectives and will benefit from a strong involvement relevant sectors of DG MOVE.

Alternative Fuels Flagship

The first idea being pursued is a joint flagship for the NSMED, NSBAL, Atlantic and SCANMED corridors to deploy alternative fuels across the corridor road networks between Helsinki and Lisbon. The project will target both passengers and freight vehicles and four categories of alternative fuels; electric vehicles (EVs), compressed natural gas (CNG), liquefied natural gas (LNG), and hydrogen (H2).

Although alternative fuels technology is still in its infancy, especially with regard to long distance transport, the number of users and the number of outlets for alternative fuels are increasing steadily. NSMED corridor countries such as the Netherlands, France and the UK are amongst the front-runners for plug-in electric vehicles, currently with a stock of around 100,000 each. The evolution and innovation of alternative and sustainable fuels is developing rapidly, with construction of new port facilities for a broader range of alternative fuels like methanol, electric propulsion and hybrid fuels for inland vessels. There is an opportunity for a flagship project to develop a cross-border approach to connect the users, and to make it possible for them to travel longer distances along the corridors. This would allow greater co-ordination of existing initiatives, either by private companies or through national authorities (e.g. BENEFIC project) and create a model that could be adopted across the wider TEN-T network.

In December 2017, an expression of interest for project promoters to participate in a workshop for the alternative fuels flagship project has been launched via the TEN-T corridor networks of stakeholders. The aim is to encourage the deployment of interoperable supplies of alternative fuels and electrical charging points by linking together a wide range of individual initiatives, supported by CEF funding.

Urban Logistics

The second flagship project for the NSMED corridor is to develop measures in some of the major cities for improving the accessibility of multi-modal facilities. A typical issue found within the corridor is that seaports, inland ports or rail-freight terminals in urban nodes have limited land for expansion, and are constrained by congested onward transport links, where they compete with local transport services. By improving the local accessibility of urban freight facilities, it is possible to increase the usage of multimodal services for long distance inter-urban transport. The aim of this flagship is therefore to involve a number of different corridor cities, provisionally including Paris, Belfast, Brussels, Antwerp and the Zuid Holland Metropolitan area, to take part in the flagship to develop projects to improve local access to long-distance multimodal networks, thus helping to achieve the corridor's aims of cohesion, economic development, and migration to low carbon alternatives.

8. The European Coordinator's recommendations and future outlook

As we conclude the third Work Plan of the North Sea Mediterranean Core Network Corridor, I would like to reflect upon the progress we have made, together with the six Member States - Belgium, France, Ireland, Luxembourg, the Netherlands and the United Kingdom - the members of the Corridor Forum and the consortium of consultancy companies contracted by the European Commission. We would not have achieved this outcome without the combined efforts of the entire team, and it is pleasing to see how new working groups and initiatives are being formed from within our network.

I was appointed as European Coordinator in 2014, and since this time we have established a firm foundation from which to develop the corridor into a fully multimodal transport system, providing connectivity and mobility, as envisaged in the TEN-T legislation, emphasising the corridor's economic functions of trade development, employment as well territorial and social cohesion and sustainability. We now see a whole range of initiatives, large and small, being realised as real-life investments across the corridor.

While acting within the scope of the Second NSM Corridor Work Plan, we have carried out a number of very fruitful on-site visits all along the corridor studying both the ongoing and planned projects including seaports, inland waterway connections, rail and road projects, pipelines, major sea locks, etc. All these visits allowed me personally and the DG MOVE's TEN-T team to gather practical information and updates straight from the field on the progress being made with the crucial projects on the Corridor and these learnings have helped us in the preparation of this Third Draft Work Plan for the NSM Corridor.

We have held by now eleven Forum meetings since 2014, involving representatives of Member States, regions, and infrastructure managers and a range of other stakeholders, and we have organised regional working group meetings in Ghent, Liège, Paris, Metz, Strasbourg and Marseille, often jointly with other Core Network Corridors. These have enabled us to enlarge the circle of participants, and to explore in more detail the specific issues arising in different urban areas, regions and across different modes of transport, and helped us to develop synergies with connecting corridors. I would therefore like to express my thanks, once again, to all the organisations and officials who contributed such valuable time and insights towards the development of this corridor.

The external challenges we face do not diminish however. Naturally, as this is the only TEN-T corridor to include the UK, there is a great deal of interest in the outcome of Brexit. Negotiations between the UK and the EU are making progress, but whatever the final outcome, there will be a continuing need for efficient transport networks and

strong trading links between the UK and her neighbours, and therefore a continuing need to maintain the integrity of the transport corridor, and to bring truly efficient and sustainable transport connections between Ireland and the European continental mainland.

As we have seen, the role of transport in our society keeps evolving. Aside from its importance in generating jobs and economic growth, the European transport sector still has a very large contribution to make towards global decarbonisation objectives, and this needs to be achieved without restricting mobility. As the North Sea Mediterranean Corridor covers some of the most heavily populated and economically active regions in Europe, with great potential for growth, and because it is still a corridor, which relies very heavily upon road transport, there needs to be a comprehensive and concerted effort here to achieve reductions in greenhouse gas emissions.

The two key opportunities are the deployment of low or zero-emission vehicles, and the greater use of lower emission transport modes, namely sea, inland waterway and rail. There needs to be a stronger connection made between infrastructure planning and transport policy in areas such as innovation, alternative fuels and ICT. Core network corridors, such as the North Sea Mediterranean, which connect some of the most prosperous and dynamic regions of Europe provide a new space for innovation deployment, and can play a key role in accelerating the take-up of clean vehicles and in shaping the evolution of a continuous and interoperable European network, in which they can be operated. We are now seeing important developments in this field, with North Sea Mediterranean Member States being amongst the leading countries in Europe for building and using zero emission vehicles, and for providing alternative fuel and electricity supplies for transport. As the technology improves rapidly, there is a need to ensure full interoperability along the corridor. In 2017, the European Commission launched its innovative flagship projects in order to bring greater focus on these initiatives within the corridor network and there are already two flagship projects taking shape on the North Sea Mediterranean corridor, one on alternative fuels deployment and the other on the accessibility of multimodal facilities in urban nodes.

Through initiatives such as the high-speed rail network, which is well developed in the North Sea Mediterranean Corridor, and with the wider use of new technology for road vehicles, there is a strong foundation for lowering carbon emissions in the passenger sector, even against a baseline forecast of economic growth and higher levels of mobility. In the freight sector, where technological solutions are further away, there is still a pressing need to achieve greater balance across the available transport modes.

In the North Sea Mediterranean corridor, maritime and inland waterway transport plays a key role in connecting the different regions. The investments which we now see in the maritime sector have a dual purpose, first in assisting the shift of freight from inland to maritime transport, and second, in improving economic cohesion across

the corridor, and especially for the more peripheral regions in Ireland and the Northern parts of the UK where maritime transport is such an important route to the EU's common market. All of these initiatives and specific projects aimed at making maritime transport alternatives more viable and realistic can serve as scalable models for the upgrading of other ports and multimodal terminal along the corridor.

The process of developing more efficient routes via seaports needs to be looked at from the point of view of door-to-door transport. Ports, which are key nodes in the corridor, need to be accessible from inland by rail and where feasible by inland waterway. In this respect, the North Sea Mediterranean is well positioned. The Dutch and Flemish ports have well-established hinterland networks using waterway and rail, and there is a supporting network of inland terminals along the Albert Canal and the Walloon region, for example, where goods can be transferred to and from barges, and relayed into Central Europe by rail. A key objective in the Work Plan is to continue to upgrade the supporting waterway and rail networks to avoid bottlenecks, and to broaden the range of destinations which can be served. Connecting Paris to the Rhine-Maas-Scheldt networks with the Seine-Nord Canal will be a critical step towards achieving the vision of the multimodal corridor. Although this has been threatened in 2017 by a funding gap, the French Government has stressed that great attention is being placed on the Seine-Nord Canal, and that the Government is committed to defining solutions with local authorities that will secure the project's funding.

In the South, Marseille feeds traffic into the corridor along the Rhône Valley towards Lyon and the North, and a new strategy is in place to increase the co-ordination of stakeholders along the corridor to help develop traffic flows at the port, and to make greater use of rail and inland waterway connections by solving bottlenecks close to the port itself. Inland ports and terminals such as Lyon, Bettembourg and Strasbourg are all developing their capacities to exploit this opportunity. In turn, the full development of this branch of the corridor opens up access to the Mediterranean and the global trade routes.

As the first and final link in the multimodal chain, we need to recognise the role of urban nodes, including secondary urban nodes, in the corridor, and the last-mile connections allowing access for heavy traffic to ports and terminals. In many of the nodes, we see a fragmented array of urban freight facilities with limited space, sub-optimal access to rail networks, high levels of competition against local passenger transport networks for rail paths, and congested road networks. Good access points for multimodal freight are essential for achieving greater modal shift. Within the rail network, there are frequently bottlenecks to be found around the major cities, restricting the total capacity for long distance rail freight and passenger rail services.

Nevertheless, this corridor has opportunities for increasing rail freight traffic. Cooperation with the North Sea Mediterranean Rail Freight Corridor plays a key role here, in promoting the growth of cross-border rail traffic and developing high-capacity connections to the wider European network. To the South West, it is expected that

following investments on the Mediterranean and Atlantic corridors, the Iberian cross-border rail freight market will open up towards Central Europe, bringing traffic into the North Sea Mediterranean via the Marseille and Paris nodes towards Belgium, the Netherlands, the UK and Germany. To the East, there are now significant developments in the establishment of viable long distance rail routes via the "New Silk Road" to China, with further and accelerated growth expected until 2030. These developments offer a lower-cost alternative to air-freight transport, and a faster alternative to maritime transport, and although freight flows are currently focused mostly on Central European hubs in land-locked areas, there are initiatives underway to establish higher capacity, lower cost services to the main logistics areas in the Benelux countries, and from there, along the North Sea Mediterranean Corridor to France and the UK. The port of Marseille can be the Mediterranean gateway of the "maritime silk roads" on the corridor.

This is the third generation of the North Sea Mediterranean Core Network Corridor Work Plan, representing the fulfilment of my first mandate as European Coordinator under Article 47 of the TEN-T Regulation. However, this is only the start of the process towards realising our objectives for a truly connected Europe by 2030. For the future we need to focus on closing the funding gap by increasing budgetary support through a new and stronger framework of grants, financial instruments and blending facilities as outlined in the Joint Declaration of the European Coordinators (September 2017), and by streamlining the planning procedures for key cross-border projects, as it is imperative to maintain the momentum. Only in this way can we realise the potential benefits in terms of jobs, growth, cohesion, decarbonisation and digitalisation. I count on your continued support and commitment in the years to come.

I wish us all a fruitful continuation of this major long-term project with the active and engaged participation of all Member States, local/regional authorities and all other corridor stakeholders - both public and private - all for the benefit of European competitiveness.

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