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European Commission

TEN-T Core Network Corridors Scandinavian-Mediterranean Corridor

2nd Phase

Final Report on the Elements of the Work Plan

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Information on the current version:

The draft final version of the final report on the elements of the Work Plan was submitted to the EC by 22.05.2017 for comment and approval so that a final version could be prepared and submitted by 06.06.2017.

That version has been improved with respect to spelling and homogeneity resulting in a version delivered on 30.06.2017.

The present version of the report is the final final version submitted on 12.07.2017.

Disclaimer

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Abbreviations

A-CDM	Airport Collaborative Decision Making
A-SMGCS	Advanced Surface Movement Guidance and Control System
ABS	Ausbaustrecke
AC	Alternating Current
AMAN	Arrival Manager
ANNA	Advanced National Networks for Administrations
ANSP	Airport Navigation Service Provider
Approx.	Approximately
Art.	Article
ATM	Air Traffic Management
BBT	Brenner Base Tunnel
BMVI	Bundesministerium für Verkehr und digitale Infrastruktur
bn	Billion
C-ITS	Connected and automated driving
CEF	Connecting Europe Facility
CEMT	Conférence européenne des ministres des Transports
CMP	Copenhagen Malmo Port
CNC	Core Network Corridor
CNG	Compressed Natural Gas
DC	Direct Current
EDI	Electronic Data Interchange
EU	European Union
ERTMS	European Rail Traffic Management System
ETCS	European Train Control System
ETIS	European Transport policy Information System
EUR	Euro
FS	Ferrovie dello Stato
GDP	Gross domestic product
HSL	High-speed line
Hz	Hertz
ICT	Information and Communications Technology
ID	Identification Number
INEA	Innovation and Networks Executive Agency
ITS	Intelligent Transport System(s)
IWW	Inland Waterways
km	Kilometre
km/h	Kilometres per hour
KPI	Key Performance Indicator
kV	Kilovolt
LNG	Liquefied Natural Gas
LPG	Liquefied Petroleum Gas
LTE	Long Term Evolution
min.	Minimum
mm	Millimetre
MoS	Motorways of the Sea
NUTS	Nomenclature des unités territoriales statistiques
ÖBB	Österreichische Bundesbahnen

RIS	River Information Service
RMG	Rail mounted gantry crane
RNE	RailNet Europe
RoLa	Rolling Motorway
RoRo	Roll on/roll off
RoPax	Roll-on/roll-off passenger
RRT	Rail-Road Terminal
RTS	Remote Tower Services
ScanMed	Scandinavian-Mediterranean
SCM	Supply Chain Management
SESAR	Single European Sky ATM Research Programme
SUMP	Sustainable Urban Mobility Plan
t	Ton
TEN-T	Trans-European Transport Network
TEU	Twenty-foot Equivalent Unit
VTMIS	Vessel Traffic Management Information System
WSV	Wasser- und Schifffahrtsamt

Country Codes according to ISO 3166:

FI	Finland
SE	Sweden
NO	Norway
DK	Denmark
DE	Germany
AT	Austria
IT	Italy
MT	Malta

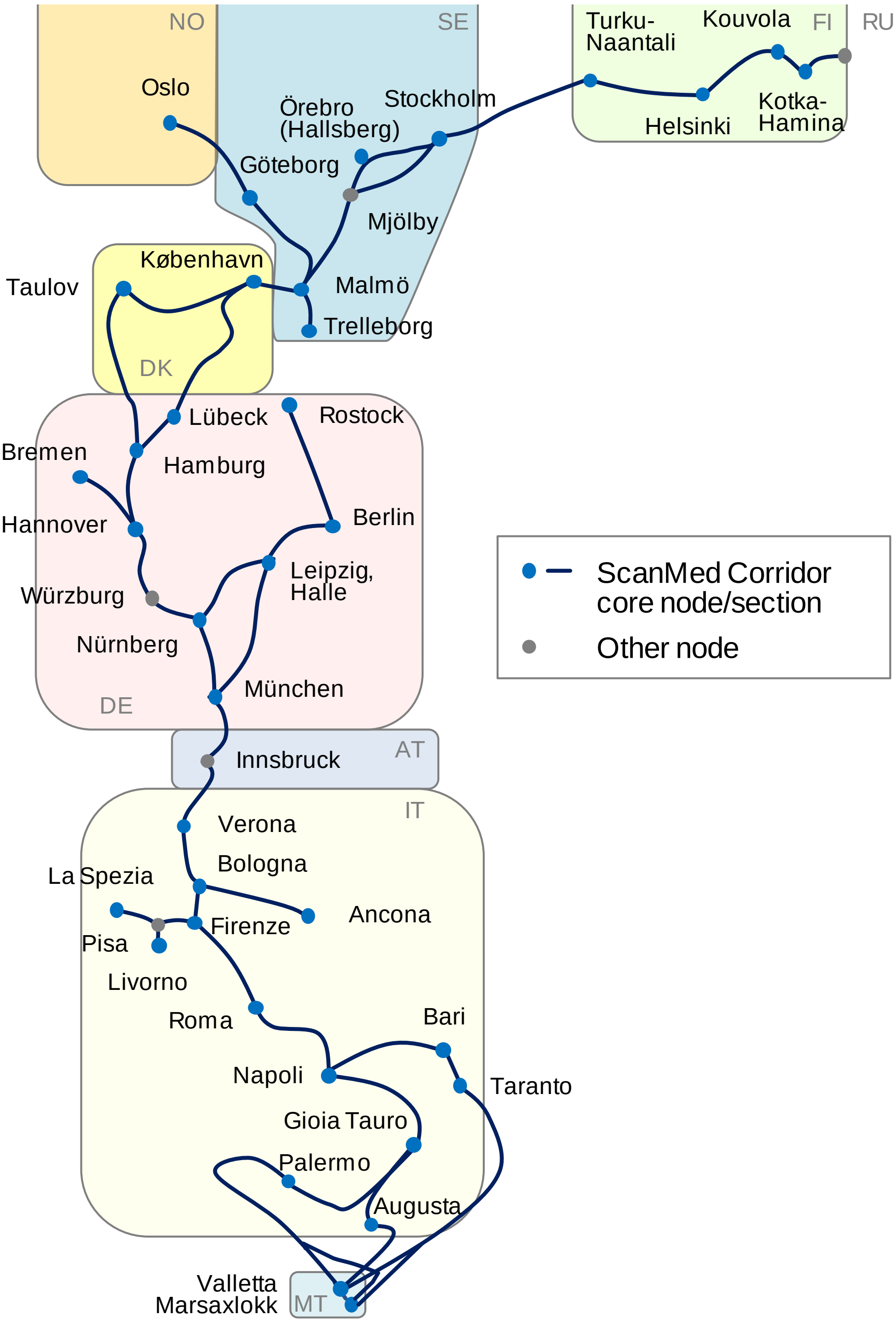
1 Executive summary

Together with the results from the first Corridor study completed in 2014, the "Preliminary Report on Elements of the Work Plan" accomplished in June 2016 and the "Final Report on the Project List" of June 2017, the contents of this "Final Report on the Elements of the Work Plan" serve as an important input for the Update of the Work Plan by the European Coordinator ("3rd generation Work Plan") to be provided in autumn 2017.

1.1 Characteristics and alignment of the ScanMed Corridor

The ScanMed Corridor links the major urban centres in Germany and Italy to Scandinavia (Oslo, København, Stockholm and Helsinki) and the Mediterranean (Italian seaports, Sicily and Malta). It covers seven EU Member States and Norway and represents a crucial axis for the European economy, crossing almost the whole continent from North to South. The cartogram in Figure 1 shows the corridor's schematic alignment and its core nodes according to the TEN-T and CEF-Regulations.

Figure 1: Alignment of the ScanMed Corridor



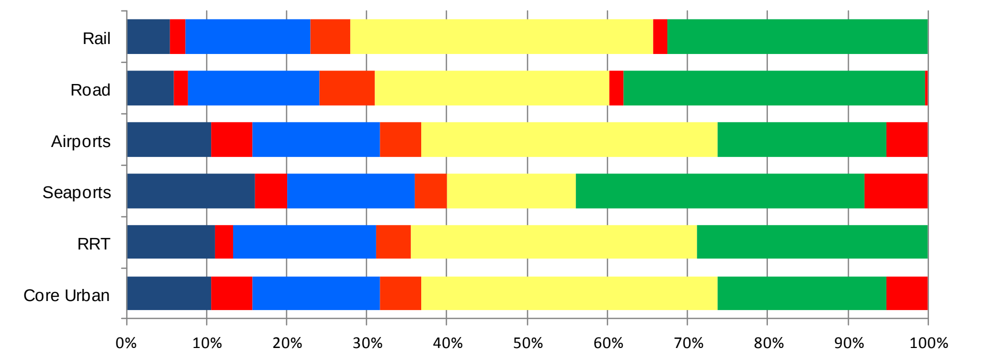
Source: KombiConsult analysis, December 2016

"Linear" modes of transport that are assigned to the corridor are mainly rail and road, while inland waterways are not relevant for European coordination along this corridor. Several sections of the alignment, in particular the connections Finland – Sweden – Denmark - Germany and Italy – Malta, cross the sea. The maritime dimension, however, goes far beyond the single corridor and connects European countries with each other and the rest of the world. The horizontal priority "Motorways of the Sea" is therefore followed by a separate European Coordinator who has presented his Work

Plan which has been adopted by the Member States in December 2016. The other dimension of the ScanMed Corridor is composed of "nodal" infrastructure such as airports, seaports and rail-road terminals of the core network. As regards modal and infrastructural interconnection between the trans-European regional and local transport networks "urban nodes" are of specific importance, since they are often the generators of traffic, both passenger and freight. In goods transport, freight villages or "interporti" are often used to consolidate cargoes. 8 out of "Top 20" European freight villages, including the ranks 1 to 4 are located on the ScanMed Corridor.

The ScanMed Corridor is the largest in terms of core network length of rail (> 9.400 km) and road (> 6.300 km) and number of core ports, airports and rail-road terminals (in total about 90 sites). An overview of the quantitative characteristics of the corridor is provided in table 2:

Figure 2: Characteristics of the ScanMed Corridor in the year 2016

Mode/Node	Dimension									Total
	ColourCode	FI	NO	SE	DK	DE	AT	IT	MT	
Rail	network length [km]	518	169	1.462	476	3.532	163	3.053	-	9.337
Road		376	116	1.039	440	1.869	109	2.401	22	6.372
Airports	number	2	1	3	1	7	-	4	1	19
Seaports		4	1	4	1	4	-	9	2	25
RRT		5	1	8	2	16	0	13	-	45
Core Urban		2	1	3	1	7	0	4	1	19
Country Shares										

Source: KombiConsult analysis, May 2017

With München, Roma, København, Stockholm and Berlin 5 of the TOP 20 European airports are located on the ScanMed Corridor. These airports facilitate also as hubs linking smaller airports and regions to the international aviation network. Also the corridor's seaports are top scoring both in passenger and freight transport. Helsinki, Stockholm and Napoli are ranking among European Top 10 passenger ports and Hamburg, Bremen (with Bremerhaven) and Gioia Tauro are among Europe's largest container ports. While other corridors are focusing on a few ports and concentrated trade lanes the strength of the ScanMed Corridor is its variety of ports, alternative routings – both by land and by sea - and resulting flexibility for the transport users.

Compliance with the technical infrastructure requirements

Regulation (EU) 1315/2013 sets out the transport infrastructure requirements for each of the transport modes and the connected infrastructure components. The comprehensive set of core parameters analysed during the first Corridor study was reduced to a limited set of Key Performance Indicators (KPI), which aim at measuring the progress of all nine Core Network Corridors in a comparable way and by exploiting publicly available sources. Corridor specific characteristics have been added in order to present a more complete picture of the Corridors' development. The selected parameters and their evolution over time are presented in the next table.

Article 4 of the Regulation (EU) 1315/2013 describes the objectives of the trans-European transport network, which shall strengthen the social, economic and territorial cohesion of the European Union. The aim is to create a single European transport area, which is efficient and sustainable, to increase the benefits for its users and to support inclusive growth. The Member States agreed a list of specific objectives, which have to be met by the ScanMed Corridor by 2030 at the latest (see the last column headlined "target 2030" in the following table).

The baseline values have been quoted from the 2014 Study and refer to data for the years 2012 or 2013, published by mid-2014. 'Status 2016' refers to data available for the years 2014/2015 in spring 2016, while the recent 'Status 2017' is based on data of the years 2015/2016 in spring 2017. In most cases the data sources are the mode managers' websites. In addition we have used the Final Project List to identify "accomplished" projects and their contribution to "improve" or "achieve" the respective KPI.

Compliance with respect to most parameters was already quite good. However, the values for airport connection to rail and availability of clean fuels in ports as well as on road infrastructure could be improved compared to the baseline.

Concerning the airports it has to be noted that Article 41(3) of the TEN-T Regulation requires (only) the "main airports indicated in Part 2 of Annex II […] to be connected with the railway and road transport infrastructure of the trans-European Transport network by the 31 December 2050. …". The "main airports" of the ScanMed Corridor are Helsinki (Vantaa), Stockholm (Arlanda), København, Berlin, Hamburg, München, and Roma (Fiumicino). These airports are already "connected" by rail and road so that also this KPI is fully achieved.

Table 1: Generic supply-side KPI – baseline 2014, status 2016, 2017 and target 2030

Mode	Generic supply-side KPI	Unit	Baseline value 2014	Status 2016	Status 2017	Target 2030
Rail network	ERTMS implementation	%	n.a.	n.a.	n.a.	100
	Track gauge 1435mm ('isolated' network with 1,524mm gauge exempted)	%	95-100	95-100	94.5-100	100
	Electrification	%	96	96	96	100
	Line speed (≥100km/h)	%	93	93	93	100
	Axle load (≥22.5t)	%	94	94	94	100
	Train length (≥740m)	%	66	66	66	100
Inland water-way network	CEMT requirements for class IV	%	n.a.*	n.a.*	n.a.*	n.a.*
	Permissible Draught (min 2.5m)	%	n.a.*	n.a.*	n.a.*	n.a.*
	Permissible Height under bridges(min. 5.25m)	%	n.a.*	n.a.*	n.a.*	n.a.*
	RIS implementation	%	n.a.*	n.a.*	n.a.*	n.a.*
Road network	Express road/ motorway	%	99	99.1	99.1	100
	Availability of clean fuels	Number	CNG n.a. LNG n.a. H2 n.a. ECP n.a.	2.271 7 53 9.318	2.242 7 63 36.987	n.a.
Airport	Availability of at least one terminal open to all operators in a non-discriminatory way and application of transparent, relevant and fair charges	%	100	100	100	100
	Connection to rail ("main airports")	%	60	63	68-100	100
	Availability of clean fuels	%	0	0	0	100
Seaport	Connection to inland waterway CEMT class IV	%	50	50	50	100
	Availability of clean fuels	%	12	20	24	100
	Connection to rail	%	83	83	83	100
	Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	%	100	100	100	100
	Facilities for ship generated waste	%	100	100	100	100
Inland ports	CEMT Class IV waterway connection	%	n.a.*	n.a.*	n.a.	n.a.*
	Connection to rail	%	n.a.*	n.a.*	n.a.	n.a.*
	Availability of clean fuels	%	n.a.*	n.a.*	n.a.	n.a.*
	Availability of at least one freight terminal open to all operators ...	%	n.a.*	n.a.*	n.a.	n.a.*
Rail Road Terminals (RRT)	Capability for intermodal (unitised) transhipment	%	71-100	71-100	71-100	100
	Availability of at least one freight terminal open to all operators	%	100	75-100	75-100	100
	Electrified train terminal accessibility	%	***)	32	36	100
	740m train terminal accessibility	%	***)	18	14	100
	*) Inland waterways and inland ports are not part of ScanMed Corridor, these KPI are not applicable. **) Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Hydrogen (H2) energy stations and electric charging points (ECP) in the ScanMed Corridor countries. ***) Data only partly available from publicly available sources (terminals' websites, network statements, since it requires detailed definitions.					

Source: HaCon, Ramböll, Uniconsult, GruppoCLAS, KombiConsult, Prognos analysis, June 2017

1.2 Traffic demand and forecast

Analysis of the baseline data shows that in 2010, the most important rail freight relationships are, in both directions, SE – DE, AT – DE, DE – IT and IT – AT. It becomes obvious that the "gravity centre" of rail freight flows is located in Germany and Austria. The most important corridor relevant road freight flows in 2010 in both ways are the relations DK – DE, IT – DE and FI – SE, which amount to almost 70 % of all international road freight flows between the corridor countries and comprise approx. 50 million tons. In comparison to the rail freight volumes, the structure of flows illustrates a broader spatial distribution of important relations on the corridor. The dominant relations are located in the northern part of the corridor, mainly related to Germany and Sweden supplemented by the flows from the remaining Scandinavian countries.

For 2030, the rail traffic calculations show high loads (> 60,000 trains / year) on the northern market sections in the area of Malmö, København and Taulov, Hamburg/Bremen – Hannover - Würzburg as well as in the Innsbruck area (Brenner) and on the sections Bologna – Firenze – Roma - Napoli. With regard to road transport, the Scandinavian traffic loads are comparatively low, while the road traffic is expected to be comparatively high in Germany (specifically Lübeck – Hamburg, Hamburg/Bremen – Hannover, as well as the Nürnberg – München market sections) and on the important Italian relation between Firenze and Roma. Most corridor aligned seaports show freight volumes between 15 and 45 million tons per year (exception: Hamburg, Göteborg, and Livorno with 50+ million tons/year).

Key performance indicators are being used in the scope of the 2015-2017 core network corridor studies to assess and monitor the evolution of the corridors.

As with the supply-side, the demand-side is subject to generic KPI's, of which the inland waterway freight flow is not relevant for ScanMed. The ScanMed airports were able to increase both their passenger flow (+16 index points) and their freight flow (+4 index points) during 2 years. Also the ScanMed ports recorded positive developments with an increase by two index points between the years 2013 and 2016 for each passenger and freight flows.

Table 2: Generic demand-side KPI, baseline 2014, status 2016 and 2017

Mode	Generic demand-side KPI	Unit	Baseline value 2014	Status 2016	Status 2017
Inland waterway network	Total inland waterway freight flows	index (2014=100) (Tonne Kms)	Not applicable	Not applicable	Not applicable
Seaports/ inland waterway ports	Total passenger flows	index (2014=100) (Passengers)	100 49.061.000	101 49.398.000	102 49.928.000
	Total freight flows	index (2014=100) (Tonnes)	100 522.421.000	103 535.627.000	100 520.316.000
Airports	Total passenger flows	index (2014=100) (Passengers)	100 238.723.000	110 262.517.000	116 277.259.000
	Total freight flows	index (2014=100) (Tonnes)	100 1.976.000	105 2.082.000	104 2.059.000

Source: Uniconsult analysis based on port statistics, data for 2013, 2014 and 2015 (since 2016 is not fully available, yet); GruppoCLAS analysis based on aviation statistics, data for 2013, 2014 and 2015 respectively.

The modal share indicators show the share of each transport mode in the total national traffic performance measured in person-kilometres for passenger transport and tonne-kilometres for freight transport. For the overall indicator, the national traffic performances of all ScanMed Corridor countries are aggregated and the respective share is calculated. Since the baseline value passengers railways have gained 1 per cent from road, while in freight inland waterways have gained 1 per cent from road.

Table 3: Corridor modal share, baseline 2014, status 2016 and 2017

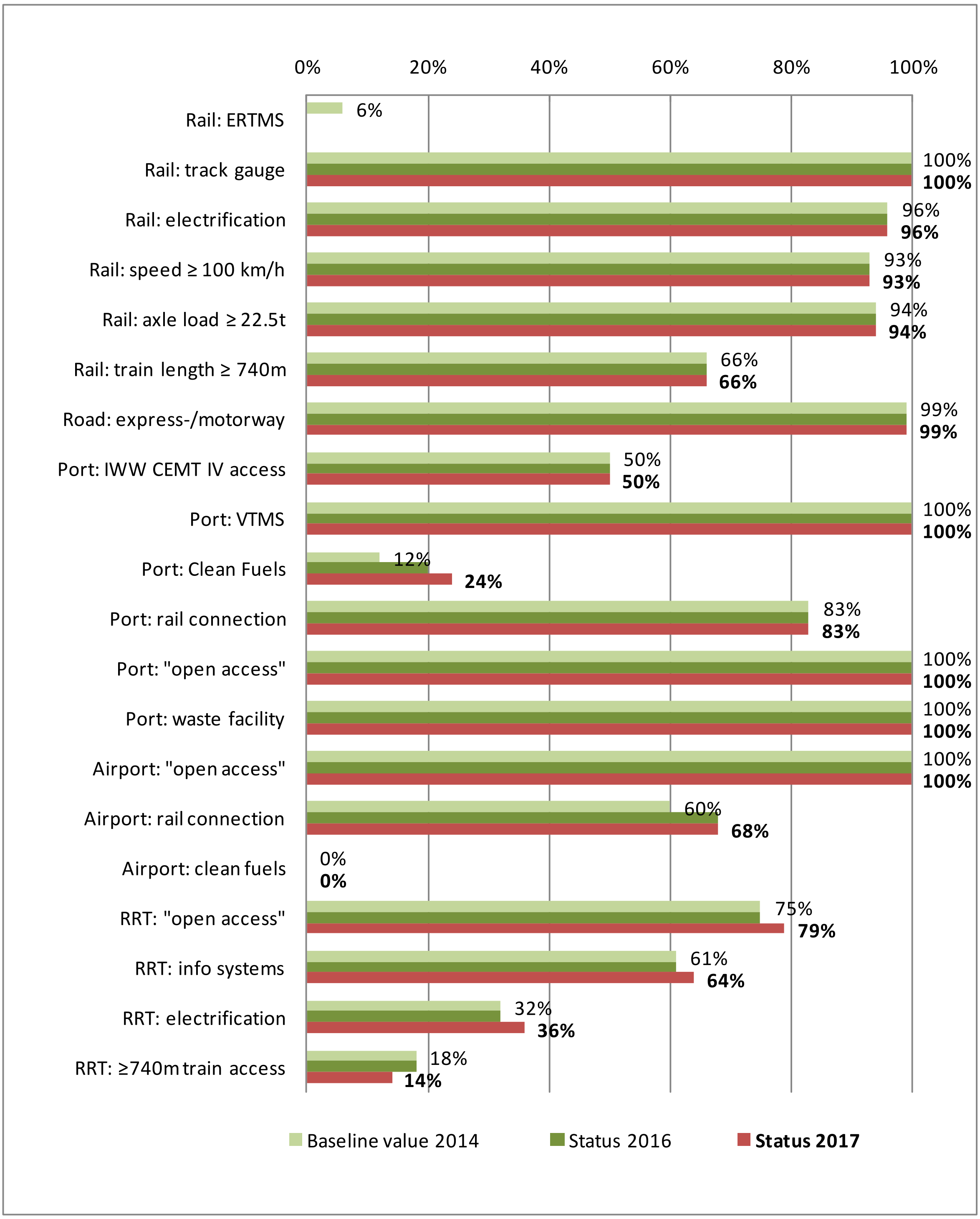
Mode	Modal share index	Unit		Baseline value 2014	Status 2016	Status 2017
Inland Surface Transport	Modal Split in National Passenger Inland Surface Transport	Percent (%)	Passenger Cars Buses and Coaches Railways Trams and Metro	83 9 7 1	82 9 8 1	82 9 8 1
Inland Surface Transport	Modal Split in National Freight Inland Surface Transport	Percent (%)	Road Rail: Inland Waterways	70 23 7	69 23 8	69 24 7

Source: Prognos based on EU Transport in figures - Statistical Pocketbook 2015, 2016 Chapters 2.3 and 2.4; data of 2011, 2013 and 2014 respectively

1.3 Actions already accomplished

In the first reporting period after the adoption of the Regulation (EU) 1315/2013, 47 identified actions were completed. They were related to all transport modes with 10 rail, 10 road, 4 airport, 21 maritime and 2 multimodal projects completed. The impact of these actions on the KPI has been analysed.

Figure 3: Development of selected KPI's baseline 2014, status 2016 and 2017



Source: KombiConsult analysis, June 2017

Since the adoption of the TEN-T Regulation values of Key Performance Indicators changed only slightly. Some further ports have implemented facilities for clean fuels and the airport of Helsinki was connected to heavy rail in July 2015. The availability of clean fuels at airports and the full implementation of "≥740m trains" remain on a low fulfilment rate. Nevertheless, Member States have implemented and prepared a number of measures in order to provide an operational Trans-European transport network in line with the provisions of Regulation (EU) 1315/2013 by 2030.

Rail Infrastructure and ERTMS

As indicated in Table 12 projects completed in the reporting period 2014-2016 did not have any effect on the listed parameters. Still, only Sweden shows compliance throughout the TEN-T parameters (ERTMS is an exception since no related project has been finished so far). Although the projects concluded did not improve parameters, they improved the overall rail transport situation on numerous sections of the corridor without explicitly addressing the parameters given. Therefore, these accomplished projects have to be considered, too.

Road Infrastructure

In terms of requirement for express road or motorway, the existing network has coverage of 99.1%, measured in kilometres. The remaining sections are in Finland, 0.7%, where the sections are in rural areas with relatively low traffic volumes or known to the Finnish planning authorities and planned for improvement. In Italy the remaining sector is the road connection to Ancona which covers 0.2% of the ScanMed Corridor.

3 of the 13 accomplished actions target traffic control and information concepts. 2 of the actions target both new or upgraded infrastructures as well as ITS solutions while 7 actions target new or upgraded infrastructure but not ITS solutions. All actions will have positive impacts on road safety.

From 2014 to 2017 there have not been any projects targeting clean fuels and safe parking.

Air Infrastructure (Airports)

In the last three years, from the issue and start of implementation of the Regulation (EU) 1315/2013 to nowadays, some starting actions aiming at the complete compliance of airports to the targets dictated to the regulation have already been undertaken.

In particular, no action is needed in order to achieve the target goal of open access in terms of accessibility for operators and viability of operations by them in a non-discriminatory environment, since it is already met by all the airports on the corridor.

The SESAR project is in its early stage of implementation and no relevant data could be collected about.

Relevant increase in capacity have been achieved in the analysis time horizons: in particular Berlin Schönefeld (+10%), Oslo Gardermoen (+17%), München (+22%), and Roma Fiumicino (+17%).

The KPI related to connection with rail highlights a slight increase due to the new rail facility opened at the airport of Helsinki. Also the rail infrastructure to the new Berlin Brandenburg airport has been completed but the airport is still not in operation. All "main airports" of the corridor are now connected with rail.

There is no relevant operational progress about the availability of clean fuels.

Maritime Infrastructure (Seaports) and MoS

On the one hand, the 25 ports of the ScanMed Corridor generally provide sufficient sea access, non-discriminatory access to at least one terminal, reception facilities for ship generated waste and VTMIS, e-Maritime services and SafeSeaNet. Furthermore, the majority of ports has rail connection (83%). One exception is the special case of Maltese ports, where no railway network exists. Hence, this parameter cannot be applied on the ports of Valletta and Marsaxlokk. The second exception is the Danish side of Copenhagen Malmö Ports and remaining exceptions are ports of Bari (the existing rail connection was deactivated in 1993), Palermo (the existing rail connection was deactivated in 1957) and Augusta (the existing railway line close to the main oil refineries was used for commuter trains only and didn't connect the port's terminals to the national railway network) in Italy.

On the other hand, only 50% of the ports which are located in Member States with inland waterways have connection to inland waterways so that single improvement measures should be taken. Broader need for improvement can be noted with regard to the availability of clean fuels. Although a strong improvement by 12 percentage points can be noted for the last three years, this positive development is mostly limited to the Scandinavian ports. Therefore, a major challenge is to facilitate the supply of clean fuels in German, Italian and Maltese ports. It is recommended that German, Italian and Maltese port infrastructure managers and politicians cooperate with and learn from their appropriate partners in the Scandinavian countries.

Rail-Road Terminals

The 28 Rail-Road Terminals of the ScanMed Corridor which were incorporated in the detailed analysis generally are connected to rail and road, provide discrimination free access for their users and are equipped with qualified handling equipment for all types of intermodal loading units. Terminal management systems are widely used for providing real time information on the operational situation in the terminal and for the data exchange with connected transport mode operators (railway undertakings, intermodal operators and forwarders). Nevertheless not all sites are equipped so that single improvement measures should be taken. The largest challenge for the present sites is their historically grown access to the rail infrastructure (single sided, non-electrified, annex to shunting yard or port railway line) and the limitation of the (wagon) train length by either the reception/departure siding or the transhipment track(s). Only 4 sites (Rosersberg, Hallsberg, Bremen and Bologna) are providing transhipment tracks of ≥ 740 m. It is recommended that rail infrastructure managers and terminal managers cooperate towards realizing the track side and terminal side improvement of that parameter in a coordinated way.

1.4 Plan for the removal of physical and technical barriers

Rail Infrastructure and ERTMS

Summarising, the analysis of the project list regarding contributions to the KPIs (line speed, electrification, axle load, train length) and other relevant parameters (line capacity, single track sections, strong inclines) has shown that substantial progress can be expected until 2030 on numerous parts of the corridor. In this context, the identified projects (Fehmarn Belt Fixed Link, VDE8 Berlin – Halle/Leipzig – Erfurt – Nürnberg, Brenner Base Tunnel, Palermo – Catania and Napoli – Bari) will provide large-scale compliance with the requirements of the Regulation.

However, it has also become evident that the envisaged development of the corridor is jeopardized by several risks, particularly concerning project maturity data, and:

- Missing KPI compliance towards permitted train length ≥ 740 m in (almost) entire Austria and Italy;
- Missing KPI compliance towards axle load ≥ 22.5 t in large parts of Italy (nota bene: projects for elimination of this incompliance are foreseen and works only need to be started;
- Single track lines, which currently show no capacity problems with mostly regional traffic, but might become a severe bottleneck with the envisaged (long-haul) volume increase by 2030. In this respect, the following line sections should receive particular attention:
    - Germany: Lübeck – Puttgarden DE/DK, southern access line of the Fehmarn Belt Fixed Link,
    - Denmark: Rødby – Ringsted DE/DK, northern access line of the Fehmarn Belt Fixed Link;
- Not yet approved, complete financing of projects or missing of respective information. As all information have been gathered from official documents and furthermore approved by the Ministries of Transport or other stakeholders, the envisaged dates for realisation have been taken for granted. It has to be noted that such gaps in project financing might just be due to missing information. Such information gaps shall be closed in the further corridor development process involving official documents as well as additional data from Ministries of Transport or from other stakeholders.
- The latter concerns in particular the southern access to the Brenner Base Tunnel where the section Fortezza – Ponte Gardena is said to be completed in line with the tunnels implementation while the directly next section Ponte Gardena – Bolzano is said to be completed after 2030 and no works costs are known at present. Even if the capacity might not be a problem directly after opening of the tunnel the operations concept for switching between the present mountain line and the new line should be clarified with RFI and the railway undertakings using the line.

The analysis has also shown that the improvement of the KPIs from 2016 to 2030 are effected by only 40 projects – out of 143 planned and on-going rail projects in total. In turn, this means that almost 72% of the rail projects either have no effect at all (e.g. pure study, project without reliable time line) or have some impact outside the KPIs of the Regulation. In most cases, these impacts are related to capacity increases, but also to noise protection, improvement of intermodality etc.

For the future this means that funding should prioritize systematic elimination of critical line sections. Projects should be clearly and provable dedicated to remaining incompliant line sections. In this context it is necessary to define criteria for evaluation of the '740 m criterion'. Up to now, no common methodology exists that would allow to decide if operation of 740 m trains on a rail network is possible or not. Such methodology is a necessary prerequisite to define the scope of projects to improve compliance of this KPI.

A similar demand for harmonized rules refers to the definition of requested line capacities as well as to a common methodology for calculation of (corridor-wide) capacity utilisation and remaining reserves. The identification of future capacity bottlenecks is the precondition for definition of respective projects to ensure sufficient capacities at the demanded line sections. This issue will play a decisive role for a successful implementation of the corridor.

The coordination of implementation of ERTMS is led by a dedicated European Coordinator who has presented his Work Plan which has been subject to consultation by the European Parliament and the Member States during summer 2016. The present version of that Work Plan indicates that all ScanMed rail infrastructure will be equipped with ERTMS by 2030.

Road Infrastructure

By 2030 all road sections, with the exception of a small connection in western Finland and another in Italy, will be compliant regarding the KPI for express road or motorway. This will mean that by 2030 almost 100% of the corridor's length will comply. The remaining sections are known to the authorities but have no planned developments at present.

Regarding the KPI for alternative clean fuels the situation is made unclear as this term covers multiple clean fuels such as LPG, CNG, Electrification, Hydrogen etc. In terms of the general KPI of alternative clean fuels all sections of the corridor are covered, however not all clean fuels are readily available in all parts of the corridor today. The situation in 2030 is unclear as there is the need for private investment as well as public investment necessary for economically viable options to be in place. Some clean fuel station projects are included in the 2017 project list but most potential new stations will be developed outside the national plans. There are no current plans to introduce LPG stations in Finland or in the København-Malmö region although these could of course eventually be built by 2030.

Many projects planned by 2030 are aimed at increasing road capacity or improving road safety. These are not KPI's but improve the quality of the road network and reduce the risk of delays or accidents. Parking facilities are available already today, in various forms and with very different service facilities. There are only a few developments on the project list for new safe parking areas in Germany, however upgrading or improvements in other parts of the network may be developed as well.

Air Infrastructure (Airports)

Some KPI targets have already been achieved by all the airports (open access) or are expected to be achieved by quite all the airports within 2030 (capacity and connection with rail or other modes of transport). The two remaining targets regarding SESAR and clean fuels are expected to be not fulfilled by the ScanMed airports in 2030, so that more efforts on the measures related to these two targets should be put in the next years.

Maritime Infrastructure (Seaports) and MoS

At present, it seems that the ScanMed ports will be 100% compliant with 4 of 8 maritime parameters with regard to the year 2030. In the target year of 2030 VTMIS, e-maritime services as well as SafeSeaNet will be fully implemented in all ScanMed seaports. The I&C Technology as well as the IT and data exchange will be further developed. Furthermore, all ScanMed ports will be equipped with adequate sea access as well as facilities for the reception of ship generated waste. Current and planned projects aim at an ongoing improvement of the before mentioned parameters so that future demand patterns resulting from the further development within the shipping industry (e.g. increase of ship size, stricter environmental constraints and new technologies like scrubbers) will be satisfied. In addition, all ScanMed ports already possess respectively will possess at least one terminal which is open to users in a non-discriminatory way and which applies transparent charges. Hence, open access will be ensured in all ScanMed ports in the year 2030.

In addition, almost all ScanMed seaports (88%) implement or plan projects to modernize and expand their capacity. The only seaport which has not communicated such measures and plans is the Port of Oslo. Furthermore, two ScanMed ports (Göteborg and Palermo) have announced a modernization respectively expansion project. However, it must be doubted that these projects will be implemented until the year 2030 because of outstanding basic planning and financing issues.

19 of the 25 ScanMed seaports are already connected with railway lines. Marsaxlokk, Valletta, Augusta, Palermo, Bari and København are the 6 remaining ScanMed seaports which are not connected with railway lines. Due to missing railway network in Malta, this maritime parameter cannot be applied on the Ports of Valletta and Marsaxlokk. So the Danish side of Copenhagen Malmö Port (CMP) and the ports of Bari, Palermo and Augusta remain the only ScanMed seaports which are not compliant to this maritime parameter. It is not clearly communicated if CMP's strategic plan to move the container terminal in København to a new site in 2018 comprises a future connection to the railway network.[1] Therefore, it seems that the Danish side of CMP will still not be compliant with regard to this maritime parameter in the target year 2030. For Bari and Palermo, no projects are known which aim to connect these ports to rail. The existing project to create rail access to the port of Augusta is pursued desultorily (preliminary analyses and financing issues are still outstanding). Hence, it is not likely that the project will be concluded before 2030.

While full or at least a high degree of compliance can be noted with regard to the 6 before mentioned maritime parameters even for the target year 2030 as well as today, a lot of progress is needed in the following two fields. First, only 50% of the ScanMed seaports located in countries with an inland waterway (IWW) network are connected to IWW. Second, clean fuels are currently only available in 24% of the ScanMed seaports. While many ports plan to make clean fuels available in the year 2030 (meaning that clean fuels will be available in at least 60% of the ScanMed seaports), there aren't any projects with the aim to connect one additional ScanMed port to IWW.

Altogether, from today's perspective the ScanMed Corridor will be fully or at least strongly compliant with regard to most of the maritime parameters in the target year 2030. Nonetheless, it has to be clearly mentioned that the aim of 100% compliance will not be reached if no additional measures will be taken.

Rail-Road Terminals

The 28 Rail-Road Terminals of the ScanMed Corridor which were incorporated in the detailed analysis are generally connected to rail and road, provide discrimination free access for their users and are equipped with qualified handling equipment for all types

1 See: http://www.cmport.com/business/containers

of intermodal loading units. Terminal management systems are widely used for providing real time information on the operational situation in the terminal and for the data exchange with connected transport mode operators (railway undertakings, intermodal operators and forwarders). Nevertheless since 1 terminal which does not state to having an ICT system in place was added, the calculated share of "compliant" terminals was even reduced. The field of ICT system implementation is thus a field where improvement measures should be taken by the owners or operators of the respective sites. If it comes to public financing the public entities should assure that the ICT systems fulfil the requirements of Articles 28(1)(b) and 29(c) of the TEN-T Regulation in the strict sense. The largest challenge for the present sites is their historically grown access to the rail infrastructure (single sided, non-electrified, annex to shunting yard or port railway line) and the limitation of the (wagon) train length by either the reception/departure siding or the transhipment track(s). Next to the present 4 sites (Rosersberg, Hallsberg, Bremen and Bologna) also Kouvola, Taulov, Hamburg, Berlin-Großbeeren, München and Verona are committed to realize that parameter (≥740 m train length) by 2030, while for the other terminals project ideas exist but "works are not yet planned/agreed for realisation" so that there is only little improvement expected compared to 2016. It is recommended that rail infrastructure managers and terminal managers cooperate towards realizing the track side and terminal side improvement of that parameter in a coordinated way.

1.5 Administrative and operational barriers

Continuity of passenger and freight flows by rail is jeopardized at cross-border sections, due to changing technical parameters. Full exploitation of train capacities is particularly impacted for long-haul train runs, as they have to cope with frequent changes and multi-system locomotives are needed. Border control procedures influence transport/travel times, costs and resource efficiency of rail transport negatively. Also deviating infrastructure parameters at last mile connections or missing interconnections hamper the increase of rail transport.

Ports set their charges autonomously and may differ substantially in line with the applied organisational scheme. Increased transparency, e.g. by an obligation to publish tariffs on the port websites would support inland waterway transport. Non-harmonized administrative procedures in ports delay or prolong transports significantly.

Interoperability of ITS and tolling systems between Member States is an obstacle and burden for the hauliers and freight forwarders on long distance transport. The only cross-border cooperation system is established between Austria and Germany.

1.6 Urban nodes

Urban nodes are a crucial component of TEN-T corridors merging and redistributing traffic flows. The ScanMed Core Network Corridor comprises a total of 19 urban nodes in 7 Member States and Norway (as a member of the European Economic Area). Overall goal of the urban node network development is the appropriate interconnection of passenger and freight transport between all modes involved. Furthermore, a seamless connection between the (long-distance) TEN-T infrastructure and regional / local traffic and urban freight delivery on the last mile shall be achieved. Urban bottlenecks are to be removed leading the enhancement of multimodal transport solutions and a shift towards more sustainable mobility for both freight and passenger.

Main aim of the present analysis was the compliance check of CNC lines within the urban nodes. The compliance check addressed the requirements of the regulation and has been carried out for the urban nodes according to the KPIs of the project list. In particular, rail parameters taken into account were: train length (≥740m), axle load (≥22,5t), speed (≥100 km/h), electrification and capacity utilisation. Road sections have been analysed with regard to the parameter "express road/motorway".

Moreover, a last-mile connection compliance check has been carried out for each urban node in order to investigate whether a seamless connection between the (long-distance) TEN-T infrastructure and regional / local traffic and urban freight delivery on the last mile is achieved. The rail connection of inland ports, trimodal terminals and rail-road terminals to the core network has been analysed according to the parameters axle load, electrification and train length. Rail connections to airports have been evaluated on the basis of heavy rail connection. Only rail parameters have been taken into account as similar road criteria do not exist due to its flexibility allowing seamless connections.

In addition, improvement projects with reference to non-compliant sections or in case of particular relevance for the urban node have been pointed out.

In Table 4 the overall corridor network compliance check for Scandinavian-Mediterranean urban nodes is displayed. Considering all nodes, 70% of the analysed parameters are compliant with the regulation. Some 20 to 25% are partly compliant and about 5% of the parameters are non-compliant.

Corridor rail lines within the 18 nodes (Valletta has no rail connection) suffer of different bottlenecks. About 65% analysed rail parameters per node are compliant while about 35% of them are not satisfying on at least a rail section within the urban node. The rail parameter most affected by bottlenecks is "capacity utilisation", that is compliant in about 30 to 35% nodes only. Moreover, the "train length" criterion of 740 m and the "speed" criterion of 100 km/h are not (completely) fulfilled in 50% and 28% nodes respectively. Instead, most of the rail corridor is electrified and allows for 22.5 t axle load. Projects focusing on the total or partial resolution of the above mentioned bottlenecks principally refer to the improvement of the capacity resolution (projects have been identified in 11 out of 12 affected nodes).

The road corridor in Scandinavian-Mediterranean nodes is almost totally compliant with the regulation. With the only exception of Valletta, where no motorways occur, all corridor lines for road are classified as motorways (express ways).

Table 4: Corridor lines compliance check on the Scandinavian-Mediterranean urban nodes

	Rail					Road
	Train length (≥ 740m)	Axle load (≥ 22,5t)	Speed (≥ 100km/h)	Electrification	Capacity utilisation	Express road / motorway
Helsinki	Yellow, P	Yellow, P	Yellow, P	Green	Yellow, P	Green
Turku	Yellow	Red, P	Green	Yellow	Yellow, P	Green
Oslo	Green	Green	Green	Green	Green	Green
Göteborg	Red	Green	Yellow	Green	Yellow, P	Green
Malmö	Yellow	Green	Green	Green	Yellow, P	Green
Stockholm	Red	Green	Green	Green	Yellow, P	Green
Copenhagen	Yellow	Green	Yellow	Green	Green	Green
Hamburg	n.i.	Green	Green	Green	Yellow, P	Green
Bremen	Green	Green	Green	Green	Green	Green
Hannover	Green	Green	Green	Green	Yellow, P	Green
Berlin	Green	Green	Green	Green	Yellow	Green
Leipzig	Green	Green	Yellow	Green	Green	Green
Nürnberg	Green	Green	Green	Yellow, P	Yellow, P	Green
München	Green	Green	Green	Green	Green	Green
Bologna	n.i.	Green	Green	Green	Green	Green
Roma	n.i.	Green	Green	Green	Yellow, P	Green
Napoli	n.i.	Green	Yellow	Green	Yellow, P	Green
Palermo	Red	Red	Green	Green	Yellow, P	Green
Valletta	n.a.	n.a.	n.a.	n.a.	n.a.	Red

GREEN	Compliant
YELLOW	Partly compliant / non-compliant
RED	Non-compliant
GREY	Not applicable (n.a.)
WHITE	No information (n.i.)
P	Project for the improvement of a non-compliant parameter (according Project list 2017)

Source: HaCon, May 2017

In general, results of the analysis show a discrepancy in terms of corridor lines' compliance between Central and Northern/ Southern Europe. Urban nodes with the majority of (partly) non-compliant parameters are Helsinki, Turku, Göteborg, Palermo and Valletta. Half (and in some cases even more) of the analysed parameters are (partly) non-compliant along their corridor sections. On the other hand, corridor lines in Oslo, Hamburg, Bremen, Hannover, Berlin; Leipzig-Halle, München, Bologna and Roma are compliant in more than 80% of the cases.

Table 5 summarises the compliance check of the access point connections to the corridor lines. Just more than half of the analysed last-mile lines (55%) are completely compliant with regard to the parameters. The remaining 45% last-mile connections are not totally compliant and improvement works are needed on the rail lines.

The parameter showing most of the bottlenecks is "train length", that is non-compliant in about 35% last-mile connections. About 5% freight connections are not electrified and/or don't fulfil the 22.5 t axle load requirement. In total, 18 airports have been inspected and 9 of them are not connected to heavy rail.

No projects with the purpose of achieving train length 740 m, line electrification and axle load 22.5 t requirements on the non-compliant sections have been identified but 2 projects with the scope of connecting the airport in Helsinki and in Göteborg to heavy rail have been recognised.

Also in this case, the analysis highlights a discrepancy between the status of last-mile connections in Central and Northern/ Southern Europe. The totality of last-mile lines in Turku, Göteborg, Malmö, København and Bologna are not completely compliant. In addition, in Helsinki, Stockholm, Roma, Napoli and Palermo at least half freight connections are not totally compliant. On the other hand, all terminal connection lines to the corridor network in Oslo, Hamburg, Hannover, Leipzig-Halle and München are compliant.

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

From the 2 Ideas Laboratories on Core Urban Nodes (München, 17th/18th November 2016 and København/Malmö, 23rd/24th March 2017) following general conclusions emerged:

- The urban nodes are important generators of traffic clearly interacting with the transport corridor(s);
- The urban node stretches beyond the administrative limits and includes its functional hinterland;
- The subjects treated in the two meetings are relevant and require a further dialogue to share further good practices. Treated subjects were used to update the "urban node analysis";
- The "Ideas Laboratory on Core Urban Nodes" of the Scandinavian-Mediterranean Corridor was evaluated an appropriate format for the peer-to-peer exchange;
- Exchange peer-to-peer demonstrated once more that addressing the challenges comprehensively and across border is a value in itself;
- The process could be continued where synergies are identified between urban nodes being the city governments, regions or the actors within the area as public transport operators and others;
- Solutions are often found at the boundaries of traditional competences and multi-disciplinary teams become more relevant such as the implementation of "energy stations" shows (is it energy or transport sector? Or both? Or maybe a new sector?);
- In order to lift economies of scale coordinated strategies, harmonised specifications or even joint tendering of innovative products may be an issue.

Urban node-specific conclusions are included in paragraph 9.3 "Analysis of results" (more specifically in paragraphs 9.3.1 to 9.3.19).

Table 5: Connection analysis of the access points to the corridor network

Node	Access points on the core network		Connection to CNC			
	Infrastructure	Type	Axle load (≥ 22,5t)	Electrification	Train length (≥ 740m)	Connected to heavy rail
Helsinki	Vuosaari Harbour	Inland/ Sea port	✓	✓	✓	n.a.
	West Harbour	Inland/ Sea port	X	X	X	X
	South Harbour	Inland/ Sea port	X	X	X	X
	Helsinki Airport	Airport	n.a.	n.a.	n.a.	X
Turku	Port of Naantali	Inland/ Sea port	X	X	X	n.a.
	Port of Turku	Inland/ Sea port	X	✓	X	n.a.
	Turku Airport	Airport	n.a.	n.a.	n.a.	X
Oslo	Alnabru	Rail-road terminal	✓	✓	✓	n.a.
	Port of Oslo	Trimodal terminal	✓	✓	✓	n.a.
	Gardermoen Airport	Airport	n.a.	n.a.	n.a.	✓
Göteborg	Gullbergsvass	Rail-road terminal	✓	✓	X	n.a.
	Port of Göteborg	Inland/ Sea port	✓	✓	X	n.a.
	Masthugget	Inland/ Sea port	X	X	X	X
	Göteborg-Landvetter Airport	Airport	n.a.	n.a.	n.a.	X
Malmö	Malmö RRT	Rail-road terminal	✓	✓	X	n.a.
	CMP/ Port of Malmö	Trimodal terminal	✓	✓	X	n.a.
	Malmö Airport	Airport	n.a.	n.a.	n.a.	X
Stockholm	Årsta	Rail-road terminal	✓	✓	X	n.a.
	Port of Stockholm	Trimodal terminal	✓	✓	X	n.a.
	Arlanda Airport	Airport	n.a.	n.a.	n.a.	✓
Copenhagen	Høje-Taastrup terminal	Rail-road terminal	✓	X	X	n.a.
	Copenhagen-Malmo Port	Inland/ Sea port	X	X	X	X
	Copenhagen Airport	Airport	n.a.	n.a.	n.a.	X
Hamburg	Billwerder	Rail-road terminal	✓	✓	✓	n.a.
	Burchardkai	Trimodal terminal	✓	✓	✓	n.a.
	Eurogate	Trimodal terminal	✓	✓	✓	n.a.
	Altenwerder	Trimodal terminal	✓	✓	✓	n.a.
	Tollerort	Trimodal terminal	✓	✓	✓	n.a.
	Hamburg Airport	Airport	n.a.	n.a.	n.a.	✓
Bremen	Bremenports	Inland/ Sea port	✓	✓	✓	n.a.
	Bremen Weserport	Inland/ Sea port	✓	✓	✓	n.a.
	Bremen-Roland	Rail-road terminal	✓	✓	✓	n.a.
	Bremenports	Trimodal terminal	✓	✓	✓	n.a.
	City Airport Bremen	Airport	n.a.	n.a.	n.a.	X
Hannover	Brinker Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Lindener Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Misburger Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Nordhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Hannover Leinetor	Rail-road terminal	✓	✓	✓	n.a.
	Hannover Linden	Rail-road terminal	✓	✓	✓	n.a.
	Nordhafen	Trimodal terminal	✓	✓	✓	n.a.
	Hannover Airport	Airport	n.a.	n.a.	n.a.	✓
Berlin	Westhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Spandauer Südhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Neukölln	Inland/ Sea port	X	X	X	X
	Großbeeren	Rail-road terminal	✓	✓	✓	n.a.
	Westhafen	Trimodal terminal	✓	✓	✓	n.a.
	Berlin-Brandenburg Int.	Airport	n.a.	n.a.	n.a.	✓
Leipzig	Schkopau	Rail-road terminal	✓	✓	✓	n.a.
	Flughafen Leipzig-Halle	Airport	n.a.	n.a.	n.a.	✓
Nürnberg	Nürnberg Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Nürnberg Hafen	Trimodal terminal	✓	✓	✓	n.a.
	Nürnberg Airport	Airport	n.a.	n.a.	n.a.	X
München	München-Riem	Rail-road terminal	✓	✓	✓	n.a.
	München Flughafen	Airport	n.a.	n.a.	n.a.	✓
Bologna	Bologna Interporto	Rail-road terminal	✓	✓	X	n.a.
	Bologna Airport	Airport	n.a.	n.a.	n.a.	X
Roma	Pomezia	Rail-road terminal	✓	✓	X	n.a.
	Fiumicino	Airport	n.a.	n.a.	n.a.	✓
Napoli	Interporto Marcianise	Rail-road terminal	✓	✓	✓	n.a.
	Interporto Nola	Rail-road terminal	✓	✓	X	n.a.
	Porto di Napoli	Inland/ Sea port	✓	✓	X	n.a.
	Capodichino Airport	Airport	n.a.	n.a.	n.a.	X
Palermo	Porto di Palermo	Inland/ Sea port	✓	✓	X	n.a.
	Punta Raisi Airport	Airport	n.a.	n.a.	n.a.	✓
Valletta	Valeta Harbour	Inland/ Sea port	n.a.	n.a.	n.a.	n.a.
	Marsaxlokk Harbour	Inland/ Sea port	n.a.	n.a.	n.a.	n.a.
	Luqa Airport	Airport	n.a.	n.a.	n.a.	n.a.

(green)	Compliant last-mile connection
(red)	Partly/ non-compliant last-mile connection
✓	Compliant
X	non-compliant
(✓)	Partly compliant
n.a.	Not applicable
n.i.	No information
⬭	Project for the improvement of a non-compliant parameter

Source: HaCon, May 2017

1.7 Analysis of wider elements of the Work Plan

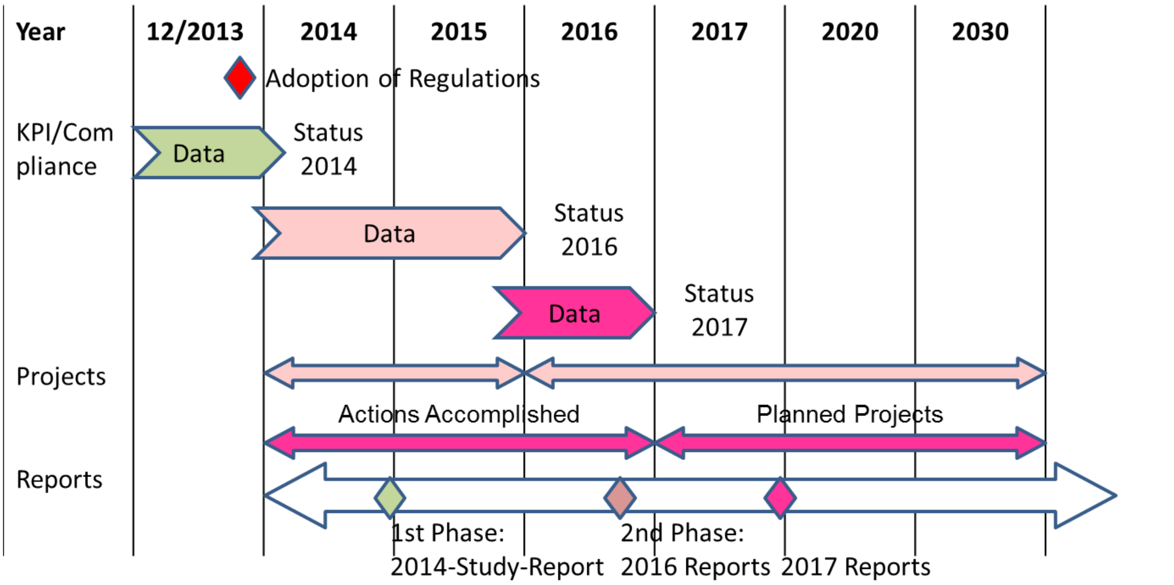
The analysis and findings concerning "wider elements of the Work Plan" are reported in a separate document which includes also the summary.

2 Introduction

This Final Report on the Elements of the Work Plan focuses on proposed measures for the implementation of the Scandinavian-Mediterranean Core Network Corridor. Besides that, it contains summarized elements from the first study conducted in 2014, such as the Corridor alignment and the analysis of compliance with the TEN-T Guidelines. Also the actions already accomplished since the adoption of the Regulation by the end of 2013 are described. It builds on the Preliminary Report on the Elements of the Work Plan that has been submitted in June 2016.

The following figure illustrates the relation of reports and reporting periods. For the compliance analysis presented with the 2014 study data of the years 2012/2013 which was available in the sequence of the year 2014 was used. This forms the "baseline 2014". For the "preliminary report" data of the year 2014/2015 available by mid 2016 was used while for the present report data of the years 2015/2016 available by mid 2017 was used thus presenting the "status 2017". Actions accomplished are those, mostly infrastructure works projects completed since the adoption of the TEN-T Regulation in December 2013 and by the end of the year 2016. Planned projects are any ongoing or foreseen projects due to be completed in 2017 and the following years.

Figure 4: Reporting Periods and Reports



Source: KombiConsult, May 2017

In chapter 3.1, the basic characteristics of the Scandinavian-Mediterranean Corridor are introduced, including the population, the Gross Domestic Product (GDP) as well as traffic flows and modal shares. In subchapter 3.2 the corridor alignment with important sections and nodes is described. Furthermore, figures give a detailed overview of the corridor characteristics (chapter 3.3). After that, information on the compliance analysis conducted in the scope of this report with corresponding Key Performance Indicators (KPIs) is provided (chapter 3.4).

The current traffic demand, as well as the results of the multimodal market study performed in the year 2014, including a forecast for 2030 is presented in chapter 4.

Since the adoption of the Regulations (EU) 1315/2013 "TEN-T Regulation" and 1316/2013 "CEF-Regulation" in December 2013, several infrastructure projects have been completed. Chapter 5 and its associated subchapters list actions accomplished between January 2014 and December 2016 per mode, giving an overview on the progresses achieved with these.

The plan for the removal of physical and technical barriers (chapter 6) is based on findings from the compliance check of existing infrastructure with TEN-T Guidelines and the analysis of the Project List. Measures improving a certain infrastructure site (e.g. a port) are presented with the corresponding TEN-T project ID and basic information on the action, separated into subchapters per mode. The Final Project List is a separate Deliverable which is accompanied by the Final Report on the Project List.

Potential administrative and operational barriers hamper the Corridor's development in addition to the physical and technical barriers. Their impact and potential solutions are described in chapter 8.

As a result of the assessment of the 2014 Study particular attention was paid to urban nodes (chapter 9). Already started in 2016 the analysis was improved by means of two Ideas Laboratories on Urban Nodes. Dedicated maps per urban node depict the infrastructure lines and access points (terminals, ports, passenger stations, shunting yards and airports), compliance with technical infrastructure parameters, on-going and planned projects, existing and envisaged interconnections or last-mile links. Chapter 9 presents the results of the urban nodes analysis, since the technical nodes, namely airports, seaports and Rail-Road Terminals, were already analysed in previous chapters. Thus the separation of work on linear and nodal infrastructure foreseen in the Terms of Reference (ToR) has been carried out but the results are presented jointly.

The Wider Elements of the Work Plan, such as application of innovation, reduction of greenhouse gas emissions and negative effects and the enhancement of the Corridor's resilience towards the impact of climate change, originally foreseen to be reported in chapter 10 are now provided as a separate report which is an Annex to this report.

As foreseen in the ToR the Final Report on Elements of the Work Plan composes of following Deliverables (in the sequence of the ToR):

- Updated compliance check of infrastructure (see chapter 3.4),
- Plan for removal of physical and technical barriers (see chapter 6),
- List of measures coping with administrative and operational barriers along the corridor (see chapter 8),
- Report on physical, technical, administrative and operational barriers at nodes (see chapter 9),
- List of measures for enhancing the performance and resilience of the corridor and its infrastructure and alleviate the negative external effects of the corridor deployment, application of innovation with respect to wider elements of the work plan is documented in a separate report (see separate report),
- Report on actions accomplished since the adoption of the Regulation (see chapter 5).

The present report has been elaborated by the contractor consortium responsible for the ScanMed Corridor according to the following work sharing:

- Overall co-ordination of this report: HaCon
- Technical contributions with respect to the modes:
    - Rail (and ERTMS): HaCon
    - Road (and ITS): Ramböll
    - Ports (Maritime): Uniconsult
    - Airports: GruppoCLAS
    - Rail-Road Terminals (Multimodal): KombiConsult
- Generic KPI and market study: Prognos
- Summary and Introduction: KombiConsult

3 Characteristics of the Scandinavian-Mediterranean Corridor

3.1 Background information

The ScanMed Corridor encompasses seven EU Member States (Finland, Sweden, Denmark, Germany, Austria, Italy and Malta) and one Member State of the European Economic Area, Norway. It is the largest of the corridors in terms of core network length – with more than 9.300 km of core rail and greater than 6.300 km of core road network – together with 25 core ports, 19 core airports, 45 core intermodal terminals and 18 core urban nodes[2]. The regions along the ScanMed Corridor constitute an important socio-economic area within the EU. In 2013 they accounted for a population share of 15% and an employment share of almost 17% of the EU 28. The ScanMed Corridor regions generated 20% of the EU's GDP, with an above EU-average income per capita of almost €35.200.[3]

Table 6: Socio-economic indicators of the ScanMed Corridor in the year 2013

	Inhabitants	Employment	GDP (million €)
EU28	506.682.935	215.443.000	13.518.112
ScanMed Corridor regions (NUTS 3)	76.687.130	36.173.000	2.697.799
	15,1%	16,8%	20,0%

Source: Prognos analysis, May 2017

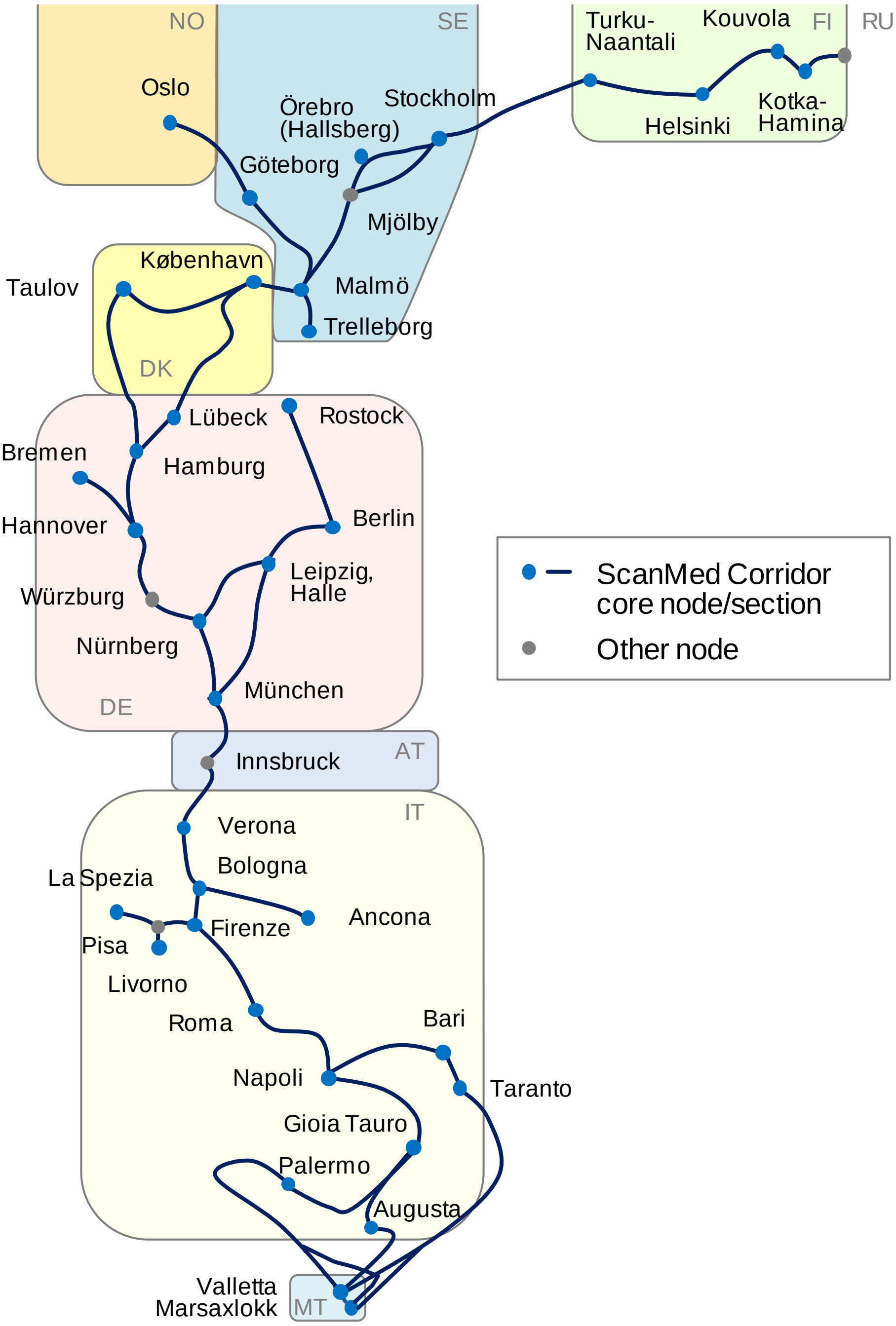
3.2 Corridor alignment

The ScanMed Corridor links the major urban centres in Germany and Italy to Scandinavia (Oslo, København, Stockholm and Helsinki) and the Mediterranean (Italian seaports, Sicily and Malta). It covers seven EU Member States and Norway and represents a crucial axis for the European economy, crossing almost the whole continent from North to South. The cartogram in Figure 5 shows the corridor's schematic alignment and its core nodes according to the TEN-T and CEF-Regulations.

2 A total of 19 including Oslo, Norway

3 The Work Plan 2015 data for 2011 was made on another basis, namely the "regions invited to the Forum meetings", while this time we have used the "NUTS 3 regions touched by the corridor", since that term popped up in the cross corridors KPI working group in the year 2015.

Figure 5: Alignment of the ScanMed Corridor



Source: KombiConsult analysis, December 2016

“Linear” modes of transport that are assigned to the corridor are mainly rail and road, while inland waterways are not relevant for European coordination along this corridor. Several sections of the alignment, in particular the connections Finland – Sweden – Denmark – Germany and Italy – Malta, cross the sea. The maritime dimension, however, goes far beyond the single corridor and connects European countries with each other and the rest of the world. The horizontal priority “Motorways of the Sea” is therefore followed by a separate European Coordinator who has presented his Work

Plan which has been adopted by the Member States in December 2016. The other dimension of the ScanMed Corridor is composed of "nodal" infrastructure such as airports, seaports and rail-road terminals of the core network. As regards modal and infrastructural interconnection between the trans-European regional and local transport networks, "urban nodes" are of specific importance since they are often the generators of traffic, both passenger and freight. In goods transport, freight villages or "interporti" are often used to consolidate cargoes. 8 out of the 20 leading European freight villages[4], including the ranks 1 to 4 are located on the ScanMed Corridor.

3.3 Corridor characteristics

The ScanMed Corridor is the largest in terms of core network length of rail (> 9.400 km) and road (> 6.300 km) and number of core ports, airports and rail-road terminals (in total about 90 sites). With the present update also the core urban nodes are displayed in the table. An overview of the quantitative characteristics of the corridor is provided in Table 7.

Table 7: Characteristics of the ScanMed Corridor in the year 2016

Mode/ Node	Dimension	FI	NO	SE	DK	DE	AT	IT	MT	Total
Rail	network length [km]	518	169	1.462	476	3.532	163	3.053	-	9.337
Road		376	116	1.039	440	1.869	109	2.401	22	6.372
Airports	number	2	1	3	1	7	-	4	1	19
Seaports		4	1	4	1	4	-	9	2	25
RRT		5	1	8	2	16	0	13	-	45
Urban Nodes		2	1	3	1	7	0	4	1	19
Rail	Share of Corridor [%]	5,5%	1,8%	15,6%	5,1%	37,7%	1,7%	32,6%	n.a.	100,0%
Road		5,9%	1,8%	16,3%	6,9%	29,3%	1,7%	37,7%	0,3%	100,0%
Airports		10,5%	5,3%	15,8%	5,3%	36,8%	n.a.	21,1%	5,3%	100,0%
Seaports		16,0%	4,0%	16,0%	4,0%	16,0%	n.a.	36,0%	8,0%	100,0%
RRT		11,1%	2,2%	17,8%	4,4%	36,6%	0,0%	28,9%	n.a.	100,0%
Urban Nodes		10,5%	5,3%	15,8%	5,3%	36,8%	0,0%	21,1%	5,3%	100,0%

Source: KombiConsult, May 2017

3.4 Compliance with the technical infrastructure parameters of the TEN-T guideline

Article 4 of the Regulation (EU) 1315/2013 describes the objectives of the trans-European transport network, which shall strengthen the social, economic and territorial cohesion of the European Union. The aim is to create a single European transport area, which is efficient and sustainable, to increase the benefits for its users

[4] European GVZ Ranking 2015 by Deutsche GVZ-Gesellschaft (German Association of freight villages, November 2015.

and to support inclusive growth. At the end of the year 2014 the Member States of the ScanMed Corridor agreed a list of specific objectives, which have to be met by the ScanMed Corridor by 2030 the latest (see the last column headlined "target 2030" in the following table).

On the basis of these objectives a compliance analysis was performed. The compliance analysis compares the current (infrastructure) parameters and target values set for the year 2030. The analysis uncovered the respective deficits on single corridor sections and nodes. To assist monitoring the achievement of objectives over time, Key Performance Indicators (KPI) have been defined across all corridors that apply to all core network corridors and measure the extent to which target values are realized. The results of the compliance analysis provide the baseline value for the KPI exercise.

The KPIs are displayed in harmonized format structured by generic supply side, generic demand-side KPIs and the corridor modal share based on the agreed methodology.

The basic concept of the KPI is to define a baseline and monitor the evolution over time until 2030. It was therefore essential that the data be recorded by and available from public sources in order to create a time series. The baseline values have been quoted from the 2014 Study and refer to data for the years 2012 or 2013, published by mid-2014. 'Status 2016' refers to data available for the years 2014/2015 in spring 2016, while the recent 'Status 2017' is based on data of the years 2015/2016 in spring 2017. In most cases the data sources are the mode managers' websites. The European Commission portal for infrastructure data does not provide reliable data. In addition we have used the Final Project List to identify "accomplished" projects and their contribution to "improve" or "achieve" the respective KPI.

Compliance with respect to most parameters was already quite good. However, the values for airport connection to rail and availability of clean fuels in ports as well as on road infrastructure could be improved compared to the baseline.

Concerning the airports it has to be noted that Article 41(3) of the TEN-T Regulation requires (only) the "main airports indicated in Part 2 of Annex II […] to be connected with the railway and road transport infrastructure of the trans-European Transport network by the 31 December 2050. …". The "main airports" of the ScanMed Corridor are Helsinki (Vantaa), Stockholm (Arlanda), København, Berlin, Hamburg, München, and Roma (Fiumicino). These airports are already "connected" by rail and road so that also this KPI is fully achieved.

Table 8: Generic supply-side KPI – baseline 2014, status 2016, 2017 and target 2030

Mode	Generic supply-side KPI	Unit	Baseline value 2014	Status 2016	Status 2017	Target 2030
Rail net-work	ERTMS implementation	%	n.a.	n.a.	n.a.	100
	Track gauge 1435mm ('isolated' network with 1,524mm gauge exempted)	%	95-100	95-100	94.5-100	100
	Electrification	%	96	96	96	100
	Line speed (≥100km/h)	%	93	93	93	100
	Axle load (≥22.5t)	%	94	94	94	100
	Train length (≥740m)	%	66	66	66	100
Inland water-way net-work	CEMT requirements for class IV	%	n.a.*	n.a.*	n.a.*	n.a.*
	Permissible Draught (min 2.5m)	%	n.a.*	n.a.*	n.a.*	n.a.*
	Permissible Height under bridges(min. 5.25m)	%	n.a.*	n.a.*	n.a.*	n.a.*
	RIS implementation	%	n.a.*	n.a.*	n.a.*	n.a.*
Road net-work	Express road/ motorway	%	99	99.1	99.1	100
	Availability of clean fuels	Num-ber	n.a.	CNG 2.271 LNG 7 H2 3 ECP 9.318	CNG 2.242 LNG 7 H2 63 ECP 36.987	n.a.
Air-port	Availability of at least one terminal open to all operators in a non-discriminatory way and application of transparent, relevant and fair charges	%	100	100	100	100
	Connection to rail ("main airports")	%	60	63	68-100	100
	Availability of clean fuels	%	0	0	0	100
Sea-port	Connection to inland waterway CEMT class IV	%	50	50	50	100
	Availability of clean fuels	%	12	20	24	100
	Connection to rail	%	83	83	83	100
	Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	%	100	100	100	100
	Facilities for ship generated waste	%	100	100	100	100
Inland ports	CEMT Class IV waterway connection	%	n.a.*	n.a.*	n.a.	n.a.*
	Connection to rail	%	n.a.*	n.a.*	n.a.	n.a.*
	Availability of clean fuels	%	n.a.*	n.a.*	n.a.	n.a.*
	Availability of at least one freight terminal open to all operators ...	%	n.a.*	n.a.*	n.a.	n.a.*
Rail Road Ter-mi-nals (RRT)	Capability for intermodal (unitised) transhipment	%	71-100	71-100	71-100	100
	Availability of at least one freight terminal open to all operators	%	100	75-100	75-100	100
	Electrified train terminal accessibility	%	***)	32	36	100
	740m train terminal accessibility	%	***)	18	14	100
	*) Inland waterways and ports are not part of ScanMed Corridor, these KPI are not applicable (n.a.) **) Compressed Natural Gas (CNG), Liquefied Natural Gas (LNG), Hydrogen (H2) energy stations and electric charging points (ECP) in the ScanMed Corridor countries. ***) Data only partly available from publicly available sources (terminals websites, network statements, since it requires detailed definitions.					

Source: HaCon, Ramböll, Uniconsult, GruppoCLAS, KombiConsult, Prognos analysis, May 2017

Like for the supply-side also the demand-side is subject to generic KPI's, of which the inland waterway freight flow is not relevant for ScanMed. The ScanMed airports were able to increase both their passenger flow (+16 index points) and their freight flow (+5 index points) during 2 years. Also the ScanMed ports recorded positive developments with an increase by 2 index points between the years 2013 and 2014 for each passenger and freight flows.

Table 9: Generic demand-side KPI – baseline 2014, status 2016 and 2017

Mode	Generic demand-side KPI	Unit	Baseline value 2014	Status 2016	Status 2017
Inland waterway network	Total inland waterway freight flows	index (2014=100) (Tonne Kms)	Not applicable	Not applicable	Not applicable
Seaports/ inland waterway ports	Total passenger flows	index (2014=100) (Passengers)	100 49.061.000	101 49.398.000	102 49.928.000
	Total freight flows	index (2014=100) (Tonnes)	100 522.421.000	103 535.627.000	100 520.316.000
Airports	Total passenger flows	index (2014=100) (Passengers)	100 238.723.000	110 262.517.000	116 277.259.000
	Total freight flows	index (2014=100) (Tonnes)	100 1.976.000	105 2.082.000	104 2.059.000

Source: Uniconsult analysis based on port statistics, data for 2013, 2014 and 2015 (since 2016 is not fully available, yet); GruppoCLAS analysis based on aviation statistics, data for 2013, 2014 and 2015 respectively.

The modal share indicators show the share of each transport mode in the total national traffic performance measured in person-kilometres for passenger transport and tonne-kilometres for freight transport. For the overall indicator, the national traffic performances of all ScanMed Corridor countries are aggregated and the respective share is calculated. Since the baseline value passengers railways have gained 1 per cent from road, while in freight inland waterways have gained 1 per cent from road.

Table 10: Corridor modal share – baseline 2014, status 2016 and 2017

Mode	Modal share index	Unit		Baseline value 2014	Status 2016	Status 2017
Inland Surface Transport	Modal Split in National Passenger Inland Surface Transport	Percent (%)	Passenger Cars Buses and Coaches Railways Trams and Metro	83 9 7 1	82 9 8 1	82 9 8 1
Inland Surface Transport	Modal Split in National Freight Inland Surface Transport	Percent (%)	Road Rail: Inland Waterways	70 23 7	69 23 8	69 24 7

Source: Prognos based on EU Transport in figures - Statistical Pocketbook 2015, 2016 Chapters 2.3 and 2.4; data of 2011, 2013 and 2014 respectively

4 Traffic demand and forecast

4.1 Results from the Multimodal Transport Market Study

The multi-modal transport market study carried out in 2014 pursued the goal to provide a “big picture” of the present and future situation of the transport market for the ScanMed Corridor. According to this objective, a comprehensive overview including all relevant transport modes and infrastructures was presented. The basis for this general perspective is an extensive review of numerous studies, reports and forecasts investigating market sections and nodes of the corridor stemming from the existing databases and additional data provided by infrastructure managers, ministries and other stakeholders. The ETIS PLUS Database formed the basis for the baseline (2010) traffic volumes. Important additional information was provided by the forecasts from national transport ministries and agencies and the consultants’ own databases.

Analysis of the baseline data shows that in 2010, the most important rail freight relationships are, in both directions, SE – DE, AT – DE, DE – IT and IT – AT. It becomes obvious that the "gravity centre" of rail freight flows is located in Germany and Austria. The most important corridor relevant road freight flows in 2010 in both ways are the relations DK – DE, IT – DE and FI – SE, which amount to almost 70 % of all international road freight flows between the corridor countries and comprise approx. 50 million tons. In comparison to the rail freight volumes, the structure of flows illustrates a broader spatial distribution of important relations on the corridor. Thus, the "gravity centre" of road freight volumes is located in the southern part of the corridor and to a less extent in the far northern part. With an overall transport volume above 128 million tons, the seaborne freight transport between all ports of the corridor countries is distinctly higher than the continental corridor flows (rail and road). The dominant relations are located in the northern part of the corridor, mainly related to Germany and Sweden supplemented by the flows from the remaining Scandinavian countries.

For 2030, the rail traffic calculations show high loads (> 60,000 trains / year) on the northern market sections in the area of Malmö, København and Taulov, Hamburg/Bremen – Hannover - Würzburg as well as in the Innsbruck area (Brenner) and on the sections Bologna – Firenze – Roma - Napoli. The market sections for road traffic loads quote a diversified picture. While the Scandinavian road traffic loads are comparatively low, the road traffic is expected to be comparatively high in Germany (specifically Lübeck – Hamburg, Hamburg/Bremen – Hannover, as well as the Nürnberg – München market sections) and on the important Italian relation between Firenze and Roma. Most corridor aligned seaports show freight volumes between 15 and 45 million tons per year in 2030, with the exception of Hamburg (exceeding 300 million tons), Göteborg (more than 55 million tons) and Livorno (approx. 50 million tons).

4.2 Continued observation of traffic demand (KPI)

Key Performance Indicators (KPI) are being used within the 2015-2017 core network corridor studies to assess and monitor the evolution of the corridors. A common set of KPIs has been developed for all nine corridors in order to permit comparability across the whole network. Concerning corridor traffic, the demand-side KPIs provide an overview for passenger numbers and freight volumes in selected modes as well as the overall modal split. See Table 9 and Table 10 in subchapter 3.4.

5 Actions already accomplished

The adoption of the Regulations (EU) 1315/2013 "TEN-T Regulation" and 1316/2013 "CEF-Regulation" in December 2013 was a milestone in the development of the trans-European Transport Network. Technical and operational targets and priorities for the Union's transport infrastructure were defined in the TEN-T Regulation and the corresponding financial framework for co-financing from Union budget was agreed upon in the CEF-Regulation. Since both Regulations are continuing from previous programmes at EU and national level and are complementary to different instruments at public and private level, it is not astonishing that already in the first 3 years after the implementation of the Regulations several actions were completed.

For the present final Report we have used a completion date between January 2014 and December 2016 for clustering these projects and avoid any intra-annual reporting which would have been the case when choosing e.g. the date of the publication (20.12.2013) and the date of the editorial closure of the final project list (26.04.2017). In addition to the "actions"[5] financed from TEN-T and CEF budgets we have applied a wider definition and analysed all projects in the Project List which were completed in the reporting period. These projects include also measures of the Member States, infrastructure managers and private entities.

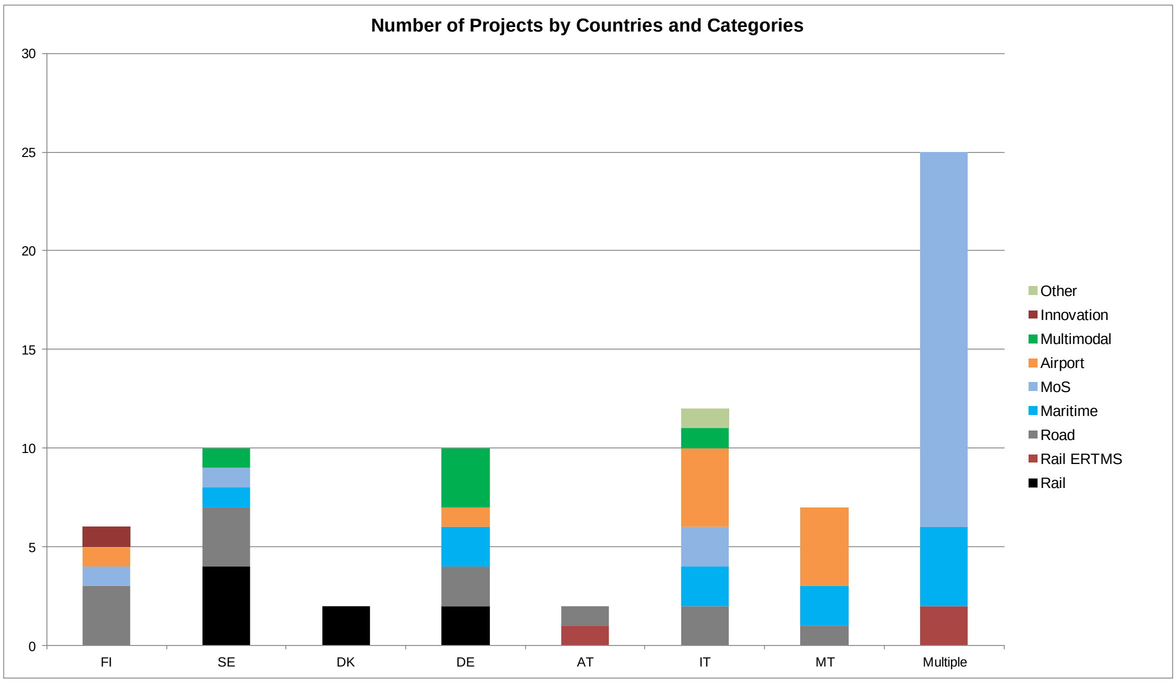
In the 3 reporting years 2014-2016 in total 74 projects have been completed. The largest number (25 in total) involved more than one Member State[6]. With 12 completed projects Italy contributed most followed by Sweden and Germany which provide each 10 projects; Malta finished 7, Finland 6 and Denmark and Austria each 2 projects in the reporting period.

Concerning the project categories the largest quantity of completed projects is with Motorways of the Sea (MoS, 23x) and maritime (11x), while 12 road, 10 airport and 11 rail and rail ERTMS projects were finished. In total 7 completed projects fall into the 'multimodal', 'innovation' and 'other' categories.

[5] The European Commission and the Executive Agency INEA are using the word "action" for projects co-financed by EU budgets. "Actions" have a clear start and end date, a "project promoter" and a "beneficiary".

[6] For a better reading we have avoided to write the legally correct term „Member States and Norway" at each stage. This is not a political statement neither for Norway nor the Union. If we speak of the countries here it means the countries to which the section or node or the project is allocated in the project list. It does not mean that the "Member State" is responsible for the project since it is explicitly wished that all types of project promoters are included.

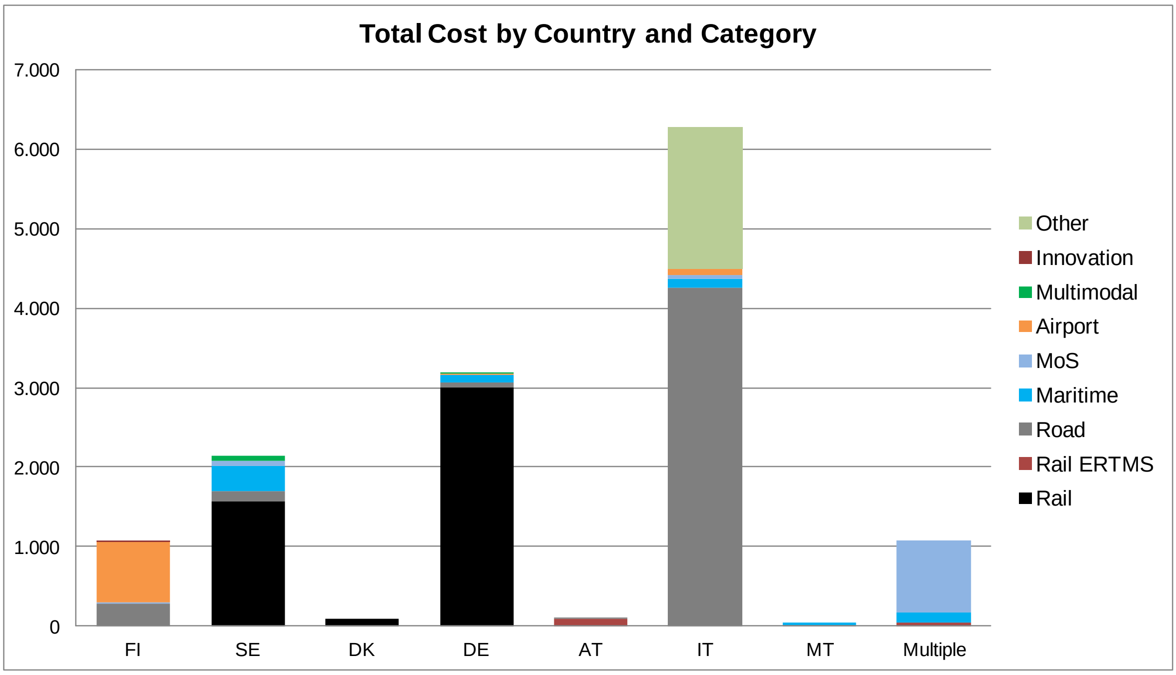
Figure 6: Number of Projects by countries and categories completed by end of 2016



Source: KombiConsult analysis, May 2017, based on Final Project List of 26.04.2017

For those projects where the total cost figure is provided the resulting graphic shows that a total of €13.962m was invested to realize these projects. Almost 45% of these cost were spent in Italy (€6.274m). Germany provides for €3.191m, while Sweden invested €2.138m and Finland €1.066m. To a smaller extent Austria (€99m), Denmark (€92m) and Malta (€35m) contributed in the past 3 years. The costs of the completed "multiple" country projects is €1.068m.

Figure 7: Total costs in million € of projects by countries and categories completed by end of 2016



Source: KombiConsult analysis, May 2017, based on Final Project List of 26.04.2017

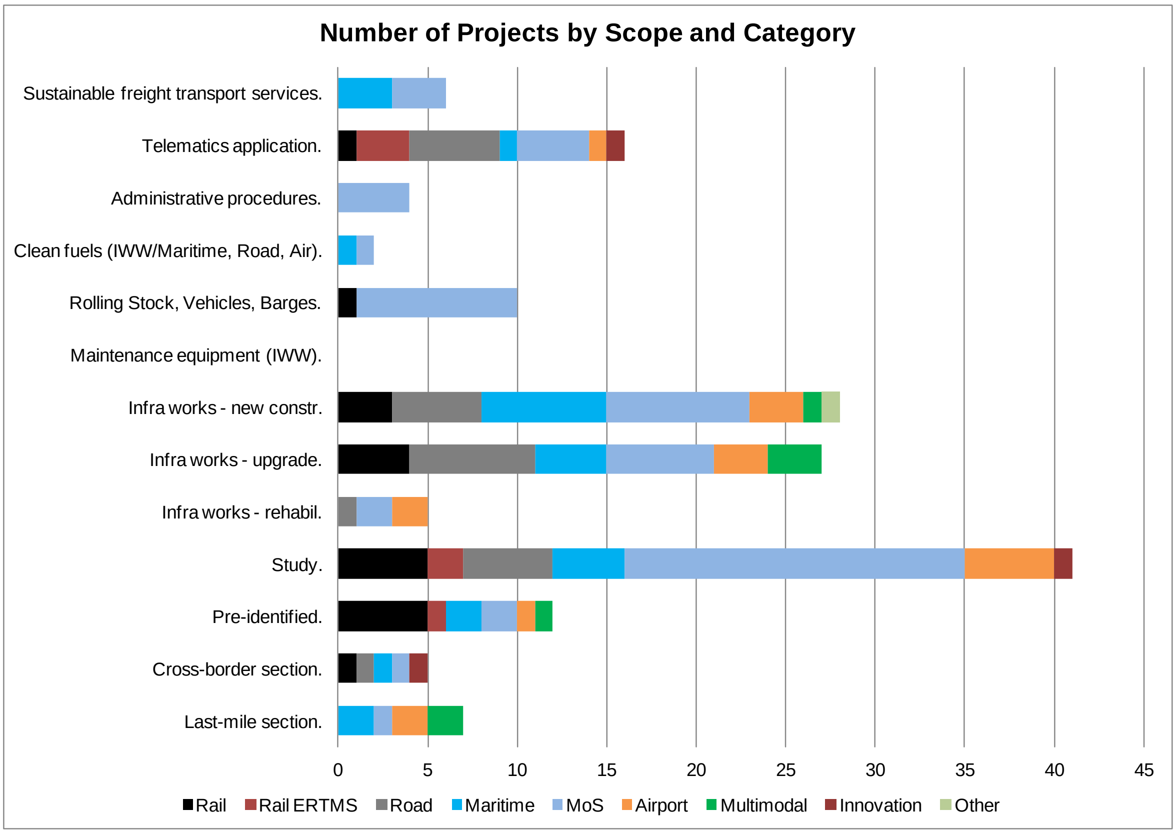
Two third of (known) costs (67%) is for the classical infrastructure sectors rail (€4.652m) and road (€4.760m). The maritime and MoS sector contributed with €683m and €1.029m respectively which is about 13% of the total costs while the airport and multimodal project provide the remaining share.

If we finally analyse the type of project, where "multi selection" was possible, we conclude that 12 projects were "pre-identified sections and projects", 7 were dealing with last mile section issues and 5 are on border crossing sections.

41 of the 74 projects included studies. 60 include infrastructure works of which 5 are for rehabilitation of existing infrastructures, 27 for upgrading and 28 for new construction. The purchase of rolling stock and vehicles was subject to 10 (9x MoS, 1x rail) projects. 16 projects included telematics applications and 4 administrative improvements. 6 targeted at "sustainable freight transport services".[7]

[7] The Helsinki – Talinn project included, among infrastructure works, also the ferry service between both cities, which is excluded from this categorisation (according to Regulation 1315/2013, Article 32; "excluding MoS") in the narrow sense. Since the mark was set it is however included as a service in the wider sense.

Figure 8: Number of Projects by scope of work and categories completed by end of 2016



Source: KombiConsult analysis, May 2017; based on Final Project List of 26.04.2017; multiple selections possible

The following mode-specific sub-chapters provide details on the parameters and their definition, the actions (projects) accomplished since the adoption of the Regulation and the compliance achieved by the beginning of 2017.

5.1 Rail Infrastructure and ERTMS

This chapter describes the impact of rail projects that have been concluded between 2014 and 2016 on the rail corridor characteristics. Table 11 provides an overview on the characteristics of the corridor lines with regard to the 6 core rail parameters as stated in Regulation 1315/2013 by end of the first phase corridor study in December 2014. 4 of these parameters, the percentage values denote the total rail length in each country, where the respective threshold values are fulfilled. Thus, figures inside the “green area” of the table indicate compliance with the Regulation, figures outside the “green area” stand for deficits compared to the standards.

Definition of parameters

Member States shall ensure[8] that the railway infrastructure of the core network fulfils the following requirements by the year 2030:

- **Full electrification.** If the rail operation requires sidings they also have to be electrified [Regulation (EU) 1315/2013, Art. 12(2)(d), Art. 39(2)(a)(i)].
- **Axle load (for freight lines): 22.5 t** [Regulation (EU) 1315/2013, Art. 39(2)(a)(ii)].
- **Line speed (for freight lines): 100 km/h** [Regulation (EU) 1315/2013, Art. 39(2)(a)(ii)] (NB: no speed requirement for passenger lines).
- Enabling **operation of 740 m freight trains** [Regulation (EU) 1315/2013, Art. 39(2)(a)(ii)].
- **Full ERTMS equipment** [Regulation (EU) 1315/2013, Art. 12(2)(a), Art.13(a), Art. 39(2)(a)(iii)].
- New lines to be built in **standard gauge (1435 mm)**, except in certain circumstances [Regulation (EU) 1315/2013, Art. 13(b), Art. 39(2)(a)(iv)].

Priorities for railway infrastructure development are:

- The impacts of noise and vibration caused by railway transport have to be reduced. This objective should be achieved by measures
  - for the rolling stock and
  - for the infrastructure as well as
  - the use of noise protection barriers.
- Seamless transport beyond national borders shall be guaranteed by increasing the interoperability (e.g. European Directive 2008/57/EC and its related documents).

Based on the corridor status of 2014, the fulfilment rate of the Regulation standards (as listed Table 11) is summarised as follows:

[8] "Without prejudice to Directive 2008/57/EC, at the request of a Member State, .., exemptions may be granted by the Commission in duly justified cases in relation to the train length, ERTMS, axle load, electrification and line speed."

Table 11: Country specific compliance of rail parameters, baseline 2014

TEN-TSCAN-MED								Status:	Dez 14
Railways		All entries: % age of all sections fullfilling the respective standard							
TENtec Technical Parameters	Standards	FI	NO	SE	DK	DE	AT	IT	Total
Length of all sections [km]		518	169	1,462	476	3,532	163	3,053	9,372
Percentage [%]		5.53%	1.80%	15.60%	5.07%	37.69%	1.74%	32.57%	100.00%
Traction	Electrified	100.0%	100.0%	100.0%	74.9%	92.6%	100.0%	100.0%	95.9%
	Diesel	0.0%	0.0%	0.0%	25.1%	7.4%	0.0%	0.0%	4.1%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Track gauge [mm]	1435 mm	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	94.5%
	other than 1435 mm	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Max operating speed [km/h] 1)	>= 100 km/h	100.0%	91.2%	100.0%	100.0%	100.0%	77.7%	80.2%	93.0%
	< 100 km/h	0.0%	8.8%	0.0%	0.0%	0.0%	22.3%	19.8%	7.0%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Max axle load [t] 1)	>= 22.5 t	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	81.7%	94.0%
	< 22.5 t	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.3%	6.0%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Maximum train length [m] 1)	>= 740 m	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	65.7%
	< 740 m	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	34.3%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ERTMS in operation	YES	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	NO	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
	Others/Unknown	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

Threshold values according to Regulation 1315/2013
1) relevant only for freight trains

Source: HaCon, December 2014

Actions accomplished

In the reporting period the Project List includes 10 "Rail" projects which have been accomplished. These are:

TEN-T Project ID 5164: The tunnel through Hallandsås is a rail project by the Swedish Transport Administration on the section Båstad – Förslöv. It targets at an 8.7 km long double track railway tunnel that increases the capacity from 4-6 trains per hour to 24, enabling heavy freight trains and reduce travel times by 10-12 minutes. The line opened in December 2015.

TEN-T Project ID 5171: Malmö Fosieby - Trelleborg is a rail project by the Swedish Transport Administration on the section Fosieby - Trelleborg. It targets at improvements for increasing capacity and safety and new stations for passenger services. The improved line and new stations opened in December 2015.

TEN-T Project ID 5160: Göteborg C Signalbox is a rail project by the Swedish Transport Administration on the node Göteborg. It targets at replacement of signal box at Göteborg C. The new signal system makes it possible to increase the capacity for rail traffic in the Göteborg area.

TEN-T Project ID 5168: Pågatåg Nordost (Regional railway network improvement) is a rail project by the Swedish Transport Administration on the regional rail network in Skåne and Småland. It targets at sixteen new stations which have been built in the years 2011-2014 to improve commuting with regional trains in north eastern Skåne and southern Småland.

TEN-T Project ID 5406: Stockholm Nord (Rosersberg), rail connection to RRT is a rail project by the Swedish Transport Administration on the node Stockholm. It targets at realizing the rail connection to/from the main line and the intermodal terminal Rosersberg (Stockholm Nord).

TEN-T Project ID 5397: Double track between Vamdrup and Vojens is a rail project by Rail Net Denmark on the section Vamdrup - Vojens (Jutland). It targets at Construction of double track in Southern Jutland in order to increase capacity and secure the current freight connection between Scandinavia and Germany. It was completed until August 2015.

TEN-T Project ID 5084: ABS Berlin – Rostock. Finalisation of the extension of the railway line Rostock - Berlin up to an axial load of 25 tons (here: section Kavelstorf - Seaport of Rostock) is a rail project by the DB Netz / Port of Rostock on the section or node Berlin - Rostock. It targets at upgrading of rail routes from the port of Rostock to the steel plant Eisenhüttenstadt to an axle load of 25 tons (mainly the missing section Rostock Seaport -> Kavelstorf or the routes from Berlin via Frankfurt/Oder to Eisenhüttenstadt). Most parts of this action have been accomplished until 2014.

TEN-T Project ID 5082: ABS Stelle - Lüneburg is a rail project by the German BMVI (DB Netz) on the section or node Stelle - Lüneburg. It targets at upgrade the line with a third track. The line opened in July 2014.

TEN-T Project ID 5088: NBS/ABS Erfurt - Leipzig/Halle (VDE Nr. 8.2) is a rail project by the German BMVI (DB Netz) on the section or node Leipzig. It targets at a new constructed high-speed line, upgrade access to node Leipzig, new interlocking in Leipzig. The line became operational with the time table shift end of 2015.

One Maritime project which improves rail operation:

TEN-T Project ID 5358: New station on Darsena Toscana and connection to Tyrrhenian line is a Maritime project by RFI in the node Livorno. It targets at Construction of a new station at Darsena Toscana terminal in the port area, and its direct connection to the Tyrrhenian line. The station was set in operation in December 2016.

One Airport project which improves rail operation:

TEN-T Project ID 5138: Ring Rail Line is an Airport project by the Finnish Transport Agency on the node Helsinki. It targets at a two-track urban line for passenger traffic to Helsinki Airport. It has an 8-kilometre tunnel with two tubes, 5 stations out of which 2 underground stations. The lines opened in July 2015.

In the reporting period the Project List includes no further ‘ERTMS’ project which has been accomplished.

Almost all recently concluded rail projects aimed at increasing the capacity and do not remedy non-compliant infrastructure as the requirements of the Regulation have already been fulfilled before; therefore, they do not influence the figures of Table 12. However, they adjust the configuration of rail stations to the demands of high-speed traffic; in this context, they enhance rail capacity and allow for higher speed of passenger trains.

With project ID 5088 a new line from Erfurt to Leipzig/Halle has been opened. This is a standard-gauge, double-track electrified railway line for high-speed passenger and freight traffic. It has a total length of 123 kilometres (effective 118 kilometres ETCS).

Compliance achieved

With, among other things, these actions accomplished the compliance achieved at the end of the year 2016/the beginning of the year 2017 ("Status 2017") is as follows:

Table 12: Country specific compliance of rail parameters, 2017

TEN-T SCAN-MED								Status:	05/2017
Railways		All entries: % age of all sections fullfilling the respective standard							
TENtec Technical Parameters	Standards	FI	NO	SE	DK	DE	AT	IT	Total
Length of all sections [km]		518	169	1,462	476	3,532	163	3,053	9,372
Percentage [%]		5.5%	1.8%	15.6%	5.1%	37.7%	1.7%	32.6%	100.0%
Traction	Electrified	100.0%	100.0%	100.0%	74.9%	92.6%	100.0%	100.0%	95.9%
	Diesel	0.0%	0.0%	0.0%	25.1%	7.4%	0.0%	0.0%	4.1%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Track gauge [mm]	1435 mm	0.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	94.5%
	other than 1435 mm	100.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	5.5%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Max operating speed [km/h] 1)	>= 100 km/h	100.0%	91.2%	100.0%	100.0%	100.0%	77.7%	80.2%	93.0%
	< 100 km/h	0.0%	8.8%	0.0%	0.0%	0.0%	22.3%	19.8%	7.0%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Max axle load [t] 1)	>= 22.5 t	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	81.7%	94.0%
	< 22.5 t	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	18.3%	6.0%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Maximum train length [m] 1)	>= 740 m	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	0.0%	65.7%
	< 740 m	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	100.0%	34.3%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
ERTMS in operation	YES	0.0%	0.0%	0.0%	0.0%	3.3%	90.7%	0.0%	2.8%
	NO	100.0%	100.0%	100.0%	100.0%	96.7%	9.3%	100.0%	97.2%
	Others/Unknown	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

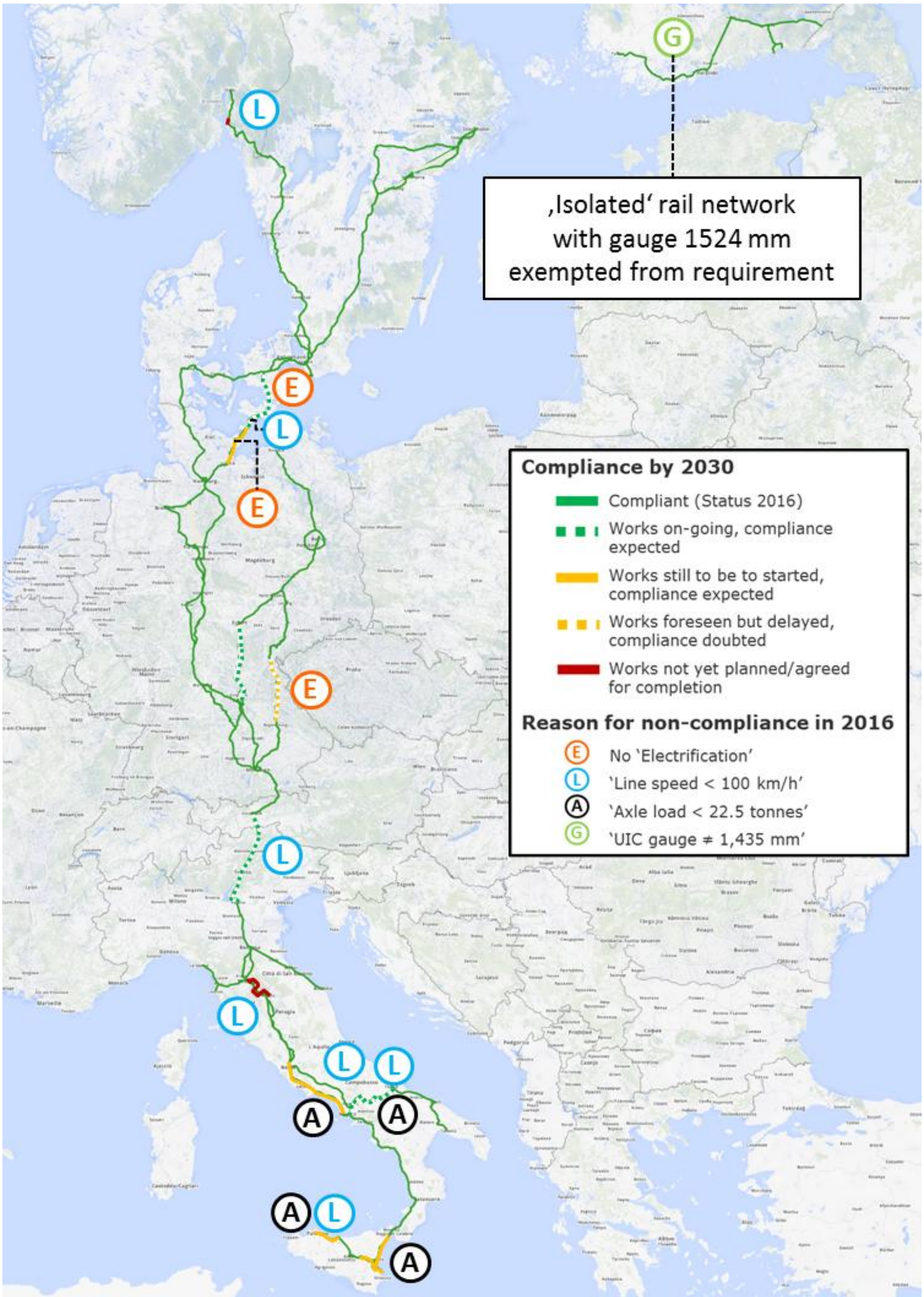
Threshold values according to Regulation 1315/2013

1) relevant only for freight trains

Source: HaCon, May 2017

The corridor's status of compliance regarding the rail parameters 'Electrification', 'Line speed ≥ 100 km/h' and 'Axle load ≥ 22.5 tonnes' achieved by 12/2016 is shown in Figure 9.

Figure 9: Rail compliance 2017 regarding parameters 'Electrification', 'Line speed', 'Axle load', and 'UIC gauge'



Source: HaCon, Update May 2017

Table 13: Development of Rail KPI 2014, 2016, 2017 and target for 2030

Rail Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Target 2030
ERTMS deployment	x	x	x	1)	n.a.	n.a.	**n.a.**	**100%**
1,435 track gauge	x	x	x	1)	100% (94.5%[1)])	100% (94.5%[1)])	**100% (94.5%[1)])**	**100%**
Mitigation of noise and vibration	x			1)	n.a.	n.a.	**n.a.**	**100%**
Electrification	x	x	x	1)	95.9%	95.9%	**95.9%**	**100%**
Line speed (≥100km/h)	x	x	x	1)	93.0%	93.0%	**93.0%**	**100%**
Axle load (≥22.5t)	x	x	x	1)	94.0%	94.0%	**94.0%**	**100%**
Train length (≥740m)	x	x	x	1)	65.7%	65.7%	**65.7%**	**100%**
	1) ‚Isolated' rail network with gauge 1,524 mm exempted from requirement							

Source: HaCon analysis, Update May 2017; P = Priority; O = Objective, K = KPI; 1) network statements of respective infrastructure managers

As indicated in Table 13, mitigation of noise and vibration is another priority related to rail developments. Since 1999 Germany has a noise prevention programme for the railway network. Every year investments in the amount of €150m are available. This includes noise protection walls as well as modifications of freight wagons (Retrofitting with new brakes ("LL-Sohle")). The conception schedules the refurbishment of 2,000 km route network by 2020 and 3,700 km by 2030 mainly on railway lines inside of 1,485 towns.[9]

The Austrian Railways ÖBB have a related noise prevention programme for 1,050 km railway lines within a 5,000 km network. By late 2012 500 km of noise barriers already have been erected, additional 144 km are planned. The costs amounted to €402m by the end of 2012. In addition to the programme for existing railway lines another 350 km of noise barriers were erected in the course of new construction projects.[10]

Parts of these programmes have been and will be realized on the ScanMed Corridor lines.

Similar to these measures also the other ScanMed countries have noise prevention programmes. Beside the construction of noise barriers Denmark has research and testing programmes for optimisation of track construction, acoustic rail grinding, noise partnership with the inhabitants and noise communication management. According to

[9] http://www1.deutschebahn.com/laerm/infrastruktur/laermsanierung.html and http://www.bmvi.de/SharedDocs/DE/Artikel/LA/zulassung-ll-sohle-und-abschaffung-schienenbonus.html

[10] http://blog.oebb.at/csr/umwelt/emissionen/laermschutz/

Sweden's noise mapping noise mitigation measures such as rail grinding, rail dampers, low height barriers and noise abatement including insulated windows and local barriers are being carried out. Sweden also favours retrofitting braking systems of existing rail cars but serious problems are still not solved concerning the braking performance in severe winter conditions. In face of a strict noise legislation including existing lines Italy also carries out a lot of measures (action plans, implementation until 2020 to be considered on about 8,000 km, costs about €6.8bn). This includes also measurements of rolling stock for noise emissions and development of new brake blocks for freight wagons. On about 3,675 km of existing lines noise barriers and building insulation is foreseen with a budget of about €8.31bn by 2030.

Since each country has its separate mitigation strategies and railway sections are equipped mostly in inhabited areas, exact values cannot be stated. Therefore, the priority "Mitigation of noise and vibration" is marked as "n.a.".

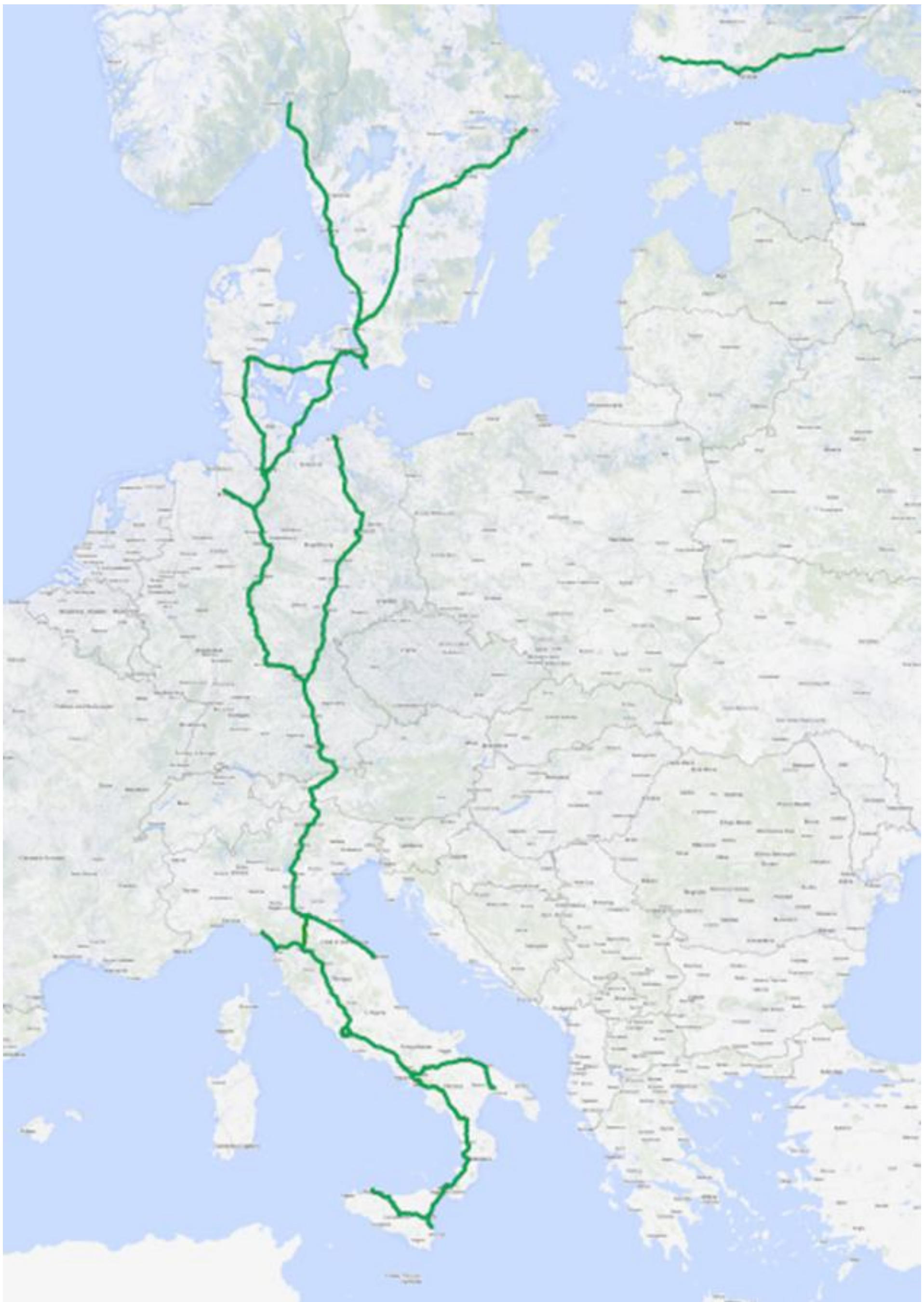
Conclusions

As indicated in Table 12, projects completed in the reporting period 2014-2016 did not have any effect on the listed KPI parameters. Still, only Sweden shows compliance throughout the TEN-T parameters (ERTMS is an exception since no related project has been finished so far). Although the projects concluded did not improve parameters, they improved the overall rail transport situation on numerous sections of the corridor without explicitly addressing the parameters given. Therefore, these accomplished projects have to be considered, too.

5.2 Road Infrastructure

The road transport network for the entire corridor is approximately 6,350 km in total. The longest road networks on the corridor are in Italy with around 2,400 km, Germany with around 1,900 km and Sweden with around 1,100 km. Malta is the shortest with no significant road links except access to the Port of Valletta.

Figure 10: Overview of the ScanMed Corridor, road network



Source: HaCon, June 2016

Definition of parameters

According to Regulation (EU) 1315/2013, Member States shall ensure for the core network roads by the year 2030 that:

- roads are either an **express road or motorway** (Art. 18(a)) - exact definition of the requirement is contained in Regulation (EU) 1315/2013, Article 17(3)[11];
- **"intelligent transport system**"[12] and tolling systems are provided which are compatible with other systems (Art. 17(4), Art. 19(b));
- **sufficient parking areas** are provided with an appropriated level of safety - at least every 100 km (Art. 39(2)(c));
- **alternative clean fuels** (defined Art. 3(w)) and thereto necessary infrastructure are available to the sufficient necessary (Art. 39(2)(c)).

Priorities for road infrastructure development are:

- Appropriate measures shall increase the **road safety**. The goal is to cut road casualties in half by 2020 and drop to zero by 2050.
- The introduction of **new technologies and innovations** shall enable sustainable low-emission road traffic. The goal is to reduce greenhouse gas emissions minimum to 60% by 2050.
- The use of **information and traffic management systems** as well as communication systems shall increase road safety, mitigate congestions on roads and reduce pollutant emissions.

For the 2nd phase of the CNC studies 2 generic supply side Key Performance Indicators were defined to assess and monitor the evolution of the corridor and the potential effect of projects or group of projects upon infrastructure interoperability and performance. For road the following KPIs were defined and agreed upon:

- **Express road or Motorway** (measured in km);
- Availability of **clean fuels** (measured as number of filling stations/charging points).

Capacity enhancements have usually a positive impact on road safety. In Table 14 the column capacity enhancements also includes improvements in road safety even though road safety is not the main target for the project in question.

Actions accomplished

In the reporting period the Project List includes 12 'Road' projects which have been accomplished. These are:

TEN-T Project ID 5443: E18 Hamina bypass is a Road project by the Finnish Transport Agency in the node Hamina. It targets at construction of a 15 km ring road for safe and smooth traffic on the north side of the city of Hamina.

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[11] "At the request of a Member State, ..., exemptions from the provisions of points (a) [motorway] or (b) [express road] of Article 17(3) may be granted by the Commission in duly justified cases as long as an appropriate level of safety is ensured." (Regulation (EU) 1315/2013, Article 39 (3).

[12] ITS = „intelligent transport system", means a system as specified in Directive 2010/40/EU.

TEN-T Project ID 5444: Ring Road III, the second phase is a Road project by the Finnish Transport Agency in the node Helsinki. It targets at Ring Road III, which is part of E18, will be improved in the Lentoasemantie area and between Lahdenväylä and Porvoonväylä.

TEN-T Project ID 5218: Implementing of cooperative ITS is a Road project by the Finnish Transport Agency on the ScanMed Corridor. It targets at Nordic way; Next ITS, EIP++.

TEN-T Project ID 5143: E4 Norrtull, Haga Södra - Kista is a Road project by the Swedish Transport Administration on the section Haga Södra - Kista. It targets at Minor improvements of existing roads and traffic management measures

TEN-T Project ID 5146: E6 Pålen - Tanumshede is a Road project by the Swedish Transport Administration on the section Pålen - Tanumshede. It targets at A 7 kilometre new motorway and the final section of the motorway through Bohuslän. Passes a world heritage area.

TEN-T Project ID 5152: E6 intersection Spillepengen is a Road project by the Swedish Transport Administration in the node Spillepengen. It targets at A grade-separated junction in the form of a bridge over the existing roundabout so that the though-traffic bypass at an upper level.

TEN-T Project ID 5105: A 10 Reconstruction Dreieck Havelland [part of DE CPR 2] is a Road project by the BMVI (BB) in node Berlin (A10; Dreieck Havelland). It targets at Reconstruction and upgrade (6 lanes).

TEN-T Project ID 5461: A 1, A 7, A 21, B 205 - upgrade of network influence system [part of DE CPR 4] is a Road project by the BMVI (HH) in the node Hamburg. It targets at part of traffic control and information concept (VLIK) for upgrade and extension of A 7 motorway.

TEN-T Project ID 5829: A 13 Rehabiltation Bergisel tunnel and Sill bridge 1 is a Road project by ASFINAG in the node Innsbruck. It targets at A 13 Rehabiltation Bergisel tunnel and Sill bridge 1.

TEN-T Project ID 5304: Bologna-Casalecchio di Reno node is a Road project by Autostrade per l'Italia SpA in the node Bologna. It targets at Upgrade of motorway connection between Bologna and Casalecchio.

TEN-T Project ID 5301: "Variante di valico" between Firenze and Bologna is a Road project by Autostrade per l'Italia SpA on the section Firenze - Bologna. It targets at a deviation of A1 motorway, 62.5 km long and with long stretches in viaduct and tunnel, running parallel to the central part of the Bologna - Firenze section.

TEN-T Project ID 5380: ITS on Maltese Roads is a Road project by Transport Malta on various sections. It targets at Supply, Delivery, Installation, Commissioning and Maintenance of an Intelligent Traffic Management System (ITMS) across the Maltese islands. This will consist of the first ever Traffic Control Centre (hub) in Malta and the deployment of: 1) 27 Intelligent Closed Circuit Television cameras (CCTV) on the strategic road network for traffic monitoring and in other critical road sections that will affect public transportation and monitoring equipment and related software; 2) 34 Electronic variable Message Signs (VMSs) in designated areas; 3) 48 Lane Changing Signs to be mounted at the access to tunnels; 4) 5 Automatic Number Plate Recognition (ANPR) systems at bus gates on certain bus lanes where appropriate and next to certain CCTV infrastructure; 5) Bus Priority Measures which include, Traffic Signals, Kerb Side Detectors, Crossing Detectors and Bus Gating Traffic signals (with RFID Readers) at the exit of bus lanes and at junctions by which the oncoming vehicular traffic is stopped so that the bus exists freely and unhindered to continue its journey; 6) Adaptive Traffic Light Solution for traffic detection systems at junctions to allow automated and/or centrally controlled functionality. These will be deployed at specific sections; The ITMS is aimed to further assist the public transport reform by reducing congestion on public transport corridors, especially where no designated bus lanes are possible. The ITMS infrastructure will be managed by Transport Malta in real-time by monitoring of traffic conditions on the road network through the installation of dedicated traffic management soft- and hardware. This will consist of high-end 'state of the art' CCTV cameras and Variable Message Signs (VMS) through which road users will be advised of congestion build up. The system would be monitored and controlled at a centralized hub, from where the road network will be monitored on a 24/7 basis thus enabling better traffic management; resulting in less congestion, shorter travel times, lower vehicle operational costs, and lower emissions of harmful gases.

Compliance achieved

With, among other things, these actions accomplished the compliance achieved at the end of the year 2016/the beginning of the year 2017 is as follows:

Table 14: Contribution of projects to Compliance of Road parameters, 2017

Road sections	Capacity enhancement/ Road safety	Express-way/ motorway	ITS / tolling	Parking	Clean fuels
Project 5443: E18 Hamina bypass	X	X	X		
Project 5444: Ring Road III, the second phase	X				
Project 5218 Implementing of cooperative ITS			X		
Project 5143: E4 Norrtull, Haga Södra – Kista in Stockholm	X		X		
Project 5146: E6 Pålen - Tanumshede	X				
Project 5152 E6 intersection Spillepengen	X				
Project 5105: A 10 Reconstruction Dreieck Havelland [part of DE CPR 2]	X				
Project 5461: A 1, A 7, A 21, B 205 - upgrade of network influence system [part of DE CPR 4]			X		
Project 5829 A 13 Rehabiltation Bergisel tunnel and Sill bridge 1	X				
Project 5304 Bologna-Casalecchio di Reno node on node Bologna	X				
Project ID 5301 "Variante di valico" between Firenze and Bologna	X				
Project ID 5380ITS on Maltese Roads			X		
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)		**99,1%**			

Source: Ramböll analysis, May 2017

Table 15: Development of Road KPI 2014, 2016, 2017 and target for 2030

Road Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Target 2030
Promotion of road safety	X							
Express Road or Motorway	X	X	X		99%	99,1%	99,1%	100%
ITS and tolling systems	X	X						
Parking areas every 100 km	X	X						
Availability of clean fuels	X	X	X	TENtec		2.271 CNG, 7 LNG and 53 H2 energy stations and 9.318 electric charging points in corridor countries (2016)	2.242 CNG[13], 7 LNG[14] and 63 H2[15] energy stations and 36.987[16] electric charging points in corridor countries (2017)	
Mitigation of congestion	X							

Source: Ramböll analysis, May 2017; P = Priority, O = Objective, K = KPI

Conclusions

In terms of requirement for express road or motorway, the existing network has a coverage of 99.1%, measured in kilometres. The remaining sections are in Finland, 0.7%, where the sections are in rural areas with relatively low traffic volumes or known to the Finnish planning authorities and planned for improvement. In Italy the remaining section is the road connection to Ancona which covers 0.2% of the ScanMed Corridor.

3 of the 13 accomplished actions target traffic control and information concepts. 2 of the actions target both new or upgraded infrastructures as well as ITS solutions while 8 actions target new or upgraded infrastructure but not ITS solutions. All actions will have positive impacts on road safety.

From 2014 to 2017 there have not been any projects targeting clean fuels and safe parking. However the number of “clean” energy supply stations increased.

[13] https://www.ngva.eu/

[14] https://www.ngva.eu/

[15] https://www.netinform.de/

[16] https://openchargemap.org/site/

5.3 Air transport Infrastructure (Airports)

Definition of parameters

The progress has been valued by means of 5 priorities defined in the Regulation (EU) 1315/2013, Articles 25 and 26 and the corresponding 4 Objectives defined in the 2014 Work Plan of the European Coordinator. 3 of these were also named Key Performance Indicators and measured across all corridors. All are related to the compliance of the infrastructure parameters to the Regulation (EU) 1315/2013 requirements. These requirements are:

1. **open access**, that is any airport offering at least one terminal which is open to all operators in a non-discriminatory way and which applies transparent, relevant and fair charges, as required by the article 25(2) of the Regulation (EU) 1315/2013;
2. **capacity**, that is the increase in airport capacity, as required by the articles 10(d) and 26(a) of the Regulation (EU) 1315/2013;
3. **single European Sky, development of SESAR system**, that is the support to the implementation of the Single European Sky and of air traffic management systems, in particular those deploying the SESAR system, as required by the article 26(b) of the Regulation (EU) 1315/2013;
4. **connection with rail**, that is the improvement of interconnections between airports and infrastructures of other transport modes, as required by the articles 10(1)(b) and 26(c) of the Regulation (EU) 1315/2013. In this objective the connectivity between airports and rail has been mainly considered.
5. **availability of clean fuels**, as required by the article 26(d) of the Regulation (EU) 1315/2013.

Actions accomplished

The Project List includes 10 "Airport" projects which have been accomplished in the reporting period 2014-2016. These are:

TEN-T Project ID 9023: New railway connection between Munich Airport and the European railway corridor TEN PP 17 is an airport project by the Bayerisches Staatsministerium für Wirtschaft, Infrastruktur, Verkehr und Technologie on the node München. It targets at main objectives: New railway connection from the airport towards the east in the direction of Erding (connection to München-Mühldorf-Salzburg line).

Sections:
a) München Airport – Erding („Erdinger Ringschluss")

b) Erding – Walpertskirchen („Walpertskirchener Spange").

TEN-T Project ID 5365: Replacement of AODB (Airport Operations Database) system is an Airport project by Malta International Airport Plc. in the node Luqa. It targets at the following objective: Provide for enhanced capabilities in the logistical management of the airport infrastructure and introduce media applications at passenger contact points.

TEN-T Project ID 5366: Enlargement of the Non-Schengen Departures Concourse is an airport project by Malta International Airport Plc. on the node Luqa. It targets at the enlargement of the Non-Schengen Departures Concourse.

TEN-T Project ID 5367: Aircraft Movement Area Rehabilitation is an airport project by Malta International Airport Plc. on the node Luqa. It targets at Taxiway C Rehabilitation.

TEN-T Project ID 5965: Aircraft Movement Area Rehabilitation is an airport project by Malta International Airport Plc. on the node Luqa. It targets at Taxilane U and W (Apron 9) Rehabilitation.

TEN-T Project ID 5138: Ring Rail Line is an Airport project by the Finnish Transport Agency in the node Helsinki. It targets at two-track urban line for passenger traffic to Helsinki Airport. The length of the line is 18 km of which 8 kilometre is in tunnel. It has 5 stations of which 2 are underground stations.

TEN-T Project ID 3276: Reprovision of ATC plant room is an Airport project by Bologna Airport in the node Bologna. It targets at reprovision of ATC plant room.

TEN-T Project ID 3613: "New highway parking" is an Airport project by Bologna Airport in the node Bologna. It targets at "New highway parking" to increase infrastructural landside capacity.

TEN-T Project ID 5944: Upgrading of the paving of the runway RWY 07/25 and 02/20 of the International Airport of Palermo and related works is an Airport project by Ges.A.P. in the node Palermo. It targets at the upgrading of the two runways RWY 07 / 25-02 / 20 through interventions in some areas identified following a lengthy study phase. The planned operations are: 1. reconstruction of flexible pavement and the underlying foundation; 2. Renovation of the wearing course; 3. Demolition of damaged and construction of new plates.

TEN-T Project ID 5945: Adjustment and restructuring passenger terminal - New Scenary 2020 of Palermo International Airport is an Airport project by Ges.A.P. in the node Palermo. It targets at a complex of civil and plant engineering works necessary to achieve a new and different set-up of the passenger terminal, aimed at adapting the building to seismic regulations and restructuring the terminal both from the functional point of view and the architectural one.

Compliance achieved

Since the adoption of Regulation (EU) 1315/2013 the Key Performance Indicators measuring the progress of the airports development of the Scandinavian-Mediterranean Corridor are quite stable.

Table 16: Compliance of Airport parameters, 2017

Airport	Open access	Capa-city	Single European sky / SESAR	Connection with rail	Availability of clean fuels
Helsinki Vantaa (HEL)*	Yes	Yes	No	Yes (rail)	No
Turku/Naantali (TKU)	Yes	n.a.	No	No	No
Oslo Gardermoen (OSL)	Yes	Yes	No	Yes (rail)	No
Stockholm Arlanda (ARN)*	Yes	Yes	No	Yes (rail)	No
Göteborg Landvetter (GOT)	Yes	No	No	No	No
Malmo Sturup (MMX)	Yes	Yes	No	No	No
Kobenhavn Kastrup (CHP)*	Yes	Yes	No	Yes (rail)	No

Airport	Open access	Capa-city	Single European sky / SESAR	Connection with rail	Availability of clean fuels
Berlin Brandenburg (BER)*	under construction				
Berlin Tegel (TXL)	Yes	No	No	No	No
Berlin Schönefeld (SXF)	Yes	No	No	Yes	No
Bremen (BRE)	Yes	n.a.	No	Yes (tram)	No
Hamburg (HAM)*	Yes	No	No	Yes (rail)	No
Hannover Langenhagen (HAJ)	Yes	No	No	Yes (rail)	No
Leipzig-Halle (LEJ)	Yes	Yes	No	Yes (rail)	No
Nürnberg (NUE)	Yes	Yes	No	Yes (metro)	No
München (MUC)*	Yes	Yes	No	Yes (rail)	No
Bologna (BLQ)	Yes	Yes	No	No	No
Roma Fiumicino (FCO)*	Yes	Yes	No	Yes (rail)	No
Napoli Capodichino (NAP)	Yes	Yes	No	No	No
Palermo Punta Raisi (PMO)	Yes	Yes	No	Yes (rail)	No
Valletta Malta-Luqa (MLA)	Yes	Yes	No	n.a.	No
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**20/20 = 100%**	**13 / 18 = 72%**	**0 / 20 = 0%**	**13/19 = 68% 7/7 =100%***	**0 / 20 = 0%**

*Source: GruppoClas analysis, May 2017; * "main airport" according to Article 41(3)*

Table 17: Development of Airport KPI 2014, 2016, 2017 and target for 2030

Airport Parameters	P	O	K	Baseline 2014	Status 2016	Status 2017	Target 2030
Open access	X	X	X	100%	100%	**100%**	100%
Capacity	X	-	-	-	-	**-**	-
Single European Sky - SESAR system	X	X	-	n.a.	n.a.	**n.a.**	n.a.
Connection with rail (* main airport)	X	X	X	60% 85%*	68% 100%*	**68% 100%***	n.a. 100%*
Availability of clean fuels	X	X	X	0%	0%	**0%**	100%

Source: GruppoClas analysis, May 2017; P = Priority; O = Objective, K = KPI

The KPI related to the open access shows the full compliance of all the airports with the requirements of the Regulation (EU) 1315/2013 in terms of accessibility for operators and viability of operations by them in a non-discriminatory environment.

No relevant data about the implementation of SESAR have been collected, mainly due to the early stages of the related projects.

Relevant increase in capacity has been achieved in the analysis time horizon to 2016. In München, where the T2 new satellite opened in 2016 and raised the capacity from

45.000.000 pax*year to 55.000.000, while in Oslo Gardermoen as T2 opened in April 2017, the capacity raised by 17% from 24.000.000 pax*year to 28.000.000. In Rome Fiumicino, "Molo E" operational in December 2016 raised the capacity of the terminal by 6.000.000 pax*year.

The KPI related to connection with rail shows no changes since the 2016 reported status. The only rail connection project refers to Helsinki, and is related to the completion of the ring rail line which became operational in summer 2015.

The data about the availability of clean fuels for aircrafts inside the airports could not be collected in the same way as the other KPI since the projects related to clean fuels at airports are really marginal or at a very early stage where implementation or operations have not been planned, yet.

Open access

The viability of operation by any European carrier in any European airport is one of the pillars of the European policy in the domain of air transport by time.

All analysed airports show the compliance with the Regulation (EU) 1315/2013 in terms of open accessibility since 2014, and before, too. It means that all analysed airports offer at least one terminal which is open to all operators in a non-discriminatory way and which applies transparent, relevant and fair charges.

Single European Sky - SESAR system

The implementation actions for the Single European Sky objective are still at early stages and will begin to bear fruits in the next years. The way to the implementation of Single European Sky will involve airports on the ScanMed Corridor, according to the strategy defined by the 2015 European ATM Masterplan - The roadmap for delivering high performing aviation for Europe. On 5 December 2014 the Commission appointed the SESAR Deployment Alliance as the body in charge for the Deployment phase (SESAR Deployment Manager).

110 "green projects" submitted to the 2014 CEF Call for proposal have been listed in the Deployment Programme and analysed in order to identify implementation priorities and gaps for the 2015 call.

The following list reports the CEF 2014 awarded projects along the ScanMed Corridor.

a) AMAN Upgrade to include Extended Horizon function (Stockholm)
b) Geographic Database for Procedure Design (Italy)
c) Basic A-CDM (Stockholm)
d) A-SMGCS Level 1 and 2 (København, München, Stockholm)
e) Airport Safety Net associated with A-SMGCS Level 2 (Rome)
f) Upgrade of ATM systems (NM, ANSPs, Aus) to support Direct Routings (DCTs) and Free Routing Airspace (Italy)
g) Implement Free Route Airspace (Italy)
h) Interface ATM systems to NM Systems (Italy)
i) Stakeholder Internet Protocol Compliance (Denmark)
j) Upgrade / Implement Aeronautical Information Exchange System/service (Germany, Italy)

Upgrade / Implement Flight Information Exchange System/Service (Italy)

The following list reports the CEF 2015 awarded projects along the ScanMed Corridor.

a) - Deploy AMAN - Arrival Management at Düsseldorf and Berlin International (Berlin)
b) Implementation of RNP Based Departure Operations in High Density TMAs in FRA, DUS, BER and MUC (Berlin, München)
c) Implementation of initial DMAN and AOP at Copenhagen Airport (Copenhagen)
d) Implementation of OTP (Sweden)
e) Initial APOC and AOP (München)
f) Initial AOP (Sweden)
g) DMAN Stockholm Arlanda Airport (Stockholm)
h) A-SMGCS Level 2 implementation (Sweden)
i) AF2.4 A-SMGCS - Routing & Planning (Copenhagen)
j) - AF 2.5 A-SMGCS - Safety Nets (Copenhagen)
k) - ASM tool Implementation (Italy)
l) Flight deployment in Italy - Phase I (Italy)
m) Flight deployment in Italy - Phase II (Italy)
n) Deploy free Route Airspace (Full FRA) in German and SWISS Airspace (Germany)
o) Slot Manager for PCP airports (Germany)
p) Implementation of ENAV "LAN Servizi" (Italy)
q) Transition of current Aeronautical Information Management System to EAD (Italy)
r) ADQ implementation Stockholm Arlanda (Stockholm)
s) Sub-regional SWIM MET deployment to support NEFRA (A and B) (Finland, Sweden, Denmark)
t) European Weather Radar Composite of Convection Information Service (Germany, other)
u) European Harmonised Forecasts of Adverse Weather (Icing, Turbulence, Convection and Winter weather) (Germany, Finland, other)
v) European MET Information Exchange (MET-GATE) (Germany, other)

However, since the detailed SESAR requirement to be achieved by each airport and the detailed contribution of each of the projects on each airport is not clear we have indicated that the KPI is not applicable ("n.a.") at this moment.

Capacity

The Regulation (EU) 1315/2013 requires that in the development of the core and comprehensive network, general priority shall be given to measures that are necessary for promoting the efficient and sustainable use of the infrastructure and, where necessary, increasing capacity. The increase in capacity of the earth infrastructure, that is the airports, has also to be coherent with the increase of the air space capacity that will happen thanks to the innovations that will be introduced by the technology envisaged by the SESAR project.

In the last 3 years 4 core network airports on the Scandinavian-Mediterranean Corridor registered an increase in capacity.

First is Berlin Schönefeld airport (SXF), whose capacity has been increased from 7.3 to 8 million passengers as a result of 2 different drivers: on one side the effective increasing demand of capacity and the impossibility to increase the capacity in the other city airport Berlin Tegel (TXL) and, on the other, the works for the building of the new Berlin Brandenburg airport (BER) that will use the current runway of Berlin Schönefeld. Also the runway, in fact, has been lengthened from 3,000 to 3,600 m.

Second in München, where the T2 new satellite raised the capacity from 45 million pax*year to 55.

Third is Oslo Gardermoen (T2 opened in April 2017), where the capacity raised from 24 million pax*year to 28.

Fourth is Roma Fiumicino, where the new "Molo E" (opened in December 2016) increased the capacity of the terminal up to 41 million pax*year.

As shown in the following table, out of 21 analysed airports, 9 of them reached an annual passenger traffic level above their respective declared potential capacity (Oslo, Göteborg Landvetter, Berlin Tegel and Schönefeld, Hamburg, Hannover, Bologna, Roma Fiumicino and Palermo) and 2 of them a passenger traffic that is between 90% and 100% of the declared potential capacity (Stockholm and Copenhagen).

Table 18: Airports passenger capacity, traffic flow and utilization (%) in 2016

Airport	Passenger capacity (2016)	Passenger traffic flow (2016)	Share of used capacity (2016)
Helsinki Vantaa (HEL)	20.000.000	17.184.861	86%
Turku/Naantali (TKU)	n.a.	312.105	n.a.
Oslo Gardermoen (OSL)	24.000.000*	25.788.610	107%
Stockholm Arlanda (ARN)	25.000.000	24.702.000	99%
Göteborg Landvetter (GOT)	6.000.000	6.375.512	106%
Malmö Sturup (MMX)	5.500.000	2.218.245	40%
Kobenhavn Kastrup (CHP)	30.000.000	29.043.287	97%
Berlin Brandenburg (BER)	27.000.000	-	0%
Berlin Tegel (TXL) Berlin Schönefeld (SXF)	28.000.000	31.906.881	118%
Bremen (BRE)	n.a.	2.573.501	n.a.
Hamburg (HAM)	15.000.000	16.223.968	108%
Hannover Langenhagen (HAJ)	4.500.000	5.452.669**	121%
Leipzig-Halle (LEJ)	4.500.000	2.192.145	49%
Nürnberg (NUE)	5.000.000	3.484.825	70%
München (MUC)	55.000.000	42.261.309	77%
Bologna (BLQ)	7.500.000	7.680.992	102%
Roma Fiumicino (FCO)	35.000.000***	41.744.769	119%
Napoli Capodichino (NAP)	10.500.000	6.755.988	64%
Palermo Punta Raisi (PMO)	5.000.000	5.309.000	106%
Valletta Malta-Luqa (MLA)	5.000.000	4.618.642**	92%

*Source: GruppoClas analysis, May 2017; * 28.000.000 since April 2017; ** figures refer to 2015; *** 41.000.000 since December 2016*

Connection with rail

The Regulation (EU) 1315/2013 requires that in the development of the core and comprehensive network, general priority shall be given to measures that are necessary for ensuring optimal integration of the transport modes and improving multimodal interconnections between airports and infrastructure of other transport modes. In particular, it requires that all main airports in the core network have to be connected with rail by 2050. Since the seven main airports are connected already now we have continued to assess all airports against this important KPI.

The status in 2017 is that 68% of the analysed airports, that is 13 out of 19, are connected with rail, with an increase of 1 airport from 2014. In 2015, in fact, the new Helsinki ring rail line connecting the airport Vantaa has been opened and also the rail link with the new Berlin Brandenburg airport has been completed, even if the airport is not in operation yet.

The compliance coefficient considers not only the connectivity with heavy rail but also two other "rail" modes of transport, that is tram (for the case of Bremen) and metro (for the case of Nürnberg). Measured against the requirement of Article 41(3) all seven "main airports" of the corridor are now connected with rail.

Availability of clean fuels

Thanks to its large scale, the trans-European transport network should provide the basis for the large-scale deployment of new technologies and innovation, which, for example, can help to enhance the overall efficiency of the European transport sector and reduce its carbon footprint. This will contribute towards the objectives of the Europe 2020 Strategy and the White Paper's target of a 60 % cut in greenhouse gas emissions by 2050 (based on 1990 levels) and at the same time contribute to the objective of increasing fuel security for the Union. In order to achieve those objectives, the availability of alternative clean fuels should be improved throughout the trans-European transport network.

Conclusions

In the last 3 years, from the issue and start of implementation of the Regulation (EU) 1315/2013 to nowadays, some starting actions aiming at the complete compliance of airports to the targets dictated to the regulation have already been undertaken.

In particular, no action is needed in order to achieve the target goal of open access in terms of accessibility for operators and viability of operations by them in a non-discriminatory environment, since it is already met by all the airports on the corridor.

The SESAR project is in its early stage of implementation and no relevant data could be collected about.

Relevant increase in capacity has been achieved in the analysis time horizons: in particular Berlin Schönefeld (+10%), Oslo Gardermoen (+17%), München (+22%), and Roma Fiumicino (+17%).

The KPI related to connection with rail highlights a slight increase due to the new rail facility opened at the airport of Helsinki. Also the rail infrastructure to the new Berlin Brandenburg airport has been completed although the airport is still not in operation. All seven "main airports" of the corridor are now connected with rail.

There is no relevant operational progress about the availability of clean fuels.

5.4 Maritime Infrastructure (Seaports) and MoS

Definition of parameters

The progress has been valued by means of 8 parameters derived from the Regulation (EU) 1315/2013. The port parameters are based on the requirements and priorities (in the following subsumed as "maritime priorities") mentioned in the section "Maritime transport infrastructure and motorways of the sea" (Art. 20, 21, 22 and 23). In addition, further relevant articles of the Regulation (Art. 39 and 41) as well as the corresponding objectives defined in the 2014 Work Plan of the European Coordinator have been considered.

5 of 8 parameters were also named Key Performance Indicators (KPI) and measured across corridors. As depicted clearly in Table 20, all parameters are related to the maritime priorities of the Regulation which are:

- **connection to inland waterway CEMT class IV** (Regulation (EU) 1315/2013, Art. 22(1)(a), Art. 23(b), Art. 41(2));
- **connection to rail network** (Regulation (EU) 1315/2013, Art. 22(1)(a), Art. 23(a), Art. 41(2));
- implementation of **VTMIS and e-maritime** services as well as **SafeSeaNet** (Regulation (EU) 1315/2013, Art. 22(3), Art. 23(c));
- provision of **reception facilities** for ship generated waste (Regulation (EU) 1315/2013, Art. 22(2), Art. 23(a));
- **availability of alternative clean fuels** for maritime transport incl. LNG (Regulation (EU) 1315/2013, Art. 23(d), Art. 39(2)(b));
- provision of **access from the sea to maritime ports**, corresponding at least to inland waterway class VI (Regulation (EU) 1315/2013, Art. 22(1)(c));
- availability of at least one **terminal which is open to users in a non-discriminatory way** and which applies transparent charges (Regulation (EU) 1315/2013 Art. 22(1)(b));
- **modernisation and expansion of the capacity of the infrastructure** necessary for transport operations within the port area (Regulation (EU) 1315/2013 Art. 23(e)).

The analysis of Motorways of the Sea (MoS) is subject of a separate study conducted for the MoS Coordinator and his Implementation Plan.

Actions accomplished

Altogether, 34 projects which can be subsumed under the category ports (these are the project categories 'Maritime' and 'MoS') were accomplished during the reporting period:

TEN-T Project ID 2069: This project is called "The Finnish NSB and ScanMed Ports". It is located in the ports of Helsinki, Turku, Naantali, Hamina, Kotka. It is a MoS-project which comprises, among others, improvements of the maritime access as well as LNG-infrastructure and services, development of the intermodality and e-Freight among the mentioned ports. The project was accomplished in December 2016.

TEN-T Project ID 2070: The so called "Twin-Port 1" project is located in the Port of Helsinki and Port of Tallinn. It is a common maritime project by the Port of Helsinki, City of Helsinki, Finnish Transport Agency working on the section and/or nodes Helsinki – Tallinn (part of North Sea – Baltic Corridor). In Helsinki the project focuses on the West Harbour, while in Tallinn it focuses on the Old City harbour. The project's central element is the development of the harbour activities including the increase of the transport capacity between Helsinki and Tallinn, improvement of the route's infrastructure efficiency and the utilization of new technology and automation. The project was accomplished in December 2015.

TEN-T Project ID 2953: This common 'maritime' project is called "Back from Black - The introduction of sulphur scrubber". Amongst others, it is located in the ScanMed core ports of Lübeck and Helsinki. The objective is to create, demonstrate, deploy and disseminate an economic and environmentally viable technology which will help to comply with the new sulphur regulations for maritime transport. The project introduced on the market a new product to tackle exhaust gas abatement and wash water cleaning technology by piloting and prototyping the installation of the hybrid scrubber (with possibility to switch between closed and open loop) on two vessels. It was accomplished in December 2016.

TEN-T Project ID 5011: This 'MoS' project is named "Upgrading and sustaining the competitive core Baltic MoS link Helsinki-Lübeck". It has two objectives. On one hand, to increase the productivity and capacity of the MoS link and service related terminal operations in the TEN-T core ports of Lübeck-Travemünde in Germany and Helsinki-Vuosaari in Finland. On the other hand, to reduce the environmental impact of ship operations. The Action was accomplished in December 2016.

TEN-T Project ID 5012: This 'maritime' project is partially located in the comprehensive port of Helsingborg. It comprises the realization of the power provision and charging installations in the port/ferry terminal, which is in conjunction with the conversion of two existing complex RoPax ships - originally driven by marine gasoil - to plug-in all electric powered operation using exclusively batteries. The Action was accomplished in December 2016.

TEN-T Project ID 5013: The project's name is almost self-explaining: "Upgrading and sustaining the competitive Baltic MoS link Germany-Finland (RoRo multiple ports loop)". This 'MoS' project is located in the core ports of Rostock, Lübeck-Travemünde, Turku and Kotka. The Action has two objectives: on one hand, to increase the productivity and capacity of the 'MoS' link and service related terminal operations and on the other hand, to reduce the environmental impact of the ship operations. The project was accomplished in December 2016.

TEN-T Project ID 5017: The action is located in the core port of Hamburg. It is a 'maritime' project and consists and aims at the significant enhancement of traffic safety as well as improvement of the flow of traffic in the Port of Hamburg with the help of new Elbe crossing, for which this project ensures the landside complementary measures. The project was accomplished in December 2016.

TEN-T Project ID 5139: "New Icebreakers" is a nationwide 'MoS' project which is promoted by the Finish Transport Agency. It is unique in many ways. The new Icebreaker 'Polaris' is the first icebreaker in the world capable of running on both liquefied natural gas (LNG) and ultra-low-sulphur diesel. Thereby, 'Polaris' is Finland's most powerful icebreaker and the most environmentally friendly diesel-electric icebreaker in the world. The vessel's innovative design (e.g. the shape) and modern technological solutions (e.g. the propulsion system) ensure its ability to take on the most challenging conditions in the Baltic Sea. It is crucial to safeguard the winter transport needs in the Baltic Sea. The 'Polaris' was delivered the 1st of November and the entire project was accomplished in December 2016.

TEN-T Project ID 5219: "Sustainable Traffic Machines - On the way to greener shipping" is an MoS project on the section or node Rødby - Puttgarden. It targets at installation of hybrid propulsion and exhaust gas cleaning solutions on 2 RoPac vessels deployed on the aforementioned link Rødby – Puttgarden. The project was accomplished in December 2015.

TEN-T Project ID 5220: "Monalisa 2.0" is an MoS project on the Baltic Sea as well as Mediterranean Sea. It targets at strengthening of efficiency, safety and environmental performance of maritime transport, reduction of administrative burden. The studies include Sea Traffic Management testing and maritime route exchange through common interface & data format. The project was accomplished in December 2015.

TEN-T Project ID 5221: "Winter Navigation Motorways of the Sea, WINMOS" is an 'MoS' project on the Baltic Sea. It targets at developing efficient maritime transport during winter. Developing and adapting winter navigation system, piloting new fuel injection technique, upgrading existing Icebreaking Management System. The project was accomplished in December 2015.

TEN-T Project ID 5222: This project is an 'MoS' project which comprises "LNG Bunkering Infrastructure Solution and Pilot actions for Ships operating on the Motorway of the Baltic Sea". The project targets at three pilot actions for LNG, methanol and the use of scrubbers and the implementation of an LNG bunker supply infrastructure at Port of Brofjorden (SE). The studies aim at the deployment of LNG in vessels deployed in the Baltic Sea and North Sea. The project was accomplished in December 2015.

TEN-T Project ID 5223: "PILOT SCRUBBER – New Generation Lightweight Pilot Scrubber Solution installed on a Ro-Ro Ship operating on the Motorway of the Baltic Sea" is a 'MoS'-project on the section or node Baltic Sea. It targets at Installation, evaluation and demonstration of a new generation, innovative lightweight scrubber technology on existing Ro-Ro vessels. Furthermore it comprises the verification and evaluation of specific port infrastructure and preparatory investments. The project was accomplished in December 2015.

TEN-T Project ID 5224: "Methanol: The marine fuel of the future" is an 'MoS' project on the Baltic Sea. It targets at Pilot action to test the performance of methanol on the existing passenger ferry Stena Germanica (Göteborg-Kiel) by creating appropriate port infrastructure for supply of methanol for bunkering. The project was accomplished in December 2015.

TEN-T Project ID 5225: "ANNA - Advanced National Networks for Administrations" is an 'MoS' project by the Kingdom of Sweden and Italian Republic on the Baltic Sea and Mediterranean Sea. It targets at Adoption of national Maritime Single Window and electronic data transmission for the fulfilment of reporting requirements for vessels entering and departing European ports. The project was accomplished in December 2015.

TEN-T Project ID 5226: "Business to Motorways of the Sea" is an 'MoS' project by the Valencia Port Foundation on the Baltic Sea and Mediterranean Sea. It targets at pilot actions aimed at preparing and adapting business communities and port authorities' systems. The project was accomplished in December 2015.

TEN-T Project ID 5227: "WiderMoS" is an MoS project by the La Spezia Port Authority on the Baltic Sea and Mediterranean Sea. It targets at improving the long term effective and sustainable connection between the sea and other transport modes by developing new port/ship/train interfaces. The project was accomplished in December 2015.

TEN-T Project ID 5228: "Green Bridge on Nordic Corridor" is an 'MoS' project on a section in the Baltic Sea (Trelleborg – Kiel - Lübeck). It targets at piloting equipment of two large, multi-engine RoPax ships with exhaust gas cleaning technologies, in form of wet-scrubbers and preparation of corridor for operating next Baltic RoRo/RoPax ship generation. Furthermore, it comprises ferry berths reconstructions and shore side electricity installations. The project was accomplished in December 2014.

TEN-T Project ID 5229: "LNG in Baltic Sea Ports" is an 'MoS' project on several nodes of the Baltic Sea (Helsinki, Stockholm, Copenhagen, Aarhus, Helsingborg, Turku). It targets at the development of a harmonised approach towards LNG bunker filling infrastructure and the achievement of standardised process for planning and construction LNG infrastructure. The project was accomplished in December 2014.

TEN-T Project ID 5230: "The Baltic Sea Hub and Spokes Project" is an 'MoS' project in the Baltic Sea (Aarhus, Göteborg). It targets at Common Hub and Spoke concepts. Four main activities of this project are: Marine Integration Project (MIP), Port Access Aarhus, Port Access Gothenburg and Port Security Tallinn. The project was accomplished in December 2014.

TEN-T Project ID 5232: "COSTA" is an 'MoS' project located in the Mediterranean Sea. It targets at developing framework conditions for the use of LNG for ships, an LNG Masterplan for short sea shipping between Mediterranean Sea and North Atlantic Ocean as well as Deep Sea cruising in North Atlantic Ocean. The project was accomplished in April 2014.

TEN-T Project ID 5233: LNG Rotterdam - Gothenburg (2012-EU-21003-P) is an MoS project by the Havenbedrijf Rotterdam NV, Vopak LNG Holding, Port of Gothenburg AB, Swedegas, LNG Break Bulk Rotterdam CV in the North Sea. It targets at the creation of break bulk infrastructure for small-scale LNG supply in the ports of Rotterdam and Gothenburg. These ports have the critical mass to assist the market transition to maritime LNG in Northern Europe. The project was accomplished in December 2015.

TEN-T Project ID 5320: "Piattaforma logistica" is an 'MoS' project on the node Taranto. It targets at the Logistics Platform which can act as an intermodal centre, allowing goods to be transferred between road, rail and sea transport and which can provide cargo services. The project's aim is to achieve a fully integrated operation based on ICT systems. On the one hand, the Logistics Platform can be used for General logistics services such as warehousing, loading and unloading, groupage and degroupage, shipment consolidation, packing and unpacking, stuffing and stripping and distribution. On the other hand, the Logistics Platform can be used for value added services such as quality control, assembling, final goods refining and personalization of products, functioning tests, etc. Potential users of these services include manufacturing companies that require processing of their products in final stages of forwarding and distribution as well as national and international logistics operators. The project was accomplished in September 2015.

TEN-T Project ID 5325: The so called "Seaport Hub" is a 'maritime' project located in the node Gioia Tauro. It targets at an infrastructure upgrade in the Gioia Tauro transhipment hub. The project was accomplished in December 2015.

TEN-T Project ID 5358: This 'maritime' project is called "New station on Darsena Toscana and connection to Tyrrhenian line". It is located in the Port of Livorno and comprises the construction of a new station at Darsena Toscana terminal in the port area as well as its direct connection to the Tyrrhenian line. The project was accomplished in December 2016.

TEN-T Project ID 5370: The 'maritime' project "Cranerail Installation and Terminal 1 Yard Expansion" comprises two subtasks. The first subtask is the construction of crane beam and installation of Quayside crane rails. These are necessary to be able to install the new Quayside Cranes on Malta Freeport's Terminal 1 North Quay. The new

Quayside Cranes are capable to reach across 25 rows of containers. Furthermore, the rail is extended by additional 360 linear metres. In addition, subtask two is the expansion of the Terminal 1 yard by 40,000 square metres meaning additional 1,000 ground slots. The project was accomplished in December 2015.

TEN-T Project ID 5371: "Investment in Quayside Cranes" describes the investment in Quayside Cranes on the section or node Marsaxlokk. It is a 'maritime' project. The project targets at the procurement of four quayside cranes by Malta Freeport Terminals. Each new Quayside Crane has a capacity of 85 tonnes, a lifting height under spreader above rail of 54 m and is capable of handling twin-lift spreaders and reaching across 25 rows of containers. Three of these Cranes are placed on Terminal 1 North Quay and one on Terminal 2 North Quay. With these Cranes Malta Freeport Terminals is the only hub in the Mediterranean capable of handling 18,000 TEU vessels (and over) on two berths. Furthermore , Malta Freeport Terminals shifted 'QC02' from Terminal Two 2 Quay to Terminal 1 North Quay. This Crane has a lifting height under spreader above rail of 34.5m and is capable of handling across 18 rows of containers in twin-lift mode (2 x 20' containers). The project was accomplished in December 2015.

TEN-T Project ID 5423: "Project Värtahamnen" is a 'maritime' project. Värtahamnen and the adjacent Stockholm Free Port at Lilla Värtan is Stockholm's main port. The project comprises the extension of the Vart Pier, the new construction of 85,000 square meters and the upgrade to 5 berths in total with an overall length of 1,200 m. Furthermore, OPS and port waste reception facilities are planned as well as railway connection. The project was accomplished in December 2016.

TEN-T project ID 5513: The 'MoS' project "Upgrading and sustaining the competitive Baltic MoS link Germany-Finland (RoRo multiple ports loop)" is located, amongst others, in the core ports of Turku, Kotka, Lübeck and Rostock. The action has two objectives. On one hand, to increase the productivity and capacity of the MoS link and service related terminal operations and on the other hand, to reduce the environmental impact of the ship operations. This comprises the upgrade of the ships deployed on the maritime link with a wet-type open-loop hybrid ready emission abatement technology, the installation of energy efficiency measures for optimizing bunker consumption and minimizing the emission of green-house gases from ship operations. Furthermore, the project comprises the implementation of quality, efficiency, capacity and safety increasing measures in two of the ports regularly called, amongst the Port of Rostock. The project was accomplished in December 2016.

TEN-T project ID 5554: The project "FAMOS Freja: Finalising Surveys for the Baltic Motorways of the Sea" is the first of three actions comprising the Global Project ''FAMOS''. Reliably surveyed shipping routes at sea are a major pillar of the marine transport infrastructure and an indispensable precondition for the safety of ship navigation and transports at sea. In the Baltic Sea, the water depth in extensive parts of the areas used by commercial shipping traffic is not yet mapped to modern standards. This project focuses on hydrographic surveying of 34,000 km² of the Baltic Sea according to the BSHC-HELCOM Scheme. In addition to hydrographic surveys, the Action also encompasses other activities, amongst others: the improvement of the data workflows and information exchange at the hydrographic offices; the improvement of the infrastructure needed for hydrographic surveys; laying the foundation for a common and unified zero level in all Baltic Sea nautical charts. The project was accomplished in December 2016.

TEN-T Project ID 5570: "Sustainable Trelleborg-Swinousjcie MoS services based on upgrading port infrastructure, developing intermodal transport and integrating hinterland corridors" is an 'MoS' project. It is located in the Port of Trelleborg. The project is part of the move of the port area and will enable the reception of larger vessels and safer and more efficient handling in the port on land and water. Activities in the project include new 3km long breakwater, new intermodal terminal, dredging in the inner port and fairway and widening of the port entrance. The project was accomplished in December 2015.

TEN-T Project ID 5573: "LNG in Baltic Sea Ports II" is an 'MoS' project in the Baltic Sea (Helsingborg, Trelleborg, Sundsvall, Klaipeda). The Action encompasses pre-investment studies, related technical design, associated permits and risk assessment procedures for LNG bunkering infrastructure (land based and floating) in partner ports, in a harmonised manner. The project was accomplished in December 2015.

TEN-T Project ID 7903: "Biscay Line - Multiple port Finland-Estonia-Belgium-Spain long distance MoS, relevant to many core network corridors" is an 'MoS' project. One of the project's targets is directly linked to the ScanMed Corridor: the reduction of the environmental impact of the RoRo vessels traffic operations with the help of emission abatement technology (wet-type open-loop hybrid ready scrubber systems). The project was accomplished in December 2016.

Compliance achieved

The ScanMed Core Network Corridor composes of 25 core ports which are located in Finland (4), Sweden (4), Norway (1), Denmark (1), Germany (4), Italy (9) and Malta (2). Due to geographic, topographic, climate and historic reasons the Member States' hinterland transport infrastructures differ. Some Member States have specifics which have to be kept in mind when infrastructure parameters referring to the hinterland connection are defined and employed on the single port. E.g. there is no railway network on the island of Malta. Hence, the port parameter "connection to rail" is not applicable on the ports of Valletta and Marsaxlokk. It does not make any sense to consider the current neither the future connection of Maltese ports to the rail network. Therefore, this parameter is only applied on the remaining 23 ports.

An overview on the parameters and each port's compliance with these parameters is given in Table 19. A "X" set in a column indicates that the port achieved compliance to the appropriate port parameter at the end of the year 2016. The symbol "(x)" stands for cases, in which the parameter is partly fulfilled (e.g. the Port of Valletta has one private shore side supply which caters for the ferry service to Sicily and which is not public). A "-" is the symbol for missing compliance. The indication "N.A." is used in cases like the a.m. Maltese case in which a port parameter is not applicable due to generally missing hinterland infrastructure.

The "N.A." is also applied on a special parameter which differs from the other parameters. In general, the parameters are representing the state of play which can be measured at a special time and which is binary meaning that the compliance IS GIVEN or it IS NOT GIVEN. However, the parameter "modernisation and expansion of capacity" describes a process. Furthermore, there is no urgent need for additional port infrastructure capacities. Hence, this parameter can be only applied to indicate ongoing or planned projects which target at handling future demands or changed demand patterns.

Table 19: Compliance of Port parameters, 2017

Ports	Connection to IWW CEMT class IV	VTMIS and maritime e-services & SafeSeaNet	Availability of clean Fuels	Modernisation and expansion of Capacity	Connection to Rail	Sea access	Open acces (non-discrimatory)	Facilities for ship generated waste
Hamina/Kotka,	(x)	X	-	N.A.	X	X	X	X
Helsinki	-	X	X	N.A.	X	X	X	X
Turku	-	X	-	N.A.	X	X	X	X
Naantali	-	X	-	N.A.	X	X	X	X
Stockholm	X	X	X	N.A.	X	X	X	X
Göteborg	X	X	X	N.A.	X	X	X	X
Malmö	-	X	-	N.A.	X	X	X	X
Trelleborg	-	X	X	N.A.	X	X	X	X
Oslo	N.A.	X	X	N.A.	X	X	X	X
København	N.A.	X	-	N.A.	-	X	X	X
Rostock	-	X	-	N.A.	X	X	X	X
Lübeck	X	X	-	N.A.	X	X	X	X
Hamburg	X	X	-	N.A.	X	X	X	X
Bremen	X	X	-	N.A.	X	X	X	X
La Spezia	N.A.	X	-	N.A.	X	X	X	X
Livorno	N.A.	X	-	N.A.	X	X	X	X
Ancona	N.A.	X	-	N.A.	X	X	X	X
Napoli	N.A.	X	-	N.A.	X	X	X	X
Bari	N.A.	X	-	N.A.	-	X	X	X
Taranto	N.A.	X	-	N.A.	X	X	X	X
Gioia Tauro	N.A.	X	-	N.A.	X	X	X	X
Palermo	N.A.	X	-	N.A.	-	X	X	X
Augusta	N.A.	X	-	N.A.	-	X	X	X
Valletta	N.A.	X	(x)	N.A.	N.A.	X	X	X
Marsaxlokk	N.A.	X	-	N.A.	N.A.	X	X	X
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**50%**	**100%**	**24%**	**N.A.**	**83%**	**100%**	**100%**	**100%**

Source: Uniconsult analysis, May 2017

With regard to the entire ScanMed Corridor it can be noted that 4 of 8 (respectively 7 applicable) parameters were already fully achieved in the year 2014. Looking at the remaining 3 parameters, 2 different patterns of development can be noted.

On the one hand, none of the Actions accomplished has any influence on the ports' connection with inland waterway or railway network. On the other hand, several accomplished MoS projects target at an improved availability of clean fuels. Hence, the parameter "Availability of clean fuels (incl. LNG)" increases significantly from 16% in the year 2014 up to 24% in the year 2016.

Table 20: Development of Port KPI 2014, 2016, 2017 and target for 2030

Port Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Target 2030
Connection to inland waterway CEMT class IV	X	X	X	1)	50%	50%	**50%**	**100%**
VTMIS and e-maritime services as well as SafeSeaNet	X	X		1)	100%	100%	**100%**	**100%**
Availability of clean fuels (incl. LNG)	X	X	X	1)	12%	20%	**24%**	**100%**
Modernisation and expansion of capacity	X			-	N.A.	N.A.	**N.A.**	**100%**
Connection to rail	X	X	X	1)	83%[17]	83%[18]	**83%**	**100%**
Sea access	X			1)	100%	100%	**100%**	**100%**
Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	X		X	1)	100%	100%	**100%**	**100%**
Facilities for ship generated waste	X	X	x	1)	100%	100%	**100%**	**100%**

Source: Uniconsult analysis, May 2017; P = Priority; O = Objective, K = KPI; 1) websites and other information of respective infrastructure managers

Conclusions

On the one hand, the 25 ports of the ScanMed Corridor generally provide sufficient sea access, non-discriminatory access to at least one terminal, reception facilities for ship generated waste and VTMIS, e-Maritime services and SafeSeaNet. Furthermore, the majority of ports has rail connection (83%). One exception is the special case of Maltese ports, where no railway network exists. Hence, this parameter cannot be applied on the ports of Valletta and Marsaxlokk. The second exception is the Danish side of Copenhagen Malmö Ports and remaining exceptions are ports of Bari (the existing rail connection was deactivated in 1993), Palermo (the existing rail connection was deactivated in 1957) and Augusta (the existing railway line close to the main oil

[17] Erratum in previous reports: the value has been amended from 100% to 83%.

[18] Erratum in previous reports: the value has been amended from 96% to 83%.

refineries was used for commuter trains only and didn't connect the port's terminals to the national railway network) in Italy.

On the other hand, only 50% of the ports which are located in Member States with inland waterways have connection to inland waterways so that single improvement measures should be taken. Broader need for improvement can be noted with regard to the availability of clean fuels. Although a strong improvement by 12 percentage points can be noted for the last 3 years, this positive development is mostly limited to the Scandinavian ports. Therefore, a major challenge is to facilitate the supply of clean fuels in German, Italian and Maltese ports. It is recommended that German, Italian and Maltese port infrastructure managers and politicians cooperate with and learn from their appropriate partners in the Scandinavian countries.

5.5 Rail-Road Terminals

Definition of parameters

The ScanMed Core Network Corridor composes of 45 intermodal terminals of which 17 are located in seaports, one in an inland port (of Nürnberg) and 27 in "dry" locations. The latter 28 sites can be classified as "rail-road terminals (RRT)" since their purpose is to facilitate transhipment of intermodal transport units between road and rail. In some nodes more than one terminal is located, e.g. in the freight villages of Verona and Bologna each three different terminals are located, so that the number of "terminals" may increase to 32.

In the compliance analysis in the framework of the 2014-Study the Commission focused on the "number of access lanes and tracks" and it was proposed by the consultants to expand the evaluation to further, more relevant criteria if the managers of RRT are considered Members of the Corridor Forum and are invited into the consultation process. Following the initiative of European Coordinator Pat Cox the managers were not only invited to the Forum but to a dedicated working group meeting. The working group meeting was organised in the form of an ideas laboratory and took place in Verona, Italy, on 19/20 April 2016.

With the explanation exchanged in the meeting and the "homework" completed by a questionnaire the dataset for the required compliance analysis could be improved considerably compared to the 2014-Study. In detail the following parameters were considered:

Article 28 of Regulation (EU) 1315/2013 defines the infrastructure requirements on terminals in such a way that:

"1. Member States shall ensure, in a fair and **non-discriminatory way**, that:

(a) transport modes are **connected** in any of the following places: freight terminals, […], in order to allow multimodal transport of […] freight;

(b) […] freight terminals and logistic platforms, […] are equipped for the provision of **information flows** within this infrastructure and between the transport modes along the logistic chain. Such systems are in particular to enable real-time information to be provided on available infrastructure capacity, traffic flows and positioning, tracking and tracing, and ensure safety and security throughout multimodal journeys;

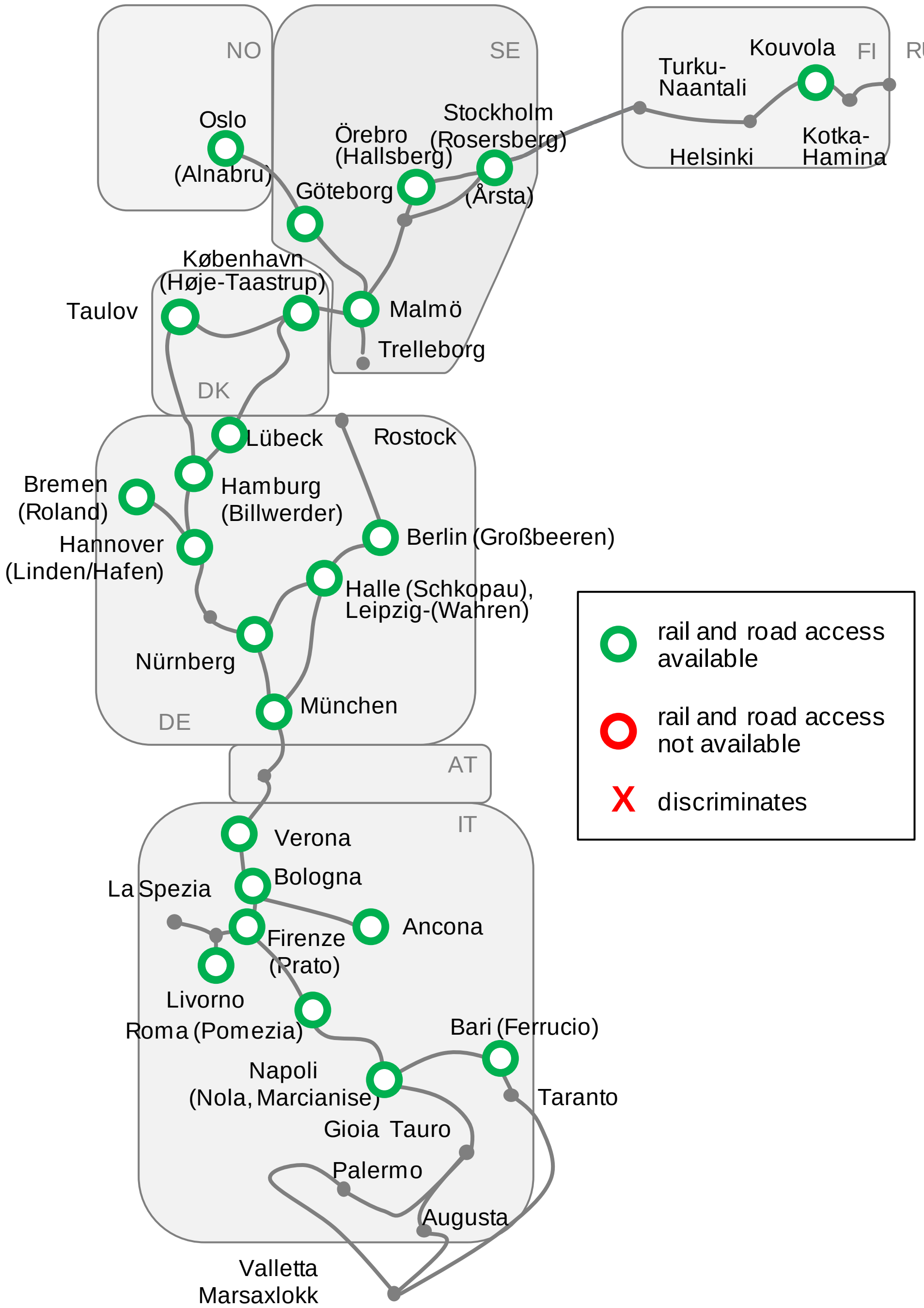
(c) […].

2. Freight terminals shall be **equipped** with cranes, conveyors and other devices for moving freight between different transport modes and for the positioning and storage of freight."

Measured against that background basically all terminals are fulfilling these criteria on the "accessibility" since no terminal has reported to discriminate its users as the next figure illustrates. The city of Kouvola has launched a project to further improve the situation and to create an "open access" terminal facilitating more intermodal transports and modal shift. It can be expected that also the terminals which did not return the questionnaire by 18.05.2016 are basically fulfilling this criteria.

Too, all but 2 terminals are capable to handle all types of intermodal transport units, semi-trailers, swap bodies and containers. Prato is focused on container handling, today, while Kouvola reports that trailers could not be handled. München-Riem is also capable to handle Rolling Motorway (RoLa) trains, although there is no such service in place currently. If we consider that the "non replying" terminals offer also at least one type of handling or that there are local market reasons for focusing on certain types of units the overall compliance can be attested.

Figure 11: Compliance Analysis of RRT – Accessibility



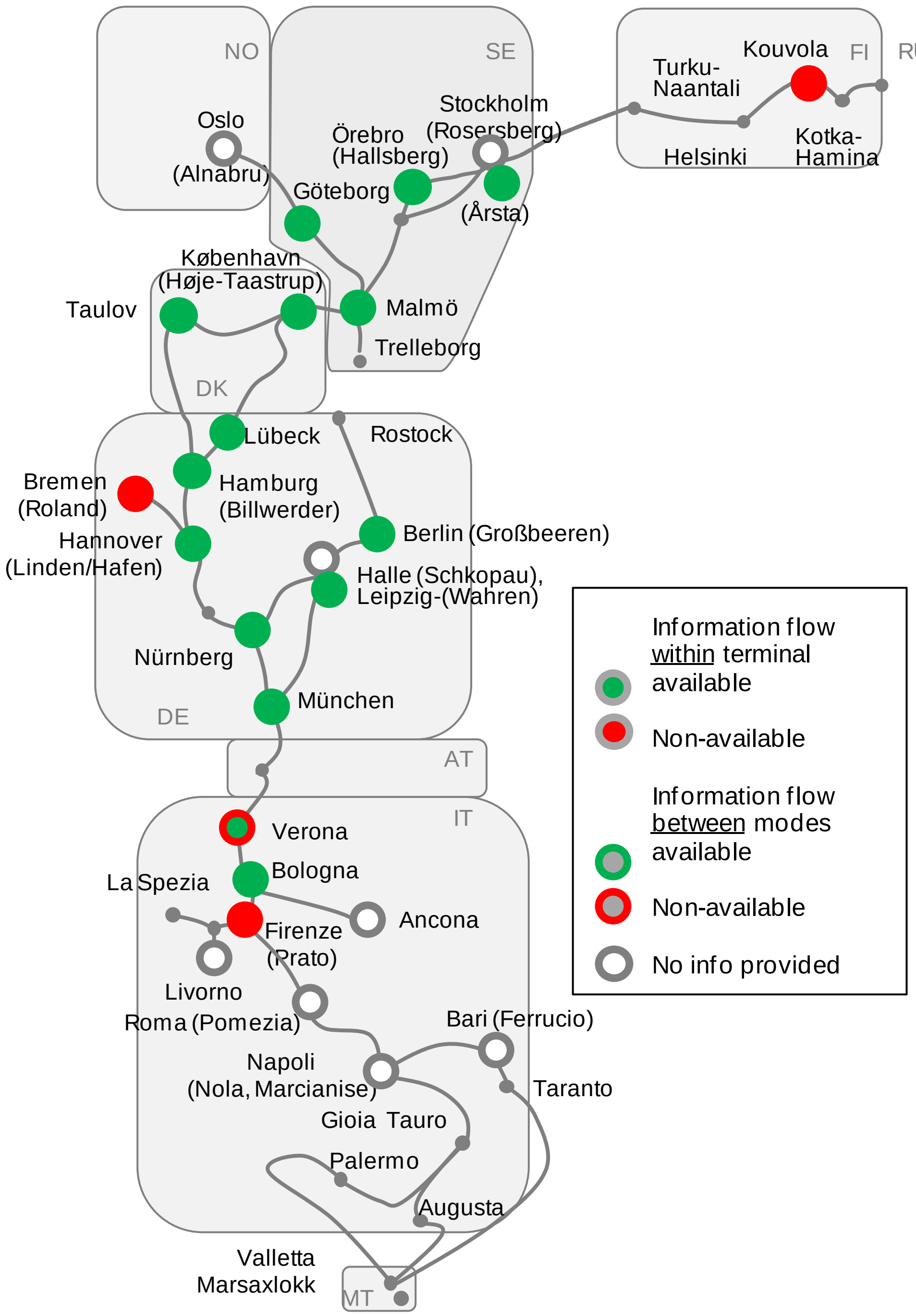
Source: KombiConsult analysis, May 2017

Article 28, too, defines that terminals shall be

„equipped for the provision of **information flows** within this infrastructure and between the transport modes along the logistic chain. Such systems are in particular to enable real-time information to be provided on available infrastructure capacity, traffic flows and positioning, tracking and tracing, and ensure safety and security throughout multimodal journeys".

From the 21 terminals who provided the corresponding information, 17 have appropriate ICT systems in place, one has different, non-integrated systems (Kouvola) and two (Bremen and Prato) reported to having no such systems in operation. The interfacing with other mode operators (rail and road) is provided by all terminals which have an ICT system in place except for Verona Q.E. where the EDI interfaces are not yet in place.

Figure 12: Compliance Analysis of RRT – ICT-Systems 2017



Source: KombiConsult analysis, May 2017

Finally the Rail-Road Terminals are also targeted by (some of) the requirements which are relevant for rail freight transport and which are laid down in Article 39 of the TEN-T Regulation. The infrastructure requirements "for the Core Network […]

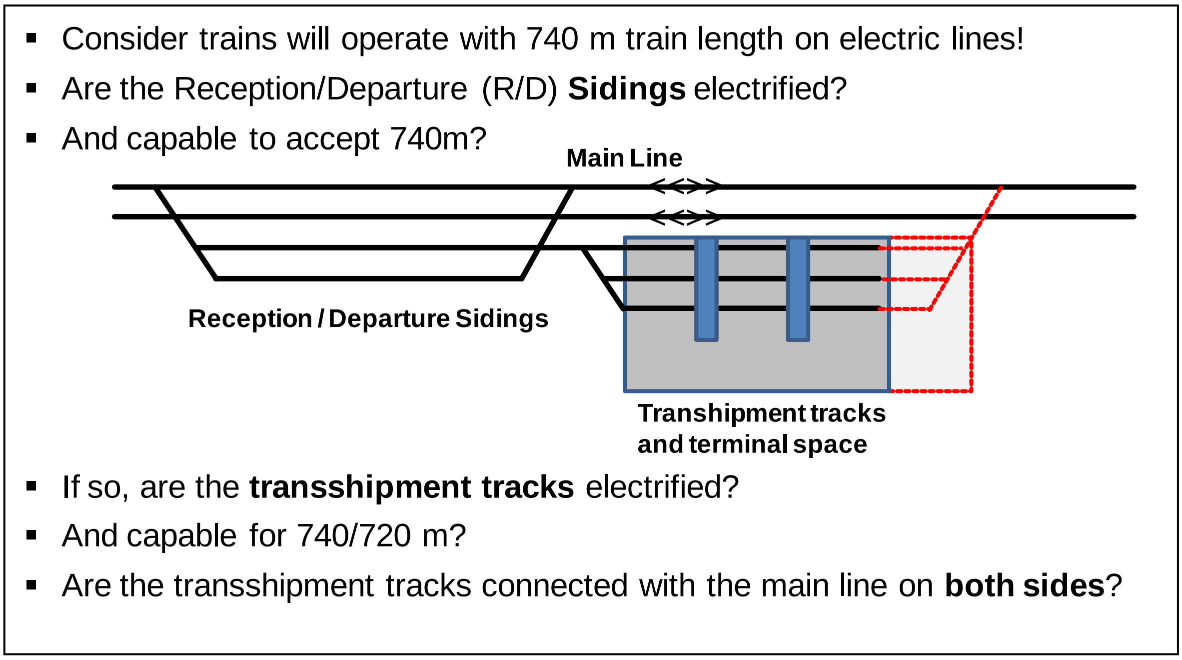
a) for railway transport infrastructure:

> (i) full **electrification** of the line tracks and, as far as necessary for electric train operations, **sidings**;
>
> (ii) freight lines of the core network as indicated in Annex I: at least **22,5 t axle load**, 100 km/h line speed and the possibility of **running trains with a length of 740 m**;
>
> (iii) full deployment of ERTMS;
>
> (iv) nominal track gauge for new railway lines: **1 435 mm** except in cases where the new line is an extension on a network the track gauge of which is different and detached from the main rail lines in the Union.

b) […]".

While all terminals (except for the Finnish sites) are connected to 1,435 mm railway tracks and an axle load of 22.5 tons the accessibility for "740 m trains in one piece" is quite challenging as the next figure illustrates.

Figure 13: Compliance Analysis of RRT – "740 m challenge"

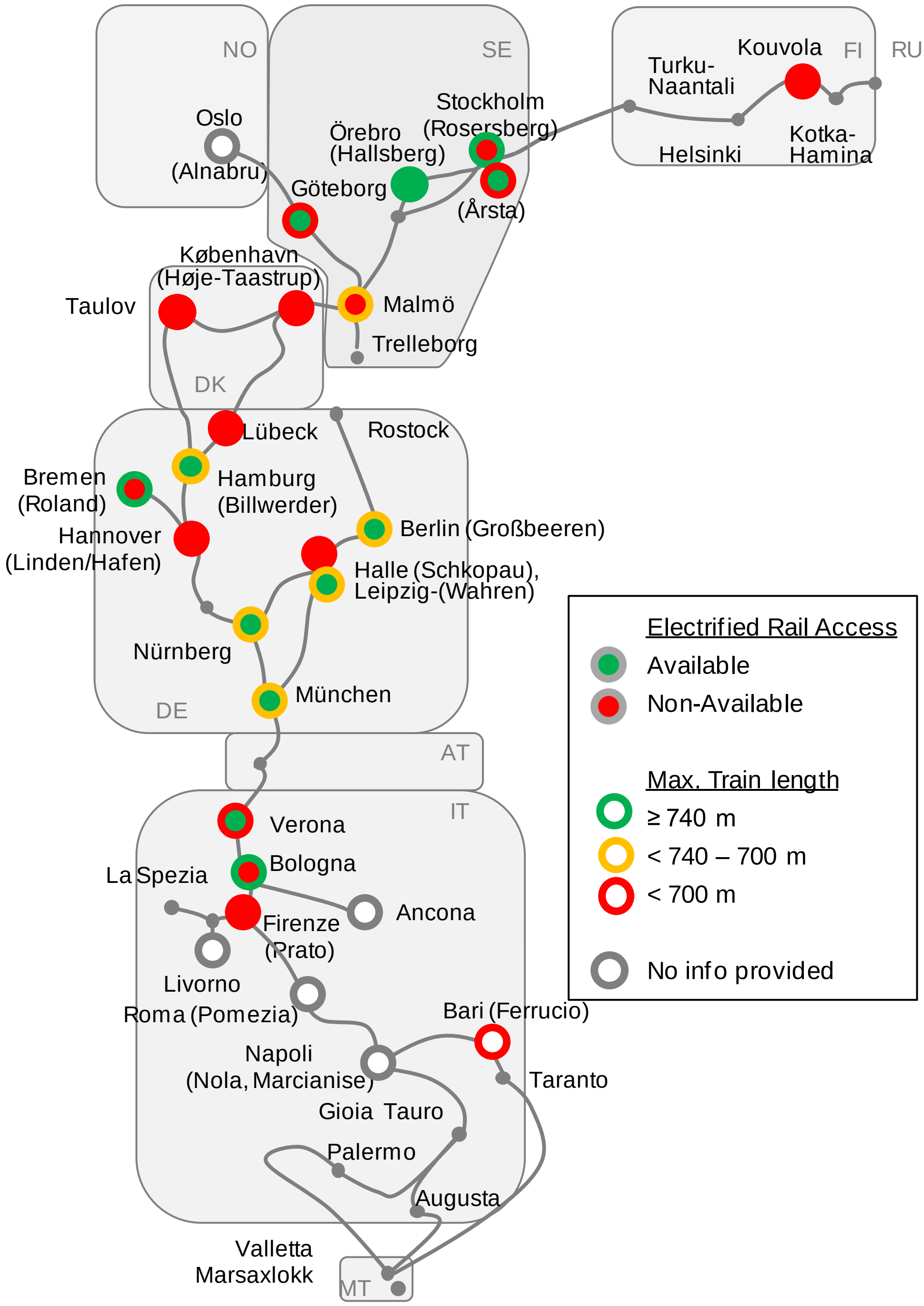


Source: KombiConsult analysis, May 2016

If the main lines were able to operate 740 m trains at least the reception and departure sidings relevant for the terminal should be as well. In addition the manoeuvring tracks (depending on the respective location) and the transhipment tracks of the terminal should also be able to accept a 740 m train (including locomotive) or 720 m (wagon train). A connection to the main line on both ends of the handling tracks would be beneficial for the operations and it could be an option to be installed if the handling tracks are to be "lengthened" and if the space and rail access (signalling, ...) allows for.

In 9 terminals the access is electrified, while 11 do not provide for such feature and require additional shunting by Diesel locomotives. Currently 8 sites have rail access on both sides of the terminals, including Leipzig-Wahren which was recently equipped in 2016, while 16 respondents have single sided access. The reception/departure sidings show a maximum length between 870 and 370 m, while the longest transhipment tracks are between 800 and 160 m. Only 4 terminals (Rosersberg, Hallsberg, Bremen and Bologna) allow 740 m trains to enter the handling tracks in "one piece". Six terminals have a maximum (wagon) train length of 700 m (which was an industry standard before the Regulation came into force) and the others are pretty much below the standard required for the year 2030. On the one hand, naturally, the terminal managers explained that the cargo handled in their region is of high specific weight so that the maximum permitted train weight is reached rather than the train length, or that the shunting yard would allow to splitting the train and handling its sections, or that the corresponding rail network does not allow longer trains neither. On the other hand the intended increase of rail efficiency which is expected from "740 m trains" and which will be reached by the – stepwise- improvement of the rail infrastructure should find its correspondence also in the terminals' infrastructure enlargement. The new double-sided access in Leipzig-Wahren and the planned project to build a new "750 m terminal" in Verona demonstrate that the message is taken seriously and that terminal managers coordinated with the rail infrastructure managers should agree upon relevant measures.

Figure 14: Compliance Analysis of RRT – Rail Access



Source: KombiConsult analysis, May 2017

Finally we have also asked the terminal managers for the capacity and handling volume of their sites. The 21 replies demonstrate a cumulative handling capacity of 4.8 million TEU which was used for handling of about 2.8 million TEU in 2015. This gives an average utilisation rate of 58% but is built on detailed utilisation factors which vary between 10% and 114% of the nominal capacity. If the capacity becomes an issue in the future it should be responded by a more detailed analysis at regional level that takes into account the development of transport in the network and the capacity supplied by neighbouring terminals eventually.

Actions accomplished [project category 'multimodal']

In the reporting period the Project List includes five "Multimodal" projects which have been accomplished. These are:

TEN-T Project ID 5406: Stockholm Nord (Rosersberg), rail connection to RRT is a Multimodal project by the Swedish Transport Administration in the node Stockholm. It targets at Rosersberg (Stockholm Nord), rail connection to RRT. The project was completed in 2014.

TEN-T Project ID 5804: Extension of capacity of terminal Schkopau is a Multimodal project by KTSK GmbH in the node Halle/Leipzig. It targets at Enlargement of the existing intermodal terminal by a 2nd Rail Mounted Gantry Crane, 2 x 220 m track and space. The maximal track length is improved to 620 m but still below the Regulation's target. The project was completed in 2016.

TEN-T Project ID 6864: Upgrade of terminal Leipzig-Wahren is a Multimodal-project by DB Netz in the node Leipzig. It targets at Construction of a 2nd module made of 4 rail tracks of each 700 m and Rail Mounted Gantry Crane. The project was completed in 2016.

TEN-T Project ID 1379: Swiftly-Green - Sustainable freight transport services is a Multimodal project by the Closer/ Lindholmen Science Park on the ScanMed Corridor. It targets at developing a toolbox for green issues in the context of TEN-T planning. It will consist of guidelines, tools and recommendations for greening of transport and will be based on best practice and results from a thorough mapping and analysis of previous and on-going projects. The resulting Green Corridor Development Plan could give input for the further planning and implementations of the TEN-T Core Network Corridors. It is also envisaged that the toolbox will stimulate the transport and logistics sector and industry to implement efficient and sustainable transport solutions. The project was completed in 2015. It is a "study" and does not contribute to the KPIs.

Project-ID-N° 9864: "Upgrade of terminal München-Riem". The infrastructure upgrade works were carried out by the terminal managers and included the construction of an interim storage area for containers. The project was completed in 2015.

Compliance achieved

With these actions and other measures implemented the following compliance with the TEN-T parameters was achieved by the beginning of 2017.

Table 21: Compliance of RRT parameters, 2017

Node / Terminal	Capability	open access	ICT-System	E-Rail Access	max. length of handling track
Kouvola (planned)	No	Not yet	Yes	No	<700 m
Oslo Alnabru					
Stockholm Årsta	Yes	Yes	Yes	Yes	<700 m
Stockholm North Rosersberg	Yes			No	≥740 m
Örebro Hallsberg	Yes		Yes	Yes	≥740 m
Göteborg Gullbergsvass	Yes	Yes	Yes	Yes	<700 m
Malmö Kombiterminal	Yes	Yes	Yes	No	< 740–700 m

Node / Terminal	Capability	open access	ICT-System	E-Rail Access	max. length of handling track
København (Høje-Taastrup)	Yes	Yes	Yes	No	<700 m
Taulov	Yes	Yes	Yes	No	<700 m
Lübeck Skandinavienkai	Yes	Yes	Yes	No	<700 m
Hamburg-Billwerder	Yes	Yes	Yes	Yes	< 740–700 m
Bremen-Roland	Yes	Yes	No	No	≥740 m
Berlin Großbeeren	Yes	Yes	Yes	Yes	< 740–700 m
Hannover-Linden	Yes	Yes	Yes	No	<700 m
Hannover-Linden Hafen					
Leipzig-Wahren	Yes	Yes	Yes	Yes	< 740–700 m
Schkopau	Yes	Yes	Yes	No	<700 m
Nürnberg Tricon	Yes	Yes	Yes	Yes	< 740–700 m
München-Riem	Yes	Yes	Yes	Yes	< 740–700 m
[no core RRT in Austria]					
Verona Quadrante Europa	Yes	Yes	Yes	Yes	<700 m
Bologna: Interporto Bologna	Yes	Yes	Yes	No	≥740 m
(Ancona)- Interporto Marche Jesi	Yes	Yes		No	<700 m
(Livorno)- Guasticce Collesalvetti (Interporto Amerigo Vespucci)	No	Yes	No	No	<700 m
Firenze Prato	No	Yes	No	No	<700 m
Roma Pomezia					
(Napoli)- Marcianise-Maddaloni	No	Yes		No	<700 m
(Napoli)- Nola					
Bari Ferruccio	Yes	Yes	Yes	No	<700 m
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**20/28 = 71%**	**21/28 = 75%**	**18/28 = 64%**	**10/28 = 36%**	**4/28 = 14%**

Source: KombiConsult analysis, May 2017; empty fields = no reply by 18.05.2016; partly completed from web research and by considering the accomplished projects

Since the adoption of Regulation (EU) 1315/2013 the Key Performance Indicators measuring the progress of the Rail-Road-Terminals' development of the ScanMed Corridor cannot be quantified since there are no publicly available information sources providing all relevant information and the criteria used in the 2014-Study was different from the currently agreed KPI.

Nevertheless, with the involvement of the terminal managers in 2016 the status data for 2015/16 could be collected and the KPI value calculated. According to KombiConsult analysis it can be concluded that the baseline value for 2014 would be similar since no recent improvement measures are known. All terminals are capable for intermodal transhipment and provide their services open to all operators in a non-discriminatory way and apply transparent charges. If we interpret the replies and web research more strictly 29% of the sites did not explicitly state that they can handle all types of loading units so that the status may vary between 71% and 100%. For the same reason the "open access" varies between 75% and 100%. 61% of the terminals have an ICT system in place, while 32% provide for an electrified access, but only 14% of the sites allow 740 m trains to enter the terminal tracks "in one piece".

With the projects accomplished since the adoption of the Regulation and other measures implemented by the infrastructure managers a small progress with respect to the KPI was made (status 2017). The evolution of KPI since the baseline is displayed in the following table[19].

Table 22: Development of Rail-Road Terminals KPI 2014, 2016, 2017 and target 2030

RRT Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Target 2030
Capability for Intermodal (unitised) transhipment	X	X	X	1)	-	71% - 100%	**71% - 100%**	100%
Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	X	-	X	1)	-	75% – 100%	**75 – 100%**	100%
Information systems	X	-	-	1)	-	61%	**64%**	100%
Electrified train terminal accessibility	X	X	X	1)	-	32%	**36%**	100%
740m train terminal accessibility	X	X	X	1)	-	18%	**14%**	100%

Source: KombiConsult analysis, May 2017; P = Priority, O = Objective, K = KPI; 1) websites, other information of respective infrastructure managers and (in 2016) completed questionnaire

Conclusions

The 28 Rail-Road Terminals of the ScanMed Corridor which were incorporated in the detailed analysis generally are connected to rail and road, provide discrimination free access for their users and are equipped with qualified handling equipment for all types of intermodal loading units. Terminal management systems are widely used for providing real time information on the operational situation in the terminal and for the data exchange with connected transport mode operators (railway undertakings, intermodal operators and forwarders). Nevertheless not all sites are equipped so that single improvement measures should be taken. The largest challenge for the present sites is their historically grown access to the rail infrastructure (single sided, non-electrified, annex to shunting yard or port railway line) and the limitation of the (wagon) train length by either the reception/departure siding or the transhipment track(s). Only four sites (Rosersberg, Hallsberg, Bremen and Bologna) are providing transhipment tracks of ≥ 740 m. It is recommended that rail infrastructure managers and terminal managers cooperate towards realizing the track-side and terminal side improvement of that parameters in a coordinated way in order to ensure that latest in 2030 freight trains with a permitted length of 740m may enter (and leave) the terminals "in one piece" without delay.

[19] The change of the „740m train terminal accessibility" from 18% to 14% was due to a counting error and not due to a change of the physical infrastructure.

6 Plan for the removal of physical and technical barriers

The compliance analysis presented in the previous chapter highlighted a couple of "non-compliance" sections and nodes with respect to the commonly agreed key performance indicators (KPI) taking into account the current ('status 2017') situation. In addition to that infrastructure may be missing ("missing link") or its capacity may be limited ("bottleneck") or other physical and technical barriers may hamper the continuous flow of passengers and goods across the corridor infrastructure.

Activities planned by Member States, infrastructure managers and other stakeholders or those identified by the study have been collected by means of a project list. Further details on the methodology and the information obtained from the project list can be found in the Final Report on the Project List.

Within this Final Report on the Elements of the Work Plan the contribution of those projects to be completed until 2030 to the Corridor's development is of primary interest. Whereby the objectives are to:

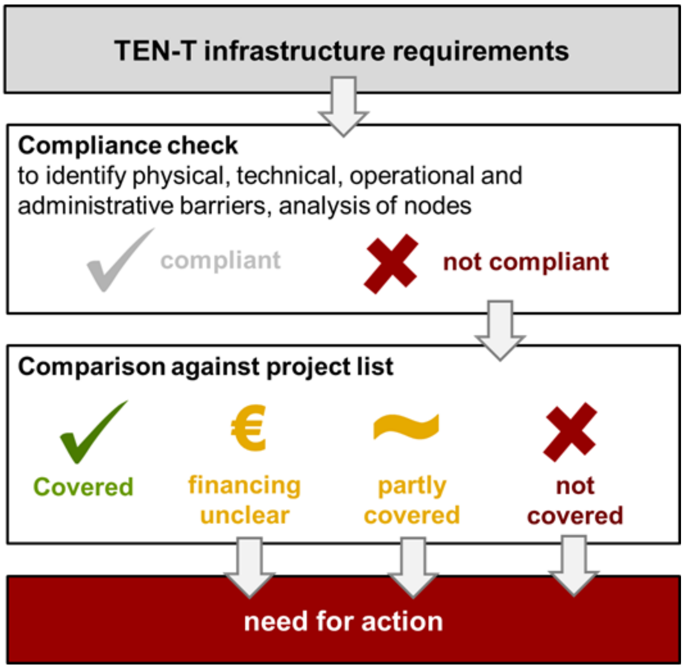
1. Identify the projects that are required in order to reach compliance with Regulation (EU) 1315/2013 requirements by 2030;
2. Identify a need for action if a section is doubted or unlikely to be compliant with Regulation (EU) 1315/2013 by 2030.

The planned projects and their impact on the Corridor's development are analysed according to the following methodology:

1. As a result of the compliance check presented in chapter 5, sections or nodes that currently ('status 2017') do not meet the requirements set out by Regulation (EU) 1315/2013 have been identified.
2. Planned improvements of non-compliant sections by projects included in the project list are analysed.
3. A need for action is identified if a non-compliant section or node:
    a. is geographically only partly covered by a project (e.g. 10 out of 50 km);
    b. is only partly covered by a project and will not achieve compliance with Regulation (EU) 1315/2013 objectives by 2030 (e.g. enables a speed of 100 km/h instead of 120km/h);
    c. is covered by a project but financing is not yet secured;
    d. has no time plan at all or an end-date after 2030;
    e. is not yet covered by a project.

This methodology is basically agreed upon with Rhine-Danube corridor, too.

Figure 15: Compliance check methodology



Source: HaCon

Sections with an identified need for action are highlighted in maps, showing the assumed compliance with Regulation (EU) 1315/2013 by 2030.

The following colouring scheme is used in the "Maps of compliance by 2030":

- Sections and nodes already compliant with the Regulation requirements in 2016 are marked in green;
- Sections and nodes where works (!) projects are on-going and compliance is expected by 2030 are marked in green dotted;
- Sections and nodes where works (!) projects are still to be started, but compliance is expected by 2030 are marked in yellow;
- Sections and nodes where works (!) projects are foreseen, but delayed and thus compliance doubted by 2030 are marked in yellow dotted;
- Sections and nodes where works (!) projects are not yet planned/agreed for completion by 2030 are marked in red.

For each of the sections with a need for action (yellow dotted and red) the reasons for non-compliance by 2030 are stated in order for Member States, Infrastructure Managers and Corridor Coordinators to initiate appropriate measures.

If reasonable measures cannot be identified, exemptions from the regulation may be an option.

Finally the plan for the removal of physical and technical barriers includes:

– Summarized description of projects which are expected to contribute to the Corridor's development;
– Comparison of non-compliant sections against the project list: expected to be compliant by 2030, compliance by 2030 doubted, compliance by 2030 unlikely;

- A list of sections with a need for action;
- Reasons for non-compliance by 2030 and options for interventions by the Member States and/or Corridor Coordinators if available.

6.1 Rail Infrastructure and ERTMS

This chapter describes the foreseen contribution of rail projects with a completion date after 2016 on the rail infrastructure requirements according to Regulation (EU) 1315/2013, Article 39. The analysis focuses on the parameters 'electrification', 'axle load ≥ 22,5 tonnes' (for freight lines) and 'line speed ≥ 100 km/h' (for freight lines).

Further analyses are provided regarding the parameters 'train length ≥ 740m' (for freight lines), track gauge =1,435 mm' and further operational issues such as capacity and strong inclines.

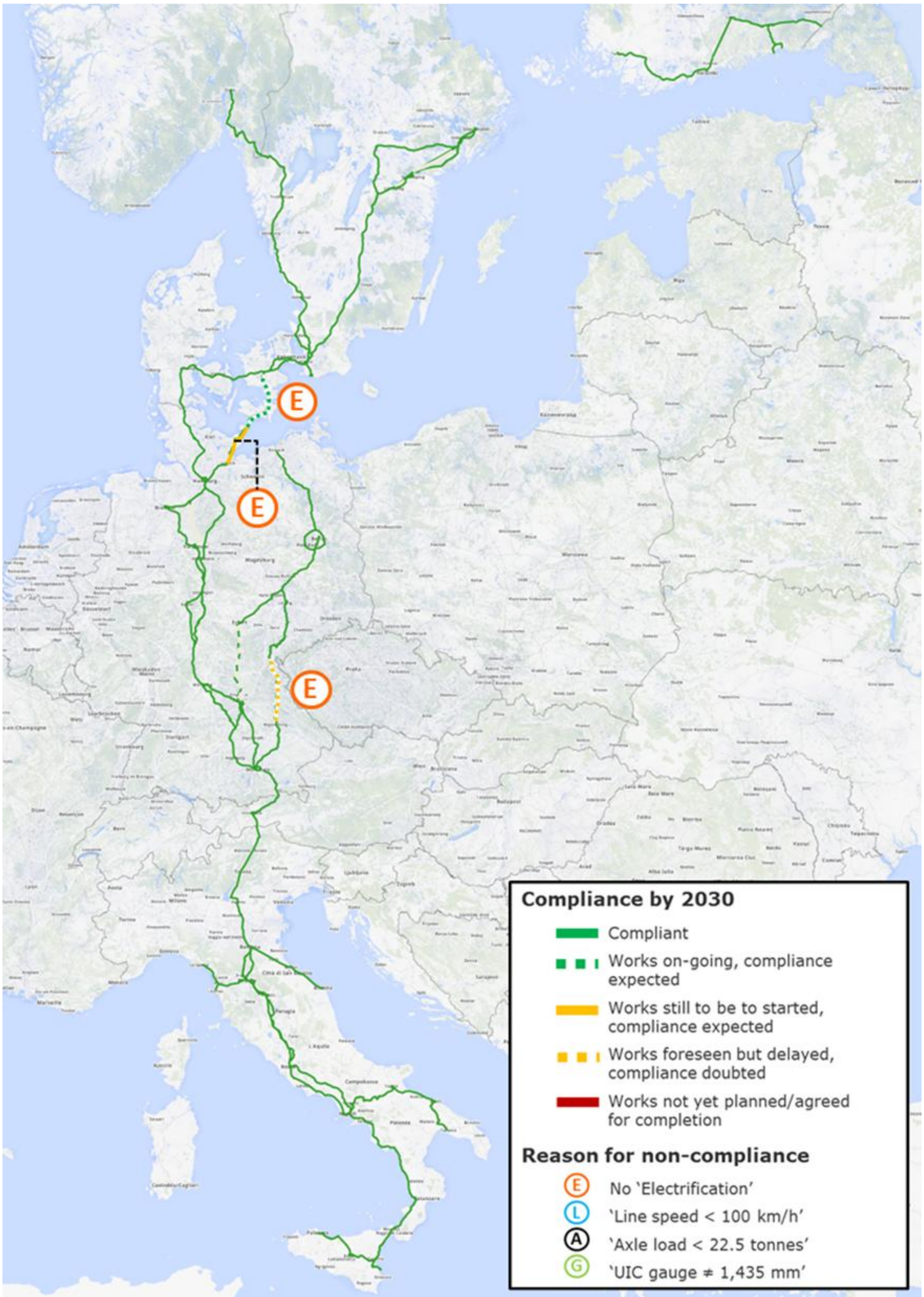
According to the Terms of Reference, the impact of projects on the deployment of ERTMS "will be examined within the framework of the TEN-T horizontal priority ERTMS". Consequently this issue is excluded from the descriptions under this chapter.

6.1.1 TEN-T infrastructure requirements – KPI 'Electrification'

Huge parts of the corridor are electrified already today (> 90%; see chapter 5.1). Only on the northern and southern access routes to the planned Fehmarn Belt fixed link in the German-Denmark border region (Ringsted – Rødby and Puttgarden - Bad Schwartau-Waldhalle) and in the east part of Germany electrification is still missing on the section Hof - Regensburg. These sections sum up 382.4 km or 4.1% of the total corridor rail length.

As Figure 12 shows, two corridor parts are expected to be electrified until 2028 in combination with partly new built lines. In detail this refers to the sections between Ringsted and Rødby as well as Puttgarden – Bad Schwartau-Waldhalle, for which the works still need to be started. For the section between Hof and Regensburg works are foreseen but the project start is delayed. Therefore the compliance realisation until 2030 is doubted.

Figure 16: Rail expected compliance by 2030 – 'Electrification'



Source: HaCon, May 2017

An overview of the non-compliant sections and details on related upgrade projects is given in Table 23. According to the current planning status, it is expected that almost half of the non-electrified corridor sections (**202.9** out of **382.4 km** = **53%**) will not reach compliance by 2030.

Table 23: Non-compliant corridor sections and related improvement projects – parameter 'Electrification'

Corridor:		Scandinavian-Mediterranean				
Parameter:		Electrification				
TENtec Technical Data Railways - Deviations for the main parameters			Length of section	No electrification	remarks	Project
country	TENtec Section		[m]			
DK	Ringsted	Rödby	119,300	x		Electrification planned, Project 5134 (Upgrade of the railway access line to the Fehmarn Belt Fixed Link - Section Ringsted - Rødby) Works on-going, compliance expected by 2028
DE	Puttgarden	Bad Schwartau-Waldhalle	83,600	x		Electrification planned, Project 5000 (ABS/NBS Hamburg - Lübeck - Puttgarden (Hinterlandanbindung FehmarnBeltQuerung (FBQ)), Works foreseen but delayed, compliance expected by 2028
DE	Hof	Regensburg Hbf	179,300	x		Electrification planned, Project 9024 (ABS Nürnberg – Marktredwitz – Reichenbach/BGr DE/CZ (–Prag); Relevant section Hof - Marktredwitz; Draft BVWP 2015 (2030) Project 2-019-V01 ABS Hof - Marktredwitz - Regensburg - Obertraubling (Ostkorridor Süd) Works foreseen but delayed, compliance doubted
DE	Regensburg Hafen Abzw	Regensburg Hafen Abzw	200	x		

Source: HaCon based on ScanMed compliance analysis and project list, May 2017

6.1.2 TEN-T infrastructure requirements - KPI 'Line speed ≥ 100 km/h'

As shown in chapter 5.1, almost the entire corridor provides a line speed of at least 100 km/h (93%). The biggest non-compliant section (184.726 km) is located in Italy on the southern access line to the Brenner Pass/Brenner Base Tunnel.

The current project list contains four projects designed to eliminate speed limits < 100 km/h. They refer to following lines:

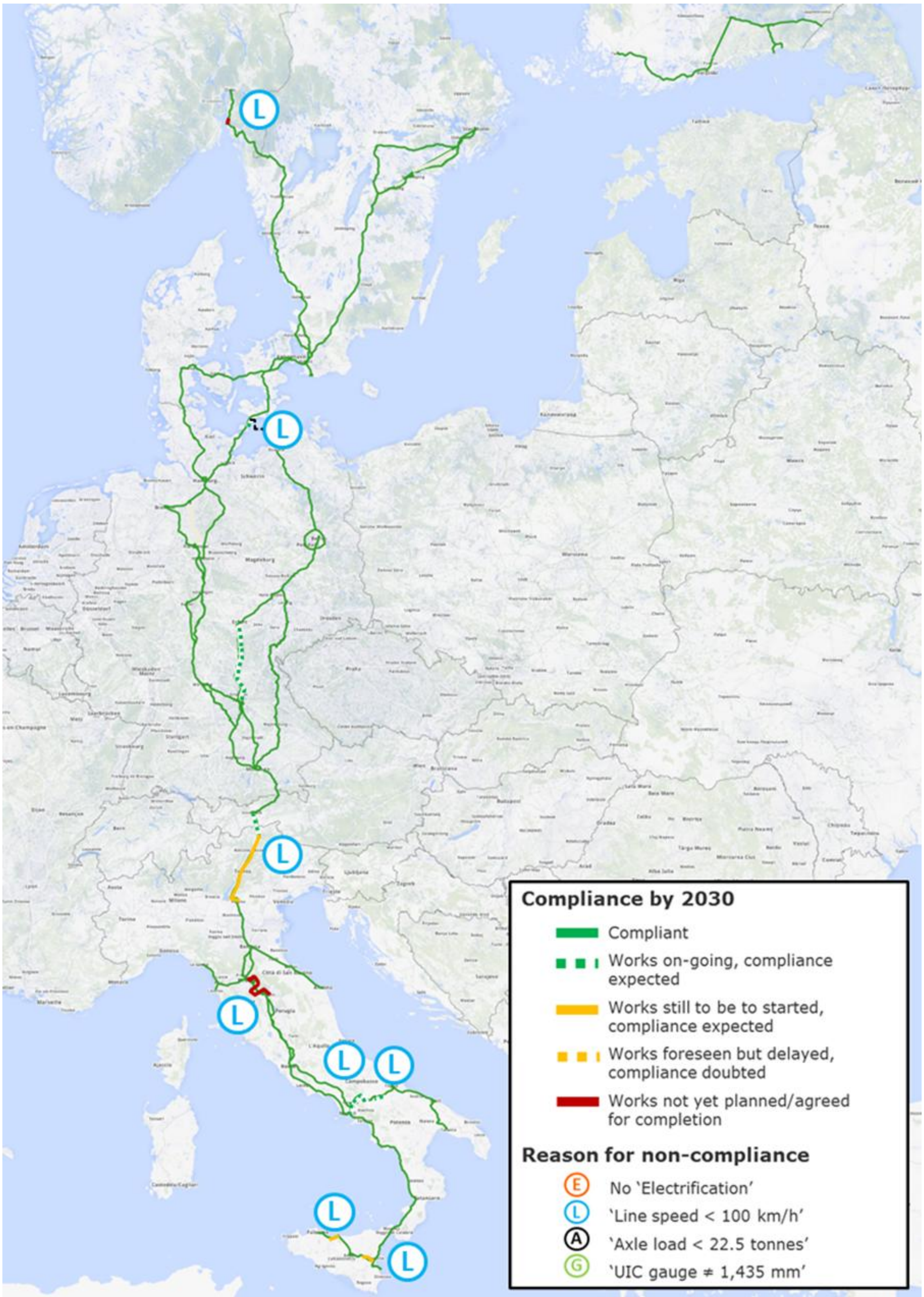
- Project 5386/5853 is designed to build the Brenner Base Tunnel (BBT);
- Project 5904 is the upgrading of the southern access line to Brenner;
- Project 5900 is designed for upgrading the line Napoli - Bari;
- Project 5906 is designed for upgrading the line Palermo - Catania.

These four projects cover 473.65 km of rail track, equivalent to 73% of the currently non-compliant corridor sections. After realisation, they will enable continuous speed ≥ 100 km/h on the access lines to the Brenner and on lines in Italy between Napoli – Bari and Palermo – Catania (compare Figure 17).

In turn, on 179.55 rail kilometres (= 2% of all corridor rail lines), no dedicated projects for speed increase on non-compliant sections are known. These non-compliant sections are located in

- Norway: section Vestby – Hølen – Kambo (14.92 km);
- Italy: sections Arezzo Nord Junction - Valdarno Nord Junction - PM Rovezzano (74.412 km), PM Rovezzano - Pontassieve - Figline (32.05 km), Montevarchi - Arezzo Junction (34.83 km) (compare Figure 17) and several small sections in the area of urban nodes (compare Table 24).

Figure 17: Rail expected compliance by 2030 – 'Line speed ≥ 100 km/h'



Source: HaCon, May 2017

Table 24: Non-compliant corridor sections and related improvement projects – parameter 'Line speed ≥ 100 km/h'

Corridor:		Scandinavian-Mediterranean				
Parameter:		Max. operating speed < 100 km/h				
TENtec Technical Data Railways - Deviations for the main parameters			Length of section	Max. operating speed	remarks	Project
country	TENtec Section		[m]	[km/h]		
NO	Vestby	Hølen	6,550	80	*	No project identified
NO	Hølen	Kambo	8,370	80	*	No project identified
AT	Innsbruck Hbf	Anschluss Umfahrung Innsbruck	4,300	80		Project 5386/5853 (Brenner base tunnel (BBT) and Brenner Base Tunnel (BBT); Austrian part) Works on-going, compliance expected
AT	Anschluss Umfahrung Innsbruck	Brenner	32,100	80		
IT	Fortezza	Brennero (C)	40,771	75		Project 5386/5853 (Brenner base tunnel (BBT) and Brenner Base Tunnel (BBT); Austrian part) Works on-going, compliance expected
IT	Verona Porta Nuova	Fortezza	184,726	95		Project 5904 Southern access line to Brenner Works on-going, compliance expected
IT	PM Tavernelle	Bologna Centrale	14,820	60		Urban node analysis? Not content of colour coded map!
IT	Valdarno Nord Junction	PM Rovezzano	39,585	90		No project identified
IT	Arezzo Nord Junction	Valdarno Nord Junction	34,827	95		
IT	PM Rovezzano	Pontassieve	11,950	90		No project identified
IT	Pontassieve	Figline	20,101	90		Urban node analysis? Not content of colour coded map!
IT	Montevarchi	Arezzo Junction	34,827	95		No project identified
IT	Napoli Campi Flegrei	Napoli Piazza Garibaldi	8,523	75		Urban node analysis? Not content of colour coded map!
IT	Caserta	Vitulano Foglianise	52,855	80		Project 5900 (Napoli - Bari) Works on-going, compliance expected
IT	Apice S.Arcangelo B.	Orsara	45,529	90		Project 5900 (Napoli - Bari) Works on-going, compliance expected
IT	Bivio Enna	Bicocca	81,154	75		Project 5906 (Upgrade Palermo - Catania)) Works still to be to started, compliance expected
IT	Fiumetorto	Castelbuono	32,215	75		Project 5906 (Upgrade Palermo - Catania)) Works still to be to started, compliance expected
	* No TENtec section description					

Source: HaCon based on ScanMed compliance analysis and project list, May 2017

6.1.3 TEN-T infrastructure requirements - KPI 'Axle load ≥ 22.5 tonnes'

Huge parts of the corridor provide an axle load of at least 22.5 tonnes already today (94%; see chapter 5.1). All non-compliant sections are located in the south part of Italy, namely on the lines Roma – Napoli, Napoli – Bari, Palermo – Catania and a short section in the area of the urban node of Roma.

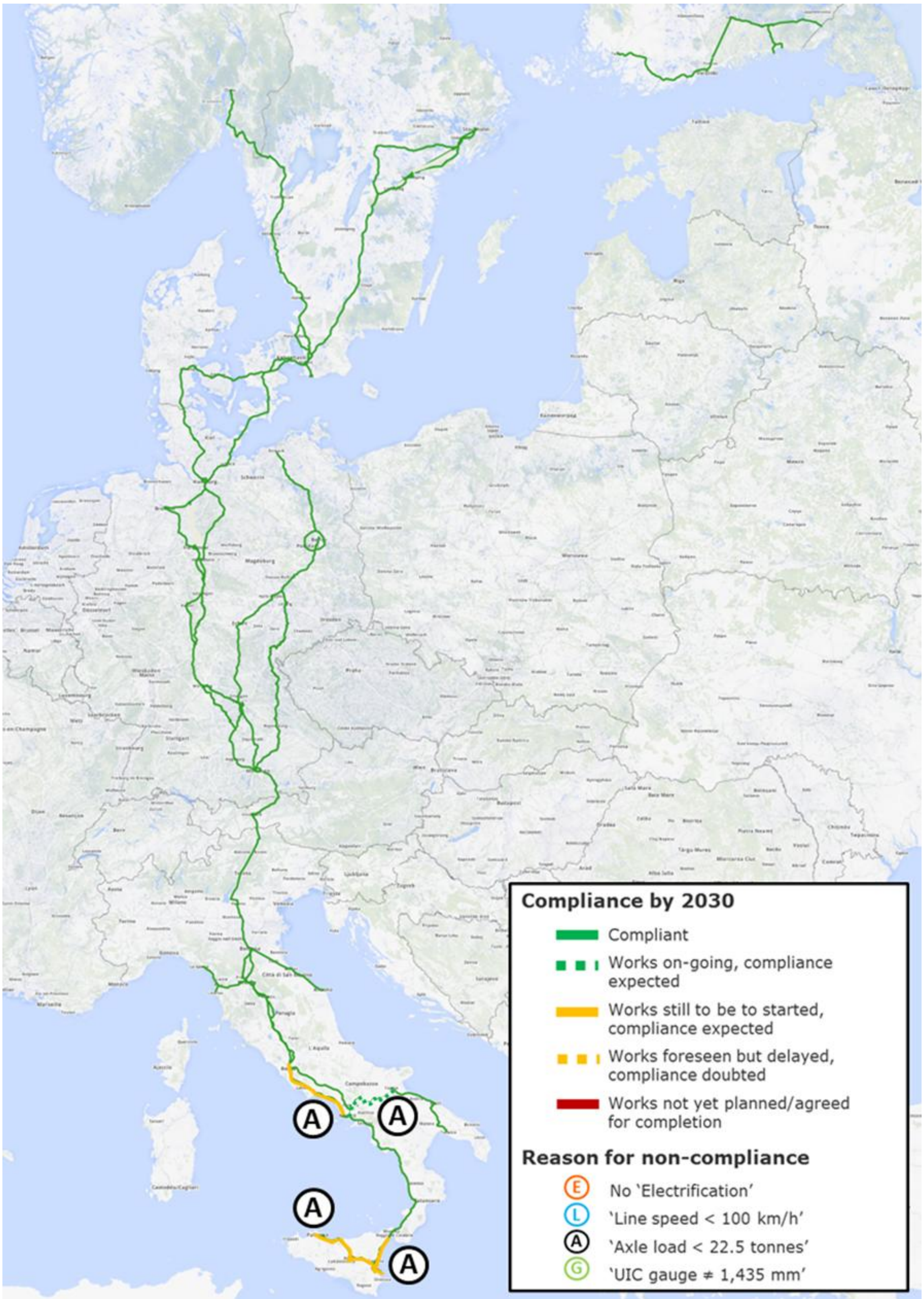
Comprehensive upgrade projects with a total length of about 630 km have been identified for most of them. Respective works still need to be started and are expected to be completed before 2030 (compare Table 25). The project of upgrading the line Napoli – Bari has been started in 2015 and is on-going.

- Project 5268 (Upgrade link Roma-Napoli) - Works still to be started, compliance expected.
- Project 5900 (Napoli - Bari) - Works on-going, compliance expected.
- Projects 5905, 5906 (Upgrade Palermo - Catania) - Works still to be started, compliance expected.
- Project 5906 (Upgrade Palermo - Catania) - Works still to be started, compliance expected.

According to this planning, it is expected that 98% of the currently non-compliant corridor parts will reach compliance by 2030. Only for a section of about 11.5 km in the area of Roma no project has been designed.

An overview of the development status until 2030 is given in Figure 18, whereas Table 25 provides details on the non-compliant sections and related projects.

Figure 18: Rail expected compliance by 2030 – parameter 'Axle load ≥ 22.5 tonnes'



Source: HaCon, May 2017

Table 25: Non-compliant corridor sections and related improvement projects – parameter 'Axle load ≥ 22.5 tonnes'

Corridor:		Scandinavian-Mediterranean				
Parameter:		Max. Axle Load < 22,5 t				
TENtec Technical Data Railways - Deviations for the main parameters			Length of section	Axle load <22,5 t	remarks	Project
country	TENtec Section		[m]			
IT	Settebagni	Nuovo Salario	6,302	x		No project identified
IT	Nuovo Salario	Roma Tiburtina	5,257	x		
IT	Roma Casilina	Campoleone	29,243	x		Project 5268 (Upgrade link Roma-Napoli) Works still to be to started, compliance expected
IT	Campoleone	Priverno	51,891	x		
IT	Priverno	Formia	43,032	x		
IT	Formia	Minturno	10,055	x		
IT	Minturno	Villa Literno	41,870	x		
IT	Villa Literno	Pozzuoli	20,991	x		
IT	Pozzuoli	Napoli Campi Flegrei	6,109	x		
IT	Napoli Campi Flegrei	Napoli Piazza Garibaldi	8,523	x		
IT	Acerra	Cancello	7,338	x		Project 5900 (Napoli - Bari) Works on-going, compliance expected
IT	Cancello	Caserta	11,787	x		
IT	Caserta	Vitulano Foglianise	52,855	x		
IT	Vitulano Foglianese	Apice S.Arcangelo B.	19,123	x		
IT	Apice S.Arcangelo B.	Orsara	45,529	x		
IT	Orsara	Cervaro	34,081	x		
IT	Cervaro	Foggia	7,923	x		
	Messina	Giampilieri	10,941	x		Projects 5905, 5906 (Upgrade Palermo - Catania)) Works still to be to started, compliance expected
	Giampilieri	Fiumefreddo	40,649	x		
	Fiumefreddo	Catania O.na	32,176	x		
IT	Bivio Enna	Bicocca	81,154	x		Projects 5905, 5906 (Upgrade Palermo - Catania)) Works still to be to started, compliance expected
IT	Fiumetorto	Castelbuono	32,215	x		Project 5906 (Upgrade Palermo - Catania)) Works still to be to started, compliance expected
IT	Fiumetorto	Termini Imerese	6,804	x		
IT	Termini Imerese	Palermo	36,415	x		

HaCon based on ScanMed compliance analysis and project list, June 2016

6.1.4 TEN-T infrastructure requirements - KPIs '(Standard) Track gauge' and 'Train length ≥ 740 m'

Track gauge: All rail lines along the ScanMed Corridor feature the standard track gauge of 1,435 mm, with the exception of Finland, which provides for a track gauge of 1,524 mm due to its connection with the same gauge on Russian territory. The Finnish rail network is thus "isolated" and can be exempted from the requirement of realising 1,435 mm.

Train length: Regulation (EU) 1315/2013 requires a value of the permitted freight train length of 740 m (wagon incl. locomotive(s)) to be achieved on the core network by 2030. The allowed length for freight trains is determined by infrastructure parameters, operating speed and especially in Germany sometimes also by the timetable of the train path – therefore specific and single values for a respective section of the infrastructure are published only in some cases in the network statement. In many cases, they are subject to a detailed path request of an authorized applicant ("railway undertaking") at the respective infrastructure manager. Also the RailNet Europe (RNE) brochures on RNE corridors contain the following remark (fine-print) for the published train parameters (length and weight)[20]:

"The displayed path/train parameters may differ in reality, as all calculated figures are average figures based on standard trains. The displayed train length comprises traction unit(s) on some networks; on others, it doesn`t. Please consult the IM´s Network statement in any case!"

With the exception of Italy, all networks allow a train length of 700 m or more regarding specific braking and/or operating conditions. In Italy, the length for freight trains is much more limited – in general to 600 m or below on some parts, especially in Southern Italy. Due to the steep grades of the ramps on the present Brenner line there are limited operation conditions, especially for the gross weight of freight trains, and double traction is required (up-hill).

"*Train length for the German corridor network is in general 740 m; restrictions due to timetabling and the operational situation can partially influence the actually possible train length*" (DB Netz AG, July 2014).

A differentiated picture results from an overall analysis of the corridor, based on the network statements of the respective IM's, as can be seen in the country specific results in Table 25;a summary related to the entire corridor follows in Table 26.

[20] http://www.rne.eu/tl_files/RNE_Upload/Corridor/C11/C11.pdf

Table 26: Overview of permitted train length per country

Corridor:	Scandinavian-Mediterranean		
Parameter:	Max. train length	HC	22.05.2017
TENtec Technical Data Railways - Deviations for the main parameters			
country	**Max. train length (Source: Network Statement)**	**remarks**	
FI	700 / 750 / 925 / 1100 m		
NO	700 m *1 / 850 m *2	*1 Brake operating conditions P, *2 Brake operating conditions G	
SE	730 m *3 / 880 m *4	*3 Brake group P/R, *4 Brake group G	
DK	600 m *5 / 835 m *6	*5 Braking system P, max. 120 km/h, *6 Braking system P; max. 100 km/h	
DE	740 m / 835 m *7	*7 Maschen - Padborg	
AT	700 m *8 / 650 m*9	*8 "V3 -Betriebsvorschrift ÖBB, 12/2009", train length without locomotive(s), *9 Kufstein - Brenner: 650 m (ÖBB, H.Hotz, E-Mail 08.07.2014)	
IT	different values *10, mostly 600 m	*10 All.1_Caratteristiche_linee	

Source: HaCon based on ScanMed compliance analysis and project list, May 2017

Table 27: Aggregation of permitted train length per country

TEN-T SCAN-MED								Status:	05/2017
Railways		All entries: % age of all sections fullfilling the respective standard							
TENtec Technical Parameters	Standards	FI	NO	SE	DK	DE	AT	IT	Total
Length of all sections [km]		518	169	1,462	476	3,532	163	3,053	9,372
Percentage [%]		5.53%	1.80%	15.60%	5.07%	37.69%	1.74%	32.57%	100.00%
Maximum train length [m] 1)	>= 740 m	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	0.0%	67.4%
	< 740 m	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	100.0%	32.6%
	Others/Unknown	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Threshold values according to Regulation 1315/2013
1) relevant only for freight trains
Improvements due to finalised projects in 2030

Source: HaCon based on ScanMed compliance analysis and project list, May 2017

Since the train length – when fully exploiting the weight, loading profile and speed limits – is the parameter which provides the most obvious efficiency gain and competitive advantage of rail compared to road transport the harmonisation of this parameter on the highest level is very important. It's worth to note that the maximum permitted train length on the section Hamburg (Maschen) – and Padborg is already 835 m and that consequently the continuation of this parameter via København, the Øresund Bridge, Malmö towards Hallsberg, Swedens largest rail yard, should be examined very carefully by the rail infrastructure managers and railway undertaking concerned so that efficiency gains can be lifted for rail freight on relative short notice.

6.1.5 Operational bottlenecks

Apart from the upgrade of the KPI described above, further parameters have considerable impact on operation and development of the corridor. This particularly refers to the aspects 'Capacity', 'Single track sections' and 'Strong inclines'.

Capacity

In general, the capacity of specific infrastructure depicts the maximum amount of traffic the infrastructure is able to manage or handle (technical maximum capacity). However, in reality the maximum capacity might also depend on external as well as the qualitative conditions of the infrastructure. In the reality of rail transport, a capacity constraint appears not only when transport demand exceeds the maximum capacity, but when the demand is about to reach 80% of the maximum capacity. In this case a high risk of unstable operation conditions i.e. timetables is possible. Corridor line sections with high or even critical capacity utilisation tend to show decreasing service quality, due to their sensitivity to train delays, which in case of occurrence are likely to be transmitted to other trains. Often such delays cannot be reduced on short term, since operational flexibility on the line is not available. Furthermore, line congestions make it difficult or even impossible to acquire additional rail traffic on the corridor. For these reasons, the provision of sufficient capacity (reserves) is an essential framework condition sine qua non.

Totally, 126 planned and on-going infrastructure projects contribute to the elimination of current or potential future capacity bottlenecks. Most of them are located in Italy (43 projects), followed by Sweden (27), Germany (24), Finland (17), Denmark (6), Norway (4) and Austria (3). Others are border overlapping dealing with capacity increase and elimination of strong incline by building new infrastructure in sections Fehmarn – Rødby and Brenner Base Tunnel.

The impact of these projects on the entire rail network, the availability of sufficient infrastructure capacity and the correspondence to actual needs is to a great extent dependent on the future traffic demand as tackled in chapter 4.

Single track sections

Single track sections show a particular congruence with the non-electrified lines in Germany and Denmark. This is no coincidence, as these two parameters often go hand in hand, characterizing a line as dedicated for regional traffic (not electrified and single track) rather than for high-speed and for long-haul freight trains.

The removal of single track sections is not explicitly demanded by the Regulation. However, experience shows that these lines are often (potential) capacity bottlenecks and reduce operational flexibility, especially in case of volume increase and operational disturbances.

26 projects of the current project list are dealing with the upgrade of single track to double track lines. Eight projects have been identified in Italy (Bari – Taranto, Catania, Messina – Catania, Napoli – Bari, Palermo – Catania, Palermo – Messina and around Bolzano). Furthermore four projects are located in Sweden (Ängelholm – Helsingborg, Båstad-Förslöv [Halandsås tunnel opened in 2015], Hallsberg – Degerön and Varberg). Two refer to Germany and Denmark upgrading the access lines in the sections of Lübeck - Puttgarden and Ringsted – Rødby. Three upgrading infrastructure projects have been identified in Norway (Oslo - Ski (Follobanen), Sandbukta - Moss – Såstad and SE/NO Haug (Råde) – Halden). Another two projects are designed in Finland in the region of Helsinki and on the line Helsinki – Turku.

Apart from that, further single track sections, that are not covered by any (infrastructure works) project and will thus keep their status as single track line beyond 2030, are located in:

- Kouvola – Hamina/Kotka (needs for renewal of the safety equipment and improvement of few railway yards and sections);
- Luumäki – Vainikkala (single track with heavy transport makes traffic sensitive to interferences).

Strong inclines

Strong inclines (of notably more than 12.5‰) may lead to restricted continuity of long-distance (freight) flows, because the permitted weight of the trains has to be reduced and/or an additional pushing loco is needed.

The elimination of strong inclines is one of the issues of the Brenner Base Tunnel (BBT) which is a double-tubed tunnel between Austria and Italy to avoid crossing the Brenner Pass and allows a "flat" railway operation ("Flachbahn").

Today the maximum grade on the section is 31 per thousand. The minimum curve radius is 264 metres. The highest point of the line is Brenner station at 1,371 m, which is also the highest point reached on the standard gauge networks of the Austrian Federal Railways (ÖBB) and the Italian Ferrovie dello Stato (FS) networks.

The new tunnel will run from Innsbruck to Franzensfeste/Fortezza for a distance of 55 km. Including the railway bypass Innsbruck, which has already been built and will be upgraded with an emergency tunnel, the entire railway tunnel system of BBT is 64 km long. Thus, it will be the longest underground rail link in the world. Together with the other access and logistic tunnels and the exploratory tunnel, necessary to explore the rock and to optimise the excavation methods of the main tunnels, the total length of the tunnel system will be more than 200 km.

The BBT is meant primarily for rail freight transport, allowing a modal shift of traffic from road to rail. Passenger trains can also travel through the tunnel. Thanks to the very low gradient, trains will no longer have to contend with the steep up- and downhill slopes on the current Brenner railway line, whose alignment is by now over 140 years old.

6.1.6 Missing links

Missing links are lines, which are part of the corridor alignment, but do not yet (completely) exist by status of this report (May 2017). This applies for the following sections of the corridor:

- Denmark/Germany: Fixed link between Fehmarn und Rødby as a combined rail and road tunnel;
- Germany: German Unity Transport Project 8 – completion of the new HSL between Erfurt and Nürnberg until December 2017;
- Austria/Italy: Brenner Base Tunnel (BBT) with respect to rail traction will provide for a maximum permitted speed of 250 km/h for passenger trains and 120 km/h for freight trains, electric power supply of 25 kV 50 Hz and ETCS Level 2 equipment.
- Italy: Upgrade of railway connection Palermo - Catania.
- Italy: Construction of a High Speed railway connection Napoli - Bari.

Apart from the line Palermo - Catania, all missing links are expected to be eliminated by 2030.

6.1.7 Summary of main results and conclusions

Summarising, the analysis of the project list regarding contributions to the KPIs (line speed, electrification, axle load, train length) and other relevant parameters (line capacity, single track sections, strong inclines) has shown that substantial progress can be expected until 2030 on numerous parts of the corridor. In this context, the following projects, which will provide large-scale compliance with the requirements of the Regulation, can be highlighted:

- Denmark/Germany: Fixed link between Fehmarn und Rødby as a combined rail and road tunnel.
    - Total investment: ~ €7bn
    - Planned completion: 2026/2028 (depending on the result of the permitting process in Germany)
- Germany: German Unity Transport Project 8 – completion of the new HSL between Erfurt and Nürnberg
    - Total investment: ~ €5.5bn
    - Most sections already completed by 2015
    - Planned completion: 2017
- Austria/Italy: Brenner Base Tunnel (BBT) with respect to rail traction will provide for a maximum permitted speed of 250 km/h for passenger trains and 120 km/h for freight trains, electric power supply of 25 kV 50 Hz and ETCS Level 2 equipment.
    - Total investment: ~ €7.4bn
    - Planned completion: 2026
- Italy: Upgrade of railway connection Palermo - Catania.
    - Total investment: ~ €6b
    - Planned completion: unknown
- Italy: Construction of a High Speed railway connection Napoli - Bari.
    - Total investment: ~ €5.8bn
    - Planned completion: 2027

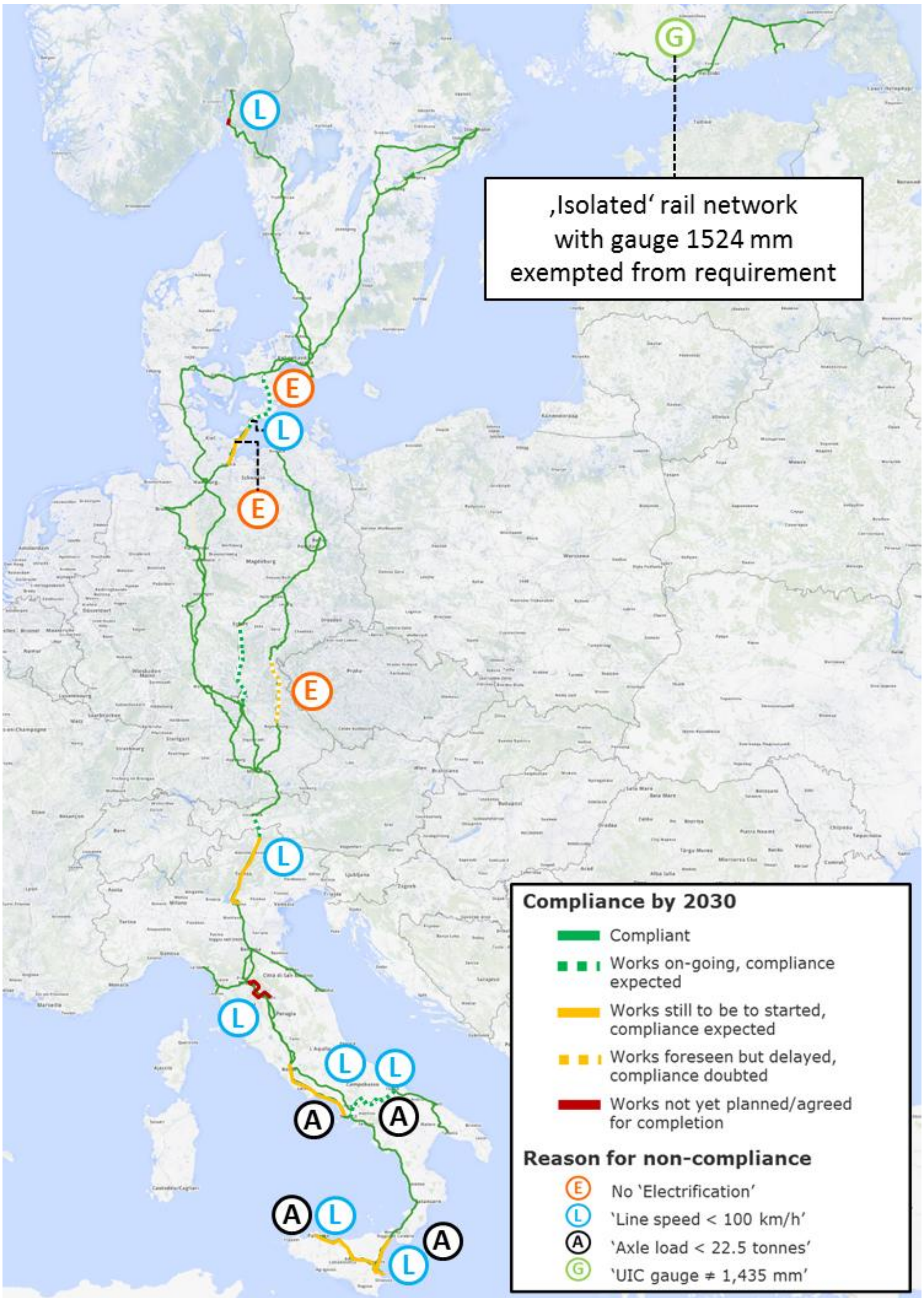
However, it has also become evident that the envisaged development of the corridor is jeopardized by several risks, particularly:

- Missing projects or projects without reliable finalisation date, interrupting throughout KPI compliance on large, connected corridor parts. Main sections affected are:
    - Electrification of the railway line between Hof and Regensburg where work is already foreseen but delayed and the compliance by 2030 is doubted
    - Speed restriction on conventional railway line between Firenze-Rovezzano, Figline Valdarno and Arezzo.
- Missing KPI compliance towards permitted train length ≥ 740 m in (almost) entire Austria and Italy;

- Missing KPI compliance towards axle load ≥ 22.5 t in large parts of Italy (nota bene: projects for elimination of this incompliance are foreseen and works only need to be started;
- Single track lines, which currently show no capacity problems with mostly regional traffic, but might become a severe bottleneck with the envisaged (long-haul) volume increase by 2030. In this respect, the following line sections should receive particular attention:
  - Germany: Lübeck – Puttgarden DE/DK, southern access line of the Fehmarn Belt Fixed Link,
  - Denmark: Rødby – Ringsted DE/DK, , northern access line of the Fehmarn Belt Fixed Link;
- Not yet approved, complete financing of projects or missing of respective information. As all information have been gathered from official documents and furthermore approved by the Ministries of Transport or other stakeholders, the envisaged dates for realisation have been taken for granted. It has to be noted that such gaps in project financing might just be due to missing information. Such information gaps shall be closed in the further corridor development process involving official documents as well as additional data from Ministries of Transport or from other stakeholders.
- The latter concerns in particular the southern access to the Brenner Base Tunnel where the section Fortezza – Ponte Gardena is said to be completed in line with the tunnels implementation while the directly next section Ponte Gardena – Bolzano is said to be completed after 2030 and no works costs are known at present. Even if the capacity might not be a problem directly after opening of the tunnel the operations concept for switching between the present mountain line and the new line should be clarified with RFI and the railway undertakings using the line.

An overview on the expected compliance situation on the corridor is provided in Figure 19. Critical sections are marked in red and yellow-dotted.

Figure 19: Rail expected compliance by 2030 – overview regarding parameters 'Electrification', 'Line speed ≥ 100 km/h' and 'Axle load ≥ 22.5 tonnes'



Source: HaCon, May 2017

Making up the balance, the prospected development of the corridor shows a heterogeneous picture (compare Figure 19): on one hand, the KPIs 'Axle load' 'Electrification' and 'Line speed', which have a high degree of compliance already today, show only small progress until 2030. On the other hand, compliance of the parameters 'Train length' will increase slightly until 2030. However, the target value of 100% will be missed clearly.

Summarizing, it has to be stated that from today's point of view an overall compliance with the Regulation's rail requirements will not be achieved until 2030.

Reliable data regarding the mitigation of noise and vibration is not available (thus marked as not available in the following table). For details refer to chapter 5.1.

Table 28: Development of Rail KPI 2014, 2016, 2017 and targets for 2020 and 2030

Rail Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Expected 2020	Expected 2030	Target 2030
ERTMS deployment	x	x	x	1)	6%	6%	6%	n.a.	n.a.	**100%**
1,435 track gauge	x	x	x	1)	100%	100%	100%	100%	100%	**100%**
Mitigation of noise and vibration	x			1)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Electrificatio n	x	x	x	1)	96%	96%	96%	96 %	98 %	**100%**
Line speed (≥100km/h)	x	x	x	1)	93%	93%	93%	93 %	98 %	**100%**
Axle load (≥22.5t)	x	x	X	1)	94%	94%	94%	94 %	99 %	**100%**
Train length (740m)	x	x	x	1)	66%	66%	66%	66 %	67 %	**100%**

Source: HaCon analysis, May 2017; P = Priority, O = Objective, K = KP;I 1) network statements of respective infrastructure managers

The analysis has also shown that the improvement of the KPIs from 2016 to 2030 are effected by only **40** projects – out of **143** planned and on-going rail projects in total. In turn, this means that almost 72% of the rail projects either have no effect at all (e.g. pure study, project without reliable time line) or have some impact outside the KPIs of the Regulation. In most cases, these impacts are related to capacity increases, but also to noise protection, improvement of intermodality etc.

For the future this means that funding should prioritize systematic elimination of critical line sections. Projects should be clearly and provable dedicated to remaining incompliant line sections. In this context it is necessary to define criteria for evaluation of the '740 m criterion'. Up to now, no common methodology exists that would allow to decide if operation of 740 m trains on a rail network is possible or not. Such methodology is a necessary prerequisite to define the scope of projects to improve compliance of this KPI.

A similar demand for harmonized rules refers to the definition of requested line capacities as well as to a common methodology for calculation of (corridor-wide) capacity utilisation and remaining reserves. The identification of future capacity bottlenecks is the precondition for definition of respective projects to ensure sufficient capacities at the demanded line sections. This issue will play a decisive role for a successful implementation of the corridor.

6.2 Road Infrastructure

The following table shows projects that will generate compliance by 2030 with regard to each KPI and objective. 30 projects will reach compliance by 2030 regarding KPI Express road/motorway (16), KPI Clean fuels (4) and objective ITS (8) as well as both KPI Clean fuels and objective ITS (2).

Seven projects regarding clean fuels and ITS are implemented in cooperation between two more countries (FI 2, SE 3, DK 3, DE 4, AT 2, IT 3 and NO 1).

Table 29: Road sections with parameters expected compliance 2030

Sections expected to be compliant by 2030	Compliance by 2030 expected to be reached through
Finland	
Hamina – Vaalima (RU border)	Project ID 5446: E18 Hamina – Vaalimaa The completion of the E18 highway between Hamina and Vaalimaa will provide a motorway-standard road from Turku to Vaalimaa, on the Russian border. KPI Express Road or Motorway will be achieved.
Helsinki	Project ID 5445: Ring Road III, the third phase. The project includes several improvement measures for the congested road sections. KPI Express road or Motorway will be improved
ScanMed sections Finland	Project ID 5519: Study, deployment and testing of four LNG/L-CNG refuelling stations. KPI Clean fuels will be improved
Naantali - Kaarina	Project ID 5447: E18 Turku Ring Road The project includes several improvement measures for the congested road sections. KPI Express Road or Motorway will be improved
Sweden	
Ljungby-Toftanäs	Project ID 5145: E4 Ljungby-Toftanäs Reconstruction to motorway standard in existing alignment. KPI Express Road or Motorway will be achieved
Stockholm	Project ID 5175: E20 Norra Länken, Värtabanan Road upgrade and road tunnel crossing railway KPI Express Road or Motorway will be achieved
Göteborg	Project ID 5147: Construction of additional lanes on existing hard shoulders and ITS systems for increased traffic safety Project ID 5150: West Swedish Agreement Road, includes measures for a better and more environmental friendly road transport system in West Sweden and the Marieholm Tunnel. Objective ITS and Tolling systems will be improved

Sections expected to be compliant by 2030	Compliance by 2030 expected to be reached through
Denmark	
Greve South – Køge	Project ID: 5136: Development of the Køge Bugt Motorway Expanding of the motorway removing bottlenecks. KPI Express road or Motorway will be achieved
Germany	
Puttgarden - Heiligenhafen-Ost	Project ID 5010: B207: Puttgarden - Heiligenhafen-Ost [part of DE CPR 2], extension of lanes KPI Express road or Motorway will be achieved
Bremen (A281; Weser fixed link)	Project ID 2294: CPR 3: A 281 Weser fixed link New construction of the 4-lane motorway. KPI Express road or Motorway will be achieved
DE Road network	Project ID 5801 and 5802: National Policy Framework on electric energy supply on road infrastructure of corridor(s). KPI Clean fuels improved.
Holledau - Neufahrn	Project ID 5455: A 9 Dreieck Holledau - Kreuz Neufahrn - traffic influence system [part of DE CPR 4]. Objective telematics applications will be improved
München	Project ID 5457: A 8, A 99 - section influence system [part of DE CPR 4] Eastern sections of A 99 and A 8 - including temporary use of emergency lane. Objective telematics applications will be improved
Austria	
Vienna area, the motorway section from Vienna to Salzburg, as well as around Innsbruck and the greater Graz area	Project ID 9604: C-Roads Austria Objective ITS will be improved C-ITS pilot sites installations as part of the C-Roads Platform. Objective ITS will be improved.
Italia	
Bologna	Project ID 1206: Realisation of the metropolitan expressway road north of the A14 between Ozzano and Bologna Realization of the metropolitan expressway. KPI Express road or Motorway will be achieved
Napoli-Salerno	Project ID 5307: Salerno-Avellino motorway upgrading Upgrading of the existing road to motorway standards. KPI Express road or Motorway will be achieved
Roma-Napoli	Project ID 5308: Benevento Caianello motorway Upgrading the existing road to 4 lanes KPI Express road or Motorway will be achieved
Verona-Bologna	Project ID 5305: Motorway link Campogalliano-Sassuolo Construction of the road link. KPI Express road or Motorway will be achieved

Sections expected to be compliant by 2030	Compliance by 2030 expected to be reached through
ScanMed: Fortezza-Verona Med: Brescia-Venezia-Trieste	Project ID 3689: C-Roads Italy The main goal is to implement and test, in real traffic conditions, cooperative systems (c-ITS) based on V2X technologies. The project is part of the C-Roads Platform. Objective ITS will be improved.
Malta	
Floriana	Project ID 5379: Upgrading of route 6 Upgrading of the existing road. KPI Express road or Motorway will be improved
Marsa	Project ID 5016: Upgrading of Modal Interconnection on Malta's TEN-T (road) Core Network: Marsaxlokk-Luqa-Valletta Phase 1 Upgrading of the existing modal interconnections. Project ID 5378: Grade separation of Route 1 Project ID 5950: Upgrading of Modal Interconnection on Malta's TEN-T (road) Core Network: Marsaxlokk-Luqa-Valletta Phase 2 Upgrading of the existing modal interconnections. KPI Express road or Motorway will be improved
Several countries	
DK,SE	Project ID 5015 Deploying charging stations across Scandinavia (SE/DK). KPI Clean fuels will be improved.
DE, AT	Project ID 5825: A12 Rehabilitation Inn bridge Kiefersfelden (border DE-AT) - Kufstein south A12 Rehabilitation Inn bridge Kiefersfelden (border DE-AT) - Kufstein south. Objective ITS will be improved.
DE, DK, FI, SE	Project ID 5009: NEXT-ITS 2 coordinated deployment of Traffic Management Services, upgrade of Traffic Management Centres, development and implementation of Traffic Management Plans and harmonisation of control and management strategies. Objective ITS will be improved
AT, IT	Project ID 5507: EVA+ (Electric Vehicles Arteries in Italy and Austria) Objective of the Action is to kick start long-distance electric mobility journeys in both countries, as well as connecting main urban nodes with TEN-T Corridors, while ensuring fast charging interoperability and roaming with other EU countries KPI Clean fuels will be improved.
FI, SE, DK, NO	Project ID 5520: NordicWay. Large-scale pilot using cellular communication (3G and LTE/4G) for C-ITS. It offers continuous interoperable services to the users with roaming between different mobile networks and cross-border, offering C-ITS services across all participating countries. NordicWay puts emphasis on building a sustainable business model on the large investment of the public sector on the priority services of the

Sections expected to be compliant by 2030	Compliance by 2030 expected to be reached through
	ITS Directive. Objective ITS will be improved.
DE, IT, NL	Project ID 5975 and 5517: URSA MAJOR 2 and URSA MAJOR NEO The projects target the deployment of ITS services to improve freight traffic on the TEN-T road network linking North-Sea-Ports, the Rhine and Ruhr area, metropolitan areas in southern Germany and in Italy. KPI Clean fuels will be achieved and objective ITS will be improved

Source: Ramböll, May 2017

16 planned projects until 2030 have no funding or no decisions on project start and/or end date yet. By country the projects are distributed as follows:

- Sweden: 1
- Denmark: 2
- Germany: 10
- Italy: 2

It is notable that there is no project planned for access to Porto di Ancona, Italy.

Table 30: Road sections with expected non-compliance in 2030 and related options for intervention

Sections with a need for action	Reason for non-compliance by 2030	Options for interventions
Sweden		
Stockholm	Project ID 5141: Small-scale investments and ITS solutions for improved capacity and traffic management. Project start date 2016. The start and end date not defined.	
Denmark		
Odense-Fredericia-Kolding	Project ID 5392: South of Odense. Capacity enhancement. Project ID 5393: Odense West – Middelfart. Capacity enhancement. Project ID 5394: Fredericia - Kolding. Capacity enhancement. Financing not concluded and end date not defined	
Germany		
Hamburg Hamburg-Pinneberg	Project ID: 5454: A 1 Hamburg-SO - section influence system. Telematics application. Project ID 5462: A 7 retrofitting of Elbe tunnel tubes 1-3. Road safety.	

Sections with a need for action	Reason for non-compliance by 2030	Options for interventions
	Project ID 5463: A 23 Section influence system, incl. ZRA. Road safety. Financing not concluded and/or no project end date.	
Hannover	Project ID: 5465: A 7 / A 2 traffic control system Hannover [part of DE CPR 4]. renewal of traffic control system The project start and end date unknown	
München	Project ID: 5456: A 8, A 92, A 99, B 471 - dynamic sign-posting [part of DE CPR 4] The project start and end date unknown	
Niedersachsen	Project ID 5464: A 1, A 2, A 7, A 26, A 27, A 35 - network influence system. Project start and end date unknown.	
Hannover	Project ID 5465: A 7 / A 2 traffic control system Hannover Project start and end date unknown.	
Kassel	Project ID 5466: A 5, A 7, A 44, A 49 - network influence system Kassel Project start and end date unknown.	
Potsdam - Niemegk	Project ID 5468: A 9 Niemegk - Dreieck Potsdam - section influence system Project start and end date unknown.	
Bayern	Project ID 5469: A 3, A 6, A 7, A 9, A 72 - dNet Bayern. Telematics application. Project start and end date unknown.	
Italy		
Salerno – Reggio Calabria	Project ID 5302: Completion of the motorway between Salerno and Reggio Calabria - functional upgrading of the remaining 58 km + construction of 6 new interchanges + technological equipment (smart road) End date unknown.	
Bari	Project ID 5343: Enhancement of Bari ring road Project start and end date unknown.	
Ancona Sud – Porto di Ancona	No project to reach compliance is defined in project list.	

Source: Ramböll, May 2017

Most projects planned and funded until 2030 regard capacity enhancement. 41 projects target capacity enhancement whereof 2 also target road safety. Furthermore there are 5 projects targeting road safety and 2 projects targeting safe parking, but not capacity enhancement. The figure below shows the projects aiming at improving objectives for the road network already compliant with regulations.

Table 31: Road parameters expected compliance 2030

Road sections	Capacity enhancement	Road Safety	Parking
Stockholm Project ID 5142: Essingelden - Södra länken.	X		
Göteborg Project ID 5149: E6.21 Göteborgs hamn/Lundbyleden		X	
Stockholm Project ID 5144: Tomteboda - Haga Södra	X		
Stockholm Project ID 5140: E4 Stockholm Bypass (new road link)	X		
Göteborg Project ID 5148: E6.20 Hisingsleden	X	X	
Göteborg Project ID 5149: E6.21 Göteborgs hamn/Lundbyleden		X	
Flädie Project ID 5151: E6 intersection Flädie	X		
Tomteboda - Haga Södra Project ID 5144: E4 Tomteboda - Haga Södra	X		
DK ScanMed Road Sections Project ID 5177: Improve technical parameter to achieve the objective set for 2030. (no data on which objectives)			
Greve South – Køge Project ID 5136: Køgebugt Motorway	X		
Biebelried - Fürth/Erlangen (A3) Project ID 9324: A3 - 6-lane expansion between motorway interesections Bibelried - Fürth/Erlangen	X		
København: Project ID 5410: Tunnel from Nordhavnsvej to Nordhavn in København	X		
Hamburg: Project ID 5718: A26-East motorway (planning) Project ID 5719: A26-East motorway (construction)	X		
Bordesholm – Hamburg: Project ID 5101: Upgrade	X		
Bremen Project ID 5467: A 27 AK Bremen - AS HB-Überseestadt	X		
DE road corridor sections: Project ID 5459: DE ScanMed Corridor Programme Road - CPR 1: Safe parking			x
Göttingen - Salzgitter Project ID 5030: A 7 AS Göttingen - AD Salzgitter, extension of lanes	X		
Hamburg Project ID 5018: A 7 motorway: upgrade to 6-8 lanes between Hamburg/NW and Hamburg/ Schleswig-Holstein border Project ID 5019: A 7 motorway: upgrade to 6-8 lanes between Hamburg/NW (A 23) and Hamburg-Othmarschen Project ID 5021: A 1: AD Hamburg-SO - AS Hamburg-Stillhorn, extension of lanes Project ID 5026: A 7 Hochstraße Elbmarsch, extension of lanes	X		
Hannover Project ID 5843: Regional strategy and action plan		X	

Road sections	Capacity enhancement	Road Safety	Parking
towards traffic safety			
Hildesheim - Salzgitter Project ID 5029: A 7 AS Hildesheim - AD Salzgitter, extension of lanes	X		
Malchow - Waren (Müritz): Project ID 4046: A 19 near Malchow	X		
München Project ID 5108: A 99 Kreuz München-Nord - Kreuz München-Süd [part of DE CPR 2]	X		
München Project ID 5458: A 99 Safety measures in the Tunnel Allach [part of DE CPR 4]		X	
München – Rosenheim Project ID 5109: A 8 Kreuz München-Süd - Dreieck Inntal [part of DE CPR 2], extension of lanes	X		
Soltau - Fallingbostel Project ID 5027: B207: A7: AS Soltau-O - AS Fallingbostel, extension of lanes	X		
Walsrode – Fallingbostel Project ID 5028:A7: AD Walsrode - AS Fallingbostel, extension of lanes	X		
Kiefersfelden – Kufstein Project ID 5110: Removal of bottleneck	X		
München - Rosenheim (- Salzburg) - Kufstein - Brennersee Project ID 5839: Expansion of safe & secure truck parking spaces and truck parking information systems on the TEN-T core network in Austria and Germany (Bavaria)			X
DE-AT border - Kufstein south Project ID 5825: A 12 Rehabilitation Inn bridge Kiefersfelden (border) - Kufstein south	X		
A12 Project ID 5826: A 12 Rehabilitation Wörgl east - Wörgl west	X		
A12 Project ID 5827: A 12 Rehabilitation of noise protection walls Radfeld-Kramsach area	X		
A12 Project ID 5828: A 12 Rehabilitation Schwaz - Wattens	X		
Vomp - Wattens Project ID 2537: A12 Reconstruction of Inn bridge Terfens replacing existing bridge due to damages	X		
Bologna Project ID 1865: Upgrading of the Bologna tolled A14 and un-tolled ring roads	X		
Bologna-Castelbolognese Project ID 1205: Fourth lane upgrading of the A14 Motorway between Bologna and Castelbolognese	X		
Fortezza – Verona Med Brescia - Venezia - Trieste Project ID 3689: C-Roads Italy	X		
A13 Project ID 5831: A 13 Reconstruction of junction Patsch-Igls.	X		
A13 Project ID 5832: Rehabilitation of carriageways and	x		

Road sections	Capacity enhancement	Road Safety	Parking
coating Europe bridge.			
A13 Project ID 5833: A 13 Rehabilitation Zieglstadl bridge - Äussere Nösslach bridge.	X		
A13 Project ID 5830: A 13 Safety upgrading of main carriageways and reconstruction of junction Innsbruck south.	X	x	
Roma: Project ID 5336: Connection between Fiumicino Airport and A24 motorway.	X		
Roma Project ID 5337: Upgrade of technological equipment and safety in the Selva Candida Tunnel along the A90 Rome Ring Road (GRA-Grande Raccordo Anulare)	X		
Palermo-Catania: Project ID 5339: A19 Motorway Palermo-Catania upgrade	X		
Catania: Project ID 5340: Catania by pass RA15	X		
Gioia Tauro: Project ID 5341: Enhancement of SS 682dir and SS 18	X		
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**100%**		

Source: Ramböll, May 2017

Table 32: Development of Road KPI 2014, 2016, 2017 and expectations for 2020 and 2030

Road Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Expected 2020	Expected 2030	Target 2030
Promotion of road safety	X									
Express Road or Motorway	X	X	X		99%	99,1%	99,1%	99,1 %	99,7%	100%
ITS and tolling systems	X	X								
Parking areas every 100 km	X	X								
Availability of clean fuels	X	X	X	TENtec	CNG n.a. LNG n.a. H2 n.a. ECP n.a.	2.271 7 53 9.318 in corridor countries (2016)	2242[21], 7[22] and 63[23] 36.987[24] in corridor countries (2017)			
Mitigation of congestion	x									

Source: Ramböll, May 2017

- Norway: 103 stations
- Sweden: 49 stations
- Finland: 0 stations
- Denmark: 4 stations
- Germany: 7,416 stations
- Austria: 42 stations
- Italy: 3,734 stations
- Malta: 5 stations

A brief survey of CNG stations along the corridor (status May 2017) [25] shows that the entire corridor is covered.

[21] https://www.ngva.eu/

[22] https://www.ngva.eu/

[23] https://www.netinform.de/

[24] https://openchargemap.org/site/

[25] http://cngeurope.com/countries/

Conclusions

By 2030 all road sections, with the exception of a small connection in western Finland and another in Italy, will be compliant regarding the KPI for express road or motorway. This will mean that by 2030 almost 100% of the corridor's length will comply. The remaining sections are known to the authorities but have no planned developments at present.

Regarding the KPI for alternative clean fuels the situation is made unclear as this term covers multiple clean fuels such as LPG, CNG, Electrification, Hydrogen etc. In terms of the general KPI of alternative clean fuels all sections of the corridor are covered, however not all clean fuels are readily available in all parts of the corridor today. The situation in 2030 is unclear as there is the need for private investment as well as public investment necessary for economically viable options to be in place. Some clean energy station projects are included in the 2017 project list but most potential new stations will be developed outside the national plans. There are no current plans to introduce LPG stations in Finland or in the København-Malmö region although these could of course eventually be built by 2030.

Many projects planned by 2030 are aimed at increasing road capacity or improving road safety. These are not KPI’s but improve the quality of the road network and reduce the risk of delays or accidents. Parking facilities are available already today, in various forms and with very different service facilities. There are only a few developments on the project list for new safe parking areas in Germany, however upgrading or improvements in other parts of the network may be developed as well.

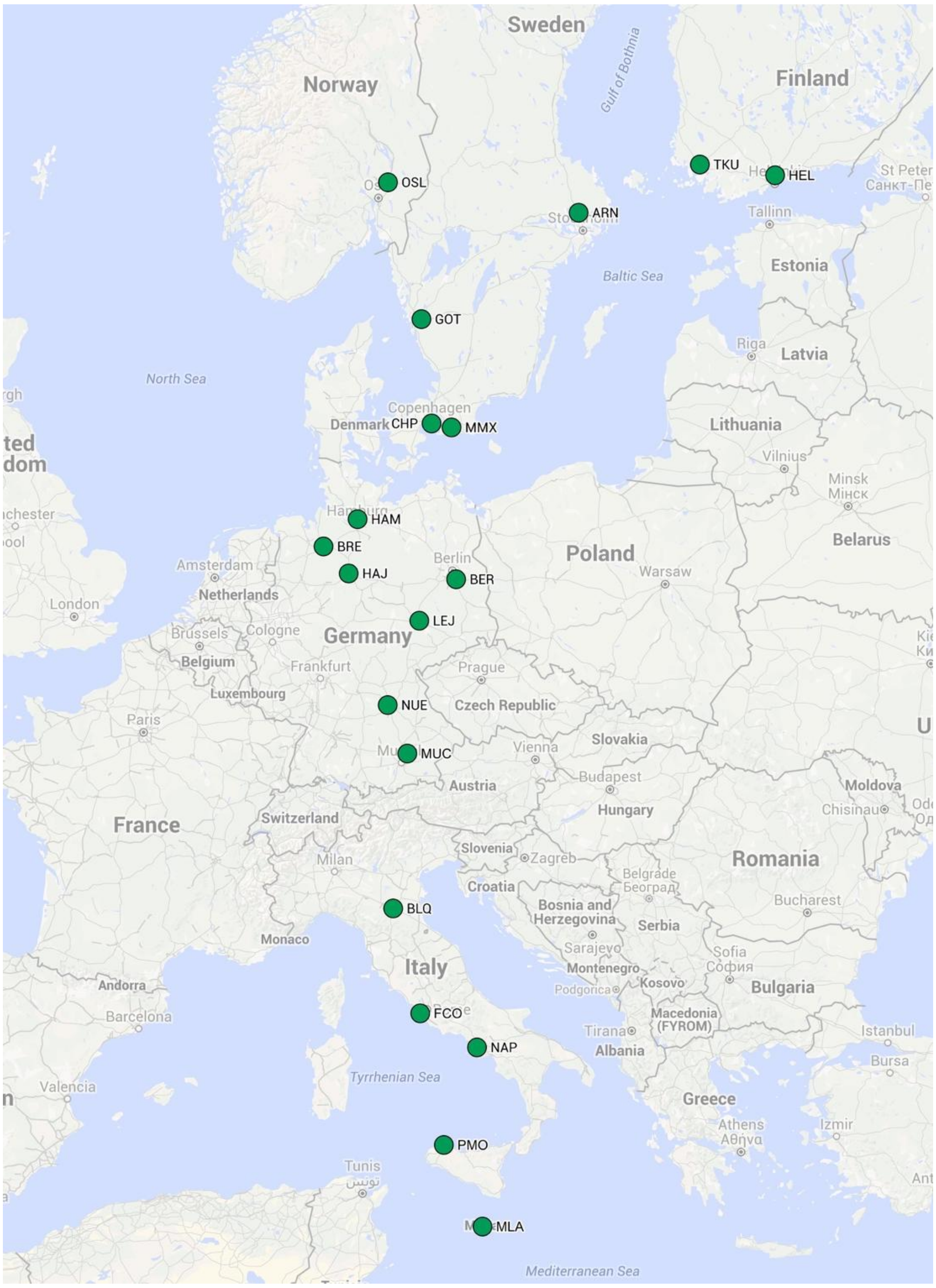
6.3 Air Infrastructure (Airports)

Open access

Since the open access is granted in all the core airports and all of them comply with the Regulation (EU) 1315/2013, no further measures in this domain have to be identified and implemented.

The following figure shows the compliance in 2030 highlighting in green the airports that will be compliant with the regulation.

Figure 20: Expected compliance of airports by 2030 – open access



Source: GruppoClas, May 2017

Single European Sky - SESAR system

The implementation actions for the Single European Sky objective are still at early stages and will begin to bear fruits in the next years.

The way to the implementation of Single European Sky will involve airports on the ScanMed Corridor, according to the strategy defined by the 2015 European ATM Masterplan - The roadmap for delivering high performing aviation for Europe. On 5

December 2014 the Commission appointed the SESAR Deployment Alliance as the body in charge for the Deployment phase (SESAR Deployment Manager).

The following projects are expected to improve the Corridor's compliance with the regulation.

Table 33: Airport projects improving compliance with the Regulation

Sections expected to be compliant by 2030	Compliance with respect to KPI "single European Sky" by 2030 expected to be reached through
Sweden	
Sweden	• TEN-T project ID: 5553 • Project name: Remote tower Services - RTS, pilot operations • Short project description: By deploying Remote Tower Services, RTS, one or numerous Air Traffic Control towers can be operated from another location irrespective of distance.
Stockholm Arlanda airport (ARN)	• TEN-T project ID: - (104AF1 in DP15) • Project name: Standardisation of A-SMGCS • Short project description: AMAN Upgrade to include Extended Horizon function
Göteborg Landvetter airport (GOT)	• TEN-T project ID: 5863 • Project name: Implementation of functional TWR at Göteborg Landvetter air-port • Short project description: updating of ATM systems of the Göteborg Landvetter Airport in order to improve the cost-effectiveness and efficiency of the operations. The Action is in line with the PCP although geographically Göteborg is not part of the SESAR Deployment Programme for these functionalities.
Stockholm Arlanda airport (ARN)	• TEN-T project ID: 5405 • Project name: Deployment plans for Stockholm Arlanda • Short project description: the development plans include a number of projects to increase terminal capacity and enhance the passenger experience.
Stockholm Arlanda airport (ARN)	• TEN-T project ID: 5864 • Project name: Skavsta Access 2.0 • Short project description: the Action aims at increasing capacity and accessibility of Stockholm Skavsta Airport and consolidating the provision of air navigation services in the Greater Stockholm region to enable safe, efficient and environmentally friendly air traffic operations.
Stockholm Arlanda airport (ARN), Malmo Sturup airport (MMX)	• TEN-T project ID: 5865 • Project name: One synchronised ATM system - Contingency ATCC at OS/MM • Short project description: the Action aims at the implementation of a single synchronised ATM system covering all air traffic operations throughout the entire Swedish airspace, defragmenting it and harmonising the ATM system within Sweden.
Sweden	• TEN-T project ID: 5866 • Project name: FRA high seas primary surveillance infrastructure • Short project description: the proposed Action covers therefore the implementation of a Primary Surveillance Radar (PSR), capable of detecting non-transponder equipped aircraft within Swedish FRA.
Sweden	• TEN-T project ID: 5867 • Project name: Expansion of Remote Tower Services • Short project description: the Action aims to expand the

Sections expected to be compliant by 2030	Compliance with respect to KPI "single European Sky" by 2030 expected to be reached through
	Remote Tower Services (RTS) that Luftfartsverket is already operating.
Denmark	
Kobenhavn Kastrup airport (CHP)	• TEN-T project ID: - (103AF2 in DP15) • Project name: SESAR Deployment Project • Short project description: Copenhagen Airport will upgrade the existing A-SMGCS to a newer and standardized version. The standardization of the existing A-SMGCS will facilitate the future procurement of ad-on modules necessary for the implementation of the A-SMGCS advanced functions. Furthermore, it will enable Copenhagen Airport to enter into a partnership with other EU airports, which are also looking to upgrade to the standardized expansion module to A-SMGCS.
Germany	
München airport (MUC)	• TEN-T project ID: 5754 • Project name: SESAR Deployment Project • Short project description: TAM (Total Airport Management)
Leipzig-Halle airport (LEJ)	• TEN-T project ID: 5875 • Project name: Safety control center • Short project description: Safety control center is a Airport-project by the Mitteldeutsche Flughafen AG on the section or node Leipzig
München airport (MUC)	• TEN-T project ID: 5038 • Project name: Preparation for future A-SMGCS Guidance and Routing Functions • Short project description: the Action will prepare Munich airport for the future Advanced Surface Movement Guidance and Control System (A-SMGCS) functions as defined in SESAR.
Italy	
	No airport project defined.
Malta	
Valletta Malta-Luqa airport (MLA)	• TEN-T project ID: 5060 • Project name: IP-based Ground to Ground communications network • Short project description: The objective is to upgrade current cross border infrastructure that links Malta and Italy and, by extension, the European continent which will bring significant improvements over technical barriers and bottleneck constraints.
	• TEN-T project ID: 5363 • Project name: Primary surveillance radar • Short project description: A new primary radar is intended to replace the current one. This radar function today covers a substantial area of the Central Mediterranean. It serves aircraft to fly safely over the region and connects the southern EU borders with North Africa. A new primary radar will avoid bottlenecks and multiple deficiencies with the detriment of substantial economic loss to Member States. This radar is of a high added value to the European Union as it links the East to West and vice versa.
	• TEN-T project ID: 5953 • Project name: Automatic Dependant Surveillance - Broadcast ADS-B • Short project description: The objective is to ameliorate communication, navigation and surveillance coverage over the

Sections expected to be compliant by 2030	Compliance with respect to KPI "single European Sky" by 2030 expected to be reached through
	Central to East Mediterranean area. The facility will provide more direct routes, hence more convenience for air travelling passengers, less circling in the air due to more efficient data, hence less emissions and a safer environment to an ever congested airspace. Above all, ADS-B will also provide support to radar surveillance.

Source: GruppoClas, May 2017

However, since the detailed SESAR requirement to be achieved by each airport and the detailed contribution of each of the projects on each airport is not clear we have indicated that the KPI is not applicable ("n.a.") at this moment.

Capacity

A high number of core network airports on the Scandinavian-Mediterranean Corridor highlight a need for further capacity, as shown in Table 18 in chapter 5.3.

Projects aimed at improving capacity are existing and underway, and the foreseen outcome will allow the stakeholders to achieve compliance with the objective set in the Regulation.

The opening of the Berlin Brandenburg airport will constitute a substantial improvement of airport capacity on the corridor, but only in the scenario envisaging the closure of Tegel but not of Schönefeld, that would be used as second terminal of the main airport. Contrariwise, the new Berlin Brandenburg airport will result to be undersized with respect to the current traffic flows.

The following projects are expected to improve the Corridor's compliance with the regulation.

Table 34: Projects expected to improve compliance

Sections expected to be compliant by 2030	Compliance with respect to KPI "capacity" by 2030 expected to be reached through
Finland	
Helsinki Vantaa airport (HEL)	• TEN-T project ID: 5450 • Project name: Development of Helsinki airport • Short project description: Several improvements, repairs and maintenance measures in a major development program
Norway	
Oslo Gardermoen airport (OSL)	• TEN-T project ID: 5184 • Project name: Airport expansion • Short project description: Further expansion of airport facilities, in particular of the terminal areas, in order to accommodate up to 24 million passengers a year by 2017
Sweden	
Stockholm Arlanda airport (ARN)	• TEN-T project ID: 5404 • Project name: Reach compliance capacity-traffic • Short project description: Improve passenger capacity to achieve the objective set for 2030.
	• TEN-T project ID: 5405 • Project name: Deployment plans for Stockholm Arlanda • Short project description: The development plans include a

Sections expected to be compliant by 2030	Compliance with respect to KPI "capacity" by 2030 expected to be reached through
	number of projects to increase terminal capacity and enhance the passenger experience. Among the changes, more aircraft parking stands will be built through a new pier and additional remote parking. Increase in the capacity of the baggage handling system will be implemented in order to manage the large increase in passenger volume. In addition, a new security checkpoint will be built. These are a few examples of the projects that are to be implemented.
Denmark	
Kobenhavn Kastrup airport (CHP)	• TEN-T project ID: 5180 • Project name: Reach Compliance • Short project description: Improve technical parameter to achieve the objective set for 2030.
	• TEN-T project ID: 5181 • Project name: Expanding CPH • Short project description: Development of the airport in order to accommodate the increase in passenger volume up to 40 million per year. Capacity expansions include new infrastructure for aircraft and passengers and improved connection between terminals and rail and metro station.
Germany	
Berlin Brandenburg airport (BER)	• TEN-T project ID: 5876 • Project name: medium-term expansion program • Short project description: Expansion SXF Nord; Media infrastructure; Expansion aircraft movement / aviation area; Construction of an additional terminal; Construction of additional operations-specific buildings; optimization of passenger terminal BER
	• TEN-T project ID: 5884 • Project name: Master-Planning - long-term infrastructure expansion planning • Short project description: Planning of airport capacity for annual passenger volume over 40 mio.
Bremen airport (BRE)	• TEN-T project ID: 5870 • Project name: Reconfiguration of the passenger terminal departure area • Short project description: Reconfiguration of departure gate areas, creation of a centralised passenger security check area, replacement of two older passenger security check areas, consideration of EU requirements, capacity increase.
	• TEN-T project ID: 5871 • Project name: Optimisation of the apron • Short project description: Elimination of bottlenecks, adaption to EASA-requirements,
Hannover Langenhagen airport (HAJ)	• TEN-T project ID: 5189 • Project name: Study on capacity improvement for airport terminals B and C • Short project description: Re-design of the buildings in order to create new passenger and baggage security check facilities. Re-design of terminals in order to compensate capacity decrease due to new passenger and baggage security check facilities.
	• TEN-T project ID: 5190 • Project name: Capacity improvement for airport terminals B and C • Short project description: Implementation, after TEN-T Project

Sections expected to be compliant by 2030	Compliance with respect to KPI "capacity" by 2030 expected to be reached through
	5189. Re-design of the buildings in order to create new passenger and baggage security check facilities. Re-design of terminals in order to compensate capacity decrease due to new passenger and baggage security check facilities.
	• TEN-T project ID: 5191 • Project name: Improvement of road access to air cargo terminals and extension of the apron for air cargo aircraft • Short project description: Upgrade of existing roads to the western part of Hannover Airport, where new cargo facilities are located, plus a new apron for air cargo aircraft.
Leipzig-Halle airport (LEJ)	• TEN-T project ID: 5195 • Project name: Extension of the apron for cargo aircraft • Short project description: Apron for 8 wide body or 16 narrow body freighter aircraft.
München airport (MUC)	• TEN-T project ID: 5753 • Project name: Expansion of Terminal 1 with an additional pier • Short project description: -
	• TEN-T project ID: 5202 • Project name: Extension apron North • Short project description: Increase of aircraft parking capacity.
Italy	
Bologna Guglielmo Marconi airport (BLQ)	• TEN-T project ID: MED_PWC10 • Project name: I site apron extension • Short project description: I site apron extension to increase infrastructural airside capacity
	• TEN-T project ID: MED_PWC11 • Project name: III site apron • Short project description: III site apron to increase infrastructural airside capacity
	• TEN-T project ID: MED_PWC12 • Project name: De-icing apron and structure • Short project description: De-icing apron and structure to increase infrastructural airside capacity and let airplane to de-ice quickly near the runway head.
	• TEN-T project ID: MED_PWC15 • Project name: New DHL warehouse • Short project description: New DHL warehouse to let business cargo to expand in another bigger area then existing one.
	• TEN-T project ID: MED_PWC5 • Project name: New pier • Short project description: New pier to increase infrastructural capacity and get flexibility between Schengen and Extra Schengen areas.
	• TEN-T project ID: MED_PWC6 • Project name: New departure lounge • Short project description: New departure lounge to increase infrastructural capacity and develop commercial offer.
	• TEN-T project ID: MED_PWC7 • Project name: New boarding piers • Short project description: New boarding piers to increase infrastructural capacity
Roma Fiumicino airport (FCO)	• TEN-T project ID: 5610 • Project name: Project Improvement of South Fiumicino • Short project description: The Project aims at completing the development of Fiumicino airport within the present boundary

Sections expected to be compliant by 2030	Compliance with respect to KPI "capacity" by 2030 expected to be reached through
	in order to adequate airport capacity to air traffic growth and increase level of service. The project consist in new infrastructures as terminals and boarding areas (+4), aircraft stands (+38) and loading bridge stands, new baggage systems (+2), taxiways, highway junction development, power plant, car parking, cargo & logistics, offices and hotels.
	• TEN-T project ID: 5611 • Project name: Fourth runway • Short project description: The project consists in a new runway, linked to the existing airport airside facilities. The 4th runway will be able to increase peak hour capacity up to 120 movements/hour, instead of 90 movements/hour today. This improvement allows to receive peak hour traffic demand, related to foresee traffic growth.
	• TEN-T project ID: 5612 • Project name: Fiumicino North Masterplan • Short project description: Fiumicino North Masterplan consists in the airport development between the two parallel runways and includes: new terminal, new runway (fifth runway) and connected facilities (e.g. new aprons, taxiways)
Napoli Capodichino airport (NAP)	• TEN-T project ID: 5615 • Project name: Upgrading of airport infrastructures performances • Short project description: The project involves the automation of operating processes (vehicular traffic and parking access, baggage handling, security checks, boarding procedures, extra Schengen security checks) in order to increase airport capacity through technological solutions.
Palermo Punta Raisi airport (PMO)	• TEN-T project ID: 5944 • Project name: Upgrading of the paving of the runways and related works • Short project description: The project involves the upgrading of the two runways through targeted interventions. The planned operations include reconstruction of flexible pavement and the underlying foundation, renovation of the wearing course, demolition of damaged and construction of new plates.
	• TEN-T project ID: 5945 • Project name: Adjustment and restructuring passenger terminal - New Scenary 2020 • Short project description: The project includes a complex of civil and plant engineering works necessary to achieve a new and different set-up of the terminal passengers aimed to adapt the building to seismic regulations and restructure the terminal both from the functional point of view and the architectural one.
Malta	
Valletta Malta-Luqa airport (MLA)	• TEN-T project ID: 5366 • Project name: Enlargement of the non-Schengen departures concourse • Short project description: -
	• TEN-T project ID: 5367, 5965, 5966 • Project name: Aircraft movementa area rehabilitation • Short project description: Taxiway C rehabilitation; Taxilane U and W (apron 9) rehabilitation; Taxilane T (apron 9) rehabilitation.

Source: GruppoClas, May 2017

The following sections will remain with a need for action.

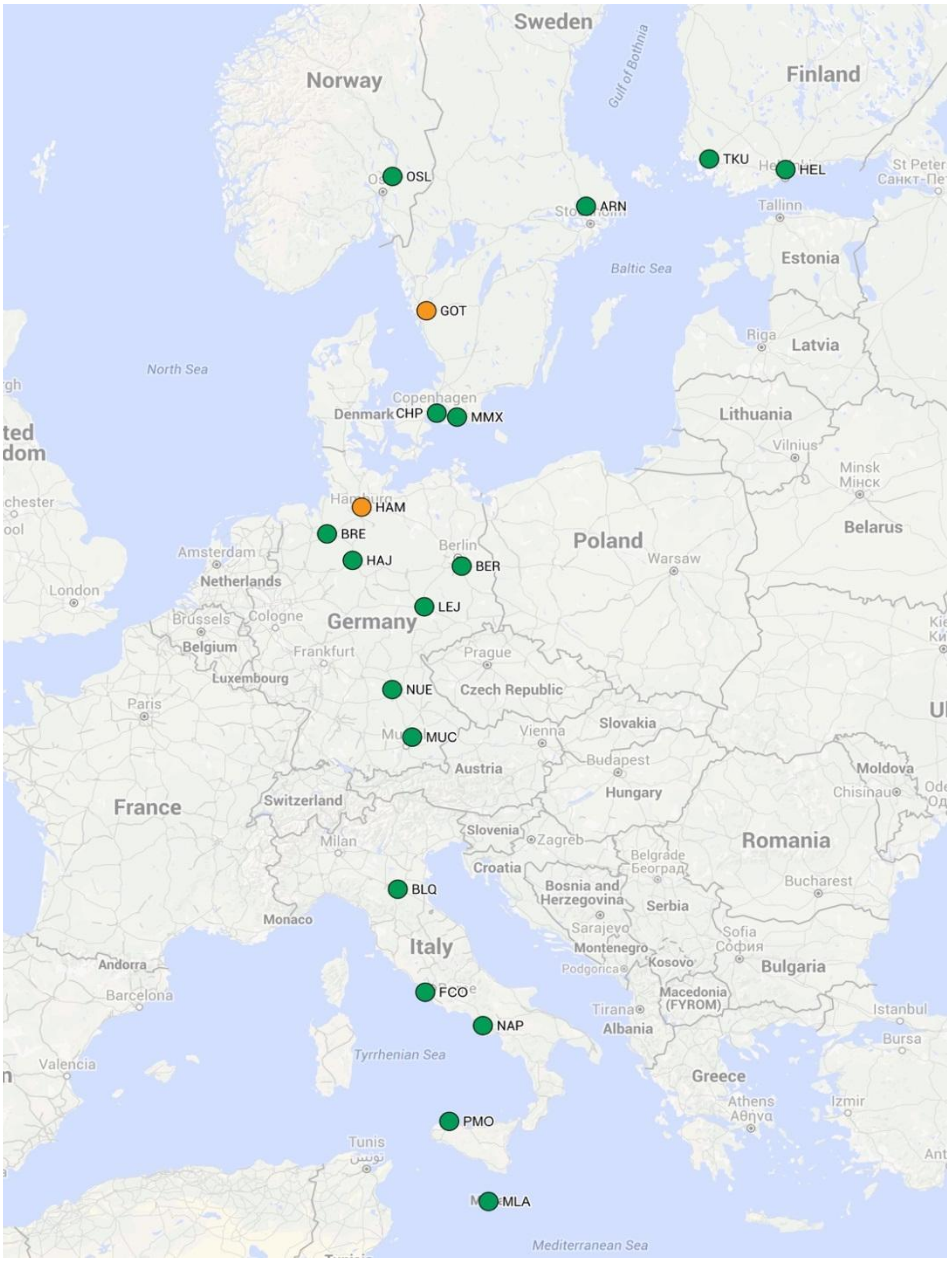
Table 35: Airports with further need for actions

Sections with a need for action	Reason for non-compliance by 2030	Options for interventions
Sweden		
Göteborg Landvetter airport (GOT)	No plans seem to be envisaged aiming at increasing the airport capacity.	Capacity expansion
Germany		
Hamburg airport (HAM)	After the expansion and modernization project implemented from 2001 to 2010, no further plans seem to be envisaged aiming at increasing the airport capacity, even if the 2015 passenger traffic has been higher than the declared potential capacity.	Capacity expansion

Source: GruppoClas, May 2017

The following figure shows the compliance in 2030 highlighting in green the airports that are expected to be compliant with the regulation, that is to have sufficient capacity to accommodate the expected demand, and in orange the ones that could register undersized capacity due to the current lack in investment planning.

Figure 21: Expected compliance of airports by 2030 – capacity utilisation



Source: GruppoCLAS analysis, May 2017, green = sufficient capacity, orange = risks to have not sufficient capacity

Connection with rail

The Regulation (EU) 1315/2013 requires that in the development of the core and comprehensive network, general priority shall be given to measures that are necessary for ensuring optimal integration of the transport modes and improving multimodal interconnections between airports and infrastructure of other transport modes. In particular, it requires that all main airports in the core network have to be connected with rail by 2050. Since the seven main airports are connected already now we have continued to assess all airports against this important KPI.

The following analysis will not consider only the pure rail mode but also related modes as tram, metro and people mover directly linked to the rail network.

The status in 2017 is that 68% of the analysed airports, that is 13 out of 19, are connected with rail, with an increase of 1 airport from 2014. In 2015, in fact, the new Helsinki ring rail line connecting the airport Vantaa has been opened and also the rail link with the new Berlin Brandenburg airport has been completed, even if the airport is not in operation yet. In 2030 the compliance coefficient to the Regulation (EU) 1315/2013 is expected to rise up to 89%.

An exemption from the regulation in terms of connectivity with the rail network is required for Valletta Malta-Luqa airport due to the peculiarity of the isle of Malta where no rail network exists. In this context a good connectivity can be guaranteed with other means of transport (e.g. bus). Thus, the calculation basis for the corridor compliance regarding connection to means of rail transport is reduced by one airport.

In 2030 Berlin Tegel and Berlin Schönefeld airports are expected to be dismissed and replaced by the new Berlin Brandenburg airport (including Schönefeld as subsidiary terminal), then the total number of core airports on the Scandinavian-Mediterranean Corridor will be just 19.The airports that are now not compliant with the Regulation (EU) 1315/2013 concerning the multimodal connectivity and that are developing projects aiming at reaching the compliance are 3: Göteborg, Bologna and Napoli.

The following table summarizes the compliance in 2030 of all core airports on the Scandinavian-Mediterranean Corridor with the Regulation (EU) 1315/2013 concerning the multimodal connectivity.

Table 36: Expected compliance of Airports by 2030 - multimodal connectivity

Airport	Current multimodal connectivity (2017)	Expected multimodal connectivity (2030)
Helsinki Vantaa (HEL)*	Yes (rail)	Yes (rail)
Turku/Naantali (TKU)	No	No
Oslo Gardermoen (OSL)	Yes (rail)	Yes (rail)
Stockholm Arlanda (ARN)*	Yes (rail)	Yes (rail)
Göteborg Landvetter (GOT)	No	Yes (rail)
Malmo Sturup (MMX)	No	No
Kobenhavn Kastrup (CHP)*	Yes (rail)	Yes (rail)
Berlin Brandenburg (BER)*	under construction	Yes (rail)
Berlin Tegel (TXL)	No	dismissed
Berlin Schönefeld (SXF)	Yes	dismissed
Bremen (BRE)	Yes (tram)	Yes (tram)
Hamburg (HAM)*	Yes (rail)	Yes (rail)
Hannover Langenhagen (HAJ)	Yes (rail)	Yes (rail)
Leipzig-Halle (LEJ)	Yes (rail)	Yes (rail)
Nürnberg (NUE)	Yes (metro)	Yes (metro)
München (MUC)*	Yes (rail)	Yes (rail)
Bologna (BLQ)	No	Yes (people mover)
Roma Fiumicino (FCO)*	Yes (rail)	Yes (rail)
Napoli Capodichino (NAP)	No	Yes (metro)
Palermo Punta Raisi (PMO)	Yes (rail)	Yes (rail)

Valletta Malta-Luqa (MLA)	n.a.	n.a.
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**13/19 = 68%** **7/7 = 100%***	**16/18 = 89%** **7/7 = 100%***

*Source: GruppoCLAS analysis, May 2017; * 'main airport" according to Article 41(3)*

Then, in 2030, 16 core airports on the Scandinavian-Mediterranean Corridor out of 19 will be compliant with the Regulation concerning the multimodal connectivity, with a compliance coefficient related to all the Corridor of 89%. Considering that (only) "main airports" are required to fulfil the "rail connection" target by the year 2050 it can be reported that the KPI has already been achieved now.

The following projects are expected to improve the Corridor's compliance with the regulation.

Table 37: Project with expected compliance improvements

Airports expected to be compliant by 2030	Compliance with respect to "connectivity with rail" by 2030 expected to be reached through
Finland	
Helsinki Vantaa airport (HEL)	• TEN-T project ID: 5536 • Project name: The multimodal Helsinki node • Short project description: Development of optimum and seamless multimodal transport connection between the TEN-T long distance, urban and airport traffic at the airport terminal area and removal of bottleneck between flight and train - bus traffic and creates links between and within different transport modes.
Sweden	
Göteborg Landvetter airport (GOT)	• TEN-T project ID: 5550 • Project name: Gothenburg-Borås Project • Short project description: Gothenburg–Borås is one of the links in a new high-speed network between Stockholm and Gothenburg/Malmö. The new railway will create a new rail connection to Göteborg Landvetter Airport and link the region's two largest cities closer together.
Germany	
Hamburg airport (HAM)	• TEN-T project ID: 5187 • Project name: Study on additional railway links to Hamburg Airport • Short project description: Study on the creation of a railway link from the northern catchment area of Hamburg Airport. Technical feasibility study as well as cost-benefit analysis.
München airport (MUC)	• TEN-T project ID: 9023 • Project name: New railway connection between Munich Airport and the European railway corridor TEN PP 17 • Short project description: New railway connection from the airport towards the east, in the direction of Erding (connection to München - Mühldorf - Salzburg line).
Italy	
Bologna Guglielmo Marconi airport (BLQ)	• TEN-T project ID: MED_PWC4 • Project name: People Mover • Short project description: building of a people mover connecting Bologna central station and the airport.
Napoli Capodichino airport (NAP)	• TEN-T project ID: 5624 • Project name: Metropolitana di Napoli

	• Short project description: Napoli Metro Line: Line 1 - Capodichino - Di Vittorio Section

Source: GruppoClas, May 2017

The following sections will remain with a need for action.

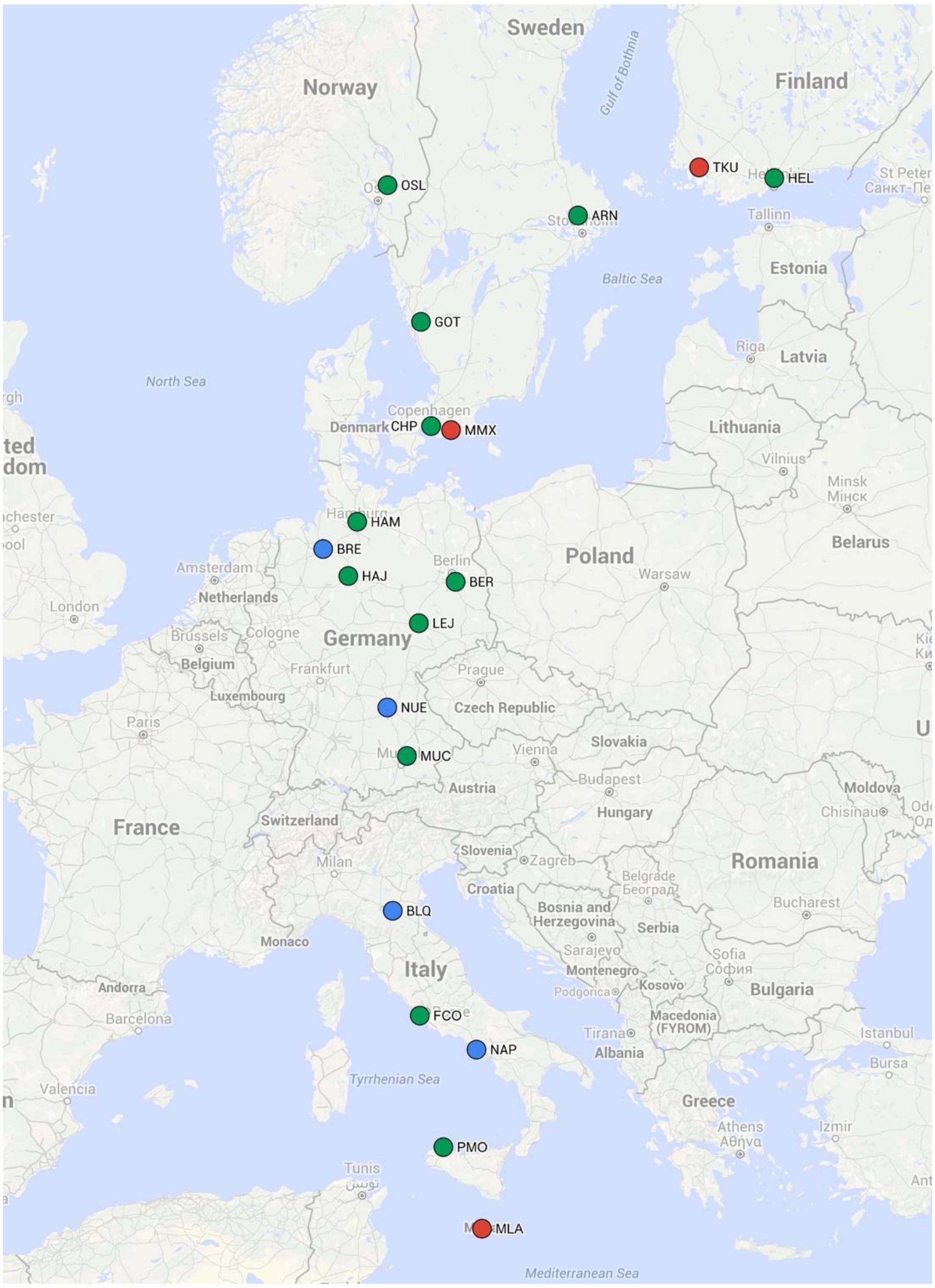
Table 38: Airports with further need for actions

Sections with a need for action	Reason for non-compliance by 2030	Options for interventions
Finland		
Turku/Naantali airport (TKU)	Negative cost-benefit ratio expected by the project due to the low traffic flow.	-
Sweden		
Malmo Sturup airport (MMX)	Negative cost-benefit ratio expected by the project due to the low traffic flow.	-

Source: GruppoClas, May 2017

The following figure shows the compliance in 2030 highlighting in green the airports that will be compliant with the regulation regarding the connectivity with rail, in blue the airports that will be compliant with the regulation, not regarding the connectivity with rail but with other means of transport like metro, tram and people mover to the rail station and, finally, in red the airports that will not have a direct rail connection in 2030 although required only at a later stage by the Regulation.

Figure 22: Expected compliance of airports by 2030 – multimodal connectivity



Source: GruppoCLAS analysis, May 2017, green = compliant, blue = no rail but other non-road public transport means, red = non-compliant; Valletta Malta-Luqa airport (MLA) is exempted from the Regulation requirement since the country has no rail infrastructure

Clean Fuels

The following projects are expected to improve the Corridor's compliance with the regulation.

Table 39: Projects with expected improvements in "Clean fuel" parameter

Sections expected to be compliant by 2030	Compliance with respect to "clean fuel" by 2030 expected to be reached through
Finland	
Helsinki Vantaa airport (HEL)	• TEN-T project ID: 5536 • Project name: The Multimodal Helsinki Node • Short project description: Development of optimum and seamless multimodal transport connection between the TEN-T long distance, urban and airport traffic at the airport terminal area and removal of bottleneck between flight and train / bus traffic and creates links between and within different transport modes.
Helsinki Vantaa airport (HEL)	• TEN-T project ID: 5450 • Project name: Development of Helsinki airport • Short project description: Several improvement, repairs and maintenance measures in a major development program at Helsinki Airport
Germany	
Leipzig-Halle airport (LEJ)	• TEN-T project ID: 5197 • Project name: Extension of the power supply facility (fuel cell technology) • Short project description: Improvement of sustainability
Italy	
Napoli Capodichino airport (NAP)(	• TEN-T project ID: 5614 • Project name: Environmental mitigation works (water and air) • Short project description: The project includes environmental mitigation measures in the fields of "water" and "atmosphere". For the "water" refers to redevelop the hydraulic system of catchment of stormwater and change of its final destination. For the "atmosphere" is intended to reduce the environmental footprint relative to CO2 introducing energy trigenerative production, streamlining the current thermo-refrigerators production, and changing the operating mode of the air processing ventilation systems, as well as replacing the current shuttle buses fleet with new e-buses.

Source: GruppoClas, May 2017

All the other airports will remain with a need for action.

Conclusion

The following table and figure illustrates the compliance of the ScanMed airports with the selected TEN-T-Regulation requirements in the year 2030.

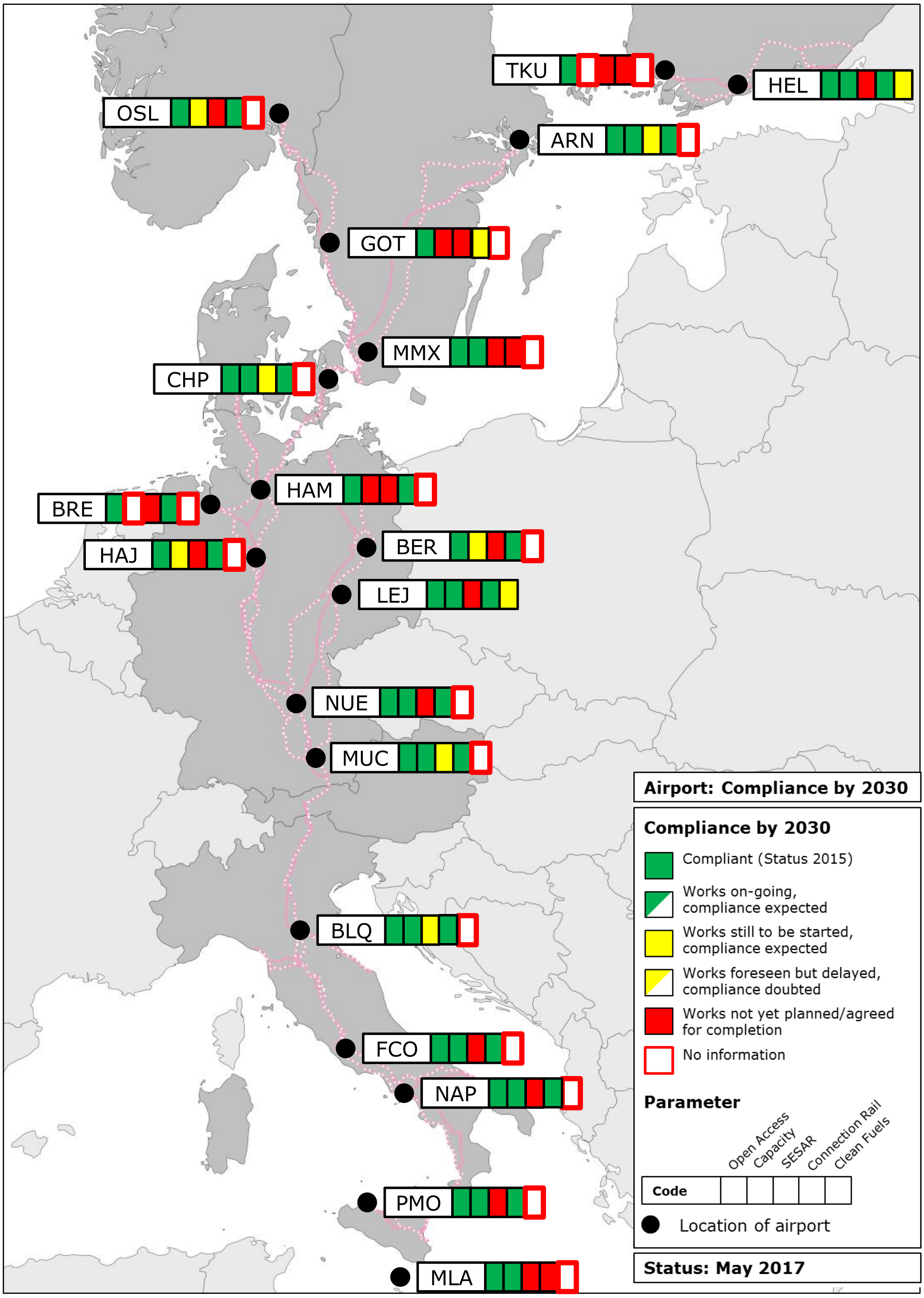
Some targets have already been achieved by all the airports (open access) or are expected to be achieved by quite all the airports within 2030 (capacity and connection with rail or other modes of transport). The two remaining targets regarding SESAR and clean fuels highlight a lower grade of expected compliance, so that more efforts on the measures related to these two targets should be put in the next years.

Table 40: Development of Airport KPI 2014, 2016, 2017 and expectations for 2020 and 2030

Airport Parameters	P	O	K	Baseline 2014	Status 2016	Status 2017	Expectation 2020	Expectation 2030	Target 2030
Open access	X	X	X	100%	100%	100%	100%	100%	100%
Capacity	X	-	-	-	-	-	-	-	-
Single European Sky - SESAR system	X	X	-	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Connection with rail (* main airport)	X	X	X	60% 85%*	68% 100%*	68% 100%*	68% 100%*	68% 100%	n.a. 100%*
Availability of clean fuels	X	X	X	0%	0%	0%	0%	0%	100%

Source: GruppoClas analysis, May 2017; P = Priority; O = Objective, K = KPI

Figure 23: Airport parameters expected compliance by 2030



Source: GruppoCLAS analysis, May 2017

6.4 Maritime Infrastructure (Ports) and MoS

Connection to inland waterway

Half of the ScanMed core ports have access to inland waterway network, unless the topographic, geographic, historic and climate structure does not provide any inland waterways for freight transport, such as Italian and Maltese ports. With regard to the other half of ports located in a country with an inland waterway network but not connected to the inland waterway network it is noteworthy that there are significant constraints for the missing connection. The main reason is that a connection cannot be realized through the construction of a new branch canal due to distances from the appropriate port to the nearest access point.

Therefore, no actions are envisaged which would improve the ScanMed Corridor's compliance by 2030 with respect to this port parameter. Hence it is expected that half of the ScanMed core ports located in countries with inland waterway transport will still not be compliant with regard to this port parameter in the year 2030 (see Table 41).

Table 41: Overview of ports that require action with related non-compliant parameter

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
Finland		
Turku	Next access point to the inland waterway network is too far away.	No reasonable options.
Naantali	Next access point to the inland waterway network is too far away.	No reasonable options.
Helsinki	Next access point to the inland waterway network is too far away.	No reasonable options.
Sweden		
Malmö	Next access point to the inland waterway network is far away.	No reasonable options.
Trelleborg	Next access point to the inland waterway network is too far away.	No reasonable options.
Germany		
Rostock	Next access point to the inland waterway network is too far away.	No reasonable options.

Source: Uniconsult, May 2017

Nevertheless, following notable actions are related to inland waterways:

TEN-T Project ID 4076: The Hamburg Port Authority plans the new construction of the Reiherstieg lock. The aim is to improve capacity on an important transport axis within the Port of Hamburg by replacing the existing Reiherstieg lock (built 1904 - 1907). Furthermore, the lock is an equivalent to dredging equipment and ensures the navigability for sea vessels and inland waterway vessels.

VTMIS and e-maritime services as well as SafeSeaNet

The ICT are on a high level. VTMIS and SafeSeaNet are fully implemented. Nevertheless, e-maritime services have to be further developed with a focus on harmonization of IT and data exchange, especially through "single window" solutions. The latter has already been subject to several MoS projects and still is so.

Availability of clean fuels

The shift from heavy crude as dominant marine fuel of the past to alternative fuels such as LNG and methanol is in full swing. In the port of Gothenburg, ships are bunkering methanol[26]. In the port of Helsinki, ships can be bunkered with LNG by specialized trucks[27]. Furthermore, many ports are planning concretely on facilities for LNG-bunkering. Table 42 lists the current projects which can be attributed to this parameter.

Table 42: List of current projects addressing the availability of clean fuels

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
Finland	
Port of Turku, Port of Hamina/Kotka and Port of Naantali	• The Northern ScanMed Ports -Sustainable Maritime Links (TEN-T project ID: 5510) • In the Port of Turku the project aims at: building a LNG bunker filling infrastructure and a waste water reception facility; preparation of onshore power supply. Furthermore, the project includes: Ports of Stockholm: onshore power supply installations and planning of waste water reception facilities. Port of Naantali: implementation of waste water and development of scrubber sludge reception facilities; planning of port environmental and security investments. Port of Hamina Kotka: planning of port environmental and security investment. Viking Line: study of energy efficient ferry and installing reference unit.
Sweden	
Port of Trelleborg	• Construction of four ferry berths, including marshalling yards and updraging existing intermodal terminal with two more tracks (TEN-T project ID: 5426) • The project is part of the move of the port area and will enable the reception of larger vessels. The berths will be equipped with OPS and with waste water reception facilities. At least one of the berths will also be for LNG bunkering and new marshalling yards in connection to the berths. Almost all planning will be made in the ongoing project 2014-EU-TM-0640-M, planning for LNG bunkering was made in 2013-EU-21007-S.
Germany	
Port of Bremen	• Small-scale liquefaction and supply facility for Liquefied Biogas as alternative fuel for the transport sector (TEN-T project ID: 5008)

26 https://ec.europa.eu/inea/en/ten-t/ten-t-projects/projects-by-country/multi-country/2012-eu-21017-s and http://www.kn-online.de/News/Nachrichten-aus-Kiel/Stena-Line-ruestet-um-auf-Methanol-Faehre-Kiel-Goeteborg (in German only)

27 http://www.kaasuyhdistys.fi/sites/default/files/pdf/esitykset/20150423_kevatkokous/M%C3%A4kil%C3%A4.pdf

Port to be compliant by 2030	**Compliance by 2030 expected to be reached through**
	• The Action is a study and full-scale real-life deployment project of a liquefaction and supply facility for LBG at the port of Bremen. In addition it will develop and demonstrate the process of the larger scale market roll out of the multi-functional facility into the TEN-T network.
Port of Hamburg	• SmartPortEnergy (Stage 1) (TEN-T project ID: 4082) • The project aims at the use of renewable energies and alternative fuels (e.g. LNG, on-shore power supply), reduction of energy consumption and emissions in the port.
	• SmartPortEnergy (Stage 2) (TEN-T project ID: 5886) • The project tries to guarantee a seamless continuation of the further development of the use of renewable energies and alternative fuels (e.g. LNG, on-shore power supply), reduction of energy consumption and emissions in the port.
Port of Lübeck	• AURORA - Newbuilding of an unique, flexible and sustainable LNG bunkering infrastructure for the European port sector (TEN-T project ID 5124) • A unique, flexible and sustainable LNG bunkering infrastructure is to be built in the port of Lübeck (and the port of Monu). Actually, it would be the first floating bunkering and storage facility in the EU.
Port of Rostock	• Construction of facilities for LNG-bunkering (TEN-T project ID: 5897)
	• Conversion of port areas into logistics areas and construction of logistics facilities (TEN-T project ID: 5899) • The project aims at the conversion of port areas into logistics areas and construction of logistics facilities (including facilities for clean fuels and facilities for ship generated waste).
Italy	
Port of Livorno	• GAINN4CORE (TEN-T project ID: 6232) • The aim of GAINN-IT Global Project is to conceive, define, prototype, test, validate and deploy, in the 2017-2030 time frame, the Italian Network of Infrastructures of Alternative Fuels for surface transport. The global project mainly addresses LNG as an alternative fuel for both maritime and road transport. In terms of LNG, each port which is an "element" of the GAINN-IT Network will include, in 2030 at the latest, the following four components: (1.) LNG receiving system and related ancillaries; (2.) LNG storage and local distribution system and related ancillaries; (3.) LNG ship refueling system and related ancillaries; (4.) LNG vehicles (non-ships) bunkering system and related ancillaries. The specific Action, GAIN4CORE, contributes to the GAINN-IT Global Project as it aims at defining, prototyping and testing two of the three Italian LNG grids (the Thyrrenic-Ligurian and the Adriatic-Ionic) including the following Core ports: a) Genoa, La Spezia and Livorno (Thyrrenian-Ligurian grid) and b) Ravenna and Venice (Adriatic-Ionic grid).
Port of La Spezia	• LNG bunkering infrastructure (TEN-T project ID: 5926) • The project aims at the provision of LNG facilities for maritime side (vessel bunkering, tug bunkering), port operations (use of LNG for cranes, reach stackers or other operational equipment) and land side (use of LNG for train shunting, shuttle trains to inland terminal and LNG trucks).

Source: Uniconsult, May 2017

Although many ports show strong efforts to build up facilities for LNG-bunkering it seems that the ScanMed Corridor will not be fully compliant with regard to the availability of clean fuels. Table 43 lists ports which may not be compliant in the year 2030 due to different reasons.

Table 43: List of ports possibly not compliant in 2030

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
Sweden		
Malmö	In the port of Malmö there aren't any current projects which aim at the provision of LNG infrastructure. However, the need for sustainable ship operations has been stated. E.g. the implementation of an onshore power supply has been taken into account. Nevertheless, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Denmark		
Copenhagen / København	In the port of Copenhagen there aren't any current projects which aim at the provision of the infrastructure for alternative fuels.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Italy		
Port of Ancona	In the port of Ancona there aren't any current projects which aim at the provision of the infrastructure for alternative fuels.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Augusta	The need for action has been stated (TEN-T project ID: 5328). However, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Bari	The need for action has been stated (TEN-T project ID: 5319). However, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Gioia Tauro	The need for action has been stated (TEN-T project ID: 5326). However, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Napoli	The need for action has been stated (TEN-T project ID: 5323). However, the basic	New financing tools or stricter laws on fuels are needed. In particular the latter could boost

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
	planning is outstanding and the financing has not been elaborated yet.	the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Palermo	The need for action has been stated (TEN-T project ID: 5324). However, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Port of Taranto	The need for action has been stated (TEN-T project ID: 5321). However, the basic planning is outstanding and the financing has not been elaborated yet.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).
Malta		
Port of Marsaxlokk	At present, the timeframe for the planned LNG bunkering study under the TEN-T project ID 5376 is unknown. Therefore, the completion of a LNG bunkering station before 2030 must be doubted.	New financing tools or stricter laws on fuels are needed. In particular the latter could boost the demand for alternative fuels as defined in the Regulation (see article Article 3 (w)).

Source: Uniconsult, May 2017

Modernisation and expansion of capacity

At present, there is no urgent need for additional port infrastructure capacities. However it is important that core ports stick to current and future developments within the shipping and transport industry by modernising and expanding the capacity of the infrastructure necessary for transport operations within the port. As listed in Table 44, many actions are addressed to this matter along the entire ScanMed Corridor.

Table 44: Selection of projects addressing future port infrastructure requirements

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
Finland	
Port of Helsinki	• Twin-Port 2 - Port of Helsinki, Port of Tallinn, Tallink (TEN-T project ID: 2047) • Development of the harbour activities including new fast+flow terminal in West Harbour, improvements in west harbour ramps and gate operations and traffic connections and other outdoor arrangements.

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	• Improvement of the maritime access of Vuosaari harbour (TEN-T project ID: 5537) • Activities include preparation of General Plans and Construction Plan for the upgrading of the fairway and of the dock in the Vuosaari Harbour, as well as preparation of the Water Permit application, leading directly to investments. In the long term, the action will improve capacity of the Vuosaari Harbour to meet future estimated increase of traffic flow.
Port of Helsinki, Port of Turku, Port of Naantali, Port of Hamina/Kotka (and Port of Stockholm)	• Pre-identified project: Port interconnection (TEN-T project ID: 5203) • Study and potential services for further port interconnections, serving the Ports of Stockholm and Finnish ports (Turku, Naantali, Helsinki, HaminaKotka).
Sweden	
(Port of Helsinki, Port of Turku, Port of Naantali, Port of Hamina/Kotka) and Port of Stockholm	• Pre-identified project: Port interconnection (TEN-T project ID: 5203) • Study and potential services for further port interconnections, serving the Ports of Stockholm and Finnish ports (Turku, Naantali, Helsinki, HaminaKotka).
Port of Stockholm	• NextGen Link (TEN-T project ID: 5846) • The project upgrades an existing maritime link to cross the Baltic Sea from Finland to Sweden in the Scandinavian-Mediterranean Corridor and develops green shipping and port interconnections. The upgrade of the maritime link includes (1) the environmental upgrade with a new sustainable LNG powered ro-pax vessel and (2) the infrastructure development in ports.
Port of Trelleborg (and Port of Swinoujscie)	• Sweden-Poland Sustainable Sea-Hinterland Services (2014-EU-TM-0640-M) (TEN-T project ID: 5571) • The project is part of the move of the port area and will enable the reception of larger vessels. The Action includes development and relocation measures (studies) inside Port of Trelleborg, planning measures (studies) for further development and relocation outside the port area in Trelleborg, such as studies and planning of a ring road, a logistic center, a secure truck centre with the possibility to check-in onto the ferries, studies and planning the move of an existing warehouse to an area close to the truck centre with an existing railway connection, studies and planning of a new road entrance to the port from the ring road and planning of two berth and EIA relocation of a conventional quay and OPS in an existing berth.
Port of Trelleborg	• Construction of four ferry berths, including marshalling yards and updraging existing intermodal terminal with two more tracks (TEN-T project ID: 5426) • The project is part of the move of the port area and will enable the reception of larger vessels. The berths will be equipped with OPS and with waste water reception facilities. At least one of the berths will also be for LNG bunkering and new marshalling yards in connection to the berths. Almost all planning will be made in the ongoing project 2014-EU-TM-0640-M (TEN-T project ID: 5571), planning for LNG bunkering was made in 2013-EU-21007-S.
	• Construction of truck centre, check-in, warehouse, new connection and port entrance from the east side and a ring road (TEN-T project ID: 5427) • The project covers the construction of a secure truck centre and the check-in to the ferries. Moving of an existing warehouse to an area close to the truck centre with an existing railway connection.

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	Construction of a new road entrance to the port from the ring road. The configuration depends on the configuration of the ring road. The timing of all elements of this projects is linked to the implementation of the ring road project and very time sensitive for the port. Studies and plans will be made in the framework of project 2014-EU-TM-0640-M (TEN-T project ID: 5571).
	• TEN-T project ID: 5572 • Project name: Removing bottleneck in Port of Trelleborg • Short project description: Construction of transition over the railway tracks to the berths in the east side from check-in/check-out on the west side of the port, in order to handle the traffic from the west side (old port) to the east side of the port until the new port entrance from the east side is in use.
Denmark	
Copenhagen / København	• New container terminal (TEN-T project ID: 5409) • Due to the city development in the port areas in Copenhagen, the present container terminal has to be laid down. A new area for establishing a new terminal is decided and land reclamation is taking place. The new terminal needs to be in operation earliest in 2019 and latest in 2021. Adjacent to the container terminal it will be possible to construct new ro-ro facilities and other port related activities in a 45 ha reclaimed area.
Germany	
Port of Hamburg	• Digital Infrastructure Hamburg Port (TEN-T project ID: 5710) • New construction respectively upgrade of the digital infrastructure (optical fibre etc.).
	• Adjustment of gateway offshore terminal (extending the turning radius, filling in inactive basin of the former Kohlenschiffhafen) (TEN-T project ID: 4074) • Widening of gateway form the Norderelbe into the highly frequented basin of the Vorhafen to meet the requirements of ship size development and to ensure safety and ease of ship traffic. Further, the excavations from the widening are used to fill in the inactive bassin of the former so called Kohlenschiffhafen to generate required land for terminal activities (increase terminal capacity).
	• Reconstruction of freight station Waltershof (TEN-T project ID: 4075) • Modernisation of signal box and adjustment of rail infrastructure (tracks be expanded for longer trains)
	• New tracks in Hohe Schaar station including connection to new Kattwyk rail bridge (TEN-T project ID: 4079) • New construction of two side tracks and two through tracks at Hohe Schaar station to increase capacity of the connection of the eastern part of the port to the new Kattwyk rail bridge and therefore to the western part of the port.
	• Engine service facility (TEN-T project ID: 4080) • New construction of storage sidings and social buildings to avoid unnecessary, capacity-consuming loco empty runs in the hinterland of Hamburg.
	• SmartPort Logistics (Stage 1) (TEN-T project ID: 4083) • Efficient use of existing infrastructure, optimisation of traffic flows
	• SmartPort Logististc (Stage 2) (TEN-T project ID: 5887) • Efficient use of existing infrastructure, optimisation of traffic flows through the use of optimising software applications leading to more sustainability in transport (less induced traffic, more safety)

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	• New Bridge Kattwyk (TEN-T project ID: 5111) • The project includes the construction of one of the largest rail vertical-lift bridges of the world crossing the Southern Elbe and optimizing the important crossing point for ship, rail and road. The construction will eliminate the existing bottleneck at the Kattwyk Bridge, where road and rail traffic currently share a lane. Thereby, the capacity for port internal traffic will be adjusted to future demands.
	• Optimization of track infrastructure in the freight station Hohe Schaar (TEN-T project ID: 5702) • Successive improvement of track infrastructure within the station Hohe Schaar to provide capacity and for optimized operational processes.
	• Western bypass to the freight station Alte Süderelbe (TEN-T project ID: 5704) • Two track bypass system to eliminate bottleneck and to increase the operational quality.
	• Connection Altenwerder Süd – Anbindung Ri. Moorburg (TEN-T project ID: 5708) • New construction of a road from the Container Terminal Altenwerder towards the highway connection Moorburg to ease the highly frequented bottleneck Finkenwerder Ring. The Finkenwerder Ring often suffers congestion and affects the container terminals' operations (and peak capacities) directly. Therefore, a new bypass will improve the ports operations significantly.
	• Construction of additional waiting and emergency berths (TEN-T project ID: 5890) • Construction of additional waiting and emergency berths for bigger container ships. So ships which cannot leave the port within the time window of the tide can free the piers. Existing capacity can be used better.
	• Transport connection of Burchardkai (TEN-T project ID: 4077) • Renewal and new conception of road and rail transport connection of Burchardkai Container Terminal.
	• Connection Georgswerder Tunnel Südanbindung A252 (TEN-T project ID: 5707) • Connection of the Eastern port through a new tunnel in Georgswerder
	• Optimisation and increase in capacity - Hamburg-Wilhelmsburg port connection (TEN-T project ID: 5064) • The Action aims at the upgrading of the railway facilities in the Wilhelmsburg area to meet the expected traffic at the interchange between port and public railway network. The Action consists of the following activities: planning of port railway approach; construction of port railway approach; planning of relief tracks; construction of relief tracks; planning of noise protection walls; and construction of noise protection walls.
Port of Luebeck	• Feasibility, planning and preparation study for the sustainable development of the port of Lubeck (TEN-T project ID: 5062) • The project's results will be a significant basis for the future masterplan of the Port of Luebeck.
	• New construction of the berths in Travemünde (TEN-T project ID: 5128) • Construction of the berths 5 and 4a with implementation of 16 hectares port area at Travemünde

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	• Railway station for the commercial area Skandinavienkai north (TEN-T project ID: 5751) • Railway station for the commercial area Skandinavienkai north to increase the efficiency of multimodal rail and sea based transport.
	• Implementation Masterplan Dänischburg-Siems for future container traffic in the short-sea shipping segment (TEN-T project ID: 5752) • Including the upgrade of the railway infrastructure for longer and more competitive trains and thus better connection to rail
	• Expansion of the railway connection to and from the terminals in Lübeck (TEN-T project ID: 5127) • Northern railway connection Skandinavienkai and Seelandkai / CTL / Lehmannkai II to the route Lübeck-Puttgarden (and thus with direct access to the Skandinavian railway network positioning the Skandinavienkai as a main junction and intermodal hub for the Scandinavian market).
Port of Rostock	• Further improvement of the IT of the seaport of Rostock by the expansion of the existing terminal information and control system (intermodal cross-linkage) (TEN-T project ID: 5750)
	• Infrastructure provision for additional areas for ferry-, Ro-Ro- and container transport (TEN-T project ID: 5895)
	• Upgrade of terminal infrastructures within the field of ferry and ro-ro-transport for the improvement of existing traffic respectively for the extension of the lines serving the seaport of Rostock (TEN-T project ID: 5896)
	• Expansion of berthing capacities for bulk and project cargo (with adequate rail access) (TEN-T project ID: 5898)
	• Conversion of port areas into logistics areas and construction of logistics facilities. (TEN-T project ID: 5899) • Including facilities for clean fuels and facilities for ship generated waste
Port of Rostock (and Port of Gedser)	• Motorway of the Sea Rostock-Gedser - Part 2 (TEN-T project ID: 5014) •This Motorway of the Sea (MoS) link between Germany and Denmark is a transport solution deploying two RoPax ships calling the ports of Rostock and Gedser. The MoS service Gedser-Rostock transports a daily average of 670 passenger cars, almost 250 lorries and over 3,640 passengers. Considering the timeline of IMO's SECA regulation, the operator decided to implement a feasible, re-producible and sustainable solution i.e. the installation on the new vessels of the link ("MS Berlin" and "MS Copenhagen") of hybrid propulsion and exhaust gas cleaning solutions already tested on the RoPax vessels operating on another sea link (Rødby-Puttgarden). The Action also includes installation and adjustment of necessary port-side equipment in Rostock and Gedser as well as the redesign of portinfrastructure in Rostock in order to optimise operations with the retrofitted vessels. The Action will contribute to sustainability of the maritime link.
Italy	
Port of Gioia Tauro	• Upgrading rail link and rail facilities at Gioia Tauro seaport (TEN-T project ID: 5297)
Port of Livorno	• Piattaforma Europa (TEN-T project ID: 5360) • The new "Piattaforma Europa" (Europa Platform) in the port of Livorno (1st phase) is a land reclamation project made in order to build up container handling capacity in the port of Livorno. The project is included in the new masterplan for the Port of Livorno and comprehends: land reclamation project, dredging, creation of a new

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	access channel to the port area, breakwater facilities, new container terminals, relocation of old terminals and development of new rail and road links to cope with the increased capacity.
	• Upgrade of the MoS link Valencia-Barcelona-Livorno (TEN-T project ID: 5481) • The Action upgrades the existing MoS link between the core ports of Valencia, Barcelona and Livorno for the transport of trailers and cars. It will lead to increased port terminal capacity and energy efficiency, improved productivity and quality, as well as enhanced sustainability and competitiveness of the MoS link. The Action consists of the following Activities: Energy efficiency improvement of maritime operations; Expansion of RoRo multi-purpose terminal in Valencia; Terminal upgrade in Livorno; RoRo terminal upgrade in Barcelona; Terminal area preparation in Valencia. The upgraded MoS link will generate added value in terms of regional development, employment, lower externalities, modal shift and cost savings.
Port of Ancona	• Improving and increasing the port facilities for freight traffic and RO/PAX (TEN-T project ID: 5314) • Works for the building of the new line of quays. Adaptation of the former industrial areas to port logistics. New RO/PAX terminal and new road access to the port and to the embarking quays. New RO/PAX moorings.
	• Development of intermodal transport (TEN-T project ID: 5315) • Works for a new rail-road terminal in the Scalo Marotti area. Extension and electrification of the shunting track to the port terminal. Extension of the terminal tracks to 600 metres.
	• New passenger terminal in the old port (TEN-T project ID: 5316)
Port of Augusta	• Seaport Hub (TEN-T project ID: 5327) • Developing the Augusta seaport as a transhipment hub, by the upgrading of existing infrastructure and equipment in order to allow container ships.
	• Construction of new railway connections to the port
Port of Bari	• Upgrading of the Ponente dock's piers (TEN-T project ID: 5929) • The intervention is aimed at improving the functionality and usability of the Ponente dock through the implementation of a 350 m long area at the top of the Quay 11 in order to create two new berths for large ships
	• New port buildings (TEN-T project ID: 5930) • Works for the realization of buildings of port depots, control of the port water surface and support for custom controls and management of goods and passenger flows.
Port of La Spezia	• WESTERN PORT EXTENSION (TEN-T project ID: 5309) • Construction of Canaletto yard and quay with buffer zone and preparatory works for the shifting of the marinas and the upgrading of Molo Pagliari (Pagliari Quay)
	• EASTERN PORT EXTENSION (TEN-T project ID: 5310) • Construction of Terminal del Golfo yard and quay and buffer zone
	• EASTERN GARIBALDI PIER EXTENSION (TEN-T project ID: 5915) • Extension of Garibaldi pier in the east side. The project will provide new space for a container terminal for about 54,000 square meters.
	• FORNELLI PIER EXTENSION (TEN-T project ID: 5916) • Extension of Fornelli Pier

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	• New rail tracks and new railway station in the port (TEN-T project ID: 5919) • 9 rail tracks up to 650 metres length including 1 track 740 metres length and new railway station for optimizing the rail infrastructure in order to increase the rail transport (goal = +50%)
	• THE LOGISTIC PROJECT - logistcs platform or FV S.Stefano Magra (TEN-T project ID: 5312) • A dry port area in Santo Stefano Magra with new tracks 650mt length managed by the new railways company - La Spezia Shunting Railways. A dedicated area for controls on goods and custom single window services. In St. Stefano Magra, very close to the Port of La Spezia, additional activities are under way to build a new 600,000 sqm Multimodal Logistics Platform for logistic activities, including rail yard (8 rail tracks 650 m long), yard operated with RTG and RS. Planning and Implementation of a Logstics Intermodal Platform in the dry Port of Stefano, improving the technical parameter on MoS for the Port of La Spezia to achieve objective set for 2030.
Port of Napoli	• Seaport Hub (TEN-T project ID: 5322) • Developing the Napoli seaport as a hub, by improving the infrastructure and the road and rail connections.
	• Upgrade of the rail connections of and within the port (TEN-T project ID: 5619) • Upgrade of Darsena di Levante and of the container terminal, improve of the accessibility - Upgrade of the rail connections within the port
	• Upgrade and improvement of the road infrastructure and connections (TEN-T project ID: 5620) • Upgrade of Darsena di Levante and of the container terminal, improve of the accessibility - Upgrade and improvement of the road infrastructure and connections
Port of Taranto	• Logistic Park of the Port of Taranto (TEN-T project ID: 5921) • The project provides for the realization of a docks road and related plants; the extension of Pier IV, for a 120 meters width and the realization of a new mooring quay for a 600 meters length; the realization of a new dock on the west side of Pier IV; a Logistic Platform (see below); a Confined Disposal Facility. The expected outcomes are to promote traffic diversification; to change the productivity and efficiency of the port for the benefit of commercial traffic; to increase the proportion of container traffic in import/export as an alternative of transshipment; to support the functioning of the Single Window process for the benefit of control procedures, management of services, reduction of costs and time saving; and to create a model of integrated and intermodal transport conceived as a single process (road - rail - sea) in an area equipped with adequate direct links with the national railway and road networks.
	• Distripark (TEN-T project ID: 5922) • The project provides for the realization of a docks road and related plants; the extension of Pier IV, for a 120 meters width and the realization of a new mooring quay for a 600 meters length; the realization of a new dock on the west side of Pier IV; a Logistic Platform; a Confined Disposal Facility.
	• Upgrade of railway connections and infrastructure in the Port of Taranto (TEN-T project ID: 5925) • The project is comprises two lots: (1.) upgrading of railway equipment for the link of Cagioni station to the port area (Molo

Port to be compliant by 2030	Compliance by 2030 expected to be reached through
	polisettoriale and new V sporgente); (2.) new tracks for new logistics platform connection with the national railway line (I and IV sporgente)
Malta	
Port of Marsaxlokk	• Masterplan measures of Malta Freeport Terminals Ltd (TEN-T project ID: 5372, 5956, 5957, 5960, 5961, 5962, 5964, 5954, 5959) • Reconstruction, site clearance, new yard equipment etc
Port of Valletta	• Deep Water Quay Upgrading - Phase 2 (TEN-T project ID: 5951) • Additional upgrading of Deep Water Quay to handle larger ships between 40,000 to 80,000 tonnes displacement.

Source: Uniconsult, May 2017

Almost all ports have started or at least planned a vast number of projects to be in the position to adapt to new and/or changed demand patterns with the help of modernizing and/or expanding. Only one ScanMed port (Oslo) has not announced any projects which could be attributed to this port parameter. Furthermore, two ScanMed ports (Gothenburg and Palermo) have announced a modernization respectively expansion project. However, it must be doubted that these projects will be implemented until the year 2030 because of outstanding basic planning and financing issues. Table 45 gives a short overview on where non-compliance with regard to the expansion and modernization of ports by the year 2030 must be expected.

Table 45: Expected non-compliant port due to lack of modernisation and expansion projects

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
Sweden		
Port of Gothenburg	• Upgrade of the short-sea shipping link Ghent-Gothenburg (TEN-T project ID 5478) • Amongst others, the project comprises the upgrade of terminal infrastructure and purchase of mobile terminal equipment in Gothenburg. • The project was not proposed fur CEF funding. Since then, no further details on the project's implementation and financing were stated.	Studies must be undertaken to identify where the port needs to be adapted to changing demand patterns and technical requirements.
Norway		
Port of Oslo	No projects are known which are related to the expansion and modernization of the ports capacity.	Studies must be undertaken to identify where the port needs to be adapted to changing demand patterns and technical requirements.
Italy		
Port of Palermo	• Reach Compliance by settting up a central logistcs platform or FV (TEN-T project ID 5330) • The need for action has been stated. However, the basic planning is outstanding and the	Studies must be undertaken to identify where the port needs to be adapted to changing demand patterns and technical requirements.

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
	financing has not been elaborated yet.	

Source: Uniconsult, May 2017

Connection to rail

In general, most of the ScanMed core ports are connected to the hinterland by rail. The only exceptions can be found in Denmark (København), Italy (Bari, Palermo and Augusta) and Malta (Valletta and Marsaxlokk). Table 46 gives a short overview on where non-compliance with regard to the rail connection of ports by the year 2030 must be expected.

Due to the missing railway network in Malta this port parameter cannot be applied on the port of Marsaxlokk and Valletta. Hence, these two ports are excluded from the compliance analysis.

The port facilities in København and Malmö are operated by the transnational Copenhagen Malmö Port AB (CMP) and managed as one entity. However, a detailed analysis reveals that rail connection is only available in port facilities located on the Swedish side in Malmö. There is no railway connection on the Danish side of CMP. Hence, the Copenhagen side of CMP is not in full compliance with regard to this parameter (Art. 22-1a). At present, no efforts are known which aim to eliminate this existing incompliance.

In Italy, 3 of 9 ports are incompliant because of missing connections to the national railway network. These are the ports of Bari, Palermo and Augusta. In Bari and Palermo tracks are available and the parameter would be fulfilled if the tracks had not been dismissed in 1993 (Bari) respectively 1957 (Palermo). In Augusta, it seems that the creation of compliance with this parameter could be made easily since a railway line runs along the port area. However, this railway line was used for commuter trains stopping close to the main oil refineries located at the coast line and not for freight trains.

Currently, there aren't any measures which aim to eliminate the existing incompliance in the ports of Bari and Palermo. Although it must be doubted that the port of Augusta will achieve compliance with regard to this parameter until the year 2030, the situation differs significantly from the situation in the aforementioned ports. This is because of the plans pursued by the Augusta Port Authority, which intends to build a new railway connection to the port (TEN-T project ID 5300). However preliminary project analyses are still outstanding, let alone financing issues.

Table 46 Expected non-compliant port due to missing rail connection

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
Denmark		
Danish side of Copenhagen Malmö Port AB (CMP)	• Currently, none of the port facilities located in København does not have any rail connection • Railway access is given indirectly with the help of local transhipments to CMP facilities with railway access in Malmö.	Due to geographic issues and the current structure of the Danish railway network it does not seem economically reasonable to create railway accesses for the Danish CMP port facilities. However, it must be analysed whether this might change with the inauguration of the Fehmarn

Port with a need for action	Reason for non-compliance by 2030	Options for interventions
		Belt fixed link and the direct connection of København with the European mainland railway network. Hence, specific studies should be undertaken.
Italy		
Port of Bari	The existing rail connection was dismissed in 1993.	The existing tracks could be reactivated and upgraded to the current technical standards.
Port of Palermo	The existing rail connection was dismissed in 1957.	The existing tracks could be reactivated and upgraded to the current technical standards.
Port of Augusta	Preliminary project analyses and financing issues are still outstanding for TEN-T project ID 5300.	The planned "Rail link to Augusta seaport" must be pursued to a greater extent.
Malta		
Port of Valletta	Parameter cannot be applied due to missing national railway network.	
Port of Marsaxlokk	Parameter cannot be applied due to missing national railway network.	

Source: Uniconsult, May 2017

As mentioned before, most of the ScanMed ports are already connected to the European railway network. Hence, compliance will be given for 19 seaports. However, in addition to the already given compliance many projects which are addressed to the connection of seaports to the railway network can be noted along the ScanMed Corridor. Most of them aim to increase the capacity of the connection itself which may be a bottleneck within and into the port. These are attributed to the capacity of a port. Others are addressed to functionality of the connection, amongst following notable projects:

TEN-T Project ID 5359: RACCORDO Project - Rail Access from Coast to Corridor (2013-IT-91033-S). The Action "RACCORDO" targets the completion of a set of studies (preliminary and final design), for the rail overpass of the "Tyrrhenian Line", (preliminary design) the completion of small scale rail hinterland connections towards Firenze and the Core Network, in order to achieve a full integration of the Livorno Logistic Node to the Scandinavian-Mediterranean Corridor and Financial Engineering Plan of the Piattaforma Europa, detailing the funding tools and the expected revenues of this large infrastructural plan.

TEN-T Project ID 5295: Upgrade of railway connections and infrastructure in the Port of Taranto. This project comprises following two lots: 1) upgrading of railway equipment for the link of Cagioni station to the port area (Molo polisettoriale and new V sporgente); 2) new tracks for new logistics platform connection with the national railway line (I and IV sporgente).

Sea access

All ports have seaward transport connection, even though some ports suffer from the limited accessibility due to maximum draught which is behind the parameter required by the current and most likely used vessel classes. Specifically, this applies for the Elbe River (Port of Hamburg), the Weser River (Port of Bremen) and the sea canal leading towards the Port of Rostock. Following projects aim at improving these limitations:

TEN-T Project ID 4071: The German ministry of transport (BMVI) and the Hamburg Port Authority aim at the upgrading of the navigability of Unter- and Außenelbe for larger sea vessels. Therefore, fairway adjustments to allow the passage of container ships with a max. draught of 14.5 m have to be carried out.

TEN-T Project ID 5123: The German ministry of transport (BMVI), represented by the WSV Stralsund, plans the expansion and deepening of the Sea Canal (seaward entrance) of the port of Rostock on a water depth of 16.50m, which would allow for access of vessels with a permissible draft of up to 15.00m.

TEN-T Project ID 5313: The Ancona Port Authority aims at improving the nautical accessibility with the help of the adaptation of the port basins to reach the draft of -14 meters and completion of the sottoflutto breakwaters and adaptation of the northern wharf to protect the new line of quays.

TEN-T Project ID 5918: The La Spezia Port Authority plans to dredge in front of Garibaldi pier and in the channel to access to the port. The dredging will improve the accessibility from the sea side to the port.

TEN-T Project ID 5369: Transport Malta plans to continue to develop the breakwater system in order to increase safety, increase capacity and all-weather access within the Port.

Open access (non-discriminatory and transparent charges)

Since all core ports that serve freight traffic offer at least one terminal which is open to all operators in a non-discriminatory way and which applies transparent charges (Art. 22(1)(b)), no further measures in this domain have to be identified and implemented.

Facilities for the reception of ship generated waste

All concerned ports have some kind of reception facilities for ship generated waste. At present, there is no indication that there is a serious lack of fulfilment of this parameter (Art. 22(2)). However, there are still ways how ports can improve their environmental performance with additional or complementary facilities for ship generated waste. Furthermore, new types of ship generated waste have to be handled e.g. scrubber sludge. Following project aims at adapting and improving the portside and environmental infrastructure:

TENT-T Project ID 5510: The MoS project "The Northern ScanMed Ports -Sustainable Maritime Links" (2014-EU-TM-0066-M) includes: Ports of Stockholm: onshore power supply installations and planning of waste water reception facilities. Port of Naantali: implementation of waste water and development of scrubber sludge reception facilities; planning of port environmental and security investments. Port of Turku: building an LNG bunker filling infrastructure and a waste water reception facility; preparation of onshore power supply. Port of Hamina Kotka: planning of port environmental and security investment. Viking Line: study of energy efficient ferry and installing reference unit.

Overview on compliance in the year 2030

At present, it seems that the ScanMed ports will be 100% compliant with 4 of 8 maritime parameters. Only 4 parameters may not be fulfilled. Table 47 gives an overview of the compliance of the ScanMed Corridor with regards to the maritime parameters.

Table 47: Port parameters compliance expected for 2030

Ports	Connection to IWW CEMT class IV	VTMIS and maritime e-services & SafeSeaNet	Availability of clean Fuels	Modernisation and expansion of Capacity	Connection to Rail	Sea access	Open acces (non-discrimatory)	Facilities for ship generated waste
Hamina/Kotka	(Yes)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Helsinki	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Turku	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Naantali	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stockholm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Göteborg	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Malmö	No	Yes	No	Yes	Yes	Yes	Yes	Yes
Trelleborg	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oslo	N.A.	Yes	Yes	No	Yes	Yes	Yes	Yes
København	N.A.	Yes	No	Yes	No	Yes	Yes	Yes
Rostock	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lübeck	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hamburg	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Bremen	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
La Spezia	N.A.	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Livorno	N.A.	Yes	No	Yes	Yes	Yes	Yes	Yes
Ancona	N.A.	Yes	No	Yes	Yes	Yes	Yes	Yes
Napoli	N.A.	Yes	No	Yes	Yes	Yes	Yes	Yes
Bari	N.A.	Yes	No	Yes	No	Yes	Yes	Yes
Taranto	N.A.	Yes	No	Yes	Yes	Yes	Yes	Yes
Gioia Tauro	N.A.	Yes	No	Yes	Yes	Yes	Yes	Yes
Palermo	N.A.	Yes	No	No	No	Yes	Yes	Yes
Augusta	N.A.	Yes	Yes	Yes	No	Yes	Yes	Yes
Valletta	N.A.	Yes	(Yes)	Yes	N.A.	Yes	Yes	Yes
Marsaxlokk	N.A.	Yes	No	Yes	N.A.	Yes	Yes	Yes
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**6/12 = 50%**	**25/25 = 100%**	**15/25 = 60%**	**23/25 = 88%**	**19/23 = 83%**	**25/25 = 100%**	**25/25 = 100%**	**25/25 = 100%**

Source: Uniconsult analysis, May 2017

Table 48: KPI Development of Ports 2014, 2016, 2017 and expectations for 2020 and 2030

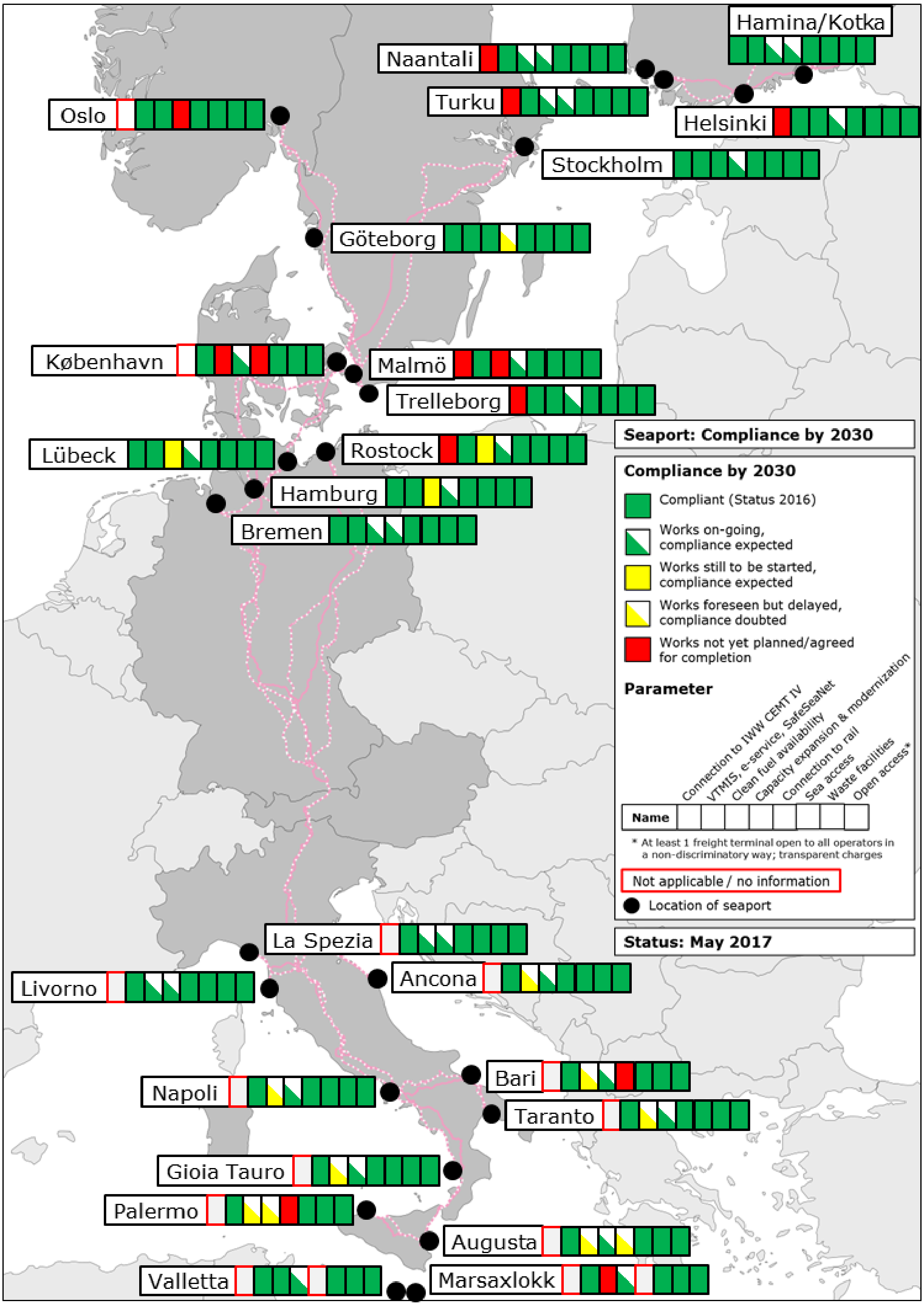
Port Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Expected 2020	Expected 2030	Target 2030
Connection to inland waterway CEMT class IV	X	X	X	1)	50%	50%	50%	50%	50%	100%
VTMIS and e-maritime services as well as SafeSeaNet	X	X		1)	100%	100%	100%	100%	100%	100%
Availability of clean fuels	x	X	X	1) 2)[28]	12%	20%	24%	36%	60%	100%
Modernisation and expansion of capacity	X			1)	N.A.	N.A.	N.A.	88%	88%	100%
Connection to rail	X	X	X	1) 2)[29]	83%	83%	83%	83%	83%	100%
Sea access	X			1)	100%	100%	100%	100%	100%	100%
Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	X		X	1)	100%	100%	100%	100%	100%	100%
Facilities for ship generated waste	X	X	X	1)	100%	100%	100%	100%	100%	100%

Source: Uniconsult analysis, May 2017; P = Priority, O = Objective, K = KPI; 1) Websites and other information of respective infrastructure managers 2) additional sources

[28] http://www.kaasuyhdistys.fi/sites/default/files/pdf/esitykset/20150423_kevatkokous/M%C3%A4kil%C3%A4.pdf

[29] http://www.cmport.com/business/containers; http://www.cmport.com/business/rail

Figure 24: Seaport parameters expected compliance by 2030



Source: Uniconsult analysis, May 2017

Conclusion

At present, it seems that the ScanMed ports will be 100% compliant with 4 of 8 maritime parameters with regard to the year 2030. In the target year of 2030 VTMIS, e-maritime services as well as SafeSeaNet will be fully implemented in all ScanMed seaports. The I&C Technology as well as the IT and data exchange will be further developed. Furthermore, all ScanMed ports will be equipped with adequate sea access as well as facilities for the reception of ship generated waste. Current and planned projects aim at an ongoing improvement of the before mentioned parameters so that future demand patterns resulting from the further development within the shipping industry (e.g. increase of ship size, stricter environmental constraints and new technologies like scrubbers) will be satisfied. In addition, all ScanMed ports already possess respectively will possess at least one terminal which is open to users in a non-discriminatory way and which applies transparent charges. Hence, open access will be ensured in all ScanMed ports in the year 2030.

In addition, almost all ScanMed seaports (88%) implement or plan projects to modernize and expand their capacity. The only seaport which has not communicated such measures and plans is the Port of Oslo. Furthermore, two ScanMed ports (Gothenburg and Palermo) have announced a modernization respectively expansion project. However, it must be doubted that these projects will be implemented until the year 2030 because of outstanding basic planning and financing issues.

19 of the 25 ScanMed seaports are already connected with railway lines. Marsaxlokk, Valletta, Augusta, Palermo, Bari and København are the 6 remaining ScanMed seaports which are not connected with railway lines. Due to missing railway network in Malta, this maritime parameter cannot be applied on the Ports of Valletta and Marsaxlokk. So the Danish side of CMP and the ports of Bari, Palermo and Augusta remain the only ScanMed seaports which are not compliant to this maritime parameter. It is not clearly communicated if CMP's strategic plan to move the container terminal in København to a new site in 2018 comprises a future connection to the railway network.[30] Therefore, it seems that the Danish side of CMP will still not be compliant with regard to this maritime parameter in the target year 2030. For Bari and Palermo, no projects are known which aim to connect these ports to rail. The existing project to create rail access to the port of Augusta is pursued desultorily (preliminary analyses and financing issues are still outstanding). Hence, it is not likely that the project will be concluded before 2030.

While full or at least a high degree of compliance can be noted with regard to the six before mentioned maritime parameters even for the target year 2030 as well as today, a lot of progress is needed in the following two fields. First, only 50% of the ScanMed seaports located in countries with an inland waterway (IWW) network are connected to IWW. Second, clean fuels are currently only available in 24% of the ScanMed seaports. While many ports plan to make clean fuels available in the year 2030 (meaning that clean fuels will be available in at least 60% of the ScanMed seaports), there aren't any projects with the aim to connect one additional ScanMed port to IWW.

Altogether, from today's perspective the ScanMed Corridor will be fully or at least strongly compliant with regard to most of the maritime parameters in the target year 2030. Nonetheless, it has to be clearly mentioned that the aim of 100% compliance will not be reached if no additional measures will be taken.

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[30] See: http://www.cmport.com/business/containers

6.5 Rail-Road Terminals

The final Project List contains 31 projects of the category "multimodal", which should also cover Rail-Road Terminals, with an end date after 2015 ("planned projects"). Two of which are for multimodal passenger transport (Helsinki and Norrköping) while two are dealing with the rail connection to ports and development of intermodal transport (Augusta, Bari Lamasinata) and thus 27 are on freight villages and Rail-Road Terminals in a strict sense. From these projects 13 provide for detailed measures by different stakeholders (Consorzio ZAI, Terminaliitalia, RFI) in the node of Verona and ten projects for nine other terminal locations. The following analysis focuses on the latter 29 freight projects.

Since all but one RRT (Örebro Hallsberg) did not fulfil the compliance parameters at the beginning of the year 2016 the following table includes all nodes (RRT) which are not compliant in 2015 for the one or the other parameter and state if there is a project which will improve or achieve the compliance of that parameter by the year 2030 ("expected compliance 2030").

The left column identifies the nodes and reminds – in brief – the reason for non-compliance in 2016, while the right column recapitulates the identified "planned project" and its contribution to the compliance (to be achieved the latest by 2030).

We have clustered the information in three tables:

The first table shows those terminals which are expected to achieve compliance by the "planned project(s)" by 2030.

The second, Table 50, shows those terminals for which improvement projects are foreseen but the project description does not allow to evaluate whether the compliance will be reached fully and which is therefore marked "compliance doubted", or where "works not yet planned".

The third table shows terminal projects which are relevant for the terminal but are not directly linked to achieving the compliance of the five compliance parameters.

Table 49: RRT analysis of expected compliance by 2030

Nodes (incompliance parameter 2016)	Compliance by 2030 expected to be reached through
Finland	
Kouvola (capability, open access, electrified rail access, track length <700m)	TEN-T Project ID 5533: Development of Kouvola rail-road terminal is a Multimodal-project by the City of Kouvola on the section or node Kouvola. It targets at Kouvola multimodal logistics platform development; infrastructure improvement and development in Kouvola rail-road terminal including appropriate implementations for Kouvola RRT infrastructure especially in open access intermodal area and last mile connection between TEN-T railway network, TEN-T road network and Kouvola RRT intermodal area.. The total costs are € 45m, of which € 45 are not financed, yet. Realisation expected in the period unknown. ➔ An interview with the responsible city has led to the assessment that the finance and timing will be improved in short notice – after completing the present study – and that the works project will be started to achieve the KPI set for 2030: Capability, open access, ICT, electrified rail access and track length
Denmark	

Nodes (incompliance parameter 2016)	Compliance by 2030 expected to be reached through
Taulov (electrified rail access, track length <700m)	TEN-T Project ID 5600: Taulov Core Rail-Road Terminal - The northern multimodal node linking Continental Europe with Scandinavia is a Multimodal-project by the Fredericia Shipping A/S on the section or node Taulov. It targets at Aiming to comply with the 2030 TEN-T objectives for nodes on the Core Network, the private company Fredericia Shipping A/S has set out to invest in the Core Rail-Road Terminal (RRT) in Taulov. The objective is to strengthen the role of the RRT as the central Scandinavian hub for transhipment of goods between road and rail, rail and maritime and between rail-based solutions. This will be obtained by further developing the RRT services, including an extension of the railway tracks, further development of the handling area and improved access control for the terminal area using ICT. The rail handling capacity of Taulov Rail-Road Terminal will be increased by 100% before the end of 2019 compared to 2016 level. The total costs are € 19,45m, of which € 3,89 are not financed, yet. Realisation expected in the period 2017 - 2020. ➔ Need for action by the promoter(s) as regards detailed definition of the contribution of the project to achieve the parameters: electrified rail access and track length.
Germany	
Hamburg-Billwerder (track length <740-700m)	TEN-T Project ID 5044: Upgrade of terminal Hamburg-Billwerder - Construction of 4th module is a Multimodal-project by the DB Netz on the section or node Hamburg. It targets at Construction of 4th module. The total costs are € 40m, of which € 40 are not financed, yet. Realisation expected in the period 2026 – 2030. ➔ Need for action by the promoter(s) as regards detailed implementation and financing.
Hannover(-Linden) (capability, open access, electrified rail access, track length <700m)	TEN-T Project ID 2312: Megahub Lehrte (DE) is a Multimodal-project by the BMVI (DB Netz) on the section or node Hannover (Lehrte). It targets at New terminal construction. The total costs are € 136m, of which € 0 are not financed, yet. Realisation expected in the period 2017 – 2020 TEN-T Project ID 5054: Upgrade of terminal Hannover-Lehrte - Upgrade Megahub Lehrte (2 cranes + 6 dollys) is a Multimodal-project by the DB Netz on the section or node Hannover (Lehrte). It targets at Upgrade Megahub Lehrte (2 cranes + 6 dollys). The total costs are € 20m, of which € 20 are not financed, yet. Realisation expected in the period 2021 - 2025 TEN-T Project ID 5055: Upgrade of terminal Hannover-Lehrte - Upgrade storage area; extension of tracks is a Multimodal-project by the DB Netz on the section or node Hannover (Lehrte). It targets at Upgrade storage area; extension of tracks. The total costs are € 10m, of which € 10 are not financed, yet. Realisation expected in the period 2021 - 2025 TEN-T Project ID 2312: Megahub Lehrte (DE) is a Multimodal-project by the BMVI (DB Netz) on the section or node Hannover (Lehrte). It targets at New terminal construction. The total costs are € 136m, of which € 0 are not financed, yet. Realisation expected in the period 2017 – 2020. ➔ Need for action by the promoter(s) as regards detailed implementation and financing. After implementing the project the KPI target will be achieved.

Nodes (incompliance parameter 2016)	Compliance by 2030 expected to be reached through
München-Riem (track length <740-700m)	TEN-T Project ID 5061: Upgrade of terminal München-Riem - Construction 2nd module (new location) is a Multimodal-project by the DB Netz on the section or node München. It targets at Construction 2nd module (new location). The total costs are € 40m, of which € 40 are not financed, yet. Realisation expected in the period 2026 – 2030 ➔ Need for action by the promoter(s) as regards detailed implementation and financing. After implementing the project the KPI target will be achieved.
Italy	
Verona Quadrante Europa (track length <700m)	TEN-T Project ID 5940: Verona RRT: New freight terminal 750 m is a Multimodal-project by the ZAI + RFI S.p.A. on the section or node Verona RRT. It targets at New freight terminal 750 m. The total costs are € 40m, of which € 40 are not financed, yet. Realisation expected in the period 2017 – 2020. ➔ Need for action by the promoter(s) as regards detailed implementation and financing. After implementing the project the KPI target will be achieved.

Source: KombiConsult analysis, May 2017

Table 50: RRT analysis of expected compliance by 2030 - compliance doubted or works not yet planned/agreed on

Nodes (incompliance parameter 2016)	Compliance doubted by 2030 or works not yet planned/agreed
Sweden	
Älmhult (non-core terminal, included due to entry in Project List)	TEN-T Project ID 5558: Älmhult Freight Terminal is a Multimodal-project by the Region Kronoberg, Municipality of Älmhult on the section or node Älmhult. It targets at The terminal is owned by municipality (majority owner) and Ikea. The terminal is open for all companies. The terminal is recently expanded and there are plans for further expansion. The development of the terminal aims to expand the business activities, increase the capacity in order to be able to transfer more of the transports by trucks to railway and also to increase the availability to manage the current and future operations at the terminal more environmentally efficient.. The total costs are € m, of which € unknown are not financed, yet. Realisation expected in the period unknown ➔ Need for action by the promoter(s) as regards detailed definition of the project (costs, finance and timing) and clarification on the contribution of the project to achieve the parameters: ICT, electrified rail access and track length
Stockholm Årsta (<700 m), Stockholm Rosersberg (electrified rail access) Göteborg Gullbergsvass (<700m), Malmö KT (electrified rail access, <740-700m)	TEN-T Project ID 5176: Reach Compliance of RRT is a Multimodal-project proposed after the compliance analysis by the consultants to be promoted by the Swedish Transport Administration on the section or node Stockholm, Hallsberg, Malmö and other core RRT. It targets to improve technical parameter to achieve the objective set for 2030, in particular last mile issues, ITS and greening measures. The total costs and their financing are not known, yet. Realisation expected in the period 2026 – 2030. ➔ Need for action by the promoter(s) as regards detailed definition of the project (measure, cost, finance) and

Nodes (incompliance parameter 2016)	Compliance doubted by 2030 or works not yet planned/agreed
	contribution of the project to achieve the parameters: electrified rail access and track length
Denmark	
København Høje Taastrup (electrified rail access, <700m), Taulov (electrified rail access, <700m)	TEN-T Project ID 5179: Reach Compliance of RRT is a Multimodal-project proposed after the compliance analysis by the consultants to be promoted by the Rail Net Denmark on the nodes Høje Taastrup and Taulov. It aims to improve technical parameter to achieve the objective set for 2030. The total costs and their financing are not known, yet. Realisation expected in the period 2026 – 2030. ➔ Need for action by the promoter(s) as regards detailed definition of the project (costs, financing) and contribution of the project to achieve the parameters: electrified rail access and track length ➔ If the node Taulov's compliance is achieved by TEN-T Project ID 5600 this project can focus on Høje Taastrup.
Germany	
Lübeck (electrified rail access, <700m)	TEN-T Project ID 5384: Baltic Rail Gate (2nd phase) is a Multimodal-project by the Lübeck Port Authority on the section or node Lübeck. It targets to extent the capacity of the present intermodal terminal at Skandinavienkai by a second transshipment module equipped with Rail Mounted Gantry Cranes (RMG). The total costs are € 50m, of which € 50 are not financed, yet. Realisation expected in the period 2021 - 2025 ➔ Need for action by the promoter(s) as regards finance (a grant to budget in the framework of the German funding directive is generally possible upon application) and contribution of the project to achieve the parameters: electrified rail access, track length
Hamburg Billwerder (<740 -700m)	TEN-T Project ID 5803: Upgrade of terminal Hamburg-Billwerder is a Multimodal-project by the DB Netz on the section or node Hamburg. It targets at Construction of two tracks for train composition. The total costs and their financing are not known, yet. Realisation expected in the period 2016 - 2020 ➔ Need for action by the promoter(s) as regards detailed definition of the project (cost, financing) and contribution of the project to achieve the parameters: track length
Bremen Roland (ICT-System, electrified rail access)	No project defined, yet. ➔ Need for action by the promoter(s) as regards definition of a project and contribution of the project to achieve the parameters: ICT-System, electrified rail access
Berlin Großbeeren (<740 -700m)	TEN-T Project ID 2520: Upgrade of terminal Großbeeren - Construction of 2 new tracks for 700 m is a Multimodal-project by the DB Netz on the section or node Berlin/Großbeeren. It targets at Construction of 2 new tracks for 700 m. The total costs are € 5m, of which € 5 are not financed, yet. Realisation expected in the period 2017 – 2020. TEN-T Project ID 2521: Upgrade of terminal Großbeeren - Construction of 2nd module is a Multimodal-project by the DB Netz on the section or node Berlin/Großbeeren. It targets at Construction of 2nd module. The total costs are € 40m, of which € 40 are not

Nodes (incompliance parameter 2016)	Compliance doubted by 2030 or works not yet planned/agreed
	financed, yet. Realisation expected in the period 2026 - 2030. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finaninc) and contribution of the project to achieve the parameters: track length (2nd module)
Leipzig Wahren (<740-700m)	TEN-T Project ID 5056: Upgrade of terminal Leipzig-Wahren - 3rd crane by the DB Netz on the section or node Leipzig. It targets at Construction of 3rd crane. The total costs are €10m, of which €10m are not financed, yet. Realisation expected in the period 2021 – 2025. ➔ Need for action by the promoter(s) as regards detailed definition of the project (financing) and contribution of the project to achieve the parameters: track length
Schkopau (ICT?, electrified rail access, <700m)	No project defined, yet ➔ Need for action by the promoter(s) as regards financing and contribution of the project to achieve the parameters: ICT-System, electrified rail access, track length
Nürnberg (<740-700m)	No project defined, yet. ➔ Need for action by the promoter(s) as regards definition of a project and contribution of the project to achieve the parameters: track length
German RRT (electrified rail access, track length)	TEN-T Project ID 5186: Reach Compliance of RRT is a Multimodal-project proposed after the compliance analysis by the consultants to be promoted by the DB Netz AG, private owners on the section or node German RRT locations, both public ("DB Netz") and private ownership. It's result of the analysis of the sections currently not compliant with the TEN-T requirements but not covered by any infrastructure investment planning until 2030. The total costs and their financing are not known, yet. Realisation expected in the period 2026 – 2030. ➔ Need for action by the promoter(s) as regards detailed definition of the project (measures, costs, finance) and contribution of the project to achieve the parameters: electrified rail access and track length
Austria	
No core RRT identified	
Italy	
Verona (<740m)	TEN-T Project ID 5979: Upgrade Verona Q.E. NEW is a Multimodal-project by the RFI on the section or node Verona. It targets at Potenziamento Verona Q.E. Upgrading of Verona Quadrante Europa in order to allow 750m train length and to increase the current terminal capacity. The total costs are to be defined, their financing is unknown, yet. Realisation expected in the period 2026 – 2030. ➔ Need for action by the promoter(s) as regards detailed definition of the project (costs, financing) and contribution of the project to achieve the parameters: track length
Bologna (electrified rail access)	No project defined, yet. ➔ Need for action by the promoter(s) as regards contribution of the project to achieve the parameters: electrified rail access

Nodes (incompliance parameter 2016)	Compliance doubted by 2030 or works not yet planned/agreed
Ancona Interporto Marche Jesi (ICT, electrified rail access, track length)	No contribution of the owner/operator to the compliance analysis or the Project List; most likely incompliance: electrification and track length; No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Livorno Guastacce Collesalvetti (Interporto Amerigo Vespucchi) (capability, ICT, electrified rail access, track length)	No contribution of the owner/operator to the compliance analysis or the Project List; most likely incompliance: capability, ICT, electrification and track length No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Firenze Prato (capability, ICT, electrified rail access, track length)	No project defined, yet. ➔ Need for action by the promoter(s) as regards contribution of the project to achieve the parameters: Capability, ICT, electrified rail access, track length
Roma Pomezia	No contribution of the owner/operator to the compliance analysis or the Project List; No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Napoli Marcianise-Maddaloni	No contribution of the owner/operator to the compliance analysis or the Project List; most likely incompliance: capability, ICT, electrification and track length; No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Napoli Nola	No contribution of the owner/operator to the compliance analysis or the Project List; No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Bari Ferruccio (electrified rail access, track length)	No project defined, yet. ➔ Need for action by the promoter(s) as regards compliance analysis and detailed definition of project eventually.
Italian RRT	TEN-T Project ID 5333: Reach Compliance of RRT is a Multimodal-project proposed after the compliance analysis by the consultants to be promoted by the Owner or infra manager concerned on the section or node Various public and private RRT. It targets at Improve technical parameter to achieve the objective set for 2030. The total costs are € m, of which € unknown are not financed, yet. Realisation expected in the period 2026 - 2030 ➔ Need for action by the promoter(s) as regards detailed definition of the project (measures, costs, finance) and contribution of the project to achieve the parameters: capability, open access, ICT-System, electrified rail access and track length
Malta	
No core RRT identified	
Norway	
Oslo Alnabru	No project identified, yet. ➔ Need for action by the project promoter(s) as regards definition

Nodes (incompliance parameter 2016)	Compliance doubted by 2030 or works not yet planned/agreed
	of the project to achieve the parameters: open access, ICT, electrified rail access and track length

Source: KombiConsult analysis, May 2017

Table 51: RRT Analysis of expected compliance by 2030 – No compliance projects

Nodes	Other issues by 2030 expected to be reached through
Germany	
Regensburg (non-core terminal, included due to entry in Project List))	TEN-T Project ID 9726: Improving the (rail) accessibility of Regensburg port is a Multimodal-project by the Bayernhafen GmbH & Co. KG on the section or node Regensburg (Port) . It targets at The terminal of Regensburg is located on the Rhine - Danube Corridor and Regensburg is listed in the Annex II part 2 of Regulation 1315/2013 as a core railroad terminal. The Action aims at improving the accessibility of the port. It is part of the global project, which aims at enhancing the port of Regensburg. Activities focus on the works for construction and the electrification of new railway tracks, and the improvement of some level crossing points. The Action will enhance the modal shift from road to rail. CO2 emissions reduction is also considered as a future effect. The total costs are € 5,5m, of which € 0 are not financed, yet. Realisation expected in the period 2017 - 2020 The project does not target specific KPI, but a general improvement of the access.
Italy	
Trento (non-core terminal, included due to entry in Project List)	TEN-T Project ID 5969: Standard adjustment 750 meters EU station Roncafort intermodal terminal, efficiency with a low environmental impact and high modal shift is a Multimodal-project by the Interbrennero Spa on the section or node Trento. It targets at Design and financing of the upgrading works and the intermodal terminal Adjustment and the Trento-existing Roncafort Station, located along the corridor of Scandinavian - Med, located in loc. Roncafort of Trento, without the use of new territory. The terminal enables the transfer of goods from road to rail with the optimization of the capacity of the railway corridor a ScanMed Following the activation of the BBT (Brenner Basis Tunnel).. The total costs are € 10m, of which € 10 are not financed, yet. Realisation expected in the period 2017 – 2020.
Verona	TEN-T Project ID 5938: Upgrade of general road access is a Multimodal-project by the ZAI on the section or node Verona. It targets at Upgrade of general road access to Quadrante Europa Freight Village. The total costs are € 20,228m, of which € 20,228 are not financed, yet. Realisation expected in the period 2021 – 2025. The project does not target specific KPI, but a general improvement of the road access.
Verona	TEN-T Project ID 5939: New infrastructure for the road access - 1 is a Multimodal-project by the ZAI on the section or node Verona. It targets at new infrastructure for the road access of future development area. The total costs are € 13,52m, of which € 13,52

Nodes	Other issues by 2030 expected to be reached through
	are not financed, yet. Realisation expected in the period 2021 - 2025 The project does not target specific KPI, but a general improvement of the road access.
Verona	TEN-T Project ID 5941: New OCR gate for Rail access is a Multimodal-project by the TERMINALI ITALIA on the section or node Verona. It targets at New OCR Gate for control wagons and load at the rail access in the terminal. The total costs and their finance are unknown, yet. Realisation expected in the period unknown. The project targets to improve elements which might be understood "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards detailed definition of the project (costs, finance, timing) and contribution of the project to achieve the parameters: ICT-System (according to Article 29 lit c of the TEN-T Regulation)
Verona	TEN-T Project ID 5942: Upgrading of informative system inside the rail terminal is a Multimodal-project by the TERMINALI ITALIA on the section or node Verona. It targets at Informative panels for trucks located at the rail tracks. The total costs are € m, of which € unknown are not financed, yet. Realisation expected in the period unknown The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards detailed definition of the project (costs, finance, timing) and contribution of the project to achieve the parameters: ICT-System (according to Article 29 lit c of the TEN-T Regulation)
Verona	TEN-T Project ID 5932: LNG refuelling station is a Multimodal-project by the ZAI on the section or node Verona. It targets at LNG refuelling station (part of CEF project LNG ScanMed Masterplan). The total costs are € 0,71m, of which € 0,71 are not financed, yet. Realisation expected in the period 2016 - 2020 The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation.
Verona	TEN-T Project ID 5934: Upgrade of internet connection is a Multimodal-project by the ZAI on the section or node Verona. It targets at Upgrade of internet connection of the Quadrante Europa Freight Village. The total costs are € 0,15m, of which € 0.15 are not financed, yet. Realisation expected in the period 2016 - 2020 The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance) and contribution of the project to achieve the parameters: ICT-System (according to Article 29 lit c of the TEN-T Regulation)
Verona	TEN-T Project ID 5935: Network Access Point for telecommunication operators is a Multimodal-project by the ZAI on the section or node Verona. It targets at Network Access Point for

Nodes	Other issues by 2030 expected to be reached through
	telecommunication operators. The total costs are € 0,3m, of which € 0,3 are not financed, yet. Realisation expected in the period 2016 - 2020 The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance) and contribution of the project to achieve the parameters: ICT-System (according to Article 29 lit c of the TEN-T Regulation)
Verona	TEN-T Project ID 5933: Upgrade of internal road access is a Multimodal-project by the ZAI on the section or node Verona. It targets at Upgrade of internal road access to Quadrante Europa Freight Village in the Northern part of the freight village to guarantee new direct accessibility to the new 750 Terminal. The total costs are € 5.544m, of which € 5.544m are not financed, yet. Realisation expected in the period 2016 - 2020 The project does not target specific KPI, but a general improvement of the road access. It is linked to and eventually a pre-requisite of TEN-T Project ID 5940 (New freight terminal 750 m) ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance)
Verona	TEN-T Project ID 5936: New rail terminal for automotive sector is a Multimodal-project by the ZAI on the section or node Verona. It targets at New rail terminal for automotive sector. The total costs are € 7m, of which € 7 are not financed, yet. Realisation expected in the period 2016 - 2020 The project does not target specific KPI, but a new rail terminal for the automotive sector. It is linked to and eventually a pre-requisite of TEN-T Project ID 5940 (New freight terminal 750 m) ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance)
Verona	TEN-T Project ID 5937: New infrastructure for the road access - 2 is a Multimodal-project by the ZAI on the section or node Verona. It targets at New infrastructure for the road access of future development area (South). The total costs are € 7,8m, of which € 7.8 are not financed, yet. Realisation expected in the period 2016 - 2020 The project does not target specific KPI, but a general improvement of the road access. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance)
Verona	TEN-T Project ID 5943: New lightning system to improve sustainability is a Multimodal-project by the TERMINALI ITALIA on the section or node Verona. It targets at New LED lamps in the terminal and project of rationalization of light user and power in the terminal. The total costs are € 4,05m, of which € 4,05 are not financed, yet. Realisation expected in the period unknown The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards detailed

Nodes	Other issues by 2030 expected to be reached through
	definition of the project (finance)
Verona, Ancona, Bologna	TEN-T Project ID 3650: E_MESSENGER-Designing the Information Systems interoperability of the Adriatic-Ionian logistics hubs - Overall Project is a Multimodal-project by the ADSP Ancona on the section or node Several nodes belonging to more than one CNC. It targets at The E_MESSENGER objective is to strengthen the integration of ICT community systems of 5 core intermodal nodes: Ancona, Trieste (IT) and Igoumenitsa (GR) ports and Bologna and Verona RRTs (IT) situated in 2 Member States and linking 4TEN-T network corridors: Scandinavian-Mediterranean, Orient/East-Med, Baltic-Adriatic and Mediterranean with the aim to increase the infrastructure efficiency to handle the freight flows through better management, organization and integration of the respective ICT systems. The Global project enhances the strategic role of the freight traffic crossing the Adriatic-Ionian Sea in the NW/SE axis and serving wide and important economic areas in the Central and Eastern Europe and in South Med and Middle/Far-East countries. The objective is pursued through the provision of a quality freight transport service based on a seamless logistic chain.. The total costs are € 1,906m, of which € 1,906 are not financed, yet. Realisation expected in the period 2017 - 2020" ➔ Need for action by the promoter(s) as regards definition of project to achieve the parameters: ICT-System.
Bologna	TEN-T Project ID 1390: ICT system application in RRT on the Italian part of the corridor, for operations synchronization and management efficiency with other nodes is a Multimodal-project by the Interporto di Bologna S.p.A. on the section or node Bologna. It targets at ICT system application in RRT on the Italian part of corridor, for operations synchronization and management efficiency with other nodes. The total costs are € 0,365m, of which € 0,365 are not financed, yet. Realisation expected in the period 2016 – 2020. The project targets to improve elements which might be understood as "new technologies and innovation" according to Article 33 of the TEN-T Regulation. ➔ Need for action by the promoter(s) as regards definition of project to achieve the parameters: electrification.
Bari (-Lamasinata, core Seaport, included due to "Multimodal" project)	TEN-T Project ID 5334: New public siding in Bari Lamasinata is a Multimodal-project by the RFI on the section or node Bari. It targets at railway connection to Bari-Lamasinata Freight village. The total costs are € 35m, of which € 0 are not financed, yet. Realisation expected in the period 2021 - 2025 The project does not target specific KPI, but a general improvement of the rail access. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance)
Augusta (core Seaport, included due to "Multimodal" project)	TEN-T Project ID 5924: Railway link within the commercial port is a Multimodal-project by the Augusta Port Authority on the section or node Augusta. It targets at Implementation of interconnection with the rail network and development of multimodal freight transport. The total costs are € 14,6m, of which € 14,6 are not financed, yet. Realisation expected in the period 2016 – 2020. The project does not target specific KPI, but a general

Nodes	Other issues by 2030 expected to be reached through
	improvement of the rail access. ➔ Need for action by the promoter(s) as regards detailed definition of the project (finance)

Source: KombiConsult analysis, May 2017

In addition to the projects analysed in the previous tables we also mention projects from the Project List which are not used in the above tables/analysis on compliance by explanation on what their contribution will/might be.

From the project category "multimodal" the eight passenger projects are placed on ScanMed Corridor:

TEN-T Project ID 5214: Long distance commuting (several projects, includes FinEst Smart Mobility) is a Multimodal project by the City of Helsinki, Helsinki Uusimaa Regional Council, EE Road Admin, City of Tallinn on various sections. It targets at long distance commuting covered by several sub-projects: travel chains, smart transport, urban development of rail terminal areas (HHT), smart mobility, joint ticketing; H-T Transplan 01/2011-04/2013 1,3 MEUR, FinEst Smart Mobility 09-2016-8/2019 1,8 MEUR; FI governmental AIKO funding for multimodal long distance commuting project portfolio, total 1 MEUR 2016-2018. AIKO is coordinated by Helsinki-Uusimaa Regional Council. The total costs are € 4m, of which € 4 are not financed, yet. Realisation expected in the period 2017 – 2020.

TEN-T Project ID 5552: Enhanced and developed multimodal personal transports in the urban node Norrkoping, is a Multimodal project by the Municipality of Norrköping in the node Norrköping. It targets at Norrkoping which is located on the comprehensive TEN-T network, in proximity of the "East Link" high speed railway line. This study aims to identify the missing links and bottlenecks between transport modes of the TEN-T in the urban node of Norrkoping. The proposed action is part of a Global Project on the construction and upgrade of the "East-Link" high speed railway line and its multimodal integration with the urban nodes along the railway network. It includes specific studies leading to works to develop a Sustainable Urban Mobility Plan (SUMP) for the urban node of Norrkoping and the region in its proximity. The total costs amounting to € 2,44m are fully financed. Realisation expected in the period 2017 - 2020.

TEN-T Project ID 5970: Rome urban core network node – Enhancement of public transport services and removal of bottlenecks along the Rome bypass is a Multimodal project by ANAS - City of Rome in the node Roma. The total costs are € 2,4m, all of which are not financed, yet. Realisation period unknown.

TEN-T Project ID 5973: "Trolleybus 90 express: upgrading of electrical system for a fleet expansion" is a Multimodal project by the Municipality of Roma in the node Roma. It targets at upgrading of the electrical system for a fleet expansion to improve the public transport service on north-east city area. The total amounting to € 3,78m are not financed, yet. Realisation period unknown.

TEN-T Project ID 5974: "Interchange node between GRA exit Casilina (n. 18) and metro C station Giardinetti." is a Multimodal project by the Municipality of Roma in the node Roma. It targets at new exchange parking to improve accessibility to heavy public transport and passenger commuting. The total costs are € 2,5375m, but not financed, yet. Realisation period unknown.

TEN-T Project ID 5980: "3 interventions for accessibility and intermodality improve: 1) Garbatella station; 2) Libia MB1 - Nomentana FL1; 3) Ponte Lungo - Tuscolana station" is a Multimodal project by the Municipality of Roma in the node Roma. It targets at 3 interventions for accessibility and intermodality improve: 1) improvement of accessibility of line B Garbatella station from western neighborhood respect subway track ; 2) multimodal interchange node rail (Nomentana FL1)-subway (Libia B1)-rail(Nomentana FL1)-trolleybus on VIa Nomentana; 3) improvement of interchange node metro A station Ponte Lungo-Tuscolana railway station. The total costs are € 25m, all of which are not financed, yet. Realisation period unknown.

TEN-T Project ID 5982: Exchange parking on metro B1 Conca D'Oro and S.Agnese - Annibaliano is a Multimodal project by the Municipality of Roma on the section or node Roma. It targets at Exchange parking on metro B1 Conca D'Oro and S.Agnese - Annibaliano, Completion works to increase access to the underground network. The total costs of € 10,2m are not financed, yet. Realisation period unknown.

TEN-T Project ID 5983: Tramway link Marconi: from viale Trastevere to Marconi station, and from viale Trastevere to Basilica San Paolo station, ex Fiera di Roma to interchange with future tramway link on Appia Antica park is a Multimodal project by the Municipality of Roma in the node Roma. It targets at new tramway to be realized as a diversion from historical Viale Trastevere line to Piazzale della Radio and Viale Marconi. New interchange node at line B station "Marconi". Prosecution on Viale Ferdinando Baldelli, to Basilica San Paolo, the ex Rome's Fair, till Caravaggio square, exchange node with the future bypass tramway Appia Antica. The total costs of € 133m are not financed, yet. Realisation period unknown.

From the project category "multimodal" the two projects with a "MoS" or "other" scope are placed on ScanMed Corridor list:

TEN-T Project ID 5492: Iberian North European Corridor Multimodal capacity increase (INEC) is a Multimodal project by the Port Authority of Bilbao on the section Bilbao – Helsingborg (?). It focuses on the upgrading of port and hinterland infrastructure to enhance the maritime link between Spain and Northern Europe. It develops the hinterland connection at Pancorbo and increases containerised cargo handling capacity in Bilbao and in Helsingborg, situated on the Atlantic and the Scandinavian - Mediterranean Corridor. The Action consists of the following activities: intermodal capacity improvement and strengthening of the Iberian hinterland connections, Noatum Container Terminal rail infrastructure improvement, Helsingborg port cargo handling infrastructure improvement, climate change study, communication, dissemination and exploitation of INEC message. INEC increases the frequency of short sea services from Spain to Northern Europe, contributing to modal shift. The total costs of € 45,219923m are not financed, yet. Realisation period unknown.

TEN-T Project ID 2950: NSB CoRe (North Sea Baltic Connector of Regions) is a Multimodal project by the Helsinki-Uusimaa Regional Council on the Northern part of NSB (From Berlin to Helsinki). It targets at improving the North Sea - Baltic Sea TEN-T corridor traffic and land use in order to maximize the benefits of investments and connect the individual cities. Activities: 1) MaaS service benchmark and development on cross-border commuting corridors (FI-EE, DE-PL, EE-LV-LT) 2); Logistics chain development HKI-BER; 3) Transnational spatial planning in transport; 4) Rail Baltic stakeholder and multi-level governance analysis. The total costs of € 3,3m are not financed, yet. Realisation expected in the period 2017 – 2020.

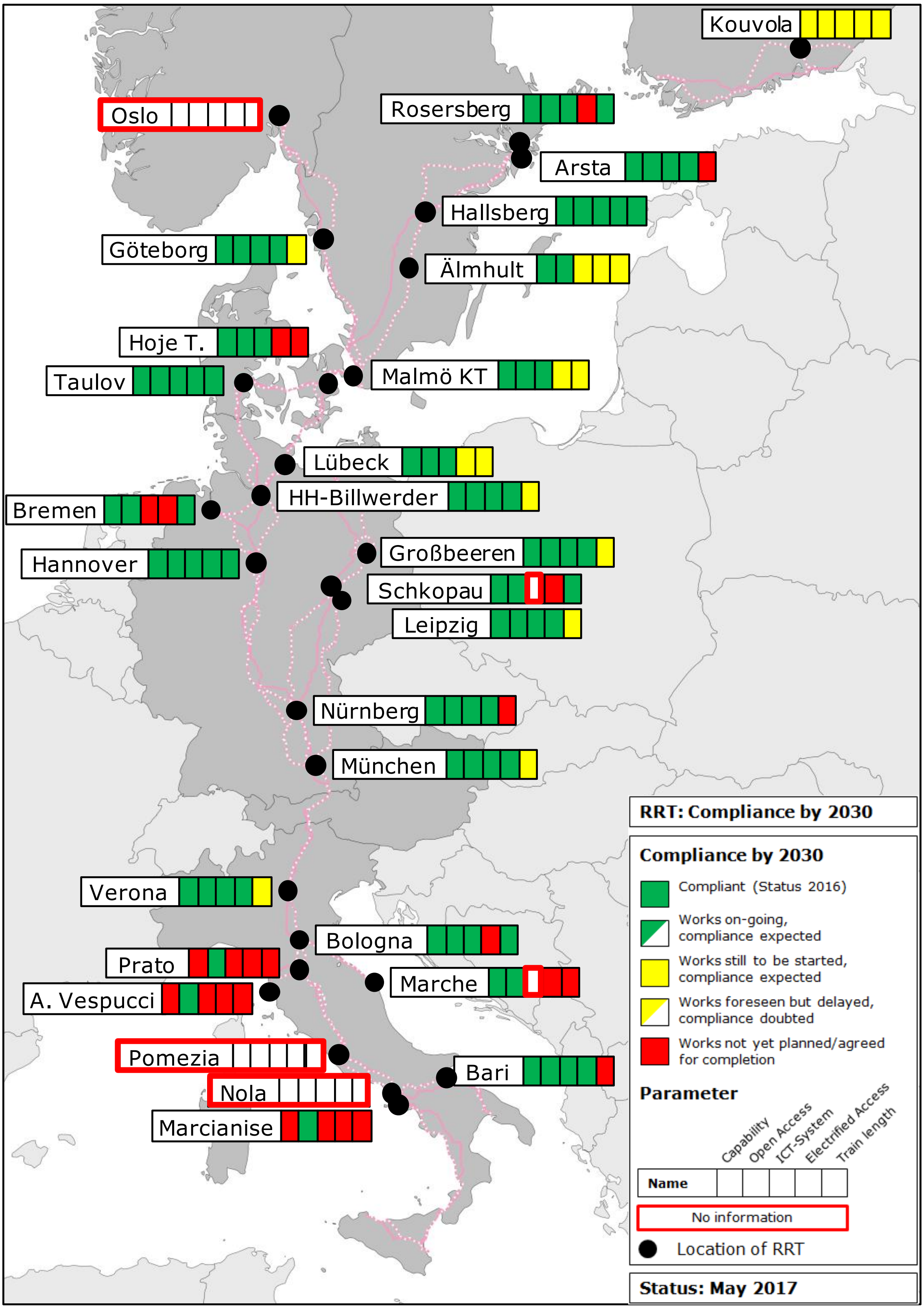
The result of the compliance analysis 2017 and the Project List were presented in the previous chapters and tables, while the following table summarizes the expected compliance in the year 2030 under consideration that the identified planned projects will be realized. It can be seen that, despite the large quantity of projects, the majority of Rail-Road terminals will not achieve a "full" compliance with respect to each parameter relevant for RRT and required by the TEN-T Regulation.

Table 52: RRT parameters expected compliance 2030

Node / Terminal	Capa-bility	open access	ICT-System	E-Rail Access	max. length of handling track
Kouvola	Yes	Yes	Yes	Yes	≥700 m
Oslo Alnabru					
Stockholm Årsta	Yes	Yes	Yes	Yes	<700 m
Stockholm North Rosersberg	Yes			No	≥740
Örebro Hallsberg	Yes		Yes	Yes	≥740
Älmhult (non-core terminal)	Yes	Yes			
Göteborg Gullbergsvass	Yes	Yes	Yes	Yes	<700 m
Malmö Kombiterminal	Yes	Yes	Yes	No	< 740 – 700 m
København (Høje-Taastrup)	Yes	Yes	Yes	No	<700 m
Taulov	Yes	Yes	Yes	Yes	≥700 m
Lübeck Skandinavienkai	Yes	Yes	Yes	No	<700 m
Hamburg-Billwerder	Yes	Yes	Yes	Yes	≥740
Bremen-Roland	Yes	Yes	No	No	≥740
Berlin Großbeeren	Yes	Yes	Yes	Yes	< 740 – 700 m
Hannover-Linden (replaced)	-	-	-	-	-
Hannover-Linden Hafen					
Hannover Lehrte (new)	Yes	Yes	Yes	Yes	< 740 – 700 m
Leipzig-Wahren	Yes	Yes	Yes	Yes	< 740 – 700 m
Schkopau	Yes	Yes		No	<700 m
Nürnberg Tricon	Yes	Yes	Yes	Yes	< 740 – 700 m
München-Riem	Yes	Yes	Yes	Yes	< 740 – 700 m
München (new)	Yes	Yes	Yes	Yes	≥740
[no core RRT in Austria]					
Verona Quadrante Europa	Yes	Yes	Yes	Yes	<700 m
Verona Quadrante Europa (new	Yes	Yes	Yes	Yes	≥740
Bologna: Interporto Bologna	Yes	Yes	Yes	No	≥740
(Ancona)- Interporto Marche Jesi	Yes	Yes		No	<700 m
(Livorno)- Guasticce Collesalvetti (Interporto Amerigo Vespucci)	No	Yes	No	No	<700 m
Firenze Prato	No	Yes	No	No	<700 m
Roma Pomezia					
(Napoli)- Marcianise-Maddaloni	No	Yes	No	No	<700 m
(Napoli)- Nola					
Bari Ferruccio	Yes	Yes	Yes	No	<700 m
TOTAL COMPLIANCE COEFFICIENT (WHOLE CORRIDOR)	**23/31 = 74%**	**24/31 = 77%**	**18/31 = 58%**	**15/31 = 48%**	**11/31 = 35%**

Source: KombiConsult analysis, May 2017; empty cells = no reply by 18 May 2016 and no project identified in the project list of 26 April 2017

Figure 25: RRT parameters expected compliance 2030



Source: KombiConsult, May 2017

After the implementation of "planned" works projects the RRT parameters improve slightly. If the terminals do not change their market position and behaviour we can attest that also in 2030 all terminals are capable for intermodal transhipment and provide their services open to all operators in a non-discriminatory way and apply transparent charges. However, only 58% of the terminals have an ICT system in place, and only 35% of the sites allow 740 m trains to enter the terminal "in one piece", while 48% provide for a (direct) electrified access. The share of ICT systems was reduced by calculation since with Älmhult one non-compliant and with the new terminals in München and Verona two more sites were added to the list (31 instead of 28 RRT) and no new project achieving the ICT requirement will be completed by 2030.

This is a strange finding but resulting from the agreed working steps and evaluation of the project list 2017.

Table 53: RRT parameters compliance evolution 2014, 2016, 2017 and expectations for 2020 and 2030

RRT Parameter	P	O	K	Publicly available source	Baseline value 2014	Status 2016	Status 2017	Expected 2020	Expected 2030	Target 2030
Capability for Intermodal (unitised) transhipment	X	X	X	1)	-	71-100%	71-100%	76-100%	74-100%	100%
Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	x	-	x	1)	-	75-100%	75-100%	79-100%	77-100%	100%
Information systems	x	-	-	1)	-	61%	64%	59%	58%	100%
Electrified train terminal accessibility	X	X	X	1)	-	32%	36%	48%	48%	100%
740m train terminal accessibility	X	X	X	1)	-	18%	14%	24%	35%	100%

Source: KombiConsult, May 2017; P = Priority, O = Objective, K = KPI 1) websites, other information and completed questionnaire of respective infrastructure managers

Conclusions

The 28 Rail-Road Terminals of the ScanMed Corridor which were incorporated in the detailed analysis are generally connected to rail and road, provide discrimination free access for their users and are equipped with qualified handling equipment for all types of intermodal loading units. Terminal management systems are widely used for providing real time information on the operational situation in the terminal and for the data exchange with connected transport mode operators (railway undertakings, intermodal operators and forwarders). Nevertheless since one terminal which does not state to having an ICT system in place was added, the calculated share of "compliant" terminals was even reduced. The field of ICT system implementation is thus a field where improvement measures should be taken by the owners or operators of the respective sites. If it comes to public financing the public entities should assure that the ICT systems fulfil the requirements of Articles 28(1)(b) and 29(c) of the TEN-T Regulation in the strict sense. The largest challenge for the present sites is their historically grown access to the rail infrastructure (single sided, non-electrified, annex to shunting yard or port railway line) and the limitation of the (wagon) train length by either the reception/departure siding or the transhipment track(s). Next to the present 4 sites (Rosersberg, Hallsberg, Bremen and Bologna) also Kouvola, Taulov, Hamburg, Berlin-Großbeeren, München and Verona are committed to realize that parameter (≥740 m train length) by 2030, while for the other terminals project ideas exist but "works are not yet planned/agreed for realisation" so that there is only little improvement expected compared to 2016. It is recommended that rail infrastructure managers and terminal managers cooperate towards realizing the track side and terminal side improvement of that parameter in a coordinated way.

8 Potential administrative and operational barriers

In the Preparatory Meeting with the European Commission on 18th March 2014 the Contractors were asked to provide not only an outline of the Corridor, the detailed assignment of rail and road infrastructure to Corridor sections and nodes as well as the TENtec analysis, but also an initial technical analysis and estimation of "main critical issues" in addition to the tasks assigned to them. Since the EU Regulations do not define "critical issues" but "missing links" and "bottlenecks", the Contractors have provided a final assessment based on their experience and analysis of studies which were already gathered. Basically, there are physical bottlenecks, technical parameters lower than the technical standards set by the objectives of the TEN-T and CEF Regulations to be achieved by 2030, interoperability issues, and the slower implementation of planned projects due to national prioritisation, budget limitations and required public consultation in order to acquire building permits.

Since the item "critical issue" was maintained to be added to the study and the work plan without a precise definition we have used the following categories (see Table 54) to group the sections or nodes – and finally the resulting measures and projects. If a certain section or node is characterized by at least one of these items, it is deemed to be a "critical issue" for the Corridor.

Table 54: Pre-identified sections and categories of "critical issues"

Category	Definition
Pre-identified	Pre-identified section according to Regulation (EU) 1316/2013, Annex I Part 1
Capacity/ Bottleneck	Network capacity issues: e.g. road congestion in urban nodes, rail capacity; Physical, technical or functional barrier which leads to a system break
Missing link	Physically missing links e.g. in highway system and rail high speed lines
Cross-border	Issues located on cross-border sections according TEN-T Regulation (EU) 1315 Article 3 and Annex II, part 1
Interopera-bility / Compliance with TEN-T standards	Regulatory, technical and operational conditions, of the infrastructure in a transport mode to allow safe and uninterrupted traffic flows for that infrastructure or mode; Technical compatibility of infrastructure/vehicles and systems e.g. missing ERTMS, ITS deployment; practically the measures resulting from the "compliance analysis"
Multimodality	Issues facilitating multimodal transport services for freight and passenger transport e.g. terminal capacity issues (expansion/upgrade/construction),
Last mile connection	Issues regarding last mile connection: e.g. lack of rail connections to airports, ports
Externalities/ Sustainability/ Innovation	Issues regarding negative transport externalities e.g. noise, pollution, accidents; Issues where the transport infrastructure is potentially affected by the climate change, e.g. floods, increase of sea level, sea ice as well as innovation issues / pilot projects e.g. LNG, ICT, tracking and tracing
Urban areas	Actions implementing/facilitating TEN-T transport infrastructure located in "Urban nodes of the Core Network" according to Regulation (EU) 1315, Annex II, part 1

Source: HaCon

This categorisation has been applied to the projects listed in Annex 3 of the Final Report on the Project List and the result has been marked in the respective column "critical issue".

Results concerning critical issues

Following the "Corridor Approach", the findings from the characterisation of "critical issues" have been grouped by mode rather than by Member State following the geographic sequence from north to south in the following sections.

In order to prevent ourselves from becoming deterred by the quantity and extent of "critical issues", we have also used the following sections to highlight the progress already realized on our corridor and "good practices" that have been achieved on the ScanMed Corridor or its sections in recent years in the same chapter. In this way of presentation, good practices are also mentioned as encouragement to continue in that direction, transfer them to other parts of the corridor and beyond, and to seek their integration into a consistent corridor system.

8.1 Rail Infrastructure

Administrative and operational barriers

Administrative and operational barriers can be allocated to several corridor levels with respective consequences on interoperability.

a.) For long-haul train runs, infrastructural and technical parameters have particular impact on the exploitation of train capacities (e.g. axle load, load gauge, train length) and the need for multi-system locomotives (traction type, rail voltage, signalling systems). As many of these parameters change at the country borders, they furthermore influence the operational procedures in the cross-border sections and on the border crossings (see next levels).

b.) On cross-border sections, administrative and operational barriers mainly refer to the change of technical parameters. These might directly jeopardize continuity of passenger and freight flows on both sides on the border.

c.) Operational/administrative border procedures with respective consequences for transport/travel times, costs, needs of resources etc.

d.) Finally, administrative and operational barriers also influence passenger and freight traffic on the last-mile within the urban nodes. This aspect is analysed within a dedicated chapter of this report (see chapter 9).

Interoperability on the long-haul

For long-haul train runs, the main technical and operational barriers on the ScanMed Corridor can be summarised as follows:

- The corridor is not entirely equipped with standard gauge (1,435 mm). The only deviation from the standard is the Finish rail network (1,524 mm). Since Finland is network-wise isolated from the rest of the corridor, the wider gauge is accepted exceptionally. However, the remaining corridor network meets the standard.
- The corridor is not completely electrified. By status of June 2016, one quarter of the total ScanMed rail network in Denmark is not electrified. Additionally, rail sections of about 260 km in Germany are not electrified. With regard to the whole ScanMed CNC, 95.4 % of the rail network is electrified. Only the German section Hof – Regensburg is doubted to be compliant by 2030 due to delayed works.

- Three different electric voltage systems are being used on the Scandinavian-Mediterranean Corridor:
  - AC 25 kV, 50 Hz in Finland, Denmark, and Italy (only high speed lines);
  - AC 15 kV 16 2/3 Hz in Germany, Austria, Sweden, and Norway;
  - DC 3 kV in Italy.
- Common signalling systems are currently used in Germany/Austria (PZB/LZB) and Sweden/Norway (ATC/EBICAB).
- Non-compliant rail sections with respect to axle load are currently only located in Italy, south of Bologna. Though, compliance for 2030 is expected.

Additionally, some rail sections have already been equipped with ETCS (European Train Control System) for test purposes. Table 55 shows currently existing as well as planned ETCS implementations on the Scandinavian-Mediterranean CNC.

Table 55: Existing and planned ETCS implementations on the ScanMed Corridor

Country	Infrastructure manager	Existing ETCS implementations	Planned ETCS implementations
FI	Finnish Rail Administration		Parts of the network and parts of the ScanMed Corridor lines until 2025
NO	Jernbaneverket	Ski – Sarpsborg (Tests, 2015)	Parts of the network and ScanMed Corridor lines predominantly until 2025
SE	Trafikverket	Nyland – Umeå (2010), Borlänge – Malung (2012), Sundsvall – Västeraspby (2012), Boden/Buddbyn – Haparanda (2013)	Whole network 2035; ScanMed Corridor lines predominantly until 2025
DK	Banedanmark		Whole network and ScanMed Corridor lines until 2021
DE	DB Netz	Erfurt – Halle/Leipzig (2015)	Erfurt – Nürnberg (2017); new HSL, freight corridors and replacement of LZB ("Linienzugbeeinflussung") on existing HSL estimated 2026 - 2030
AT	ÖBB Infrastruktur	(Kufstein -) Wörgl – Innsbruck (- Brenner), HSL Wien – St. Pölten (2012)	Parts of the network until 2025 ("Zielnetz 2025+")
IT	Rete Ferroviaria Italiana (RFI)	Rom – Neapel (2005), Rom – Florenz (2006), Novara – Turin (2007)	Parts of the network until 2025

Source: HaCon, May 2017

Differences in rail voltage and different signalling system require the employment of multi-system locomotives. Alternatively, locomotive change processes have to be optimised at border sections. With regard to loading gauges, there is no specific requirement in the Regulation, but intermodal transport is one of the backbones of rail freight traffic on the ScanMed Corridor and may disproportionately grow in the future. Thus, the availability of an intermodal loading gauge in line with the market demand (at least P/C400 allowing basically the transport of 4 m high semi-trailers in pocket wagon) is an important prerequisite for competitive rail freight services.

Interoperability on cross-border sections

Administrative and operational barriers affect rail transport especially at border crossings. A total of five country/country rail connections are part of the Scandinavian-Mediterranean CNC.

Two major projects will have great impacts on the overall ScanMed Corridor transport performance: the Fehmarn Fixed Link (Denmark – Germany) and the Brenner Base Tunnel (Austria – Italy). Both actions will bolster European traffic flows by cutting transport times, enhanced capacity and, finally, improved interoperability between countries. For instance, the rail connection between Hamburg (DE) and København (DK) is currently operated via ferry with diesel-powered passenger trains. The Fixed Link is designed for freight trains too which can avoid the 160 km detour via the Great Belt.

However, rail infrastructure parameters vary from country to country. As mentioned above, these differences require the operation of multi-system locomotives. Table 56 gives an overview of changing interoperability on border-crossings.

Table 56: Change of interoperability rail parameters on cross-border sections

Border crossing	**Coun-tries**	**Cross-border section**	**Change of parameters with impact on interoperability**							
		Urban nodes	Trac-tion	Track gauge	Load gauge	Axle load	Rail voltage	Train length	ERTMS a)	Signal. system
Malmö/Copenhagen	*SE-DK*	*Malmö-København*					X			X
Ed/Kornsjø	*SE-NO*	*Malmö-Oslo*						X		
Padborg/Flensburg	*DK-DE*	*København-Hamburg*					X			X
Kiefersfelden/Kufstein	*DE-AT*	*München-Verona*							X	
Brennersee/Brenner	*AT-IT*	*München-Verona*					X	X	X	X

a) No ERTMS changes in 2030 displayed (ERTMS projects are not included in the scope of this project)

Source: HaCon based on ScanMed Final Report 2014

According to the results presented in the table above all border-crossing rail sections show changes in relevant parameters. While only minor changes occur on connections from Germany to Austria (ERTMS only) which do not extensively hamper interoperability, a total of four parameters change from Austria to Italy: Besides the rail voltage the maximum allowed train length, ERTMS equipment as well as the signalling system vary. In general, distinctions in rail voltage are most common parameter changes on ScanMed border sections.

Operational and administrative procedures have particular impact on freight traffic due to different compositions of the trains (different types of cargo, types of wagons) with respective, numerous regulations and for technical and commercial check as well as for authority procedures (customs clearance, police control, phytosanitary control). The complexity of these processes is furthermore intensified by diversification of long-haul freight train runs to several railway operators, normally changing locomotives and loco drivers at the borders.

8.2 Road Infrastructure

There is a very high level of compliance for express road or motorway already in 2013, over 99% of the kilometres, which has been slightly improved with additionally planned projects by 2030. There are only small projects in Finland and in Italy outstanding for full compliance by 2030 but these are known to the responsible authorities.

Regarding the KPI for clean fuels there are still some issues to be agreed upon, most notably agreement of which clean fuels should be made available for the entire corridor, be it Electricity, Liquefied Natural Gas (LNG), Compressed Natural Gas (CNG) or Hydrogen. Although in general clean fuels are available on the whole corridor, some have less coverage in some parts of Europe, for example LPG (liquefied petroleum gas) is not available in Finland or in the Copenhagen region.

Cross-border sections

By the year 2030 all cross-border road sections will be in place and compliance achieved, these are notably the Fehmarnbelt connection between Denmark and Sweden and the Brenner motorway between Austria and Italy. There are also cross-border sections that will remain maritime links notably between Sweden and Finland as well as between Italy and Malta.

Table 57: Cross-border road sections on the ScanMed Corridor

Cross border road sections
Project ID 5446: E18 Hamina – Vaalimaa, FI
Project ID 5109: A 8 Kreuz München-Süd - Dreieck Inntal [part of DE CPR 2], extension of lanes, DE
Project ID 5010: B207: Puttgarden - Heiligenhafen-Ost [part of DE CPR 2], extension of lanes, DE
Project ID 5825: A12 Rehabilitation Inn bridge Kiefersfelden (border DE-AT) - Kufstein south, DE/AT
Project ID 5110: A 93 Innbrücke Kiefersfelden, DE/AT
Project ID 5839: Expansion of safe and secure truck parking spaces and truck parking information systems, DE/AT
Project ID 5832: A 13 Rehabilitation of carriageways and coating Europe bridge, AT
Project ID5829: A 13 Rehabiltation Bergisel tunnel and Sill bridge 1, AT

Cross border road sections
Project ID5830: A 13 Safety upgrading of main carriageways and reconstruction of junction Innsbruck south, AT
Project ID5833: A 13 Rehabilitation Zieglstadl bridge - Äussere Nösslach bridge 1, AT
Project ID5831: A 13 Reconstruction of junction Patsch-Igls, AT
Project ID5975: URSA MAJOR 2, DE/IT/NL
Project ID5517: URSA MAJOR NEO, DE/IT/NL
Project ID5015 Multimodal e-mobility connectivity for the Oresund Region (MECOR), DK/SE
Project ID 5520: Nordic Way, FI, SE, DK, NO

Source: Rамböll, May 2017

Missing links

Missing sections or gaps exist in Finland and in Italy. The missing section in Finland is Naantali-Raisio and in Italy Ancona Sud – Porto di Ancona. These amount to about 0.3% of the entire length of the corridor. The section Ancona Sud – Porto di Ancona is an end-point in the corridor and not therefore really a missing link. The section Naatali-Raisio connects to the port of Naatali and connection by ferry to Sweden.

8.3 Air Infrastructure (Airports)

In general, airports of the core nodes aligned with the corridor comply with the Regulation (EU) 1315/2013 in term of open access but have some deficiencies in meeting the other goals in term of SESAR development, capacity and multimodal connection, in particular with rail.

Regarding SESAR and the implementation actions for the Single European Sky objective, they are still at early stages and will involve airports on the ScanMed Corridor, according to the strategy defined by the 2015 European ATM Masterplan, in the next years. A critical issue in this domain is to coordinate the development of the project and, at the same time, to foster the related investment in all the airports.

Out of the 21 analysed airports, 8 of them reached in 2015 an annual passenger traffic level above their respective declared potential capacity (Oslo, Göteborg Landvetter, Berlin Tegel and Schönefeld, Hamburg, Hannover, Bologna,Rome Fiumicinoand Palermo) and 2 of them a passenger traffic flown that is close to the declared potential capacity (Stockholm and Copenhagen).

During last year, important capacity improvements have been reported in Munich (April 2016, T2 Satellite, 11 million pax*year), Rome Fiumicino (December 2016, Molo E, 6 million pax*year, Oslo Gardermoen (April 2017, T2, 4million pax*year).

Capacity enlargement plans are ongoing in all highlighted airport except for Göteborg and Hamburg that, at this time, do not envisage infrastructural measures aiming at increasing capacity. The enlargement plans are usually disputed on a local level. Airport managers, industry representatives and residents impacted by the noise and other harmful emission of the airport and the resulting air and land traffic discuss whether and how the capacity can be increased in a sustainable way. In some case the location itself of the airport is a physical limit to the capacity expansion and bigger programme envisaging the relocation of the airport could be considered. A potential threat to the compliance of the airport to the Regulation in term of capacity is the time inconsistency of the intervention. In some case delays in the implementation of the plans worsen the capacity problems, as in the case of Berlin-Brandenburg (BER), that suffers from delayed completion.

Quite all the airports are expected to comply with the Regulation in terms of multimodality and rail accessibility, just few cases will not comply due to the fact that the investment that would have been required would be excessive with respect to the expected traffic flow and so to the related benefit. For the ScanMed airports of Helsinki, Stockholm, København, Berlin, Hamburg, München and Roma, the possibility and necessity for a connection to the high-speed railway network has to be analysed in a separate study by these airports and regional stakeholders.

In some case the intervention aiming at a better connectivity are not under the direct control of the airport manager, then they could be not directly controlled. In particular in the cases of connectivity of the airport with the high speed rail, the involvement of other stakeholders is relevant and the interest of the airport - and the goal of the airport connectivity - could be overshadowed by other transport interest.

The same problem occurs regarding the road connectivity that seems to become a bigger problem due to the saturated road access at peak times in most of the airports of the core nodes aligned with the corridor.

It should be discussed with the airport managers whether airports as single installations would require a local, regional or national coordination (e.g. the German "Flughafenkonzept", that is the airport concept established in 2009 or in the framework of the Italian "Piano Nazionale degli Aeroporti", that is the national plan on airports), rather than or in addition to a European Corridor coordination, despite their "land" catchment areas are crossing borders (e.g. København/Malmö). However, issuing an "Airport National Plan" could lead to incoherence between the Plan and the current definition of the core network. As an example, the latest version of Italian "Piano Nazionale degli Aeroporti"[31], which provides a cluster of 10 "strategic" airports (one per "traffic basin"), and other 26 "airports of national interest", identifies 3 "strategic" airports that are on ScanMed Corridor but not part of the core network, namely Firenze/Pisa, Bari and Catania.

8.4 Maritime Infrastructures (Ports) and MoS

In general, the majority (19) of the ScanMed core ports is connected with railway access to the hinterland. The only exemptions are the Danish side of Copenhagen Malmö Port (CMP) and the Italian ports of Bari, Palermo and Augusta. For none of these ports compliance can be expected until the year 2030. Due to the absence of a national railway network, this parameter cannot be applied on the Maltese ports of Marsaxlokk and Valletta. Hence, this parameter will be fulfilled by 83% (19 of 23) of the ScanMed ports on which this parameter can be applied in the year 2030.

A comparable initial position can be noted with regard to the connection of the core ports with inland waterways. Due to geographic, climate, historic and topographic reasons there aren't any inland waterways which are used for freight transport in Malta, Italy, Denmark and Norway. Half of the Finish, Swedish and German core ports have connection to inland waterways. The other half is located too far away from the next access point so that a connection cannot be established at reasonable efforts.

[31] Released by Italian Government on 30.09.2014.

All ports comply with regard to sea access, free access to at least one terminal, reception facilities for ship generated waste and ICT. Furthermore, the core ports along the ScanMed Corridor face new challenges and technical requirements by improving and further developing these parameters. Examples are reception facilities for sludge from scrubbers which are a new type of ship generated waste or ongoing investments into better ICT-systems as well as the adaption of fairways to new generation of ships.

Almost all ports are planning to modernise and expand their capacity in case of need. Many projects which aim at the modernisation and expansion of port capacities exist in the ports. Only one port of 25 seems not to have any plans and two ports seem to have only desultory plans for the expansion and modernisation of their capacities.

Most efforts still have to be done with regard to the availability of clean fuels (e.g. LNG and methanol). At present, clean fuels are only available in 20% of the ScanMed ports. However, 13 ports are planning to provide such fuels until the year 2030. Nevertheless, the provision of clean fuels seems to be the most critical path on the way towards an efficient and sustainable transport corridor. Fifteen ports risk not to be able to provide clean fuels in the year 2030.

A main hindrance may be the fact that the construction of such facilities is quite expensive while the demand is currently limited to only a couple of ships. Therefore, the political and financial framework must be set so that investment costs can be spread over more users.

It can be noted that the Scandinavian and Finish ports have progressed most with regard to the provision of clean fuel. It is recommended that German, Italian and Maltese port infrastructure managers and politicians cooperate with and learn from their appropriate partners in the Scandinavian countries and Finland.

8.5 Rail-Road Terminals

Since the terminal users were not directly involved in the Corridor Forum and the analysis, yet, any detailed administrative or operational bottleneck for the terminals cannot be reported. Since the terminals are challenged by legislation in railways and roads (and inland waterways) and for transport as such the modal inconveniences apply also to the terminals.

The European Parliament has adopted the update of the Directive 96/53 on weights and dimensions in international road transport which needs to be implemented into national law by mid-2017, now. The impact on terminals is due for longer vehicles, aerodynamic devices and the – anticipated – increase of the transport of 45 foot containers.

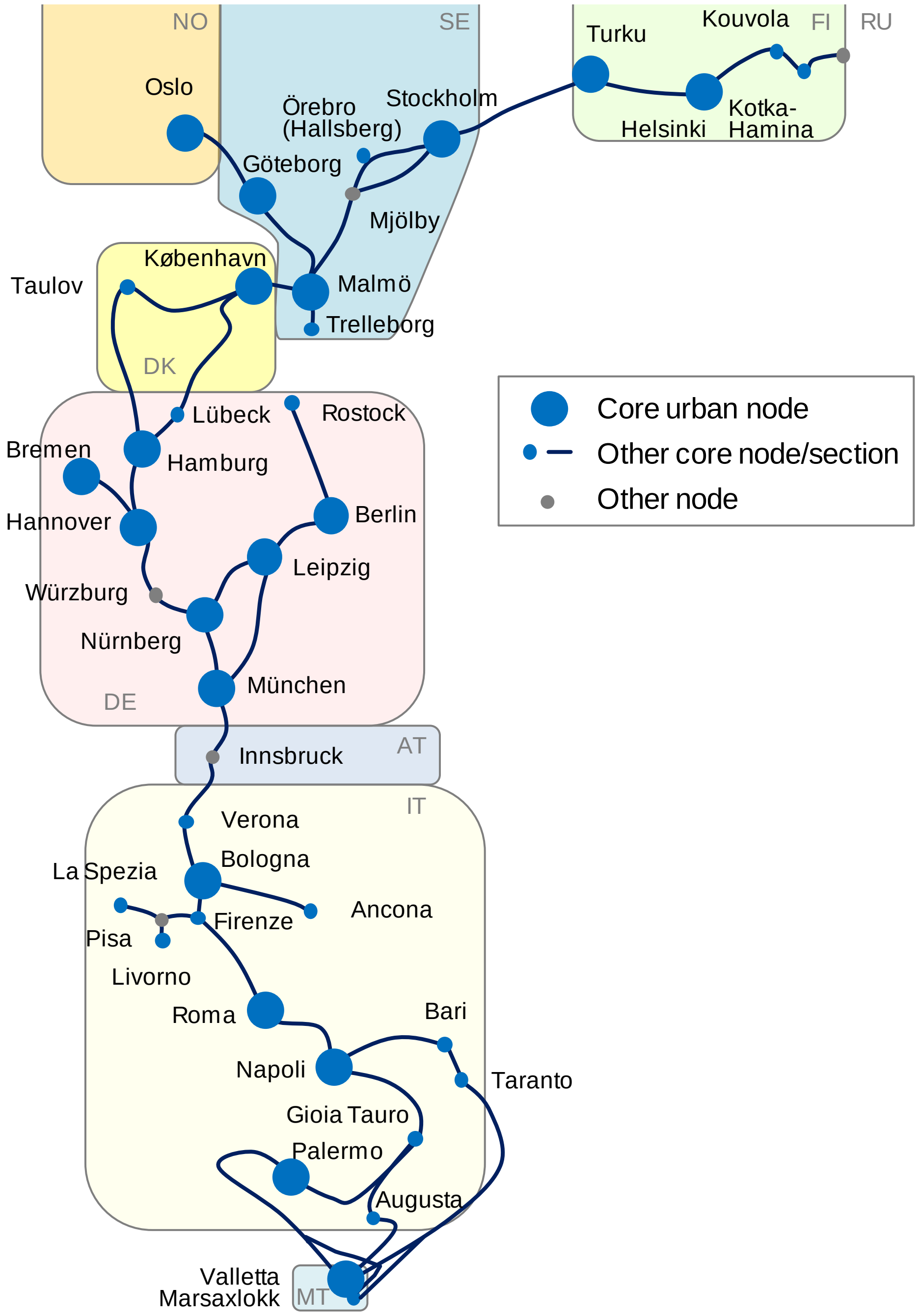
The Directive 92/106, which is of equally importance for combined transport needs to be improved still and the consultation process should involve also terminals so that proper definitions as regards e.g. "close appropriate terminal" can be agreed upon which are easily applicable by the market parties and the authorities.

9 Analysis of urban nodes

Urban nodes are a crucial component of TEN-T corridors merging and redistributing traffic flows. The ScanMed Core Network Corridor comprises a total of 19 urban nodes in seven Member States and Norway (as a member of the European Economic Area). In addition to 18 urban areas within the European Union the Norwegian capital Oslo has been elaborated, too.

According to Regulation 1315/2013, the Scandinavian-Mediterranean corridor core network is characterised by nineteen urban nodes. Eighteen of them are located in six countries belonging to the European Union (Finland, Sweden, Denmark, Germany, Italy and Malta) and one in Norway (Oslo). The Scandinavian-Mediterranean nodes are: Helsinki (FI), Turku (FI), Oslo (NO), Göteborg (SE), Malmö (SE), Stockholm (SE), København (DK), Hamburg (DE), Bremen (DE), Hannover (DE), Berlin (DE), Leipzig-Halle (DE), Nürnberg (DE), München (DE), Bologna (IT), Roma (IT), Napoli (IT), Palermo (IT) and Valletta (MT). The next figure provides an overview on the locations of all these urban nodes.

Figure 26: Urban nodes on the ScanMed Corridor



Source: KombiConsult; December 2016; Oslo has been marked, too

Table 58: Overview on ScanMed urban nodes

Coun-try	Urban node	Shared with	Involved modes		Access points on the core network				
			Rail	Road	Airport	Maritime port	Inland port	RRT	Trimodal terminal
FI	Helsinki	NSB	X	X	X	X			
	Turku		X	X	X	X			
NO	Oslo		X	X	X			X	X
SE	Göteborg		X	X	X	X	X	X	
	Malmö		X	X	X	X		X	X
	Stockholm		X	X	X			X	X
DK	København		X	X	X	X		X	
DE	Hamburg	NSB, OEM	X	X	X	X	X	X	X
	Bremen	NSB, OEM	X	X	X	X	X	X	
	Hannover	NSB, OEM	X	X	X		X	X	X
	Berlin	NSB, OEM	X	X	X		X	X	X
	Leipzig-Halle	OEM	X	X	X			X	
	Nürnberg	RD	X	X	X		X		X
	München	RD	X	X	X			X	
IT	Bologna	MED, BA	X	X	X			X	
	Roma		X	X	X			X	
	Napoli		X	X	X	X		X	
	Palermo		X	X	X	X			
MT	Valletta			X	X	X			

Source: HaCon, June 2017

Table 58 provides an overview on the main characteristics of the urban nodes and the connections with other corridors. Overlaps with other corridors exist for 9 nodes (+ 1 CNC = 4; + 2 = 5) while the remaining 10 nodes have no access to any other corridor. With the exception of Valletta, all nodes provide access to both rail and road corridor networks. Inland ports and maritime ports are present in six and ten nodes, respectively. Seven nodes provide access to a trimodal terminal. Moreover, fourteen nodes include a core rail-road terminal (RRT). Each Scandinavian-Mediterranean urban node includes a core airport.

In this chapter, the urban node analysis, according objectives as well as the methodology will be presented. Detailed results of each urban node analysed are given in subchapter 8.3.

9.1 Introduction and objectives

In line with the tender specifications the analysis of urban nodes within the Scandinavian-Mediterranean corridor aims at the identification of physical, technical and administrative barriers to the full development and functioning of the CNC. The underlying official documents by the European Commission are Regulation (EU) 1315/2013, Article 30 and 41, as well as the Issue Paper "Urban nodes / mobility". It is important to notice that the Commission Delegated Regulation (EU) No 275/2014 of 7 January 2014 amending Annex I to Regulation 1316/2013 had no influence on the defined nodes.

Urban nodes are 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" (Regulation 1315/2013, 3p). According to this definition the geographic boundaries are not clearly determined. Urban nodes are further specified as starting points (first mile), final destination (last mile) and/or points of transfer within or between different transport modes for freight and passengers on the trans-European transport network. Urban nodes shall be connected with multimodal links to achieve long-term sustainable mobility on the comprehensive network. Overall goal of the urban node network development is the appropriate interconnection of passenger and freight transport between all modes involved which includes for example the connection between airports and TEN-T railway lines. Furthermore, a seamless connection between the (long-distance) TEN-T infrastructure and regional / local traffic and urban freight delivery on the last mile shall be achieved. Finally, urban bottlenecks are to be removed leading the enhancement of multimodal transport solutions and a shift towards more sustainable mobility for both freight and passenger.

9.2 Methodological approach

The urban node analysis has been conducted based on a schematic approach for all nodes exploiting already gathered data and illustrating all results in a harmonised way. As appropriate, deeper individual analyses may be conducted on demand at a later stage as part of task 6 of this study.

The nodes to be analysed were chosen according to Regulation 1315/Annex II. Due to the unclear geographical definition of an urban node the analysis area has been set to the urban area which is often equal to the NUTS-3 region. Corridor elements which are outside the above defined analysis area but obviously belong to the urban node were also considered.

Based on the official TENtec interactive maps showing the CNC elements in the respective urban areas, three layers (=charts) have been produced for each urban node with different contents as follows:

- Layer I: Overview on the urban node including entire corridor infrastructure
- Layer II: Analysis of the corridor lines
- Layer III: Analysis of the last-mile connections

Layer I

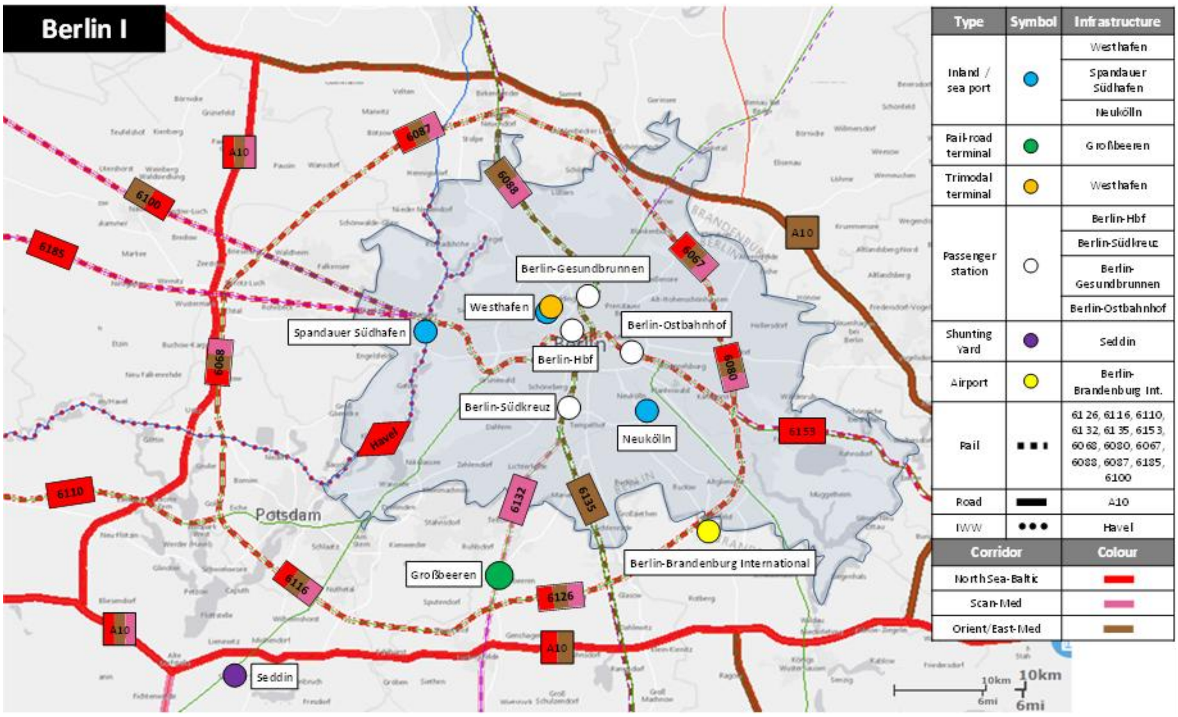
Apart from the TENtec basic map with the various coloured corridor alignments this layer includes:

- Marking of the urban area
- Railway route numbers
- Road numbers
- Inland waterway name

- Urban node-specific infrastructure (access points to the corridor) according to Regulation 1315/2013
  - Intermodal, rail-road terminals
  - Intermodal, trimodal terminals (rail, road, water)
  - Maritime ports
  - Inland ports
  - Airports
- Additional access points
  - Passenger stations (with regular high-speed stops, long-haul passenger trains to/from other urban nodes)
  - Shunting yards (train composition)

It is important to notice that in case of overlapping corridor alignments only one corridor is visible. Therefore, the number and name labels are then multi-coloured. Concerning water access points, trimodal terminals have been set only in case of intermodal handling. An example for layer I can be seen below:

Figure 27: Urban node analysis - layer I (example)



Source: HaCon, June 2016

Layer II

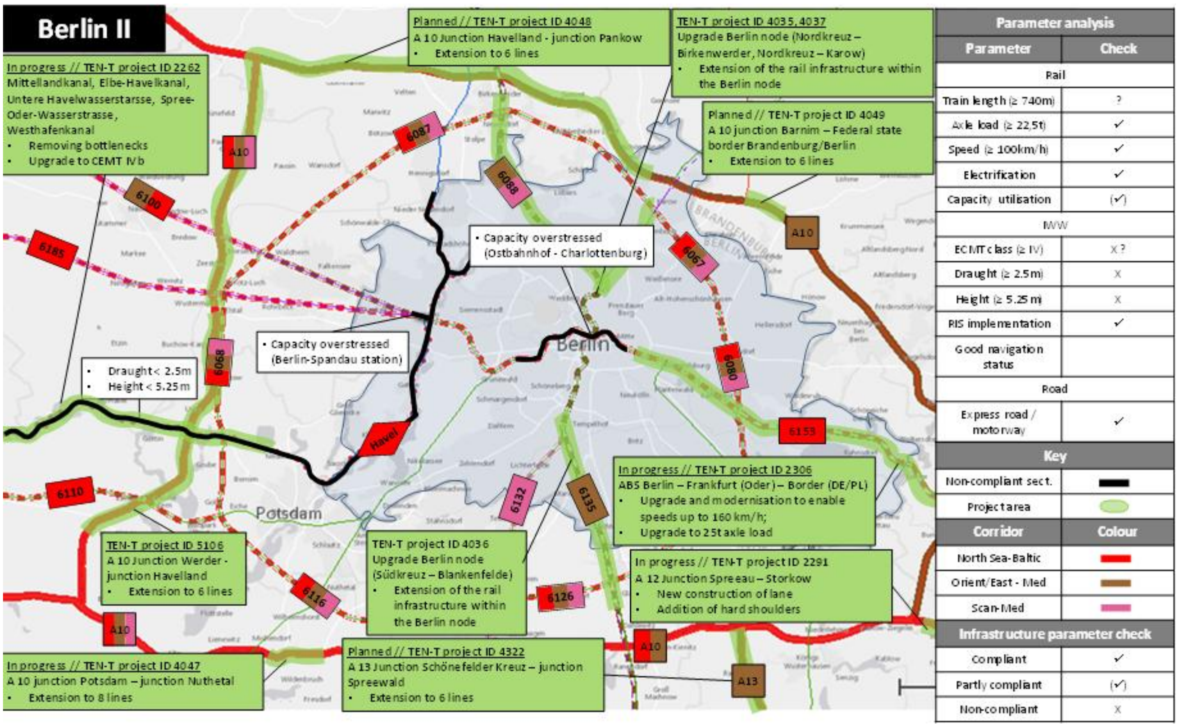
Apart from the TENtec basic map with the various coloured corridor alignments this layer includes:

- Marking of the urban area
- Railway route numbers

- Road numbers
- Inland waterway name
- Compliance check of the corridor lines
- Projects

The compliance check addressed the requirements of the regulation and has been carried out for the urban node according to the KPIs of the project list. Non-compliant sections have been highlighted in black and labelled with a short description of the failure(s). The mode-specific parameters for the check are summarised in a table on the layer. In case of full compliance within the entire node, the parameter in the table was marked with ✓, a partial compliance with (✓) and a total non-compliance with X. Projects with reference to the non-compliant sections or in case of particular relevance for the urban node development are displayed in the map together with key upgrade features. The project area has been highlighted in green and labelled with a short, standardized description. An example for layer II can be seen below:

Figure 28: Urban node analysis - layer II (example)



Source: HaCon, June 2016

Layer III

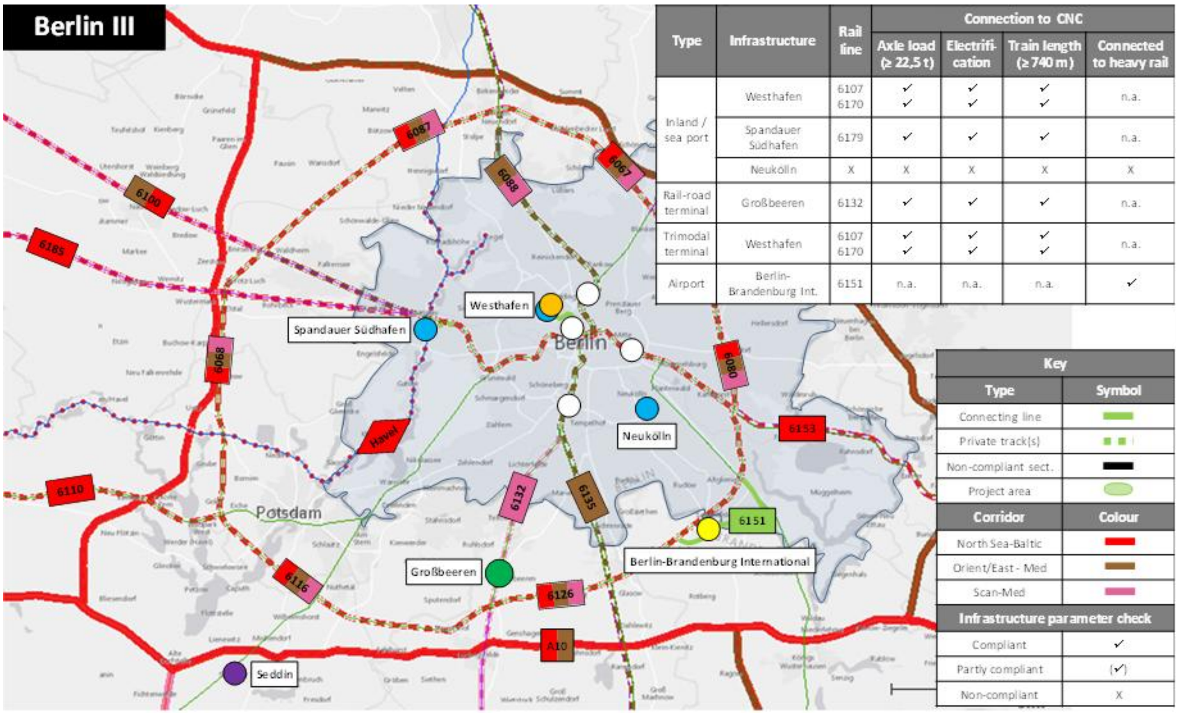
Apart from the TENtec basic map with the various coloured corridor alignments this layer includes:

- Marking of the urban area
- Relevant railway route numbers
- Urban node-specific infrastructure (access points) according to Regulation 1315
  - Intermodal, rail-road terminals

  - Intermodal, trimodal terminals (rail, road, water)
  - Maritime ports
  - Inland ports
  - Airports
- Additional access points
  - Passenger stations (with regular high-speed stops, long-haul passenger trains to/from other urban nodes)
  - Shunting yards (train composition)
- Compliance check of the last mile access point connection
- Connecting lines between the corridor alignment and the access points
- Relevant private tracks prior to access points

The underlying question for the compliance check was whether it is possible to perform a continuous, seamless traffic from the CNC lines via the last mile connection until the respective access points (until the transfer station) and vice versa. The parameter to be analysed were taken from the Regulation and the KPI list and narrowed down to those aspects that are relevant for interoperability on the last mile. The rail connection of inland ports, trimodal terminals and rail-road terminals to the core network has been analysed according to the three parameters axle load, electrification and train length. However, in case of missing heavy rail connection to the terminals, the information has been indicated in the appropriate field of the compliance check table. Rail connections to airports have been only evaluated on the basis of heavy rail connection. Furthermore, only rail parameters have been taken into account as similar road criteria do not exist due to its flexibility allowing seamless connections. All compliance check results have been summarised in a table on the chart. Again, non-compliant line sections of the last mile as well as relevant projects were highlighted and labelled. An example for layer III can be seen below:

Figure 29: Urban node analysis – layer III (example)



Source: HaCon, June 2016

Working Group "Ideas Laboratory on Core Urban Nodes"

The Scandinavian-Mediterranean Corridor has also organised two Ideas Laboratories on Core Urban Node (München, 17th/18th November 2016 and København/Malmö, 23rd/24th March 2017). The aim of the ideas laboratories was to deal with urban node-specific topics in a focus group of experts as a peer-to-peer exchange of good practices and creating synergies. General conclusions of the two Working Groups are presented in the end of paragraph 9.3.20 while urban node-specific conclusions are included in paragraph 9.3 "Analysis of results" (more specifically in paragraphs 9.3.1 to 9.3.19).

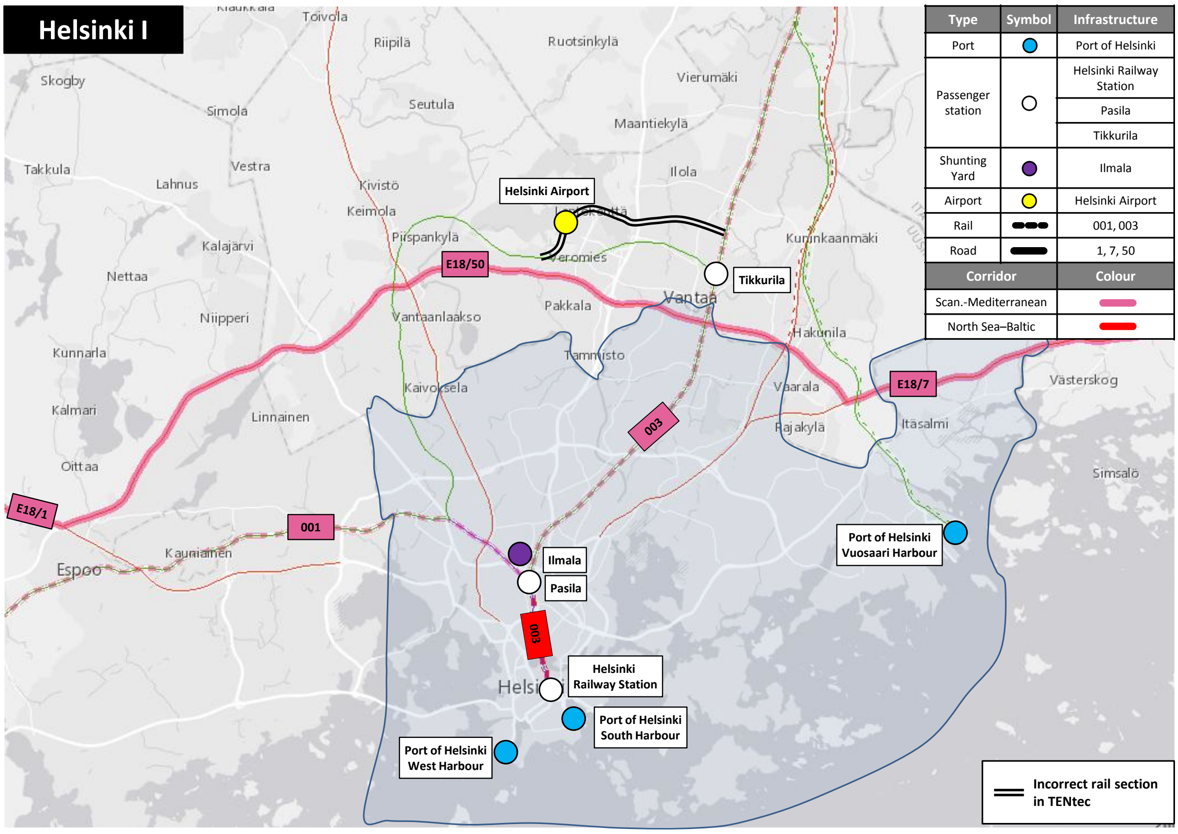
9.3 Analysis results

The main analysis results are described hereunder for each urban node along the Scandinavian-Mediterranean corridor.

9.3.1 Helsinki

Helsinki is the biggest city and capital of Finland and it is located on the North Sea-Baltic and Scandinavian-Mediterranean corridors. Helsinki is the main logistic node in Finland. The port of Helsinki is a TEN-T core port, one of the biggest cargo ports in Finland and one of the biggest passenger traffic ports in Europe. The port serves container and roro traffic. The port hinterland is entire Finland. The Vuosaari harbour serves the cargo transport and the West harbour and the South harbour serve the passenger traffic and roro-transport. The most important regular passenger traffic connections are to Tallinn and Stockholm. The Helsinki airport is a TEN-T core airport, clearly the biggest airport in Finland and a hub, which serves both domestic and international traffic. The TEN-T core road E18 (the roads 1, 7 and 50) connects Helsinki to the east-west direction. Other main roads connect Helsinki to the north-south direction. The Helsinki node is the main node of the north-south and east-west rail connections.

Figure 30: Helsinki urban node

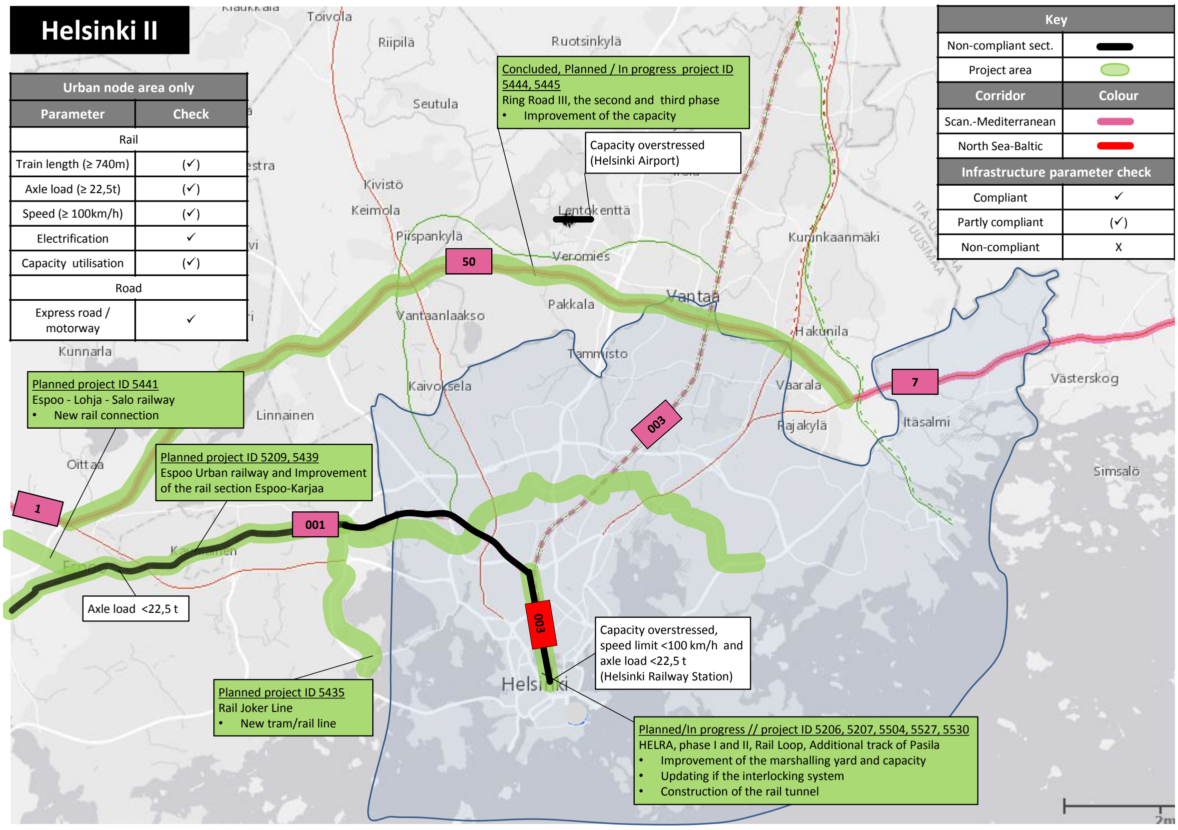


Source: Ramböll Finland, May 2017

Major investment packages are planned for all transport modes. They include for example several different kinds of improvement, repair and traffic management measures for the roads, capacity improvement and updating measures, additional tracks and new lines for the railway infrastructure, deepening of the fairway and measures to improve the capacity and efficiency for the port and maritime infrastructure as well as improvement and repair measures for the Helsinki airport.

The road corridor network in Helsinki is compliant with regard to the "express road/motorway" requirement, however the road 50 (Ring Road III) has capacity problems. The project 5444 will improve the situation, but they do not solve all the problems. There are also capacity problems in the Helsinki rail yard and the Helsinki–Pasila rail section. There are several ongoing/planned projects to improve the current situation. Moreover, the connection to Helsinki rail yard doesn't meet the requirements for the train length and the axle load, which however, is used only for the passenger traffic. Also the rail connection from the Pasila station to the west (001) does not meet the requirements for the axle load. The rail system does not meet totally the requirements for the speed limits and axle load. ERTMS is not implemented and the Finnish rail system has the 1524 mm rail gauge.

Figure 31: Analysis of corridor lines in Helsinki



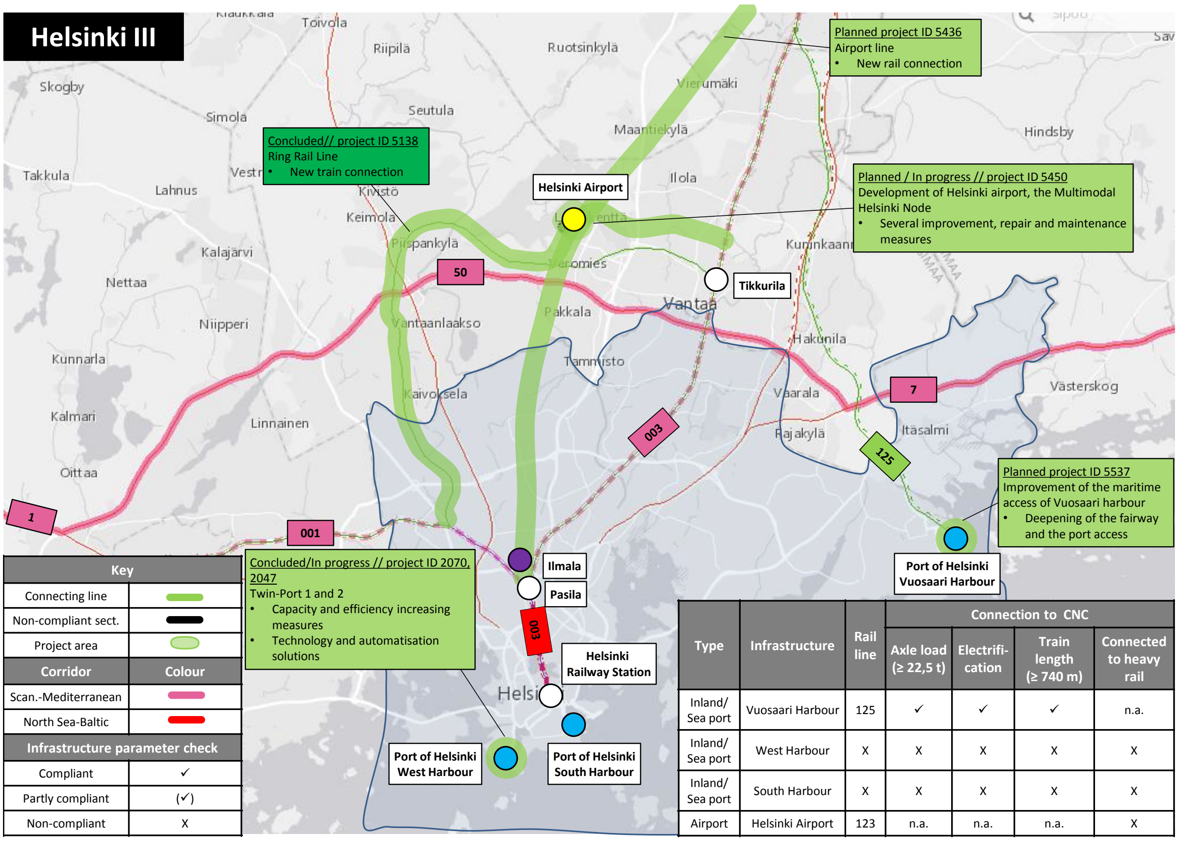
Source: Ramböll Finland, May 2017

The last-mile rail connection to the Vuosaari harbour (125) is compliant with regard to the "axle load", "electrification" and "train length" requirements. On the other hand, West and South harbours as well as Helsinki airport are not connected to heavy rail.

The most important completed project related to the last-mile sections is the Ring Rail Line (project 5138), which connected the Helsinki Airport to the rail system.

The rail and road connections to the port of Helsinki are not in the TEN-T core network. Also the road connection to the Helsinki Airport is not in the TEN-T core network.

Figure 32: Analysis of last-mile connections in Helsinki



Key	
Connecting line	
Non-compliant sect.	
Project area	
Corridor	**Colour**
Scan.-Mediterranean	
North Sea-Baltic	
Infrastructure parameter check	
Compliant	✓
Partly compliant	(✓)
Non-compliant	X

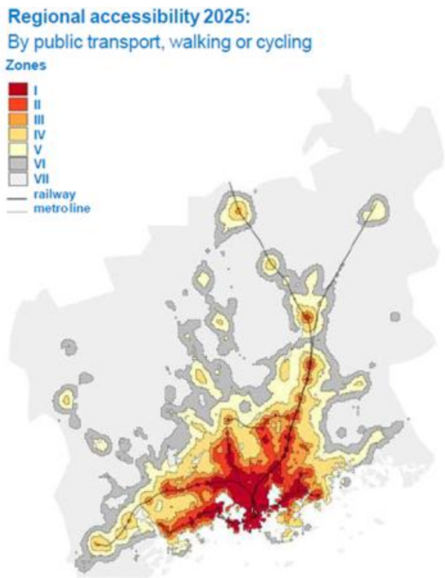
Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
Inland/ Sea port	Vuosaari Harbour	125	✓	✓	✓	n.a.
Inland/ Sea port	West Harbour	X	X	X	X	X
Inland/ Sea port	South Harbour	X	X	X	X	X
Airport	Helsinki Airport	123	n.a.	n.a.	n.a.	X

Source: Ramböll Finland, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

In the Helsinki region the transport and land use planning support each other. The goal is to expand the good accessibility in the region. About 60% of new housing concentrations are located in the areas with competitive public transport services. Accessibility will improve in particular in centres, areas around stations and along the existing and future rail corridors.

Figure 33: Regional accessibility 2025 in Helsinki



Source: Helsinki Region Transport, March 2017

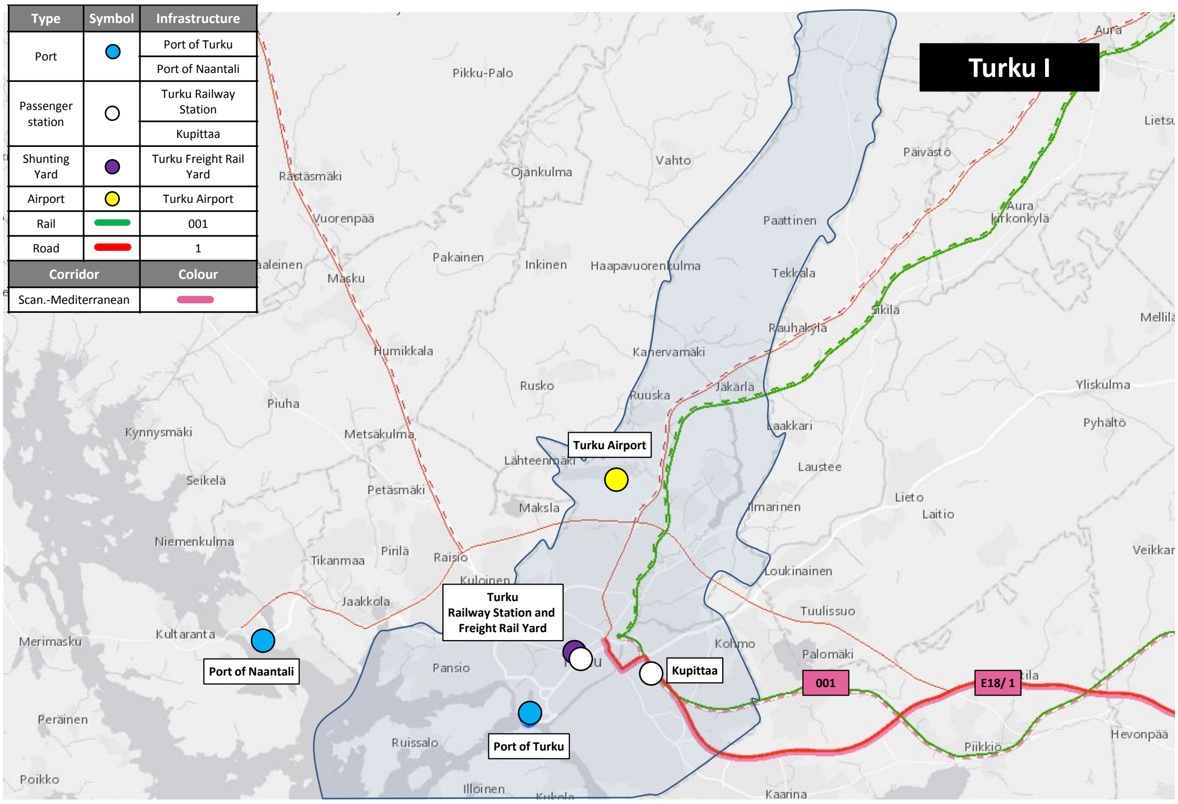
The Helsinki Metropolitan Area develops the multimodal traffic system. The Ring Rail Line was completed last year to connect the Helsinki Airport to the rail system. Expansion of the metro system with "the West Metro" is under construction and it will be completed during this year. "The Jokeri Light Rail Line" has funding decision from the state and the cities. The construction is planned to start in the beginning of the year 2019. "The City Rail Loop" is a planned urban railway line for commuter trains under the Helsinki city centre. When the City Rail Loop is realised, part of the commuter trains in the Helsinki region can be diverted to a track section specially designated for them. The planning of the project is still in progress.

Important part of the sustainable urban development is cycling and walking. The Helsinki Metropolitan Area promotes cycling and it has defined the desired network 2020 for the main cycle roads.

9.3.2 Turku

Turku is one of the biggest cities in Finland and it is located on the Scandinavian-Mediterranean corridor. Turku is together with Helsinki the main logistic node of the connections to Scandinavian. The ports of Turku and Naantali form together a TEN-T core port. The focus of cargo transports in the port of Turku is on trailer and container transports. The transport of the port of Naantali consists of trucks, trailers, liquids and dry bulk. There are regular passenger traffic connections to Stockholm and Turku is the second largest passenger port in Finland. Turku airport is a TEN-T core airport. The TEN-T core road E18 (the road 1) connects Turku to the east-west direction. Other main roads connect Turku to the north-south direction. The TEN-T core rail (001) connects the Turku node to the east-west direction and other rails to the north-south direction.

Figure 34: Turku urban node

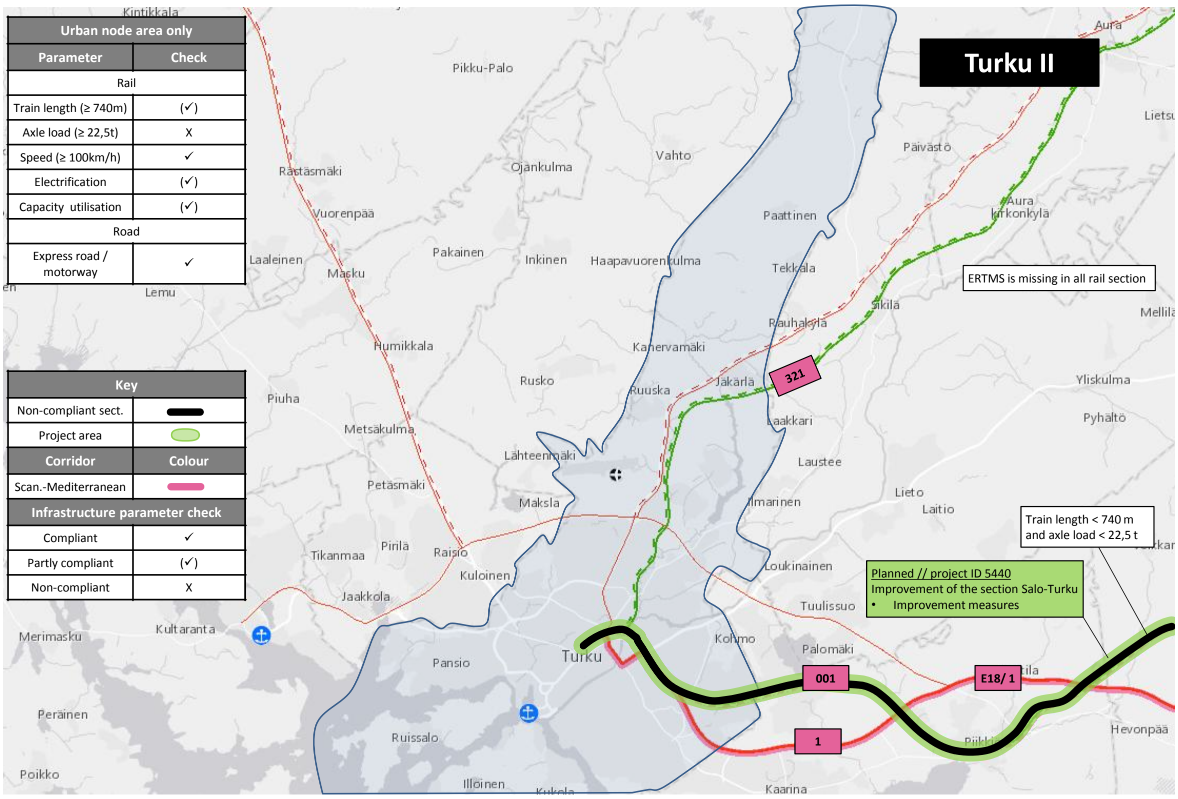


Source: Ramböll Finland, May 2017

The planned infrastructure investments include development of the railway yard and the travel centre and improvement of the rail section Salo–Turku. Also the development of the smart electric public transport system for Turku City Region (tram/el. superbuss) is planned. Furthermore, the investment of the E18 Turku Ring Road is planned, but it is located on the Turku Ring Road (main road 40), which is not in the TEN-T core network.

The road 1 meets the requirements of the motorway/express road. The TEN-t core rail connection towards Helsinki does not meet totally the requirements for the train length, axle load and electrification. Moreover, in some rail sections the capacity utilisation is overstressed. ERTMS is not implemented and the Finnish rail system has the 1524 mm rail gauge. A project for the improvement of the section Salo-Turku has been planned. In particular, output of the project will be the achievement of the 22.5 tonnes axle load target and the elimination of current capacity bottlenecks on the section.

Figure 35: Analysis of corridor lines in Turku

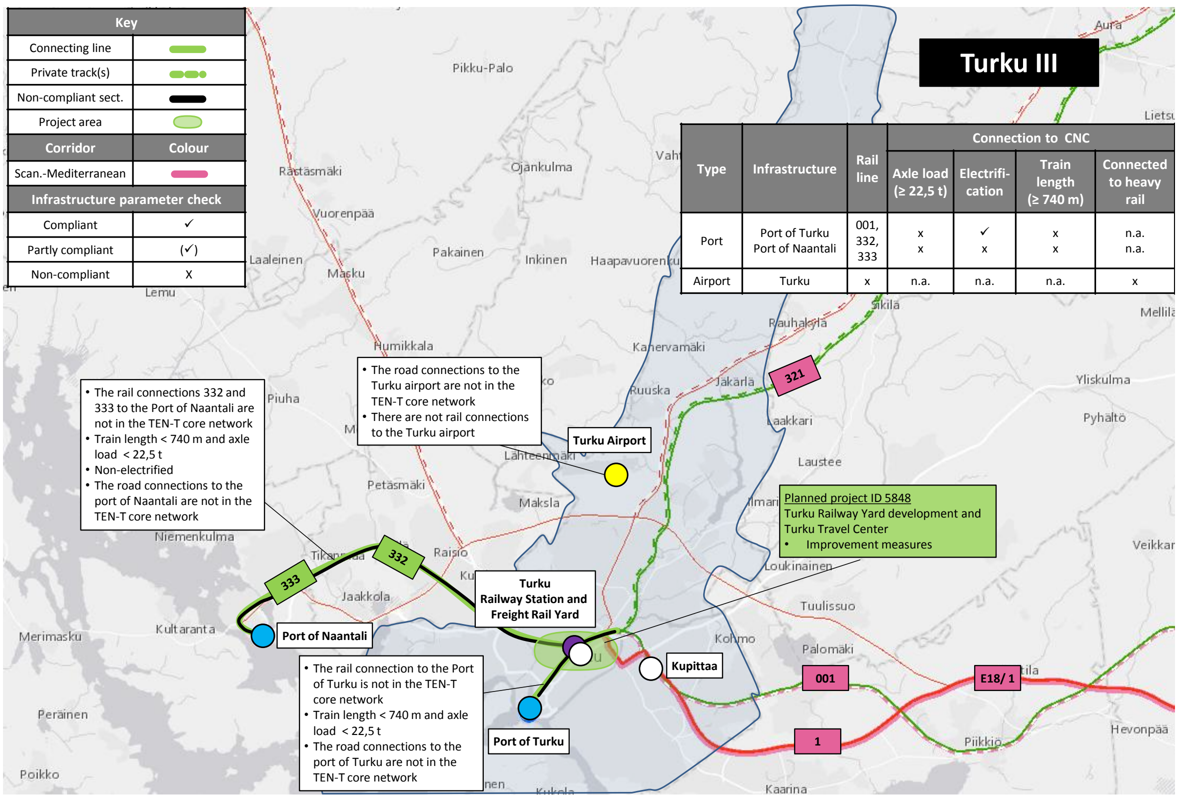


Source: Ramböll Finland, May 2017

The rail connection to the port of Naantali is not electrified and both rail connections to the ports of Turku and Naantali do not meet the requirements for the train length and axle load. The airport in Turku is not connected to heavy rail and no plans for a railway connection to the airport are foreseen.

The rail and road connections to the ports of Turku and Naantali are not in the TEN-T core network. Also the road connection to the Turku Airport is not in the TEN-T core network.

Figure 36: Analysis of last-mile connections in Turku

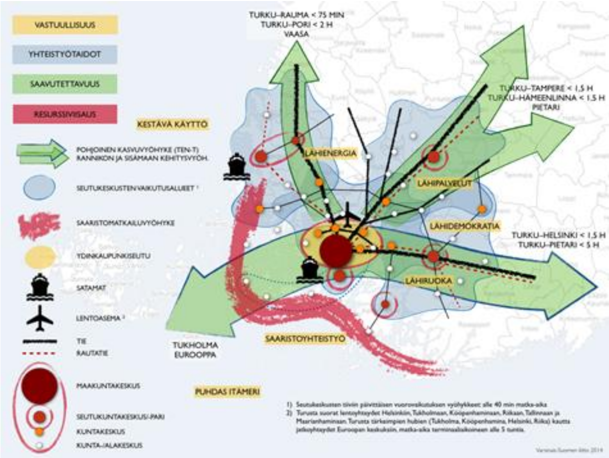


Source: Ramböll Finland, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The interaction of land use, territorial / urban planning and traffic is vital for traffic generation including traffic avoidance in neighbourhoods and modal shift. Related to planning dense and human scale cities, the desired regional structure 2035+ in the Southwest Finland, where Turku belongs, could be called "semi-polycentric". The Structural Model for 2035 includes 14 municipalities of the Turku City Region. The municipalities have common objectives for future growth and development to improve the public transport. The 2nd Land use Housing Transport agreement (LHT) between the state and the 14 municipalities, defines how to implement the model.

Figure 37: Southwest Finland – Regional structure 2035+

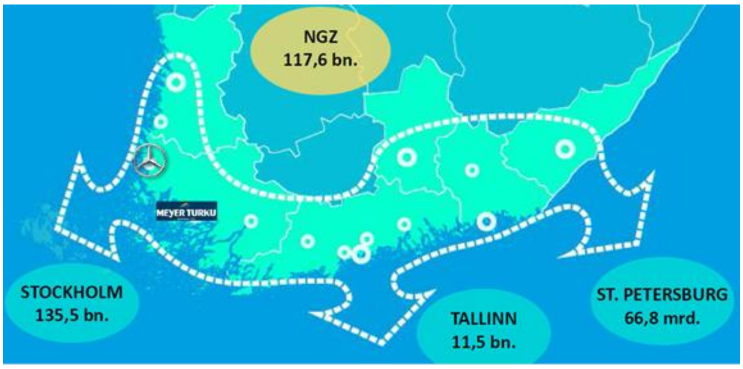


Source: Regional Council on Southwest Finland, March 2017

The city of Turku has plans to develop a smart electric public transport system for the region. Development of the tram system is one of the alternatives. Development of the cycling and walking is important part of the future sustainable transport system. Development of the walking and cycling system requires an own Master Plan.

"The Northern Growth Zone" is a northern Baltic zone stretching from Stockholm via Turku and Helsinki to St Petersburg designed to bring the area's actors together to boost the region's attractiveness and competitiveness in the global arena through the creation of a single, internationally recognized market, a single commuter belt and a world class industry and business cluster.

Figure 38: Northern Growth Zone



Source: Regional Council on Southwest Finland, March 2017

The Turku–Helsinki One Hour Train ("Tunnin juna") is a project, which connects the whole Southwest Finland. The planned project ID 5440 Improvement of the section Turku–Salo is part of the project. The regional accessibility will improve, when the rail section Turku–Uusikaupunki will be electrified.

Figure 39: Turku-Helsinki One Hour Train

Source: Regional Council on Southwest Finland, March 2017

9.3.3 Oslo

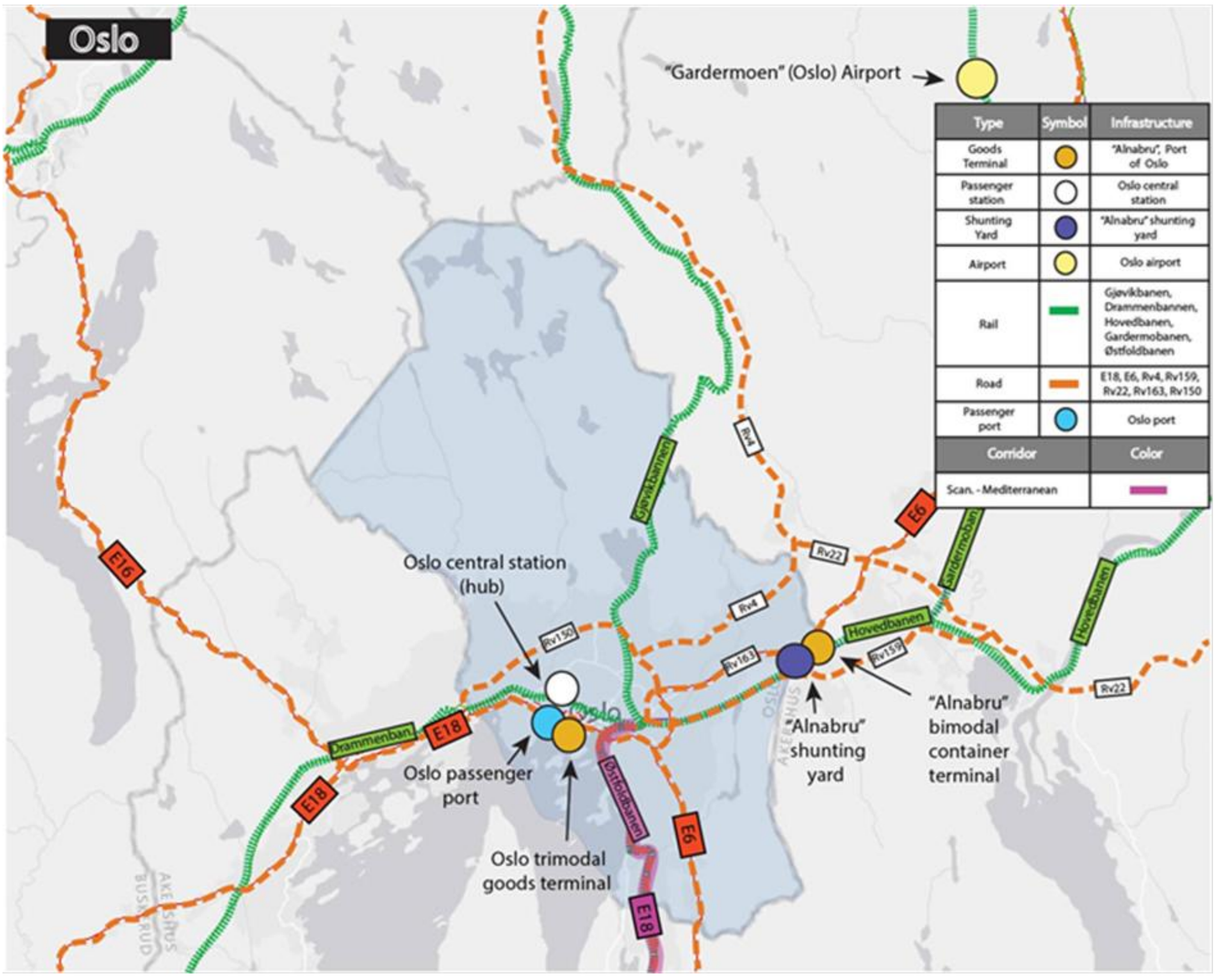
Oslo is a capital of Norway and major financial and trade center in the country. The city is located on Oslo fjord, which provides a good connection with a North Sea.

Figure 40 shows the part of the Scandinavian – Mediterranean railway and road corridor which belongs to Oslo node.

Access points to the node are:

- Oslo port;
- Lysaker railway station on west, Roa railway station on north, Lillestrøm railway station on east and Ski railway station on south;
- International airport (Oslo Airport Gardermoen) on the north of the city.

Figure 40: Oslo urban node

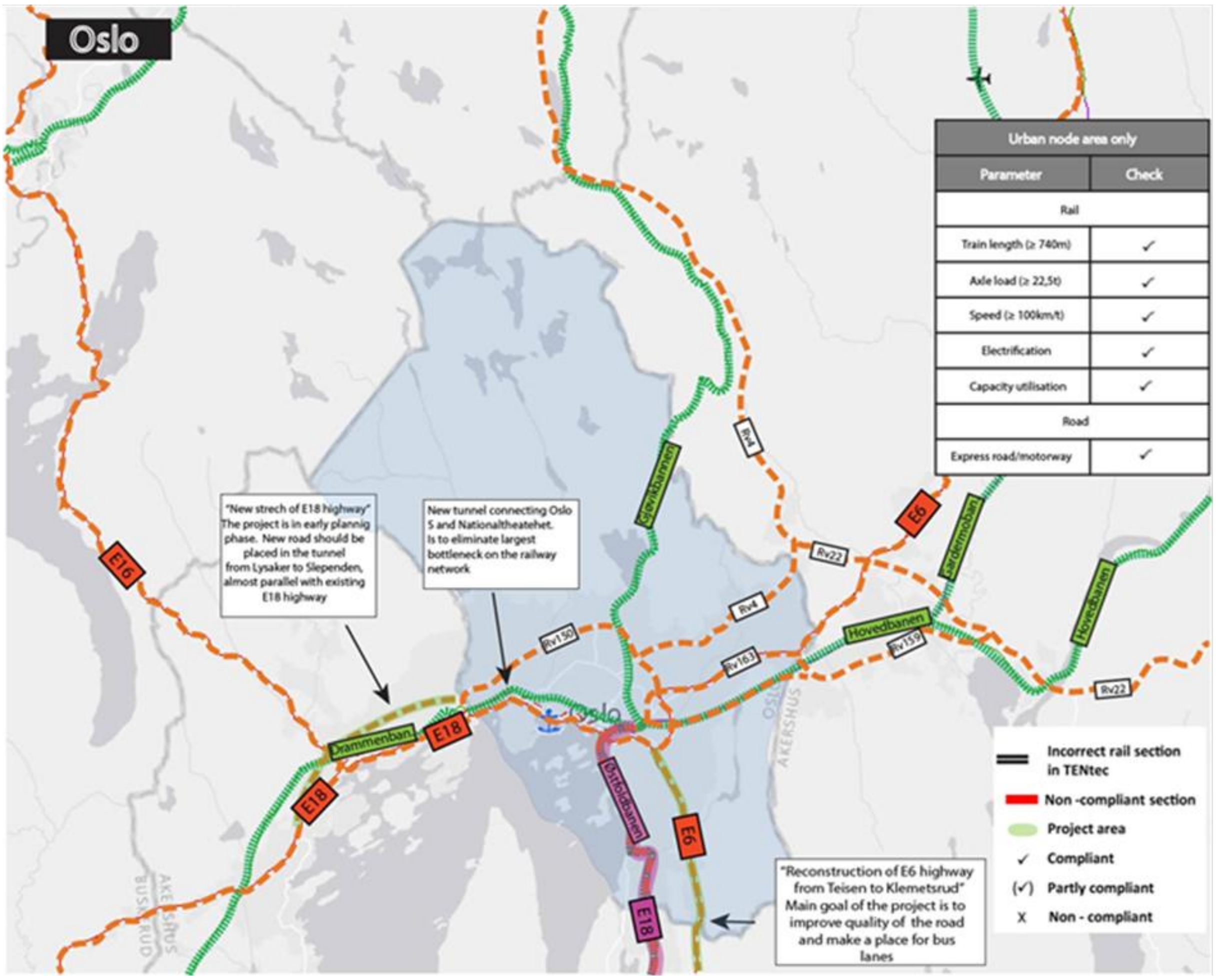


Source: Ramböll Norway, June 2016

Over 900 trains pass Oslo central station every day. The station is the main hub for passenger transport where commuter and long distance rail lines are connected. Numerous bus, tram and metro lines serve area (hub) around the station where passengers can easily reach any part of the city. It is planned an increase of the capacity on several rail lines, which can be achieved by the use of rolling stock with higher capacity or by introducing more trains (higher frequency). This will bring more passengers to the station, which is the main reason for planned expansion of passenger facilities. This could lead to new plans for further improvements of existing railway network (new east-west tunnels under central Oslo) and building of new Oslo bus station over the railway tracks at Oslo Central Station. Those plans are still in early phases and they are not approved by local authorities or government agencies.

Alnabru is bimodal (rail-road) goods terminal located on the east side of Oslo. It is estimated that next 20 years will traffic demand be significantly higher than capacity of the hub. Norwegian railway administration (Jernbaneverket) has a plan to expand capacity within 4 phases. Each phase will be activated when traffic volume reach certain critical points.

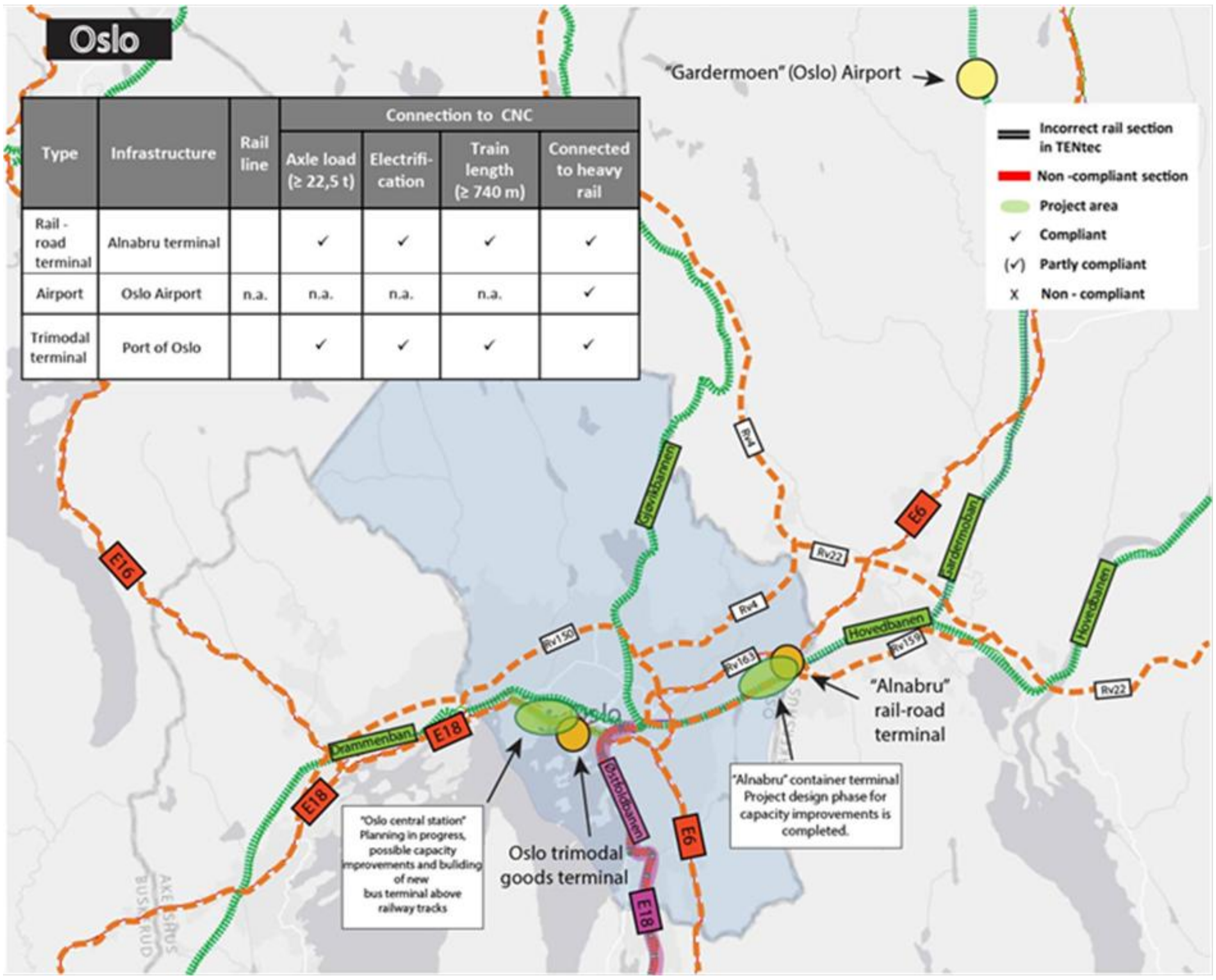
Figure 41: Analysis of corridor lines in Oslo



Source: Ramböll Norway, June 2016

Norwegian railway network consists of 27 main routes with total length of 4220 km. "Drammenbanen" is one of the most important routes and its stretch from Oslo central station to stations Nationaltheatret, Skøyen and Lysaker is considered as the largest bottleneck in the network. Construction of a new tunnel connecting these stations is in early planning stage, but once the plan is approved, a double-track railway tunnel will be built.

Figure 42: Analysis of last-mile connections in Oslo



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
Rail - road terminal	Alnabru terminal		✓	✓	✓	✓
Airport	Oslo Airport	n.a.	n.a.	n.a.	n.a.	✓
Trimodal terminal	Port of Oslo		✓	✓	✓	✓

Source: Ramböll Norway, June 2016

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

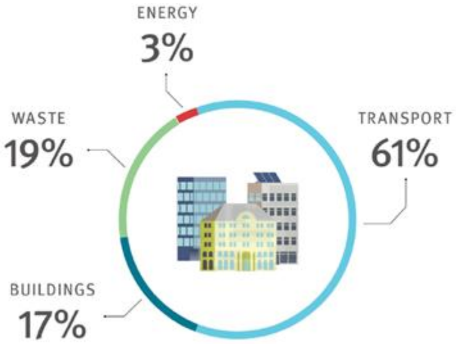
This chapter is focusing on transports impact on greenhouse gas emission.

Norway has adapted the international goal with an ambition of limiting global temperature increase to a maximum of two degrees Celsius. Norway is committed to contribute to a 30% reduction in greenhouse gas emission by 2020, compared to 1990 level (Political decision 2012). Greenhouse gases are primarily CO2. Based on political decisions in 2012 CO2 –equivalent emission in 2020 shall be 45-47 million tons, compared to 59 million tons based on a reference path 2007. This is a 30% cut including credit from CO2 a positive effect from Norwegian forest areas. By 2015 this goal was changed to a (more ambitious) 40% cut by 2030, compared to 1990 level.

City of Oslo has set even more ambitious climate goals for the period to 2025 and 2030:

- 50% CO2 reduction by 2020;
- 95% CO2 reduction by 2030.

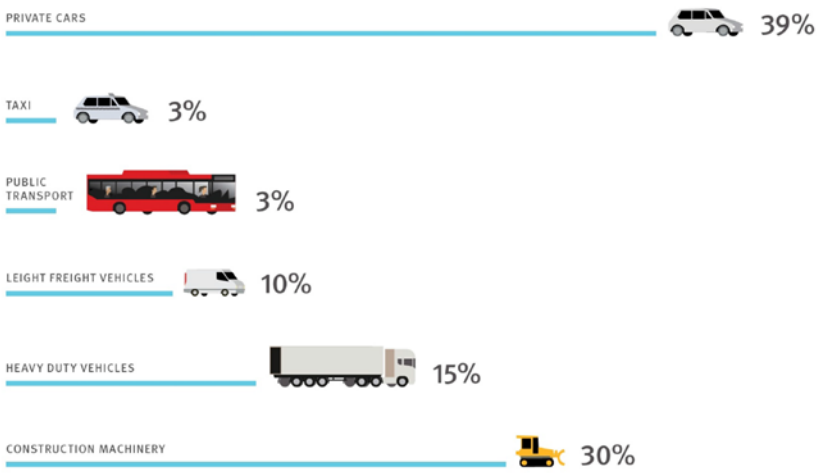
Figure 43: Distribution of CO2 emission. Transport is a major contributor to CO2 emission



Source: City of Oslo, March 2017

Distribution of CO2 emission from transport indicates that a reduction of CO2 emission will have to include several modes of transport, such as cars, construction machinery, heavy trucks and delivery vans and trucks.

Figure 44: Distribution of CO2 emissions from transport



Source: Statistics Norway combined with The City of Oslo's own numbers

Buses and taxies also account for a proportion of CO2 emission.

Strategies towards a zero emission city:

1) Change in mobility – by means of how we transport people and freight;
2) Shift from fossil to renewable energy use (transport);
3) City Governance.

1) Change in mobility

Regional development

Actively develop offices, shopping and residential areas close to public transportation nodes or important / high capacity public transportation infrastructure. At the same time limiting the possibility of development in rural and remote areas in the Oslo region.

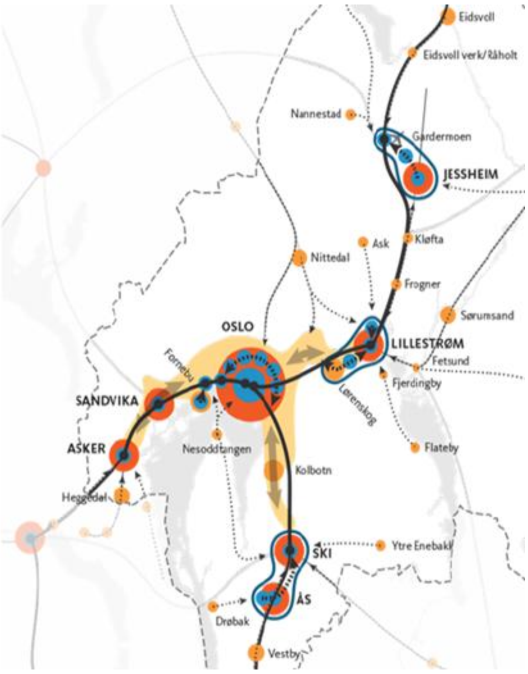
<u>Transportation</u>

20% traffic reduction by 2020

33% traffic reduction by 2030

This within the same timeframe as the Oslo Region will have a predicted to growth from approximately 1.2 million to approximately 1.55 million in 2030.

Figure 45: Regional Development in the Oslo region – Oslo and Akershus



Source: City of Oslo, March 2017

2) Shift from fossil to renewable energy use

Reduction in emission from transport in the Oslo Region by means of:

- Fossil free public transport;
- Zero emission taxi fleet;
- Charging infrastructure for electrical vehicles;
- Zones with restricted access for fossil vehicles;
- Toll road system with zero or low rates for fossil free vehicles. This will encourage car owners to shift to electrical, hydrogen or other fossil free vehicles or hybrids (in 2016 in Norway, EL accounted for 16% and chargeable hybrids for 13% of all new cars, with the Oslo Region as a lead region).

3) City Governance

The City of Oslo is constantly focusing on greenhouse gas emission through integrating goals for the transport sector in:

- Climate Budget 2017 – 2020 and on;

- Develop a Climate Strategy;
- Knowledge shearing with other European countries.

9.3.4 Göteborg

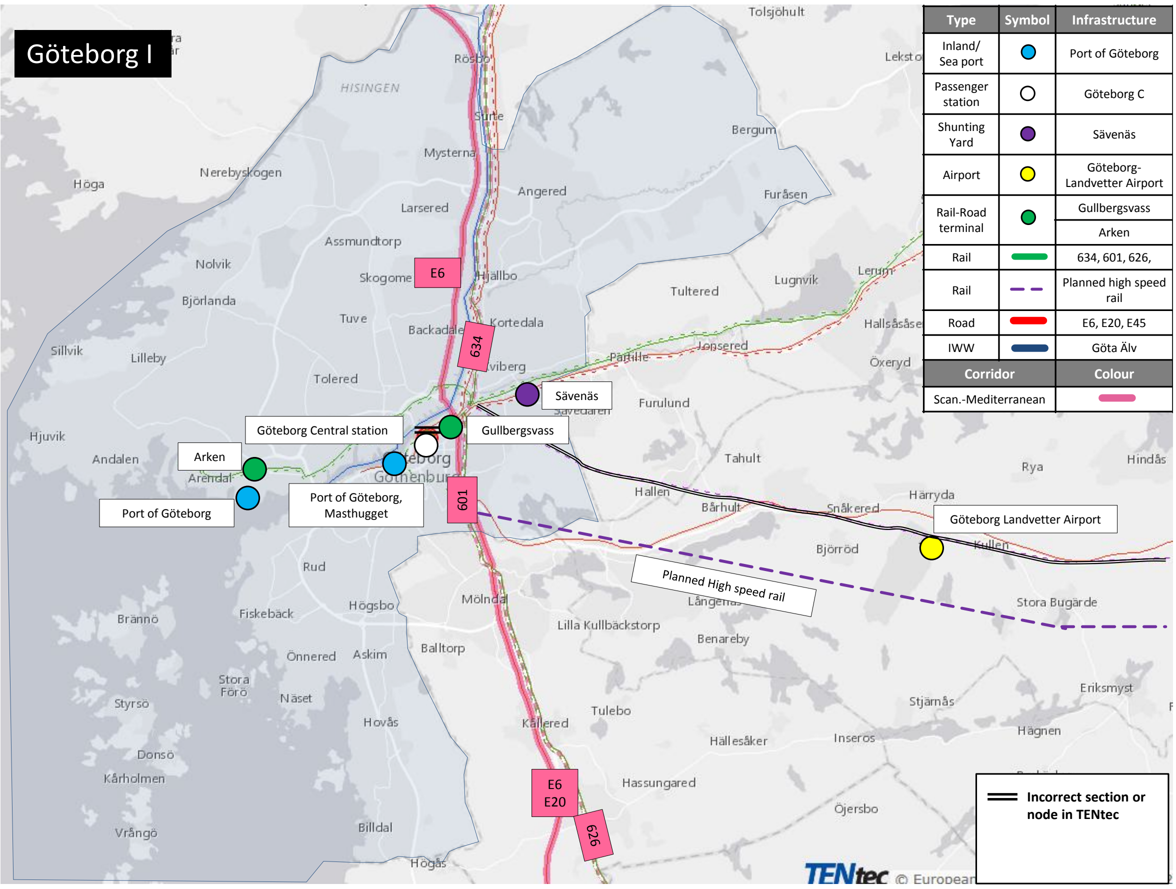
Gothenburg is the second largest city in Sweden and is the main logistics centre in Sweden. The city is the centre for Swedish automotive industry and manufacturing. The Port of Gothenburg is the largest in Scandinavia and specialized on container, roro and oil. The port hinterland is entire Sweden and large parts of Norway.

The Scandinavian-Mediterranean corridor runs through the city from København to Oslo. Access points within the urban node are Gothenburg Central station for passengers and the Gullbergsvass rail-road terminal. At the end of year 2017 Gollbergsvass will close and be replaced by the rail-road terminal Arken at the port of Gothenburg. The port of Gothenburg is geographically divided in two parts: the outer main port and the inner port, Masthugget. The latter is specialized on freight and passenger transport between Sweden and Denmark (Fredrikshavn). The Göteborg-Landvetter Airport is located outside the municipality but is a part of the urban node.

In ongoing national negotiations on infrastructure investments a high-speed rail between Gothenburg and Stockholm is discussed.

The waterway through Göteborg is part of the TEN-T core network, but not of the Scandinavian-Mediterranean corridor.

Figure 46: Göteborg urban node



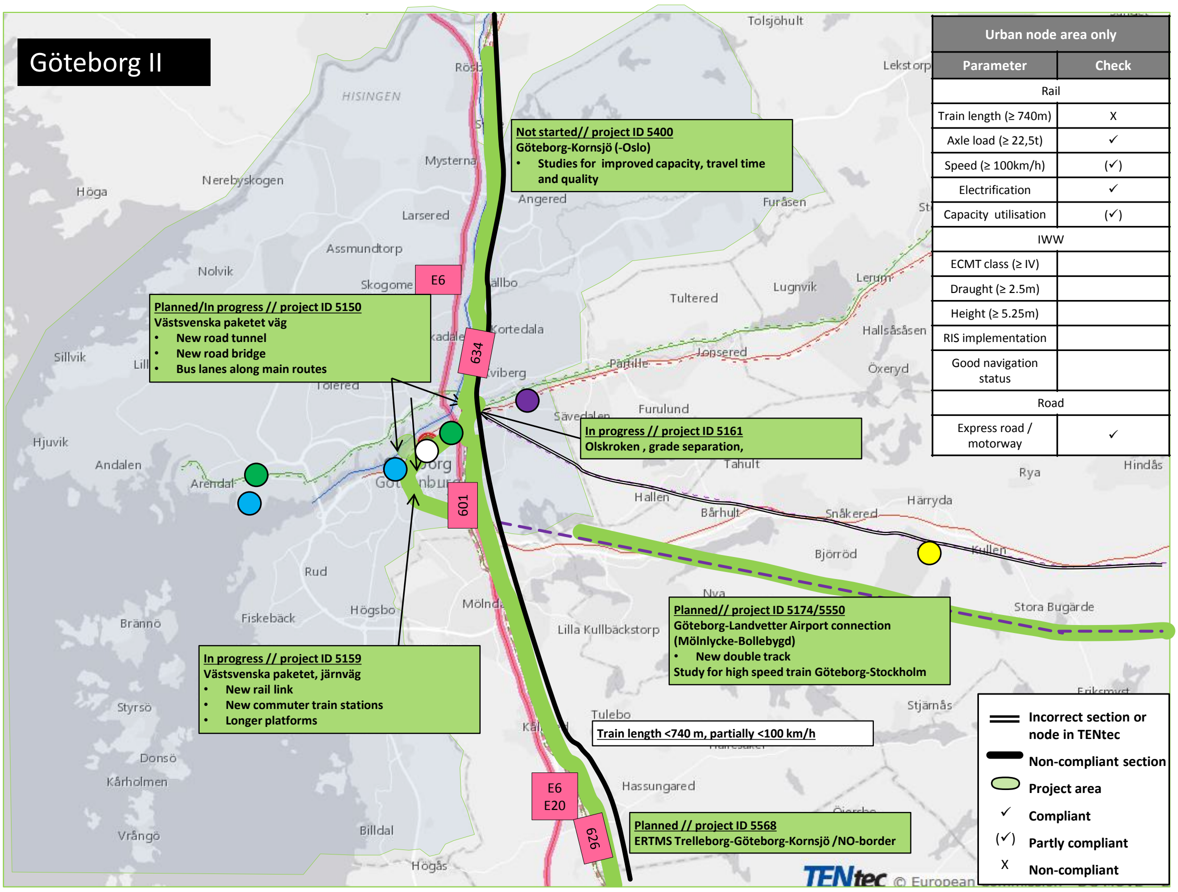
Source: Ramböll Sweden, May 2017

Major investment packages are planned for both rail and road. These include for example new connections, road and rail, crossing the river Göta Älv and a new railway link for passenger trains through the city. A new railway link (Mölnlycke-Bollebygd) will provide rail access to Göteborg Airport and is a part of the planned high speed rail between Göteborg and Stockholm.

The rail corridor presents currently a bottleneck regarding capacity utilization. The investment package for rail (project 5159) will increase capacity and remove the bottleneck by 2026. A study for measures for increased capacity northwards toward Oslo is planned. Swedish railway system does not meet the requirement for 740 meter long trains. Where the corridor railway and connection to the port meet the requirement for >100 km/hour is not met. ERTMS is not implemented.

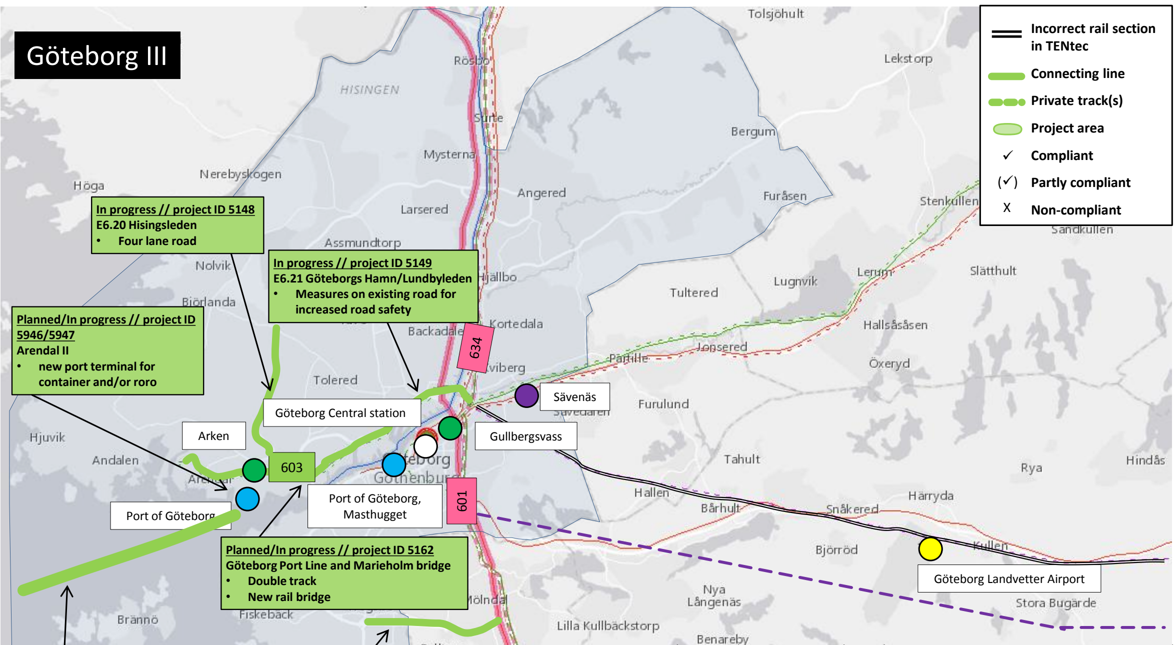
The possibility to improve capacity in the fairway to the port, and thereby improve possibilities for trans-ocean shipping, is ongoing.

Figure 47: Analysis of corridor lines in Göteborg



Source: Ramböll Sweden, May 2017

Figure 48: Analysis of last-mile connections in Göteborg



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Trimodal terminal	Port of Gothenburg	601 634 603	✓ ✓ ✓	✓ ✓ ✓	X X X	✓ ✓ ✓.
Rail-Road Terminal	Gullbergsvass	601 634	✓ ✓	✓ ✓	X X	✓ ✓
Airport	Göteborg-Landvetter Airport	X	n.a.	n.a.	n.a.	X

Source: Ramböll Sweden, May 2017

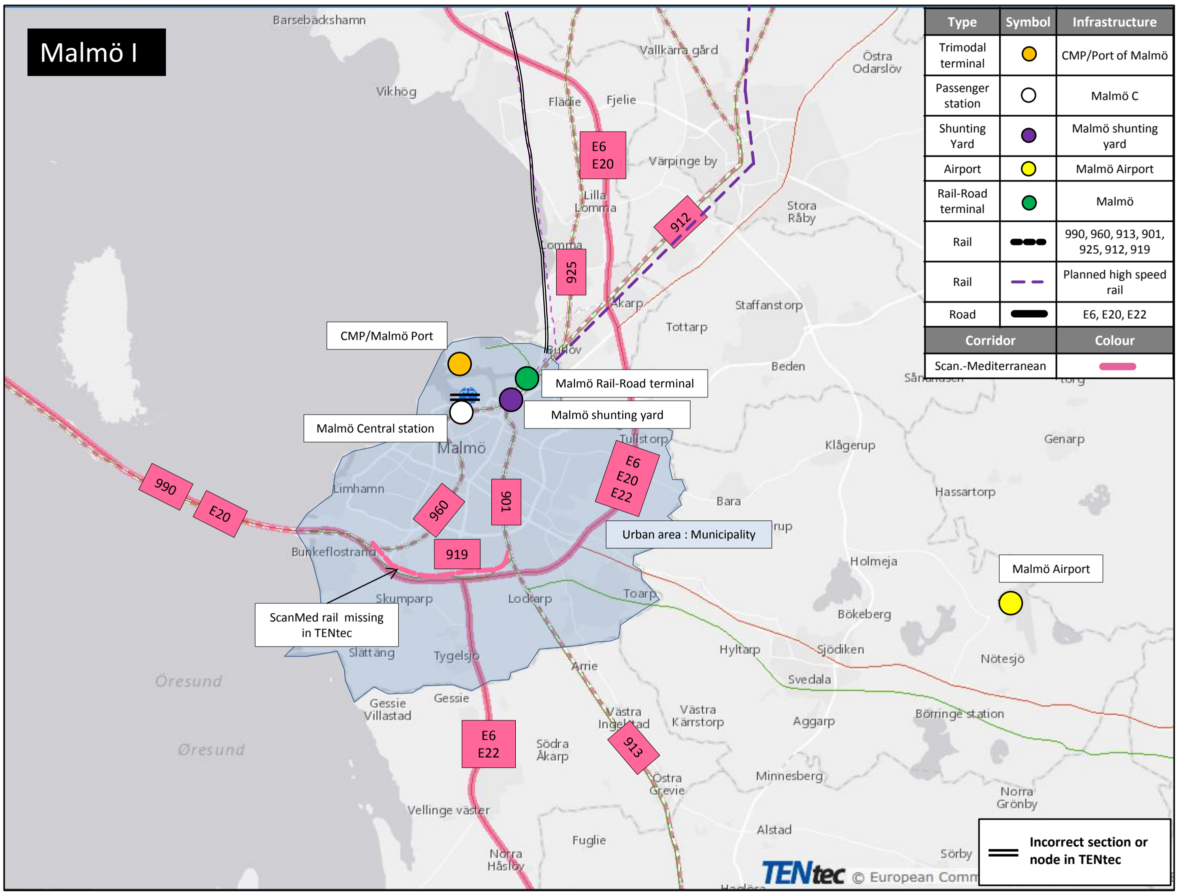
Last-mile sections are mainly directed towards the port of Gothenburg. Measures to increase capacity on both rail and railway are in progress. The west Swedish investment packages for road and rail contains several larger and smaller measures to increase capacity and accessibility. One part of Port of Göteborg (Masthugget) is located close to city center and is connected to road E45 which is part of the comprehensive network. Masthugget is a ferry port and does not have rail connection. A new railway connection to Göteborg-Landvetter is planned. However the final project approval is not yet submitted. The rail connection is a part of the planned high speed line towards Stockholm.

9.3.5 Malmö

Malmö is the third largest city in Sweden and a major logistic node. A major part of Swedish trade with continental Europe passes Malmö including all international railway transport. The Scandinavian-Mediterranean corridor divides in several branches; from København and Trelleborg, via Malmö, to Gothenburg/Oslo and Stockholm. In Malmö and north of the city the rail corridor is divided into separate freight and passenger rail corridors. From Malmö towards Trelleborg the corridor does only apply to freight transport.

Access points are all in the northern part of the city; Malmö Central Station, Malmö RRT and port of Malmö. Malmö Airport is located 20 km east of the city and has no rail connection. However, the main airport servicing Malmö is Copenhagen Airport. In ongoing national negotiations on infrastructure investments a high-speed rail between Malmö and Stockholm is discussed.

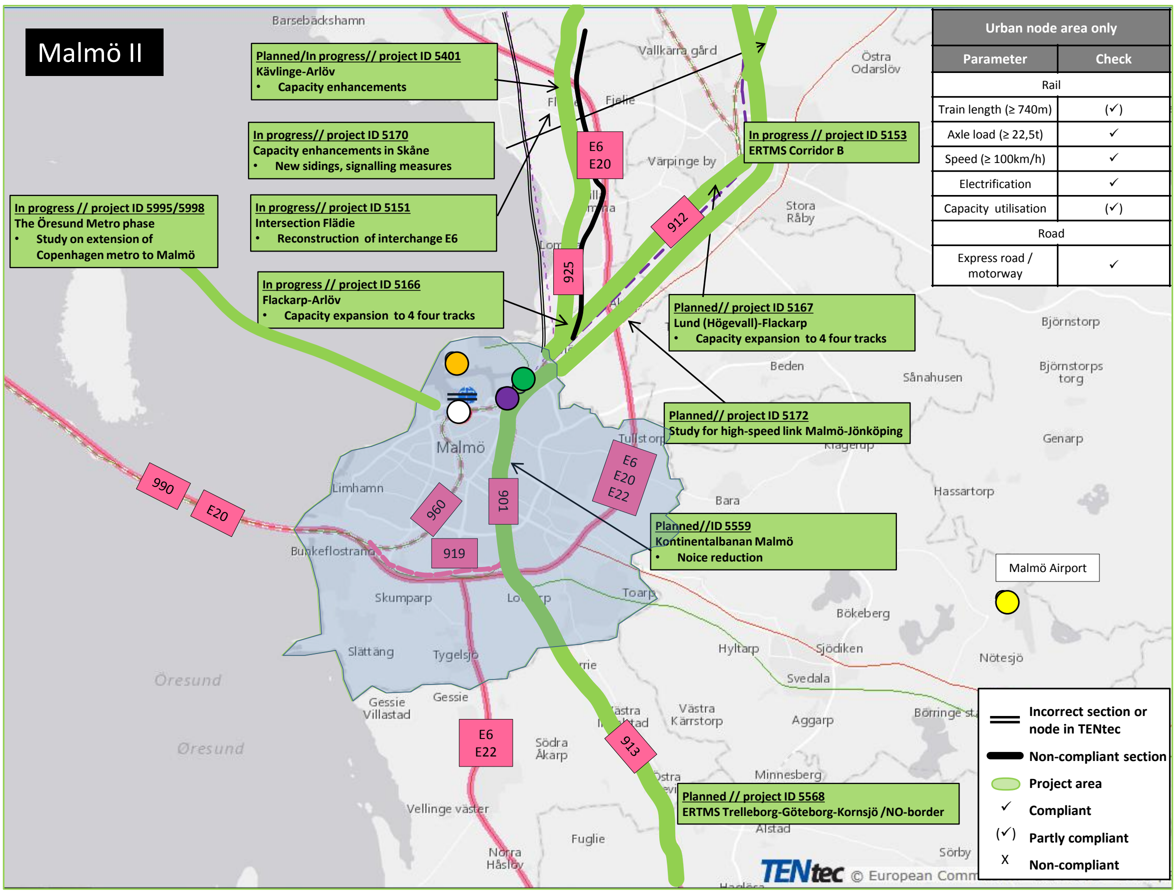
Figure 49: Malmö urban node



Source: Ramböll Sweden, May 2017

The corridor is compliant to TEN-T regulations regarding road. The railway from Malmö towards København and Trelleborg is compliant with TEN-T regulations. The railway from Malmö and northwards does not allow for 740 meter long trains. ERTMS implementation is planned. Railway capacity utilization is high and does not allow for increased traffic from Malmö and northwards. Capacity measures on the railway are planned or in progress.

Figure 50: Analysis of corridor lines in Malmö



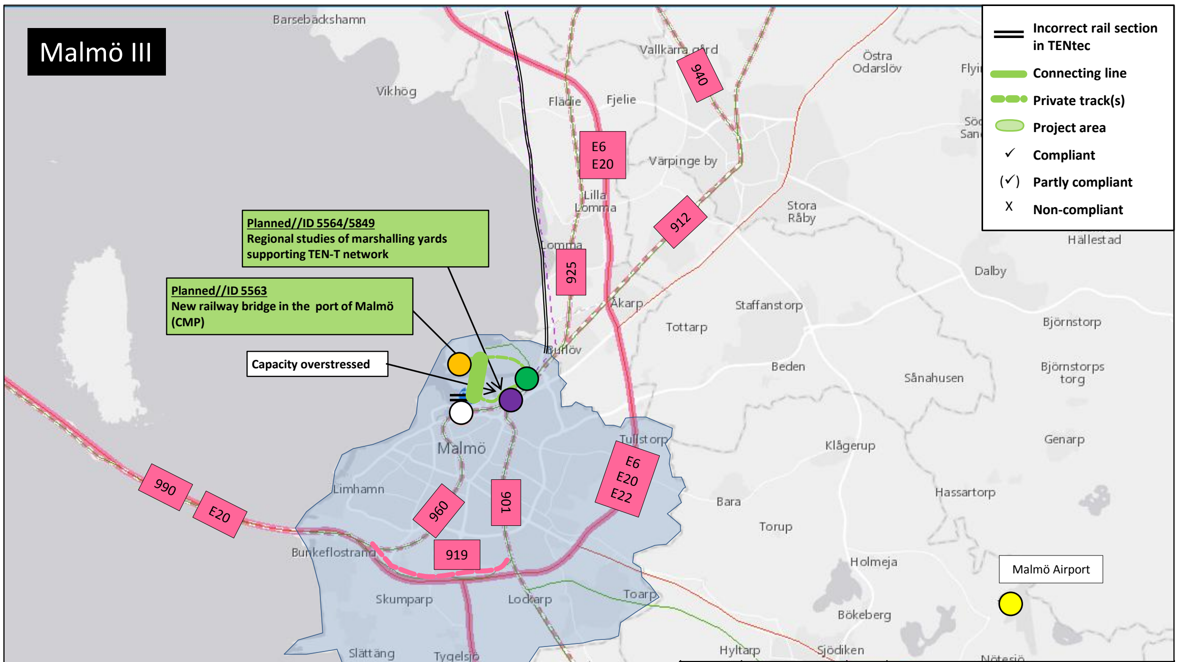
Source: Ramböll Sweden, May 2017

Last-mile sections are connections between road and rail corridor to the port of Malmö. The Malmö shunting yard is highly congested and limits the accessibility by rail to the port. In the port area and logistics transport centre of Malmö the accessibility and functionality will be improved by a new railway bridge. A study for handling capacity issues at the shunting yard of Malmö is planned. There are no planes for railway connection to Malmö Airport.

The planned high speed rail raises the issue about capacity limitations on the Öresund fixed link. However, the capacity limitations will first appear on the access infrastructure to the Öresund fixed link, both on Swedish and Danish side.

The cities of Malmö and København are studying a possible extension of the København metro to Malmö C.

Figure 51: Analysis of last-mile connections in Malmö



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Trimodal terminal	CMP/Malmö port	901	✓	✓	✓	✓
		925	✓	✓	X	✓
		912	✓	✓	X	✓
		919	✓	x	✓	✓
Rail-Road terminal	Malmö Godsbangård	901	✓	✓	✓	✓
		912	✓	✓	X	✓
Airport	Malmö Airport	X	n.a.	n.a.	n.a.	X

Source: Ramböll Sweden, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The urban node of Malmö can be defined in several ways. The city and the northern municipality of Burlöv constitute the morphological urban node with a continuous built-up area. However the functional urban node, based on commuting or logistical patterns, can be defined as the southwestern region of Scania including the core port Trelleborg or the local labour market also including the comprehensive ports of Ystad and Helsingborg. Furthermore taking into consideration the integrated region of Öresund, Greater Copenhagen and region of Scania can functionally be described as the core node.

The Greater Copenhagen and Skåne Committee Traffic Charter prioritize the expansion of Copenhagen airport, Fehmarn belt fixed link, a second fixed link (heavy rail) crossing the Öresund at Helsingborg-Elsinore (passengers) and thereafter extension of the Copenhagen metro system to Malmö, high speed rail Stockholm-Malmö/Copenhagen-Hamburg, a coherent public transportation system and green mobility.

With regard to future fixed links for heavy rail crossing Öresund an alternative solution connecting Landskrona to Österport (passangers and freight) is promoted by the city of Landskrona. The possibilities of future fixed links are promoted by regions and municipalities.

9.3.6 Stockholm

Stockholm is the capital of Sweden and primarily a consumption area. The two ferry ports in Stockholm are, together with Kapellskär 100 km north of the city, the main transport routes between Sweden and Finland. The ports in Stockholm also connect with RoRo-transport to Russia, Estonia and Latvia.

The port of Stockholm/Värtahamnen is in urban development process. Container and oil products will relocate to other ports. Värtahamnen will remain ferry/RoRo-port. A new container port will be developed in Norvik/Nynäshamn about 60 km south of Stockholm. The port of Nynäshamn is a part of the urban core node Stockholm.

The Scandinavian-Mediterranean corridor ends in central Stockholm, with a last-mile connection to the Port of Stockholm. The road corridor is compliant with the TEN-T regulations however congested.

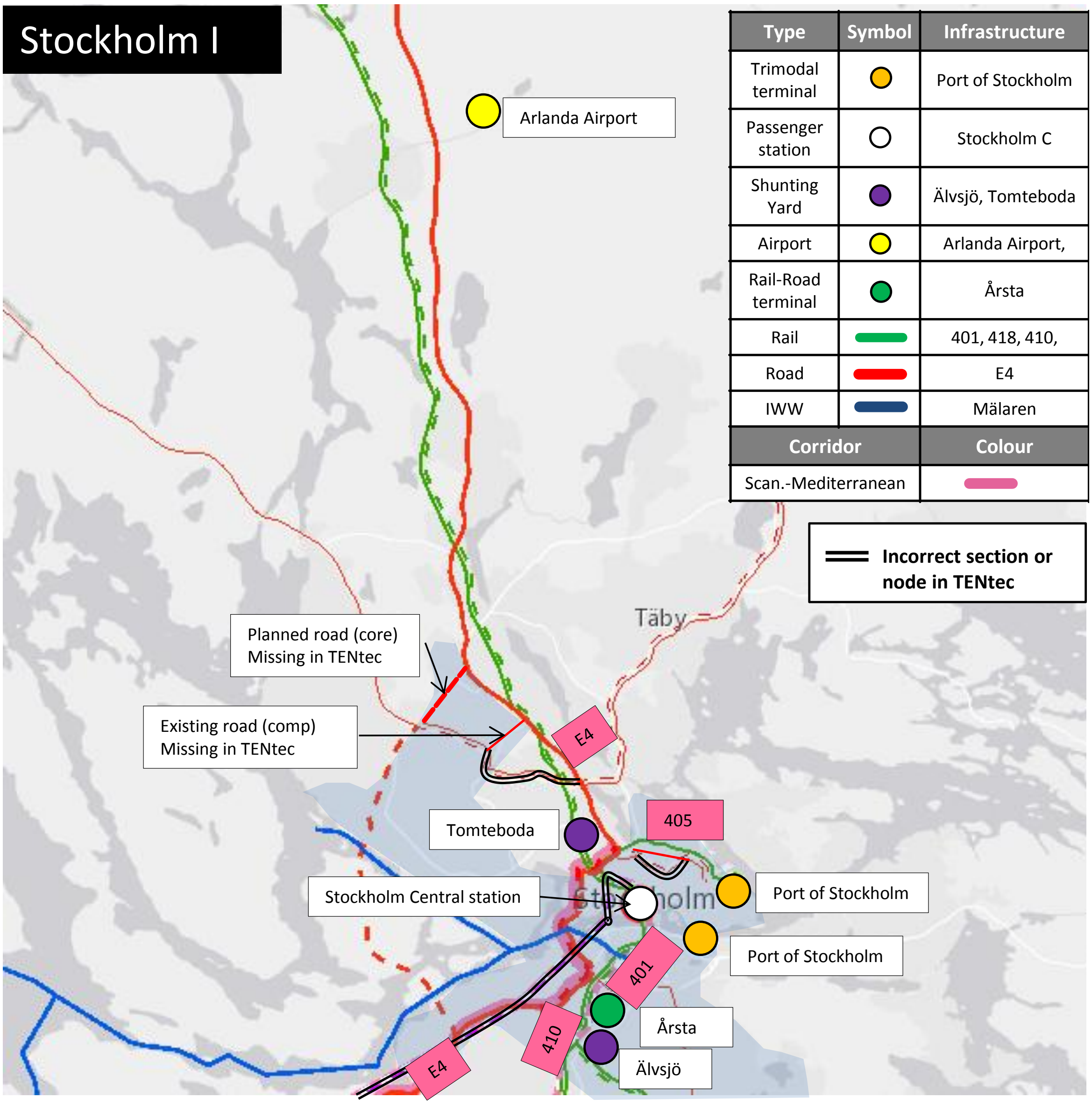
The rail corridor does not allow for >740 meter long trains. ERTMS implementation is in progress. Railway capacity utilization is high and does not allow for increased traffic. Capacity measures on the railway are planned or in progress.

In the ongoing national negotiations on infrastructure investments an extension of the Stockholm metro system is discussed.

At Stockholm-Arlanda Airport (part of the urban node) improvements in capacity and functionality are in progress, as well as pilot operations for remote tower services. Road and rail connections to the airport are not part of the TEN-T network.

In the municipality of Stockholm the Scandinavian-Mediterranean railway corridor ends at Stockholm central Station. The road corridor ends in the northern part of central city (Norrtull). Access nodes are Stockholm Central station (passengers), Årsta rail-road terminal and Ports of Stockholm. The northern port in central Stockholm (Värtahamnen) is connected to the Scandinavian-Mediterranean corridor by comprehensive rail and road network. The main shunting yard in Stockholm is Älvsjö, and Tomteboda is a complementary shunting yard. In western Stockholm a road (Bypass Stockholm) is planned as part of the TEN-T core network.

Figure 52: Stockholm urban node



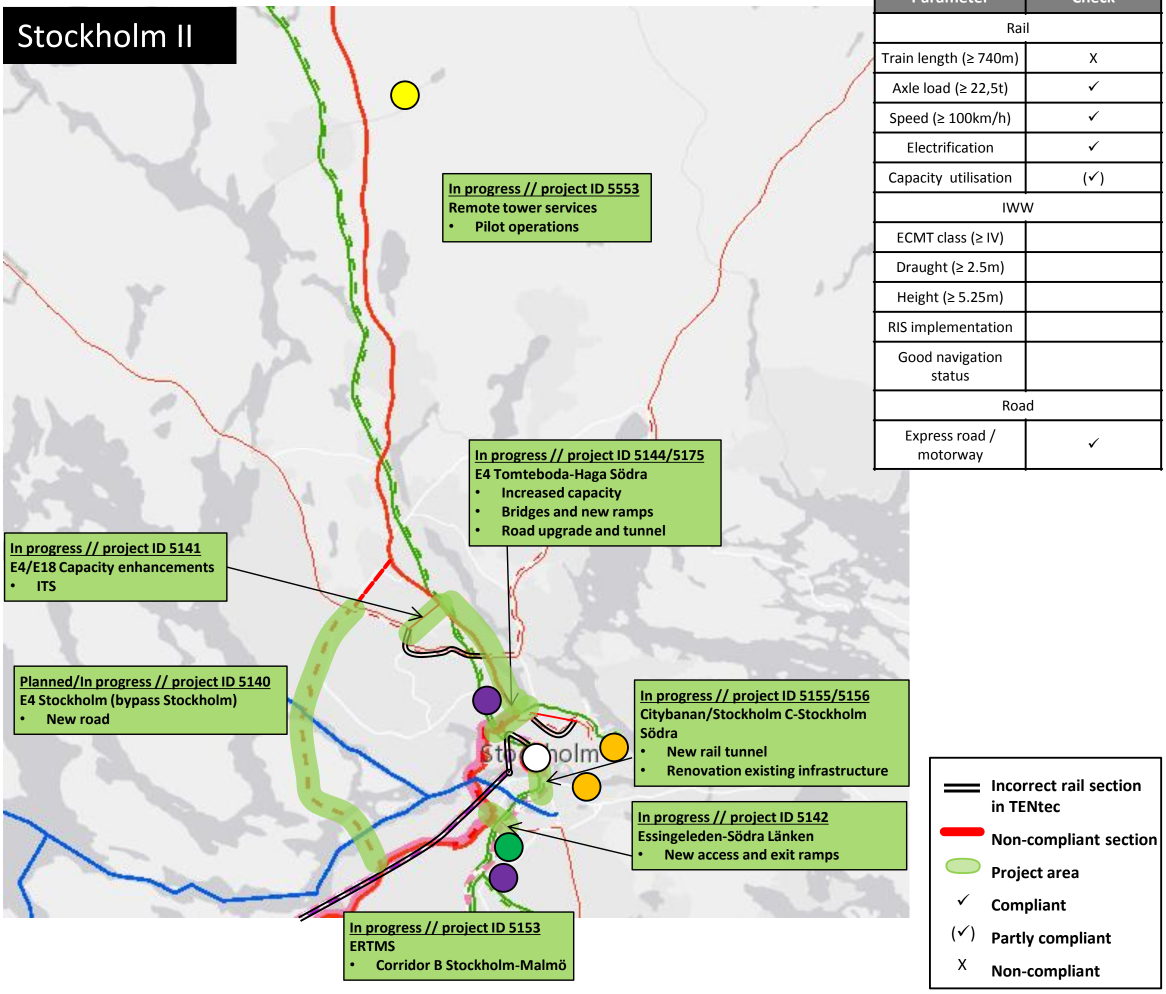
Source: Ramböll Sweden, May 2017

The largest ongoing infrastructure project in Stockholm is the construction of a double track tunnel in the city centre (Citybanan) which will open in December 2017. Also capacity measures on the road network in central Stockholm are in progress.

Works on the Bypass Stockholm has started and the road is planned to open at 2025. Bypass Stockholm is part of the TEN-T core network but not of the Scandinavian-Mediterranean corridor. The corridor work plan project list also includes capacity enhancements on road E4/E18 in the northern part of the municipality but is not part of the Scandinavian-Mediterranean corridor. However, both projects have impacts on Scandinavian-Mediterranean road corridor by reducing congestion.

The waterway through Stockholm is part of the TEN-T core network, but not of the Scandinavian-Mediterranean corridor.

Figure 53: Analysis of corridor lines in Stockholm

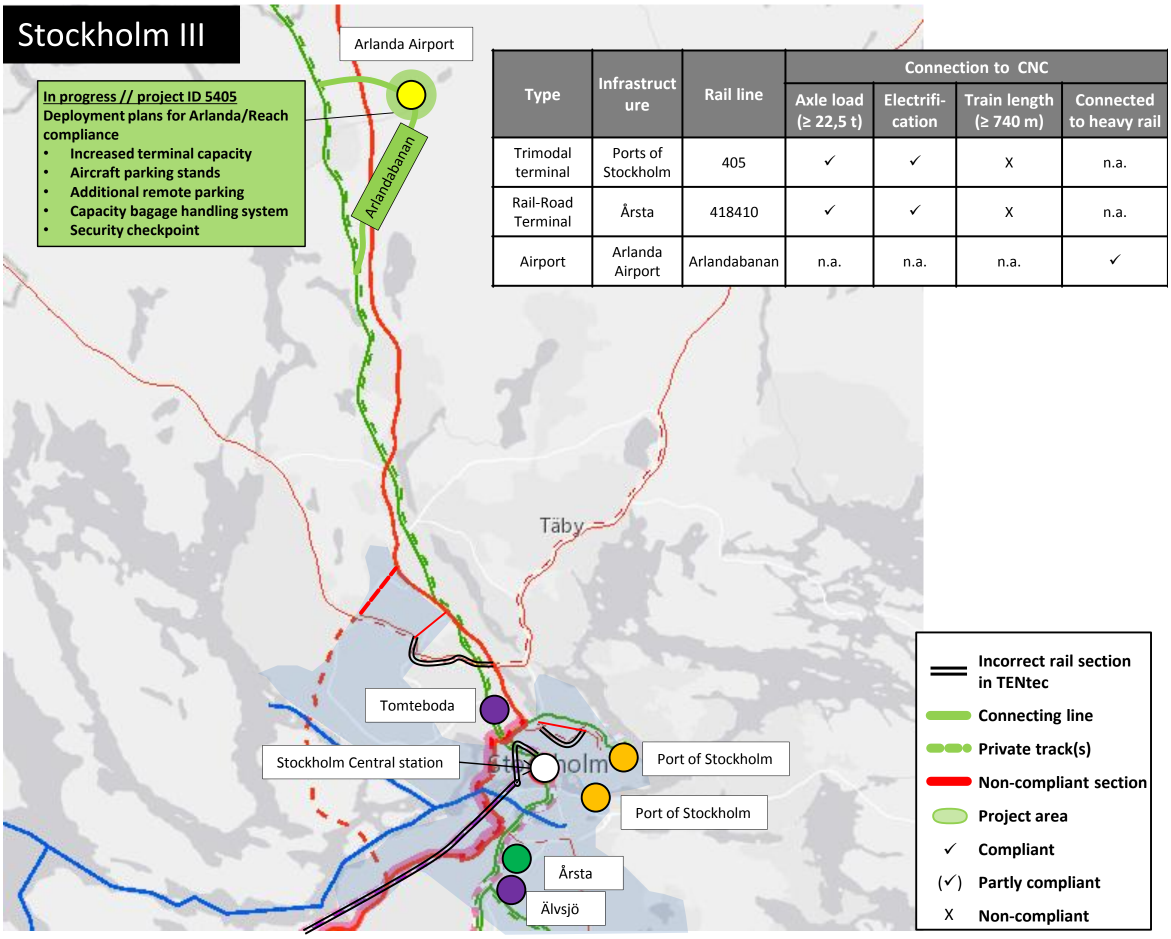


Urban node area only	
Parameter	**Check**
Rail	
Train length (≥ 740m)	X
Axle load (≥ 22,5t)	✓
Speed (≥ 100km/h)	✓
Electrification	✓
Capacity utilisation	(✓)
IWW	
ECMT class (≥ IV)	
Draught (≥ 2.5m)	
Height (≥ 5.25m)	
RIS implementation	
Good navigation status	
Road	
Express road / motorway	✓

Source: Ramböll Sweden, May 2017

The last-mile connections to the terminals don’t allow for train length >740 meters, otherwise the rail connections to access nodes are compliant with the TEN-T regulation. The railway to Stockholm-Arlanda is connected to heavy rail, Arlandabanan, which is used for passenger transport. Arlandabanan is not part of the TEN-T network.

Figure 54: Analysis of last-mile connections in Stockholm



Type	Infrastructure	Rail line	Connection to CNC			
			Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Trimodal terminal	Ports of Stockholm	405	✓	✓	X	n.a.
Rail-Road Terminal	Årsta	418410	✓	✓	X	n.a.
Airport	Arlanda Airport	Arlandabanan	n.a.	n.a.	n.a.	✓

Source: Ramböll Sweden, May 2017

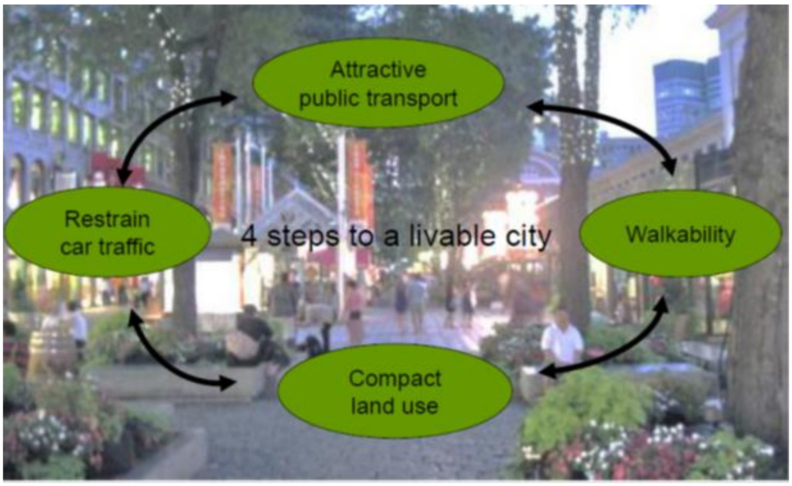
Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The back-bone of the transportation system in Stockholm is the high capacity metro and commuter trains. Even though Stockholm is characterised by high income and a high car ownership the public transportation share is 70% in rush hours. Even with a well-developed public transportation system there are severe congestion problems. A new commuter train tunnel in central Stockholm opens in December 2017 and will double the capacity. Furthermore, extensions on the metro are planned. Also the system of busses and trams develops continuously. As the quality of transport increases, so does demand.

Even with an excellent public transportation system there are congestion problems on the road network. The building of a new motorway, Bypass Stockholm, has started and will increase road capacity between northern and southern Stockholm which are divided by water. Road and public transport investment will not alone solve congestion problems in the long run.

The strategy for an integrated transportation and land-use planning can be described with four main pillars: attractive public transport, compact land use, restraining car traffic and walkability (see Figure 55).

Figure 55: Four steps to a livable city



Source: Centre for Transport Studies Stockholm, November 2016

Stockholm has a long tradition of long term integrated planning for land-use and transportation. Large parts of the suburbs in the city of Stockholm were built in coordination with the development of the metro system. With the growth of Stockholm cooperation between municipalities became necessary. A formal organisation for cooperation between a few municipalities was established in 1952 and since 1971 the county council produces regional plans for the Stockholm County about every 8th year. These plans usually have a 30 year perspective and give guidelines for the regional structure of transportation system and urban structure.

The integrated land-use and transportation planning is to a large extent explaining the high share of public transport. During the last 20 years, more attention has been given to density in areas with good public transport accessibility. In the master plan for the City of Stockholm, the concept of walkability has been introduced. High density of the built up area leads to shorter trips, a viable public transportation and better options for walking.

To reduce congestion on road network also regulating or pricing for car traffic is necessary, mainly parking charges and congestion charges. The road pricing scheme in Stockholm was introduced in August 2005. The fee is 1-2 Euros per passage depending on time of day. During rush hours the number of vehicles has decreased with 20%. Car drivers are cost-sensitive and adapt to economic incentives. Some change transport mode while others choose different routes or travelling different times of the day.

Figure 56: Stockholm road pricing scheme

Source: Centre for Transport Studies Stockholm, November 2016

9.3.7 København

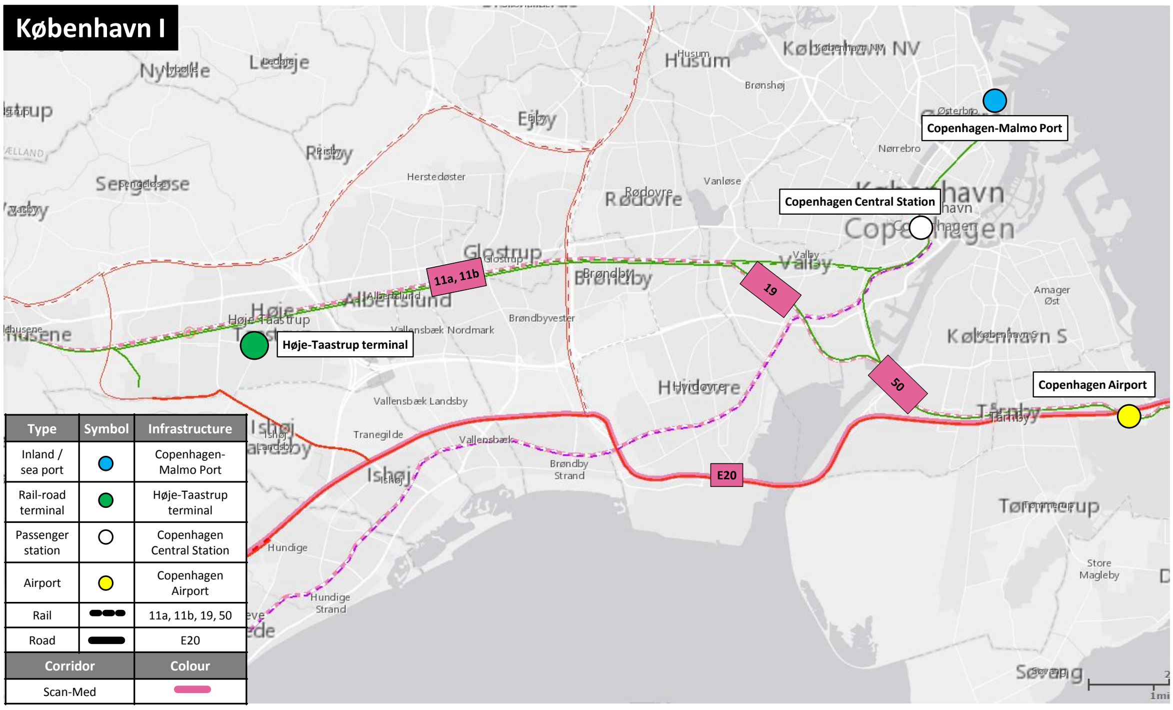
København is the capital of Denmark and the largest city in Denmark with a municipal population of 590.000 and 1,3 mio. in the Greater København area. København is a coastal city and hosted earlier the most important container harbour in Denmark. Now a great part of the container handling for Denmark is handled in Aarhus Harbour and in Malmo. The Scandinavian- Mediterranean Corridor runs through the Greater København area just south of København Municipality on the E20 Motorway, the international railway and the Copenhagen Malmo Port located in the northern part of København Municipality.

København and Malmo harbours have formed a cooperation called Copenhagen Malmo Port (CMP). CMP is marketed as the logistics hub for the Baltic Region and is the biggest Nordic port for car imports. CMP is also named as Europe's leading cruise destination mainly based on the proximity to the attractive cities of København and Malmo and on the proximity to Copenhagen airport, which is part of the København urban node.

Access points to The Scandinavian-Mediterranean Corridor in the København node regards to the rail passenger traffic are København Central Station, København Airport Train Station and the new Ny Ellebjerg Station. Copenhagen Airport is the main airport hub in Scandinavia and the main air travel access point to København. Regards to road traffic the Motorway E20 from south-west and the Oresund Link bridge/tunnel are the main access points. København Harbour is the main access point regards to cruise ships and container and bulk goods.

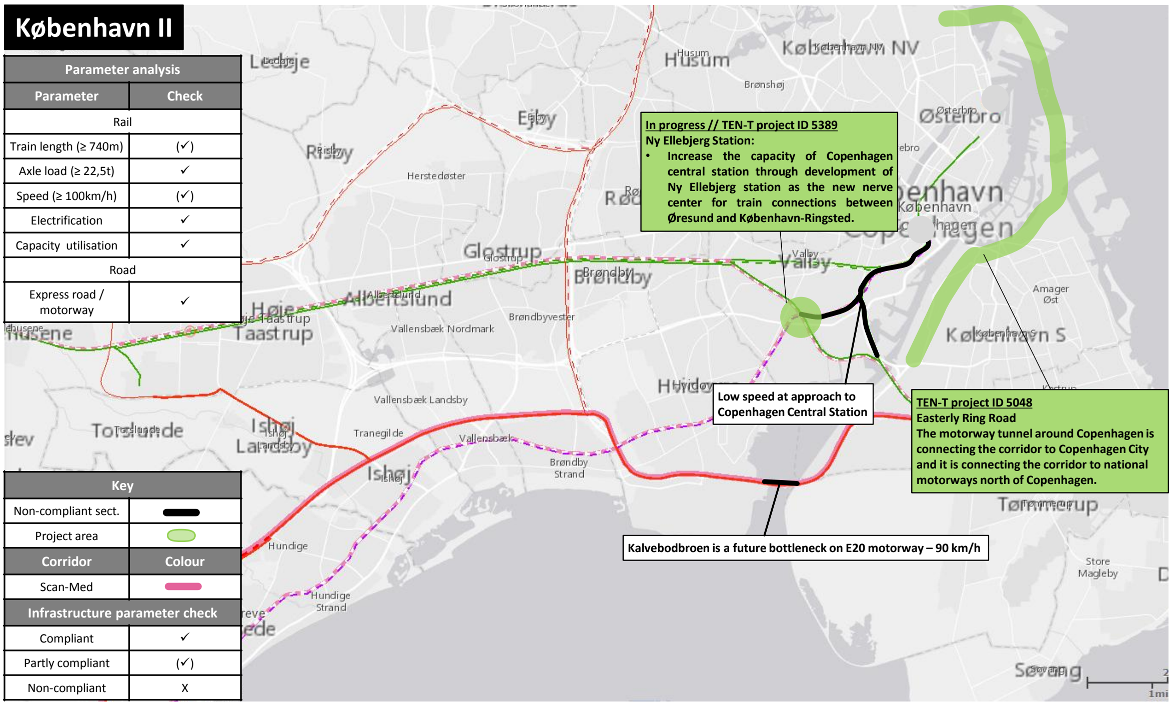
A Road-rail terminal is located in the south-western part of København in Høje-Taastrup.

Figure 57: København urban node



Source: Ramböll Denmark, May 2017

Figure 58: Analysis of corridor lines in København



Source: Ramböll Denmark, May 2017

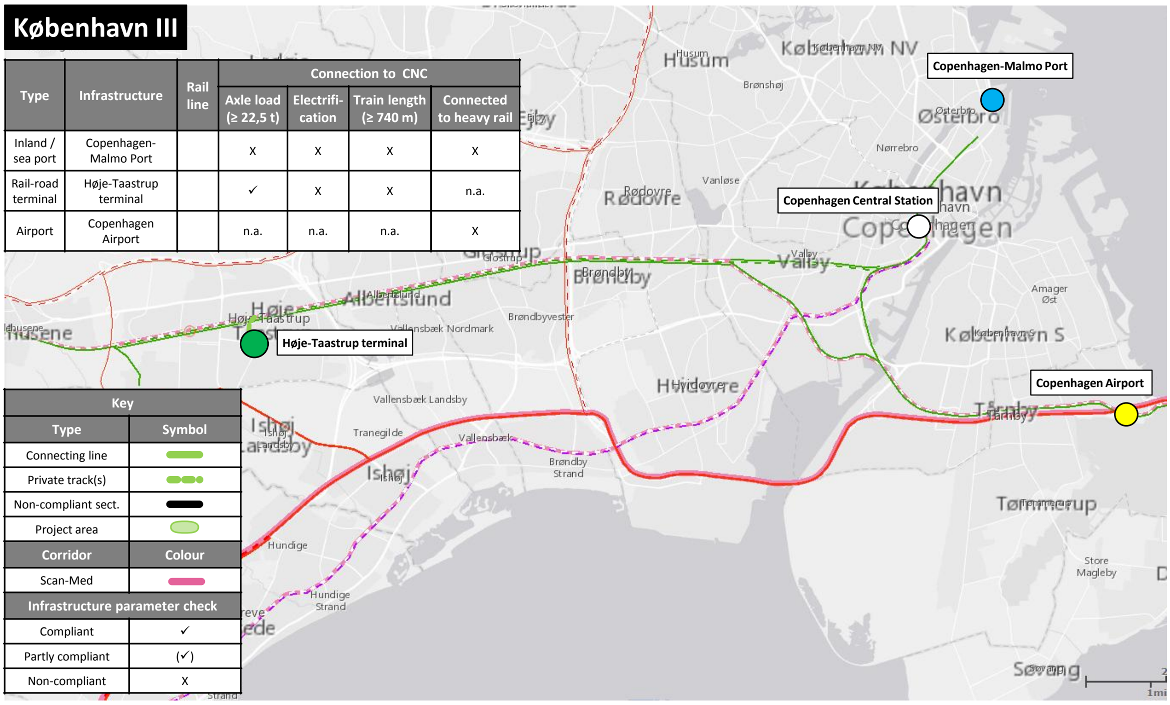
Significant investment packages are at the moment being executed to upgrade the capacity of the rail network in København (project 5389), where the central train station today represents a bottleneck. København Central Station does not meet the requirements for 740 meter long trains.

Kalvebodbroen on E20 motorway represent a future bottleneck. The bridge is now 3 lanes in each direction with a speed limitation of 90 km/h and has an average annual daily traffic of 102.000 cars.

Last mile analysis are ongoing for a new ring road east round of København (Easterly Ring Road) to ease the connection from the urban node to the corridor and to create a new connection from the corridor to the motorway network north of København (project 5048). The next phase of preliminary analysis of the connection has just been adopted in the national budget for 2017 and the analysis works is expected to start mid 2017mid-2017.

Rail shunts have been established from the corridor rail line to København Central Station. These shunts do not allow speeds over 100 km/h.

Figure 59: Analysis of last-mile connections in København



Source: Ramböll Denmark, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The city of Copenhagen is experiencing a great migration to the city from the suburbs and outskirts of Copenhagen. Further a considerable number of people are migrating to Copenhagen from other European cities, from the Americas, from Asia and the refugee generating conflict areas. Copenhagen is thus expected to grow with 20-25% within year 2025. To accommodate for this growth the city is expanding the transportation system considerably. All expansions and revisions of existing transport infrastructure are based on the policy of making Copenhagen CO_2 neutral in 2025.

Thus all planning is made on SUMP assumptions integrating the service provisions from all modes of transport and from TOD planning principles for all new urban developments in the city region.

A new Metro Circle Line is being built at the moment expected to be opened in 2019 and plans for further Metro lines after this have already been made. This includes a Metro across the sea connecting the city centres of Copenhagen and Malmo. This Metro line together with the existing and the coming Metro Circle Line will create an even better last mile service between the Urban Node of Copenhagen and the ScanMed Corridors public transport network.

This connection between Copenhagen and Malmo has not yet been approved, but will be even more relevant when the creation and consolidation of a new city region called "Greater Copenhagen" is in operation, including cities of Malmo, Copenhagen and Helsingborg as well as 19 municipalities and 3 regions on both Swedish and Danish side of the Oresund Sea. Creation of this new city region will also call for renewed planning and discussion of a fixed link between Helsingborg (Sweden) and Elsinore (Denmark). A new fixed link crossing the Oresund Sea will create more capacity on the border crossing traffic both regards to road and rail transportation, taking the load pressure off the Oresund Bridge and possibly also the Danish road bottleneck Kalvebod Bridge.

Copenhagen Airport is experiencing growing passenger numbers and has started preparation of a expansion masterplan that can take the capacity from the 25 million passengers per year today to 40 million passengers, which will accommodate for the next many years expected passenger growth.

With the coming Femern Link and the new high speed rail connection to Copenhagen being built at the moment it is considered to establish a HSL train station in Copenhagen Airport also taking into consideration the expansion plans for the Airport. This new part of the Copenhagen Airport Station can be included into the overall masterplan for the new airport layout.

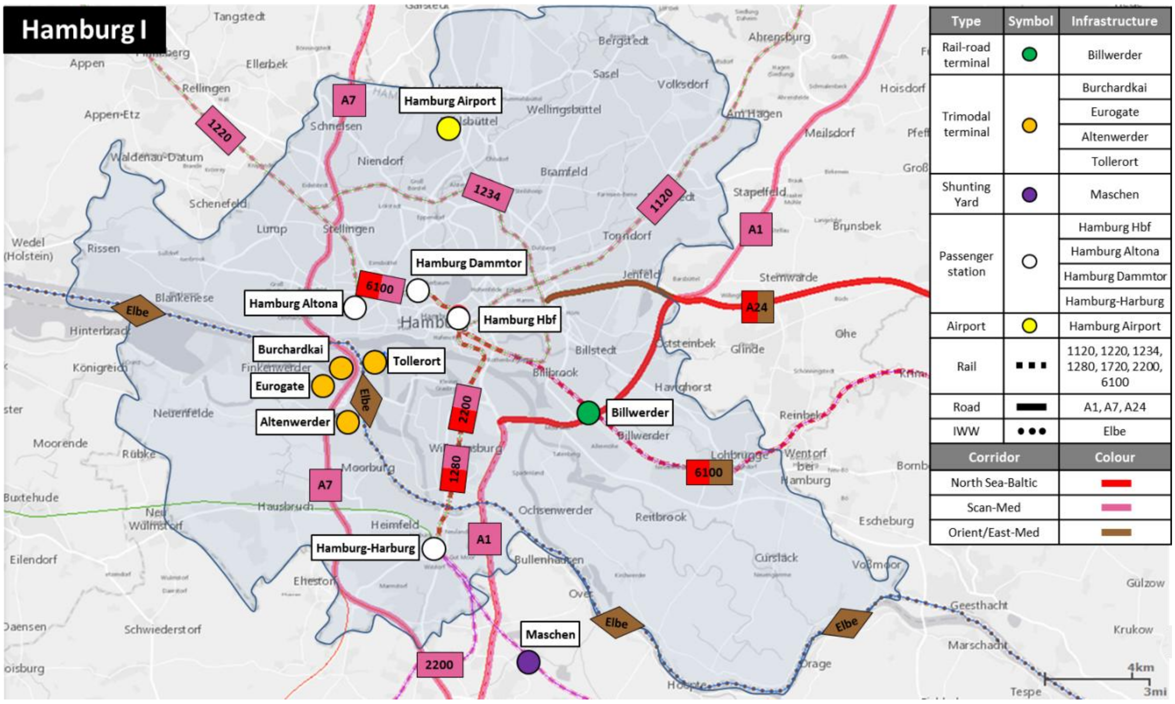
9.3.8 Hamburg

The Free and Hanseatic City of Hamburg is one of three German federal city states. It is the second biggest German city and the centre of the metropolitan region Hamburg. The Port of Hamburg is the biggest German port with a significant volume of cargo delivered respectively picked up by train and located within the municipal area. Hence Hamburg is an important centre for rail freight traffic connecting European main lines in the north-south direction and eastwards. Two major motorways connecting Scandinavian countries with Germany in the north-south direction intersect close to the municipality and cross the river Elbe (representing a natural barrier) within the city area. A third major motorway connects the urban node of Hamburg eastwards.

As shown in Figure 60, three corridors run through the urban node of Hamburg, the North Sea-Baltic, Orient/East-Med and Scandinavian-Mediterranean. The motorways A1 and A7 and many corridor rail lines are part of the Scandinavian-Mediterranean corridor while the A24 and several corridor rail lines are part of the North-Sea-Baltic and Orient/East-Med corridors. Furthermore, the river Elbe belongs to the Orient/East-Med corridor.

Several access points exist within the urban node. Many of them are located in the port area. The most important access points within the port are the four trimodal container terminals (Container Terminal Burchardkai, Container Terminal Tollerort, Container Terminal Altenwerder, Container Terminal Hamburg). An important rail-road terminal is located outside the port in Billwerder in the east of the municipality area. The biggest European shunting yard Maschen is located close to the city and port in the southeast. The international airport in the north of the city and the central station in the heart of the city centre are further noteworthy access points.

Figure 60: Hamburg urban node



Source: HaCon, Uniconsult, May 2017

The motorway corridor core network in Hamburg represents a bottleneck regarding the capacity utilisation on the motorway A7. The A7 is an important north-south axis within TEN-T road network. By absorbing also a high portion of regional and local traffic it is essential for the traffic flow within the urban node of Hamburg, too. Furthermore, it runs right through the port area and connects the port of Hamburg to the TEN-T road network. Currently, the A7 is significantly overstressed. This is the reason why this essential road infrastructure will be upgraded from six to eight lanes with the help of several parallel ongoing and sequenced projects (see Figure 61).

IWW-traffic on the Middle Elbe suffers under unreliable draught conditions while the draught conditions of the lower and outer Elbe aren't sufficient for the newest generation of Ultra Large Container Vessels. Therefore, the deepening of the lower and outer Elbe is planned (but still outstanding due to judicial decisions) (see Figure 61).

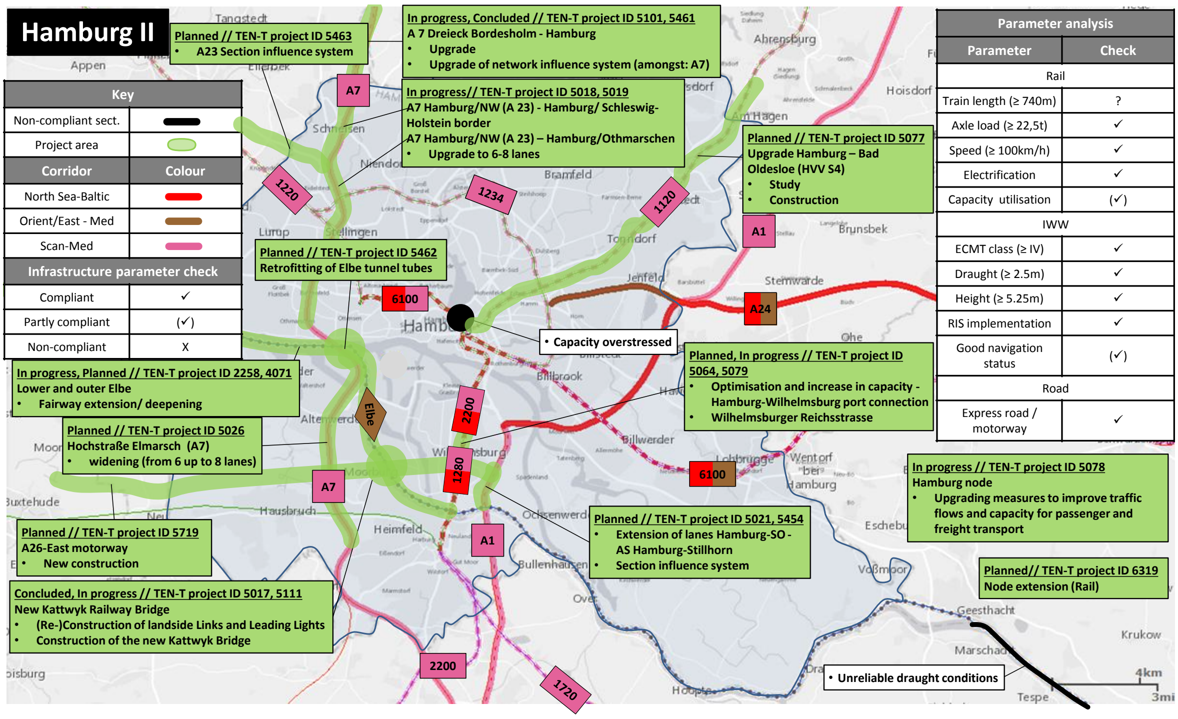
The airport in Hamburg is a main airport falling under the obligation of Article 41(3) and it is connected to the heavy rail network. A S-train guarantees short travel times and connections to all long-distance trains via the central station (see Figure 62).

The central station is the major interchange point for all short-distance and long-distance rail lines. It is one of the most frequented railway stations in Germany. The central station is equipped with only 12 platform lines and its capacity is significantly overstressed. The CNC railway line 1120 leading towards Lübeck frequently used by regional and international (Hamburg – Copenhagen) passenger trains. Furthermore, it is the only axis which connects the port of Lübeck to the European railway network.

It is planned to upgrade the CNC railway line 1120 with additional tracks. These tracks will be exclusively used for an additional regional line of S-trains (replacing conventional regional trains). On the one hand, this will increase the capacity of the currently overstressed central station due to faster handling times of S-trains compared to regional trains. On the other hand, this project will relocate the regional traffic from the already installed (conventional) tracks to the new S-train-tracks. Thereby, capacity will be freed for additional trains from and to Copenhagen. It is likely that the number of international passenger trains will increase significantly after the completion of the fixed Fehmarn Belt link (see Figure 61).

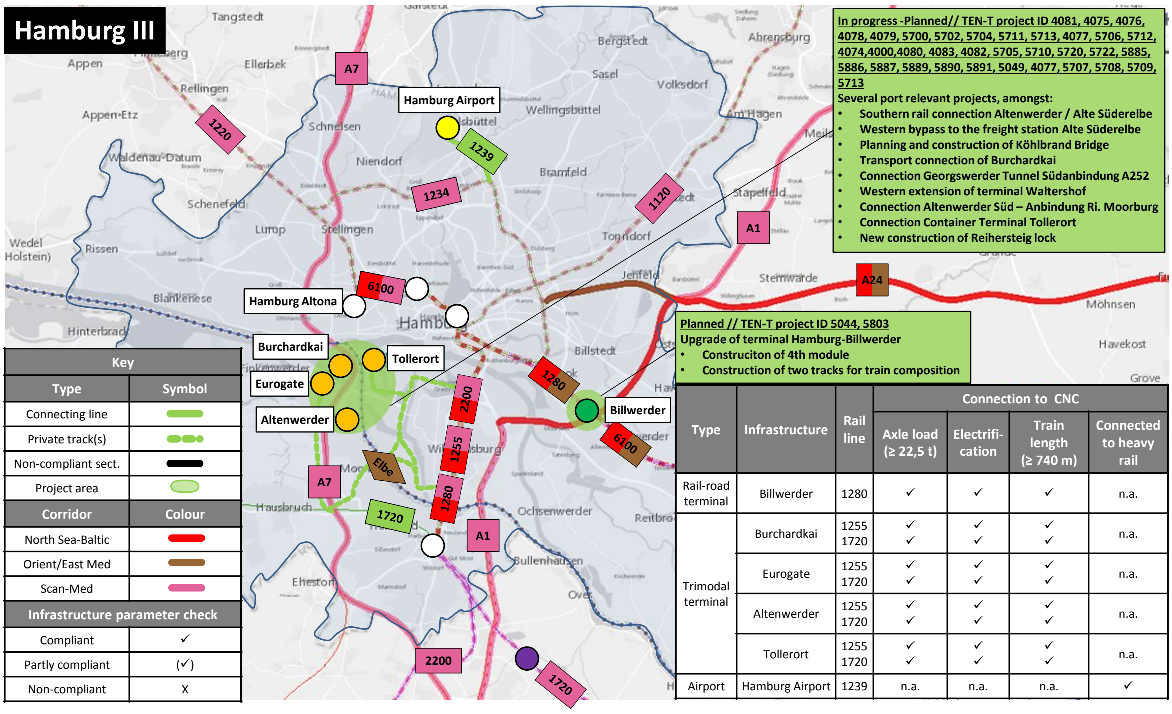
Last but not least, several current and future infrastructure projects aim at improving the port's last-mile connections to the corridor's rail (and motorway) network as well as to increase the port's capacity. Their realisation will remove bottlenecks and establish compliance with the requirements formulated in the Reg. (EU) 1315/2013 (see Figure 62).

Figure 61: Analysis of corridor lines in Hamburg



Source: HaCon, Uniconsult, May 2017

Figure 62: Analysis of last-mile connections in Hamburg



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Rail-road terminal	Billwerder	1280	✓	✓	✓	n.a.
Trimodal terminal	Burchardkai	1255 1720	✓ ✓	✓ ✓	✓ ✓	n.a.
	Eurogate	1255 1720	✓ ✓	✓ ✓	✓ ✓	n.a.
	Altenwerder	1255 1720	✓ ✓	✓ ✓	✓ ✓	n.a.
	Tollerort	1255 1720	✓ ✓	✓ ✓	✓ ✓	n.a.
Airport	Hamburg Airport	1239	n.a.	n.a.	n.a.	✓

Source: HaCon, Uniconsult, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

In addition to the before mentioned and depicted projects, the Core Urban Node of Hamburg pursues an additional local measure which has been presented during the "Ideas Laboratory on Core Urban Nodes" in Copenhagen / Malmö on March 23 and 24, 2017. This additional local measure is addressed to the principle of controlling the vehicle use within cities and fosters the decarbonisation of courier, express and package services (CEP services) as well as the relief of the highly frequented road infrastructure. The measure was put into action by UPS in cooperation with the city of Hamburg.

The measure comprises an improved and innovative concept on last mile logistics. It is located within the city centre of Hamburg. The city centre of Hamburg is heavily influenced by its historical settlement structure, dominated by canals and the lake Alster as well as relatively narrow roads. The inner city road infrastructure is highly frequented respectively overstressed. This leads to a negative impact on the residents as well as the traditional business model of the growing CEP industry.

In a nutshell, the measure is the adaption of CEP operations to the local conditions. Instead of using up to nine conventional (diesel powered) package cars, UPS uses a concept which is based on the consolidation and deconsolidation at four stationary container locations. Each container location consists of at least one storage container, three helpers, one cargo cruiser, one tricycle and three carry aids.

The storage containers are served with the help of feeder moves. Then, the shipments are delivered and collected in a precisely defined catchment area by using e-powered vehicles, bikes and carry aids.

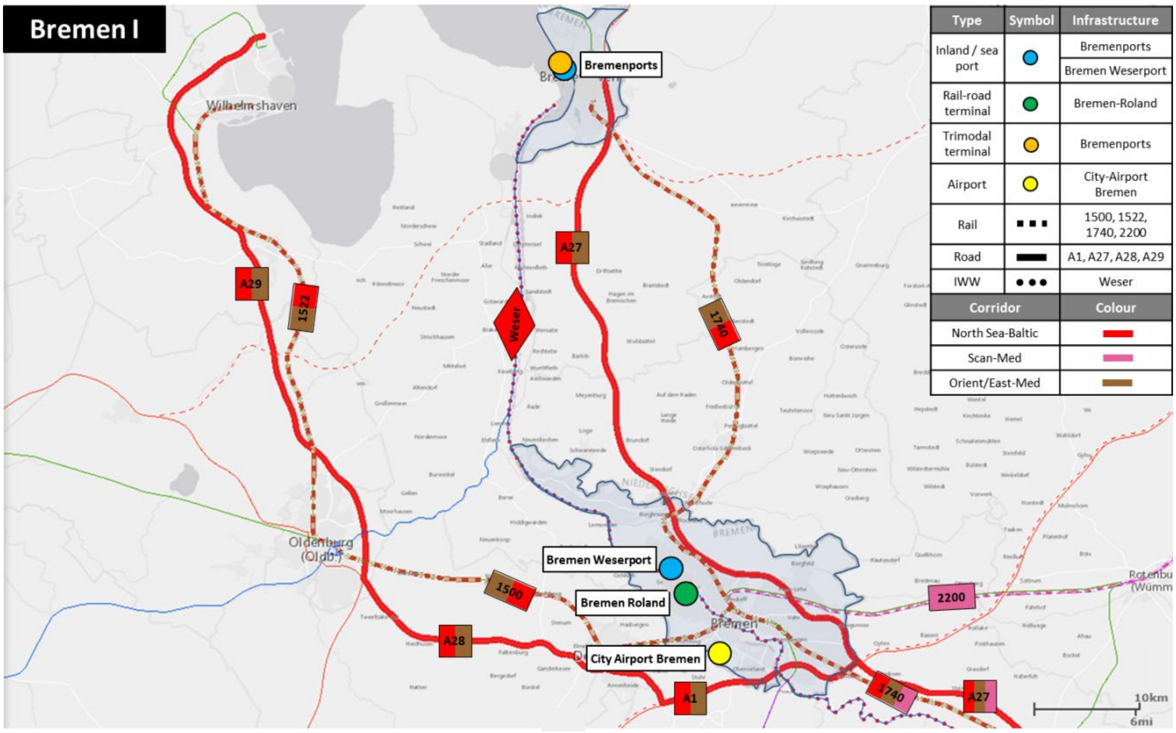
Altogether, the measure results in the reduction of approximately 600 package car movements within the inner city. This also implies significant economies of scope, meaning less traffic obstruction caused by package cars leading to fewer emissions, less noise and higher road safety (less risky overtaking processes by others and less turning processes with package cars).

9.3.9 Bremen

The cities of Bremen and Bremerhaven are the two parts of the federal state „Bremen". They are a major centre in North-western Germany. Germany's container port number 2 and largest port for import and export of vehicles is located in Bremerhaven. Today, the port in the city of Bremen has minor importance. The important intersection of motorways A1 and A27 as well as railway lines are located in Bremen. Bremen is also an important node for the hinterland traffic to and from the seaport of Wilhelmshaven (via rail lines and motorways A28 and A29).

As shown in Figure 63, three corridors run through the urban node of Bremen, the North Sea-Baltic, the Orient/East Med and the Scandinavian Mediterranean. The important rail lines to Hamburg and Hannover as well as the A27 motorway (to the A7 motorway (Hannover, South Germany)) belong to the Scandinavian Mediterranean corridor. Access points within the urban node are the ports (trimodal terminal in Bremerhaven), the rail-road terminal Bremen Roland and the airport Bremen. The river Weser belongs to the North Sea-Baltic corridor.

Figure 63: Bremen urban node

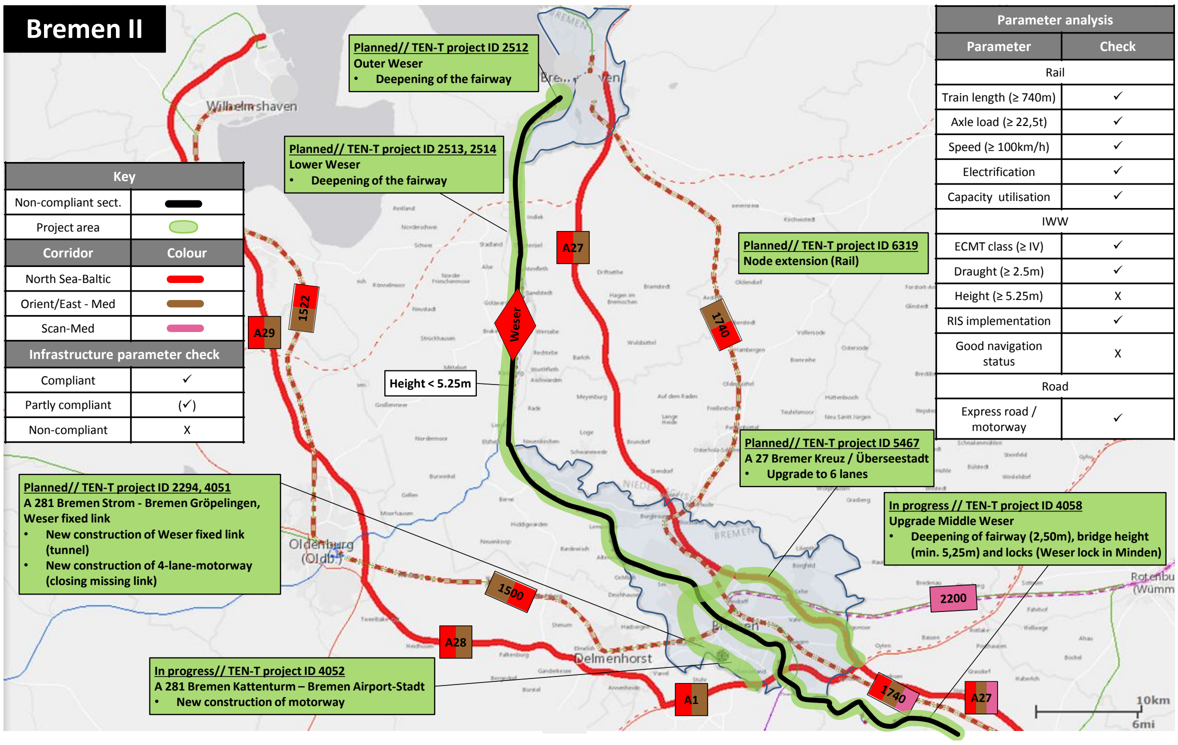


Source: HaCon, May 2017

Rail and road infrastructure meet the compliance requirements. The part of the river Weser in Bremen and south of Bremen ("Mittelweser") has not a good navigation status and does not meet the requirement of minimum 5.25m height under bridges. An extension and deepening of this part of the river is in progress. Important motorway projects are the extension of the motorways A27 (6 lanes between Bremer Kreuz and Überseestadt) and A281 (including Weser tunnel) (see Figure 64).

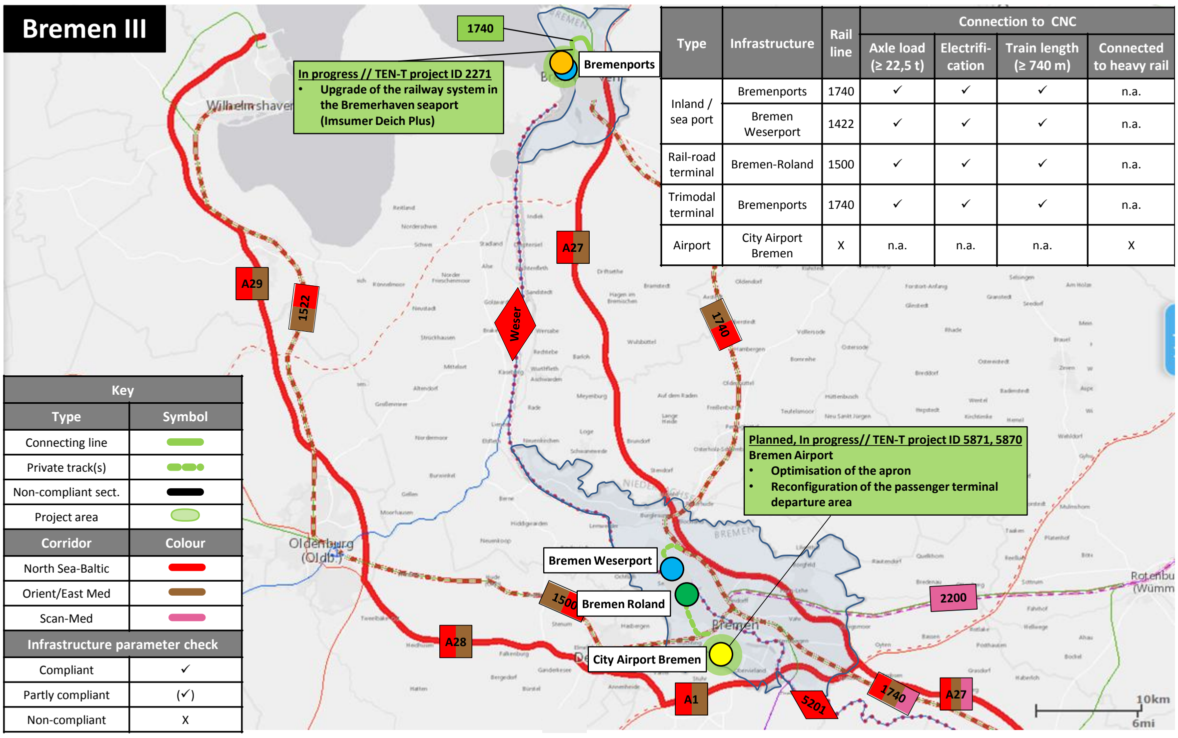
Last-mile connections to the corridor's rail network are compliant. The airport in Bremen is not connected to heavy rail. The port's connection is constantly adapted to future demands, currently the railway system (see Figure 65).

Figure 64: Analysis of corridor lines in Bremen



Source: HaCon, Uniconsult, May 2017

Figure 65: Analysis of last-mile connections in Bremen



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
Inland / sea port	Bremenports	1740	✓	✓	✓	n.a.
	Bremen Weserport	1422	✓	✓	✓	n.a.
Rail-road terminal	Bremen-Roland	1500	✓	✓	✓	n.a.
Trimodal terminal	Bremenports	1740	✓	✓	✓	n.a.
Airport	City Airport Bremen	X	n.a.	n.a.	n.a.	X

Source: HaCon, Uniconsult, May 2017

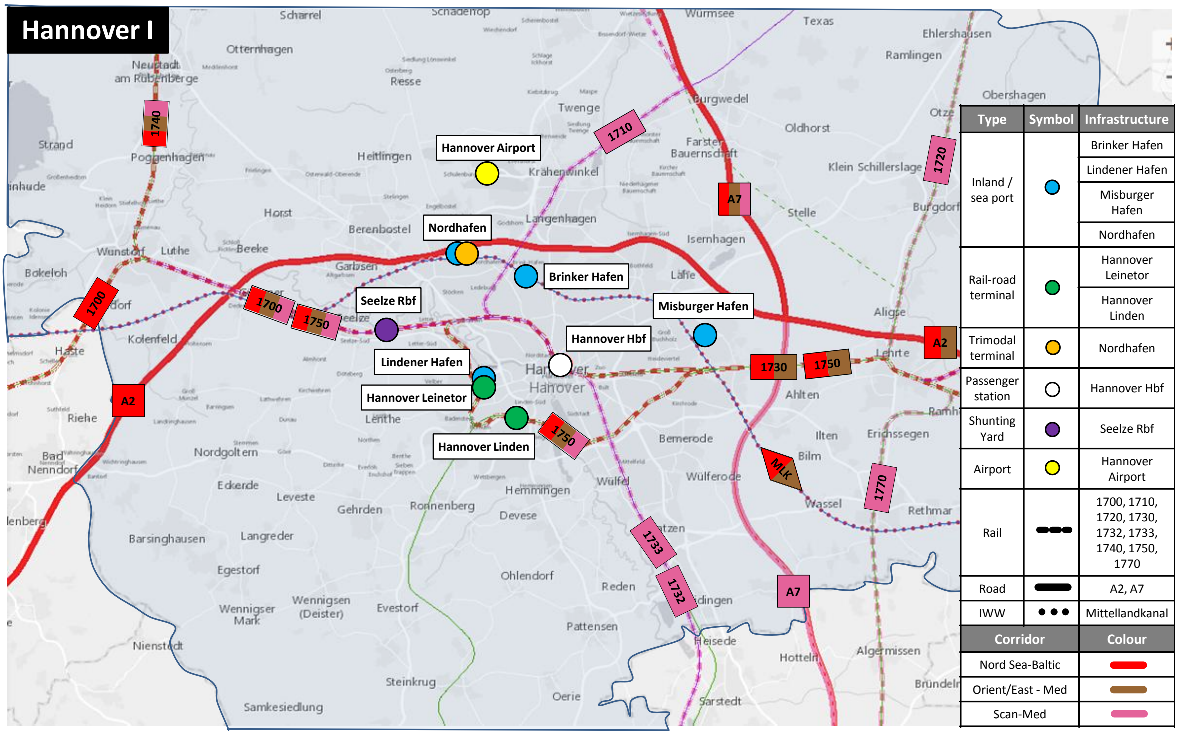
9.3.10 Hannover

Hannover is the capital of the German federal state of Lower Saxony and a major centre of Northern Germany. The city is an important intersection point of railway lines and motorways, connecting European main lines in both the east-west and north-south directions.

As shown in Figure 66, three corridors run through the urban node of Hannover, the Nord Sea-Baltic, Orient/East-Med and Scandinavian-Mediterranean. The highway A7 and many corridor rail lines are part of the Scandinavian-Mediterranean corridor while the Mittellandkanal waterway belongs to Nord Sea-Baltic and Orient/East-Med corridors. The Elbe-Seitenkanal, that flows east of the urban node, belongs to the Orient/East-Med CNC.

Access points within the urban node are four inland ports (Brinker Hafen, Lindener Hafen, Misburger Hafen and Nordhafen), two rail-road terminals (Hannover Leinetor and Hannover Linden; in next future MegaHub Lehrte too), the trimodal terminal Nordhafen and the international airport on the north of the city. The urban node is part of the freight-village network (Güterverkehrszentrum). Freight villages are not only interfaces between transport modes, but also nodes for efficient logistics and special services to the city. Therefore, Hannover, Lehrte and Wunstorf are strategic places for freight villages.

Figure 66: Hannover urban node

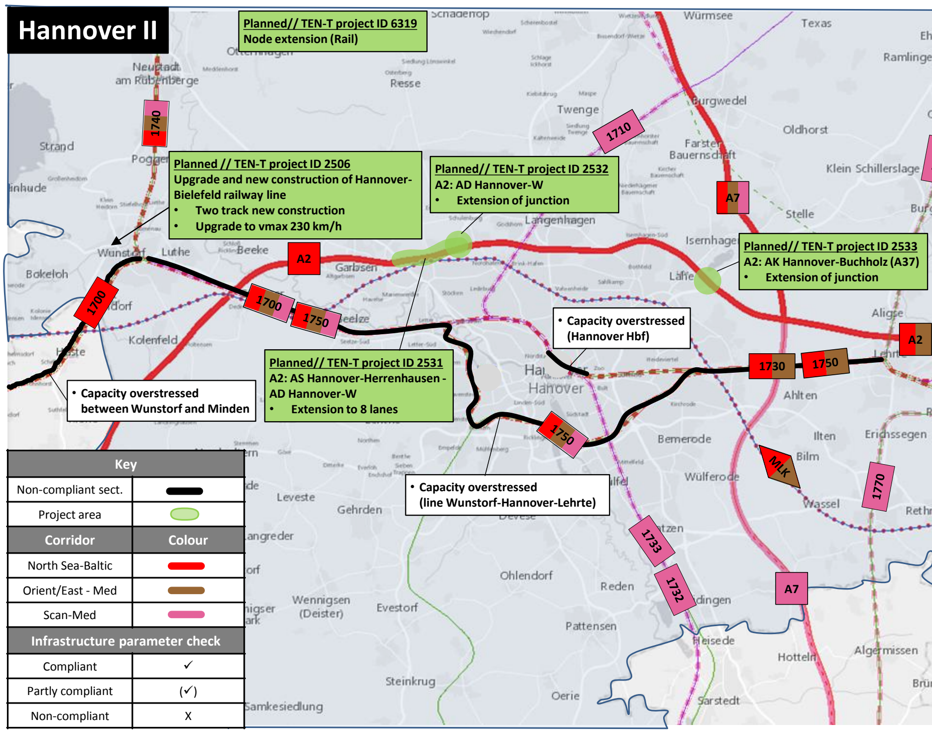


Source: HaCon, May 2017

The rail corridor core network in Hannover presents bottlenecks regarding the capacity utilisation on the rail section between Wunstorf and Minden, on the rail line Wunstorf – Hannover – Lehrte and at the main station. Due to the increasing rail volumes further bottlenecks are expected. Also the highway presents some capacity bottlenecks; it is necessary to extend the capacity for increasing transports and for a better safety. Further corridor lines within the node are compliant. Some projects with the scope of eliminating capacity bottlenecks on the urban node rail sections have been already planned (see Figure 67).

Last-mile connections to the corridor's rail network are compliant and the airport in Hannover is connected to the heavy rail (see Figure 68).

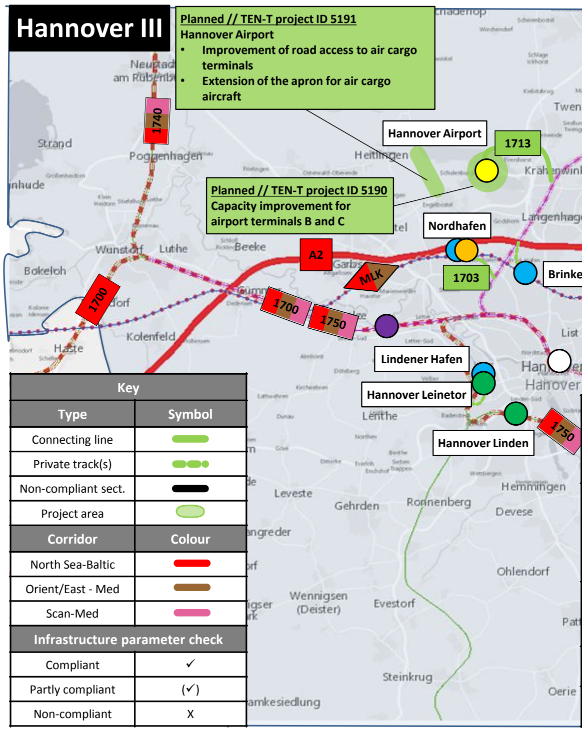
Figure 67: Analysis of corridor lines in Hannover



Parameter analysis	
Parameter	Check
Rail	
Train length (≥ 740m)	✓
Axle load (≥ 22,5t)	✓
Speed (≥ 100km/h)	✓
Electrification	✓
Capacity utilisation	(✓)
IWW	
ECMT class (≥ IV)	✓
Draught (≥ 2.5m)	✓
Height (≥ 5.25m)	✓
RIS implementation	✓
Good navigation status	✓
Road	
Express road / motorway	✓

Source: HaCon, May 2017

Figure 68: Analysis of last-mile connections in Hannover



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Speed (≥ 100 km/h)	Train length (≥ 740 m)	Connected to heavy rail
Inland / sea port	Brinker Hafen	1710	✓	✓	✓	✓	n.a.
	Lindener Hafen	1750	✓	✓	✓	✓	n.a.
	Misburger Hafen	1750	✓	✓	✓	✓	n.a.
	Nordhafen	1703	✓	✓	✓	✓	n.a.
Rail-road terminal	Hannover Leinetor	1750	✓	✓	✓	✓	n.a.
	Hannover Linden	1750	✓	✓	✓	✓	n.a.
Trimodal terminal	Nordhafen	1703	✓	✓	✓	✓	n.a.
Airport	Hannover Airport	1713	n.a.	n.a.	n.a.	n.a.	✓

Source: HaCon, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

In Hannover the road network and its use are optimised thanks to a Regional Traffic Management System. The activities of the Traffic Management Center include the implementation of the traffic warning service, the operation of the motorway traffic management system, traffic management at fairs and large events, use of mobile display systems (DRIP – Dynamic Road Information Panels), operation of traffic lights in the HDI Arena football stadium area, monitoring and operation of the parking guidance systems in the urban area of Hannover and at the exhibition grounds, network influence with dynamic routing and integrated congestion information and country and cross-border traffic management.

Moreover, the city of Hannover implements measures for encouraging walking and cycling. Every year the capital city hosts the cycle competition "Stadtradeln" and "Star Ride" on Highways.

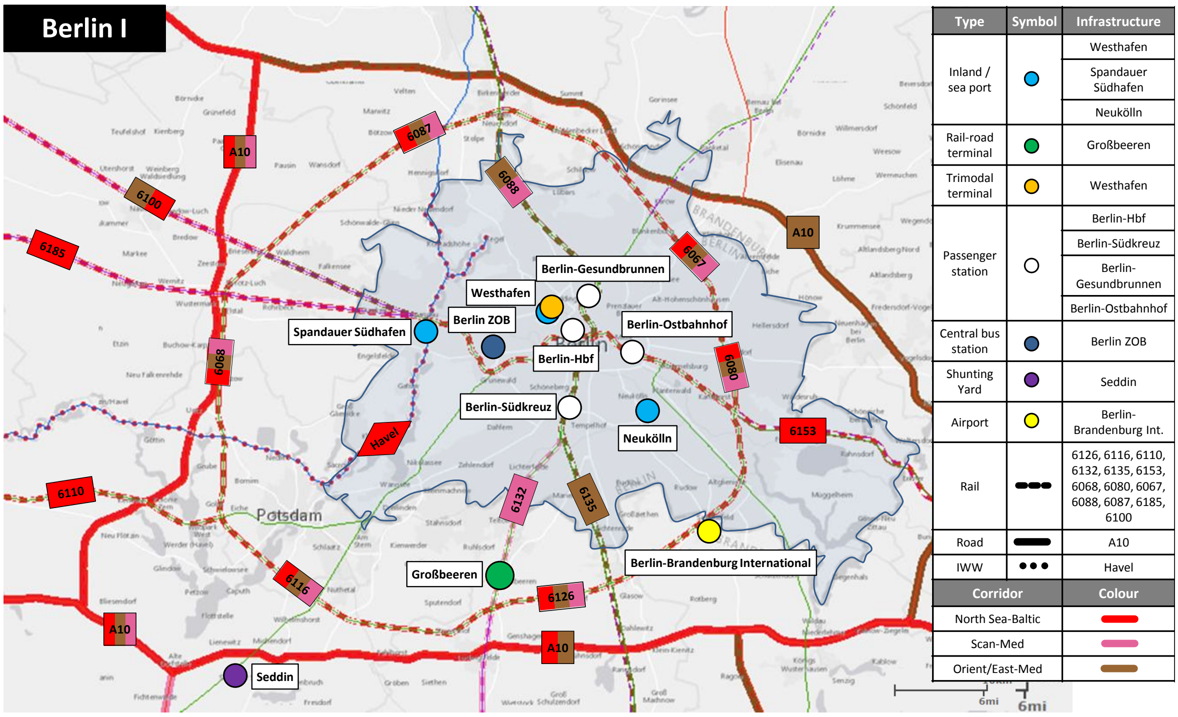
Hannover also promotes the diffusion of clean vehicles in its urban area. This goal has been achieved through the renewal of the municipality own fleet. The ÜSTRA (the public transport operator in the city of Hannover) bus fleet includes 62 hybrids and from 2016 three e-busses.

9.3.11 Berlin

Berlin is the capital of Germany and it is located on North Sea-Baltic, Scandinavian-Mediterranean and Orient/East-Med corridors.

A part of the motorway A10 (the part passing on the west of the node) and several corridor rail lines belong to the Scandinavian-Mediterranean network while the Havel waterway is affiliated to the North Sea-Baltic core network corridor. The access points within the node according to the regulation are three inland ports (Westhafen, Spandauer Südhafen and Neukölln), the rail-road terminal Großbeeren, the trimodal terminal Westhafen and the airport Berlin-Brandenburg. The urban node stretches beyond the administrative limits of Berlin and includes its functionally linked areas of Brandenburg. A schematic overview of the infrastructure in Berlin-Brandenburg is displayed in Figure 69.

Figure 69: Berlin urban node



Source: HaCon, May 2017

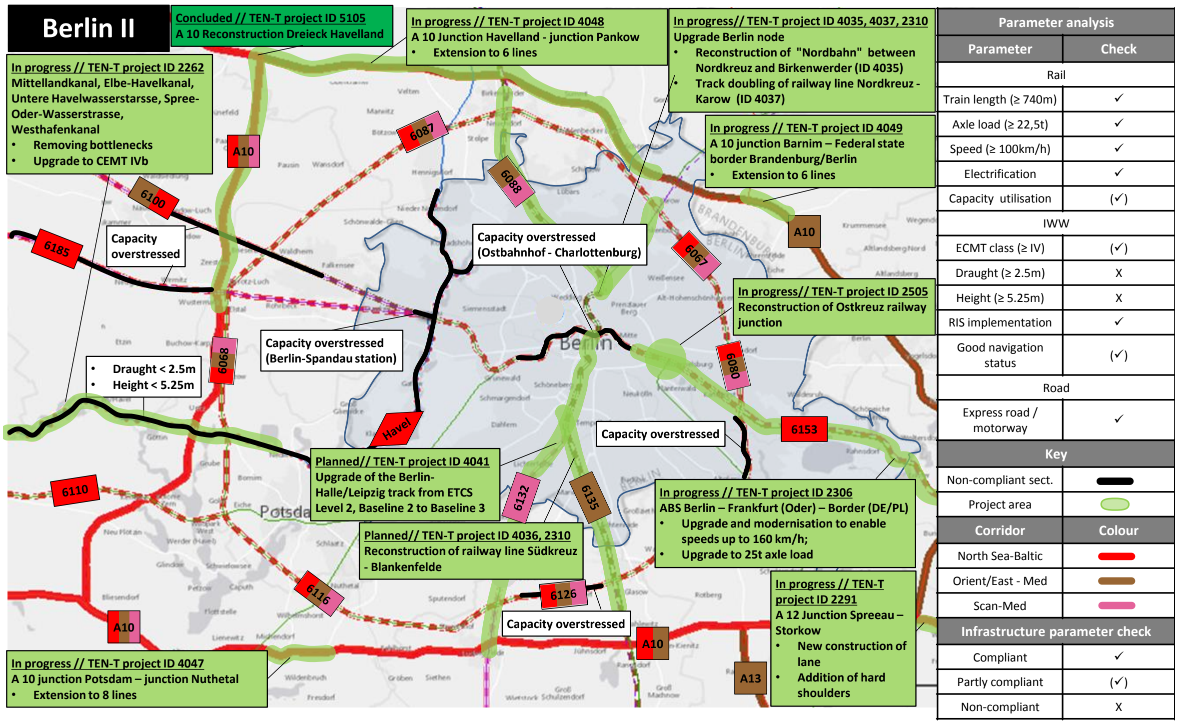
With regard to rail and road most of the corridor lines within the node are compliant with the regulation. However, due to the multiple interconnections of the Berlin-Brandenburg area with other regions (especially Poland) there are many bottlenecks on the node rail network. Conflicts arise especially on sections where long-distance, regional and freight traffic come together. According to Verkehrsverbund Berlin-Brandenburg (VBB) the following main capacity bottlenecks relevant for the CNC have been identified (source: URBAN-NODES-Conference, Berlin, 21st-22nd October 2015): the city railway line “Stadtbahn”(overlap long-distance/regional traffic), Berlin Spandau station, Spandau-Nauen line, railway line from Wustermark in the direction of Hannover, Berlin outer ring (overlap passenger/freight traffic), Ostbahnhof-Charlottenburg.

In contrast to rail and road, the inland waterways in the node (Havel) are characterised by several non-compliant sections. The entire Havel Canal section within the Berlin node doesn’t meet the 5,25 m height under bridges and 2,5m draught requirement. The minimum required standard of CEMT IV and the parameter “good navigation status” are not fulfilled in some sections of the inland waterway in Berlin. A project with the scope of removing the above mentioned bottlenecks in the Havel Canal is ongoing (see Figure 70).

The inland port Neukölln has no rail connection while all other last-mile connections to the corridor’s rail network are compliant. The airport Berlin-Brandenburg International is connected to the heavy rail (see Figure 71).

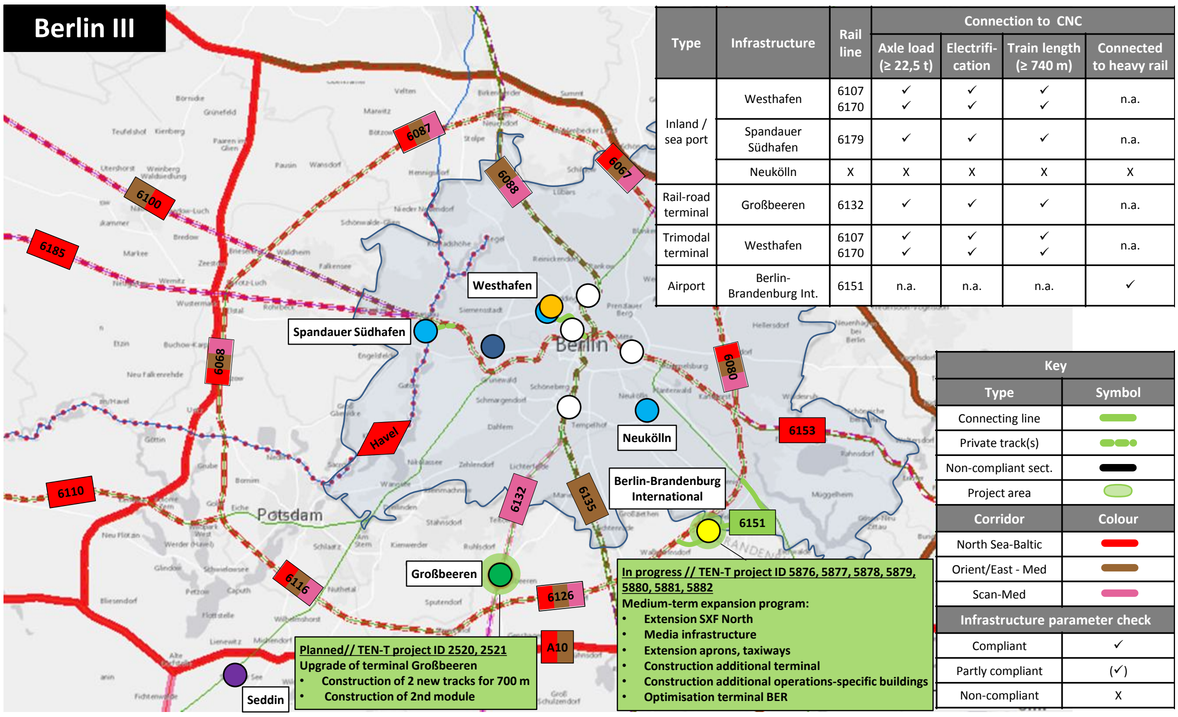
Figure 70 and in Figure 71 display a selection of relevant projects within the urban node. However, further projects have been planned within the node (see Project List 2017).

Figure 70: Analysis of corridor lines in Berlin



Source: HaCon, May 2017

Figure 71: Analysis of last-mile connections in Berlin



Source: HaCon, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

During the "Ideas Laboratory on Core Urban Nodes" (Copenhagen/ Malmö, 23rd-24th March 2017) further local measures for the urban node Berlin Brandenburg have been presented. In the context of the CEF Call 2016 a new Innercity railway line (S21) between the Central Station to the southern part of Berlin has been planned. The new Innercity railway line will connect long-distance and local transport and it will constitute a new linkage between the three Core Network Corridors North Sea-Baltic, Orient/East-Med and Scandinavian-Mediterranean.

The Mobility Strategy 2030 for the federal State of Brandeburg has been pointed out during the Working Group as well. The Mobility Strategy 2030 aims at modelling how the mobility will be organised until 2030 (with a revision every 5 years). It sets out following eight goals:

1) Mobilising the European Capital Region;
2) Appropriate mobility in all areas (urban and rural);
3) Mobility as policy for growth and structure;
4) Appropriate infrastructure;
5) Mobility for target groups;
6) Designing an eco-friendly mobility;
7) Using the digital revolution (active communication of solutions);
8) Social and secure mobility.

These goals should be achieved through the use of European funding and European Solutions, initiatives jointly with Berlin, cooperation and coordination with other regions, expanding cross-border railway connections, innovative forms of mobility (combibus), radial and tangential connecting lines within the capital region, multilingual information and increasing accessibility. Measures for 2017 within the Mobility Strategy 2030 are the revision of the plan for the local transport, the development of a cycling strategy, a strategy for roads, a strategy electromobility and the conference on mobility with Berlin.

Finally, also the guidelines of the governmental policy of Berlin 2016-2021 have been mentioned at the Urban Node laboratory. They include, among others, following goals: supporting environmentally friendly transport (preservation instead of new construction), definition of priority networks for public transport, cycling and private transport, expansion of tram, development of the charging infrastructure for electromobility (1000 charging stations until 2018), improvements of the railway connections to Szczecin, Wroclaw and Prague and organisation of innercity transports by green transport modes.

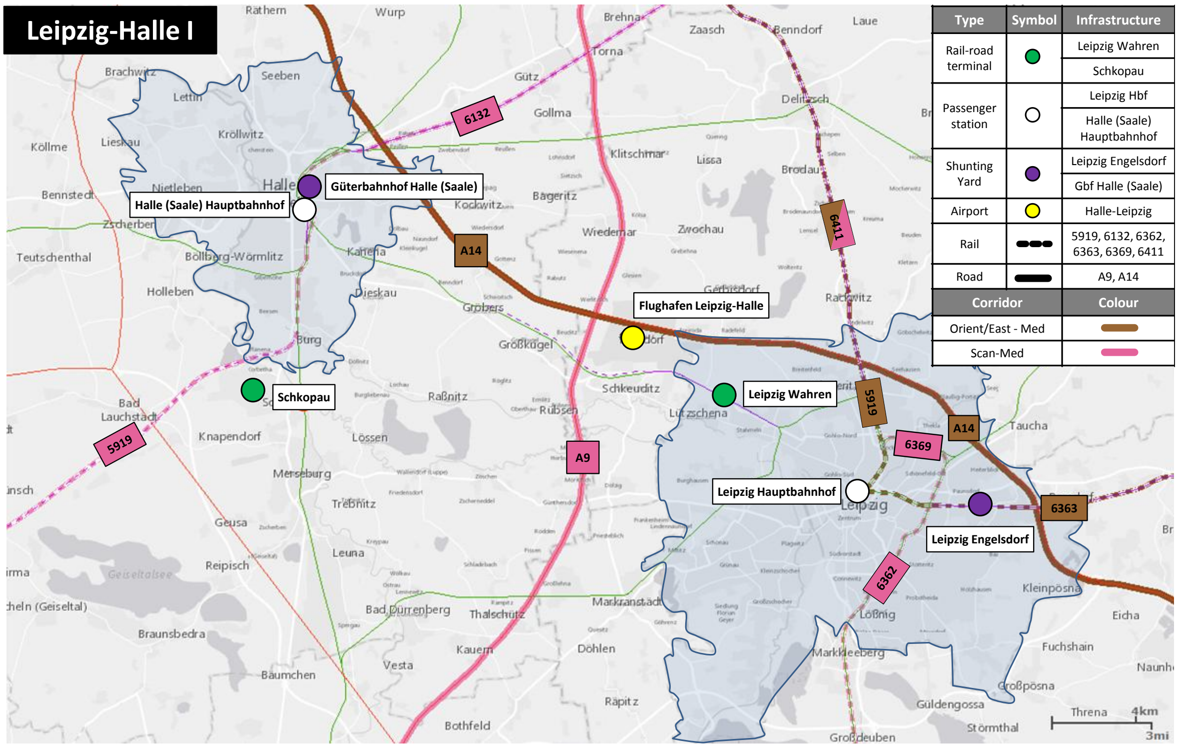
9.3.12 Leipzig, Halle

Leipzig is the largest city in the German federal state of Saxony and it is situated on the Orient/East-Med and Scandinavian-Mediterranean corridor networks. "Leipzig" is identified as the core urban node in List 1 of Annex II of the TEN-T Regulation. However in List 2 of the same Annex "Leipzig, Halle" is the name of the node so that we have enhanced the analysis to Halle.

The core network running through the city only consists of rail and road lines. The motorway A9 and great part of the rail network in the node "Leipzig, Halle" are part of the Scandinavian-Mediterranean corridor. The rail-road terminals Schkopau and

Leipzig Wahren and the airport Leipzig/Halle are the main access points in line with the regulation within the urban node (see Figure 72). Further terminals (not in line with the regulation) within the urban node are the Container Terminal Halle Saale (CTHS) and EMONS Terminal.

Figure 72: Leipzig, Halle urban node

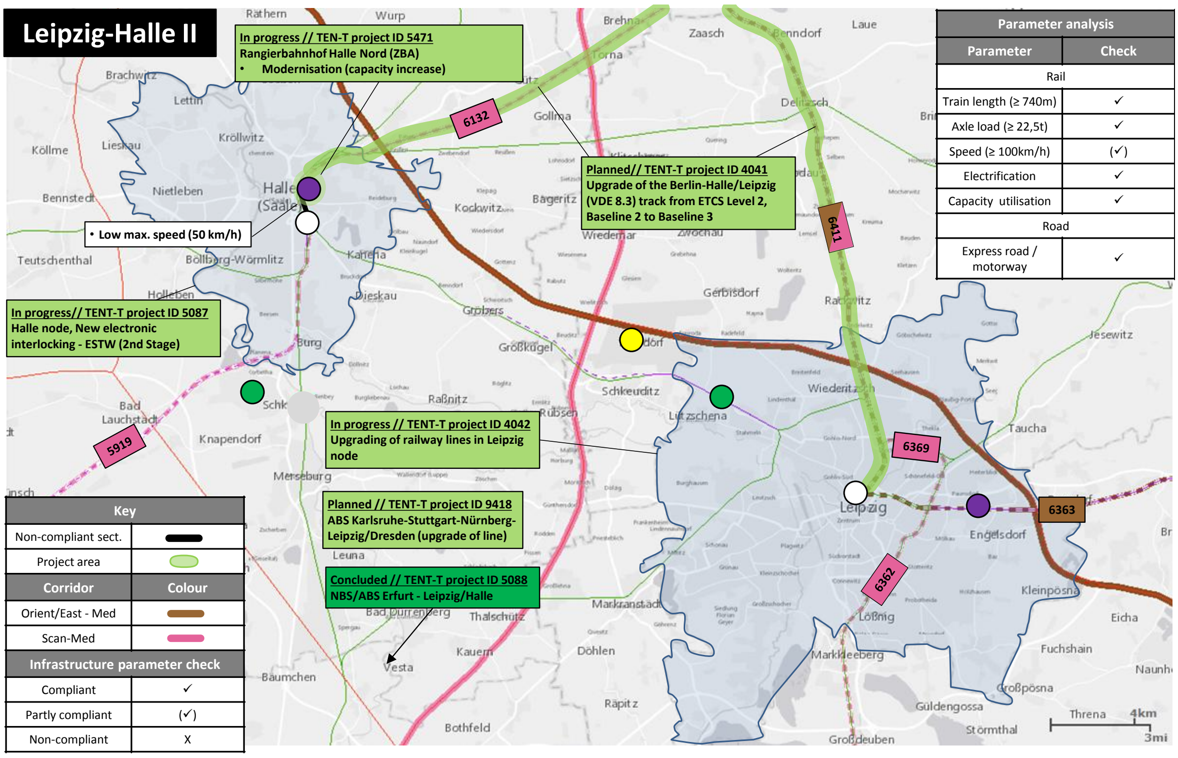


Source: HaCon, May 2017

A part form a rail section at the shunting yard Güterbahnhof Halle (Saale), where the maximal permitted speed is 50 km/h, the corridor core network in Leipzig-Halle is compliant (see Figure 73).

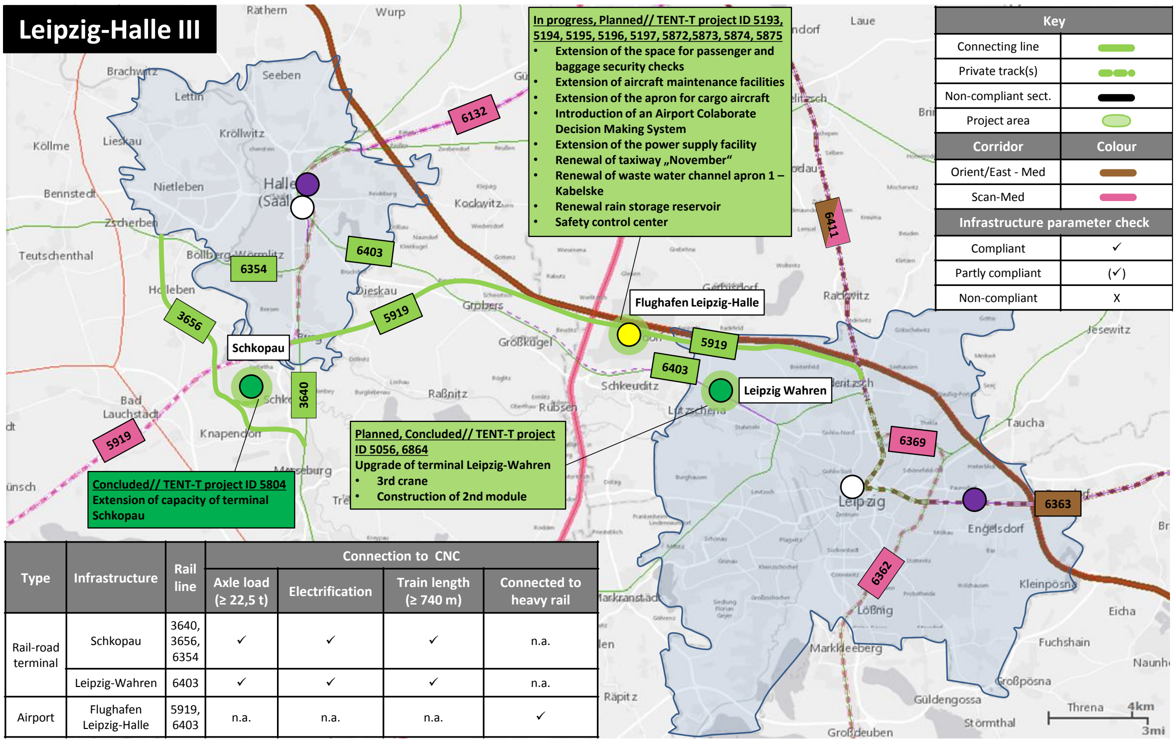
The last-mile connections of the rail-road terminals Schkopau and Leipzig Wahren to the corridor's rail network are compliant and the airport in Leipzig/Halle is connected to the heavy rail (see Figure 74).

Figure 73: Analysis of corridor lines in Leipzig, Halle



Source: HaCon, May 2017

Figure 74: Analysis of last-mile connections in Leipzig, Halle



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
Rail-road terminal	Schkopau	3640, 3656, 6354	✓	✓	✓	n.a.
	Leipzig-Wahren	6403	✓	✓	✓	n.a.
Airport	Flughafen Leipzig-Halle	5919, 6403	n.a.	n.a.	n.a.	✓

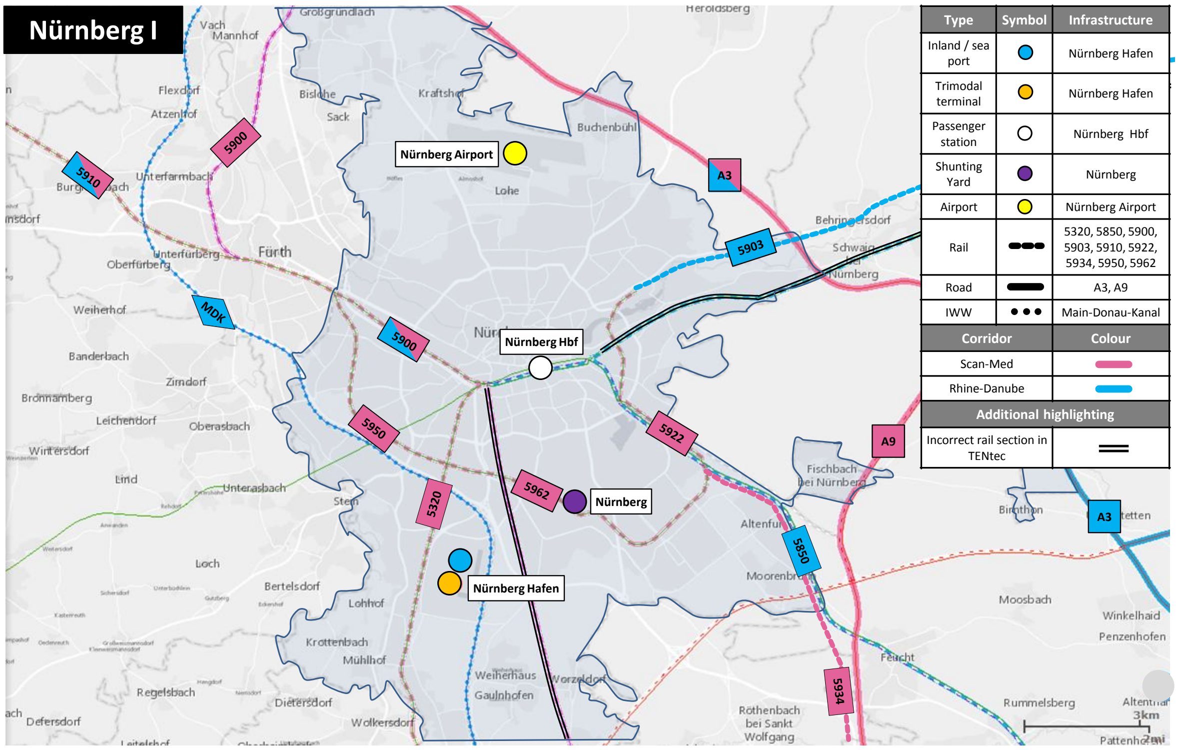
Source: HaCon, May 2017

9.3.13 Nürnberg

Nürnberg is located in the southern part of Germany in the federal state of Bavaria, where it is the second-largest city after München. The transport infrastructure in that area includes many railways, important highways and an inland waterway. It is perceived as a relevant node for the commerce with Eastern Europe.

Two corridors (Scandinavian–Mediterranean and Rhine-Danube) run through the urban node (see Figure 75). Motorways A3 and A9, passing next to the node, as well as different rail lines are part of the Scandinavian-Mediterranean network while the Main-Danube Canal belongs to the Rhine–Danube corridor. The access points included in the urban area are an inland port (Nürnberg Hafen), a trimodal terminal (Nürnberg Hafen) and the airport on the north of the city.

Figure 75: Nürnberg urban node

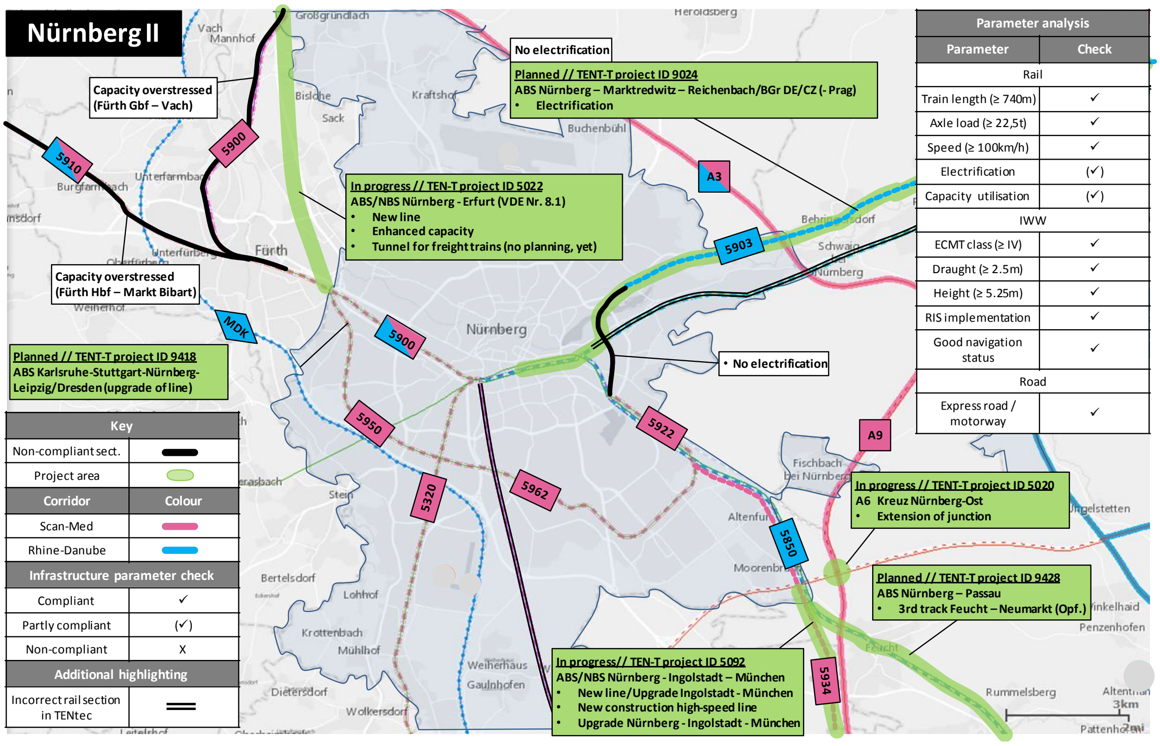


Source: HaCon, KombiConsult, May 2017

Among the projects envisaged in the urban node area there is a project aiming at the electrification of the rail line "Nürnberg – Marktredwitz – Reichenbach". In addition to the above mentioned not electrified rail line, two further corridor rail sections present a bottleneck. The sections "Fürth Hbf – Vach" and "Fürth Hbf – Markt Bibart" on the north-western part of the city are afflicted by overstressed capacity. For this purpose, a project for the construction of a new line and for enhancing the capacity on the line Nürnberg-Erfurt has been identified. The "freight train tunnel" planning has not yet been started. Core network lines for road and inland waterways in the urban node are compliant to the regulation (see Figure 76).

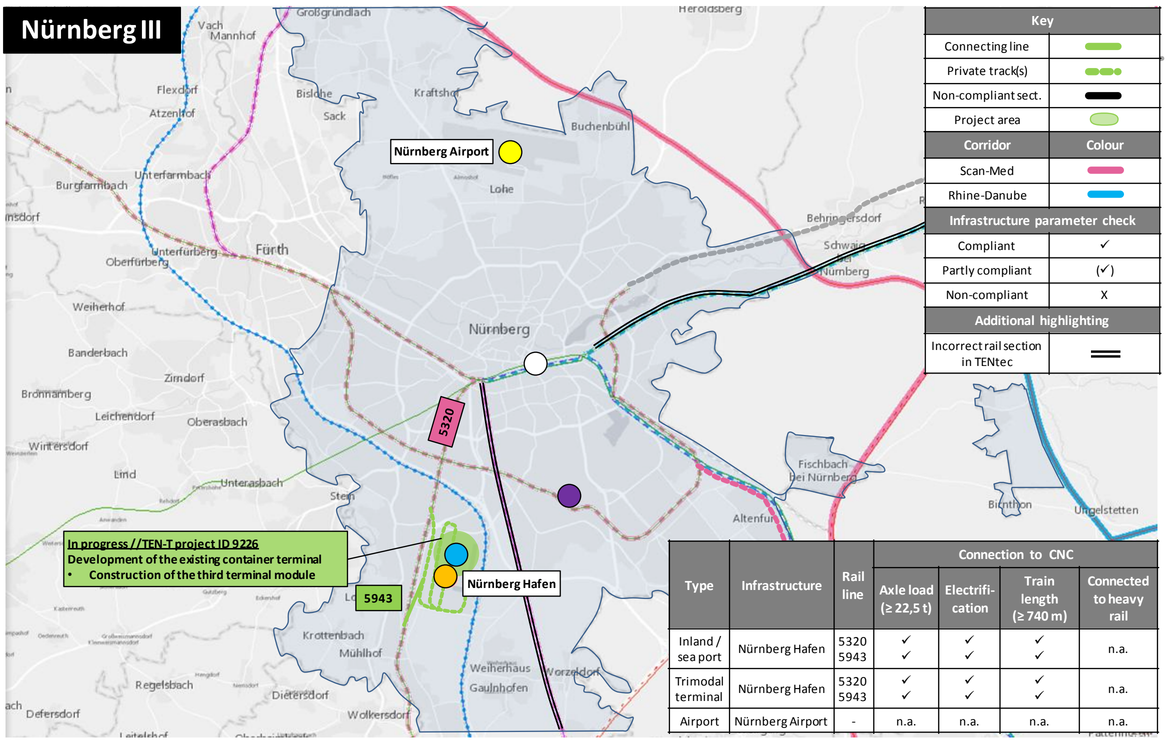
The last-mile rail connections between the access points and the core rail lines are compliant with regard to axle load, electrification and train length requirements while the airport has no connection to the heavy rail (see Figure 77).

Figure 76: Analysis of corridor lines in Nürnberg



Source: HaCon, KombiConsult, May 2017

Figure 77: Analysis of last-mile connections in Nürnberg



Source: HaCon, KombiConsult, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The city of Nürnberg has a clear strategy for encouraging walking and cycling. Under the motto of "Nürnberg moves up" several goals such as creating a bike friendly atmosphere, increasing the bicycle share, improving the bicycle safety and linkage with public transport measures are agreed upon. Among other things improvement of infrastructure (routes, lanes, racks a.o.), signposting, safety measures (improved street design) and marketing/information campaigns have been implemented. With the opening of the central market place for bicycles one "mssing link" in the Pan-European far distance bike path Paris – Prag could be closed. The measures have resulted in an increase of the use of bicycles in the daily traffic.

Figure 78: Nürnberg – bike-lane in the Königsstarße

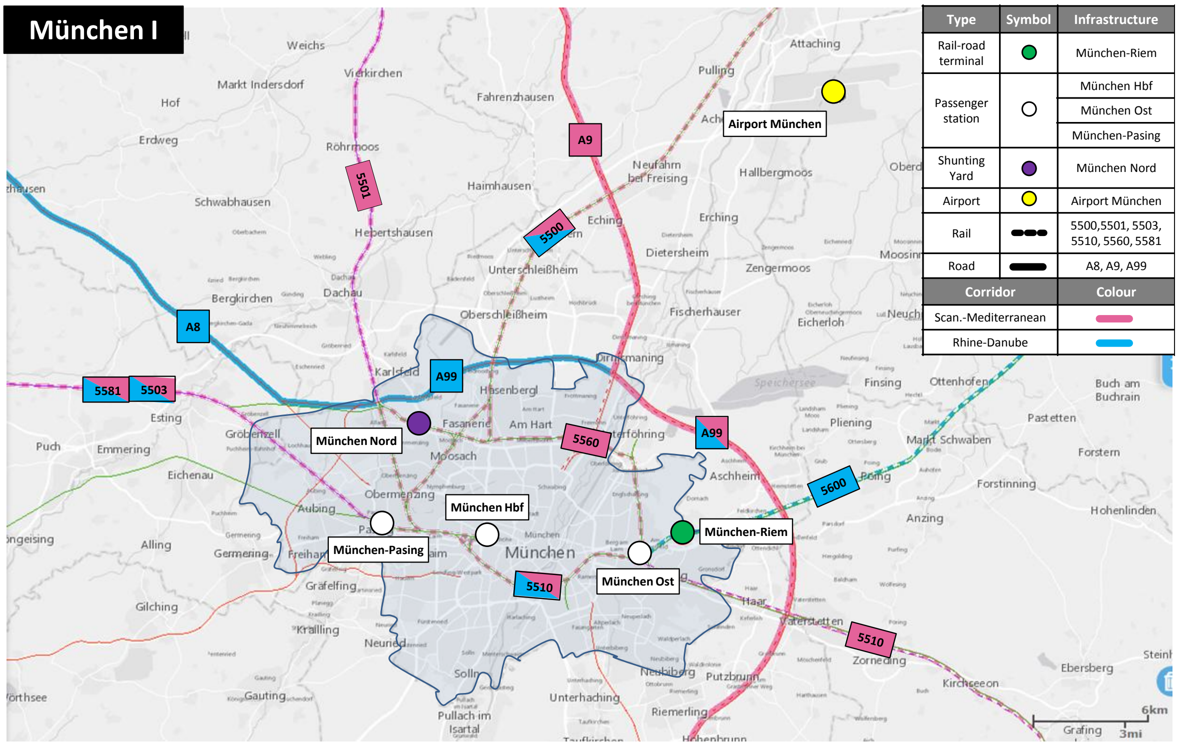
Source: Stadt Nürnberg, November 2016

9.3.14 München

München, the capital and biggest city of the German federal state Bavaria, is the third largest city in Germany.

The Scandinavian–Mediterranean and the Rhine-Danube corridors flow through the node. Rail and road corridor lines are part of the Scandinavian-Mediterranean corridor while no inland waterway is present on the München corridor core network. A rail-road terminal (München-Riem) and the airport on the north of the city are the unique access points in line with the regulation within the urban node (see Figure 79).

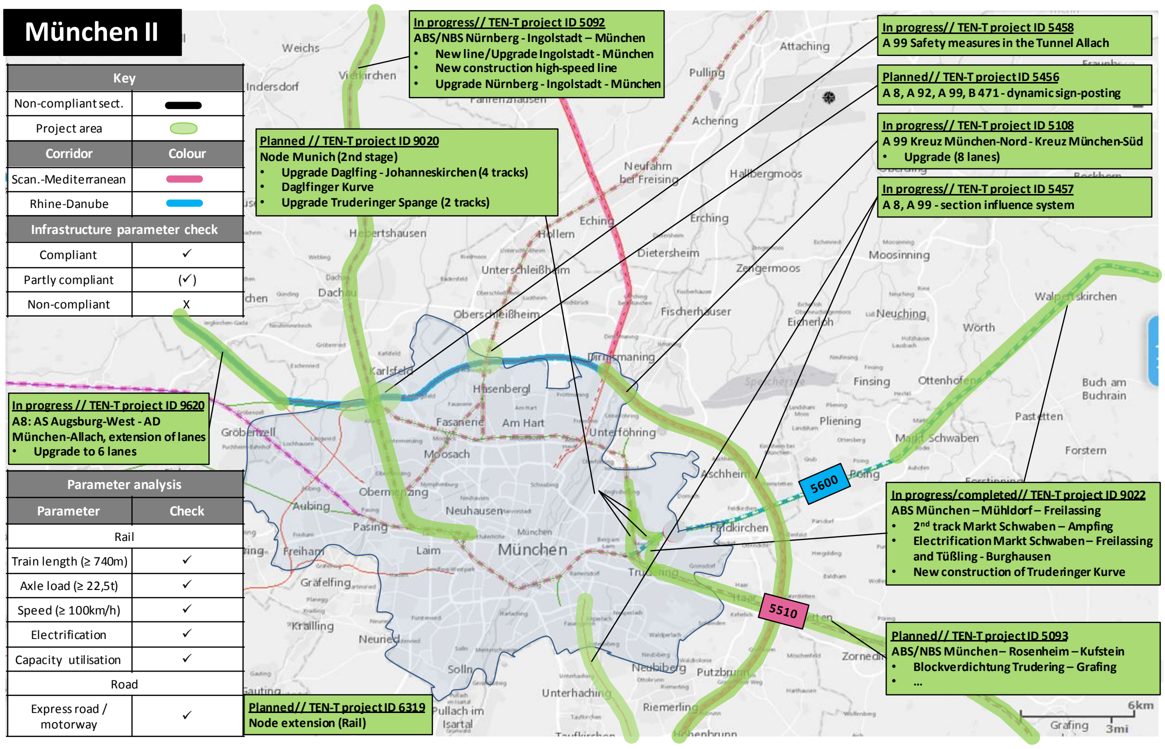
Figure 79: München urban node



Source: HaCon, KombiConsult, May 2017

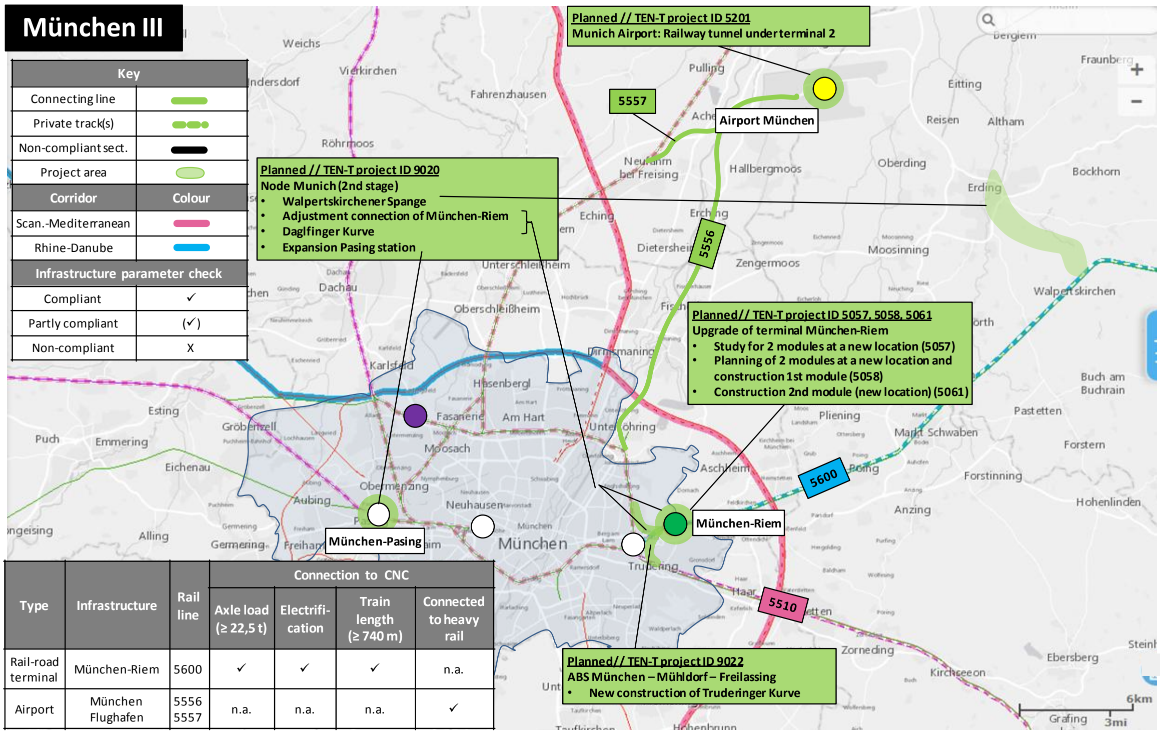
The corridor core network in München is completely compliant and the airport has a heavy rail connection (see Figure 80 and Figure 81).

Figure 80: Analysis of corridor lines in München



Source: HaCon, KombiConsult, May 2017

Figure 81: Analysis of last-mile connections in München



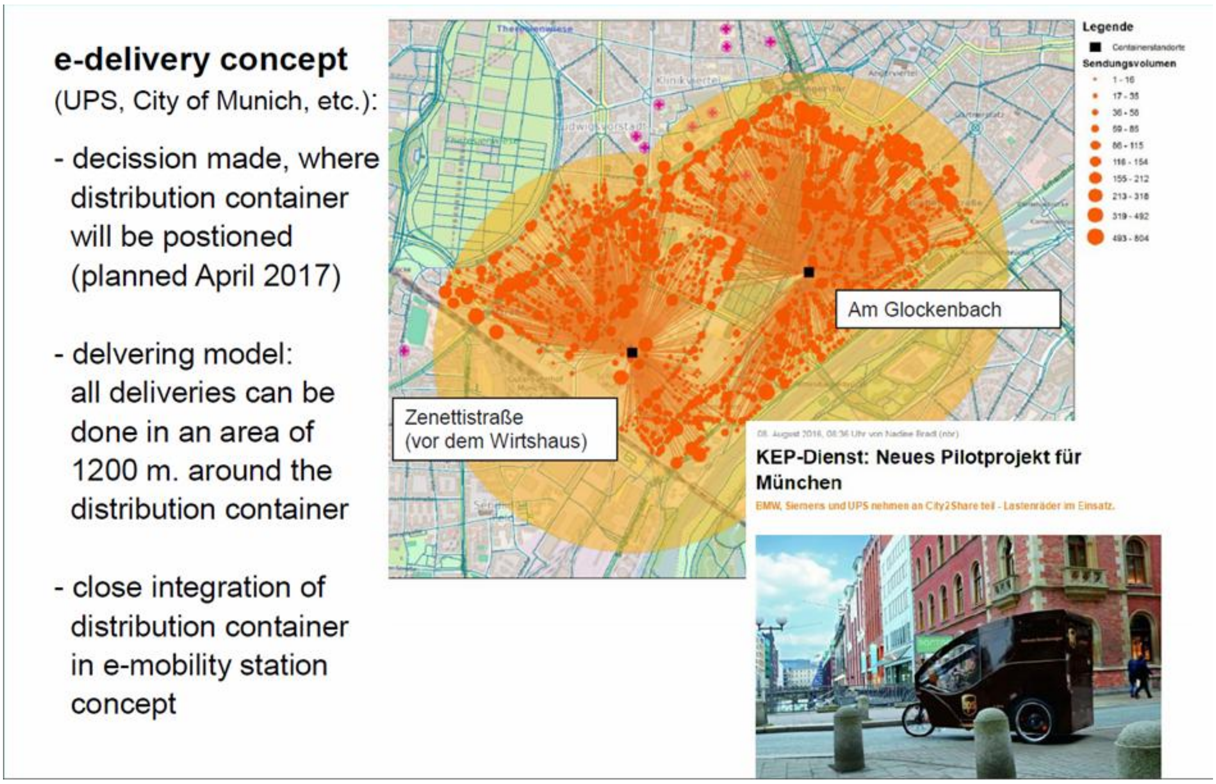
Type	Infrastructure	Rail line	Connection to CNC			
			Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Rail-road terminal	München-Riem	5600	✓	✓	✓	n.a.
Airport	München Flughafen	5556 5557	n.a.	n.a.	n.a.	✓

Source: HaCon, KombiConsult, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

The city of München is currently experimenting an inner city model area for sustainable urban mobility within the "City2Share" –project (2016-2020).The project's idea is to integrate innovative mobility solutions in a real-life inner-city context. The integrated concept is made of the following modules: integration of e-mobility infrastructure for private cars, pedelecs and sharing systems at one point close to public transport stops (e-mobility stations), distribution container and delivery pedelecs („cargo cruisers") for last mile of urban freight transport (delivery concept) with the integrator UPS, testing of automated / autonomous cars in an inner city area and developing an information plattform for inhabitants and visitors and active participation of inhabitants and local business Communication). It is expected increase the share of sustainable modes of transport, provide more space for inhabitants, pedestrians and cyclists rather than parking space and trucks and to increase people's participation in the planning process.

Figure 82: München – e-delivery concept



Source: Stadt München, November 2016

9.3.15 Bologna

Bologna is the main relevant railway and road node in Italy due to its strategic positioning along the north-south axis. Bologna is the seventh largest city in Italy and sixth in economic importance. The node is part of the Scandinavian-Mediterranean, Baltic Adriatic and Mediterranean Corridors.

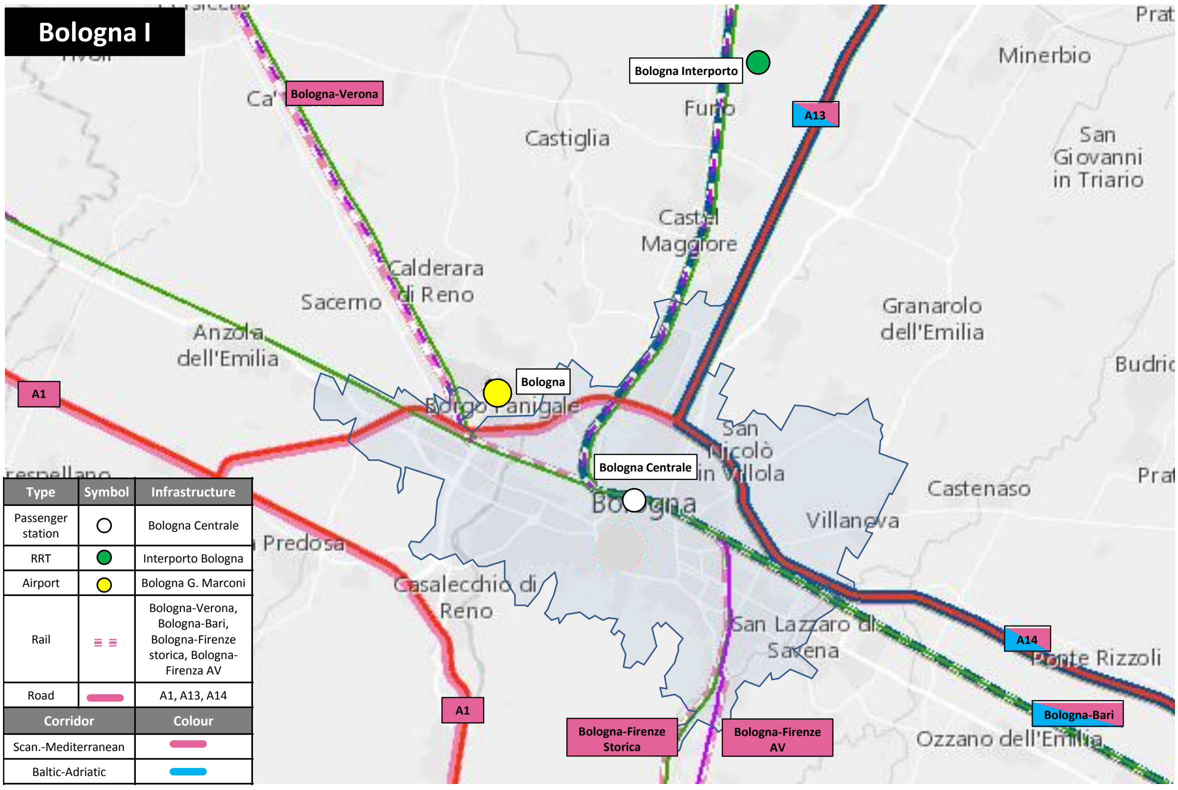
The Scandinavian-Mediterranean runs through Bologna between the Brenner boarder and the core urban node of Rome. Main access points are represented by the Bologna high-speed central station, the international airport and the freight village Interporto di Bologna.

The high-speed infrastructure developed at national level (from Torino to Napoli and Salerno) sees Bologna as a central pole and relevant train interconnections are developed through the Adriatic line as well as towards Brenner along the corridor.

Concerning road transport, the Bologna node represents a relevant bottleneck on which specific investments are envisaged.

As a logistics centre, Bologna can count on its rail-road terminal (Interporto di Bologna), which is well connected to the motorway and railway system and benefitting from the strategic location of the node towards the three mentioned corridors.

Figure 83: Bologna urban node



Source: GruppoClas, May 2017

Main investments focus both on road and rail infrastructure as well as on development project for the airport and the rail-road terminal.

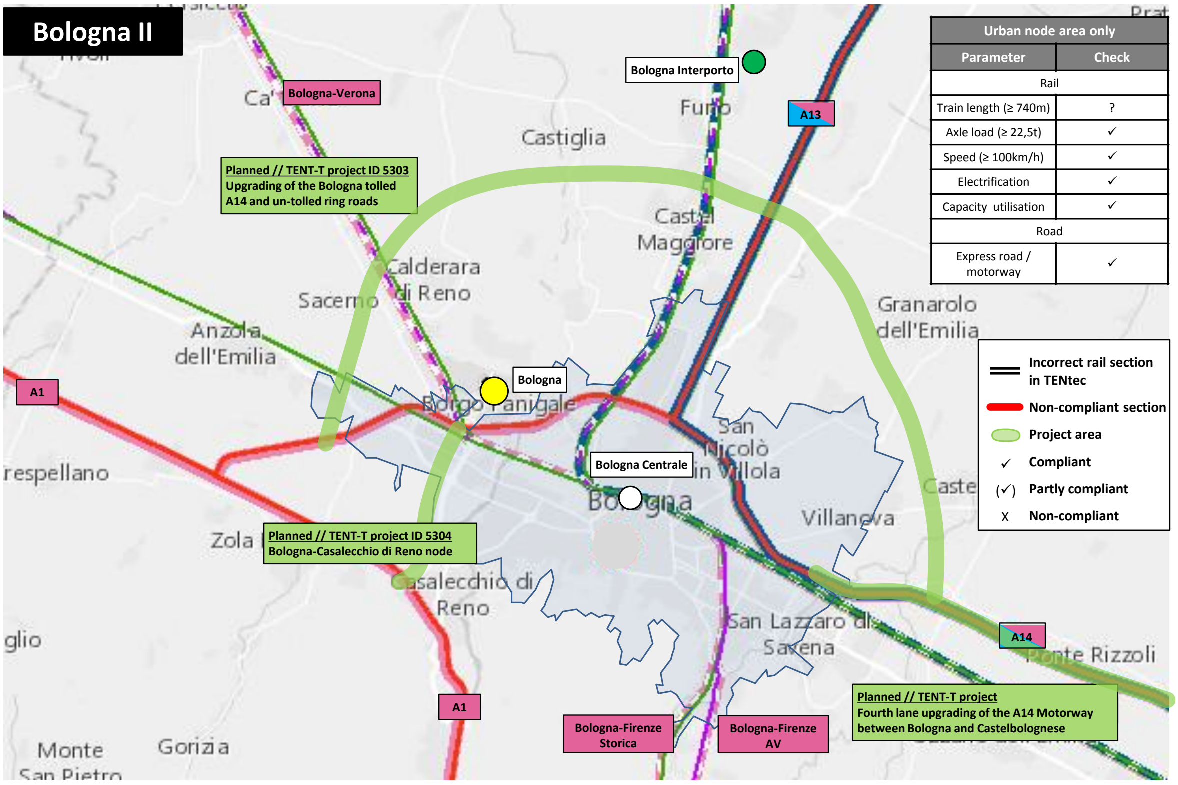
Concerning the railway infrastructure, projects affecting the node are focused on capacity improvements (Technological and functional upgrading of the Bologna-Castelbolognese), in synergy with the technological upgrading of the Adriatic line (Bologna – Ancona (Ancona - Foggia) + Foggia – Taranto). A second range of intervention has a focus on the enhancement of the regional and suburban railway system, also including trolleybus infrastructure development along the main public transport routes and construction of an underground section between Portomaggiore and Bologna.

Road related intervention consist in the upgrading of the Bologna tolled A14 and un-tolled ring roads, the upgrade of the A14 Motorway between Bologna and Castelbolognese and of the Bologna-Casalecchio di Reno node, the realisation of a metropolitan expressway road north of the A14 between Ozzano and Bologna

Rail-road terminal improvements consist according to the projects included in the workplan in the implementation of ICT system application in RRT on the Italian part of the corridor, for operations synchronization and management efficiency with other nodes. Moreover, the RRT is involved (together with other RRTs and ports in Italy and Germany) in the development of the LNG Masterplan for inland transport, in order to comply with the requirements set by Directive 2014/94/EU that requires an appropriate number of points along the TEN-T core network for the coverage of LNG needs for heavy-duty vehicles by the end of 2025.

Last group of investment projects are related to the development of the airport, and include both internal and external interventions for the improvement of the infrastructure.

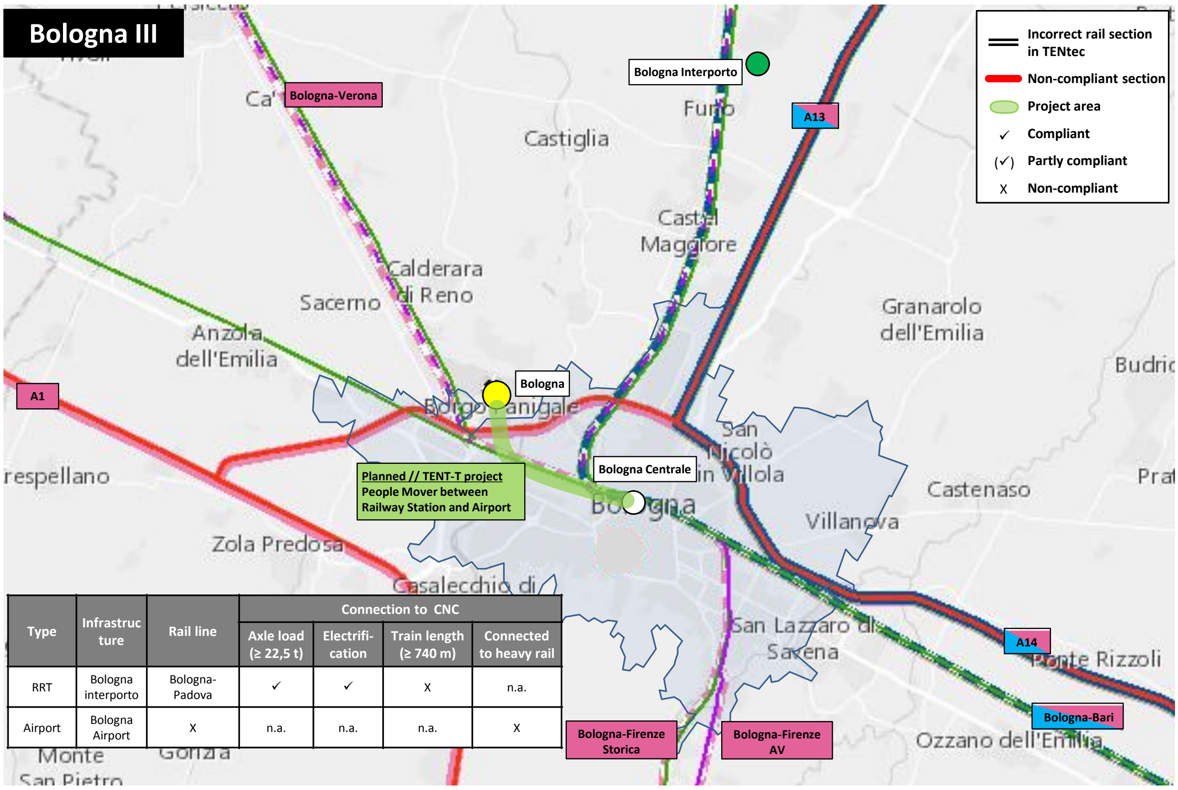
Figure 84: Analysis of corridor lines in Bologna



Source: GruppoClas, May 2017

The corridor core network within urban node is compliant with Regulation (EU) 1315/2013. On the other hand, the last-mile connection of the Interporto Bologna to the core network does not fulfil the 740 m train length criterion and the airport is not connected to heavy rail.

Figure 85: Analysis of last-mile connections in Bologna



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
RRT	Bologna interporto	Bologna-Padova	✓	✓	X	n.a.
Airport	Bologna Airport	X	n.a.	n.a.	n.a.	X

Source: GruppoClas, May 2017

Main last mile project concerning the Bologna urban node is represented by the construction of a people mover system connecting Bologna central station with the airport.

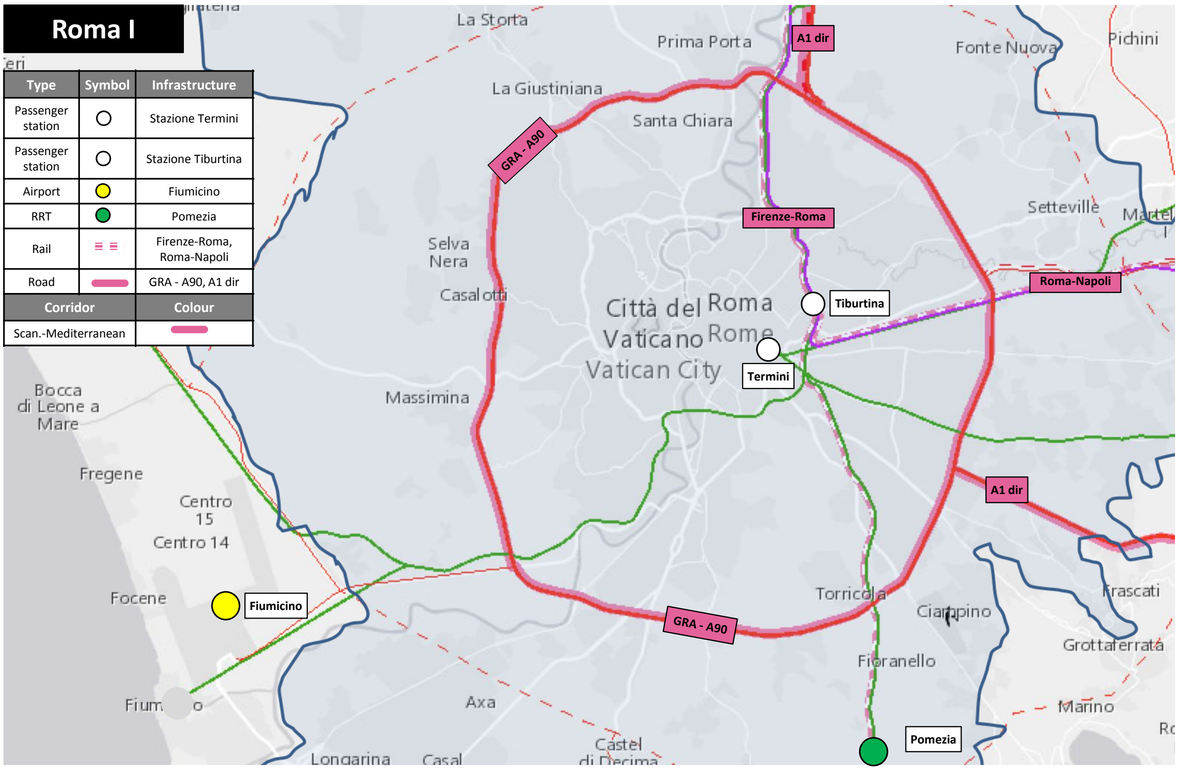
9.3.16 Roma

Roma is the capital of Italy and the Intercontinental Fiumicino Airport is the main airport infrastructure in the country. The node is interested only by the Scandinavian-Mediterranean corridor, representing one of the main critical points both for rail as well as road infrastructure.

Access points are represented by the A1 motorway and the high-speed line from Florence on the north side and Napoli from the south side. A 68,2 km ring road motorway around the city (GRA- Grande Raccordo Anulare) connects the different roads and motorways accessing the city. The development of the high-speed rail connection allowed the upgrade of the two main stations Roma Tiburtina and Roma Termini.

Fiumicino Airport is located around 30 km south east of the city centre, and is connected by a rail service, and its road and metro connections represent a relevant issue for the development of the infrastructure. On the south of the node is situated the Pomezia rail-road terminal.

Figure 86: Roma urban node



Source: GruppoClas, May 2017

The main project along the corridor starting from the Roma node towards south is the upgrade of the Roma-Napoli line, including both HS and conventional lines (5268).

Concerning bottlenecks, the railway node is affected by capacity stress, therefore several interventions are planned in order to upgrade and reinforce the infrastructure.

Railway and road projects related to the whole node are the following:

- Upgrade of the Roma railway node (technological improvements, northern and southern bypasses, HDTS, ERTMS) (5265), and
- Upgrade of technological equipment and safety in the Selva Candida Tunnel along the A90 Roma Ring Road (5337).

Moreover, concerning railways a new station (Pigneto) between Tiburtina and Tuscolana is planned (5913).

Great part of the planned interventions is related to the Airport and its connections with the city.

Concerning the Airport infrastructure, the 5610 project focuses on the improvement of the southern part of the terminal (including boarding areas, aircraft stands and loading bridge stands, new baggage systems, taxiways, highway junction development, power plant, car parking, cargo & logistics, offices and hotels). Some of these infrastructures are under construction and some other under design phase.

Project 5612 represents the masterplan for the northern part of the airport, and it includes new terminal, new runway (Fifth runway) and connected facilities (e.g. new aprons, taxiways).

Project 5611 envisages the construction of a 4th runway.

Concerning urban projects, the following have been planned by the Municipality in order to enhance sustainable mobility options at urban level:

Multimodal

- Enhancement of public transport services and removal of bottlenecks along the Rome bypass;
- Trolleybus 90 express: upgrading of electrical system for a fleet expansion;
- Interchange node between GRA exit Casilina (n. 18) and metro C station Giardinetti;
- 3 interventions for accessibility and intermodality improvement: 1) Garbatella station; 2) Libia MB1 - Nomentana FL1; 3) Ponte Lungo - Tuscolana station;
- Exchange parking on metro B1 Conca D'Oro and S.Agnese – Annibaliano;
- Tramway link Marconi: from viale Trastevere to Marconi station, and from viale Trastevere to Basilica San Paolo station, ex Fiera di Roma till to interchange with future tramway link on Appia Antica park;

Innovation

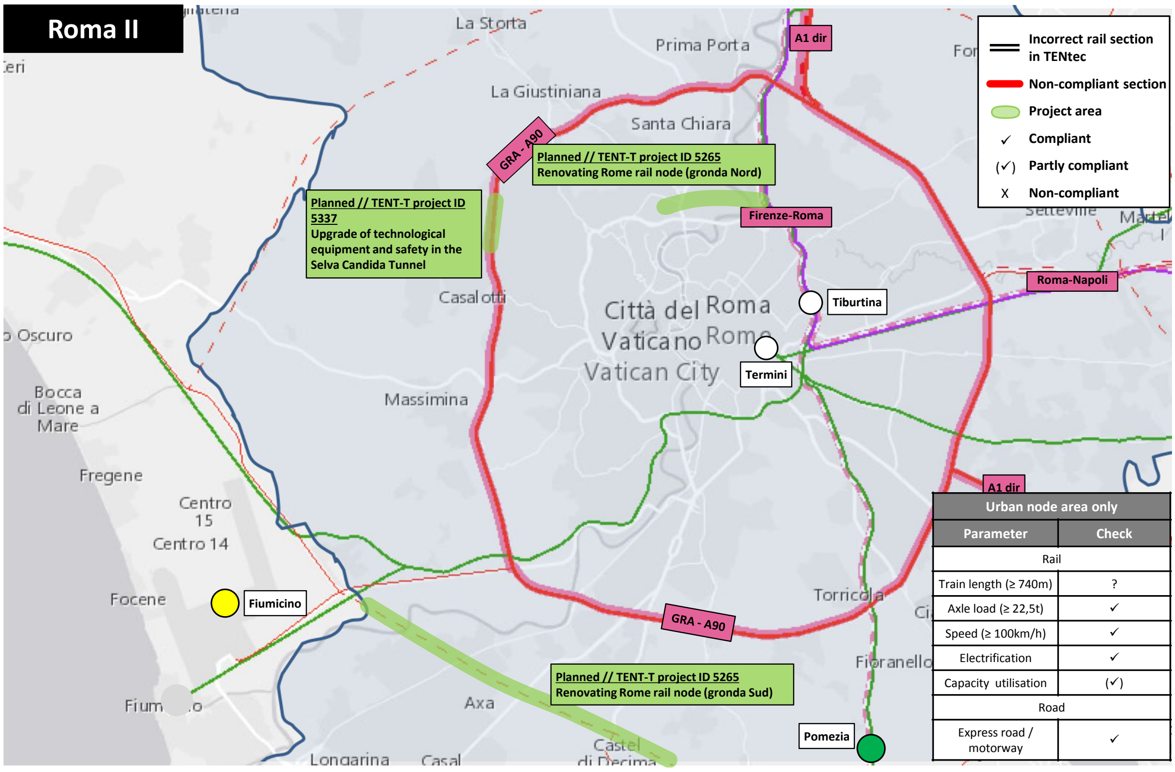
- Improvement of electric bus fleet to serve LTZ (60 vehicles);

"Other"

- Tangential corridor 1 (tramway): Tor Marancia - Parco Appia Antica - Ponte Mammolo;
- Tangential corridor 1 (trolleybus): Ponte Mammolo - Monte Cervialto - Jonio - Vigne Nuove - Nuovo Salario - Saxa Rubra - Sant'Andrea;
- Cableway Battistini – Boccea GRA – Casalotti;
- Light rail Jonio B1 – Vigne Nuove - via della Bufalotta;
- Tramway link Fori Imperiali: Largo Corrado Ricci - Piazza Venezia;
- Extension of trolleybus Laurentina - Tor Pagnotta to University "Campus Biomedico" and Trigoria;
- "Boulevard Via nazionale", urban refurbishment and new tramway link.

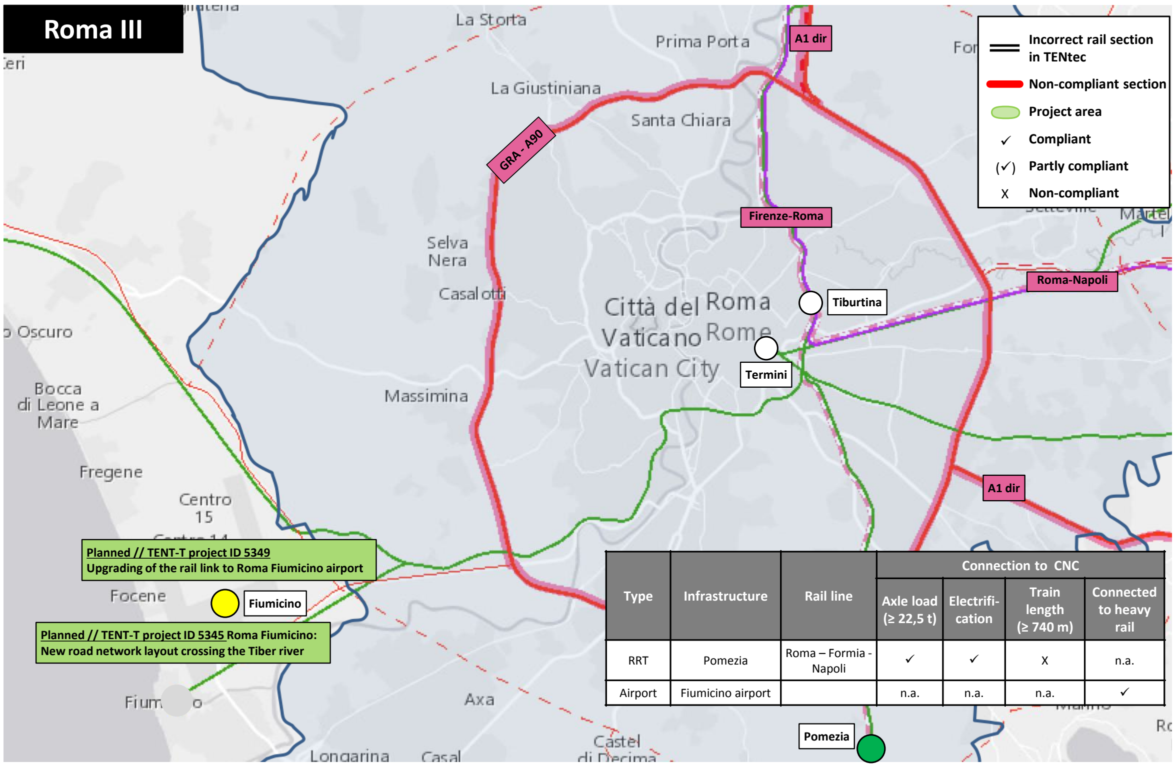
A major specific urban node project is represented by the extension of metro line B: Rebibbia - Casal Monastero, which includes the development of a road-rail Interchange node.

Figure 87: Analysis of corridor lines in Roma



Urban node area only	
Parameter	Check
Rail	
Train length (≥ 740m)	?
Axle load (≥ 22,5t)	✓
Speed (≥ 100km/h)	✓
Electrification	✓
Capacity utilisation	(✓)
Road	
Express road / motorway	✓

Figure 88: Analysis of last-mile connections in Roma



Type	Infrastructure	Rail line	Connection to CNC: Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
RRT	Pomezia	Roma – Formia - Napoli	✓	✓	X	n.a.
Airport	Fiumicino airport		n.a.	n.a.	n.a.	✓

Source: GruppoClas, May 2017

Concerning the airport accessibility, projects focus both on railway (5349, upgrading of the rail link).

Furthermore, projects planned to enhance the road link are the new motorway connection (5336, connection between Fiumicino Airport and A24 motorway) and new local road network (5345).

9.3.17 Napoli

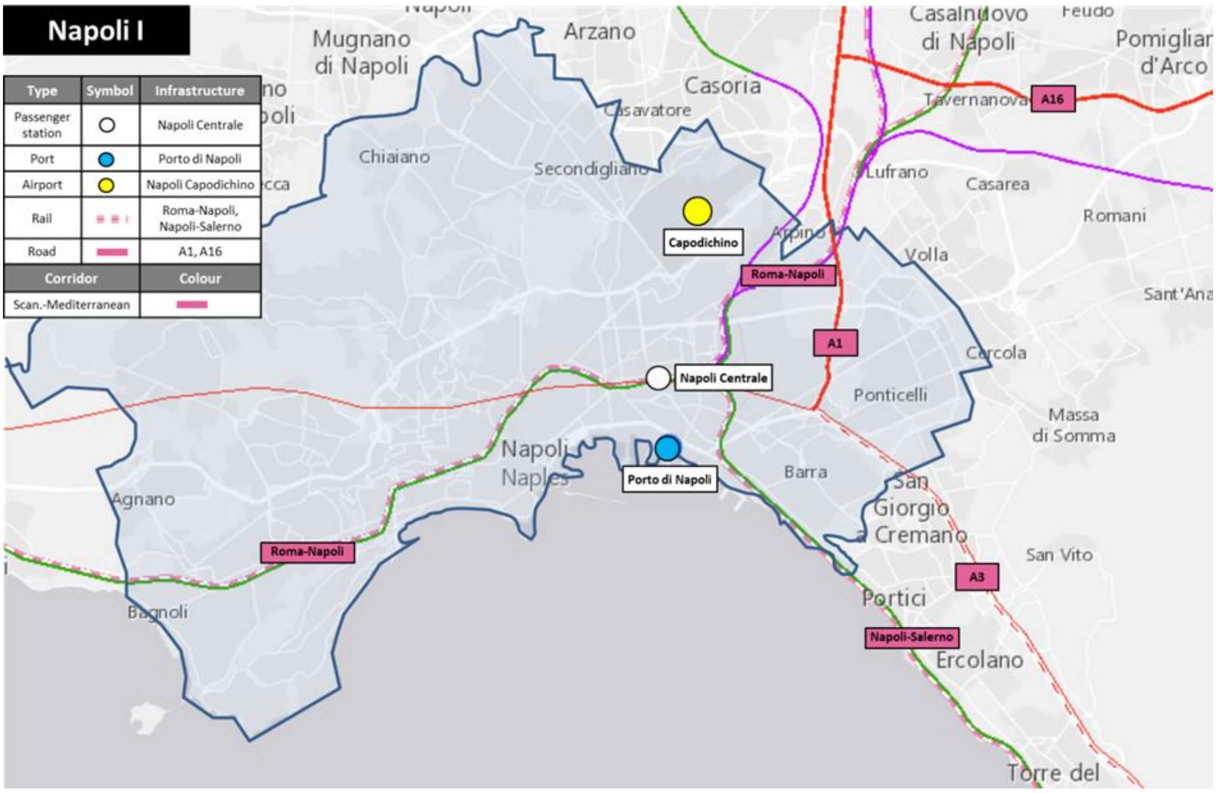
Napoli represents the core node connecting southern Italy to the Scandinavian-Mediterranean Corridor. The corridor splits here in two main branches, one towards south to Sicily and Palermo, the second one toward east/south to Bari and then Taranto in Puglia.

Napoli is as well one of the largest Italian seaports and one of the largest seaports in the Mediterranean, located inside the urban area. Capodichino Airport, Interporto Marcianise and Interporto Nola are as well located inside the urban node area.

Access points are represented by the A1 motorway and the high-speed line from Roma on the north side and Salerno from the south side. In Salerno begins the A3 Salerno-Reggio Calabria motorway.

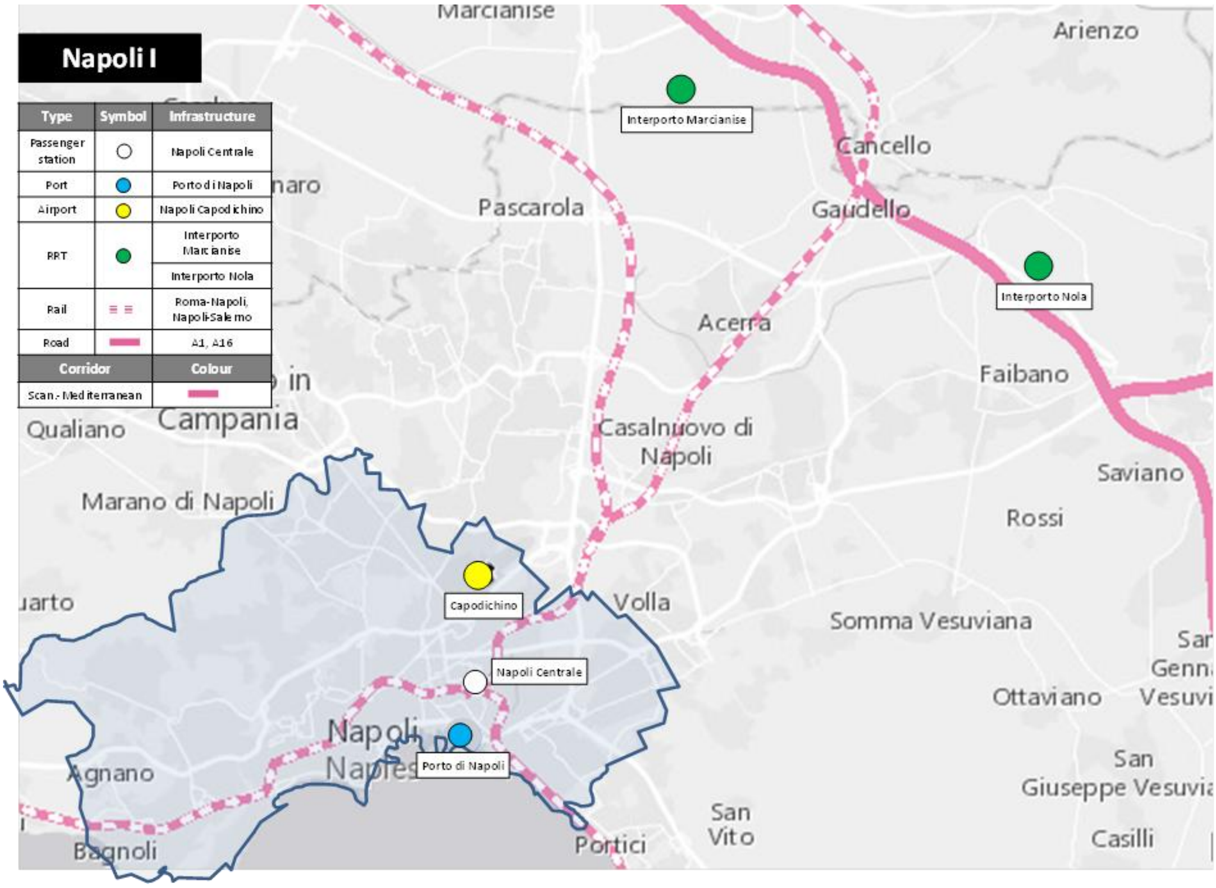
Both high-speed rail and motorway infrastructures bypass the urban node centre, and developed dedicated interconnections leading towards the sea bringing to the central station and the port area.

Figure 89: Napoli urban node



Source: GruppoClas, May 2017

Figure 90: Napoli urban node (with RRT)



Source: GruppoClas, May 2017

Large projects along the corridor affecting the Napoli node are mainly related to railway infrastructure on the two leading south branches: in particular, on the eastern branch the completing of the Napoli-Foggia-Bari connection (5900) and towards south the upgrading of the Napoli-Reggio Calabria line.

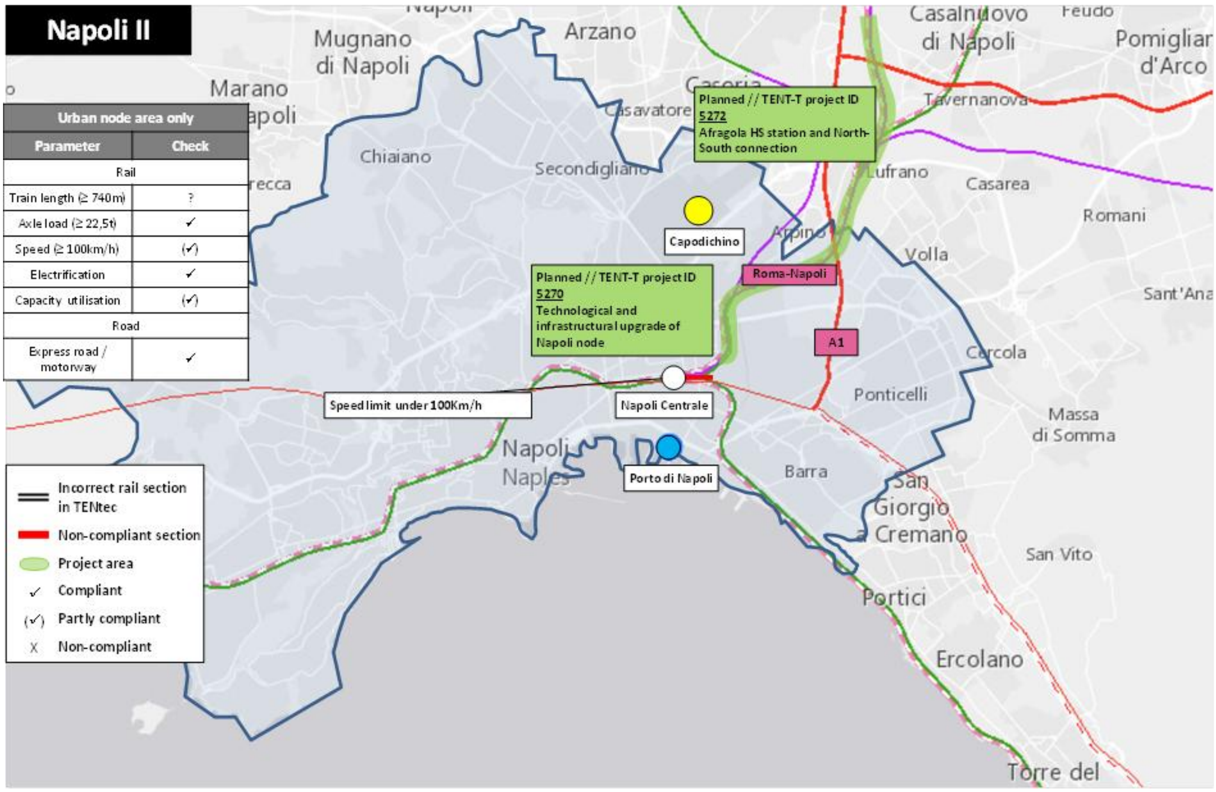
Concerning bottlenecks, the railway node is affected by current and expected capacity stress, therefore interventions of harmonization and improvement of capacity have been planned. In terms of speed limitations, the critical point is represented by the link to the central station: the construction of a new high-speed station will help to overcome the problem.

Looking specifically at the Napoli railway urban nodes, a fundamental project is the construction of the Afragola (access from east-north) high-speed station and the related north south connection along the line (5272), accompanied by the technological and infrastructural upgrade of the node (5270) node.

The port represents the core node infrastructure for the city, and relevant interventions are planned for its development, such as the improvement of the infrastructure in order to develop as a Sea Hub (5322), the upgrade of rail and road connections (5619 and 5620, Upgrade of Darsena di Levante and of the container terminal), and the planning and Implementation of LNG bunkering facilities and Onshore Power Supply (5323).

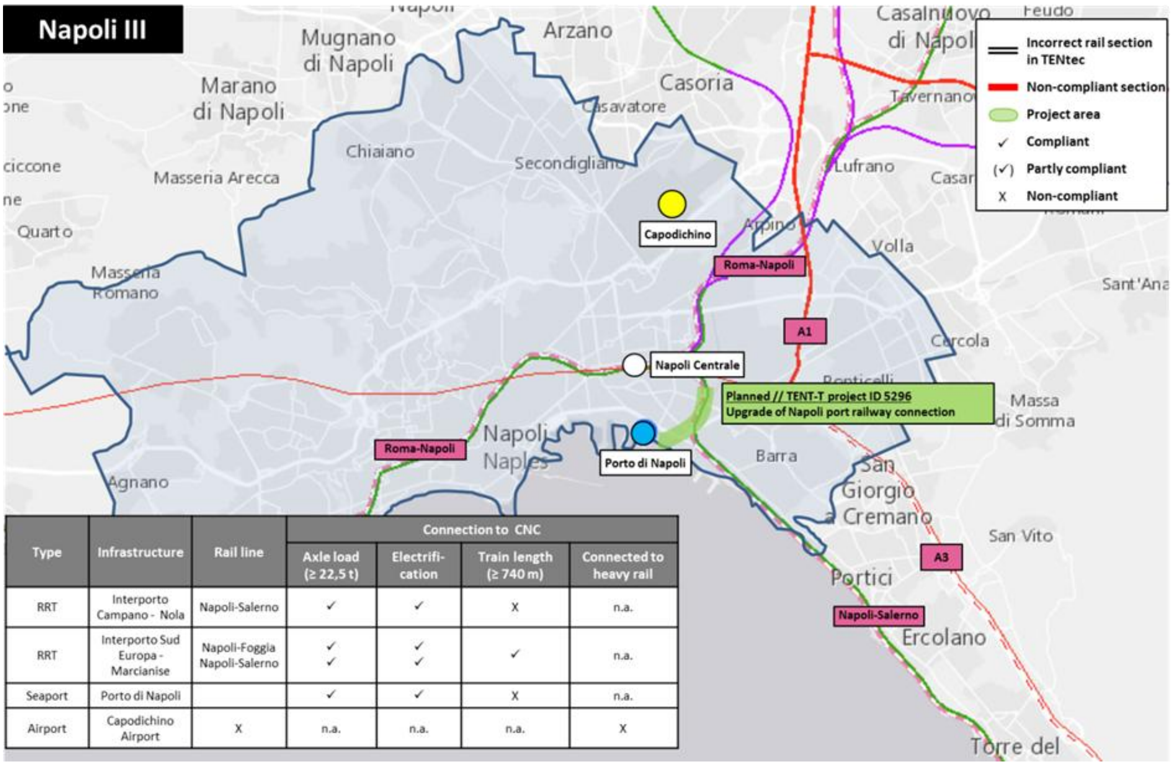
Concerning the Capodichino Airport, the development an upgrade is planned in order to increase airport capacity through technological solutions (5615), accompanied by mitigation measures (5614) and by the development of a new Terminal Cargo and related Facilities (5613).

Figure 91: Analysis of corridor lines in Napoli



Source: GruppoClas, May 2017

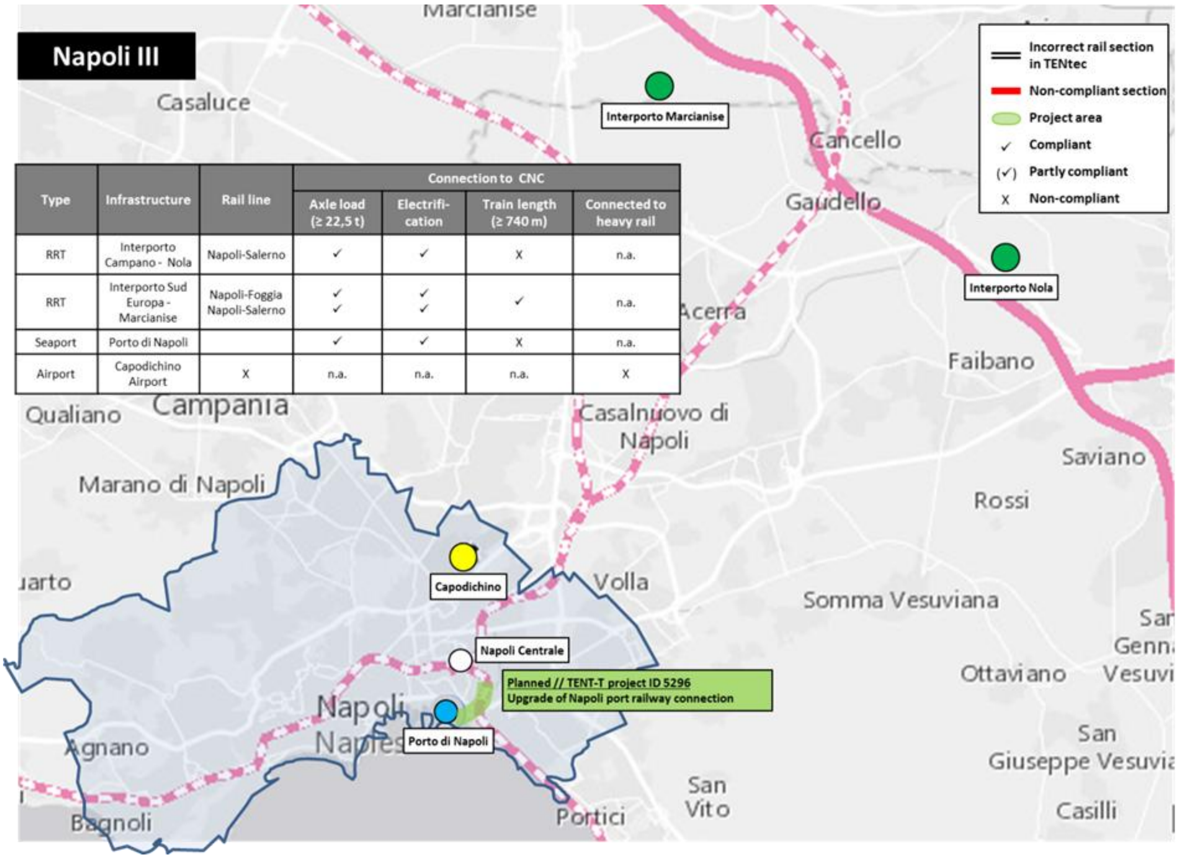
Figure 92: Analysis of last-mile connections in Napoli



Type	Infrastructure	Rail line	Connection to CNC			
			Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
RRT	Interporto Campano - Nola	Napoli-Salerno	✓	✓	X	n.a.
RRT	Interporto Sud Europa - Marcianise	Napoli-Foggia Napoli-Salerno	✓ ✓	✓ ✓	✓	n.a.
Seaport	Porto di Napoli		✓	✓	X	n.a.
Airport	Capodichino Airport	X	n.a.	n.a.	n.a.	X

Source: GruppoClas, May 2017

Figure 93: Analysis of last-mile connections in Napoli (with RRT)



Type	Infrastructure	Rail line	Connection to CNC			
			Axle load (≥ 22,5 t)	Electrification	Train length (≥ 740 m)	Connected to heavy rail
RRT	Interporto Campano - Nola	Napoli-Salerno	✓	✓	X	n.a.
RRT	Interporto Sud Europa - Marcianise	Napoli-Foggia Napoli-Salerno	✓ ✓	✓ ✓	✓	n.a.
Seaport	Porto di Napoli		✓	✓	X	n.a.
Airport	Capodichino Airport	X	n.a.	n.a.	n.a.	X

Source: GruppoClas, May 2017

The last-mile connections of Interporto Nola, Interporto Marcianise and Porto di Napoli are compliant with regard to the axle load and electrification parameters. Moreover, the rail connection to the Interporto Marcianise fulfils the 740m train length criterion. On the contrary, the rail lines to Interporto Nola and Porto di Napoli don’t allow for 740 m trains. The airport has no connection to heavy rail.

The main last mile connection that will be improved is the one with the port: in particular, project 5296 consists in the upgrade of port railway connection.

A range of urban node related projects the development of the metro system (in strong synergy with the railway infrastructure) includes the connection with the Capodichino Airport. Interventions are the following:

- Line 1 - Completion of the section Dante - Garibaldi - Centro Direzionale and upgrading and enlargement of the depot (5622);
- Line 1 - Capodichino - Di Vittorio Section (5624);
- Line 6 - Completion of Mergellina- Municipio section (5623);
- Line 6- Completion of Mostra - Arsenale Section - Depot Officina Arsenale- 1° and 2° phase (5625);
- Ex. SEPSA Metro section. Link between Cumana and Circumflegrea (5626).

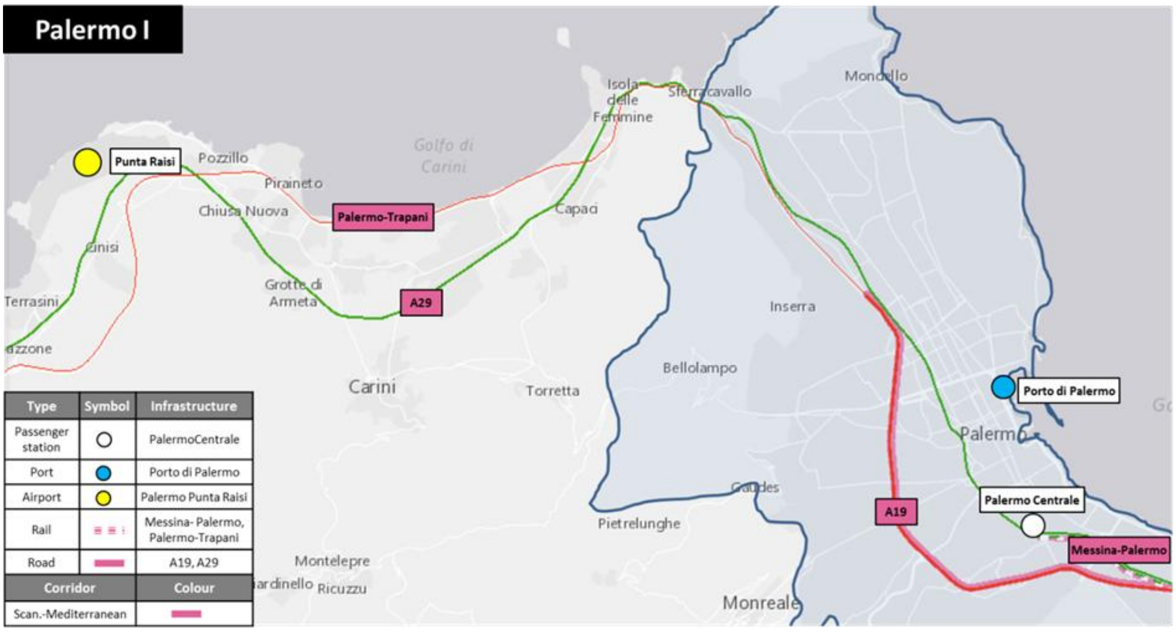
9.3.18 Palermo

Palermo is the main urban area in Sicily, core urban node of the Scandinavian-Mediterranean corridor.

The Punta Raisi airport is located around 30 km west of the city centre, and connected by rail and road infrastructure running along the coast, while the seaport is located inside the urban area.

The main corridor infrastructure accesses the urban node from east (Messina).

Figure 94: Palermo urban node



Source: GruppoClas, May 2017

Main corridor projects affecting the urban node are related to its connections towards east, since with the exception of Malta Palermo represents the end of the corridor.

In particular, rail and road connections are being developed and upgraded towards Messina, and Catania, as well as in the node (for rail). Compliance analysis highlighted in fact limitations in terms of train length as well as axle load.

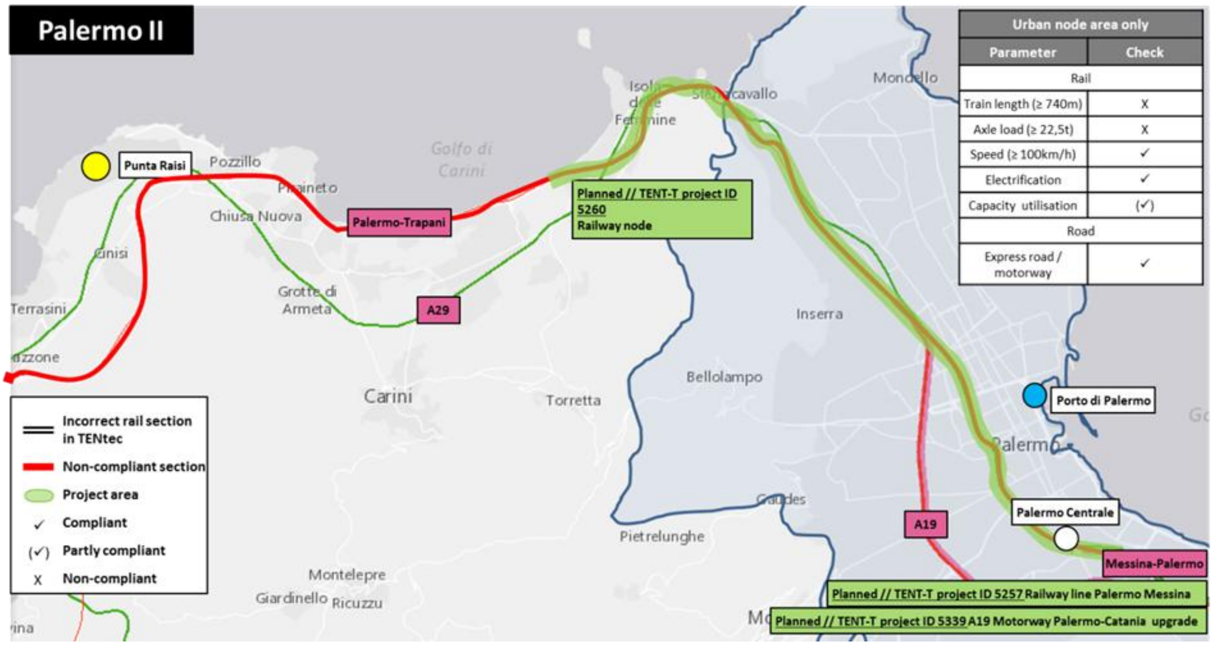
The railway lines Palermo-Messina and Palermo-Catania will be upgraded in order to be compliant with the Regulation (5257 and 5906), as well as the railway node (5260).

The seaport will be improved in order to comply according to the creation of a central logistic platform, and will be provided with LNG bunkering facilities and Onshore Power Supply.

The motorway between Palermo and Catania will be upgraded through safety interventions (5339)

The airport runways will be upgraded (5944), and the terminal will be restructured (5945).

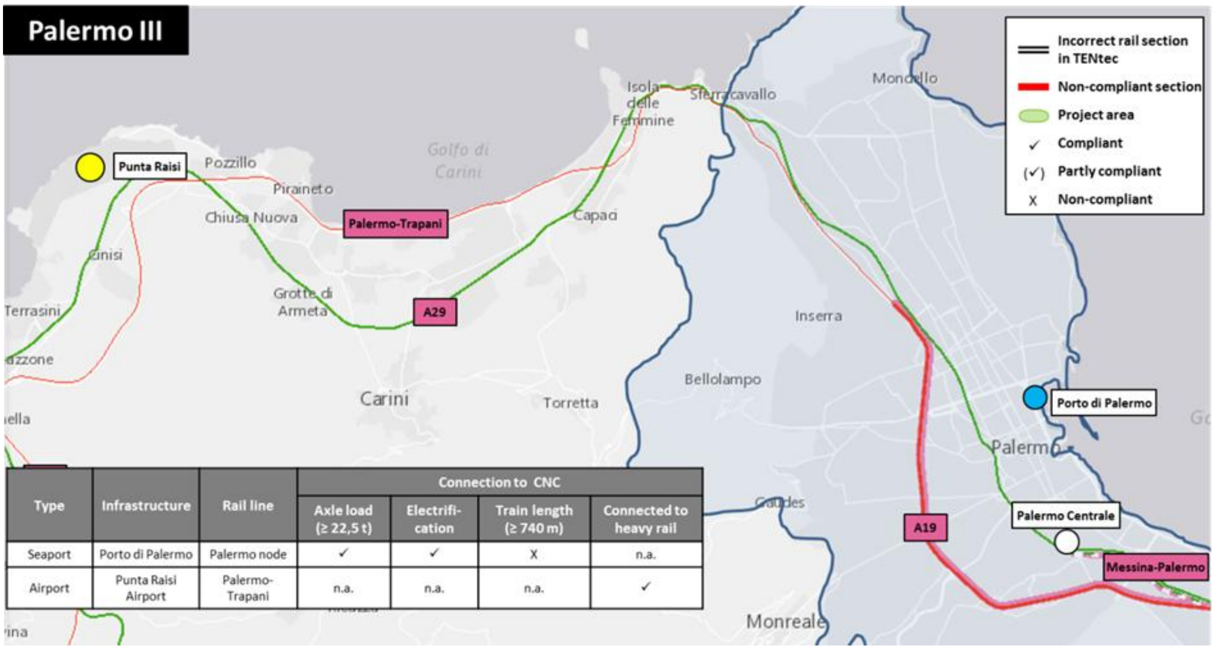
Figure 95: Analysis of corridor lines in Palermo



Urban node area only	
Parameter	Check
Rail	
Train length (≥ 740m)	X
Axle load (≥ 22,5t)	X
Speed (≥ 100km/h)	✓
Electrification	✓
Capacity utilisation	(✓)
Road	
Express road / motorway	✓

Source: GruppoClas, May 2017

Figure 96: Analysis of last-mile connections in Palermo



Type	Infrastructure	Rail line	Connection to CNC			
			Axle load (≥ 22,5 t)	Electrifi-cation	Train length (≥ 740 m)	Connected to heavy rail
Seaport	Porto di Palermo	Palermo node	✓	✓	X	n.a.
Airport	Punta Raisi Airport	Palermo-Trapani	n.a.	n.a.	n.a.	✓

Source: GruppoClas, May 2017

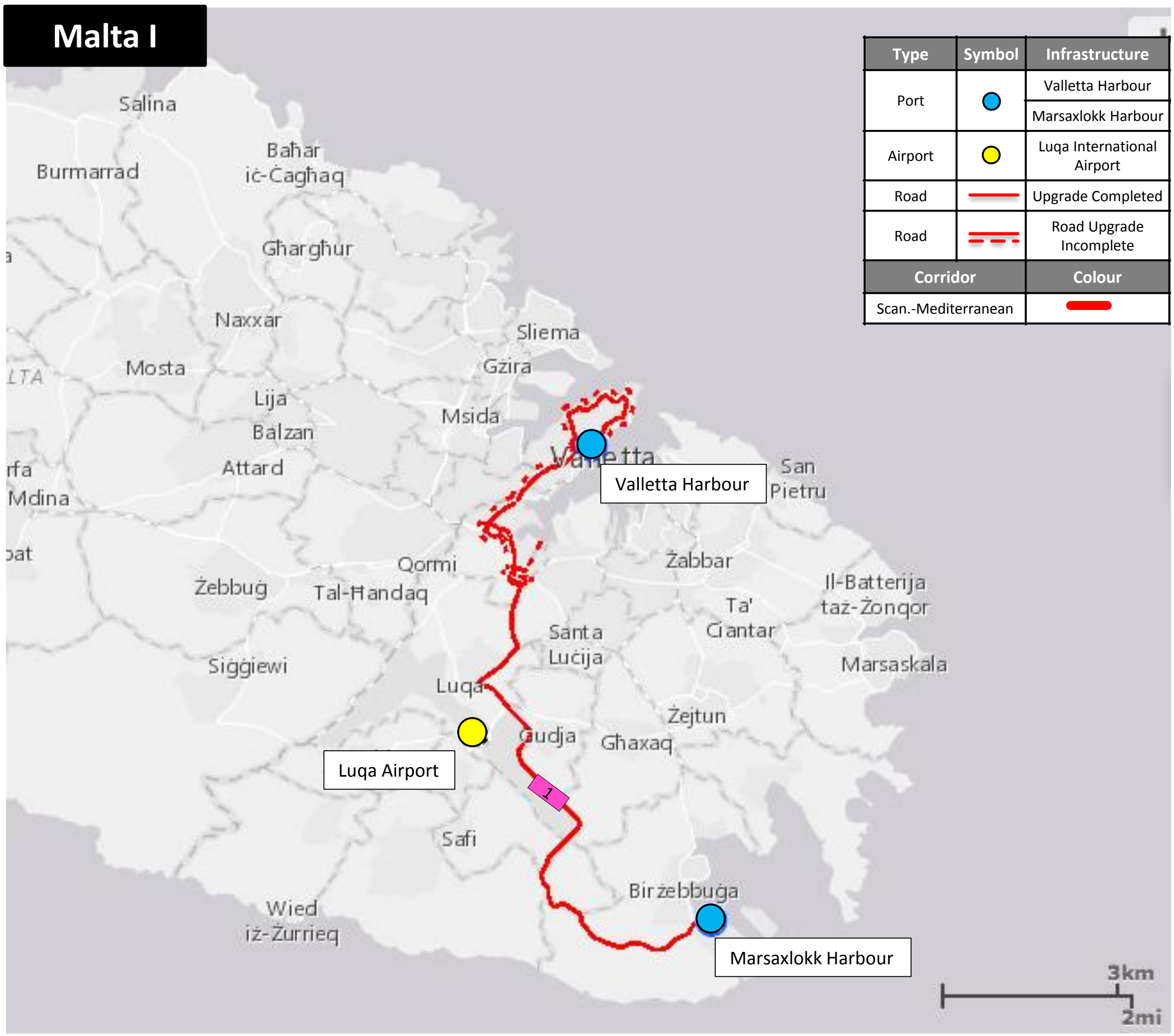
9.3.19 Valletta

Valletta is the capital city of Malta. The City is located on the main island of Malta and together with its extended urban area it forms the single built area which defines the island's city state. The infrastructure of the urban area is critical to the accessibility of goods and people within and outside the islands.

As shown in Figure 97, one corridor runs along the islands' core network linking Valletta to the airport (Luqa) and the harbour in Marsaxlokk. The core corridor is part of the Scandinavian-Mediterranean corridor which links the islands to Italy.

Access points within Malta are two ports (Valletta Harbour and Marsaxlokk Harbour) and the international airport of Luqa.

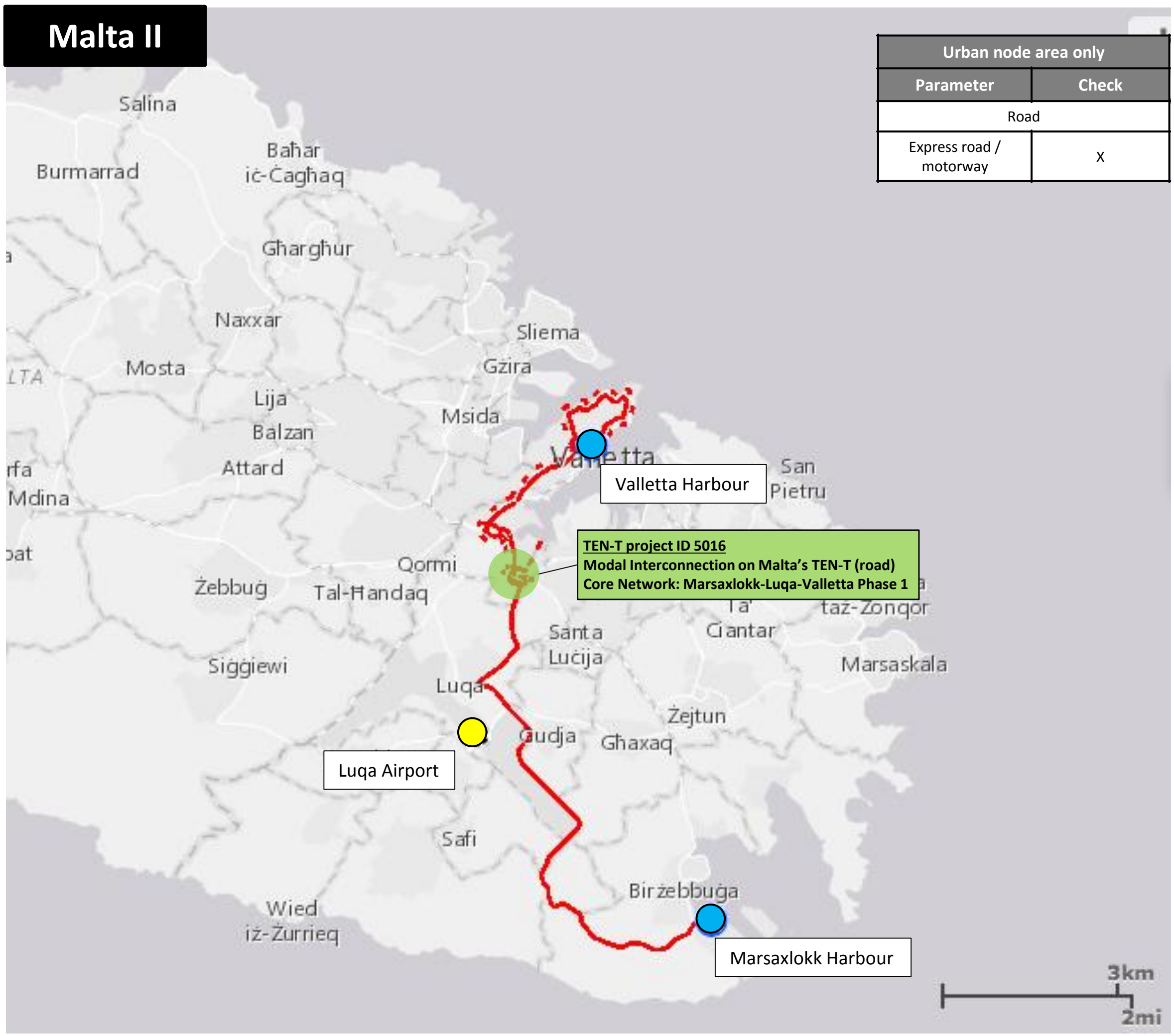
Figure 97: Valletta urban node



Source: Maria Attard, May 2017

The road corridor core network in Malta presents a bottleneck between the nodes of Valletta Harbour, Luqa Airport and Marsaxlokk Harbour. A project with the scope of eliminating the capacity bottleneck on the road section has been already planned (see Figure 98).

Figure 98: Analysis of corridor lines in Valletta



Source: Maria Attard, May 2017

9.3.20 Conclusions

Urban nodes are a crucial component of TEN-T corridors merging and redistributing traffic flows. The ScanMed Core Network Corridor comprises a total of 19 urban nodes in seven Member States and Norway (as a member of the European Economic Area). Overall goal of the urban node network development is the appropriate interconnection of passenger and freight transport between all modes involved. Furthermore, a seamless connection between the (long-distance) TEN-T infrastructure and regional / local traffic and urban freight delivery on the last mile shall be achieved. Urban bottlenecks are to be removed leading the enhancement of multimodal transport solutions and a shift towards more sustainable mobility for both freight and passenger.

Main aim of present analysis was the compliance check of CNC lines within the urban nodes. The compliance check addressed the requirements of the regulation and has been carried out for the urban node according to the KPIs of the project list. In particular, rail parameters taken into account were: train length (≥740m), axle load

(≥22,5t), speed (≥100 km/h), electrification and capacity utilisation. Road sections have been analysed with regard to the parameter "express road/motorway".

Moreover, a last-mile connection compliance check has been carried out for each urban node in order to investigate whether a seamless connection between the (long-distance) TEN-T infrastructure and regional / local traffic and urban freight delivery on the last mile is achieved. The rail connection of inland ports, trimodal terminals and rail-road terminals to the core network has been analysed according to the three parameters axle load, electrification and train length. Rail connections to airports have been evaluated on the basis of heavy rail connection. Only rail parameters have been taken into account as similar road criteria do not exist due to its flexibility allowing seamless connections.

In addition, improvement projects with reference to non-compliant sections or in case of particular relevance for the urban node have been pointed out.

In Table 4 the overall corridor network compliance check for Scandinavian-Mediterranean urban nodes is displayed. Considering all nodes, 70% of the analysed parameters are compliant with the regulation. Some 20-25% are partly compliant and about 5% of the parameters are non-compliant.

Corridor rail lines within the eighteen nodes (Valletta has no rail connection) suffer of different bottlenecks. About 65% analysed rail parameters per node are compliant while about 35% of them are not satisfying on at least a rail section within the urban node. The rail parameter most afflicted by bottlenecks is "capacity utilisation", that is compliant in about 30-35% nodes only. Moreover, the "train length" criterion of 740 m and the "speed" criterion of 100 km/h are not (completely) fulfilled in 50% and 28% nodes respectively. Instead, the most of the rail corridor is electrified and allows for 22.5 t axle load. Projects focusing on the total or partial resolution of the above mentioned bottlenecks principally refer to the improvement of the capacity resolution (projects have been identified in 11 out of 12 affected nodes).

The road corridor in Scandinavian-Mediterranean nodes is almost totally compliant with the regulation. With the only exception of Valletta, where no motorways occur, all corridor lines for road are classified as motorways (express ways).

Table 59: Corridor lines compliance check on the Scandinavian-Mediterranean urban nodes

	Rail					Road
	Train length (≥ 740m)	Axle load (≥ 22,5t)	Speed (≥ 100km/h)	Electrification	Capacity utilisation	Express road / motorway
Helsinki	P	P	P		P	
Turku		P			P	
Oslo						
Göteborg					P	
Malmö					P	
Stockholm					P	
Copenhagen						
Hamburg	n.i.				P	
Bremen						
Hannover					P	
Berlin						
Leipzig						
Nürnberg				P	P	
München						
Bologna	n.i.					
Roma	n.i.				P	
Napoli	n.i.				P	
Palermo					P	
Valletta	n.a.	n.a.	n.a.	n.a.	n.a.	

GREEN	Compliant
YELLOW	Partly compliant / non-compliant
RED	Non-compliant
GREY	Not applicable (n.a.)
WHITE	No information (n.i.)
P	Project for the improvement of a non-compliant parameter (according Project list 2017)

Source: HaCon, May 2017

In general, results of the analysis show a discrepancy in terms of corridor lines compliance between Central and Northern/ Southern Europe. Urban nodes with the majority of (partly) non-compliant parameters are Helsinki, Turku, Göteborg, Palermo and Valletta. Half (and in some cases even more) of the analysed parameters are (partly) non-compliant along their corridor sections. On the other hand, corridor lines in Oslo, Hamburg, Bremen, Hannover, Berlin; Leipzig-Halle, München, Bologna and Roma are compliant in more than 80% of the cases.

Table 60 summarises the compliance check of the access point connections to the corridor lines. Just more than half of the analysed last-mile lines (55%) are completely compliant with regard to the analysed parameters. The remaining 45% last-mile connections are not totally compliant and improvement works are needed on the rail lines.

The parameter showing the most of bottlenecks is “train length”, that is non-compliant in about 35% last-mile connections. About 5% freight connections are not electrified and/or don’t fulfil the 22.5 t axle load requirement. In total, 18 airports have been inspected and 9 of them are not connected to heavy rail.

No projects with the purpose of achieving train length 740 m, line electrification and axle load 22.5 t requirements on the non-compliant sections have been identified. On the contrary, two projects with the scope of connecting the airport in Helsinki and in Göteborg to heavy rail have been recognised.

Also in this case, the analysis highlights a discrepancy between the status of last-mile connections in Central and Northern/ Southern Europe. The totality of last-mile lines in Turku, Göteborg, Malmö, København and Bologna are not completely compliant. In addition, in Helsinki, Stockholm, Roma, Napoli and Palermo at least half freight connections are not totally compliant. On the other hand, all terminal connection lines to the corridor network in Oslo, Hamburg, Hannover, Leipzig-Halle and München are compliant.

Table 60: Connection analysis of the access points to the corridor network

Node	Access points on the core network		Connection to CNC			
	Infrastructure	Type	Axle load (≥ 22,5t)	Electrification	Train length (≥ 740m)	Connected to heavy rail
Helsinki	Vuosaari Harbour	Inland/ Sea port	✓	✓	✓	n.a.
	West Harbour	Inland/ Sea port	X	X	X	X
	South Harbour	Inland/ Sea port	X	X	X	X
	Helsinki Airport	Airport	n.a.	n.a.	n.a.	X
Turku	Port of Naantali	Inland/ Sea port	X	X	X	n.a.
	Port of Turku	Inland/ Sea port	X	✓	X	n.a.
	Turku Airport	Airport	n.a.	n.a.	n.a.	X
Oslo	Alnabru	Rail-road terminal	✓	✓	✓	n.a.
	Port of Oslo	Trimodal terminal	✓	✓	✓	n.a.
	Gardermoen Airport	Airport	n.a.	n.a.	n.a.	✓
Göteborg	Gullbergsvass	Rail-road terminal	✓	✓	X	n.a.
	Port of Göteborg	Inland/ Sea port	✓	✓	X	n.a.
	Masthugget	Inland/ Sea port	X	X	X	X
	Göteborg-Landvetter Airport	Airport	n.a.	n.a.	n.a.	X
Malmö	Malmö RRT	Rail-road terminal	✓	✓	X	n.a.
	CMP/ Port of Malmö	Trimodal terminal	✓	✓	X	n.a.
	Malmö Airport	Airport	n.a.	n.a.	n.a.	X
Stockholm	Årsta	Rail-road terminal	✓	✓	X	n.a.
	Port of Stockholm	Trimodal terminal	✓	✓	X	n.a.
	Arlanda Airport	Airport	n.a.	n.a.	n.a.	✓
Copenhagen	Høje-Taastrup terminal	Rail-road terminal	✓	X	X	n.a.
	Copenhagen-Malmo Port	Inland/ Sea port	X	X	X	X
	Copenhagen Airport	Airport	n.a.	n.a.	n.a.	X
Hamburg	Billwerder	Rail-road terminal	✓	✓	✓	n.a.
	Burchardkai	Trimodal terminal	✓	✓	✓	n.a.
	Eurogate	Trimodal terminal	✓	✓	✓	n.a.
	Altenwerder	Trimodal terminal	✓	✓	✓	n.a.
	Tollerort	Trimodal terminal	✓	✓	✓	n.a.
	Hamburg Airport	Airport	n.a.	n.a.	n.a.	✓
Bremen	Bremenports	Inland/ Sea port	✓	✓	✓	n.a.
	Bremen Weserport	Inland/ Sea port	✓	✓	✓	n.a.
	Bremen-Roland	Rail-road terminal	✓	✓	✓	n.a.
	Bremenports	Trimodal terminal	✓	✓	✓	n.a.
	City Airport Bremen	Airport	n.a.	n.a.	n.a.	X
Hannover	Brinker Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Lindener Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Misburger Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Nordhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Hannover Leinetor	Rail-road terminal	✓	✓	✓	n.a.
	Hannover Linden	Rail-road terminal	✓	✓	✓	n.a.
	Nordhafen	Trimodal terminal	✓	✓	✓	n.a.
	Hannover Airport	Airport	n.a.	n.a.	n.a.	✓
Berlin	Westhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Spandauer Südhafen	Inland/ Sea port	✓	✓	✓	n.a.
	Neukölln	Inland/ Sea port	X	X	X	X
	Großbeeren	Rail-road terminal	✓	✓	✓	n.a.
	Westhafen	Trimodal terminal	✓	✓	✓	n.a.
	Berlin-Brandenburg Int.	Airport	n.a.	n.a.	n.a.	✓
Leipzig	Schkopau	Rail-road terminal	✓	✓	✓	n.a.
	Flughafen Leipzig-Halle	Airport	n.a.	n.a.	n.a.	✓
Nürnberg	Nürnberg Hafen	Inland/ Sea port	✓	✓	✓	n.a.
	Nürnberg Hafen	Trimodal terminal	✓	✓	✓	n.a.
	Nürnberg Airport	Airport	n.a.	n.a.	n.a.	X
München	München-Riem	Rail-road terminal	✓	✓	✓	n.a.
	München Flughafen	Airport	n.a.	n.a.	n.a.	✓
Bologna	Bologna Interporto	Rail-road terminal	✓	✓	X	n.a.
	Bologna Airport	Airport	n.a.	n.a.	n.a.	X
Roma	Pomezia	Rail-road terminal	✓	✓	X	n.a.
	Fiumicino	Airport	n.a.	n.a.	n.a.	✓
Napoli	Interporto Marcianise	Rail-road terminal	✓	✓	✓	n.a.
	Interporto Nola	Rail-road terminal	✓	✓	X	n.a.
	Porto di Napoli	Inland/ Sea port	✓	✓	X	n.a.
	Capodichino Airport	Airport	n.a.	n.a.	n.a.	X
Palermo	Porto di Palermo	Inland/ Sea port	✓	✓	X	n.a.
	Punta Raisi Airport	Airport	n.a.	n.a.	n.a.	✓
Valletta	Valeta Harbour	Inland/ Sea port	n.a.	n.a.	n.a.	n.a.
	Marsaxlokk Harbour	Inland/ Sea port	n.a.	n.a.	n.a.	n.a.
	Luqa Airport	Airport	n.a.	n.a.	n.a.	n.a.

	Compliant last-mile connection
	Partly/ non-compliant last-mile connection
✓	Compliant
X	non-compliant
(✓)	Partly compliant
n.a.	Not applicable
n.i.	No information
	Project for the improvement of a non-compliant parameter

Source: HaCon, May 2017

Conclusions from the Working Group "Ideas Laboratory on Core Urban Nodes"

From the two Ideas Laboratories on Core Urban Node (München, 17th/18th November 2016 and København/Malmö, 23rd/24th March 2017) following general conclusions emerged:

- The urban nodes are important generator of traffic clearly interacting with the transport corridor(s);
- The urban node stretches beyond the administrative limits and includes its functional hinterland;
- The subjects treated in the two meetings are relevant and require a further dialogue to share further good practices. Treated subjects were used to update the "urban node analysis";
- The "Ideas Laboratory on Core Urban Nodes" of the Scandinavian-Mediterranean corridor was evaluated an appropriate format for the peer-to-peer exchange;
- Exchange peer-to-peer demonstrated once more that addressing the challenges comprehensively and across border is a value in itself;
- The process could be continued where synergies are identified between urban nodes being the city governments, regions or the actors within the area as public transport operators and others;
- Solutions are often found at the boundaries of traditional competences and multi-disciplinary team become more relevant such as the implementation of "energy stations" shows (is it energy or transport sector? Or both? Or maybe a new sector?);
- In order to lift economies of scale coordinated strategies, harmonised specifications or even joint tendering of innovative products may be in issue.

Urban node-specific conclusions are included in paragraph 9.3 "Analysis of results" (more specifically in paragraphs 9.3.1 to 9.3.19).

10 Wider elements of the Work Plan

The analysis and findings concerning “wider elements of the Work Plan” are documented in a separate Report.