European Commission

Mediterranean

Third Work Plan of the European Coordinator

Laurens Jan Brinkhorst

APRIL 2018

Mobility and Transport

APRIL 2018

This report represents the opinion of the European Coordinator and does not prejudice the official position of the European Commission.

Contents

1. Developing further the Mediterranean Corridor work Plan

1.1. Introduction

On 1 January 2014 a new era has begun in European infrastructure policy with the setting up of nine Core Network Corridors (CNC) led by a European coordinator and the creation of the Connecting Europe Facility (CEF) as financing instrument.

This work plan is largely based on the Study of the Mediterranean Corridor (the 2014 Corridor Study) carried out in 2014 and on the on-going analysis of the new Study for 2015-2017 (the 2015-2017 Corridor Study). It is the result of the collaborative efforts of the Member States, the European Commission and external consultants chaired by the European Coordinator[1].

The work plan has been elaborated in accordance with the provisions of Regulation (EU) No 1315/2013 which establishes Union guidelines for the development of the trans-European transport network (the Regulation)[2].

The concept of core network corridors rests on three pillars: modal integration, interoperability and the coordinated development of its infrastructure.

The Mediterranean corridor is the main east-west axis in the TEN-T network south of the Alps. It runs between the south-western Mediterranean region of Spain and the Ukrainian border with Hungary, following the coastlines of Spain and France and crossing the Alps towards the east through Italy, Slovenia and Croatia and continuing through Hungary up to its eastern border with Ukraine. The Mediterranean corridor's ports lie within very important global trade routes, such as traffics from the Sea of China through Suez channel as well as with a significant internal maritime dimension for the intra-EU trade (i.e. between Spain and Italy).

This Corridor of about 3,000 km, integrating former Priority Projects 3 and 6, ERTMS Corridor D and corresponding to the Mediterranean Rail Freight Corridor, will provide a multimodal link for the ports of the western Mediterranean with the centre of the EU. It will also create an east-west link through the southern part of the EU, contribute to modal shift from road to rail and maritime in sensitive areas such as the Pyrenees and the Alps, and connect some of the major urban areas of the EU with high speed trains.

The regions along the Mediterranean Corridor represent an important socio-economic area within the EU. With 18% of EU's population, the Corridor regions generated 17% of the EU's 2014 GDP. Economically speaking the most important regions of the Corridor are Piedmont ant Lombardy, the Rhone-Alpes region, Catalonia and Madrid.

The Mediterranean Corridor is intersecting with the Atlantic Corridor in Spain (Algeciras-Madrid), with the North Sea-Mediterranean Corridor in France (Marseille-Lyon), with the Rhine-Alpine Corridor in Italy (Novara/Milano), with the Scandinavian-Mediterranean Corridor in Italy (Verona),

---

[1] https://ec.europa.eu/transport/sites/transport/files/mediterranean_study_0.pdf

[2] Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010 (OJ L 348, 20.12.2013, p.1).

with the Baltic-Adriatic Corridor in Italy and Slovenia, with the Rhine-Danube Corridor in Croatia and Hungary and with the Orient-East Med Corridor in Hungary.

The key section of the Corridor is the new cross-border rail link between France and Italy (Lyon-Turin). In addition, the cross-border links with Slovenia, Croatia and Hungary need to be taken into account. Multimodal connections to ports as well as some rail sections need to be improved in order to remove key bottlenecks for freight transport.

The coexistence of two gauges (1668 mm in Spain and 1435mm in the other countries) is another challenge for this Corridor, which needs to be tackled particularly as regards the financial aspects[3].

1.2. Roadmap to setting up the WPIII

Regulation (EU) 1315/2013 defines that *each European Coordinator shall, by 22 December 2014, submit to the Member States concerned a* ***work plan*** *analysing the development of the corridor. After it has been approved by the Member States concerned, the work plan shall be submitted for information to the European Parliament, the Council and the Commission. The work plan shall include, in particular, a description of the characteristics, cross-border sections and objectives of the core network corridor*.

The First Work Plan was approved in May 2015. The extensive analysis carried out continued to be largely supported through the regular meetings of the **Corridor Forum** and dedicated **working groups.** The **Second Work Plan** was approved in May 2016.

Finally, the present **Third Work Plan** is the outcome of a final revision and update, and constitutes a concrete technical and financial basis for the fully development of the MED Corridor in terms of establishing the critical issues and overall investment needs and will serve as a pillar for building the future strategic and investment decisions for all parties involved.

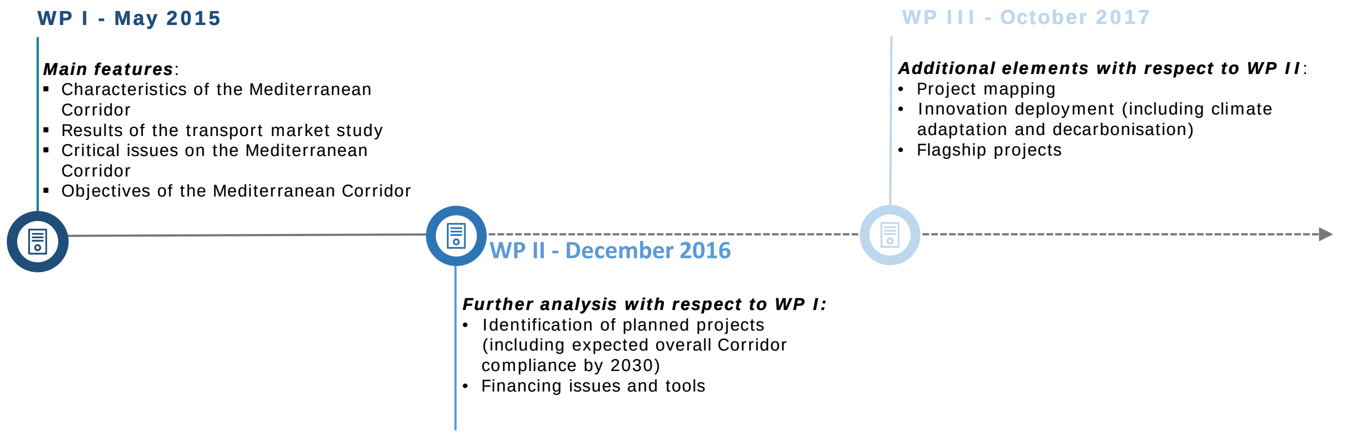


Figure 1 – Roadmap to setting up the WPIII

[3] The information shown in this document is based on the results of the Corridor Studies of 2014 and 2015-2017, including the definition of a Corridor project list with the details of main infrastructural projects needed for corridor implementation.

2. Characteristics of the Mediterranean Corridor

2.1. Corridor alignment

Figure 2 – Mediterranean Corridor alignment (TENtec 2016)

The Mediterranean Corridor links the ports in the south-western Mediterranean region to the centre of the EU, following the coastlines of Spain, France, and crossing the Alps towards the east. It runs across northern Italy and continues east, up to the Ukrainian border with Hungary.

The main branches of the Mediterranean Corridor are identified in Annex I of Regulation (EU) 1316/2013 as follows:

- Algeciras – Bobadilla – Madrid – Zaragoza – Tarragona;
- Sevilla – Bobadilla – Murcia;
- Cartagena – Murcia – Valencia – Tarragona;
- Tarragona – Barcelona – Perpignan – Marseille/Lyon – Torino – Novara – Milano – Verona – Padua – Venezia – Ravenna/Trieste/Koper - Ljubljana – Budapest;
- Ljubljana/Rijeka – Zagreb – Budapest – UA border.

Besides these rail, road and inland waterway (IWW) axes the Mediterranean Corridor comprises in total 70 core nodes distributed across the six Member States as shown in the table below.

MS	Urban	Airports	Ports	Rail Road Terminals	IWW nodes	Total nodes per MS*
ES	4	6	6	7	1	24
FR	2	2	1	3	2	10
IT	4	6	3	6	5	24
SI	1	1	1	1		4
HR	1	1	1	1		4
HU	1	1		1	1	4
Total	13	17	12	19	9	70

Table 1 – Nodes belonging to the Mediterranean Corridor

This table is based on the list of nodes as set out in Annex II of Regulation (EU) 1315/2013. A detailed description of the alignment of the various sections of the Mediterranean Corridor by transport mode is given in chapter 4.2.1.2 of the 2014 Corridor Study.

Overlapping sections

The Mediterranean corridor is one of the most interconnected in Europe, since it is crossed by other six corridors (Atlantic, North Sea – Mediterranean, Rhine – Danube, Rhine – Alpine, Orient / East - Mediterranean, Scandinavian-Mediterranean and Baltic-Adriatic).

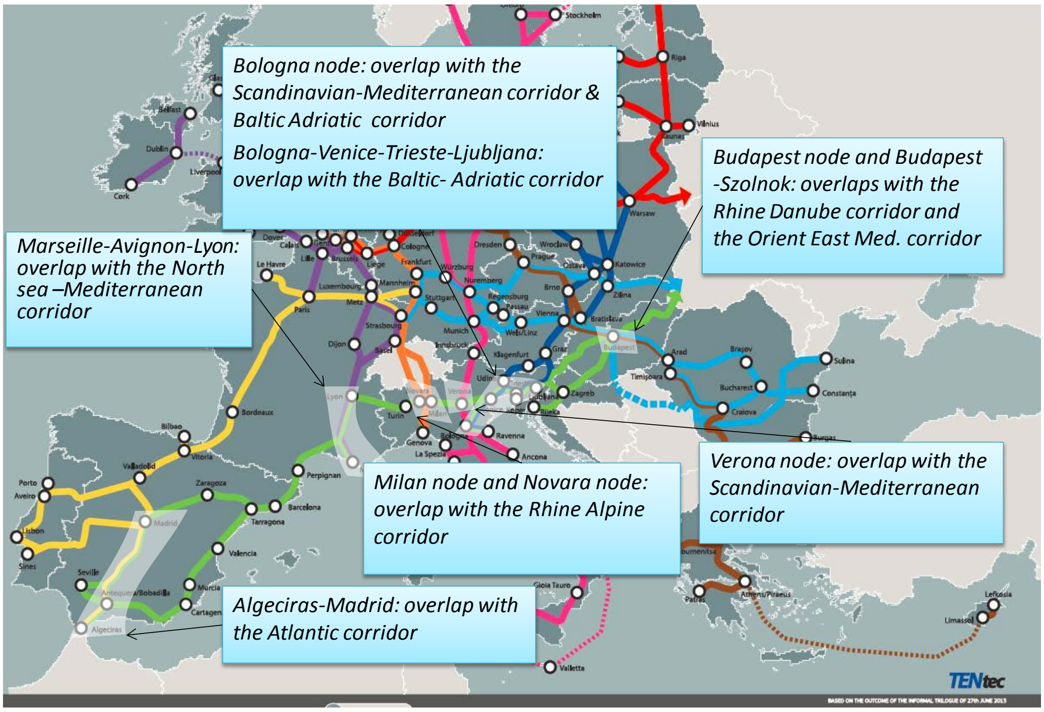


Figure 3 Overlapping sections

The overlapping sections are detailed in the following table by MS.

MS	Mediterranean Sections	Overlapping and connections with other corridors
ES	Algeciras - Sevilla - Cordoba	Atlantic corridor
ES	Cordoba - Madrid	Atlantic corridor
FR	Marseille - Avignon - Lyon	North Sea - Mediterranean corridor
IT	Novara node	Rhine - Alpine corridor
IT	Milan node	Rhine - Alpine corridor
IT	Verona node	Scandinavian - Mediterranean corridor
IT	Bologna node	Scandinavian - Mediterranean corridor Baltic - Adriatic corridor
IT	Venice and Trieste Node	Baltic - Adriatic corridor
IT	IT/SI border - Trieste - Venezia - Padova - Bologna – Ravenna	Baltic - Adriatic corridor
SI	Maribor - Ljubljana - SI/IT Border	Baltic - Adriatic corridor
SI	Ljubljana node	Baltic - Adriatic corridor
HU	Budapest node	Rhine - Danube corridor
		Orient / East - Mediterranean corridor
HU	Budapest – Szolnok	Rhine - Danube corridor
		Orient / East - Mediterranean corridor

Table 2 - Overlapping sections

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

In the TEN-T Regulation the transport infrastructure requirements have been defined for the core network which will have to be met by 2030 at the latest.

The 2014 Corridor Study (cf. chapter 4.2.1.4) contains an in-depth analysis as to how the current infrastructure in the six Corridor countries complies with the TEN-T Regulation's technical parameters set for each transport mode or infrastructure category.

Key Performance Indicators (KPIs) are used within the 2015-17 CNC studies to assess and monitor the evolution of the corridors and the potential effects of individual projects or groups of projects on infrastructure interoperability and performance. A common or “generic” KPI framework has been developed for all nine corridors, in order to permit comparability across the whole network.

A summary of this compliance check is given below, on the basis of the updated information provided by the 2015-2017 Corridor Study.

Rail

Electrification is ensured on 92% of the Corridor's railway lines; it is only lacking on some sections in Spain, where interventions in this respect are already planned. On the rest of the Corridor three different voltages are in use, raising the issue of interoperability: 1.5kV DC (on conventional lines in France), 3kV DC (on conventional lines in Spain, Italy and Slovenia), 25 kV AC (on high-speed lines in France, Italy and Spain; conventional lines in Croatia and Hungary).

One of the main challenges of the Corridor is the different **track gauges**. France, Italy, Slovenia, Croatia and Hungary feature the 1435 mm standard UIC gauge, whereas in Spain, the standard gauge (used on the high-speed lines) coexists with the Iberian gauge 1668 mm on the large part of the remaining network. During the coming years, Spain is expanding the UIC gauge along the Rail Freight Corridor 6 (RFC6) as well.

In Spain, several projects listed in the Spanish implementation plan aim at solving this challenge on most of the conventional lines of the Corridor, rather by upgrading to mixed gauge through a third rail or establishing new UIC gauge lines.

In addition, several Spanish projects have been proposed in order to provide standard gauge access to some logistics and rail freight facilities along the Corridor. Among these projects are the project “Barcelona Port land accessibility and connections” (code 3806), the project “Developing and upgrading freight rail road terminal in Barcelona Can Tunis Terminal” (code 3830) and the project “Improvement of the hinterland rail connection and the maritime accessibility to the Port of Valencia (CONNECT VALENCIAPORT)”. Additional projects aim at providing the standard gauge for rail sections, such as the global project "Implementation of the standard track gauge between Castellbisbal (Barcelona) and Almería” and the project “Bobadilla - Villaverde Bajo - Implementation of UIC track gauge”.

In this case, the adaptation to UIC of the related rail connections will allow an increase of the share of freight rail vis-à-vis road in the short term all along the two main sections of the Mediterranean corridor.

ERTMS-ETCS is deployed on high-speed lines in Spain and Italy, as well as on some short cross-border sections between Spain and France and between Hungary. In Slovenia, ERTMS-ETCS is deployed on 89 % of the MED corridor (except section Zidani Most-Dobova-state border).

A **train length** of 740 m is only allowed in France and on half of the Hungarian network as well as and on small part of Spanish and Slovenian networks. On the rest of the Corridor, various train length restrictions apply, allowing a train length between 400m and 700m.

The Corridor's railway infrastructure allows the required **axle load** of 22.5 t on all of the sections in Spain, France, Italy and Croatia, while in Hungary[4] and Slovenia[5] limitations still exist on some sections.

In France, on some sections the axle load is restricted to 17 t, but these sections are used for passenger services only[6]. In Hungary and Slovenia, several interventions on rail sections are planned which aim at resolving these physical bottlenecks.

The required minimum **line speed** of 100 km/h for freight lines is achieved in Spain, France, Italy (except on the existing cross-border sections), and Hungary, on about 41% of the rail sections in Slovenia and in some sections in Croatia.

---

[4] CEF projects: 2014-HU-TMC-0493-W (between Budapest/Kelenföld - Százhalombatta), 2015-HU-TM-0003-M (between Százhalombatta - Pusztaszabolcs), and 2015-HU-TM- 0158-M (between Budapest/Rákos – Hatvan) aim to develop different sections on the MED CNC rail in order to fulfil all EU requirements - among them the axle load criterion.
[5] Axle load of 22.5 tons/axle is provided on 93 % of the railway network on the MED corridor in Slovenia.
[6] For freight please see the « Declaración de Red Document de Référence du Réseau Network Statement 2016”, page 38 (http://www.tpferro.com/sites/default/files/images/Document-de-reference-du-reseau-2016.pdf).

The table below gives an overview of the compliance rate as regards rail.

Parameters	Requirement	2017
Electrification	Electrified rail network km as a proportion (%) of CNC rail network km	92%
Track gauge 1435mm	Standard (1435mm) track gauge as a proportion (%) of CNC rail network km	72%
ERTMS implementation	Length of Permanent Operation (excluding operational test lines) of both ERTMS and GSM-R on rail network, as a proportion (%) of CNC rail network km	16%
Line speed>=100km/h	Length of freight and combined line with allowing for a maximum operating speed greater than or equal to 100 km/h, as a proportion (%) of CNC rail network km without load restriction	92%
Axle load (>=22.5t)	Length of Freight and combined line with a permitted axle load greater than or equal to 22.5 tonnes, as a proportion (%) of CNC rail network km	76%
Train length (740m)	Length of freight and combined line with a permitted train length greater than or equal to 740m, as a proportion of CNC rail network km	23%

Table 3 – Rail technical parameters (source TENtec)

Road

The total length of the road network included in the Mediterranean Corridor is about 5500 km, with Spain covering more than 50% of the entire Corridor.

As regards the parameter "Motorway or Express roads" only a few sections are not motorways such as the Hungarian section close to the Ukrainian border.

The table below shows the compliance rate of the Mediterranean Corridor's roads.

Parameter	Requirement	2017
Express road/ motorway	Road network km classified as motorway or express road, as a proportion (%) of CNC road section km.	98%
Availability of clean fuels (stations)	Number of fuel stations offering plug-in electricity, hydrogen, liquid biofuels, LNG/CNG, bio-methane or LPG along CNC road sections or within 10km from its junctions.	NA

Table 4 – Road technical parameters (Source TENtec)

Besides the requirements described in the previous paragraph, Regulation (EU) 1315/2013 also requires Member States improve the availability of clean fuels along the roads of the Core Network.

In this respect, the tables below show the number of refuelling points offering LPG and CNG (together with the density per country and Corridor) as well as the Corridor compliance with Art 39 of Regulation 1315/2013, which sets specific indications for parking space for commercial road users that shall be available approximately every 100 km, in order to guarantee an appropriate level of safety and security.

Country	Length (km)	N. of clean fuels LPG	N. of clean fuels CNG
ES	2855	43	19
FR	503	47	1
IT	848	86	31
SI	433	21	2
HR	293	20	0
HU	587	45	4
MED CNC	5503	279	57

Table 5 – Refuelling points offering LPG and CNG along the Corridor

Parameters	ES	FR	IT	SI	HR	HU	MED CNC
Km of road	2855	503	848	433	293	587	5503
Number of parking	25	19	15	51	1	3	87
Number of parking per 100 km	0,88	3,78	1,82	11,78	0,34	0,50	1,58
compliance with TEN-T requirement	88%	100%	100%	100%	34%	50%	79%
Target (n. of parking to be compliant)	29	5	8	4	3	6	55

Table 6 – Corridor density of safe and secure parking areas for commercial road users

Ports

Ports represent the main gateways for passengers and especially freight transport to core network Corridors as well as key nodes for maritime intra-EU trade connecting the corridors countries through seas (i.e. Spain and Italy).

There are 12 core ports in the Mediterranean Corridor, mainly located in the western part: Bahía de Algeciras, Sevilla, Cartagena, Valencia, Tarragona, Barcelona, Marseille/ Fos-sur-Mer, Ravenna, Venezia, Trieste, Koper and Rijeka. For ports, Regulation (EU) 1315/2013 requires the connection to the rail network by 2030.

All ports are reported to be fully compliant. Nevertheless, it shall be highlighted that several ports are further improving the rail connection with a view to improving the rail hinterland connection and thereby increasing possibilities for modal shift.

Inland Waterways (IWW)

The Inland Waterway system belonging to the Mediterranean Corridor consists of:

- 9 inland ports (Sevilla, Marseille/Fos-Sur-Mer, Lyon, Cremona, Mantua, Venice, Trieste, Ravenna and Budapest);

- the Rhône river, between Lyon and Fos-Sur-Mer, with extensions to the Port of Sète (by the “canal du Rhône à Sète”) and to the north (outside the Corridor) with the Saône river until Chalon-sur-Saône;
- The Po River and the IWW system of northern Italy, connecting the inland ports of Cremona and Mantua to Ferrara / Porto Garibaldi and Venice / Porto Nogaro / Monfalcone.

The Regulation (UE) 1315/2013 states the minimum requirement for the inland waterways of international importance: CEMT IV class, which means the fulfilment of the following parameters:

Class IV CEMT	Maximum length	Maximum beam	Draught	Tonnage
Motor vessels and Barges	80-85	9.5	2.5	1000-1500
Pushed convoys	85	9.5	2.5-2.8	1250-1450

Table 7 – IWW class IV CEMT

About 80% of the IWW network of the Corridor meets this requirement. The 20% not complying correspond to the sections Pavia-Casale Monferrato and Piacenza –Pavia covering about 150 km, where the minimum width is about 8 m instead of 9.5 m and a short IWW section to Sete.

Airports

The Mediterranean Corridor comprises 17 core airports: 6 are located in Spain (Valencia, Alicante, Sevilla, Malaga, Barcelona, Madrid – Barajas); two airports are in France (Lyon Saint-Exupery and Marseille-Provence); 6 in Italy (Bergamo-Orio al Serio, Milano – Malpensa, Milano – Linate, Venezia – Tessera, Torino – Caselle, Bologna – Borgo Panigale); and one each in the capitals of Slovenia, Croatia and Hungary.

Out of these 17 airports, six are considered main airports in the meaning of Regulation (EU) 1315/2013, and thus subject to the provisions of Art 41(3), which requires the connection to the trans-European transport network by 2050: Madrid, Barcelona, Lyon, Malpensa, Linate and Budapest.

According to EU prescriptions, only airports having direct rail services linking the airport with high-speed lines or long distance TEN-T railway lines shall be considered as properly “connected with rail”. Local or regional/suburban rail connections, although improving accessibility, are not sufficient for the full compliance with the Regulation. Under such assumption, only Lyon airport can be considered currently as directly connected to heavy rail.

2.3. Progress of the Corridor development

The current state of the Corridor compliance in 2017 underlines the need to increase Corridor performances for some rail parameters mainly, as shown in the following figure, presenting a selection of the most important requirements for the Corridor implementation.

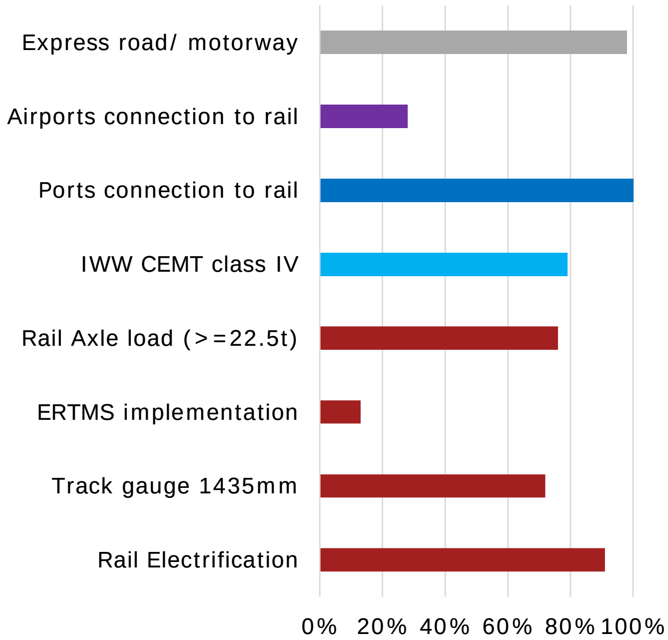


Figure 4 - Corridor KPI 2017 (selection)

As shown above, the Corridor compliance is about 100% for road and ports main parameters (i.e. respectively express/motorways, ports connection to rail and CEMT class IV), while airport connectivity to rail and some rail KPIs (e.g. ERTMS, axle load and track gauge) are not yet fully compliant.

In conclusion, the following main issues arise per mode:

For **rail**, the different electrification systems, 1,5KV DC, 3KV DC, 25 KV AC represent an interoperability challenge. Electrification is pending in some sections in southern Spain as well as track gauge adaptation in the Spanish network. Yet, ERTMS deployment on the Corridor sections has to be implemented, as well as 740 train length that is not always ensured. Axle load is an obstacle to railway interoperability in Hungary[7] and freight train speed limitations exist on the FR/IT border, and on sections in Croatia, Slovenia and Hungary.

For **IWW**, from Cremona Westward, CEMT IV class and full RIS are not available along the entire section and Sète IWW section is limited by CEMT class < IV[8].

As regards last miles, rail connection to ports is available but should be upgraded in order to meet the full interoperability; at the contrary **airport** rail connection is mainly not available.

[7] CEF projects: 2014-HU-TMC-0493-W (between Budapest/Kelenföld - Százhalombatta), 2015-HU-TM-0003-M (between Százhalombatta - Pusztaszabolcs), and 2015-HU-TM- 0158-M (between Budapest/Rákos – Hatvan) aim to develop different sections on the MED CNC rail in order to fulfill all EU requirements - among them the axle load criterion.

[8] Several projects are in course of implementation to increase the capacity of the Padania-Veneto river axis, such as (among others) the RIS II and the INIWAS.

2.4. Completed projects

The following figures give a view on the totality of MED accomplished actions in the period 2014-2016, under both the total number of projects and the total investment per mode.

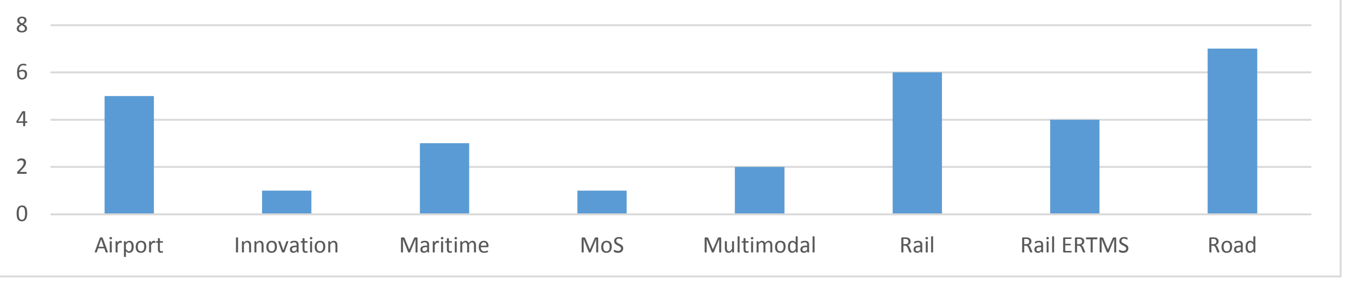


Figure 5 – Accomplished MED projects – Total number of actions

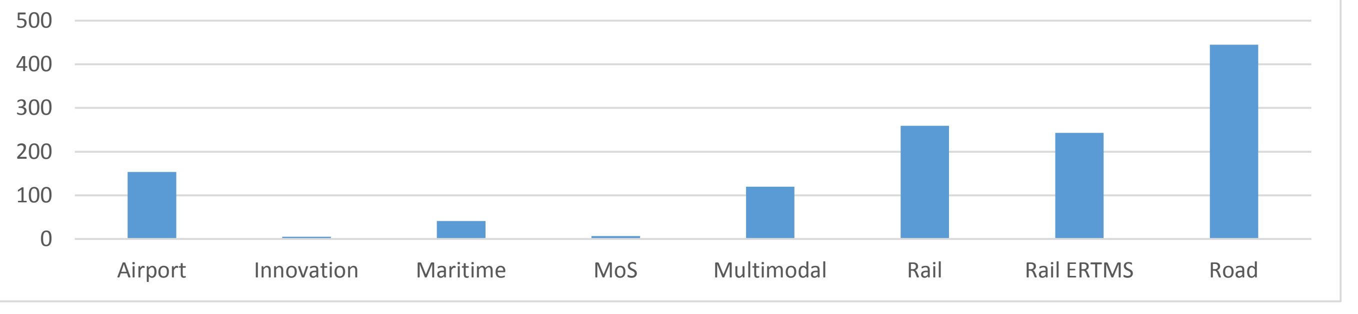


Figure 6 - Accomplished MED projects – Total cost in million €

Exemplary of the work accomplished on the Corridor are two main completed projects, which are described below.

Reconstruction of the existing line on the section Divača-Koper, Slovenia

The railway line is used for passenger transport between the coast and the hinterland and is an important transport route for the import of goods and source material and for the export of goods produced by Slovenian companies; Port of Koper is highly relevant also for Austria, Slovakia and Hungary. With the improvement of the line's capacity, the project will bring most benefit to the users of the railway infrastructure, as it will provide fluent freight flows from and to the port of Koper. The transfer of goods transport from road to rail will have a positive impact on the environmental and increase traffic safety. The modernised railway line will also contribute to interoperability.

The project was completed in 2016 with a total cost of €194 million.

MXPT2 (Railink)-UP

Rail accessibility to Malpensa airport had an important improvement following the 2017 connection between Terminal 1 and Terminal 2, which has made it possible to significantly expand the potential user base. Over 6 million passengers a year can now reach Terminal 2 by rail, more economically advantageous compared to other modes of transport.
The project consisted of the construction of the underground railway station, of the continuation of the railway line for 3.4 km in a double-track tunnel and trench, and of the design of the railway facilities all along the railway link and within the T2 station.

3. Transport market analysis

3.1. Results of the multimodal transport market study

The Corridor Study, which has been published end of 2014[9] contains a detailed transport market Study (TMS) (cf. chapter 4.2.2) which analyses the transport flows along the Corridor by assessing the capacity and traffic flows on the respective parts of the infrastructure[10].

The results of the TMS presented in this chapter have been inserted in the Work Plan in order to illustrate the traffic flows, demands and future prospects. The base year for market analysis is the year 2010, which is the last year where a global set of data for the whole Corridor is available, in particular for Origin-Destination matrices). Recent evolutions of traffic, in particular for ports and cross-border flows, are presented where available. These evolutions show that traffic on the corridor remains quite dynamic despite a context of weak economic growth between 2010 and 2015. Therefore, long-term projections made in 2014 can still be considered valid[11].

It is important to underline that the estimated traffic forecast are based on the full implementation of the Corridors in terms of interventions aimed at solving all identified bottlenecks and critical issues.

Current flows in the Corridor's market area

In the 2014 Corridor Study, a “market area” for international flows of goods and passengers on the Corridor has been defined, based on origin-destination pairs that cross at least one common border of two Corridor countries. Then, a forecast for the year 2030, target date for the completion of the core network Corridors, was made on this basis (NB: due to the difficulty in obtaining origin-destination data for maritime transport, this mode is dealt with separately from the modes road and rail).

Goods

The transport of goods by road and rail in the corridor’s market area amounted to 152 million tons in 2010[12]. The modal split was 85% for road and 15% for rail. In addition to these land transport flows, about 40 million tons were exchanged between Corridor countries by Sea, in particular between Spain and Italy.

---

[9]http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/Corridors/Corridor-studies_en.htm

[10] Maritime transport has not been considered in the analysis yet. The MED TMS will be updated in the next round of studies with the results of the demand study launched by the EC (study on support measures for the implementation of the ten-t core network related to sea ports, inland Ports and inland waterway transport) and other in-depth analysis on the maritime dimension of the corridor.

[11] The transport forecast will be updated in the next round of studies also considering results of the demand study launched by the EC (“Study on support measures for the implementation of the ten-t core network related to sea ports, inland Ports and inland waterway transport”) and other in-depth analysis on the maritime dimension of the corridor.

[12] Baseline has been built on the ETISPLUS matrix 2010 for road and rail and on ports’ data 2015, the former will be updated in the new study, chart on ports’ data will be updated in the revision of the WP.

Mode	1000 tons / year (2010)	%
Road	129,623	85%
Rail	22,206	15%
Total (except sea)	151,829	

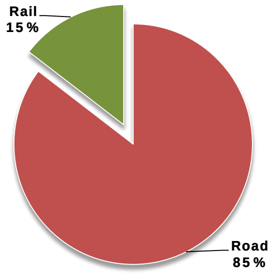


Figure 7 –Freight flows in the Corridor's market area in 2010 (1000 tons / year)

An analysis of the trade flows showed that:

- Corridor countries have strong cross-border exchange flows at regional level, with each other and with the rest of Europe; in particular Catalonia and Lombardy appear as the predominant generators of trade flows;

- Road is the dominant mode for flows between Corridor regions, and rail share remains at a relatively low level when compared for example with cross-Alpine freight flows in a north – south direction.

Over the recent period, cross-border flows on the Corridor were still growing. At the Mediterranean SP-FR border, freight flows represent 48 million tons in 2015, compared to 42 million in 2010, with an annual average growth of 2,8%. Rail share is still low, but rail flows have grown from 1,6 to 2,3 million tons (+40%) with help of the new UIC gauge rail link between Perpignan and Figueres. On the FR-IT border (including coastal flows at Ventimiglia), traffic has remained stable (about 41 million tons) in a difficult economic context for France and Italy. Rail share seems to be slowly growing again after having decreased a lot in the previous decade (3,7 million tons in 2015 compared to 3,2 in 2010, +15%).

Another source of major international flows on the Corridor are the freight flows generated by the **seaports**. The total volume of commodities passing through the sea ports of the Corridor amounted to nearly 400 million tons in 2010, of which about 100 million tons concerned goods shipped between EU countries. 327 million tons (80%) of goods generate flows to and from the hinterland, the rest being transhipped.

The volume of goods handled by the ports of the Corridor is growing rapidly: in 2015, their total traffic reaches nearly 450 million tons, showing an average annual growth rate of 2,7% between 2010 and 2015. For container traffic specifically this growth is even higher (about 5% per year).

The map below shows the total volume of goods treated in each port and the rate of EU-internal flows.

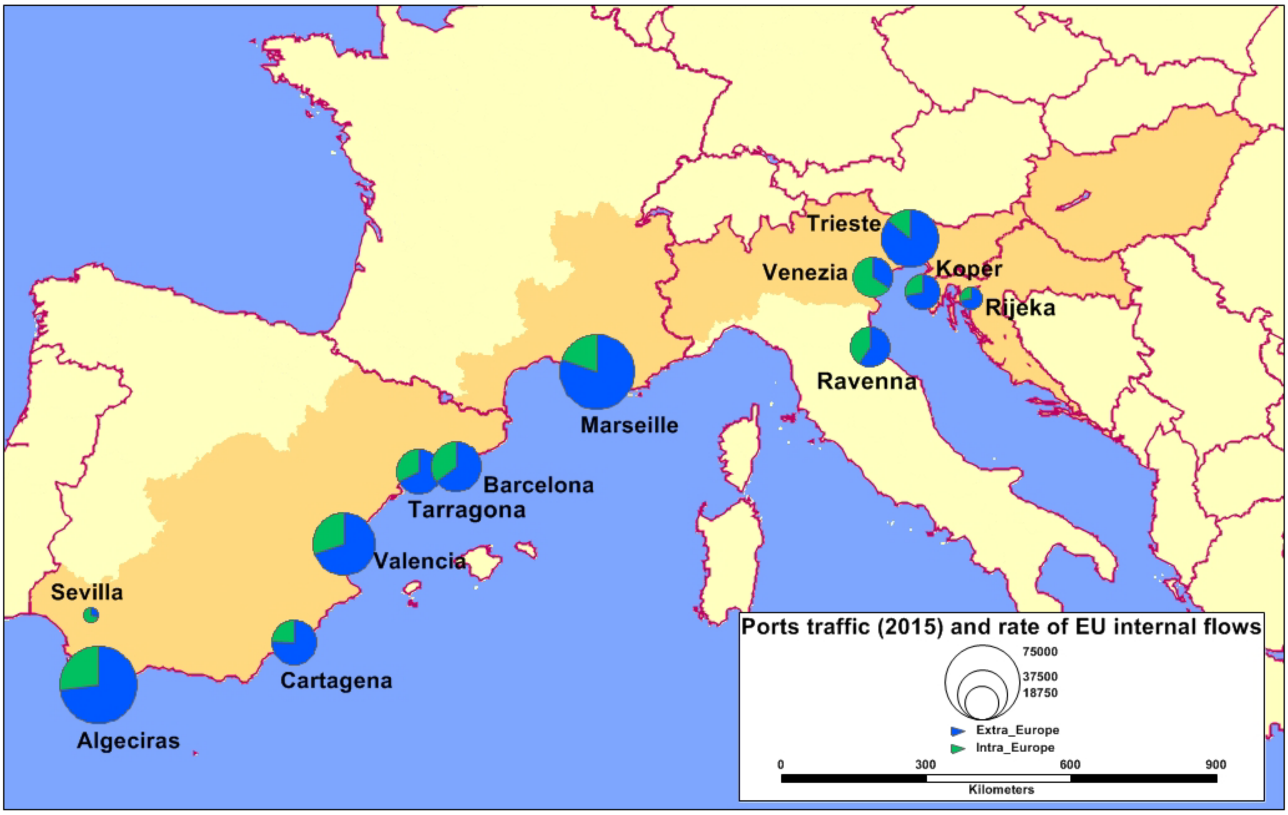


Figure 8 –Volume of total goods handled by ports and rate of EU-internal flows (1000 tons/year)

As regards **inland waterways**, in 2010, freight traffic on the two waterways of the Corridor amounted to 5.8 million tons on the Rhône; and 1.6 million tons in northern Italy, from which 0.4 million on the Po river and 1.2 million between Venice and Porto Nogaro.

The main inland port on the Rhône is the Port Edouard Herriot of Lyon, which accounted for 1.3 million tons in 2010, only for inland traffic. The global transit traffic was 12 million tons in 2010.

In Italy Mantua had 0.2 million tons, Cremona 0.08 million tons and Rovigo 0.09 million tons of IWW traffic in 2010. Porto Nogaro had 1.2 million tons. It is to note that IWW traffic in Italy has known a severe decrease between 2008 and 2010. In 2007 the port of Cremona had an IWW traffic of nearly 0.5 million.

Passengers

The total international passenger traffic between the six Corridor countries was 81 million passengers per year. The two main flows are between France and Spain, and France and Italy: these two relations represent 80% of the international traffic considered. The overall modal split is 64% for road, 33% for air and 3% for rail transport.

The Spain – France and Italy – France relations are characterized by strong road traffic, consisting mainly of short-distance trips around the respective border points of Le Perthus (ES-FR) and Ventimiglia (IT-FR). Regarding air traffic, the first country per country relation is between Italy and Spain, with almost 10 million passengers per year. France – Italy and France – Spain have both similar air traffic volumes (7.5 million).

The rail market share was generally weak, in particular for flows with Spain; flows between Hungary and Slovenia / Croatia have significantly higher rail market shares (15-20%) than the other flows, but on relatively small volumes of demand (200 000 and 400 000 passengers per year respectively).

Mode	1000 pax / year (2010)	%
Road	51,687	64%
Rail	2,514	3%
Air	26,627	33%
Total	80,828	

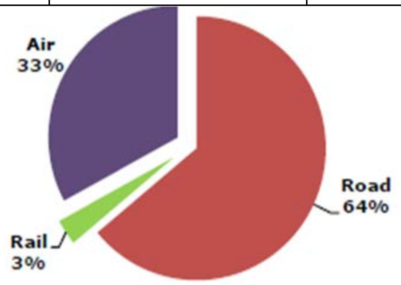


Figure 9 – Total passenger demand between Corridor countries

Passenger flows in the "market area" of the Corridor (i.e. based on origin-destination pairs that cross at least one common border of two Corridor countries) can be summarised as follows:

Total market (area 1000 pax / year)	2010
Road	46,261
Rail	3,001
Air	79,659
Total	128,921
Rail Share	2.3%

Figure 10 – Total passenger flows in the marker area of the Corridor

These international passenger flows in the Corridor's market of about 129 million passengers per year in 2010 are concentrated mainly in the western part of the Corridor. The low rail share can be explained by the fact that a large part of these passenger movements are short-distance cross-border trips, which are still carried out more efficiently by road than by rail.

The other important flows are the flows between major cities and to touristic zones of the Corridor countries or neighbouring countries ; the distance between these major nodes is generally really high (over 1000 km in most of the cases), which gives the air transport a tremendous market advantage for these type of flows.

Forecast of the overall transport demand

Freight

In order to assess the potential future traffic on Corridor rail infrastructure, in particular for cross-border sections, an assessment of the potential rail freight matrices at 2030 has been performed, considering Corridor implementation.

This assessment takes into account:

- The traffic growth derived from the analysis of the international flows on Corridor market area;
- The traffic generated by the ports, according to the consortium's forecasts;
- The traffic growth of national traffic on Corridor sections, estimated with a simplified assumption linking traffic growth and GDP.

The result of this assessment is shown on the map below:

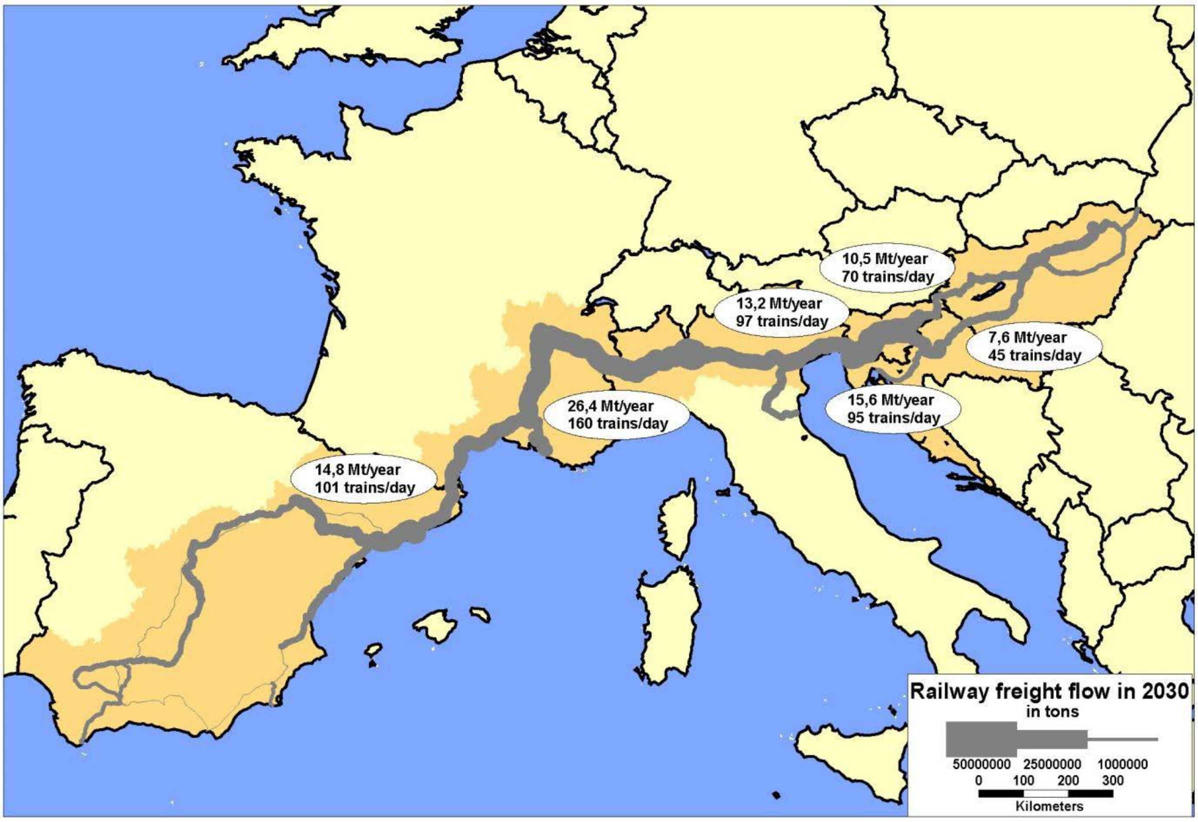


Figure 11 – Potential rail traffic on cross-border sections of the Corridor in 2030

According to the Study the total demand in the market area of the Corridor would increase from 151 million tons in 2010 to 267 million tons in 2030, with an average annual growth rate of 2.9%.

With the full implementation of the Corridor, the rail market share could potentially increase up to 27%, reaching about 72 million tons a year.

The table below summarizes the forecasting results for the Corridor's market area:

Mode	2010	2030 Trend (do-nothing)	2030 Corridor implemented	2030 Corridor implemented (+ accompanied rolling motorway)[13]
Road	129,623	228,647	195,131	186,431
Rail	22,206	38,958	72,474	81,174
Total (except sea)	151,829	267,605	267,605	267,605
Rail share	14.6%	14.6%	27.1%	29.4%

Table 8 – Forecast for freight (thousand tons)

The forecasts in the 2014 Corridor Study show that there is a **strong potential** for international **rail traffic** development on the Mediterranean Corridor.

- The global demand can be expected to have a solid dynamic if GDP growth in Europe turns back to "normal" rates (as is expected in EC projections) on a long term average. It is particularly the case for the exchanges of goods with countries of Eastern Europe.

- Starting from a relatively low base in 2010, the final rail shares given by the forecasting model (between 20% and 30% for most of the relations considered) are not excessively high for international continental rail transport as long as it offers competitive performances; they remain below observed rail shares in Europe on the north – south direction.

- Thus, implementing the Corridor could potentially shift about 33 million tons per year from road to rail (about 2.3 million trucks/year equivalent) or even 41 million tons / year (3 million trucks) if we include accompanied combined transport (rolling motorway) on the Lyon – Turin axis[14].

- However, these forecasts express the *potential* market of the Corridor, meaning that reaching these effects imply the complete implementation of the Corridor with fulfilment of the TEN-T standards and the absence of bottlenecks, and imply also the creation of appropriate transport services along the infrastructure, particularly in combined transport.

As regards **maritime traffic**, all ports and all commodity types are expected to grow in the period 2010-2030, in particular container traffic (about 4% per year) without assuming shifts between ports and without specific growth of the transhipment traffic.

It is reasonable to expect that the level of rail traffic generated by the Corridor's ports could double by 2030 as compared to 2010 levels, even taking into account an increase of train length. The most important effects can be expected at the ports of Algeciras, Valencia, Barcelona and Marseille, resulting of traffic growth and important modal shift expectations, as a result of the expected improvements of the ports' rail connections. Although to a lower scale, this can also be

[13] Traffic flows for accompanied rolling motorway have been estimated considering results of the Lyon – Turin demand study and taking into account the full deployment of the corridor (including the access lines to the cross border).

[14] The introduction of the rolling motorway could also consistently increase the environmental benefits associated with combined transport.

expected on the other ports along the Corridor, particularly ports of Sevilla, Tarragona and Cartagena (Dársena de Escombreras).

Taking into account potential additional growth from shifting traffic from the Northern European ports, this rail traffic increase could be even more important.

The maritime dimension of the Corridor is also expressed by a strong traffic of short sea shipping and RoRo services between the Corridor's countries or between Europe and northern Africa. This traffic is also expected to grow rapidly in the coming years with the further development of the motorways of the sea and with the economic and demographic growth of Africa.

Passengers

Implementing the Corridor will significantly reduce rail travel time, and consequently increase frequency of train services on various international relations along the Corridor, therefore generating shifts from road or air to rail but also, as already mentioned, traffic induction.

The Corridor's full implementation would **increase rail shares** in particular for traffic between France and Spain (from 2% today to 12% in 2030) and between France and Italy (from 4% to 8%).

The table below summarizes the forecast for the whole market area:

Mode	2010	2030 Trend (do-nothing)	2030 Corridor implemented	Corridor gain with respect to do-nothing
Road	46,261	63,539	61,125	- 2,414
Rail	3,001	4,061	10,011	+ 5,950
Air	79,659	110,179	108,153	- 2,026
Total *(except sea)*	128,921	177,779	179,289	1,510
Rail share	2.3%	2.3%	5.6%	

Table 9 – Forecast for passengers (thousand passengers)

Implementing the Corridor could thus increase the international rail traffic by nearly 6 million passengers/year in 2030. This increase would come from modal shifts from air (2 million passengers), modal shifts from road (2.4 million passengers) and traffic induction (1.5 million passengers). Rail share would go from 2.3% to 5.6% on the overall market area, which represents more than a doubling of the rail traffic with respect to the do-nothing scenario.

Conclusions drawn from the transport market Study

The implementation of the Mediterranean Corridor represents a major opportunity to **shift important volumes of freight from road to rail**, with a potential shifting of 40 million tons of goods from road to rail by 2030. Nevertheless, the realization of this objective needs a fully upgraded and interoperable infrastructure with adapted services and rail-road terminals.

Developing the Corridor will also lead to an increased competiveness of rail in the international passenger traffic, with a potential increase of 6 million passengers per year by 2030, 2 million of which shifted from air traffic. This would more than double the rail share.

The connections to the ports, including their hinterland link with RRTs and dry ports, are a key element for the success of the Corridor.

The IWW can play an important role in the future for the Mediterranean Corridor, despite the current low traffic volumes. Especially by connecting major industrial zones to seaports, they could offer an interesting alternative to road or rail transport for certain types of goods.

The Corridor developments also likely to improve significantly the competiveness of rail for international passenger traffic, with a potential increase of 6 million passengers per year by 2030, 2 million of which shifted from air traffic.

The Corridor implementation will also have important effects for national and regional traffic, improving travel time on sections with strong national flows (Valencia – Barcelona, Nîmes – Montpellier - Perpignan, Lyon – Chambéry / Grenoble, Milano – Venezia - Trieste…) and creating opportunities for new performant regional services where congested nodes are relieved.

3.2. Capacity issues along the Mediterranean Corridor

The main problems relating to capacity and line saturation along the Corridor lie in the large urban areas and are summarised below.

- The realization of the new railway link **Lyon – Turin** aims at developing efficient passenger and freight services and contributing to modal shift from road to rail. Beyond the completion of the cross-border section including the 57 km base tunnel by 2030, the rest of the line needs to be implemented depending on the evolution of the passenger and freight traffic, in order to benefit fully from the capacity offered by the new base tunnel. There is an important reflection process going on, both on French and Italian side, in order to optimize phasing, effectiveness and costs of the access lines.

- The **Lyon node** is already critical today and its situation prevents any significant development of rail traffic coming from Spain or from the port of Marseille to northern Europe, Switzerland or to Italy. An alternative path to Switzerland or Italy might be available in the short term via the newly electrified line between Valence, Grenoble and Chambéry but with quite limited capacity.

- The **Turin Node** is an essential point of the national railway system, both concerning its function as a node for the HS/HC system and for the Turin-Lyon Corridor and its metropolitan mobility value. The planned interventions for the node, both infrastructural and technological, are essential in order to increase its capacity and enhance the intermodal integration. In particular, rail projects are foreseen in order to allow better track occupancy and increase the capacity of the node.

- The **Brescia-Verona-Venezia** rail section is affected by punctual capacity limitations due to traffic promiscuity and to the high existing transport volumes, expected to increase in the future.

- In all major **urban nodes** (i.e. Madrid, Barcelona, Valencia, Marseille, Lyon, Milano, Venice, Ljubljana, Zagreb and Budapest), bottlenecks exist due to the overlapping of different types of rail traffic (metropolitan, regional, long distance and freight). The planned investments are necessary to relax these constraints. Taking the urban area of Barcelona, for instance:

once all major traffic generators will be connected to the rail network, capacity issues in the urban area of Barcelona will arise, with about 100 – 150 freight trains per day on some sections having to share the tracks with heavy commuter rail traffic; this issue would merit a more in-depth analysis of local traffic.

- Regarding **Zagreb node**, the critical bottleneck is the lack of capacity in the short and medium run, since the most intensive long-distance cargo and passenger transport takes place along this sector, being the most densely populated area in Croatia. Without major efforts, the Zagreb railway node will not have sufficient capacities to receive the forecasted increased railway transport (inner suburban passenger transport and local cargo transport, inbound or outbound long distance passenger and cargo transport, transit passenger and cargo transport). The RRT in Zagreb also suffers from capacity issues.

- The need for a new line is also clear in the **central part of Slovenia**, where freight traffic could reach over 200 trains a day. Such traffic will not be easily added to the passenger traffic in the Ljubljana area. As regards road, the Ljubljana ring road is already a main bottleneck, suffering from capacity limitations especially during peak hours.

- Regarding the Budapest node, the main issues derive from the limited capacity of the Southern Danube Railway Bridge and the missing North-Western section of the ring motorway M0 around Budapest as well as from the missing rail link between Budapest Liszt Ferenc International Airport and the main Hungarian railway lines.

- Between **Montpellier and Perpignan** capacity issues could become critical at the latest once all connections to Spanish seaports, industrial plants and the other logistic terminals will be upgraded at UIC gauge. The new line, beginning with a first section between Montpellier and Beziers, will become necessary to realize the potential demand of the Corridor, clearly aiming at a strong development of rail freight transport on this axis.

- Given the present traffic and its potential development, the upgrade of the line between **Divača** and **Koper** is an absolute priority: there are 82 trains/day on this single-track line, with an expected increase to and 142 trains per day by 2030. In light of this projected increased traffic, the Slovenian government has passed the bill to build a second rail between Koper and Divača that has already been confirmed by the public on the referendum in September 2017. The construction is set to begin in the end of 2017, while the project is expected to be finished by the end of year 2025. Studies for the construction of the second track on the line Koper – Divača have been recently finalised. A special purpose vehicle company (Second Track Koper- Divača - 2TDK) has been established which will act as a promoter of this initiative. The works are planned for implementation in the period 2017-2025 in support of the planned expansion of the port terminal infrastructure (960.1 € million).

4. The identified planned projects to be realised by 2030

4.1. General overview

Chapter 2 gave an outline of the Corridor, including the problems still affecting its full development, while Chapter 3 focused on the analysis of the potential market for transport along the Corridor, providing details of the specific figures and challenges. This Chapter will discuss the investments required for the development of the corridor infrastructure by 2030 and addressing the identified problems and issues.

As a major task of the 2015-2017 Study a list of projects was established in cooperation with national and regional authorities, infrastructure managers and other relevant stakeholders. The time horizon of the project list is 2030, in order to align project timing with the objective of the TEN-T Regulation.

General Statistics

The Mediterranean Project list comprises 462 projects, for a total cost of about 104 billion €. The following figure shows the total number of projects and the associated cost per each project category.

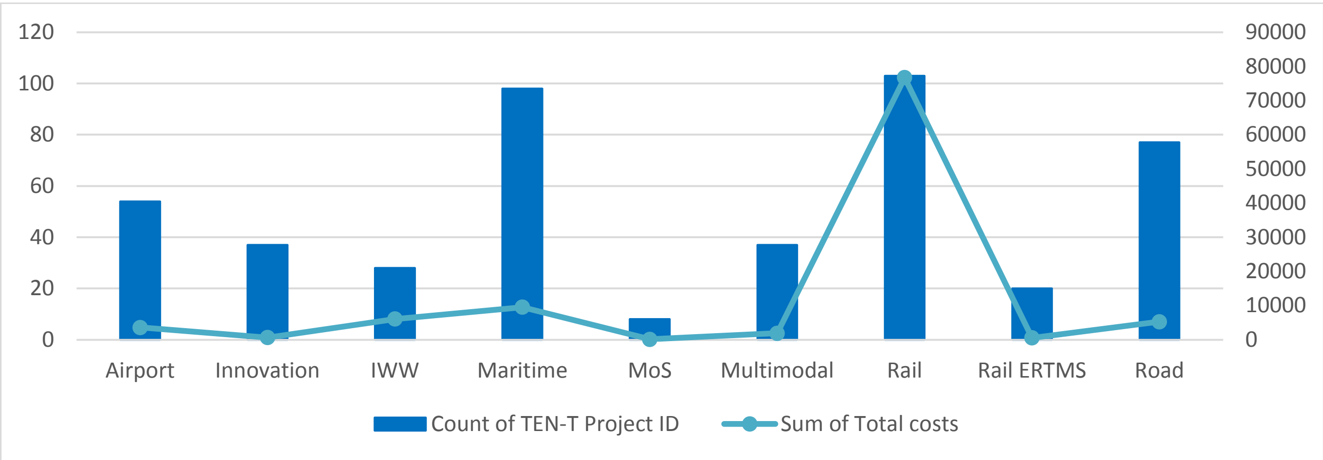


Figure 12 – Total number of projects and related cost per each project category

NB – The costs shown in the figure reflect the financial needs expressed by projects with fully available cost information only.

As shown in the figure above, rail is by far the most represented mode in the Project list for the corridor, with about 24% of projects addressing rail works (corresponding to about 77 billion €).

Other modes, such as road, maritime and multimodal and airport categories follow in terms of number of projects (with respective percentage amounting to about 17% of total projects for road, 20% for maritime and 10% both for multimodal and airport) and much lower figures for project cost (approximately below 10 billion €).

This allocation of costs presented above reflects both the general objectives of the Regulation (EU) N°1315/2013 and corridor specific objectives, as specified in the 2014 corridor study, such as:

- providing the infrastructure network with the capacity required, by eliminating the existing bottlenecks and creating the "missing links", in particular for the rail network;
- assuring the adoption of EU standards for each mode (interoperability); and
- guaranteeing coordination between different modes of transport and a smooth connection between nodes and road / rail network.

The number of projects and the cost[15] per each MS are shown in the following figure.

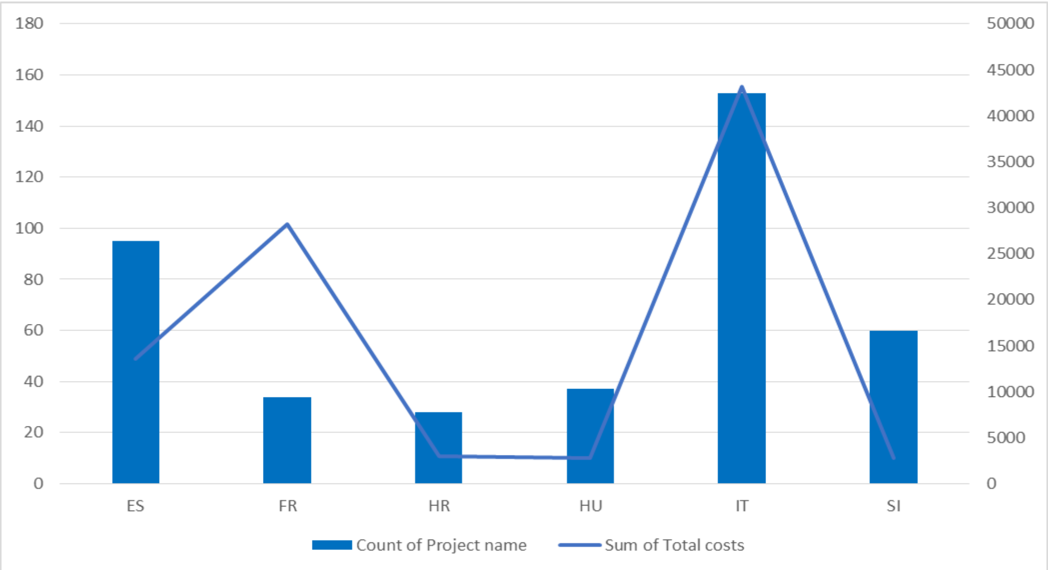


Figure 13 – Total number of projects and related cost per each MS (excluding cross-border projects)

As shown in the figure above Italy, France and Spain record higher costs (respectively, about 43, 28 and 13 billion €), while Hungary, Croatia and Slovenia follow with lower amounts.

The repartition of costs and number of projects among Member States also reflects the different number of nodes belonging to each country, as set out in Annex II of Regulation (EU) 1316/2013[16], as well as the extension of the corridor within the State, in terms of km of road, rail and IWW sections.

4.2. Analysis per transport mode

Rail & RRT including ERTMS deployment plan

The analysis of the Project list regarding contributions to rail KPIs (electrification, track gauge, ERTMS, axle load, train length and line speed) shows a good progress to be expected possibly by 2030. Although the only KPI reaching full compliance is the electrification, positive results can be achieved in terms of:

[15] There are projects without defined project costs, and hence those projects do not contribute to the figures shown.

[16] According to the Regulation, Spain has 24 nodes, France 10, Italy 24, Slovenia, Croatia and Hungary 4 nodes, for a total amount of 70 core nodes belonging to the Mediterranean Corridor.

- Track gauge 1435mm (90% in 2030);
- ERTMS implementation (77% in 2030);
- Axle load (>=22.5t) (84% in 2030);
- Train length (740m) (64% in 2030).

Looking to the rail big picture, it is possible to underline that the targets for 2030 will nearly tend to the full compliance. Nevertheless, although ERTMS implementation is the KPI with a higher progress, only 77% of the rail network will be equipped with this signalling system. Limitations to train length will penalize about 65% of the Corridor sections.

Rail KPI	Forecast 2030
Electrification	100%
Track gauge 1435mm	90%
ERTMS implementation	77%
Line speed>=100km/h	94%
Axle load (>=22.5t)	84%
Train length (740m)	64%

Table 9: Expected progress in the rail network until 2030

IWW & inland ports including RIS Deployment Plan

For inland waterways, the identified projects contribute to reach the full compliance for all the infrastructure requirements set by the Regulation

Maritime Ports & MoS

Bottlenecks identified for seaports will be solved by 2030. The provision of alternative fuels for maritime transport as well as the deployment of an operational single window environment in order to achieve interoperability will be further investigated in the coming months.

All inland ports will be connected by rail as required by the Regulation (EU) N 1315/2013. The connection by CEMT Class IV waterway will be achieved by projects solving this bottleneck by 2030.

Road transport (including ITS deployment)

The road network was already very near to the compliance for all countries in 2015, with the selected projects expected to increase the relative share of motorway/express road sections to 100% of the total Corridor length. Constant improvements seem yet to be a concern of the road infrastructure managers; therefore, some projects for this are presented in the Project list in terms of secure parking, availability of clean fuels as well as the deployment of intelligent transport system.

Airports

The connection of main airports with rail network is fundamental to achieve the intermodality objective set by the Regulation. In order to provide a detailed analysis of airports requirements (distinguishing for core and main airports) and airport projects, the following subparagraphs deal with issues related to current and expected connectivity of corridor airports.

Connection to road and rail network

The physical and technical parameter compliances of the airports situated on the MED corridor were analysed using the Regulation (EU) N° 1315/2013 as a benchmark. Particularly, articles 24, 26, 28 and 41 describe the conditions that need to be met by 2050.

A key condition to ensure interoperability of the airports is their connection to the railway network. This, together with the availability of clean fuels, are the KPIs that are taken into consideration in the Project List.

There are 17 core airports along the MED corridor (Sevilla, Malaga, Alicante, Valencia, Madrid, Barcelona, Marseille, Lyon, Turin, Milano Linate, Milano Malpensa, Milano Orio al Serio, Bologna, Venice, Ljubljana, Zagreb, Budapest,). Out of these airports, six Airports (marked with *) are the main airports that have to be connected to TEN-T "heavy rail" (preferably the high-speed rail network) and road by 2050 according to Art. 41 of the Regulation.

The following table provides detailed information on current airport connectivity and on 2050 compliance.

- C = Compliant
- NC = Not compliant
- NR = Not required

Table 10 - Core airports of the Mediterranean corridor (rail connection)

Core airports	Heavy rail AS-IS	Heavy rail by 2050	Foreseen projects[17]
Sevilla	NR	NR	
Malaga	NR	NR	
Alicante	NR	NR	
Valencia	NR	NR	
Madrid*	**NC**	C	3863
Barcelona*	**NC**	C	3033
Marseille	NR	NR	
Lyon*	NR	C	
Turin	NR	NR	
Milano Linate*	NR	NR	
Milano Malpensa*	**NC**	C	6812
Milano Orio al Serio	NR	NR	

[17] Details of the projects indicated in this table are given in Annex

Core airports	Heavy rail AS-IS	Heavy rail by 2050	Foreseen projects[17]
Bologna	NR	NR	
Venice	NR	NR	
Ljubljana	NR	NR	
Zagreb	NR	NR	
Budapest*	**NC**	C	4424

*** Main airport ex. Annex II Regulation (EU) 1315/2013**

As shown in the above table, out of the 6 main airports of the corridor, only one (Lyon) is currently considered compliant to the characteristics of "Main airports", according to Annex II of the Regulation (EU) N° 1315/2013,

For other Main airports, the following information can be summarized:

- **Madrid Barajas airport**: the airport is currently connected with conventional rail in one of its terminals but lacks of heavy rail connection. Project 3863 will provide the airport with high speed rail connection by 2030.
- **Barcelona airport**: the airport is currently connected with conventional line in one of its terminals (out of two) but has no connection to heavy rail. Project 3033 will extend conventional rail to the second terminal by 2030 but no project for connecting the airport to the high speed rail network is foreseen so far.
- **Milano Linate**: the airport is not currently provided with the connection with conventional and/or heavy rail. A project is foreseen to connect the airport by underground to be linked to the conventional rail line. No project is foreseen by 2050 for heavy rail connection.
- **Milano Malpensa**: the airport is connected by conventional rail from Milano with Ferrovie Nord and with Trenitalia (via Gallarate). A connection to heavy rail is planned to be realised with project 6812 ("Milano Malpensa Airport - South Access") aiming at establishing a new high speed railway connection between the airport and the high speed rail line Turin-Milan.
- **Budapest airport**: the Budapest Liszt Ferenc International Airport is not connected to the main Hungarian railway network. The project "Connection of the railway line Budapest-Arad to the multi-modal hub at Budapest Airport" (ID 4424) is expected to eliminate this bottleneck.

4.3. Urban nodes

In the framework of the new TEN-T policy, urban nodes play an important role within the development and functioning of the core network as a multimodal and interoperable infrastructure for both passenger and freight traffic. Urban nodes along the corridor connect network links – both of the core and the comprehensive networks, often logistically supported by RRT's for freight traffic belt line. They also interconnect transport modes, thus enhancing multimodality. Finally, they connect long distance and/or international traffic with regional and local transport (passengers and freight).

The 13 Core Urban Nodes derived from the Regulation (EU) N° 1315/2013, Annex II along the MED corridor are listed below.

Countries	Urban Node	CNC affected	Involved modes		
			Rail	Road	IWW
ES	Sevilla	MED – ATL	x	x	x
ES	Madrid	MED – ATL	x	x	
ES	Valencia	MED	x	x	
ES	Barcelona	MED	x	x	
FR	Marseilles	MED - NS	x	x	x
FR	Lyon	MED - NS	x	x	x
IT	Turin	MED	x	x	
IT	Milan	MED - RALP	x	x	
IT	Bologna	MED – SCANMED - BA	x	x	
IT	Venice	MED - BA	x	x	x
HR	Zagreb	MED	x	x	
SI	Ljubljana	MED - BA	x	x	
HU	Budapest	MED – OEM - RD	x	x	x

Table 11: Overview of MED corridor urban nodes

The main issues of the urban nodes along the MED corridor are detailed below.

Sevilla

- Rail access to Port of Sevilla interferes with the passengers railway line Sevilla-Cádiz, as freight trains need to cross the passenger line to enter the port. This affects negatively the capacity of the railway access, possibly creating a bottleneck in the near future with the extension of the port rail facilities. A new rail by-bass is planned to avoid this situation.
- SE-30 ring road suffers from traffic congestion, which negatively affects primarily medium and long distance traffics through the Sevilla node. A new ring road SE-40 is foreseen including a new access to the port of Seville.
- The need for several developing and upgrading interventions on the maritime port infrastructures, especially involving enhancement of the navigational access capacity (the limited available draughts of Seville port poses some limitations to certain types of traffic requiring bigger vessels).
- Sevilla port accessibility, and its connection to the hinterland, is hampered by current infrastructures. However, there are specific projects ongoing addressing this situation.

Madrid

- Strong heterogeneous rail traffic sections due to overlapping of metropolitan, regional, long distance and freight traffic. This mixed use of infrastructure negatively affects node performance requirement for freight traffic.
- In regard to the high speed rail network, there is a lack of connectivity in UIC gauge between north (Madrid Chamartín) and south (Madrid Puerta de Atocha) stations, which prevents direct services connecting the regions in the north-west/north with the regions in the north-east/east/south through Madrid, although there is a tunnel already built to connect Chamartín and Atocha which will be put into service in the next years.

- The Madrid rail freight traffic is mainly articulated through the dry port of Coslada and the RRTs of Abroñigal (containers) and Vicálvaro / Villaverde (conventional freight). These facilities lack the capacity to absorb the expected rail freight traffic demand mainly due to limited number of tracks and usable track lengths. Additionally, the lack of UIC gauge may reduce rail competitiveness in the future transport market.
- Main access roads suffering from traffic congestion in Madrid are the M-30 and M-40 ring roads. M-30 problems are specially located at the eastern arch, on the section between the A-2 (Madrid-Barcelona) and A-3 (Madrid-Valencia) radial accesses; and M-40 problems are located at the eastern and southern arches, were traffic congestion on peak hours is mainly related to accessibility to the economic areas located in these city sectors (e.g. Ribera del Loira, Villaverde, Julián Camarillo).
- In terms of last mile connection, Madrid airport is not connected to long-distance rail, which impedes the realisation of journeys from other Spanish cities connected with Madrid by HS rail. This means that at present, passengers travelling by train to Madrid to catch a flight from Madrid airport need to change at either Madrid Chamartin or Madrid Puerta de Atocha HSR stations. According to recent studies about HSR – aeroplane complementarity in Madrid, passengers doing these changes would add up to 600,000/year.

Valencia

- The existing rail line must be updated in order to improve the freight capacity and reduce sharp slopes, as well as enhancing the metropolitan lines.
- Limited access for heavy goods vehicles given that Valencia port has just one access; however, a new exclusive road access to the port is planned.
- The rail access to Valencia port and the hinterland connections are being upgraded.
- Several rails sections for the lines surrounding the city need upgrades in order to be compliant with TEN-T requirements.
- Road connection to the Airport needs to be improved.
- The bottleneck caused by the insufficient rail capacity between Valencia and Sagunto is also significant, as more than 100 journeys are performed every day.

Barcelona

- The rail access to the Port of Barcelona has a provisional and limited connection in UIC, producing important operation problems and reducing load capacity. A new rail access fully interoperable to connect the southern area of the port with the corridor is a priority.
- The main necessity for the city would be finishing the construction of the Intermodal Rail Terminal La Sagrera (this will provide high speed, long and short distance to the surrounding areas).Similarly, the implementation of UIC gauge in the La Llagosta terminal would allow a better connection to the corridor.
- Although there is a rail connection with Terminal T2 of the airport, it should be connected with Terminal T1, which is the most used one.
- An enhancement of ring roads and accesses of Barcelona is necessary in order to reduce congestion; a fourth ring road would allow for smoother traffic management.

Marseille

- Access to the Port facilities needs improvements. There is a lack of quality rail connections and terminals in both Marseille and Fos-sur-Mer. The road access to Fos-sur-Mer presents last mile issues with large portions of non-express roads to reach the terminal facilities, causing safety and congestion issues. The IWW connection of Fos-Sur-Mer port terminal is also incomplete, as one of the major docks (darse 2) in not directly connected to the Rhône River.
- Important bottlenecks in rail traffic due to overlapping of metropolitan, regional, long distance and freight traffic, and the configuration of the St-Charles station as “end station”.
- The Miramas RRT offers only insufficient train length and limited capacity.
- Road congestion affects in particular the accessibility of the port facilities situated in the heart of the urban area of Marseille.

Lyon

- An intense congestion in rail traffic due to overlapping of metropolitan, regional, long distance and freight traffic, most of them passing on an infrastructure of limited capacity in the heart of the city. This congestion causes delays, operating issues and prevents any significant future development of rail traffic. The sections with major capacity issues are Lyon St – Clair – Guillotière (north-south crossing of the city including the Lyon Part-Dieu Station) and St-Fons – Grenay, of particular relevance for MED corridor since it is the initial section of the major rail axis from Lyon to Torino,
- Lyon Venissieux RRT offers only insufficient train length and suffers from lack of capacity.
- The Edouard Herriot inland Port is located in the city centre of Lyon, in a very densely populated area. Its rail accesses in particular need an upgrade as they demand complex train manoeuvres.
- Lyon is also affected by road congestion. Its specific configuration with a motorway crossing the city centre (A6/A7) calls for solutions enhancing bypasses for long-distance traffic.

Turin

- The current infrastructural organisation of the node does not permit to exploit its potential capacity in terms of rail traffic.
- The planned interventions for the Turin Node need to be completed with specific projects to allow the capacity and punctuality increase, due to the overlapping of different types of rail traffic (metropolitan, regional, long distance and freight).

- Technological upgrade is being completed on the rail section Torino – Padua conventional line.

Milan

- The mixed use of rail infrastructure negatively affects node's performance requirement for freight traffic and represent a potential harm to the smooth functioning of the corridor.
- Road network hardly copes with the high population density coupled with high density of industrial and commercial sites.
- Improved rail accessibility is required for Milan Malpensa airport (located in the intersection between two different TEN-T corridors).
- Insufficient integration among transport modes and IWW channels is also to be underlined, due to the lack of last "mile" connection to Milan to Italian IWW system.

Bologna

- The node suffers from severe road sections capacity shortage (e.g. A14 Motorway between Bologna and Castelbolognese and A13 Motorway between Bologna and Ferrara).
- Technological upgrading with a new management system is needed in the railway sections Bologna-Padua and Bologna-Rimini.
- The intermodal rail connection with the Bologna airport is currently unavailable.

Venice

- Lack of rail connection with the airport.
- Reduced rail accessibility to port areas, due to single track rail connection to Venice port causing traffic flow restrictions. Railway traffic from/to the port has to pass through the Venezia Mestre station, thus reducing the station's capacity.
- Rail sections going eastward are being upgraded; preferably by enhancing the conventional line in order to allow a maximum speed up to 200 km/h.
- Infrastructure and technological/signalling upgrading of the existing lines are necessary (station traffic control and management system) in order to increase the available capacity and to separate passenger traffic from freight traffic.
- The limited available draughts of Venice port (due to the lagoon) limits certain types of traffic (requiring vessel of big dimensions).

Ljubljana

- There is a limitation of capacity due to high traffic volumes on roads and RRTs.
- Lack of capacity for railway lines.
- Lack of connection between Ljubljana airport and the railway network.
- Cargo traffic through the city centre needs to be reduced, through a bypass of the Ljubljana railway hub.
- Lack of a direct connection between railway section Primorska and Gorenjska region –all train compositions must be directed to the train station in Ljubljana, stop and change the direction and continue on the other section.

- The Ljubljana ring road is the main road bottleneck, as it suffers from severe capacity limitations especially during peak hours.

Zagreb

- Main physical bottleneck in the railway system, in particular need for electrification and compliance with Core Network standards,
- Additionally to railway, the air traffic control system is facing certain issues which are being resolved with planned projects.

Budapest

- Non-compliance of some MED/OEM/R-D CNC rail sections (between Budapest-Kelenföld and Budapest-Keleti railway stations) with requirements of Reg. 1315/2013; limited capacity of the Southern Danube Railway Bridge,
- Lack of capacity of the road link between the Airport and the city centre within the urban area,
- Missing North-Western section of the ring motorway M0,
- Missing rail link between Budapest Liszt Ferenc International Airport and MED/OEM/R-D CNC railway lines penetrating into the capital city area.

5. Future challenges

5.1. How do we identify the Critical Issues (vs Corridor Objectives)

Developing the Corridor as the backbone of international exchanges between the Eastern and Western parts of Europe will contribute to the economic growth and competitiveness of the Corridor countries. Furthermore it will facilitate the connection of these countries with third countries (in particular with countries in North and West Africa as well as in the East).

The TEN-T Regulation defines the general objective of the TEN-T network as to strengthen the social, economic and territorial cohesion of the Union and to contribute to the creation of a single European transport area. It shall demonstrate European added value by contributing to the objective in the categories: (i) territorial and structural cohesion; (ii) efficiency between different networks; (iii) transport sustainability; (iv) and increasing the benefits for the users.

In order to fully develop of the Corridor certain aspects have to be addressed which are critical for ensuring the efficient and sustainable use of the infrastructure capacity and for guaranteeing the Corridor's full interoperability. These so-called critical issues relate to cross-border sections, capacity, interoperability, intermodality as well as administrative and operational barriers.

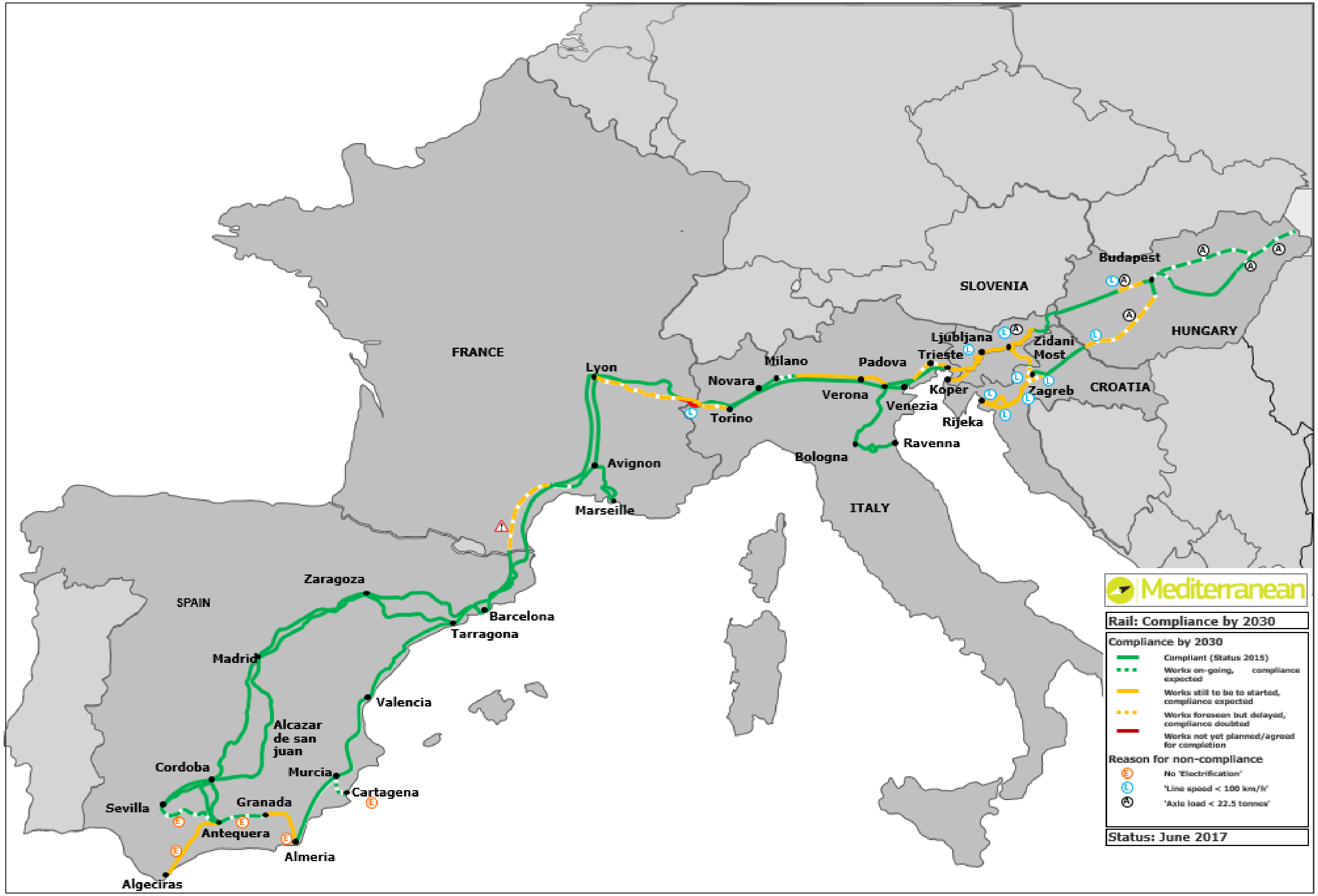
Experience has shown that the development of infrastructure is most difficult on cross-border sections when technical and financial difficulties are exacerbated by the fact that two Member States have to work together. This is why the European Coordinator's work needs to focus on these sections first, in order to enhance land and maritime connections between Member States.

The following picture can be drawn of the main critical issues of the Mediterranean Corridor, based on the analyses performed in the Corridor Studies (both 2014 and 2015-2017), the intensive consultation of stakeholders in the framework of the eleven Corridor Forum meetings held so far, the Working Groups active on specific topics as well as on consultations between the Coordinator and the Member States.

Technical compliance maps

This section shows the level of compliance of the Rail and IWW network along the Mediterranean CNC.

Figure 14: Overview of Corridor compliance by 2030 (rail)



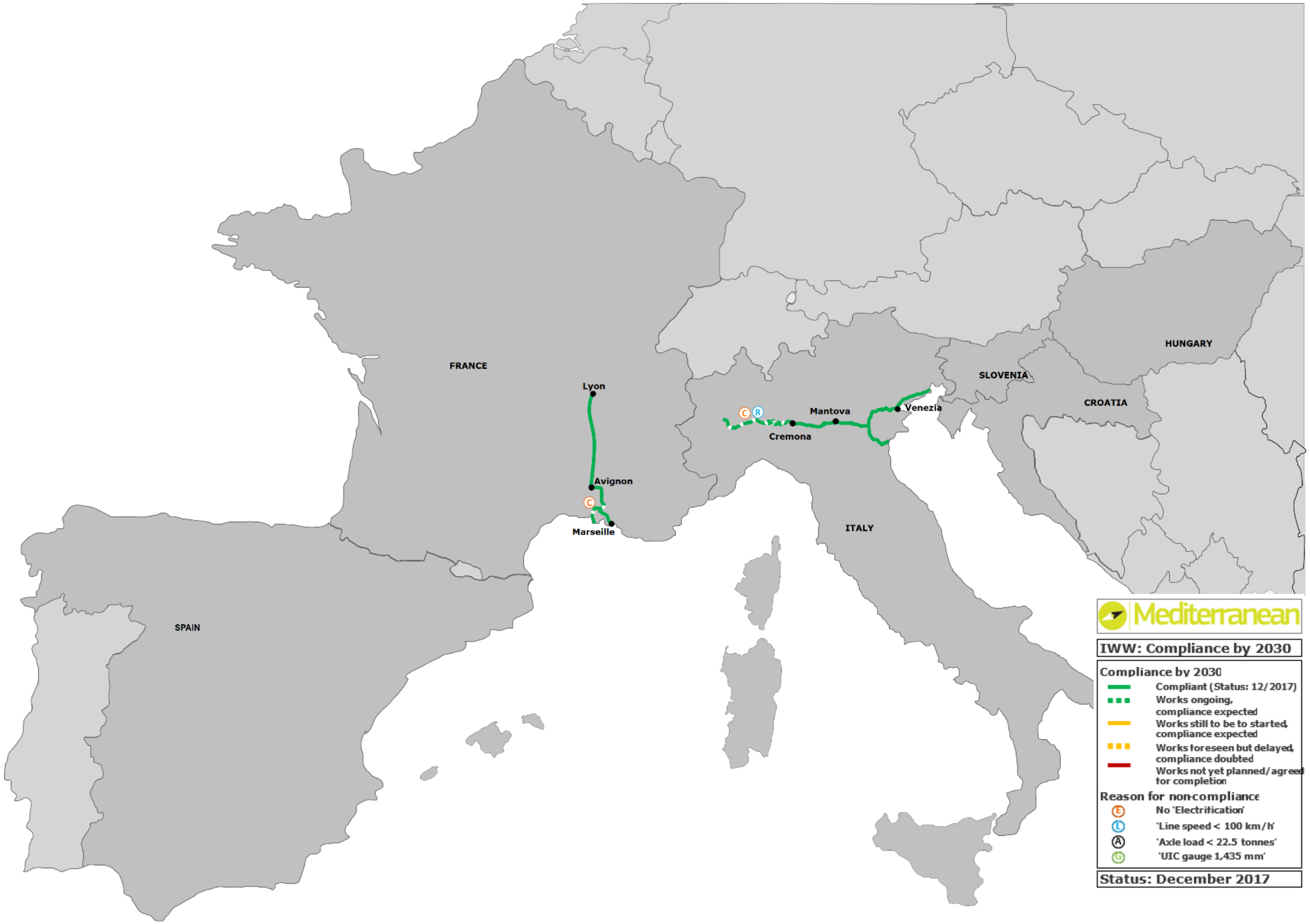


Figure 15: Overview of Corridor compliance by 2030 (IWW)

5.2. Persisting bottlenecks (all modes)

Cross border sections

Cross border sections are here considered as the most representative issues connected with the persistence of the bottlenecks along the Mediterranean Corridor. All of the other problems hampering the full development of the Mediterranean CNC are listed in the following sections, taking into account both the administrative and the operational aspects.

Specific rail sections affected:

- **Spain-France**: The new HS line between **Figueres** and **Perpignan**, which opened on 1 January 2013, offers capacity, fluidity and safety; although traffic has significantly grown since then, it is still underutilized. On that specific topic, the Coordinator launched a meeting was held in March 2016 with the stakeholders to address the different issues. Main problems identified concern: lack of UIC gauge connectivity in ES (with last mile issues to main generators other than the port of Barcelona), three signalling systems and voltages required for long-distance trains running through the line[18], and night-time closure at Le Pertus, reducing the number of commercially attractive slots. These issues are being tackled, some by actions listed in the Corridor's Project list.

- **France-Italy**: the steep gradient of the existing railway line on the French side of the border requires double push locomotives for regular sized freight trains (single loco trains are limited to 650 tons). In addition, the existing sidings and passing tracks restrict further the train lengths making the line uncompetitive. The **new railway link Lyon-Turin** with a 57km base tunnel as its main part is the main project of the whole Mediterranean Corridor. It is highly strategic, because it is the main missing link in the Corridor which aims at connecting south-western Europe with central and eastern European countries. Failing this high performance connection transport relations especially between Italy and France, Italy and Spain, Spain and Italy, and Spain and central and Eastern Europe are hampered. As a consequence freight flows are confined to road transport and deviated to other routes causing congestion and creating additional costs. **Renewed commitment of both governments has been announced** for the completion of the cross-border section by 2030, while reflexions are on-going to optimize the projects of the access lines. Still, it is important to ensure that the potential of the new basis tunnel will not be diminished by bottlenecks on nearby sections of the Corridor.

- **Italy-Slovenia**: the existing line between Trieste/Aurisina and Divača needs to be up-graded to meet TEN-T standards. However, recent traffic forecasts suggest that the capacity of the up-graded line will be sufficient to accommodate traffic up

[18] This leads to a lack of available locomotives capable of running on the HS line.

to 2030[19]. After 2030 both sides will reconsider justification for new high-speed line.

- **Slovenia-Croatia**: on both sides of this cross-border section, which is part of the line connecting the two capitals Ljubljana and Zagreb, the line suffers from speed limitations as well as limitations on train length. The line is not in conformity with TEN-T standards and needs up-grading. On the Slovenian side the line is expected to be upgraded to TEN-T standards by 2030. Slovenia is also in the final stages of construction of the new highway connecting Maribor and the Croatian border towards Zagreb, which will be finished by the end of 2018. In addition, the Dobova – Zagreb section suffers from the following limitations: train speed for freight (<100km/h) and train length limitations (400-500m.)

- **Croatia - Slovenia**: on the Croatian side of this cross-border section, which is part of the line connecting the two capitals Ljubljana and Zagreb, the line suffers from speed limitations as well as limitations on train length. The line is not in conformity with TEN-T standards and needs up-grading.

- **Slovenia-Hungary:** an improvement of the HU rail section Bajánsenye-Boba(-Hodos, SI) (installation of ETCS2 on a 102-km line) is to be concluded in the 1st half of 2018. The development of M70 expressway section Letenye - Tornyiszentmiklós (HU-SI border) into a full 4-lane motorway to be concluded by the end of 2019 will improve traffic safety significantly on this road section. Furthermore, routine and extraordinary road maintenance issues should be discussed between the competent authorities of SLO and HU. An up-grading of this cross-border section has been recently completed with the Pragersko-Hodoš railway line project, which is fully compliant with the TEN-T standards and no particular bottleneck exists.

- **Croatia-Hungary**: this cross-border section (Botovo- Gyékényes) is part of the main railway line connecting Zagreb and Budapest. As most of this important connection the cross-border section requires up-grading to TEN-T standards. The Croatian rail infrastructure manager HŽ Infrastruktura has signed a EUR 241 million grant agreement with EU’s INEA- Innovation and Networks Executive Agency for the upgrading of the existing track and the construction of a new second track of the 43.2 km long Križevci-Koprivnica-Hungarian state border railway section. HŽ Infrastruktura continues the modernisation of the Mediterranean Corridor with works on Zagreb-Hungarian state border railway section. The new line will generally follow the existing route, except in the section between Carevdar and Lepavina. Works will include reconstruction and construction of four rail stations and six stops, upgrade/removal of removal / upgrade level crossings, the removal of one existing bridge over the river Drava and the construction of a new one. These activities will increase the line capacity,

[19] The Slovenian Government has not abandoned the plans to build a fast track in the future. Indeed, the new Trieste-Divača high speed line is considered as a priority project by the Government, since it would constitute Slovenia's only link to the high-speed railway networks of Europe.

enable speeds of up to 160 km/hour, shorten travel times, allow usage of interoperable trains, and increase the level of safety.

- **Hungary–Ukraine**: three HU road projects aim at constructing the cross-border road section between Hungary and Ukraine, which is a main missing road link of the corridor crossing an EU external border. The works foreseen will extend the Hungarian M3 motorway up to the border. In terms of prioritisation, the realisation of the HU/UA road missing link is one of the important cross-border projects ensuring the smooth functioning of the corridor.

  Specific road sections affected:

  - **Expressway M3 between Vásárosnamény and Beregdaróc/Déda HU/UA border**. Being the last mile (27 km long) and main border crossing section of motorway M3 (as well as MED CNC in Hungary) this is a missing link. Existing narrow two-directional roads are carrying serious accident risk. According to government decision 1833/2016. (XII. 23.), it is planned to build a 2x1 lane first carriageway by 2020 (financed from the State budget), suitable to be upgraded later into a full 2x2 lane M3 motorway. Preparatory works in this respect are under way.
  - **Expressway M34 between Vásárosnamény and Záhony/Cop HU/UA border (39km).** This a missing link and an additional border crossing section of motorway M3 (as well as MED CNC). Although the currently observed and expected volume of traffic does not justify yet economically its construction, preparatory works are under way, aiming to elaborate an officially approved design related to a 2x2 lane motorway. It is planned to build a 2x1 lane first carriageway by 2020 (financed from the State budget), suitable to be developed later into a full 2x2 lane M34 motorway.
  - **Expressway M70 between Letenye (Interchange M7/M70) and Tornyiszent-miklós at HU/SL border.** Due to lack of resources and low traffic forecast, 2x1 and 2x2 lane sections alternate on this 21 km long road constructed between 2002-2005), causing frequent and serious accidents following its opening. Although safety level is improved since 90 km/h speed limit has been introduced and strictly enforced on the 2x1 lane sections (totalling 12 km), constantly increasing traffic volume justifies the reconstruction of the existing expressway into a standard 2x2 lane motorway. An approved CEF project (2015-HU-TM-0107-W; ID 3157) started already aiming to upgrade the M70 expressway by autumn 2019 to a full 2-lane dual-carriageway motorway, with emergency lanes, a central reservation and a maximum speed of 130 km/h. The technical characteristics will be in compliance with the TEN-T requirements and will match the standards of the adjacent A5 motorway in Slovenia and M7 motorway in Hungary.

5.3. Persisting Administrative & Operational barriers

Spain

Rail

In terms of infrastructures limitations, the following main points can be noted:

- the **existing limitations to train length** (550 to 600m) does not allow, in most of the Spanish corridor, the operation of freight trains with the maximum interoperable length of 740 m., which penalizes rail transportation competitiveness. Project addressing this issue: 3855
- the maximum grades reaching 18 ‰, requiring additional traction depending on the gross load hauled (e.g. regarding the stretch Algeciras-Bobadilla-Granada-Moreda-Almeria, conventional line, the maximum grade varies between 22 and 28 ‰).
- the sections with **single-track lines** (i.e. Vandellós-Tarragona, Algeciras-Bobadilla) limiting its potential development, the available capacity and/or conditioning timetabling;
- the sections with **heavy commuter train traffic** (i.e. Martorell- Castelbisbal) penalize freight trains, limiting its potential development because the few available windows cannot host competitive paths. Project addressing this issue: 3843
- the sections with **non-electrified lines,** as Algeciras-Bobadilla, requiring, when appropriate, the exchange of the locomotive; Project addressing this issue: 3850
- the high gradient recorded in six of the analysed stretches causes:
  - reduction of the (maximum) load of the freight train, or
  - need of two locomotives (more power)
  - reinforced couplings (higher strength)

  These solutions would suppose a cost increase of the freight service (€/tonne).

Seaports and Rail road terminal

Critical investments have been made in Spain in order to **provide a standard gauge access to some logistics and freight rail facilities along the corridor**.

Anyhow, the capacity and the performance of these links have shown some limitations in order to absorb significant traffic growths, as those expected in the corridor.

It is critical to endow ports in the Mediterranean corridor with the logistics road and railway connections and installations required to ensure their intermodality and competitiveness as well as with the appropriate port capacity to attend the growths of the maritime traffic.

Project addressing this issue: 3080, 3082, 3840, and 3815.

Airports

As regards the integration among transport modes, it is important to underline the following topics.

- Considering direct connections between air and rail, there is no freight rail traffic in the airports,
- Passenger rail access is normally achieved through commuter trains or subway in the biggest cities,
- High Speed Rail services are not available in the airports. However, all of them have a High Speed Rail station in 10 km around.

France

Railways[20]

As shown below, the most relevant critical issues are related to:

- **the Lyon rail bottleneck**, where trains suffer every day from delays due to intensive and mixed use of the infrastructure inside one of the most important railway hubs in Europe, preventing further development of regional or freight traffic. Project addressing this issue: 3100, 3110
- **the link between Spain – Perpignan – Montpellier and Nîmes**, where mixed traffic and limited passenger speed could affect the development of international freight trains and high-speed passenger trains. The new section of HSL between Nîmes and Montpellier is operational since the 10th of December 2017. It is equipped with ERTMS and has been designed to accept also freight trains; another line is in project between Montpellier and Beziers, then to Perpignan, where the existing line is a bottleneck both in terms of capacity and standards (level crossings, low speed and mixed traffic). Project addressing this issue: 3099, 3107.
- the rail bottleneck of Marseille and the **rail linkage of the port of Marseille**, which suffers from insufficient standards and complexity which affects the productivity of freight trains[21]. Project addressing this issue: 3112.
- as already mentioned, the **disparity in the signalling systems** (ERTMS in UIC gauge tracks and ASFA in conventional Spanish network and KVB in France – for the cross border) is a problem, because it implies the use of (more expensive) new tri-standard locomotives or the adaptation of existing ones to ensure

[20] Also see paragraph on cross border issues.
[21] the port became recently manager of the railway system inside the port area and plans important investments

international continuity. Currently, locomotives are changed at the border. The **disparity of the power supply** (3KV in mixed gauges and 25 KV in high speed in Spain and 1.5 KV in France) requiring new tri-standard locomotives (much more expensive) or the adaptation of the existing ones. Therefore, the short-term problem is the lack of adapted locomotives to the special features of rail link from Spain to Perpignan.

Roads

The most relevant critical issues are related to:

- the Fréjus tunnel (assessed in the Italian section),
- road congestion around Lyon and in the Rhône Valley, Montpellier and between Perpignan and the Spanish border,
- road access to the port of Marseille.

Ports

The rail and road accesses to the port facilities of Fos and Marseille are penalized by the inadequacy of the infrastructures to the freight exploitation modes in the conditioning of the containers and in the volumes to be handled. The port authority has several projects to overcome this issue:

- On Fos terminal projects concern the automation of the signalization and the creation of a supplementary crossing zone;
- In Marseille the program includes three independent functional phases, including the reopening of the Mourepiane link, and the update to the high and low gauges in the link Avignon-Mourepiane.

These projects will increase by 60% the rail tonnage capacity at all Marseille / Fos Port facilities.

In addition, two rail-road terminals (one in Fos and the other in Mourepiane) and one rolling motorway terminal (in Marseille) are also being projected, with the objective of improving rail system productivity by putting together the port's container and ro-ro flows and the flows from the surrounding industrial zones.

The IWW link between the port of Fos and the Rhône is also insufficient because the container terminal of Fos is not directly connected to the IWW system; therefore a project of direct IWW link between this terminal and the Rhône is under study.

The port must also adapt to increasing maritime traffic and vessel sizes, therefore it has several projects to improve capacity and adequacy of both maritime terminals in Fos and Marseille, including improvement of facilities for the motorways of the sea. Project addressing this issue: 3123

Road rail terminals

The most important technical bottleneck regarding rail road terminals on the corridor is the length of the tracks, which often prevent train assembly from making 740m long trains, therefore affecting productivity and competitiveness of combined transport. For example, the maximum available track length at rail road terminals on the corridor is:

- 400 m. at Avignon – Courtine,
- 320 m. at Le Boulou,
- 400 m. at Perpignan,
- 320 m. at Marseille – Canet,
- 350 m. at Lyon – Venissieux.

Improvements of capacity and access to the Lyon-Venissieux terminal are foreseen in the framework of the Lyon Railway Node program. Project addressing this issue: 3110

Two rolling motorway terminals are located on the corridor, one in Perpignan and one in Aiton (Aiton is connected with Orbassano in Italy). They are both dedicated to the Modalohr system. The realization of a new terminal near Lyon has been included among the options offered to candidates of the joint call for tenders for the concession of Alpine rolling motorway launched by the French and Italian Governments on 1 August 2017.

New rolling motorway lines are in the planning to be implemented in the short term, Paris - Barcelona and Calais – Orbassano.

The French-Spanish working group on rolling motorways works for the implementation of additional rolling motorway services. A call for interested industry parties to submit information (technical specifications, commercial information) on rolling motorway rolling stock was opened over March-June 2017. Five files were received which are under examination. A new call for interested services suppliers will be launched shortly.

Inland waterways and inland ports[22]

The Rhône river between Fos-sur-Mer and Lyon is efficient and allows the navigation of large vessels. However, ports and terminals along the river can be described as insufficient and lack of intermodal facilities:

- The container terminal of Fos sur Mer is not directly connected with the Rhône,
- The Port of Lyon (Edouard Herriot) needs improvement of its rail and road access: rail access in particular is not electrified and generates complex train

[22] Although the French inland waterways are not part of the Mediterranean corridor, they have been analysed because included in the scope of the study.

manoeuvres. Its situation in the heart of the city of Lyon is an asset but makes further development of port facilities difficult,

- Improvements of the rail access to the port of Lyon are part of the Lyon Railway Node program.

A further way of improving the use of the Rhône as major freight transport infrastructure would be to create new intermodal facilities. In fact, two projects along the Rhône have the objective of linking new or extended industrial zones with intermodal terminals combining road, rail and waterway: the Salaise-Sablons platform (just south of Lyon) and the Avignon – Courtine platform.

The canal linking the Rhône near Fos-sur-Mer and the port of Sète is also part of the TEN-T core network. Several improvement works are on-going on this canal, to reach TEN-T standards (from CEMT class III to IV) and to increase its performances.

Projects addressing this issue: 8200, 3098

Airports

Two French core network airports are situated in the corridor. The Lyon Saint-Exupéry Airport is connected by rail directly on the Paris - Marseille high-speed line. It has also a tram-train connection with the city centre since 2011. Works to enhance the terminal for low cost airlines are over and the new terminal 1 is under construction. The airport has an ambitious long-term development program aiming at a capacity of 20-25 million passengers per year, with a third runway and a freight zone connected with the future railway bypass of Lyon.

The airport of Marseille - Provence has recently opened a second terminal, dedicated to low cost airlines. The terminal is connected to the regional trains between Marseille and Miramas - Avignon but the train station is not directly situated near the terminals (5min with bus shuttle); the high speed trains can be reached at Aix-en-Provence TGV station (12 min with bus shuttle).

Italy

Railways

The most relevant critical issues are related to:

- The extreme western part of the corridor, from the Italian/French border up to Pioltello (conventional line), where the standard for the loading gauge is limited to PC45 50 whereas on eastern sections after Pioltello the available loading gauge is up to PC80;

- The urban nodes (Venezia, Torino, and Milano) are characterized by a high promiscuity of rail traffic due to overlapping of metropolitan, regional, long distance and freight traffic.

The careful planning and renewal of infrastructure (including a rationalization of traffic management for Milano and the deployment of new lines to separate passenger from freight traffic by limiting as much as possible interference in case of Milano Lambrate or Venezia Mestre “linea dei bivi”) is aiming to solve such issue.

Concerning the node of Torino, the main critical issue is the infrastructural organisation of the node, which hampers the capacity of the node and the smooth functioning of rail freight transport.

- the connection Venezia-Trieste that is affected by low performance for freight (maximum train length) and passenger (speed) trains,
- the railway infrastructure of Trieste port that shows a capacity lack.

Project addressing this issue: 3298, 3232

Roads

As shown below, the most relevant critical issues are related to:

- **Fréjus tunnel:** currently with a single tube accommodating both traffic directions creating potential safety concerns as it happened in 2005 when an accident in the tunnel caused two fatalities. However, the increase of capacity, as it could be generated by the opening of the second tube, is also source of concern as unsuitable improvement of road capacity,
- **In Northern Italy**: the high population density coupled with many small firms and residences spread all over the territory generate a large amount of transport demand that gives rise to congestion problems.

Airports

The critical issues of the Italian airports can be mainly clustered in three different categories of infrastructures: airside, landside and intermodal connections.

- **Airside infrastructures**: the growing traffic expected in the next ten years will lead to airport capacity shortage; therefore, the expansion of infrastructures is mandatory in order to avoid congestion in peak hours. In the two airports of Milan Malpensa and Venice the realization of a new runway is foreseen, indicating the constraints to handle the growing traffic with the current runways endowment. This intervention is also linked to the enlargement of others airside facilities such as terminals, aprons and taxiways. If present in the airport, the upgrade of freight facilities is generally expected too. In the other airports, terminal enlargements are expected in order to cope with the growing passenger and freight demands of the following years; in some cases, such as Turin and Bergamo, the specialization of the available infrastructures is expected in order to manage freight, passengers, etc. In Brescia (specialized airports for freight only), the extension of the existing runway is expected to cope with the wide body plane used for freight activities. Funding of the proposed interventions are often uncompleted, indicating potential constraint in their realisation;

Projects addressing this issue: 3617, 3615, 3601, 3604

- **Landside infrastructures:** previous air-side interventions are related to the enlargement of the landside infrastructures in few airports (within the corridor only in Malpensa and Turin). In particular:

  - Bergamo airport: the rail link is currently unavailable (a feasibility study has been carried out),

  - Milano Malpensa: the rail connection is available;

  - Turin Caselle: rail connection existing;

  - Venice airport: the rail link is currently unavailable, but it is planned.

  Projects addressing this issue: 1119

Offering new connections which seriously challenge road transport on travel time is mandatory. For main airports, such as Milan and Venice, to realise the metropolitan connection (to easily reach the airport from the city) is important; long distance connections further enlarging the airport catchment area and finally increasing the potential airport passengers are important too.

Therefore, the further development of the connections of Malpensa with the existing High Speed rail and the realisation of the new intermodal connection in Venice Tessera airport is a priority.

Ports

The list of physical bottlenecks, low technical standards (compared to TEN-T Regulation) and lack of interoperability issues along the MED Ports network include, but do not limit to, the following points.

- **The limited available draughts** of **Venice port** (due to the lagoon) pose some limitations for certain types of traffic (requiring vessel of big dimensions). Projects addressing this issue: 1278

- **The freight traffic for Trieste port** is served by distinct rail transport facilities interconnected and connected to the external international network (in the port area there are about 70 km of tracks). However the freight traffic flow is inadequate in comparison to the available draught (deep enough to allow huge ships to dock). Projects addressing this issue: 1852

- A critical issue of the **Ravenna port is the limited draught** (structural problem since Ravenna is a canal-harbour). Yet, Ravenna's port physical bottlenecks would require several works for the upgrading of port infrastructure. Projects addressing this issue: 1858

- **Need of improved traffic management Systems.** For many Italian ports (Trieste and Ravenna included), a consistent issue concerns the adopted IT platforms and the absence of a common platform for all Players/entities. Projects addressing this issue: 1272

Rail road terminals

As shown below, the most relevant critical issues are related to:

- the **Orbassano node,** that is now facing a lack of accessibility to HS rail (the access to conventional rail exists); this will be solved with the new Lyon - Turin line and the related works in the node of Turin. The project foresees a dedicated connection of the rail road terminal with the new line. The direct access from the HS line would enhance capacity on the existing conventional rail line where it is expected to be increased a metropolitan rail service. Some critical voices indicate that to fully use the access along the HS line it would be necessary to use dual voltage locomotives (not so common among the rail freight undertakings). Otherwise, in case of old locomotives it would be used the conventional line (thus may lead to manage priorities between metropolitan and freight trains using the same line).

Inland waterways

As shown below, the most relevant critical issues on inland waterways are related to:

- **limited draught of waterways** subject to seasonal variations (only in the summer season),

- **lack of direct transhipment** between inland and sea ports,

- **lack of a direct rail connection** up to the quay in the main inland ports (i.e. Cremona),

- **accessibility** of the western part of the corridor (between Cremona Milan and Casale Monferrato) is limited to main vessel due to **a missing lock**; the channel linking Milan with the existing IWW is currently under construction;

- **low navigability reliability:** the low rate (60%) is due to the constant variations in hydraulic conditions. This constraint provokes a limited draught and the consequent reduction of the transported tonnes per vessel. In particular, about twenty critical points have been identified, five of them are along the Cremona- Mincio section;

- **inadequate fleet:** the current Italian fleet is not sufficient in terms of units and qualitative standards because there are no vessels which meet Class V requirements; on the contrary, the majority of the convoys follow Class IV standards because of the infrastructural constraints such as limitation of lock measure.

Projects addressing this issue: 3196, 3186, 3254

Croatia

Rail

The most relevant critical issues are listed below:

Entire Croatian section equipped with **single track** except Dugo Selo -Zagreb section, which is double track. Section Dugo Selo -Zagreb suffers from overlapping of traffic flows, bottleneck. Moreover, all sections are not equipped with **ERTMS**, suffering from **train length** limitations (average train length allowed is in the range of 400-700m.) and **train speed** limitations for freight. Projects addressing this issue: 3140, 3174

About **safety** equipment the auto stop device (AS) of the INDUSI (I 60) type is in use on the entire network.

About gauge: loading gauge PC 80/410 (UIC Type: C) except Dreznica-Rijeka and Ostarije-Dreznica which have a class A (UIC type).

Max admissible **axle load** for all sections permits to exploit 22.5 ton. About **electrification** System: all sections are equipped with 25kV, 50 Hz

Zagreb Main Station – Rijeka line was built 135 years ago, it has unfavourable route (hard shapes etc.), completely contrary to the modern traffic requirements, especially the section Karlovac-Rijeka (70% of its length is in curves) that is the direct connection to Rijeka port. Projects addressing this issue: 3138

Zagreb node suffers from a lack of capacity in the short – medium run (by pass for freight trains needed). Barring any large and radical efforts, Zagreb railway node shall not have sufficient capabilities to receive planned increased railway transport (inner suburban passenger transport and local cargo transport, inbound or outbound long distance passenger and cargo transport, transit passenger and cargo transport). Projects addressing this issue: 3144

Inland Waterways

The list below summarises the identified barriers concerning inland waterways in Croatia, although no projects are part of the Mediterranean corridor.

- **RIS implementation.** RIS is implemented on all rivers (Danube, Drava and Sava) but there still exist a problem with lack of staff due to non-employment for RIS centre.
- Shortage of **Workforce** in public sector.

Seaports

Concerning the seaports in Croatia, the following issues can be listed as problems affecting the network.

- **Rijeka**: Container storage area is rather small, and space is limited, so that is a severe bottleneck of the port of Rijeka. Increasing of container transhipment requires the construction of dry ports in the port hinterland and efficient railway connections. In addition, research has shown that equipment in port of **Rijeka** is technologically old, and 80% of its historic cost is written off, which means that this kind of equipment is not reliable for attracting new amounts of cargo, and it is not possible to bid a competitive price for port – transport services. Projects addressing this issue: 3514

- **Long vessel waiting times** re-scheduling due to port congestion: In peak times, vessels have to wait offshore before they are unloaded, which is related to capacity bottlenecks. Projects addressing this issue: 3517

- Insufficient **mooring space**: a capacity bottleneck that has to be eased by (costly) extensions or through shortening of berth time. Projects addressing this issue: 3137

- Not flexible infrastructure to increasing **ship size**.

- Low level of **information integration** among port community: a port encloses a high number of stakeholders.

- Lack of **common integrated development strategy** of the seaports and atomised market.

- **Insufficient integration** among transport modes**.** At the container terminal in Rijeka, there are no conditions for achieving a higher significant usage of railway -short range gauge that goes through the city.

Roads

Lack of efficient and sustainable traffic management system of Rijeka – Zagreb Motorway. Among the proposed measures to solve the problem:

- increasing fluidity of transport flows
- reduction of bottlenecks
- modernize the system for traffic management and accident prevention
- investments in guard rails for motorways
- ensure environmental protection by construction of noise barriers
- reconstruction of the existing lighting system and transfer to energy-efficient lighting system.

Airports

One of the identified physical bottlenecks in traffic in Croatian airspace is high seasonality, with the main flows running in South-east - North-west stretch. The volume of traffic in the period May-October is almost double than the volume in the rest of the year. This seasonality of traffic provides challenges in achieving a balance between the required capacity and use of resources throughout the year.

Other critical issues are mainly identified with the:

- Low **technical standards**
- Need of improved traffic management systems
- Administrative procedures
- Insufficient integration among transport modes

Projects addressing this issue: 3135, 3509

Slovenia

Railways

In the 2014-2020, the orientation given by the EC gives high importance to the development of rail transport (especially for cargo) in order to reduce environmental impacts.

Additionally, the general orientation is to invest into rail service because of possible ecological issues. Rails should take over most of the imported cargo; otherwise the roads will be over occupied and the emissions above acceptable levels.

Thus, the removal of existing bottlenecks for upgrading of existing infrastructure concerns: Divača – Koper (new line); Divača – Trieste (in progress); Divača – Ljubljana (upgrade of the current infrastructure); Ljubljana node (short-term solution: track deepening, Tivoli arc); Zidani Most – Celje (increase in capacity); Pragersko – Hungarian board (project in progress, electric traction); Šentilj –Maribor (upgrade of the existing track).

As far as passenger transport is concerned, only 5% of the population is using rail service as a mean of transport. It should be pointed out that adequate infrastructure and good rail connections are of great importance to attract foreigners to Slovenia, in particular tourists during the summer period. There is a relatively poor connection with Italy, although the direct train between Ljubljana – Trieste – Venice will start to operate in June 2018. In 2018 INTERREG program SI-IT will finance project called CROSSMOBY with the aim to improve environmentally friendly cross border passenger traffic between two countries and apparently limited interests to improve it. Projects addressing this issue: 1906 (Identification of additional measures for upgrading (increase abilities) of the existing line Divača-Koper), 1941 (Upgrading the railway line between Ljubljana and Divača, 1. Phase).

Roads

Concerning passenger transport, Ljubljana has already established a park&ride (P&R) system, Maribor is going to establish P&R in 2019. According to recent studies, however, no more than 25% of the population will be using public transport.

In addition, high traffic volumes are observed during the rush hours in Ljubljana node. So, the Ljubljana ring road could be considered as the main bottleneck, suffering from capacity limitations, especially during peak hours. At the moment, a specific action in order to reduce noise pollution on the Ljubljana bypass is going to be addressed by the road infrastructure manager (DARS, a state-owned company), which is studying possible changes to the traffic regime (a reduction of the speed limit from 100 to 80 km/h). Measures are also directed at diverting transit traffic from the very busy northern towards the eastern bypass, which has fewer residential buildings in its direct vicinity.

Ports

Luka Koper's main planned infrastructural activities are the extension of the existing piers, the deepening of waterways and the construction of a third pier, which would allow the reorganization of works and improved operational flexibility. One of the priority projects is also an increase in the capacity of cargo transferred from the port to rail. In order to maintain the 60% modal split, a second track on the track Divača-Koper needs to be implemented. Projects addressing this issue: 1143 (Construction of the 2nd track Divača-Koper)

Road rail terminals

Railway intermodal terminal located in Ljubljana (operated by Slovenske Železnice) needs more capacity (new investments have been programmed in 2013). Projects addressing this issue: 1391 (Upgrading and modernization of Ljubljana container terminal infrastructure for improvement of intermodal transport services and logistics centre)

Airports

The most important planned activity in the near future for the country's main airport (Letališče Jožeta Pučnika, Ljubljana) is the construction of a new passenger terminal (EUR 17m of European, funds obtained, project currently on stand-by). Meanwhile, the key point regarding the unification of infrastructure would be to connect the airport to rail service and to improve road infrastructure around the airport and in the region (planned in 2040, local roads between Štajerska and Gorenjska). It needs to be taken into account that Aerodrome Ljubljana is currently sold, hence its development heavily depends on its new owners (investments on passenger and freight terminals are needed). Projects addressing this issue: 1934: Renovation and modernization of airport infrastructure, 1921 (Airport Ljubljana - Development of airport infrastructure - In the context of the National Spatial Plan will set area for the location of the airport and other infrastructure) 1922 (Reallocation of the main road)

Hungary

Railways

Before moving to the detailed description of the critical issues, it is important to underline that MAV plans to eliminate bottlenecks on several sections belonging to the corridor. The related investments are under preparation and cover:

- **Track alignment** (lifting slow-down signs)[23];
- **Energy supply system of catenary** (sub-stations and catenary);
- **Renewal of old bridges**;
- **Station reconstruction**, in particular the renewal of the three Budapest head-stations;
- **Intermodal investments** in Kaposvár and Debrecen in order to increase the quality of services as detailed below.
  - Debrecen plays an important role in its Euro-region and the Eastern part of the country. Its integration into transport systems should be developed accordingly. Part of the efforts is the creation of an intermodal node serving the city's population and its visitors. The main railway station in the centre of the town will be reconstructed.
  - Kaposvár sees the following investments: interconnection of the railway station, the local and inter-city bus terminals, PR, BR, joint platforms, information system, passenger facilities and other functions; two-level separation of roads and railways, separation of pedestrian movement and bike traffic. The related feasibility study is completed.

Projects addressing this issue: 3905, 3908

Roads

Main critical issues along the Hungarian road network can be summarised in:

- **Low density of clean fuel stations** alongside and in the vicinity of MED CNC road sections
- **Congestion on various sections** due to lack of resources, low traffic forecast, high rate of trucks and shortage of 2x2 lane sections. This of course also affects the traffic, making it rather difficult to calculate the expected travel time.

Projects addressing this issue: 3919, 3916

Road Rail terminals

Trans-loading rail terminal at Záhony (HU/UA border). The international market position of the trans-loading terminal is worsened due to the sharp decline of

---

[23] CEF projects: 2014-HU-TMC-0493-W (between Budapest/Kelenföld - Százhalombatta), 2015-HU-TM-0003-M (between Százhalombatta - Pusztaszabolcs), and 2015-HU-TM- 0158-M (between Budapest/Rákos – Hatvan) aim to develop different sections on the MED CNC rail in order to fulfill all EU requirements.

international trade with Ukraine and substantial decrease of international transit traffic, due to the war-like situation in the Eastern part of the country.

METRANS RRT Csepel Island – Budapest. This new privately financed RRT has been built and opened recently (14.06.2017) by METRANS (the intermodal subsidiary of Hamburger Hafen und Logistik AG). Its capacity is 250 000 TEU/year. The length of its 8 tracks, however, doesn't allow to handle 750 m long trains and its railway connection is not electrified yet. For the time being it is not freely accessible by third parties.

Csepel Freeport, Budapest. The capacity of the trimodal terminal operated by Budapest Freeport Logistic Co. doesn't allow to handle 750 m long trains and its deteriorated railway connection is not electrified yet. The renewal of the railway line connecting the terminal to the MÁV main line No.150 at Soroksár (including upgrading of the Gubacsi Bridge across the Danube branch) is under preparation (see approved CEF project 2015-HU-TM-0365-S listed in RD CNC Project List 2017 as ID 9732).

Projects addressing this issue: 9841

Airports

Railway connection of Budapest Airport is missing yet, hampering further development and increase of capacity of it. Connecting the freight handling areas of Budapest airport to the main Budapest-Arad railway line is under way. Projects addressing this issue: 9904.

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

6.1. What remains to be done

Below is a summary of what still to needs to be done in terms of infrastructure implementation by 2030 in parallel with the need of ensuring a sustainable, smart and innovative European transport system in line with related EU Policies (see also next paragraphs).

Cross-border projects: These projects are crucial for the establishment of direct links between MSs and typically have a high European added value, but may have lower direct economic effects compared to purely national projects. Such projects should be the subject of priority intervention by the Union in order to ensure that they are implemented.

Rail and ERTMS: By comparing infrastructure quality standards, with the current status of the Mediterranean rail core sections, the following key critical issues could be highlighted:

- With regards to speed standards, the Corridor shows limitations in Slovenia and Croatia, specifically on the core sections linking the national network to the ports of Koper and Rijeka,
- Lack of compliance in terms of electrification on several lines is shown in Spain,
- Lack of compliance in terms of axle load is present in Hungary,
- Shift from Iberian gauge to standard or mixed gauge is still a significant issue on part of the corridor alignment.
- Train length limitations on the majority of the Corridor alignment with the exception of French lines,
- ERTMS signalling system to be deployed on the majority of Corridor railway lines.

Maritime: With regard to the impact on KPI, all MED ports already meet the basic requirement of TEN-T Regulation (EU) N. 1315/2013, art. 41.2, stating that all core ports need to be connected with rail. Nevertheless, the completion of these planned works will allow an improvement of these technical parameters, enhancing modal shift for freight transport.

Road: With regards to the express road/ motorway parameter, only 2% of the sections, (i.e. the Hungarian section close to the Ukrainian border) are not compliant yet.

Last mile projects: Rail connection to ports is available but should be upgraded in order to meet the full interoperability. However, airport rail connection is mainly unavailable. Needless to say, European legislation requires that last mile connections are ensured by 2030, with the exception of last mile railway connections to airports; in the sense that only main airports shall be directly linked with heavy TEN-t Core Rail Network (HS or Conventional) by 2050.

Urban nodes: Effective integration of urban nodes in the corridors is an urgent key issue. The importance of a global and integrated strategy from the Regions, aligned with the Member States and EU policies, to effectively address bottlenecks within urban nodes is accentuated.

Innovation: This high level overview on past and existing European transport initiatives shows that innovation is of paramount importance for the achievement of the different strategic goals set for the transport sector in Europe, across all modes. Only 40% of innovation projects have a direct contribution to transport decarbonisation. This results in a total of 52 innovation projects. It is worth mentioning that these figures represent only those projects that are considered to have a direct impact on transport decarbonisation but there are many other that also contribute to a lesser extent or in a less evident way.

Climate change & Environmental issues: The implementation of the TEN-T Mediterranean Core Network Corridor will provide a significant contribution to the necessary mitigation of environmental impacts of transport in Europe. The reduction of GHG, NOx, SOx & particles emissions is primarily linked with modal shift from road to rail and maritime, in particular for international freight transport. The Corridor also contributes to a more efficient rail transport, with total electrification and higher load factors thanks to the implementation of the TEN-T standards. The Corridor also mitigates other environmental impacts such as noise and air pollution. While the environmental impacts of the Corridor should be globally very positive, some negative impacts, often local or limited in time, need to be addressed and reduced. Among others, two can mentioned:

- The construction of new infrastructure, which can have impacts on biodiversity, land use, hydric resources. This needs to be addressed by a detailed EIA for each project, implementing the appropriate measures to avoid or mitigate / compensate these impacts. The GHG emissions in construction phases should also be reduced to a possible minimum, encouraging sustainable construction techniques;

- The modal shift towards rail could lead locally to an important development of traffic on existing rail lines, often crossing urban nodes and dense population areas. Appropriate measures should be taken in order to protect the population of the consequences of this development of traffic, in particular noise exposure.

The positive impacts of the Corridor could also be maximized through a set of measures at European, national or local level, for example:

- Implementing the TEN-T core network as a whole enhancing good interconnections between corridors, as we have seen how they are interdependent as well as between branches of the same corridor through the maritime dimension (namely, interconnection with the motorways of the sea component);

- Encouraging innovation for improving energy efficiency and decarbonisation of all transport modes;
- Lowering the level of CO2 emissions for the production of electricity by encouraging the development of renewable energy sources: this would make the modal shift to rail more efficient for GHG emission reductions;
- Promoting modal shift.

6.2. Focus on Project mapping

Methodology

The mapping of investments has been based on the analysis of common defined KPIs, the projects' data previously gathered and the relative analysis carried out concerning the update of the Work Plan.

The analysis involved two main aspects:

- **Project maturity:** analysed by assessing the level of progress ("not started" / "in progress" / "concluded") on specific project steps, such as (1) Planning stage / pre-feasibility studies / Strategic Environmental Assessment (SEA) (2) Preliminary project analysis/ Feasibility studies (3) Environmental Impact Assessment (EIA) / Detailed Design / Detailed Implementation Plan / Administrative Permits and Licences.
- **Project relevance:** basically related to the purpose of the intervention and its capacity to meet **TEN-t and EU** priorities, as set by Regulation (UE) N. 1315/2013 and 1316/2013 (reflected by the technical parameter and bottlenecks tackled by the intervention).

The above-mentioned criteria have been evaluated through the analysis of data currently available in each CNC Project list. Furthermore, it shall be underlined that already completed projects as well as projects only dealing with studies have been excluded from this assessment.

Results

The following section summarises the project mapping analysis. The complete table including the outcome of the clustering exercise is provided in annex V.

The figure below indicates the overall mapping of the 415 work-related projects. As explained in the methodology above, the 49 actions involving only a study were not included in the analysis.

It is evident from the pie chart that the great majority of the projects fall in the high end of the mapping, i.e. the range in which values assigned to each action span from 0.51 to

1. Furthermore **the total number of projects mapping a full 1** is 59 clearly reflecting the importance of the MED CNC project list. In order to implement the projects within the highest ranking cluster, an amount of €38 billion is necessary, equivalent to 33% of the total cost required for the implantation of the MED CNC project list.

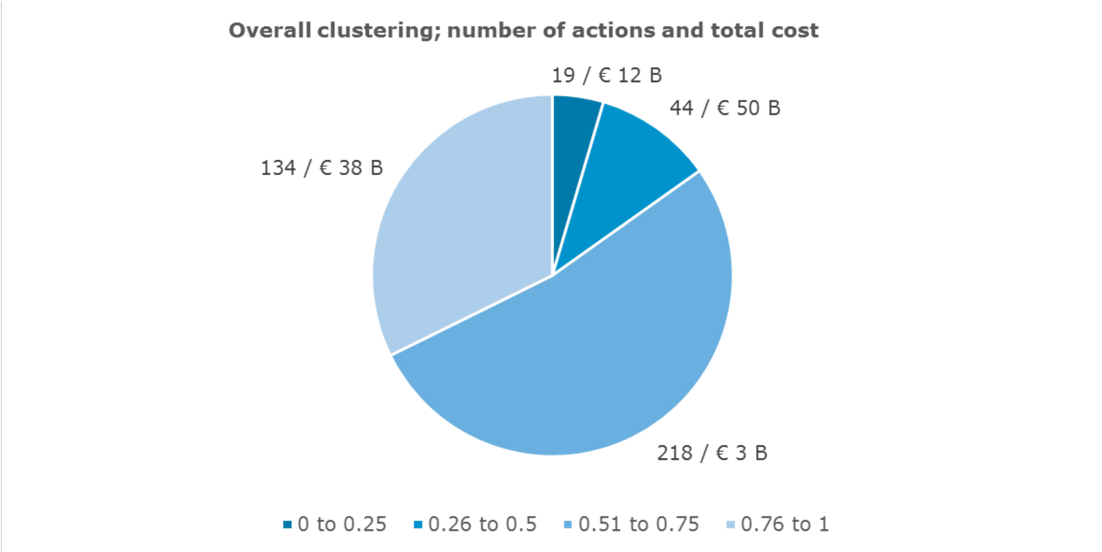


Figure 16: Overall mapping of Mediterranean corridor projects

Here below details on the breakdown per transport mode is provided. From the graph, it is evident that Rail and ERTMS projects, which are the priority at European level, have a very high ratio. Among the categories with a ratio higher than the mean, there are also Innovation, IWW and Maritime projects, reflecting their importance in terms of positive impact on the environmental sustainability.

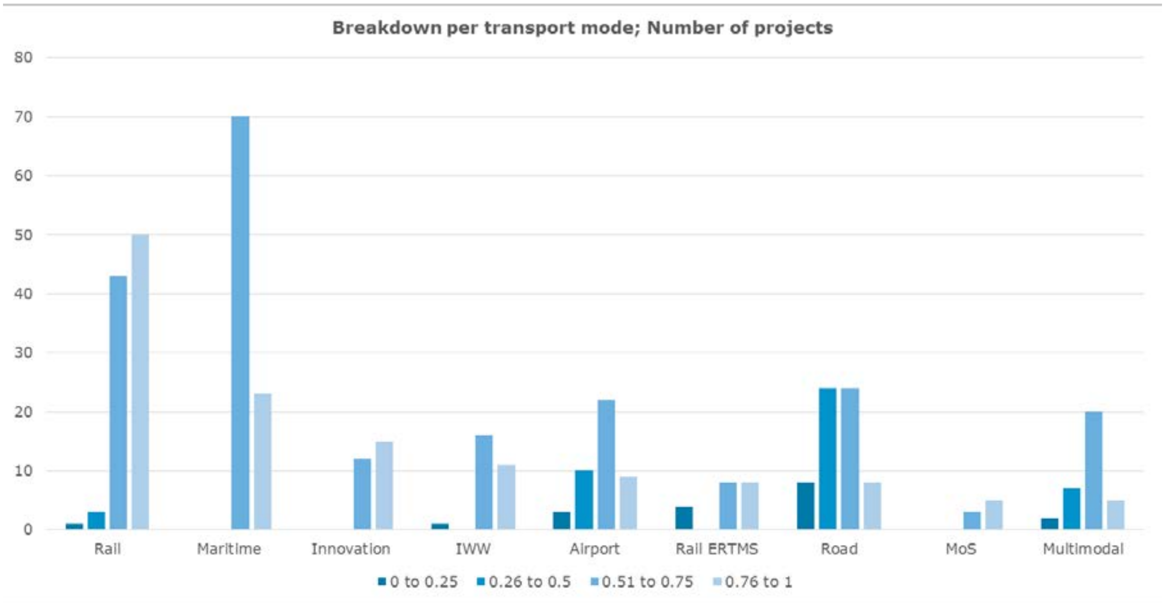


Figure 17: Mediterranean projects mapping: breakdown per transport mode

Since the mapping exercise is the result of two different indicators, namely relevance and maturity, a more in-depth look into the singular mapping of these two indicators is hereby provided.

Figure 18 illustrates, in the same way used for the overall mapping, the number of projects falling into each one of the clusters: this time though, the only value accounting for the mapping is the maturity.

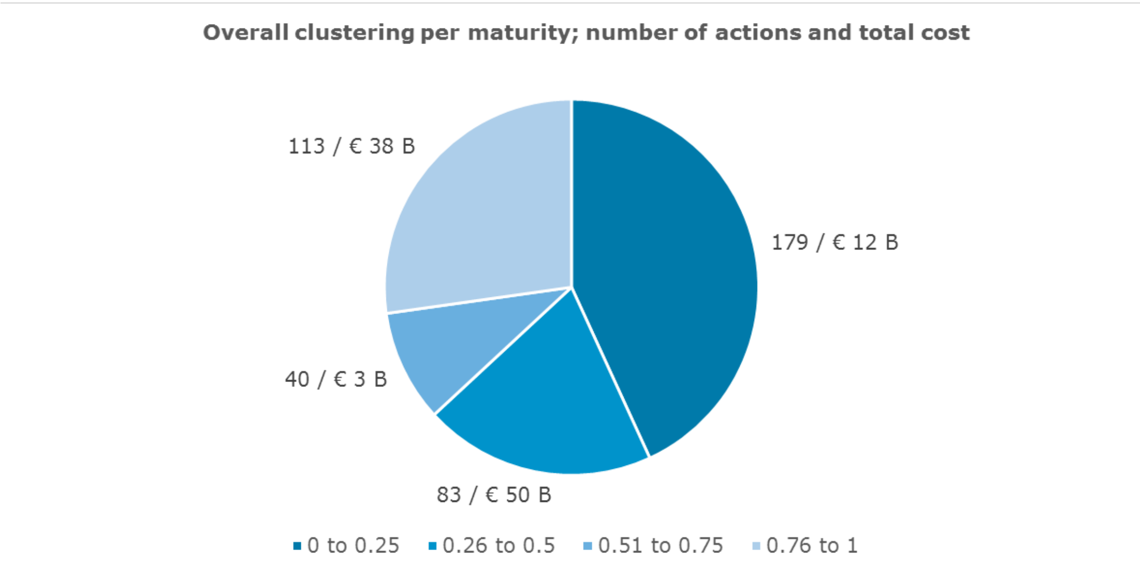


Figure 18: Mapping of MED projects per maturity

The results, as presented in the pie charts, are not in line with the overall mapping proposed in the previous page. This is due to the fact that the project maturity only accounts for the 40% of the overall mapping, hence the impact of the maturity indicator could not be enough weighed to be reflected as a trend in the overall mapping.

The breakdown per modal category is presented in Figure 19, with rail (including for the purpose of this calculation also rail ERTMS) accounting for the greatest share of mature actions: out of a total of 117 actions, 41 score between 0.76 and one full point, of which 25 score a full 1.

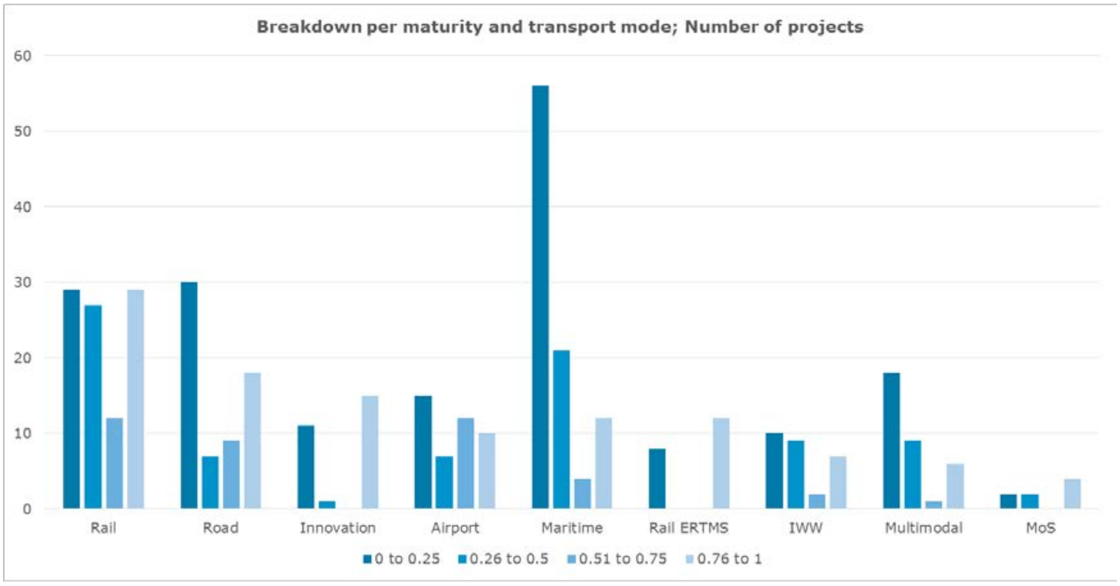


Figure 19: Breakdown of overall mapping per maturity indicator and transport mode

Concerning the relevance indicator, which determines 60% of the overall mapping, the figure below illustrates in the usual way the distribution of actions among the 4 clusters.

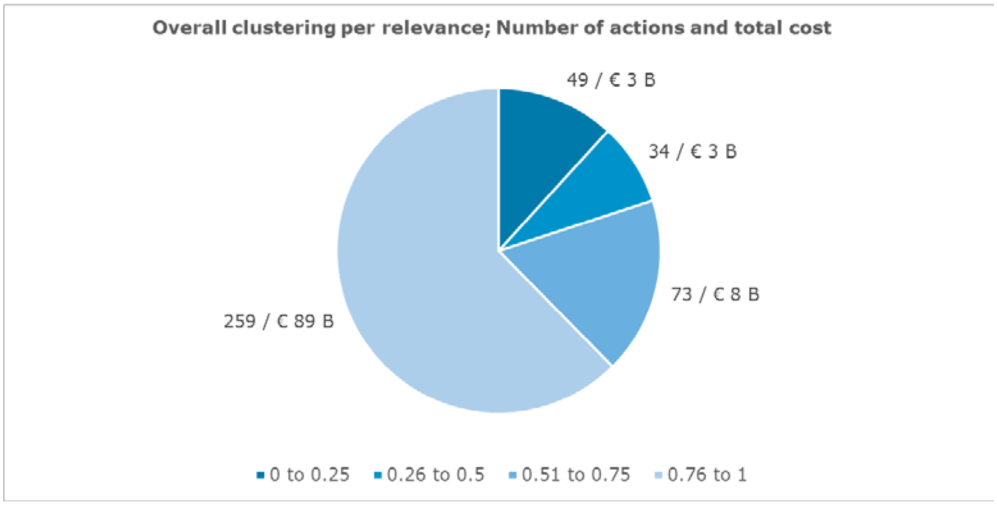


Figure 20: Breakdown of overall mapping per relevance indicator

As already mentioned, relevance is the more important criterion taken into consideration when doing the mapping analysis: this assumption is easily verifiable as the trend here is much more similar to the overall one. As previously done for the maturity indicator, Figure 21 below indicates the modal share of the entire set of 415 actions.

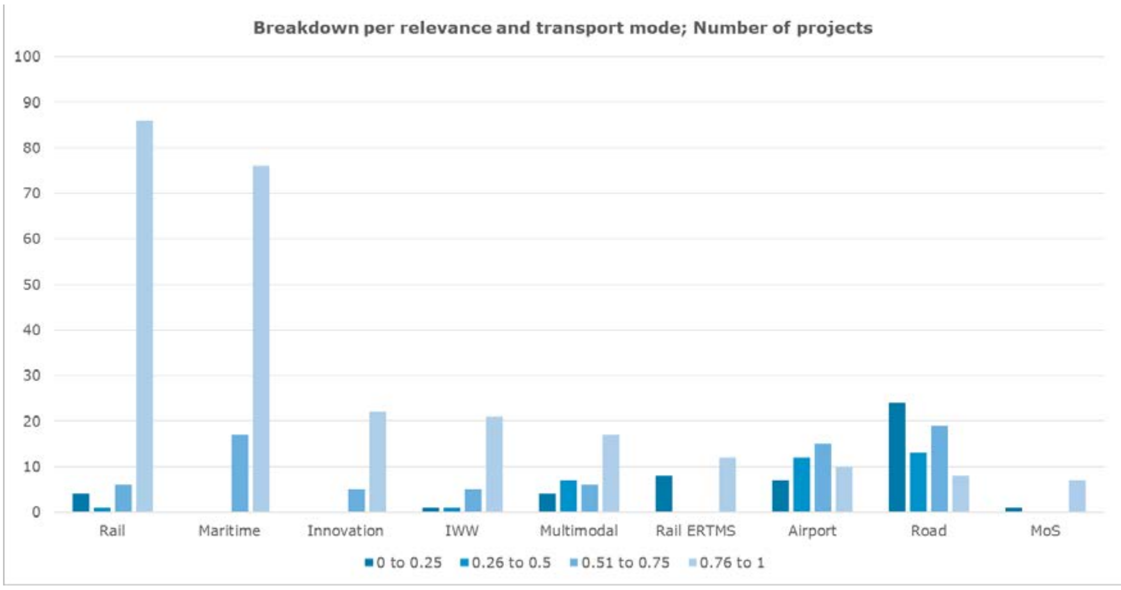


Figure 21: MED projects mapping: breakdown per transport mode, relevance indicator and number of projects

6.3. Innovation Deployment

The main objective of this task was to analyse how the projects part of the Mediterranean project list contribute to the deployment of innovation projects in the corridor.

In order to ensure consistency across all CNCs, a common methodology was developed and agreed with DG MOVE.

The Mediterranean project list contains **a total of 129 projects that can be considered as innovation projects** according to the Regulation (EU) N. 1315/2013. The following figure shows the total number of innovation projects affecting the Mediterranean corridor and their associated cost, when available:

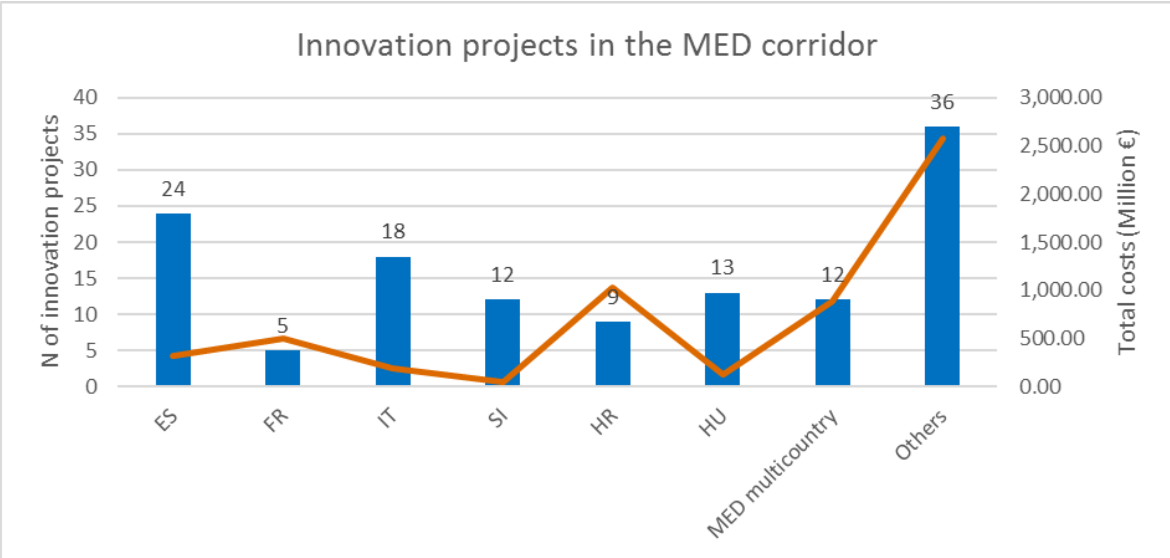


Figure 29 - Number of innovation projects

The assessment of the innovation projects in the project list was undertaken by analysing a series of common features. This section summarises those features and the main results obtained.

Type of innovation

Innovations have been divided in three different types for the purposes of this study:

- Catch-up innovations: initiatives that are directly transposed or transferred from other sectors or regions.
- Incremental innovations: those that provide additional functions, applications or improvements to an existing idea.
- Radical innovations: introduction of new technologies or procedures that can generate a step-change and provide unexplored solutions.

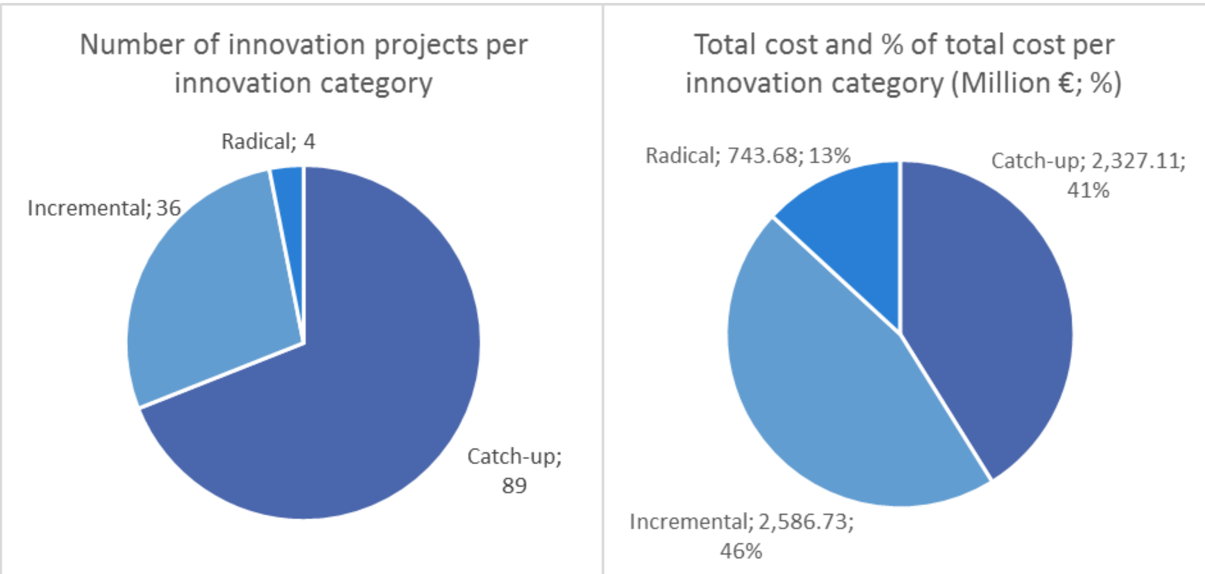


Figure 22: Number of innovation projects and total cost per innovation category

As shown in the figure above, the majority of innovative projects in the project list are classified as catch-up innovations: a total of 89 projects out of 129. The number of incremental and radical innovations projects is 36 and 4, respectively.

From Figure 22, it is clear that incremental and radical innovations have a higher average cost per project than catch-up innovations.

The name of the projects classified as radical innovations are as follows:

- Sustainable LNG Operations for Ports and Shipping - Innovative Pilot Actions (GAINN4MOS) (Project ID 3871)
- LNG Technologies and Innovation for Maritime Transport for the Promotion of Sustainability, Multimodality and the Efficiency of the Network (GAINN 4 SHIP INNOVATION) (Project ID 7060)
- Joint Application for PDP Implementation - Cluster 1 (New 2017)
- STM_MONALISA 3.0 - STM Validation Project (Project ID 3887)

Projects 3871 and 7060 are considered to be radical innovations since both of them entail the development of LNG retrofitted prototype vessels, hence contributing to the development of a totally new product, despite applying a known and tested fuel technology.

The other two projects deal with the testing of new traffic management or navigation functions. These can be classified as radical innovations as they are not fully developed, tested and deployed yet.

Impacts, barriers and project scalability

A set of standardised expected **impacts** were stablished to ensure homogeneity across projects and TEN-T corridors. These were inferred from the scope of the project provided by the project description.

The most frequent impact expected from innovation projects is "Transport efficiency improvement through data sharing" followed by the contribution to the development of the European technological industry, transport digitalisation and safety improvement.

High investment costs are the most frequent **barrier** (cited in 54 innovation projects) followed by the lack of sufficient public support and insufficient standardisation and regulation. From the 129 innovation projects in the Mediterranean project list, a total of 29 does not have either awarded or expected funding from a public source, which represent 22% of the innovations.

Regarding project **scalability**, 69% of innovation project are considered scalable (easily improved with little additional investment).

Contribution to decarbonisation

The contribution of innovations to transport decarbonisation is one of the key elements of this analysis. It complements the assessment of the overall contribution of the corridor to transport greening and climate change abatement.

To some extent, many projects may contribute to transport decarbonisation. However, the aim of this analysis was to identify those projects with a direct or larger contribution. In particular, the contribution of innovation projects has been evaluated in terms of:

- The deployment or facilitation of alternative fuels (electricity or hydrogen)
- The deployment or facilitation of alternative fuels (natural gas or biofuels)
- Efficiency improvement in propulsion technologies
- Modal shift, in particular through the introduction of innovative transport services such as MoS (Motorways of the Seas), rolling motorways, etc.

The analysis shows that only 40% of innovation projects (i.e. 52 projects) have a direct contribution to transport decarbonisation. It is worth saying that these figures only represent those projects that are considered to have a direct impact on transport decarbonisation but there are many other that also contribute to a lesser extent or in a less evident way.

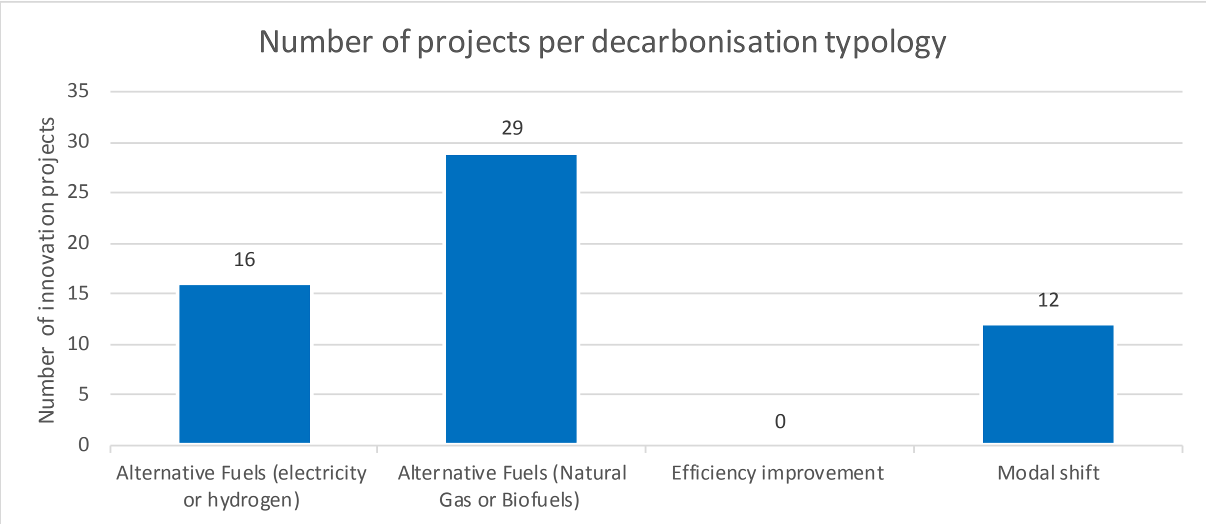


Figure 31: Number of innovation projects per decarbonisation typology

The Figure above shows that the majority of innovation projects that contribute directly to decarbonisation do this through facilitating the use of alternative fuels. None of the projects focus on the efficiency improvement of engine or propulsion solutions (although there are a few examples of retrofitting existing vessels with LNG-fuelled engines) and 12 of them contribute to decarbonisation by means of modal shift.

The amount of innovation projects that encourage the deployment of natural gas or biofuels almost doubles the amount of those aimed at encouraging the use of electricity or hydrogen as alternative fuels. In the first case, most of the projects entail the deployment of LNG or CNC refuelling stations for freight vehicles or the installation of bunkering facilities in ports. In the second case, the majority of projects focus on the deployment of charging facilities for electric cars followed by a mix of other types of projects.

Contribution to decarbonisation through modal shift is achieved by means of introducing of MoS and rolling motorway services in most of the cases.

There are 5 projects that contribute to decarbonisation in more than one of the above-mentioned ways. Of these projects, 4 focus on encouraging the use of electricity/hydrogen and natural gas/biofuels simultaneously. The remaining project contributes to decarbonisation through the use of electricity and modal shift. This project (ID 1946), CarEsmatic, promoted by Luka Koper d.d. is aimed at facilitating the transport of electric cars through a MoS between the ports of Barcelona (Spain) and Koper (Slovenia).

Conclusion

This in-depth overview on past and existing European transport initiatives shows that innovation is of great importance for the achievement of the different strategic goals set for the transport sector in Europe.

The total cost of all innovation projects in the Mediterranean Corridor is more than 5.600 M € and the incremental and catch-up innovation categories represent 87% of the total cost accumulated by the innovation projects. This shows that, as expected, the number of radical innovations is low compared to the total of innovation projects.

6.4. Impacts to Jobs & Growth

Analysis of the growth and jobs impact of the corridor has been assessed applying a multiplier methodology based on the findings of the study *Cost of non-completion of the TEN-T*[24]. For the analysis we classified the projects contained in our project list as of May 2017 into three mutually exclusive categories:

- Cross-border projects.
- Innovation projects.
- Other and thus average projects.

The three categories also present a hierarchy. If a project is marked in the project list as cross-border it belongs to that category. If not, it is checked if it falls under an innovation category. If that is not the case, it will be treated as average project. Mixed rail and ERTMS projects are counted with 10% as an innovation project and the reminder as average project. Only those projects were considered that were not completed before 2016. For each of the three categories we aggregated the investments related to the projects of the category and thus obtained the investments planned for the period 2016 until 2030.

The multipliers in table 36 have been applied to estimate the total growth and job impacts of the corridor over the period 2016 to 2030.

---

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

Categories	Average	Cross-border	Innovation	Unit of measurement
GDP-Multiplier	4,35	16,8	17,7	bn€-GDP / bn€-INV
JOB-Multiplier	16.300	37.000	38.700	FTE-JobY / bn€-INV

Table 12: Multipliers used for the growth and jobs analysis derived from the study of Cost of non-completion of the TEN-T (2015)

The projects for which cost estimates are available and that are planned to be implemented over the period 2016 until 2030 amount to an investment of 88.5 B $€_{2015}$. The implementation of these projects will lead to an increase of GDP over the period 2016 until 2030 of 540 B $€_{2015}$ in total. Further benefits will occur also after the year 2030.

The investments will also stimulate additional employment. The direct, indirect and induced job effects of these projects will amount to 1,702,000 additional job-years created over the period 2016 to 2030. It can be expected that also after 2030 further job-years will be created by the projects.

6.5. Modal shift and impact to decarbonisation and Climate Change Adaptation

Climate change adaptation and mitigation

Transport is responsible directly and indirectly (energy, infrastructure, etc.) for about 25% of CO2 emissions, which contribute to global warming and to changes in climate that have major impacts on those same transports. It is recognized and scientifically proven that climate change hazards can affect the life-span and effectiveness or even destroy infrastructure in the transport sector with serious social and economic consequences.

The 2015 Paris Climate Conference (or COP21) has validated an international agreement on climate, applicable to all countries, setting a goal of limiting global warming between 1.5 °C and 2 °C by 2100. European Union was strongly involved in the success of this event.

With respect to the issue of climate change, the Mediterranean Corridor, like the TEN-T network as a hole, has to face two different types of challenges:

- *The mitigation of the impacts of transport on climate change*: the Corridor has to be an instrument for the reduction of GES emissions due to the transport sector. This can be achieved through modal shift towards low-emission modes and through the deployment of new, carbon-efficient technologies.
- *The adaptation of the corridor's infrastructure and services to climate change*: climate change is underway, and number of its consequences can already be seen and they will increase in the future. These disturbances are inevitable because of the inertia of the climate system and require adaptation. This adaptation must be considered as an indispensable complement to the mitigation actions.

Climate change adaptation: increasing the infrastructure's resilience

A risk assessment exercise was made in order to evaluate and map (at large scale) the main climatic risks that the corridor's infrastructure will have to consider in the coming years. The results suggest that the entire corridor infrastructure is concerned by a probable increase in frequency and intensity of extreme weather events (floods, storms, heat waves) with potential consequences for transport going from temporary service interruption to heavy damages to the infrastructure.

In Spain, average temperatures in summer are expected to increase by about 6 ° C, while precipitations will be reduced by 30%. These changes will be accompanied by periods of intense drought and extreme temperatures, which will have a significant impact on transport infrastructure. Rail buckling, weakening of the structures, energy supply disruption can increase with heat and drought, but the most preoccupying risk mentioned by the stakeholders is the increase of number and intensity of fires.

Although rainfall is moderately reduced by global warming in corridor regions, extreme rainfall events can increase flash floods in frequency and intensity. These phenomena are accentuated by droughts and cause significant material damage to infrastructures, in addition to the risks incurred by the users of these infrastructures. The whole of the corridor's terrestrial infrastructures are concerned, and in particular railways, more sensitive because often without possibility of alternative route. This risk concerns particularly Spain, France, Italy and Hungary, with infrastructures located in large river valleys intersected by tributaries subjected to this type of risk (Rhone valley, Po valley, etc.).

All maritime ports and coastal infrastructure will be affected by maritime flooding as well as extreme flooding. Storms will also affect navigation and thus the commercial capabilities of ports. All the countries in the corridor, except of course Hungary, are concerned, although some ports, given their situation, are more subject to this risk than others.

The analysis shows that transport systems on the Corridor will have to adapt to changes in average climate conditions but primarily to the higher likelihood of occurrence of extreme events. To ensure the continuity and security of the transport of people and goods, measures must be taken to improve the resilience and adaptability of infrastructure. In the present state of our knowledge of the detailed vulnerability and risk, it is difficult to establish a scale of priorities for action and an acceptable level of risk. Nevertheless, several recommendations can be made:

- Establishing crisis management mechanisms to avoid total network cuts, on a scale that should be adapted to climate events and involving all stakeholders.
- Realizing systematic territorial assessments of transport systems, in order to deepen the knowledge of the local effects of climate change on the corridor and its associated infrastructures.
- Adapting technical reference systems for the design, operation and maintenance of infrastructures to climate change. It is necessary to ensure that infrastructures

built according to old standards can be adapted to climate change, just as new infrastructure projects are in line with the projected hazards.

- Improving the knowledge of the behaviour of materials and structures (rails, pavements, platforms, bridges, tunnels etc.) to new stresses (high temperatures, submersions, wind and wave effects). Climate change will also modify the behaviour of the users and the journeys will no longer be carried out according to the same considerations as today. The training of people affected by climate change, whether they are infrastructure managers or users, is also essential.

Globally, the issue of climate change resilience is addressed by Member States at national or regional level, through general guidelines in design, building and maintenance of the infrastructure, and through consideration of climatic risks (especially floods) in urban and regional planning documents. In this context, the Corridor can be an interesting tool to develop coordination between Member States and exchange of good practices in such policies.

Climate change mitigation: reducing GHG emissions through modal shift and innovation

Based on the results of the transport market study on the Corridor, an estimation of the potential GHG emission savings through modal shift has been conducted. It starts with the total number of tons/km that can be shifted from road to rail and IWW and the number of passengers/km shifted from road or air to rail, with the implementation of the Corridor. EC recommended emission factors by mode were then applied, taking also into account the improvement of railway standards for freight (electrification, 750m train length and axle load, leading to higher load factors).

The results of this analysis show that the TEN-T Mediterranean Core Network Corridor can provide a significant contribution to the necessary mitigation of GHG emissions of transport in Europe. Considering its full implementation and modal shift potential, between 2 and 3 million tons of CO2 eq. emissions could be avoided each year after 2030. Until 2080, the total cumulated amount of GHG savings could sum up to 175 million tons CO2 eq. The main contributor to this reduction would be modal shift from road to rail in international freight transport (95 million tons saved), but the contribution of other types of traffic (passengers and local / national traffic) is not to be neglected.

While reducing GHG emissions, the Corridor also mitigates other environmental impacts such as noise and air pollution. The total avoided external costs (for GHG emissions, air pollution and noise) thanks to the Corridor sum up to a present value of about 10 billion euros, considering a 3% discount rate.

Beyond this calculation, a number of additional effects of the Corridor - that can only be partially quantified at this stage - are worth mentioning:

- The reduction of ramps and distances through major projects like the Lyon-Turin;
- Additional modal shift provided by new freight transport services like rolling motorways and the development of green motorways of the sea (new or existing);

- Projects contributing to decarbonisation of road transport, by promoting electro mobility and alternative fuels.

Another important effect is the investment in ports connections and facilities. The improvement of the Mediterranean ports can also lead to a better equilibrium between ports of the north range and ports of the south range in Europe. This could avoid a lot of GHG emissions by reducing both maritime and terrestrial distances. Other important reductions in GHG can be expected with the development of LNG facilities in ports and short-sea services like Motorways of the Sea.

These positive environmental impacts of the Corridor could be maximized through a set of measures at European, national or local level, for example:

- Providing good interconnections between corridors, adapted services and terminals to fulfil the Corridor's modal shift potential (see conclusions of the transport market study) and enhancing its maritime dimension for international (intra and extra) EU flows;
- Encouraging innovation for improving energy efficiency and decarbonisation of all transport modes (see conclusions of innovation assessment);
- Lowering the level of CO2 emissions for the production of electricity by encouraging the development of renewable energy sources: this would make the modal shift to rail more efficient for GHG emission reductions;
- Promoting modal shift for regional transport through actions at local level, in particular where Corridor actions are improving rail capacities in urban nodes.

6.6. Infrastructure funding and innovative financial instruments and Project's Financial Sustainability

The Connecting Europe Facility (CEF Transport) supports Trans- European networks and infrastructures in the sectors of transport, telecommunications and energy. Under the CEF, 26.25 bn € are made available from the EU's 2014-2020 budget to co-fund TEN-T projects in the EU Member States (of which 11.3 bn € is earmarked from the Cohesion Fund and therefore applies to eligible Member States only).

From a transport point of view, besides allocating part of its budget to the CEF for the development of the TEN-T transport networks, the Cohesion Fund supports transport projects which clearly benefit the environment and/or develop and rehabilitate comprehensive, high quality and interoperable railway systems, and promote noise-reduction measures. Under this context, the projects listed in the Mediterranean project list have benefited from the results of the latest 2015 CEF call.

In total, 21 interventions located on the Mediterranean Corridor have been proposed for funding by the European Commission with a global grant of € 1.6 billion. For 18 projects, grant agreements were signed, for which CEF grants of € 125 million enabling investments of € 215 million in Italy (5), Hungary (4), while 7 were multistate interventions.

Definition of the methodology

The analysis aims to identify the funding sources of projects listed within the CNC WP pipelines. The rationale of the exercise is to leverage the information provided in the CNC WP project list and determine the presence of funding gaps and the potential for other-than-public-grants forms of support.

Before the analyses were performed, the data was reviewed and corrected. Once data was cleaned and unique categories of funding sources names for all the projects were defined, the analysis were performed.

As a sum up, it was necessary to cluster funding sources used to cover investment costs, linking every recurring funding source name to a specific pre-determined tag:

- Macro-level tag: in which the different “funding sources” were related to macro categories (i.e. MS/ public; EU; Private/own resources),

- *Detailed tag*: where, specifically for the EU support, a further break down was made to categorise the EU funding sources (i.e. CEF, ESIFs and Other/unspecified),

- *Data analysis*: once data were cleaned and the categories of funding sources names for all the projects were unique, the analysis was performed, following a specific procedure,

- *Identification of the overall investment requirement for the CNC WP,* summing up all the investments costs of each project on the Corridor,

- *Identification of the share of investments for the analyses‘ elaboration,* taking into account only the projects that presented complete information (total cost equals to the sum of the amounts listed in the funding sources),

- Analysis *of the funding sources identified to cover the investment cost,* considering the “potential” and “approved” share of funding and identifying the EU funding already approved;

- *Application of the ratios to the overall investment cost,* carried out to assess if the EU share of the investment costs of the whole Corridor WP can be financially sustained by the identified sources, keeping fixed the rate of the EU grants approved.

Comments on the results for the MED Corridor

MED Corridor is composed by 462 projects[25], accounting for €103 B. 21% of those presents complete financial information and hence are eligible for the analysis. The corresponding amount (approx. € 6.8 B is divided into the following financial sources:

- *MS/ Public grants*: €2.6 B, or 39% of the total,
- *EU Grants (CEF, ESIF)*: about €2.2 B, or 32% of the total,
- *Private/own resources:* nearly €1.9 B, or 27% of the total,
- *EIB/Bank loan & others:* about €0.1 B, or 2% of the total.

The EU grants share of the total is then further divided into subcategories related to their origin:

- CEF/ TEN-T: €1,7 B, or 76% of the total,
- ESIF: €0,3 B, or 17% of the total,
- Other: €0.1 B, or 7% of the total.

This analysis is further broken down considering the "potential" and "approved" share of funding, when available (e.g. when not specified, funding has been considered as potential).

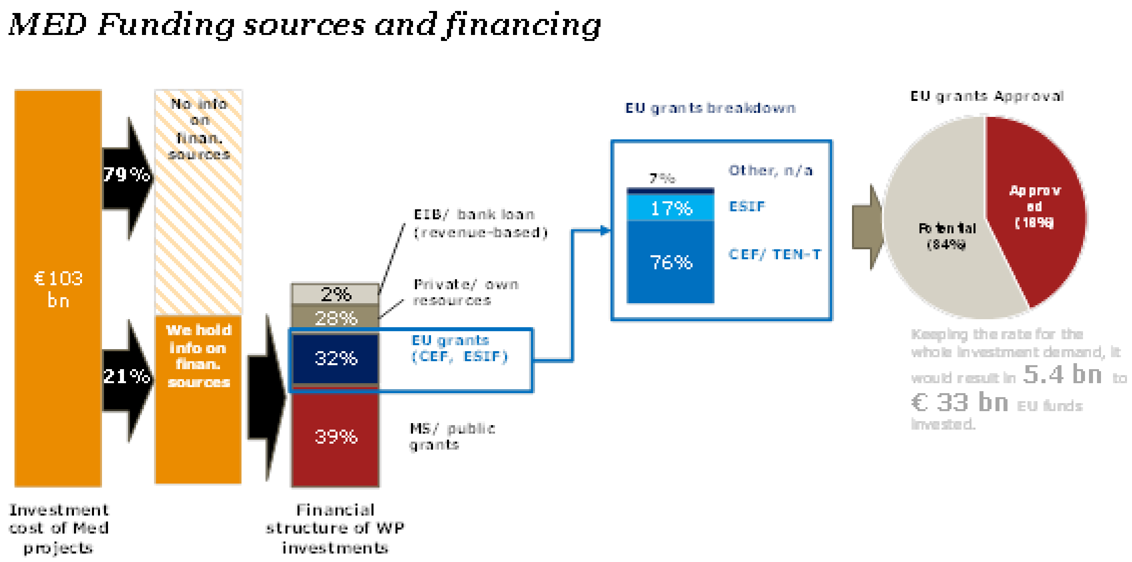


Figure 32: MED Corridor funding sources and financing

[25] Study-only interventions were excluded from the analysis.

Approved funding accounts for almost 42% of the total, while the remaining 58% of the total is still potential.

The results of the analysis shows that keeping the rate fixed to 42% for the whole investment demand, it would result in €13.7 B to €32.3 B of EU funds deployed. The inclusion of private investors and the use of financing (properly favoured through financial instruments, when necessary) can strongly contribute to provide the resources the market needs.

Mediterranean Corridor financial sustainability assessment

Following the analysis of financially sustainable projects in the Mediterranean Corridor list, 35% of the projects are not financially sustainable, 40% is potentially financially sustainable and 25% is financially sustainable.[26]

Total value of financially sustainable projects is € 41 billion, it is therefore apparent that if 15% of CAPEX were financed with private capital/loans, the reduction in grand expenditure would be equal to € 6.1 billion.

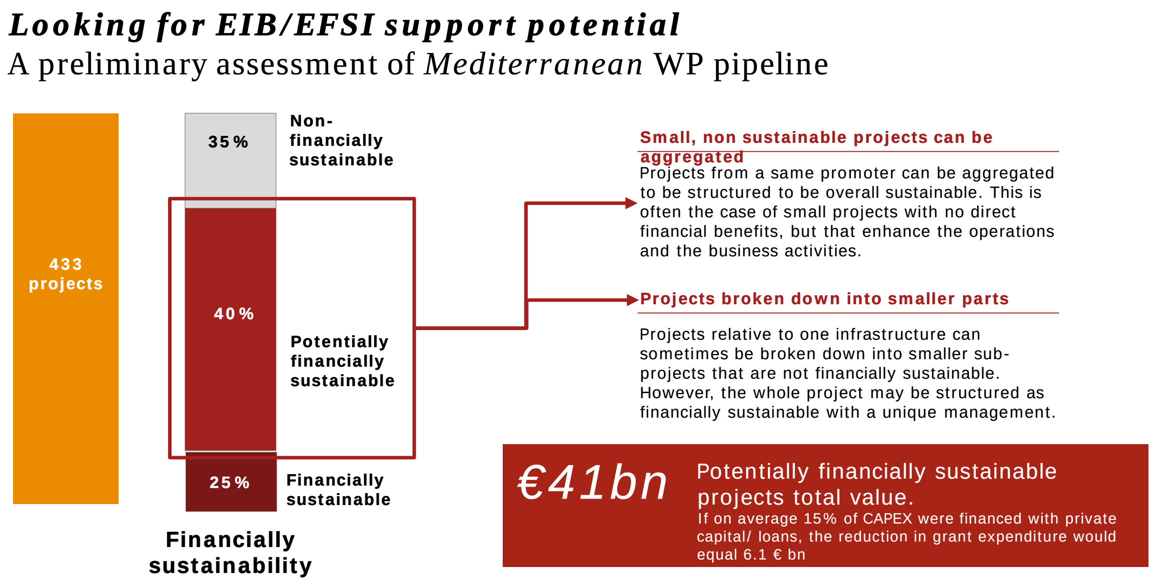


Figure 33: Mediterranean Corridor analysis of financial sustainability of projects

[26] Please note that as for the previous analysis studies-only interventions were not considered within the analysis.

7. Flagship projects

Flagship projects are connected actions which – as a whole – generate, in a period of no more than 3 to 4 years, clear benefits for users or/and society.

Such projects should be backed by the **commitment of actors** involved and have a genuine chance of being implemented and generating benefits in the shorter run (about 3 to 4 years).

The topic of the projects must be linked to the **issues papers, or ensuring compliance** with relevant EU transport policy objectives.

Along the Mediterranean Corridor there are 6 Flagship projects, which are hereunder listed.

- ITS for Roads
- MEDTIS 3
- LNG for Ports - CORE LNGas hive
- LNG for Ports – GAIN4MOS
- LNG for Ports – GAIN4SHIPS Innovation

8. The European Coordinator's recommendations and outlook

The analyses presented in the above chapters show that the Mediterranean is facing multiple challenges, notably in terms of node capacity and infrastructural bottlenecks. The consolidated project list and the Corridor maps show how the Member States and the relevant stakeholders intend to solve them to ensure a future smooth functioning of the Mediterranean Corridor.

Since 2014, the first year of the new Corridor approach, considerable progress has been made:

- There is agreement on the alignment and we have gained a detailed overview of the state of compliance of the Corridor infrastructure with the TEN-T requirements.
- The transport market Study analysed the socio-economic situation of the Corridor as well as its transport flows.
- For the first time there is a clear picture of the investments needed on the Corridor for all modes to reach the EU targets of 2030.
- The definition of a Corridor project list (updated in 2016) offers a first picture of the individual measures to be taken, together with timing, financial requirements and funding sources.

It is against this background that my recommendations should be read. It will not come as a surprise that they flow from the critical issues discussed earlier on in the Work Plan. As a general rule all interventions which resolve critical issues need to be tackled. In addition, it is the duty of the European Coordinator to recommend certain priorities, given that not all critical issues can and should be addressed at the same time.

For these reasons, the following paragraphs will deal with the identification of Corridor priority objectives and my recommendations for the future of the Mediterranean Corridor.

8.1. Overall considerations for the Mediterranean Corridor

Within the context specified above, and based on the analysis of the Corridor and on the wide consultation with stakeholders in the Corridor Forum, a few considerations shall be given, which represent the areas where efforts to develop the Corridor shall be primarily concentrated.

Continuity of the Corridor alignment

The continuity of the corridor alignment should be guaranteed in terms of long-distance or cross-border flows. In this respect, it is very important to encourage projects with the highest added value aiming at solving bottlenecks constraints as well as improving or maintaining the quality of infrastructure in terms of safety, security, efficiency and sustainability.

In particular, the Corridor crosses some of the most developed region of Europe (Madrid, Cataluña, Rhone-Alpes, Northern Italy), but nevertheless all its territories suffered considerably during the economic crisis of last years as shown by socio-economic data. The re-launch of the growth of the economic potential of the Corridor's regions will certainly be boosted by better connections between them and to other European market areas. This will also improve the function of ports as essential links for the longer distance exchanges with other continents, as well as intra-EU trade.

Advanced technological and operational concepts allowing interoperability, tracking & tracing of goods, better intermodal integration are among the accompanying measures to be implemented in order to achieve such targets.

This continuity can be implemented only if the works along the Corridor will be coordinated and harmonized, especially at cross-border sections and in the urban nodes.

In particular, the fulfilment of an agreed time table for cross border projects should be ensured in order to avoid serious delays in the expected benefits arising from the investments made.

As a consequence, the importance of bilateral Working Groups and coordination meetings for the development of the Mediterranean Corridor should be promoted.

Priority to railways, inland navigation, and crossing-borders improved practices

Given the socio-economic characteristics of the territories involved, the Corridor is especially relevant for the international trade of goods, given the strong economic relationship between the Countries of its Western part and the development – in perspective – of the ones with the Countries on the Eastern part.

Due to the crossing of environmentally sensitive areas, such as the Pyrenees and the Alps, the objectives of "low-carbon and clean transport, and environmental protection" can be met only by developing efficient rail or maritime freight transport supply (in terms of both services and infrastructure), well interconnected by efficient "last mile" links with relevant freight transport nodes (sea and IWW ports, intermodal rail-road terminals). The latter shall provide sufficient capacity and efficient operations, in order to avoid that the removal of bottlenecks at network level will create new ones on nodes.

Removal of existing localised bottlenecks on the infrastructure, as well as the alignment of it to suitable technical standards for freight (e.g. 740 m allowed length for trains, maximum gradients for new lines 12,5 mm/m, 22,5t axle load, loading gauge UIC C) appears also key Corridor development measures.

Coordination of the transport development plans

In order to ensure a harmonized development of the Mediterranean Corridor, information about transport development plans of the MS affected by the Corridor shall be shared in order to enhance coordination and harmonisation.

Member States eligible for co-funding from the cohesion funds should use these financing instruments towards the logic of the transport core and comprehensive networks development aiming at an efficient inter-modality approach.

Maintain a multimodal transport network

The maintenance and promotion of multimodal transport infrastructures for people and goods shall be seen as a primary objective for evolving the demand for mobility in highly populated and intense economic developed areas of the Corridor.

A much better integration of the various modes remains a challenge for many ports, industries and airports along the corridor. In particular the combination of high numbers of short distance passenger rail services and freight services remains a major challenge mainly in the urban nodes, hampering the development of freight transport in these sections of the Corridor.

Projects evaluation

The evaluation of projects should focus more on their viability and should also incorporate cost-benefit assessments and economic impacts.

The project maturity is relevant as well and should be evaluated in terms of:

- Project Identification (objectives, investment type)
- Technical readiness (Spatial Planning and technical documentation)
- Institutional readiness (institutional framework and capacity)
- Financial/Economic maturity (coverage of costs)
- Social/Environmental maturity (EIA, social/environmental impacts)

Operational and administrative bottlenecks

Special attention should also be paid to the operational and administrative barriers that can have a negative impact on the profitability of the investment and on the efficiency of the Corridor on the whole.

In particular, a specific study of these bottlenecks on the borders and along the corridor should be carried out and focus especially on the following items:

- Harmonising national procedures regarding authorisation and certification of rolling stock,

- Traffic management,
- Management of terminals.
- Access to the market and services

Links to third countries

The corridor shall provide economically efficient and clean transport options to the flows of passengers and goods between those territories as well as the other Countries that will take benefit from the Corridor's development for their international flows (e.g. Balkan countries, Ukraine etc. on the Eastern side).

Especially in relation to Western Balkans regions, but also considering Northern African and Eastern European countries, the Corridor should include the links with third countries.

The important growth potential of these territories, where the transport connections remain still very weak, requires a particular attention in terms of development of transport infrastructure as well as of regulatory reforms and convergence.

After the adoption of the work plan a better understanding of the needs to connect the different parts of the Mediterranean Corridor will be obtained.

Communication and promotion

It is important to continue the multilateral, cross-border cooperation between Member States. For the main missing links, Lyon-Turin and Trieste-Divača, this cooperation should be intensified.

Synergies will be sought with the Rail Freight Corridor 6 (RFC6), notably in addressing the administrative and operational barriers on the historic lines, especially on sections where new cross-border projects are being developed and the historic lines need to serve still as main line in the medium term.

The cooperation with the RFC6 should be strengthened on a regular basis.

Finally, as foreseen by the TEN-T Regulation, the following working groups will be proposed on:

- urban nodes useful to have a local or regional point of view
- ports and RRT.

Due to the maritime dimension of the corridor the working group for ports should be institutionalised and organized on regular basis and focused on last miles investments, port infrastructure as well as non-infrastructure nature issues (i.e. administrative and custom procedures, IT, innovative services with a maritime component, clean fuels, etc.).

Importance of the cross-border cooperation

Appropriate cross-border cooperation is important to address the corresponding challenges, taking into account the particularities of each cross-border section.

Meetings related to specific cross-border issues should be organized on regular basis. This process would help to achieve a smoother implementation of the Corridor.

Importance of investing not only in new infrastructure and upgrades but also in maintenance of the networks to keep them efficient and reliable

The investments foreseen for the Corridor shall also be oriented at the ordinary and extraordinary maintenance of the networks, in order to guarantee efficient and reliable functioning of the Corridor axes. Accordingly, maintenance strategies and associated financial costs shall be considered when defining the future financial needs for Corridor implementation.

8.2. Specific recommendations for improvements in the Mediterranean Corridor by mode

Railway network

Completion of missing key sections

The new railway link Lyon-Turin is the key section on which the optimal functioning of the whole Corridor hinges. Without this new link the Corridor will not be able to perform its role of the major east-west axis south of the Alps.

Similarly, the Montpellier-Perpignan section will become crucial to utilise the full potential of the newly built railway connection in UIC gauge between France and Spain. The further development of this section will be looked at in the light of the traffic evolution in order to avoid that the section becomes a bottleneck in the medium term, at the latest once all connections to Spanish seaport, industrial plants and the other logistic terminals will be upgraded at UIC gauge.

Several cross-border rail and also road connections in the eastern part of the Corridor need to be addressed under this heading as well.

Implementation of ERTMS

In order to reach our final target to achieve an interoperable and competitive railway network, three conditions need to be fulfilled along the Corridors: sufficient infrastructure quality, harmonisation of national rules throughout Europe and introduction of ERTMS. To speed up this process and to show tangible results in the railway sector, we need to accomplish quick wins through implementing short-term and less costly projects. Implementation of interoperability actions, such as the 740m train length standard, harmonisation of operation and authorisation rules would have a direct impact on productiveness.

Detailed ways how to accelerate ERTMS equipment along the core network shall be evaluated according to the current European Deployment Plan and the related strategy for ERTMS equipment by 2030, as laid down in Regulation (EU) 1315/2013.

Ensuring full interoperability

The completion of the new HS line between Figueres (Spain) and Perpignan (France) was a historic event, creating the first interoperable link with the Iberian Peninsula. However, for the above explained reasons, this interoperability, in practice, appears to be only partial. To overcome this situation, the structured cooperation between the two Member States should be intensified.

In general, the realization of the rail potential international traffic in Spain can only be achieved by a full UIC gauge connection from the main traffic generators to the border. But also on the remaining railway sections of the Corridor, delivering interoperability means agreeing on the full deployment of the UIC gauge.

In order to enhance the modal shift, a substantial improvement of the overall interoperability of the Corridor has to be ensured by removing the remaining restrictions in particular in terms of train length, axle load and signalling system needed to meet the market needs (especially on the Eastern part of the Corridor). While this effort can only be made gradually, this kind of issue is only solved when the whole Corridor has reached the common standards, and even a very small section remaining with lower standards in the central part of the Corridor has enormous negative effects on its potential.

Maritime ports

Ensuring full connectivity of maritime ports

Major investments have been made over the last few years, all resulting in a significant growth in the use of ports and of their influence areas (hinterlands). In order to complete the hinterland connections and therefore achieving the highest returns from the measures implemented, it is necessary to complete the pending road and railway accesses.

In particular, as regard rail, proper connections with hinterland are the most relevant critical issue. Rail connection should be addressed in terms of: (1) developments inside the port in order to connect the different terminals with the port rail access; (2) connection between port and rail network (i.e. “last mile connection”); (3) long distance connections because of their bottlenecks and missing sections affect the development of services with origin and destination in the port.

Inland waterways

Ensuring full reliability of IWW

Full reliability for inland waterways sections is very important for Corridor implementation, both in terms of 365 day navigability and absence of physical constraints. Furthermore, the considerations presented for ports full connectivity can be extended to inland ports.

Airport intermodality

Increasing rail connections to the airport

The development of heavy rail connection to the airports shall be set as primary objective for airport intermodality, both for passenger and freight. Specific projects presented in the Mediterranean Project list go to that direction (e.g. rail connection to Venice airport, People Mover construction in Bologna airport and Rail connection to T1 Terminal of Barcelona airport).

Road network

Reaching the TEN-t targets

Road network needs to be fully compliant with the criteria set by the Regulation (EU) No 1315/2013 both for the establishment of express road or motorway and the availability of clean fuels along the Corridor. This is important in cross-border sections.

In this respect, the project Vásárosnamény - Beregdaróc (HU-UA border) will permit to upgrade the Eastern road section of the Corridor to the desired standards. Similar road projects exist (e.g. IT-SI road cross border section) and others shall be supported.

Urban nodes

Development of urban nodes

It became quite apparent in the Corridor Study that the main urban areas along the Corridor constitute sometimes serious bottlenecks for rail hampering not only local and regional traffic but also restricting severely international traffic. Attention must not only be given to passenger services but equal treatment should be given to freight services using the same infrastructure. While the general problem is similar in all urban nodes, the specific situations of the various urban nodes differ and need to be studied individually.

Particular attention needs to be paid to urban nodes which form the crossing points with other core network Corridors, in order to allow a seamless flow of high-speed passengers and freight flows. This concerns first of all the major nodes like Madrid, Lyon and Milan, but also Verona, Venice and Budapest.

9. Outlook

The Mediterranean Corridor has high potential to develop into a major transport axes serving all corridor countries with better connections among each other, but also towards the other EU Member States. The approach we are pursuing since 2014 is to fully tap into this potential by developing the corridor to a maximum.

As European Coordinator for the Mediterranean Corridor, I have seen it as my main task to bring all Member States and other stakeholders together in a transparent and constantly deepening dialogue. The Corridor Forum has been an ideal place for this, but I have also directly addressed the Member States and other stakeholders in bilateral meetings, visiting them and witnessing the progress on the ground.

When building the Corridor and thus creating a truly European Core Network a change of minds has to take place: we need to depart from national perspectives and adopt a corridor and a network perspective where priorities are set to achieve the common goal: implementing the core network in Europe by 2030.

As a consequence this change of culture could have an impact on the priorities of national transport plans. Increased attention by national transport authorities to the links with international cross border projects should be stimulated. In this way the overall objective of a more integrated European network can be promoted. This would not only lead to better effects of connectivity, but also of economic growth and an earlier attainment of climate change goals in Europe.

While implementation of the Mediterranean Corridor will also in future require long-term investments in infrastructure projects, such as the Lyon-Turin base tunnel, we should also explore possibilities to reach tangible results through the execution of short-term actions requiring lower level of investments (i.e. ERTMS Le Soler-Perpignan); measures at the operational, administrative and permitting level, which can quickly yield results - the so called 'rail breakthroughs'.

In this respect we need to continue to seek synergies with the Mediterranean Rail Freight Corridor, notably on the historic lines of the Corridor, and on sections where new cross-border projects are being developed and the historic lines need to serve still as main line in the medium term. The use of the infrastructure will need to be improved at best possible terms to make the corridor not only a distant dream but rather an immediate reality, serving citizens and business alike.

Finally, the work on the Mediterranean Corridor, the results achieved and the benefits to be expected, needs to be better and more widely communicated.

<u>Contacts</u>

Laurens Jan Brinkhorst, European Coordinator

https://ec.europa.eu/transport/themes/infrastructure/mediterranean_en

Contact details:
European Commission – Directorate General for Mobility and Transport
Directorate B – Investment, Innovative & Sustainable Transport
Unit B1 – Transport Networks
http://ec.europa.eu/transport/index_en.htm
email: move-info@ec.europa.eu
Offices:
Rue Demot 28
1049 Brussels, Belgium

Design & Layout by TENtec