European Commission

Orient East Med

Third Work Plan of the European Coordinator

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1.1. A Core and Multimodal Network Approach

European Transport policy reached a major milestone in 2014 with the adoption of the TEN-T and CEF Regulations leading to a more efficient transport policy. The **core network approach** linking urban nodes, ports, airports and rail road terminals may be considered as the backbone of a European transport area, which guarantees a connection to the comprehensive network with all European regions.

This **multimodal network** approach supported by financial instruments can boost the competitiveness of the European economy and contribute to sustainable growth and the development of the internal market. This new concept of TEN-T core network corridors underlines the need to go further than national visions for transport and encompass a trans-border vision on the way people and goods can move across Europe.

Further than the importance of creating a real European transport area, the setting-up of a modern and performing TEN-T is a key element for EU growth, the creation of jobs and the fight against climate change and other negative externalities.

The Orient/East Med Corridor (in short: OEM Corridor) covers all modes of transport and includes nine Member States, with seven benefiting from the Cohesion funds support. It is a crucial connector for central and southern European countries to the rest of the EU, fostering thereby the internal market. As a result, the Corridor faces several challenges, and, hence, there is absolute necessity for cooperation between states independently of their current socio-economic trends. For example, it only makes sense to develop the Elbe if there is a consensus between Germany and the Czech Republic about the future use of this inland waterway. Likewise, the development of an interoperable railway line from Greece to Hungary and beyond requires agreement between the four Member States on the technical parameters, while keeping costs within reasonable limits. Better integration between modes remains a challenge for many ports and airports along the Corridor.

In light of the above, any investment on the Corridor in any of the nine countries will immediately bring an added value along its entirety.

1.2. CEF funding

The EU has endeavoured to support the Corridors' development through the implementation of targeted investments by providing co-funding via the Connecting Europe Facility (CEF) instrument, which has completed 3 series of standard transport calls for proposals in the course of 2014-2015 and 2016 and one blending call in 2017.

Under the 4 calls (2014-2015-2016 and 2017) 86 actions have been selected representing an investment of € 2.9 billion or 4.3% of the total identified needs)

On 29 June 2015, the EU Transport Commissioner Violeta Bulc announced the outcome of so far the biggest CEF Call for Proposals launched in 2014. Following the selection 22 grant agreements were signed, for which CEF grants of € 794 million are enabling investments of € 1.334 million in Austria, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Hungary and Romania.

Out of the 22 funded projects, 11 are railway projects (50%) for construction, rehabilitation or feasibility studies and ERTMS; 2 concerns road infrastructure, 1 inland waterways, 5 the deployment of alternative fuels stations, 1 related to ITS, 1 is a MoS project and 1 a Multimodal logistic platform project.

Under the 2015 call, 29 projects contributing to the OEM corridor have been selected for a total CEF grant of € 711 million, contributing to € 929 million of total investment costs. The breakdown of these 29 actions per transport mode/funding priority is the following: 9 rail, 2 road, 6 innovation, 1ITS, 3 Safe and Secure infrastructure, 3 IWW, 3 MoS and 2 multimodal logistics platforms.

Results from the 2016 CEF Call have also been published in the summer of 2017, with 27 of the funded projects on the OEM Corridor, for a total of approximately € 446 million of CEF grant contributions to € 550 million of investment costs..

Finally, under the 2017 blending call, 8 projects were selected under the OEM for a total CEF grant of € 50 million contributing to € 200 million of total investment costs.

1.3. Road Map to setting up the Corridor Work Plan

In June 2014, I was given the mandate as **European Coordinator** for the Orient / East-Med Corridor in accordance with the stipulations of Regulation (EU) 1315/2013.

Since the first Work Plan of 2014, the extensive analysis carried out continued to be largely supported through the regular meetings of the **Corridor Forum** with the active participation of representatives of the involved ministries of the Member States, the infrastructure managers (public and private) for railways, RRTs, ports, inland navigation, airports and roads, as well as representatives from the regions along the Corridor. This also included the OEM Rail Freight Corridor (RFC 7) management. Different services of the European Commission are actively supporting the staff of DG MOVE, INEA, while the European Investment Bank also participated in the dialogue. Finally, specific topics were analysed and discussed during meetings of dedicated **working groups.**

The present **Third Work Plan** is the outcome of a final revision and update, and constitutes a concrete technical and financial basis for the development and realisation of the OEM Corridor in terms of defining inter alia the critical issues and overall investment needs. Although a sound project pipeline has been developed, there is still a lot that remains to be done. In this sense, the third generation Work Plan can act as a solid background argument document for building a strong case for future strategic and investment decisions for all parties involved.

1.4. Key Activities for the Corridor

Based on efforts made since March 2016, when a 1st workshop on the potentials to improve rail transport efficiency at border crossings was realised in Budapest, the ambitious joint action with the members of RFC 7 has become one of my main focus topics.

In June 2016, a joint ministerial declaration on effective improvements eliminating the bottlenecks and facilitating international traffic on the Orient/East-Med Rail Freight Corridor has been signed between the Ministers responsible for transport of Austria, Bulgaria, the Czech Republic, Germany, Greece, Hungary, Romania and Slovakia in Rotterdam. The main objective is to significantly reduce the average border-crossing times of freight trains, with the target of maximum 2 hours waiting time, except for waiting times due to border procedures specific to Schengen external borders, at the latest by 30 June 2018.

To reach this target, a detailed Action Plan for the Rail Freight Corridor 7 is on-going and the progress to achieve the Two-hour goal was discussed during two additional meetings in April 2017 (Wien) and October 2017 (Brussels) on Rail Cross-Border Issues. To this purpose, I also extended an invitation for a High-Level meeting in April 2017 with the representatives of the signees of the Rotterdam Declaration and several CEOs of the Rail Infra Managers, highlighting the need for increased efforts by all involved stakeholders in order to overcome the identified shortcomings and justify previous investments. This is also deemed highly necessary to achieve modal shift from road to rail freight transport and safeguard the transport decarbonisation targets. In the meantime, I raised with several Transport ministers along the OEM the issues of railway border crossing and railway efficiency.

Furthermore, starting in September 2017 with a meeting held in Bonn, I decided to support the dialogue between Germany and Czech Republic on the further improvement of navigability on the Elbe River, being the most important inland waterway of the Corridor with limited capacities, based on the recent political steps achieved in Germany with the “Gesamtkonzept Elbe”. The 11th Corridor forum also gave a specific insight into the IWT’s potential on digitalization.

I am also supporting the border-crossing achievements by Saxony and the Czech Republic to establish a joint planning framework to construct a first section of a high-speed rail connection between Dresden and Praha by use of an EGTC model.

Finally, given the need to work towards the development of sustainable ports, I chaired the 2nd Working Group meeting on Seaports in December 2016 in Brussels, shifting the focus on new technologies and exchange of best practices for further digitalization, green port development as well as the capacity increase of seaports' hinterland connections.

Since the second Work Plan, I pursued all my contacts at Ministerial level, regional level, including political decision makers, CEO's of different transport infrastructures, private industry and civil society stakeholders.

The Top/down, Bottom/Up governance employed has proved to be very efficient, allowing mutual exchanges and trust between all actors concerned by the implementation of the OEM Core Network Corridor.

1.5. Content

Building on the 2nd Work Plan for the Orient/ East-Med Corridor, which was published in December 2016, the following sections include the main findings of the analyses performed during the year 2017. A similar Corridor approach is adopted and the 3rd Work Plan is based on the 2017 update of the project list, complemented by the analysis of the “Wider Elements” that relate to broader policy objectives, namely potential for innovation deployment, climate change adaptation and expected impact of the Corridor’s infrastructure investments on jobs, economic growth and decarbonisation.

In the closing section, I will provide a set of recommendations taking stock of the results of the study, the outcomes of the various meetings and my overall experience acquired from the Corridor. These will include both technical considerations, as well as political conclusions taking into account where priorities have to be set and which type of approach has to be followed in accordance with the various political, technical, economic, environmental and social aspects that have emerged during the elaboration of the study and through the implementation of actions.

The very constructive debates and exchanges I had the pleasure to chair since 2014, being it in the Corridor Forum meetings, the ad-hoc working groups or during my official visits to the countries and regions along the OEM corridor, combined with the content of the study of the OEM Corridor characteristics, have given me a good **insight into the challenges and the progress** of the development of the OEM Corridor.

2. Characteristics of the Orient / East-Med Corridor

2.1. Corridor alignment

The **Orient / East-Mediterranean Corridor** is a long north-west to south-east corridor which connects Central and South East Europe with the maritime interfaces of the North, Baltic, Black and Mediterranean seas. It runs from the German ports of Bremen, Hamburg and Rostock via the Czech Republic and Slovakia, with a branch through Austria, further via Hungary and Romania towards the Bulgarian capital of Sofia, with links to the port of Burgas and to Turkey, then to the Greek ports of Thessaloniki, Igoumenitsa, Patra and Piraeus, ending with a "Motorway of the Sea" link to Cyprus.

It comprises railways, road, airports, ports, rail-road terminals and the Elbe-Vltava waterway (IWW) system (Brunsbüttel – Mělník – Praha/ – Pardubice; Germany and Czech Republic) with the IWW links from Magdeburg to Bremerhaven (Mittellandkanal and River Weser) and from Lübeck to Wolfsburg (Elbe-Seitenkanal and Elbe-Lübeck-Kanal in Germany). In Cyprus, no rail infrastructure is deployed. Maritime infrastructure exists in 4 countries, namely Bulgaria, Cyprus, Germany and Greece.

The Orient / East-Med Core Network Corridor includes sections of former **TEN-T Priority Projects** (PP 7, PP 22 and PP 21, PP 23, PP 25 partly) and ERTMS Corridors (D and parts of B, E, and F).

Two Rail Freight Corridors have been established on parts of the alignment of the OEM Core Network Corridor, the RFC 7 "Orient / East-Med" on the central and southern section Praha – Budapest – Sofia – Athens and branches of the RFC 8 "North Sea Baltic" along the northern section between Bremerhaven / Wilhelmshaven / Hamburg and Praha.

The **9 Member States** involved are (in alphabetical order): Austria, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Hungary, Romania, and Slovak Republic.

According to the Regulation 1316/2013[1] and clarifications agreed with the Member States, the **alignment** of the Orient / East-Med Corridor consists of the following parts and remains unchanged:

- Rostock – Berlin
- Brunsbüttel – Hamburg – Berlin – Dresden
- Bremerhaven / Wilhelmshaven – Magdeburg – Leipzig/Falkenberg – Dresden
- Dresden – Ústí nad Labem – Mělník/Praha – Kolín
- Kolín – Pardubice – Brno/Přerov – Wien/Bratislava – Győr – Budapest – Arad –
- Timişoara – Craiova – Calafat – Vidin – Sofia
- Sofia – Plovdiv – Burgas
- Plovdiv – Svilengrad – Bulgarian/Turkish border
- Sofia – Thessaloniki – Athens – Piraeus
- Athens – Patra / Igoumenitsa
- Thessaloniki / Palaiofarsalos – Igoumenitsa
- Piraeus / Heraklion – Lemesos – Lefkosia – Larnaka

[1] Regulation (EU) No 1316/2013 of the European Parliament and of the Council of 11 December 2013

Figure 1: Alignment and nodes of the Orient/East Med Corridor

Source: OEM study, May 2017

The **length of the corridor** infrastructure sums up to approximately 5,800 km of rail, 5,400 km of road and 1,700 km of IWW. In comparison to the first Work Plan of 2014, the above distances were slightly adapted mainly due to local re-definition of alignment to reflect new motorway sections, urban by-pass sections, etc.

Core Network Nodes

In summary, the number of core urban nodes along the Orient/East-Med Corridor is 15, with the majority located in Germany (5) and Greece (3), as well as one per other Member State. The same number applies for core airports, from which 6 are dedicated airports to be connected with high-ranking rail and road connections until 2050. Furthermore, 10 Inland ports and 12 Maritime ports are assigned to the Corridor, as well as 25 Rail-Road Terminals (RRTs). These are listed in Table 1.

Table 1: Urban and traffic/logistic nodes of the core network belonging to the Corridor alignment

	Urban nodes of the core network along Corridor		Airports *		Maritime ports To be connected to TEN-T rail and road by 2030		Inland core network ports		Rail-road terminals		Σ
DE	Hamburg Bremen Hannover Berlin Leipzig	5	*Hamburg *Berlin (BBI) Bremen Hannover Leipzig	5	Hamburg Bremerhaven Wilhelmshaven Bremen Rostock	5	Hamburg Bremerhaven Bremen Hannover Braunschweig Magdeburg *Berlin*	6	Hamburg; Bremerhaven Bremen; Hannover (Nordhafen / Linden. Lehrte); Braunschweig Magdeburg Leipzig Rostock Berlin-Großbeeren	9	30
CZ	Praha	1	*Praha	1			Děčín Mělník Praha-Holešovice Pardubice	4	Děčín Mělník Praha-Uhříněves Pardubice Přerov	5	11
AT	Wien	1	*Wien	1			*Wien*		Wien (Freudenau / Vienna South)	2	4
SK	Bratislava	1	Bratislava	1			*Bratislava* *Komárno*		Bratislava	1	3
HU	Budapest	1	*Budapest	1			*Komárom* *Budapest-Csepel*		Budapest-Soroksár	1	3
RO	Timişoara	1	Timişoara	1			*Drobeta-Turnu-Severin* *Calafat*		Timişoara Craiova	2	4
BG	Sofia	1	Sofia	1	Burgas	1	*Vidin*		Sofia Plovdiv	2	5
EL	Thessa-loniki Athína Heraklion	3	*Athína Thessaloniki Heraklion	3	Athína / Piraeus Heraklion Thessaloniki Igoumenitsa Patras	5			Thessaloniki Patras Athína/ Piraeus / Thriassio Pedio	3	14
CY	Lefkosía	1	Larnaka	1	Lemesos	1					3
Σ	**15**		**15**		**12**		**10**		**25**		**77**

Source: Consortium, based on Annex 1 to Regulation No.1315/2013
**) Airports marked with * are to be connected to TEN-T heavy rail and road by 2050 according to Art. 42*
Inland core network ports depicted in ITALIC are connected to the inland waterway assigned to the Rhine-Danube Corridor or the North Sea-Baltic Corridor.

Overlapping sections with other CNCs

Several segments of the Orient/East-Med Core Network Corridor are coinciding with others of the 9 Core Network Corridors, such as:

Rhine - Danube Corridor (approx. 1000 km, in CZ between Praha and Brno, along the road/rail routes Wien - Bratislava – Budapest – Drobeta – Calafat – Vidin),

North Sea - Baltic Corridor (between Wilhelmshaven/Bremerhaven and Magdeburg resp. Hamburg and Berlin),

Scandinavian - Mediterranean Corridor (Rostock – Berlin, Hamburg and Hannover nodes)

Baltic - Adriatic Corridor (between Brno/Přerov and Bratislava resp. Wien).

Table 2 provides the background information on network characteristics and socio-economic statistics of the catchment area for the Orient/East-Med Core Network Corridor.

Table 2: Background information on the Corridor

Scope	Unit	Baseline value (2010)	2013	2014	2015	2016
GDP (of crossed NUTS3 areas)	million EUR (in current prices)	1.393.925	1.380.964	T1.410466	1.463.840	t.n.a.
Employment (of crossed NUTS3 areas)	Persons	29.935.910	30.498.900	30.865.400	31.074.300.	31.166.700.
Population (of crossed NUTS3 areas)		67.918.633	70.435.153	66.544.068	66.650.205	70.749.354
OEM Rail Network	km of alignment	-	5.851	5.851	5.850	5.884
OEM Road Network		-	5.430	5.432	5.416	5.369
OEM IWW Network		-	1.659	1.659	1.659	1.659
OEM Corridor Node	**Unit**	**Defined by Reg. 1315/2013 Annex 2)**	**Nodes in operation**			
Core Seaports	Number	12	12			
Comprehensive Seaports		7	7			
Core Inland waterway ports		10	9			
Comprehensive Inland waterway ports		16	16			
Core Airports		15	15 (thereof 6 major airports acc. to Art. 41)			
Comprehensive Airports		7	7			
Core RRTs		25	24			
Comprehensive RRTs		11	11			

t.n.a. - temporarily not available data
Source: EUROSTAT, Panteia, April 2017

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

In summary, the infrastructure of the Orient / East-Med Core Network Corridor is characterised by a North-South divide of typical infrastructure supply and quality, mirroring each Member State's economic conditions, also with respect to its year of accession to the European Union. An additional challenge is the Corridor's geographical alignment, especially in the southern Member States, where the relatively high costs of transport infrastructure crossing mountainous terrain is complicated by a still relatively low transport demand.

Regarding the Corridors' infrastructure, Regulation (EU) 1315/2013 puts forward explicit target values for technical infrastructure parameters that need to be met by 2030, the latest. On the basis of the latter, a compliance analysis was performed with a view to compare the OEM current (2016) infrastructure parameters with the standards stipulated by the Regulation. The analysis identified compliance deficiencies on Corridor sections and nodes.

2.2.1. OEM railways network and Rail Road Terminals

At the end of 2016, the infrastructure of the railway network along the OEM Corridor is still in considerable parts of the alignment not compliant with some of the technical characteristics thresholds set out by Regulation No. 1315/2013, particularly regarding the key infrastructure parameters train length and control system (ERTMS). For technical characteristics such as operational (line) speed, axle load, electrification, the non-compliance along the Corridor is around or below 20%.

In summary, 87% of the OEM rail network is not compliant with the requirement for ERTMS[2] deployment; when considering ETCS baseline 2 only, the value accounts to 98% of network non-compliant to ERTMS (by end of 2016). In 50% of the network a train length of 740m is not allowed. Minimum Axle load of 225 kN is an issue mainly in Romania, summing up to 17% non-compliance rate of the OEM rail network. The criterion of a line speed of at least 100 km/h is not fulfilled in parts of Slovakia and in Bulgaria amounting to 21% of the OEM rail network. Only 11% of the network is not electrified.

The analysis of the Rail-Road Terminals along the OEM Corridor shows that in 2016 only 4 of the 25 RRTs, namely Hamburg-Billwerder, Bremerhaven, Leipzig and Berlin-Großbeeren, are fully compliant with the TEN-T requirements. The new Vienna South Terminal is compliant from 2017. In Timişoara and Craiova, substitution of outdated terminals is planned, albeit still without secured financing. Sofia’s terminal is deemed inadequate. The nominated RRT in Patra does not exist. Also for 16 other terminals, no or insufficient projects are known, hampering an efficient and optimum integration of intermodal transport of goods on the Corridor.

2.2.2. The OEM inland waterway network and ports

The analysed OEM inland waterway network comprises of the Rivers Elbe (Labe), Weser and Vltava, as well as the canals Elbe-Seitenkanal, Elbe-Lübeck-Kanal, and Mittellandkanal. River Danube is exclusively addressed in the analysis of the Rhine-Danube Corridor. Overall, around 1627 km of IWW are compliant with the two TEN-T requirements, representing 98% of the OEM IWW network. The non-compliant section is the uppermost river section of Elbe / Labe between Týnec nad Labem and Pardubice.

- CEMT class IV: The majority of the OEM IWW network (98%) is allowed for vessels of CEMT class IV or higher, based on the requirement of navigability for ships of 9.5m horizontal width, disregarding other parameters (such as draught and underpass height) that are not necessarily to be met.
- RIS systems are deployed on the same section.

With regard to the additional parameters assessed:

- **Permissible height under bridges**: A minimum height under the bridges (>5.25 m) is fulfilled on 1.206 km of waterways, representing 73% of the OEM IWW network. Recent non-compliant section is the TENtec section “CZ/DE border – Magdeburg” (332 km) with three historic road bridges in Dresden (Albertbrücke, Augustusbrücke, Marienbrücke) which are non-compliant in the case of highest navigable water level. Further non-compliant sections are the Elbe section Tynec n.L. – Pardubice (32 km), the entire navigable Vltava River (94 km), the Elbe-Lübeck-Kanal (68 km) as well as the Weser river section Bremen – Minden (117 km).
- **Permissible Draught**: A minimum draught of 2.5 m is only fulfilled on 670 km (40%) of the OEM IWW network, whereas the free flowing parts of Elbe are located between Ústí nad Labem/ Střekov and Hamburg. A so called Good navigation status of free-flowing IWWs (i.e. days with water depth >2.5 m) cannot be achieved. **Locks reliability** (locks to be out of service) is problematic for the following stretches:
  - Germany: Biggest issue is lift Lüneburg-Scharnebeck,
  - Czech Republic: the main problematic locks are located on the Vltava sections , mainly within the City of Praha and at the Upper Elbe between Mělník and Přelouč.

The replacement of the Lüneburg-Scharnebeck lift is foreseen in the Federal Transport Infrastructure Plan.

[2] The calculation of the KPI “ERTMS in operation” from this study does not distinguish between different ETCS levels (as this is part of the European ERTMS deployment plan and the related study by DMT consortium). Thereunder, CNC rail sections that are currently in operation with baseline <2 or no legal versions, are not counted as compliant sections.

A jointly coordinated schedule is expected with the German study "Gesamtkonzept Elbe". During the Bonn meeting in September 2017, German IWW authorities stated that a minimum draught of 2.5 m cannot be met, due to the nature of the River Elbe along that section. Based on the agreement made in the "Gesamtkonzept Elbe" among all German stakeholders, the German authorities are putting efforts to render this section compliant to a draught level of at least 1.4 m. Key objective is to provide reliable operating conditions for inland waterway transport. Considering the latter, the OEM draught compliance rises from 40% to 64%.

RIS is fully implemented in Germany, whereas in Czech Republic it is only 90% due to the new section Týnec nad Labem – Pardubice, which is still not navigable. Furthermore, in the Czech Republic, basic RIS applications have been implemented. Currently as a part of international project RIS COMEX the enlargement of AIS infrastructure as well as launch of mandatory AIS usage are being prepared. All these services are being implemented jointly with Germany as a part of Elbe – Weser corridor within the RIS COMEX project.

There are 10 defined OEM core river ports. The planned core inland port of Pardubice does not exist yet. Some of the 9 existing core OEM inland ports, namely Hamburg, Bremerhaven, Bremen, Hannover, Braunschweig, Magdeburg, Děčín, Mělník and Praha-Holešovice, are compliant with the requirements set out in Regulation 1315/2013, regarding the connection with rail, connection with road, the availability of at least one terminal open to all operators in a non-discriminatory way and application of transparent charges. None of them provide alternative fuel refuelling points. In German ports LNG can be provided by trucks. In addition, in Bremerhaven and Bremen a LNG-powered vessel started operations in 2017. No further RIS development plans are known for the Czech core network ports (Děčín, Mělník and Praha-Holešovice); especially, the direct input to the service "Notices to skippers" is not established yet.

The main problematic parameter for the nine operating inland ports is the "Availability of alternative fuels", which does not exist in any port. In addition, the core inland port of Praha-Holešovice is deemed to be out of operation for freight handling and could lose its limited connection to rail.

2.2.3. The OEM seaports and maritime infrastructure

The OEM seaports include 12 core ports, the German Ports of Hamburg, Bremerhaven, Bremen, Wilhelmshaven and Rostock, the Greek Ports of Piraeus, Heraklion, Thessaloniki, Igoumenitsa and Patra, as well as Burgas and Lemesos in Bulgaria and Cyprus, respectively. Bremerhaven, Bremen and Hamburg ports also constitute core inland ports. The OEM Corridor includes one Motorways of the Sea (MoS) link in the Eastern Mediterranean Sea connecting the hinterland of the Greek Port of Pireas to that of the Port of Lemesos in Cyprus via the Port of Heraklion in Greece.

A key requirement of Regulation No. 1315/2013 is a maritime port connection with the road and rail network. The Ports of Igoumenitsa and Patra in Greece are currently lacking connections to the country's railway network (80% compliance). All OEM seaports are fully compliant with the requirement to offer at least one terminal open to users in a non-discriminatory way applying transparent charges, while all ports also provide port waste reception facilities. The Ports of Bremerhaven, Bremen and Hamburg have waterway connections of CEMT IV. An additional requirement of the Regulation is the provision of publicly accessible Liquefied Natural Gas (LNG) refuelling points for maritime transport. Such facilities are currently missing for most ofl OEM ports with the exception of Bremerhaven and Bremen where a LNG-powered vessel started operation in 2017.

2.2.4. The OEM road infrastructure

Road infrastructure along the Corridor shows the highest level of compliance with technical requirements compared to the other modes' infrastructure. Currently, the largest part of the OEM road Corridor is either of motorway or express road class

(88%), while the total length of conventional road sections is 633.8 km, as presented in Table 4.

Table 3: Motorway/ express roads per MS

MS	OEM length	Motorways/ express roads length / %	Conventional roads length/ %
DE	1 397.6 km	1 397.6 km/ 100%	0 km/ 0%
CZ	473.3 km	403.4 km/ 85%	69.9km/ 15%
AT	123.6 km	92.0 km/ 74%	31.6 km/ 26%
SK	80.7 km	80.7 km/ 100%	0 km/ 0%
HU	439.2 km	439.2 km/ 100%	0 km/ 0%
RO	405.6 km	149.7 km/ 37%	255.9km/ 63%
BG	948.2 km	677.9 km/ 71%	270.3/ 29%
EL	1 373.3 km	1 373.3 km/ 100%	0 km/ 0%
CY	127.0 km	120.9 km/ 95%	6.1 km/ 5%
Total	**5 368.6 km**	**4 734.8 km/ 88.2%**	**633.8 km/ 11.8%**

By the end of 2016, some 95% of the Corridor length is covered by stations for at least one type of alternative fuel, compared to some 89% in 2013. The total number of alternative fuel stations located at a less than 10 km distance from the OEM Corridor route exceeds 1 800. LPG and CNG are widely available in all OEM countries, except Cyprus in the case of CNG, although the density of the stations along the Corridor differs from country to country. The number of infrastructure systems of publicly accessible stations to recharge electric vehicles is steadily increasing.

Table 4: Number of alternative fuel stations

MS	LPG stations		CNG stations		Recharging points for electrical vehicles
	total	OEM	total	OEM	
DE	7 399	covered	1 055	covered	yes
CZ	1 178	55	167	44	>6 in Praha urban node
AT	41	4	165	13	>8 in Wien urban node
SK	282	5	11	2	>2 in Bratislava urban node
HU	459	39	12	3	>6 in Budapest urban node
RO	1 158	48	1	0	3
BG	861	53	112	60	>1 in Sofia, Plovdiv & Burgas
EL	848	52	12	5	several in Thessaloniki and Athina urban nodes
CY	5	4	no	no	several along the Lefkosia-Lemesos and Lefkosia - Larnaka Motorways

Progress of a minimum of 7% is reported in respect to the availability of safe and secure parking areas along the Corridor. The actual number and location of rest areas along all sections of the Corridor meets the criterion set in the Regulation, however, these either do not provide appropriate level of security, or information on security facilities is not available. In Romania, Bulgaria and Greece, there are still long road sections without any suitable facility.

2.2.5. The OEM airports

There are 15 core airports along the OEM Corridor (Hamburg, Berlin, Bremen, Hannover, Leipzig/Halle, Praha, Wien, Bratislava, Budapest, Timisoara, Sofia, Athina, Thessaloniki, Heraklion, and Larnaka).

Out of the six major core airports, 3 (Hamburg, Praha and Budapest) still need to be **connected to "heavy rail",** i.e. capable to operate high-speed passenger trains. In addition, Bratislava, Timisoara, Sofia and Thessaloniki airports still miss a connection to rail.

Concerning the availability of **alternative fuels**, currently, no fixed storage tank facilities for aviation biofuel are reported to be in use in the OEM airports. Regarding the availability of alternative fuels for airport ground services (e-mobility, hydrogen, CNG, LPG), certain airports have recently introduced charging or fuelling stations. Natural gas (CNG) and liquid gas (LPG) are already being used at Hamburg Airport as low-emission fuels, while a Hydrogen Project was introduced earlier. In 2013, a charging station for e-cars and a LPG fuelling station for the operation of 37 natural gas-powered vehicles were introduced in Wien.

2.3. Progress of Corridor Development

To assist in the monitoring of the OEM Corridor's evolution, as well as the potential effects of individual projects or groups of projects upon infrastructure interoperability and performance, Key Performance Indicators (KPIs) were jointly defined for all 9 Core Network Corridor studies. The KPIs are provided in two main categories, namely supply side KPIs and demand side KPIs. On the supply side, KPIs were calculated for the years 2013-2016 and allowed for the evaluation of compliance levels against the infrastructure quality targets set out in Regulation 1315/2013.

Since the adoption of Regulation 1315/2013, **92 projects** were accomplished[3] along the alignment of the Orient/East-Med CNC **until December 2016**, divided per mode of transport as follows:

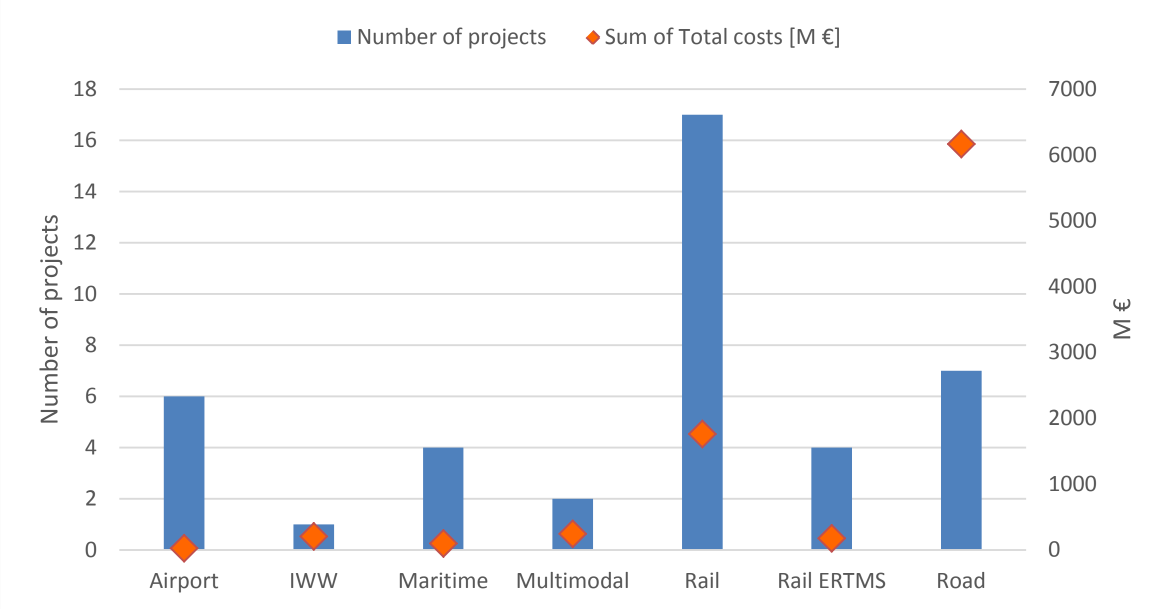
- Rail: 32 projects, € 5000 mln
- Rail ERTMS: 4 projects € 125 mln
- Air:15 projects, € 880 mln
- Road: 24 projects, € 2300 mln
- IWW: 7 projects, € 60 mln
- Maritime: 8 projects, € 420 mln
- Multimodal: 3 projects, € 140 mln

Accordingly, supply related corridor indicators for rail increased between 1 and 5 %-points between 2013 and 2016, the largest increase noted for the electrification (now 88%) and axle load (80%) ones. Between the years 2013 and 2016, there has been a 7% increase in the express road/ motorway KPI and one additional airport has achieved rail connectivity. For the remaining modes (inland waterways, seaports, inland ports and Rail-Road Terminals), there have been no changes in the KPIs during this period.

In addition, 41 projects have been completed –or are expected to be completed by the end of the year- in 2017 along the OEM Corridor, for a total value of € 8.7 billion. The chart below gives an idea of the ratio between the number of projects and the total investment per category.

[3] Total investment: € 8.9 billion

Figure 2: Projects expected to be completed in 2017



The following sections present the progress of the Corridor development per mode in the period 2013-2016, listing the number and type of accomplished projects. The latter is also reflected in the evolution of the supply related KPIs values for each mode. Reference is also made to the projects expected to be completed within year 2017, per transport mode. Finally, a list of the most prominent projects is presented in terms of investment size and contribution to increasing compliance rates (relative KPIs).

2.3.1. Accomplished rail projects

36 rail projects (both works and studies) have been completed since December 2013 with impact on the overall compliance of the rail Corridor. During the first three years of the TEN-T Regulation, 17 rail development projects were finalized. The central rail stations of Breclav, Wien, Sofia, Pazardzhik and Burgas were rehabilitated or rebuilt completely, ERTMS was deployed on 82 km in Austria, the capacity bottleneck between Praha and Česká Třebová was partly relieved, the Leipzig node and the capacity of the hinterland connection of the Bremen seaport was enhanced, while the last non-electrified section of the Bulgarian OEM alignment Dimitrovgrad – Svilengrad was electrified. Moreover, 19 studies / designs were completed, from which a Pre-Planning Study (Vorplanungsstudie) for the border crossing High speed rail line Dresden – Praha is one of the most significant for the Corridor, together with a number of studies regarding preparation for the required infrastructure works for the major non-compliant rail sections in Bulgaria.

Table 5: Supply-related KPIs evolution for OEM rail Corridor (2013 - 2016) in % of modal CNC length[4]

#	KPI	Baseline 2013	Status 2016
1	**Electrification**	83%	89%
2	**Track gauge 1435mm**	100%	100%
3	**ERTMS implementation[5]**	11%	13%
4	**Freight rail line speed ≥ 100km/h**	75%	78%
5	**Axle load ≥22.5t**	77%	82%
6	**Train length 740m**	47%	50%

By the end of 2017, 17 Rail works projects (including 4 telematics application projects in Austria and 1 in Hungary) and 4 studies are expected to be completed. Besides Greece, smaller infrastructure modernisation and upgrade projects are expected to be finalised by the end of 2017; more specifically, in Romania, the border section HU/RO until Arad (30km) and in Bulgaria, the modernisation of the Septemvri - Plovdiv section (53km).

2.3.2. Accomplished IWW projects

Along the OEM inland waterways (7 completed projects), the five completed works projects provided two modernized locks on the Czech part of River Elbe between Mëlnik and Pardubice and an upgrade of the Mëlnik port. In Germany, upgrade works on IWW sections Magdeburg – Wolfsburg (Mittellandkanal) and Minden – Bremen (Weser) were achieved. Additionally, two studies, the IRIS 3 Europe study project and the elaboration of the German Overall future strategy on the River Elbe were finalised. The above projects did not change related KPIs.

Table 6: Supply-related KPIs evolution for OEM IWW Corridor and inland ports (2013 - 2016)[6]

#	Mode	KPI	Baseline 2013		Status 2016	
			CZ	DE	CZ	DE
7	Inland waterway network	**Waterway categorized as CEMT class IV or more**	90%	100%	90%	100%
				98%		98%
8		**Permissible Draught (≥ 2.5m)**	0%	51%	0%	51%
				40%		40%
9		**Perm. Height under bridges (≥ 5.25m)**	62%	59%	62%	59%
				60%		60%
10		**Minimum RIS implementation**	90%	100%	90%	100%
				98%		98%
11	Inland ports	**Connection with CEMT Class IV waterway[7]**	75%	100%	75%	100%
				90%		90%
12		**Connection to rail**	50%	100%	50%	100%
				80%		80%
13	Inland	**Availability of alternative fuels**	0%	0%	0%	0%

4 Percentages are mainly based on known distances resp. operated sections and may in future slightly deviate.

5 The calculation of ERTMS implementation is based on operation of both GSM-R and ETCS (all levels) and thus may differ from the ERTMS EDP 2016.

6 The CEMT class IV requirement is not met in certain parts of the Czech Republic, notably the section from Týnec nad Labem to Pardubice, as this section is hardly possible to be used for inland waterway transport. Problems include draught and height of bridges.

7 The percentage given considers only the 3 (of 12) OEM core seaports Bremen, Bremerhaven and Hamburg, where a navigable IWW connection is geographically suitable.

#	Mode	KPI	Baseline 2013		Status 2016	
			CZ	DE	CZ	DE
	ports		0%		0%	
14		**Availability of ≥1 freight terminal open to all operators...**	50%	100%	50%	100%
			80%		80%	

Within 2017, the upgrade Middle Weser project in the section Bremen-Minden in Germany is foreseen to be completed, which includes works for fairway deepening (2.50m), bridge height (min. 5.25m) and locks (Weser-Schleuse Minden).

2.3.3. Accomplished maritime projects

Eight maritime projects (6 works and 2 studies) were completed with no impact on 2013 compliance levels, which remain at 80% for port connection to rail and 0% for the provision of alternative fuels facilities. The majority of implemented works of higher investment costs contributed to required port capacity enhancements (Ports of Hamburg, Lemesos), as well as the improvement of rail connections (Ports of Hamburg, Bremerhaven). One project significantly improved the VTMIS coverage at the Port of Burgas.

In 2017, four projects are foreseen to be completed, the most important being the construction and launch of a hopper barge with an LNG unit in the Bremen/Bremerhaven ports (DE), marking a significant step in the alternative fuels area, when compared against other OEM ports. The remaining three include a feasibility study for the establishment of Port Community Systems in the Port of Burgas in Bulgaria, gateway-widening works at the Port of Hamburg and further improvement of the IT terminal information and control system at Rostock port (DE).

2.3.4. Accomplished road projects

By the end of 2016, the OEM road infrastructure increased its motorway / expressway compliance from 81% to 88% via the implementation of 22 work projects (2 studies were also completed). Before 2014, it was compliant in Germany and Slovakia and became fully compliant by 2015 in Greece and Hungary. Also, in Bulgaria and Romania, recent works accomplished contributed to a longer OEM motorway/expressway network. The most important gap closed has been the border crossing Corridor section from Makó (HU M43) to Arad (RO A1). Also, the sections of A1 Timisoara to Lugoj (RO), A3 Dupnitsa – Blagoevgrad (BG) and A3 Sandanski – Kulata border (BG), A4 Orizovo – Harmanli (BG) and A1 Lamia – Raches (EL) were newly opened. Other projects related to capacity enhancements on existing sections of German and Austrian motorways. Regarding the availability of alternative fuels, a significant increase of fuelling or charging stations was recorded (year 2016 >1000).

In 2017, five more projects with total investment costs of € 6.35 bln have been or are about to be completed. These are D8 section Lovosice – Řehlovice (CZ), and four projects in Greece with a total length of 390 km: Korinthos – Patra (A8 Olympia Odos), Skotina – Evagelismos (A1), Antirio – Ioannina (A5) and Strymoniko – Petritsi (A25), essentially completing the OEM road network in the country.

Table 7: Supply-related KPIs evolution for OEM road Corridor (2013 - 2016)

#	KPI	Baseline 2013	Status 2016
20	**Express road/ motorway**	81%	88%
21	**Availability of alternative fuels (stations)**	n/a	n/a.

2.3.5. Accomplished RRT projects

3 RRT projects were completed in the years 2014 to 2016, one being the construction of a new intermodal terminal in the Plovdiv area.

Table 8: Supply-related KPIs evolution for OEM RRTs (2013 - 2016)

#	KPI	Baseline 2013	Status 2016
22	**Capability for Intermodal (unitised) transhipment**	79%	79%
23	**740m train terminal accessibility**	25%	25%
24	**Electrified train terminal accessibility**	46%	46%
25	**Availability of ≥ 1 freight terminal open to all operators**	67%	71%

By end of 2017, two new projects are either completed or expected, the first one being the construction of a new Rail-Road Terminal (Freight Centre Vienna-South) in Wien-Inzersdorf, Austria, which also includes the relocation of the RRT Wien Nordwestbahnhof. Nevertheless, both projects shall not solve the Corridor's accessibility and electrification issues.

2.3.6. Accomplished airport projects

Since 2014, the OEM Corridor airport infrastructure was developed through 50 projects, 15 of which have already been completed by mid-2017. Among the most relevant, are two projects enhancing the usability of the Vienna International Airport though an improved connection to the main railway line. These projects, whose total cost amounted to almost €200M, emerge as the most significant out of the set of accomplished actions, as the vast majority of the rest are studies, which do not affect the efficiency of the Corridor before being rendered into concrete interventions. 11 design studies have been finalized in the Berlin node, where various interventions have been studied aimed at the renewal of the Berlin Brandenburg Airport.

The latest completed project concerned the upgrade of the Hungarian ATM system for the Airport Collaborative Decision Making (A-CDM) capability as part of the Local Single Sky Implementation Plan, which constituted a step towards the implementation of the SESAR ATM sub-functionality S-AF 2.1 pre-departure management.

Table 9: Supply-related KPIs evolution for OEM airports (2013 - 2016)

#	KPI	Baseline 2013	Status 2016
26	**Connection to rail**	46% (50% - for main core airports)	54% (50% - for main core airports)
27	**Availability of ≥ 1 terminal open to all operators**	100%	100%
28	**Availability of alternative fuels**	0%	0%

Within year 2017, six airport projects are expected to be completed, out of which three are studies and concern the long-term infrastructure expansion planning for the Berlin airport (DE), the designs for the connection of the PATHE road axis with the Thessaloniki airport (EL) and the feasibility study to develop and validate the Free Route Airspace Concept of Operations (CONOPS) for the Budapest airport (HU). Work projects include the reconfiguration of the passenger terminal departure area of the

Bremen airport, as well as space extensions for security checks and the renewal of a waste water channel at the Leipzig airport in Germany.

2.3.7. Selection of accomplished projects with highest contribution to KPI

Table 11 provides examples of the major accomplished projects, selected by investment size and impact in terms of contributing to achieving the Corridor objectives (KPI).

Table 10: Key accomplished projects at OEM CNC (selection by mode)

#	Project name	Transport Mode	MS	Cross-border section	Last-mile	Pre-id. CEF section / project	KPI impact	Project end date	Total costs in mln EUR
9076	Vienna Airport: Adaptation of Passenger Rail Station	Airport	AT		x	x	x	2014	118.80
9075	Connection Eastern Railway – Airport suburban line near Kledering with Vienna Central Station	Airport	AT		x	x	x	2014	63.10
4059	Mittelweser Improving navigability	IWW	DE				x	12/2015	31.30
2277	Hamburg Port Extension, deepening of the fairway (14.5m)	Maritime	DE					12/2016	199.00
2279	Hamburg Port: Container Terminal Burchardkai, New concept of the road and rail links	Maritime	DE					12/2016	103.70
5131	Megahub Lehrte (Hannover)	Multimodal	DE					12/2016	136.00
4202	Construction of a new intermodal terminal in Plovdiv area	Multimodal	BG			x	x	12/2016	7.31
9042	Vienna Central Railway Station (Wien Hbf)	Rail	AT		x	x	x	2015	1,006.00
9074	Implementation of GSM-R on Austrian A-network / ERTMS Level2 Wien - Breclav	Rail ERTMS	AT				x	2014	81.40
4215	Reconstruction and electrification of Plovdiv - Svilengrad railway line	Rail ERTMS	BG			x	x	12/2016	200.32
4090	D8 motorway construction Lovosice - Řehlovice	Road	CZ	x			x	12/2016	524.93
4923	Construction of the Lamia - Raches section of the A1 PATHE Motorway	Road	EL				x	03/2015	304.97
4195	Construction Nadlac - Arad Motorway A1	Road	RO	x			x	07/2015	207.52
4915 & 4916	Construction of A3 Struma Motorway Lots 2 & 4 (Dupnitsa – Blagoevgrad & Sandanski-Kulata)	Road	BG	Wider			x	10/2015	219.40
9619	Construction Makó-Csanadpalota-Nadlac Motorway M43	Road	HU	x			x	07/2015	155.00

3. Transport Market Analysis

3.1. Results of the Multimodal Transport Market Study (MTMS)

The MTMS, performed in 2014, described the transport market characteristics of the OEM Corridor in its present condition and in the future. Its main objective was to analyse the OEM Corridor-related transport system and assess the capacity and traffic flows on the respective parts of the infrastructure, covering the time period from 2010 to 2030. The time horizon of 2030 was selected as it represents a major milestone for European policy and at the same time, provides a reliable basis for future results.

During the update of the Work Plan in 2016, it was examined whether the same premises still hold compared to the figures of the MTMS of 2014. Therefore, latest transport figures and the trend from 2010 are included. The MTMS provides information on the macroeconomic framework, as well as the Corridor-related demand flows creating the basis for the MTMS. The outcomes of the above activities led to the following results.

There are mixed results for **population** forecasts, since a decline is expected for 4 Member States (Bulgaria, Germany, Hungary and Romania). The development of **GDP** in the period 2010 – 2030 shows that for all countries in the OEM Corridor a positive growth is expected. **National forecasts** and **national transport figures** are available through the project sources, however not for all countries on a regional level and, while the timing of the scenarios may differ. This means that on the basis of this information, the OEM Corridor cannot be isolated from other Corridors and any further analysis cannot be made at this stage. Regarding **freight** and **passenger transport**, especially road transport has a more moderate growth. This is resulting in lower volumes, but also in a more favourable modal split compared to previous forecasts. On the longer distance, there is more competition between road versus rail and inland waterways.

The **first level** of Corridor traffic, that is, **transport within the Corridor catchment area**, has been described for the base year 2010. For freight transport, the domestic transport has been included. Notably, for road transport, domestic transport is carried out on short distances. This is one of the reasons why the volumes for road are relatively high. The short distance transport by road is attributed to a high share of building materials, foodstuffs, agricultural products and final products. On the longer distance, there is more competition between road versus rail and inland waterways. The **second level** (origin and destination in the Corridor) and **the third level** (transit) of Corridor traffic have been considered for rail and road transport. For rail, the first level traffic is subdivided in domestic and international traffic, and the second level in imports and exports. For road, the first level domestic traffic has been further split into domestic short distance and domestic long distance.

For **inland waterways**, in total, a growth of 25% is expected in the period 2010-2030 for land-land flows, while a 14% for maritime transport. The results for the forecasts are summarized in Tables 12.

The trend analysis of the annual transport volumes since 2010 shows a stable development for **freight transport** in the OEM countries for road, rail and inland waterway. Investment in rail and inland waterway infrastructure is needed in order to attain a shift from road transport towards more environmentally friendly transport modes.

The passenger demand for the period of 2010 to 2030 remains almost stable with a growth rate of 0.05% per year. The analysis of the trend of 2010-2013 confirms the stable development of passenger transport, where there is a slight increase in car mobility, expected with increasing welfare levels.

Table 11: Freight transport volume between the OEM regions for 2010, 2030 reference scenario; in 1,000 tonnes

Mode	2010	2030 reference scenario
Road	415,483	746,158
Rail	189,711	379,966
Inland waterway	18,694	23,361
Maritime	74,995	85,578
TOTAL	**698,884**	**1,235,063**
Rail share	*27.1%*	*30.8%*
IWW share	*2.7%*	*1.9%*

In the 2030 reference scenario [8], the share for **rail** is expected to grow from 27.1% in 2010 to 30.8%, whilst the share of **inland waterways** is expected to decrease from 2.7% in 2010 to 1.9% (despite increasing IWW transport volumes). If full compliance with TEN-T standards was achieved by 2030, the share of rail and inland waterways may be expected to increase. Investment in rail and inland waterway infrastructure is, therefore, required in order to attain a shift from road transport towards more environmentally friendly transport modes.

3.2. Capacity issues along the OEM Corridor by 2030

Capacity utilization of the OEM Corridor infrastructure has been analysed with a focus on the supply side of the infrastructure.

3.2.1. Rail capacity

Capacity issues or potential future capacity bottlenecks exist on several sections of the OEM rail corridor, with the most important bottlenecks being:

- The section Dresden – Czech border is already highly used and freight transport volumes in the Elbe Valley increased between 6.5–11% during 2014-2015. Out of the maximum 280 train slots per day, on average 126 freight trains, 17 long distance passenger trains and 56 regional trains, are travelling on this section. Given the forecasted growth in freight and passenger transport, the Coordinator considers that there is a high probability that this section might constitute a bottleneck in 2030;
- The Praha – Česká Třebová line was at full capacity in 2010, and for the year 2030, freight transport volumes are expected to be doubled, confirming that this section is a significant bottleneck; existing capacity issues are partly addressed by projects for the section Pardubice – Ceska Trebova .
- For the rail sections to/from Budapest, a doubling of freight transport volumes is expected. According to the Hungarian railways, the planned improvements will be sufficient (i.e. upgrade of Budapest South Railway Bridge).
- The South branch of the corridor starting from Békéscsaba and Thessaloniki is rather long (1168 km, around 20% of the total OEM Corridor length) and runs on the territories of Hungary, Romania, Bulgaria and Greece. Currently, the characteristics of the railway lines are rather heterogeneous and many sections do not meet the requirements set by the Regulation No. 1315/2013, the technical barriers being often problematic, specifically regarding train lengths and axle load or lack of ERTMS. According to the reference scenario for this section, traffic volume growths for subsections are expected in 2030 in the range 70%- 160%. The biggest growth is expected for the section Filiaşi – Arad

[8] The 2030 reference scenario assumes that none of the projects of the OEM Project list will be implemented until 2030 (status quo).

in Romania. For the subsections in Bulgaria and Greece, a growth of70% is forecasted. The Hungarian section Békéscsaba – Lökösháza HU/RO border and the Greek sections Domokos – Tithorea and Inoi –SKA (Sidirodromiko Kentro Acharnes) have only currently one track and are thus deemed to lack capacity. Nevertheless, certain existing projects address these issues by removing single track sections along the OEM (Békéscsaba – Lökösháza, HU/RO border – Curtici – Arad and Tithorea – Domokos) They will solve the problems.

Apart from expected demand, there are other factors that influence the future capacity of OEM rail infrastructure, such as the long border waiting times in rail freight transport and the capacity on mixed traffic lines. Single track sections do not necessarily imply capacity problems, as long as the number of trains does not exceed the line capacity leading to unsatisfying operational conditions. Long term planning should make sure that capacities offered are in line with expected demand.

In case of closure of main lines alignment for works, accidents or other reasons, new capacities should be identified preferably in advance by setting-up contingency plans to improve resilience to external events.

All OEM Rail Road Terminals are linked with national rail and road networks, although the quality of “last mile” connections needs in certain parts to be improved and capacity problems solved. Regarding the state of development of RRTs, there are differences between the northern and southern Corridor parts, ranging from a dense network of terminal locations, with limited capacities in both the terminals and the connecting rail and road network to a lack of modern and efficient terminals with adequate capacity.

3.2.2. IWW capacity

Being widely a free flowing river, the River Elbe is characterised in general by unreliable navigability conditions. Problems are heterogeneous and include unsatisfactory draught conditions, incomplete network, limited underpass clearances, non-compliant lock chambers, capacity deficiencies, etc. Also, the Vltava River and the Elbe-Lübeck-Kanal between Lauenburg and Lübeck show similar problems.

One important bottleneck on the OEM IWW network is related to the ship lift Lüneburg-Scharnebeck (for CEMT Class V waterways). Due to the limitations in the length of lock chambers, only barges with a maximum length of 100 m can pass. The pushed convoys have to be decoupled for the passage and lifted or lowered individually. Furthermore, there is a problem with lock reliability, as at the moment, basic maintenance operations are on-going, resulting in longer waiting times. Currently, there is a project for the construction of a new lock in Lüneburg-Scharnebeck listed in the German Federal Transport Infrastructure Plan (BVWP 2030) under the category ‘Vordringlicher Bedarf’ (first priority), which would solve the above issues. However, its realisation date is unclear as the lack of human resources calls for the prioritisation of all inland waterways infrastructure projects, even if included in the "Vordringlicher Bedarf".

A major bottleneck for the Elbe waterway on the Czech side constitutes the 40 km long stretch between Ústí nad Labem/Střekov to the DE/CZ state border, which limits the navigability (0.9 m draught) and hence its efficient use due to the significant fluctuation of the river flow. Notably, navigation through this critical area is interrupted for approximately 3 to 6 months every year.

An additional issue is the insufficient capacity of the Praha-Smíchov lock chamber; this is addressed by a project planned for 2018.

3.2.3. Capacity of Seaports and hinterland connections

The threshold of annual freight transhipment stipulated by the Regulation is exceeded by all OEM Corridor seaports. Capacity is a particularly prominent issue in the northern part of the Corridor. Several projects that include expansions and/or construction of terminals and additional facilities to accommodate growth in demand are expected to address the identified limited handling capacity at the Ports of Hamburg, Rostock and

Lemesos, as well as the Greek Ports of Piraeus, Thessaloniki, Patra, and Igoumenitsa. With regard to hinterland connections, capacity issues have been identified at the Ports of Bremen, Bremerhaven and Hamburg. At the Port of Hamburg, several projects address the upgrade of both road and rail port and hinterland infrastructure, while there is an intense investment on the Bremerhaven port's railway system. In Cyprus, new link roads are foreseen to relieve congestion and improve access to both of the Port of Lemesos' two terminals. Finally, hinterland connection bottlenecks at the Port of Thessaloniki are being addressed by related projects to improve both the last mile connections, as well as the road and rail network within the port zone itself. Planned works are expected to relieve most capacity issues; nevertheless, the completion of a number of projects is foreseen beyond 2030.

3.2.4. Road capacity

As a general rule, congested road sections are located in urban agglomerations due to the overlay of international, regional and local traffic flows. Capacity bottlenecks are observed along several OEM Corridor sections with a total length of about 500 km, out of which some 40% are saturated motorway sections located in Germany, Czech Republic, Austria, Hungary and Cyprus. The remaining single-carriageway congested sections are located in Czech Republic, Hungary and Bulgaria. Capacity issues are addressed by planned projects for the completion of ring-roads (Praha, Wien, Budapest, Sofia, and Lefkosia) and upgrading or construction of new motorway sections in Czech Republic (D1), Austria (A5), Hungary (M15), and Bulgaria (A3 Struma).

3.3. Analysis of potential market uptake / Modal Shift

The overall goal of the "analysis of modal shift potential" is to identify the potential of those modes which are most environmentally friendly, inland waterways, in particular.

Inland waterway transport is deemed to be reliable, energy efficient and- most of all – has the capacity for expansion. It is considered "greener" than other transport modes due to its relatively low energy consumption and noise emissions. It is also considered highly safe, especially in the context of dangerous goods transport. Specific attention must be paid to the last mile transport connections and the relevance of the nodes.

As it was originally shown in the 2014 OEM corridor study, the forecasted capacity of the 2030 railway network is limited and a shift towards rail would further exacerbate capacity problems. Also due to the expected compliant rail sections along OEM corridor, a certain shift from road to rail can be forecasted for 2030.

.In order to identify individual transport flows that, jointly hauled, could bring enough volume to operate a liner service between two (or more) inland terminals, a top-down approach has been employed to determine the multimodal market potential. The total potential for the OEM Corridor for three alternative scenarios for 2030 was estimated. These constitute the current road volumes that can be containerised and shifted to inland waterways (including pre- and end haulage) on the Elbe River and canal system.

Based on this analysis, a modal shift potential related to the OEM inland waterway network could be evidenced, that is supporting the transport market in Germany and the Czech Republic (The inland waterway network of the OEM Corridor where additional capacity is available is exclusively related to the Elbe, Weser and Vltava River and connecting canals. The inland waterway potential of the Danube River is referred in the analysis of the Rhine-Danube CNC that overlaps with the OEM Corridor). Here, a large potential is available, even in the case of the most efficient scenario for direct road transport, where the predicted modal shift ranges from 3.3 mln tonnes to 59.2 mln tonnes. In comparison, the current volume on the OEM IWW network is 18.7 mln tonnes.

4. The OEM CNC identified projects to be realised by 2030

Building on the outcome of the 2014 study, the original OEM CNC identified projects' list database structure was extended to include additional information, and the project list was subsequently updated during two extensive rounds of information collection in direct consultation with Member States, infrastructure managers and other involved stakeholders within the framework of the 2nd Phase of the study. The list contains ongoing and planned measures[9] such as studies, designs and works projects. The project list includes projects identified in the 2014 Work Plan, new projects stemming from the 2014 and 2015 CEF calls, as well as new projects submitted by national/regional stakeholders.

The project list compiled for the OEM forms the basis for the implementation of the Corridor by 2030. It depicts the way the Corridor is assumed to be developed in the future following the realisation of the on-going and planned projects in line with the provisions of Regulation 1315/2013, while also the extent to which identified projects contribute to the Corridor's objectives. The following summarise the main results of the evaluation of the OEM Corridor project list. Further actions required are addressed in Section 5.

4.1. Overview of the project list

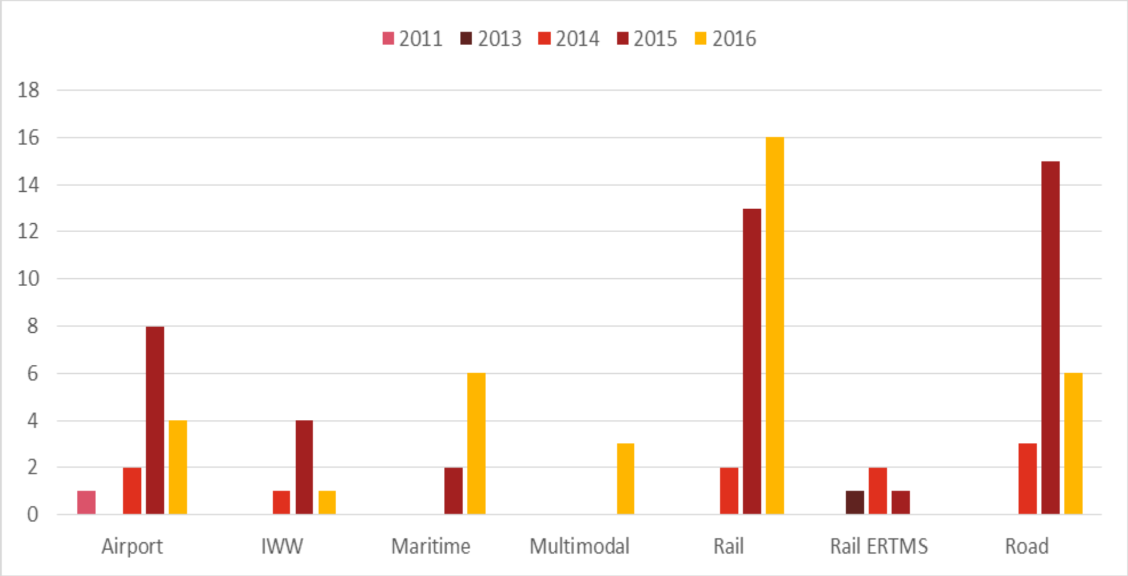
The OEM Corridor updated project list is composed of 415 projects, belonging to 9 countries and 9 different categories[10]. A significant share of the projects is to be found in Rail, Maritime and Road categories, with these three modes accounting for 75% of the total. Key figures are:

- 92 (48 OEM only) projects have been completed in 2014-2016
- 41 (14 OEM only) projects which are to be completed during 2017
- 212 (57 OEM only) on-going projects, with 53 started in 2016
- 209 (69 OEM only) projects (50%) with end date in 2016-2020
- 275 projects overlap with other Corridors
- Investments (between 2017 and 2030):
    - € 68 billion (cost information was made available for 376 projects).
    - € 30 billion for OEM only projects.

Accomplished projects on the OEM Corridor include all modal categories, as shown in Figure 3.

[9] Projects accomplished between 2014 and 2016 are provided in a separate list (see section 2).
[10] 139 projects are only part of the OEM CNC.

Figure 3: Accomplished projects on the OEM CNC



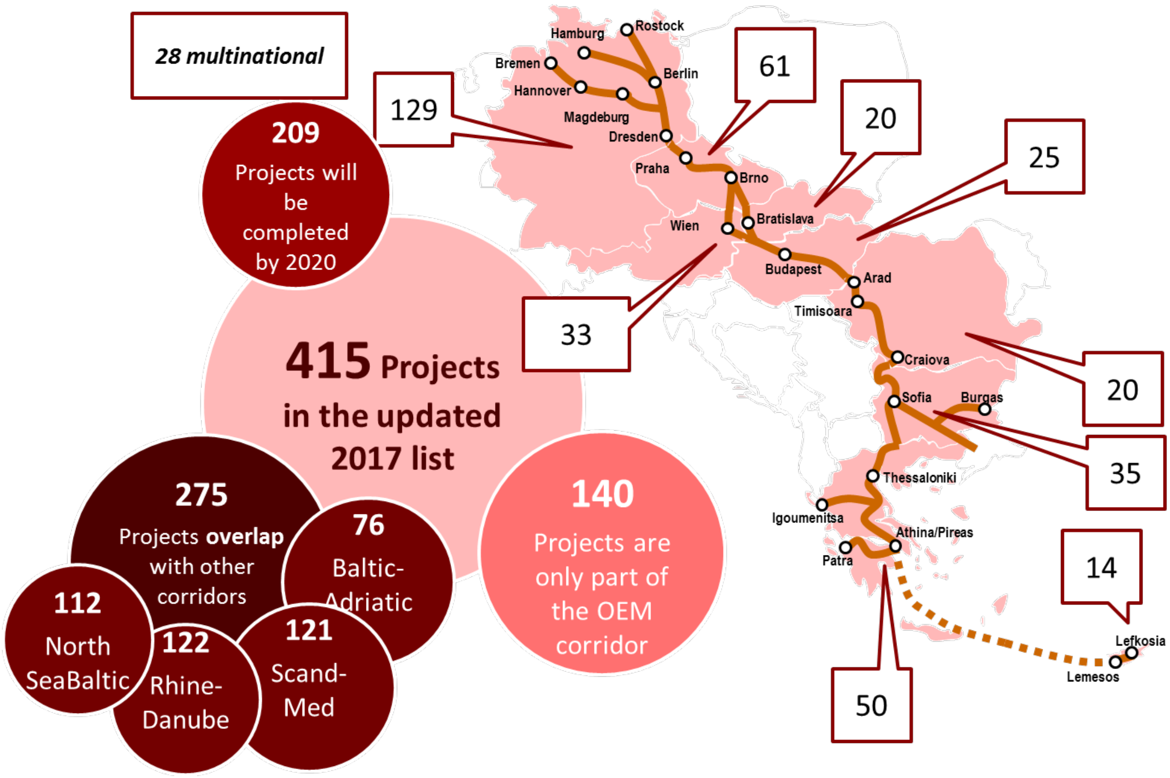
The relative majority of the projects will be deployed in Germany, which alone accounts for 129, roughly a third of the grand total. The Czech Republic, Greece and Bulgaria follow with 61, 50, and 35 projects, respectively.

The economic impact of the Corridor projects can be expressed in different forms, among which total cost is the first and more impactful one: **€ 68 billion** (sixty-eight billion Euro) is the estimated investment needed to perform all the works and studies, with 82% of the projects falling in a cost class ranging from €0-500M.

More specifically, 107 fall within the <€10M class category, 115 in the €10-50M class, 41 into the €50-100M range and 84 between €100 and €500M.

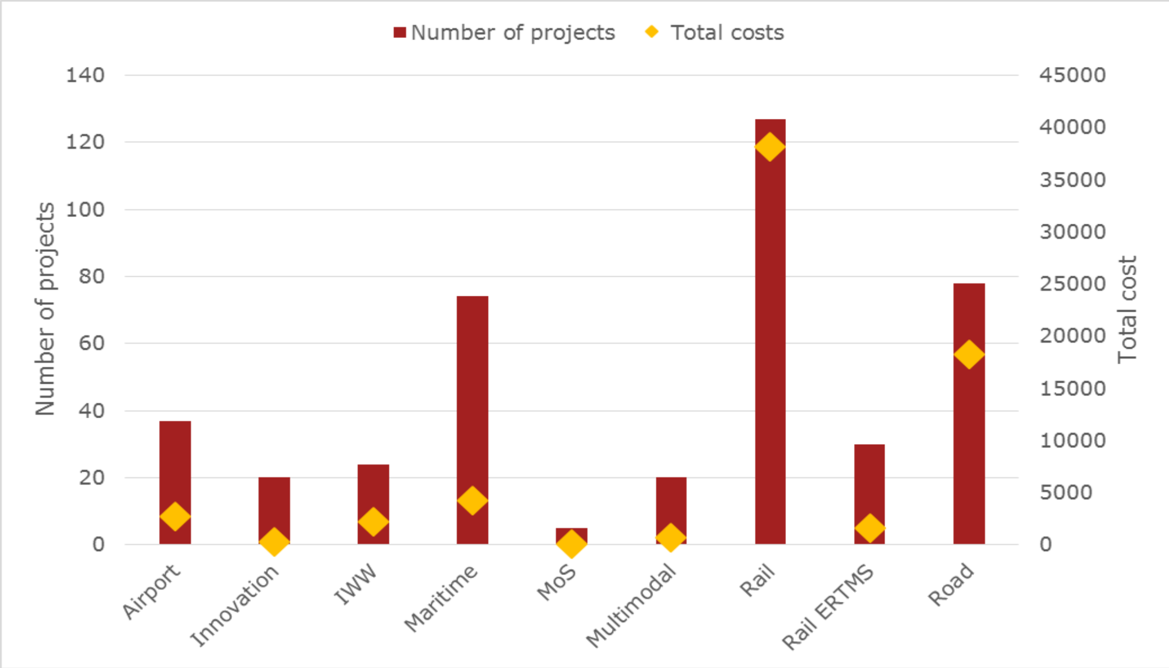
Figure 4, below gives an overview of the OEM CNC in terms of number of projects per Member State, overlapping projects with others CNCs and projects to be completed by 2020, while Figure 4 provides an overview per mode in terms of number and cost.

Figure 4a: Number of projects per Member State and overlaps



Source: OEM CNC study, May 2017

Figure 4b: OEM project list in terms of modal categories and total cost in million €



140 out of the overall 415 projects (33%) are located on the Orient East Med Corridor exclusively. Among those Corridors the OEM is sharing projects with;, the Rhine-Danube CNC is with 122 projects the most represented, followed by the Scandinavian Mediterranean with 121 projects.

74 Orient/East Med Corridor projects are related to a cross-border section. 28 projects were also marked as bilateral or multilateral projects.

59 projects refer to last-mile infrastructure between the Corridor lines and transhipment or interchange points (ports, terminals, airports, main stations). Urban nodes with particularly numerous last-mile projects are Hamburg (11 projects) and Bratislava (10 projects).

Finally, 166 OEM Corridor projects (40% of total) were identified to match the “pre-identified sections including projects”, list of the Regulation 1316/2013 Annex I, Part I. These pre-identified CEF projects constitute mainly rail, waterway and multimodal projects: 113 are allocated to Rail and Rail ERTMS category, followed by Road and Maritime.

The project list dated June 2017 is available under the following link: https://ec.europa.eu/transport/sites/transport/files/oem_project_list.pdf

4.2. Analysis per transport mode

4.2.1. Rail and Rail -Road Terminal development

There are 127 rail projects and 30 Rail ERTMS projects on the list, representing 38% of the grand-total. A high number of rail projects belong to Germany (26), Greece (23), Bulgaria (21), the Czech Republic (19), Slovakia (14), while Austria has 12, Romania 8 and Hungary 4. Regarding the 30 Rail ERTMS projects, 5 belong to Austria 4 to Hungary, 4 to Czech Republic, 3 to Greece, 2 to Germany, while Slovakia and Bulgaria follow with 1 project each. 10 projects are multi-country.

The total cost of the above projects is € 39.7 billion (out of which € 38.1 bln for rail and € 1.7 billion for Rail ERTMS); however, it should be noted that information on cost is available for only 143 out of 157 projects. 58 Rail and Rail ERTMS projects belong solely to the OEM Corridor (not overlapping with other Corridors) of a total cost of € 18.5 billion (47% of OEM relevant Rail and Rail ERTMS projects).

The majority of the Rail and Rail ERTMS projects, 83 projects (53% of total), shall be finalised before the end of 2020, while 47 projects (30%) are expected to be finalised by 2030. The remaining 26 (17%) projects either have unknown implementation schedule or are planned for after 2030.

There are 93 rail projects and 20 Rail ERTMS projects on pre-identified CEF sections, the majority located in Bulgaria (21 Rail and 1 Rail ERTMS), Czech Republic (16 Rail and 3 Rail ERTMS), Greece (17 Rail and 3 Rail ERTMS), Slovakia (11 Rail projects and 1 Rail ERTMS), and Austria (11 Rail and 5 Rail ERTMS). Germany follows with 5 Rail and 1 Rail ERTMS, Hungary with 4 Rail projects and 3 Rail ERTMS projects, and lastly Romania with 8 Rail projects.

55% of the Rail and Rail ERTMS projects regard rehabilitation and upgrade infrastructure works, while 33% relate to works which include new construction of infrastructure, including land acquisition and infrastructure works for increasing design speed, achievement of GC loading gauge, improvement of safety and installation of electronic rail control centres, ETCS and GSM-R (mainly in Bulgaria and for the high speed lines in Germany and Czech Republic).

Regarding the RRT projects, out of a total of 20 projects estimated to account for € 671 mil, 5 projects are exclusive OEM projects (estimated cost € 40.9 mil – 6% of total OEM relevant RRT projects), and are not shared with other CNC's.

4.2.2. ERTMS deployment

On 5 January 2017, the European Commission adopted the Implementing Regulation (EU) 2017/6 on European Rail Traffic Management System European Deployment Plan (ERTMS EDP) that replaces the old deployment plan of 2009. The reviewed ERTMS EDP adapts the geographical scope of deployment to the TEN-T Regulation, and sets new targets for ERTMS deployment on CNC's until 2023. These target dates are firm commitments made by Member States and Infrastructure Managers during the consultation and negotiations, led by Mr Karel Vinck, European ERTMS Coordinator, between 2014 and 2016.

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

The deployment of an interoperable Single European Rail Area has faced numerous barriers by implementing ERTMS over the last 10 years. In order to streamline its implementation, an ERTMS Deployment Action Plan, has been adopted and published as a Commission Staff Working Document on 14 November 2017. It defines the actions to remove all identified obstacles with the responsible parties in the frame of well-defined timelines. This Action Plan setting out the targets is the last step in a thorough analysis of the ERTMS deployment in the European Union, followed by detailed negotiations with the Member States and the Rail Sector, including their commitment in terms of actions and execution times.

4.2.3. IWW and Inland Ports development

There are 24 projects representing a mere 6% of the total. Their total cost amounts to € 2.211 bln, i.e 3.2% of the total (figure excluding costs for 2 projects). 19 projects belong solely to the OEM Corridor, with a total cost of €1.975 bln. Fifteen of these projects are located solely in Czech Republic (all OEM), 5 in Germany (4 OEM) and 1 in

Hungary (R-D CNC). The remaining 3 projects concern multiple countries and are assigned to the R-D Corridor, whereby two projects concern RIS deployment and involve all countries crossed by the EU inland waterway. Most projects (13/8 OEM) are expected to be completed by the end of 2020, ten (all OEM) by 2030, while for one OEM project, the end date is unknown.

The majority of projects (13) involve infrastructure works and upgrades. The remaining 11 are divided between 5 on new construction works and 4 studies concerning potential future expansions of inland waterways and ports. The other two projects concern infrastructure rehabilitation and traffic control of waterways.

4.2.4. Maritime Ports and MoS development

74 maritime projects have been recorded, accounting for 18% of the sum. The vast majority belongs to Germany, with 47 projects assigned to the North-Sea Baltic and Scandinavian Mediterranean CNCs. The remaining 27 belong only to the OEM Corridor, and include those submitted by Greece (15), Bulgaria (6) and Cyprus (6).

Their total cost amounts to approximately € 4.259 bln (€1.154 bln for pure OEM projects), the latter figure excluding 6 projects (none pure OEM), for which no information on cost was available. Over a third of the total (38%-12 OEM only) is expected to be completed by 2020, whereas a similar share (36%-8 OEM only) is expected to be completed by 2030. Only 5 projects (1 OEM only) are expected to be completed after 2030 (7%). For a significant share (19% / 14 projects-6 OEM only), completion dates are unknown to present. Finally, 14 projects (all OEM only) refer to pre-identified CEF sections / CEF projects.

The majority of projects relate to works developing port infrastructure and terminals to improve capacity, including dredging works and maintenance activities to improve accessibility and navigability, followed by those targeted at the improvement of road and rail connections, both last mile and within port zones. Fewer projects are related to the deployment of various types of ITS, e-maritime and telematics services and the provision of alternative fuels facilities.

In addition, 5 MoS projects will be implemented with a total cost of € 128.2M, out of which 2 belong solely to the OEM with a total cost of €54.8 mln. All MoS projects are expected to be completed by 2020, with the exception of one (Scan-Med), for which the completion date is unknown. OEM MoS projects deal with the adoption of LNG clean fuel at ports and the introduction of onshore power supply as propulsion alternative for ships.

In parallel to my work programme, Brian Simpson, the European Coordinator for Motorways of the Sea, delivered the second version of the Motorways of the Sea (MoS) Detailed Implementation Plan (DIP). The document, following extensive consultations with stakeholders and Member States, presents a number of recommendations to shape the MoS programme of tomorrow in close coordination with other European Coordinators.

The DIP singles out the key three future development priorities:

- Environment
- Integration of maritime transport in the logistic chain
- Safety, Traffic Management and Human Element.

The MoS work programme is instrumental in identifying future TEN-T maritime policy objectives and clarifies the main areas that would require EU financial contribution in order to help the maritime industry improve its environmental and safety performance.

It also includes a number of suggestions with the objective to contribute to the increased efficiency of the logistic chain within the 9 Core Network Corridors by pointing out to gaps in terms of maritime links.

Brian Simpson's work programme comprises also a set of recommendations defining possible future funding objectives with regard to the maritime dimension of the TEN-T policy, paying particular attention to future trends in Short Sea Shipping in Europe and the crucial MoS contribution to better connectivity with peripheral and outermost regions.

The document is supported by a full set of data on ports characteristics, which are an integral part of the TEN-TEC database (September 2017- the data has not been yet approved by MS), while a detailed analysis on ports and shipping operations with regard to all 331 seaports included in the TEN-T core and comprehensive network is provided in an annex.

The document makes an effort to characterize the main bottlenecks and investment needs in the Comprehensive Network of ports as well as point out the main inadequacies of the current network of MoS links.

4.2.5. Road Transport and ITS development

The identified 79 road projects, out of which 27 belong solely to the OEM, account for € 18.3 billion in total. The estimated investments for pure OEM projects are € 8.66 billion, or some 28% of the total estimated Corridor investment needs. Three of these projects miss cost estimation. The majority of road projects (54%) are planned to be completed by 2020. The remaining 30 projects, for which the estimated completion date is known, are expected to be implemented by 2030. The relative share of pure OEM projects that are planned to be completed by 2020 is somewhat lower at 48% (13 projects out of 27).

Out of the total, the number of studies is merely 13 (3 for OEM only), while 7 (2 for OEM only) projects include both studies and works. Deployment of ITS is the subject of 11 projects: in Austria, Bulgaria, Cyprus, Czech Republic, Germany, Hungary and Slovakia. None of these ITS projects refer only to the OEM. There are 3 projects in total for the deployment of alternative fuels in Cyprus, Czech Republic and Hungary, respectively. The highest number of projects (20 joint and 13 OEM only) relate to new construction only, out of which 11 (6 OEM) projects are for constructing new motorway sections, as follows: 2 projects in Austria (none OEM only), 1 in Bulgaria, 1 in Cyprus, 3 in Germany (none OEM only) and 4 in Greece. Remaining projects regard rehabilitation or upgrade works or a combination of rehabilitation, upgrade and new construction works.

4.2.6. Airports

There are 37 airport projects on the list (8 OEM only), representing 9% of the grand-total. The vast majority of them belong to Germany, which accounts for 25 projects (none OEM only), followed by Hungary (5/2 OEM) and the Czech Republic (4 OEM only). Austria, Cyprus, Greece and Romania have submitted one project each, with the one of Austria belonging to the Baltic-Adriatic Corridor. An additional project at Larnaca Airport (Cyprus) is counted under "Multimodal" projects. The total cost of the projects is €2.75 bln (€733 mln for OEM only), with information on cost available for 30 projects. Four of the projects are located on a pre-identified CEF section (3 OEM only) or represent a pre-identified CEF project and 7 (5 OEM only) serve last mile connections.

4.2.7. Innovation

The category termed “innovation” includes those projects with innovation components. Notably, the innovation projects related to infrastructure (e.g. ERTMS installation, or an upgrade of a railway station) might also be found in the category of the related transport mode. Their scope of work has been classified in three categories: “Alternative fuels”, “Telematics application” and “Sustainable freight transport services”. As a result, 22% (92) of the overall OEM projects have been identified as projects with innovation components, with 17 of them only being part of the OEM Corridor. 52 (10 OEM only) of these, or 57% of the total, are related to Telematics applications, such as ERTMS and ITS among several others. The Alternative Fuels category is the second largest of the cluster with 19 projects (3 OEM only).

A brief analysis of the projects with innovative components highlighted the following:

- Out of 52 projects related to Telematic applications, 5 are related to ERTMS implementation
- The remaining 47 projects include ITS (road), RIS (IWW), SESAR (airport) or other telematics applications, except ERTMS;
- 23 out of these 47 are related to road transport,
- 5 are RIS projects under IWW projects,
- 3 (SESAR, ITS and other telematics application) are under airport projects.

Articles 3, 32 and 33 of the TEN-T regulation define innovation elements such as: “telematics applications (except ERTMS), sustainable freight transport services and new technologies and innovation”. Therefore, since such projects include one or more transport modes (rail, IWW, road, etc.), only 20 projects are classified in the category “innovation” in the project list (5 of these are only part of the OEM Corridor), including among other:

- 5 Alternative fuel projects
- 8 Telematics applications (ITS) projects
- 3 Other telematics applications projects

Although no KPIs have been defined for these projects, they are considered to have an impact on the capacity increase of the respective mode, as well as the reduction of GHG emissions and enhancement of multimodality. A larger number of projects are allocated to more CNCs than solely the Orient East Med Corridor; they are often grouped under common project category.

4.3. Urban Nodes roles in the CNC

Fifteen (15) Core Urban Nodes are identified by Regulation No.1315/2013, Annex II along the Orient/East Med Corridor, namely Hamburg, Bremen, Hannover, Berlin, Leipzig(-Halle) (DE), Praha (CZ), Bratislava (SK), Wien (AT), Budapest (HU), Timisoara (RO), Sofia (BG), Thessaloniki, Athina, Heraklion (EL), and Lefkosia (CY). OEM nodes of Germany, Czech Republic, Slovakia, Austria, Hungary and Romania are also multi-modal connecting points with other CNCs.

Apart from being the main generators of traffic flows along of the OEM Corridor, they essentially constitute hubs for the interconnections between the Corridor’s different transport modes for both passengers and freight, and, consequently, their critical importance lies in their ability to foster intermodality, one of the key CNC objectives. Notably, within their wider urban region, a number of the OEM Corridor’s key core nodes/access points, that is, 7 maritime/inland ports, 14 rail/road (and 6 tri-modal terminals) and 14 airports, are connected among themselves, as well as to the urban/regional network and the other CNCs.

The OEM Road Corridor transits the majority of the 15 urban core nodes with the exception of Praha and Thessaloniki, but OEM road traffic can also by-pass the urban conglomeration in the German urban nodes, Budapest, Sofia, Thessaloniki and Athina. The construction of by-pass road arteries is either on-going or planned for Praha, Bratislava, Wien, Timisoara and Lefkosia and, once completed, an uninterrupted flow would be achieved along the Corridor by-passing congested urban/local roads of densely populated areas. OEM rail arteries transit all urban nodes, where railway infrastructure exists, while these can also by-pass the nodes of Hamburg, Bremen, Hannover, Berlin, Thessaloniki and Athina. For the remaining urban nodes, the missing by-passing rail lines could be characterised as a bottleneck.

Some of the total 183 on-going and planned projects identified within the boundaries of the 15 urban nodes (NUTS3) are expected to address non-compliant parameters of urban rail sections as well as increase line capacity; in certain cases, lower max speed and train length are not deemed problematic by national infrastructure managers.

Pertaining physical/ technical urban bottlenecks that must be alleviated relate mainly to last-mile connections:

- missing motorway / express road connection to the Praha Uhříněves RRT;
- insufficient capacity of the Budapest airport-city centre road link;
- exhausted capacity and inappropriate location of existing RRT in Sofia;
- need for modernizing the Sofia railway node and the Sofia – Pernik railway line;
- last-mile connections of rail, seaport and airport nodes only possible through congested urban arteries in Thessaloniki.
- Exhausted road capacity for the southern entrance of Lefkosia.

In light of the above and from a TEN -T infrastructure perspective, it can be assumed that upon completion of the works, OEM Corridor lines within the respective urban boundaries will be in their majority compliant, while the urban nodes' fabric structure will allow for the integration and seamless connection of the OEM long distance traffic with the urban leg of TEN-T journeys. The latter, together with the implementation of efficient last-mile connections will reinforce the urban node's multimodal dimension and contribute to the full development and functioning of the OEM Corridor by enhancing intermodality, safeguarding a seamless intermodal transport along the OEM supply chain and also create potential for modal shift.

Finally, congestion in the urban nodes areas that influences negatively the performance of the long-distance services and traffic safety requires further attention. Without doubt, TEN-T Corridor objectives must be linked to those of sustainable urban mobility planning, in line with European policies in the area of urban transport (i.e. 2013 Urban Mobility Package) aimed at creating a culture for clean urban mobility. Hence, the development of OEM urban nodes must coordinate with related Sustainable Urban Mobility Plans (SUMPs), clean low-emission transport measures, deployment of innovative Intelligent Transport System solutions, etc. In the case of Cyprus, a SUMP was prepared in 2010 for Lefkosia City and the proposed actions are underway. For Lemesos City, the plan is under preparation

There is appropriate coverage of LPG/CNG refuelling stations in OEM urban nodes for road transport while a sufficient number of electric recharging stations are available in all nodes. The supply of alternative fuels infrastructure is problematic for maritime and inland ports located within urban nodes. In addition, a number of ITS and telematics applications projects have been submitted, the majority concerning the road sector and include certain urban nodes (i.e. CROCODILE 2.0, C-Roads platforms).

Finally, OEM Corridor issues' links with SUMPs, including innovative technologies and soft measures to promote shift to public transport and lower emission transport modes, is an area that should be further explored, underpinned by cooperation among national authorities and relevant regional/local planners, as well as Member States.

5. Future Challenges

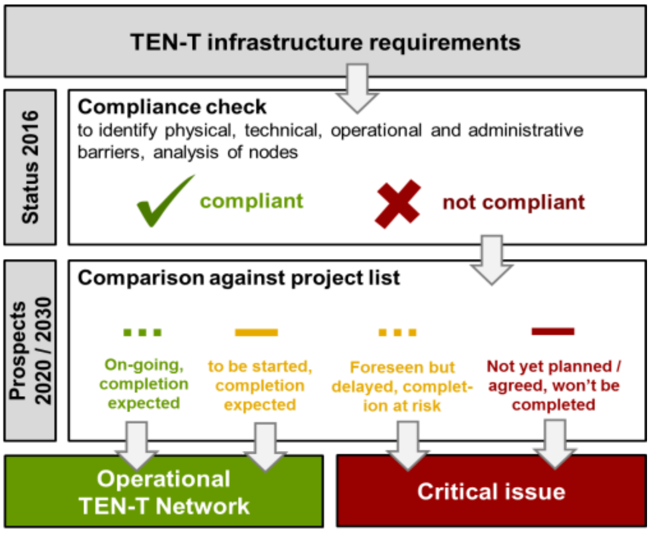
5.1. How do we identify the Critical Issues of Corridor development

The analyses performed in both phases of the OEM Corridor Study (2014 & 2015-2017) entailed a combination of the Multimodal Transport Market Study and the compliance check of the Corridor's technical parameters with the standards set by the Regulation No.1315/2013, in order to identify bottlenecks that could hamper the operational efficiency and functionality of the Corridor. These were subsequently compared against the list of on-going and planned infrastructure projects, assessed accordingly in terms of their ability to:

1. Address technical non-compliance and alleviate other identified critical bottlenecks
2. Fill in missing links/infrastructure gaps
3. Contribute to the realisation of the principles and general objectives of the Corridor/TEN-T Network, as set out in Regulation 1315/2013 (*Cohesion*, *Efficiency*, *Sustainability* and increasing the *Benefits for its Users*), as well as a number of specific objectives tailored to reflect the specificities of the OEM Corridor.

The adopted approach, as depicted in Figure 6, leads to the identification of persisting bottlenecks and remaining infrastructure gaps-*Critical Issues*- that were either not or insufficiently addressed (due to unknown timelines/lack of agreement and/or finance securisation) by any project submitted in accordance with information known until the end of 2016.

Figure 6: Approach for the analysis of CNC identified projects



Source: Viadonau, Study on Rhine-Danube CNC, May 2017

5.2. Persisting bottlenecks

The list of on-going and planned infrastructure projects defines the prospects for the compliance with Regulation 1315/2013 and the alleviation of other identified key barriers related to cross-border sections, interoperability, intermodality as well as administrative and operational barriers. This section highlights the remaining non-compliant sections and nodes, and attention is drawn towards persisting bottlenecks to the implementation of a fully compliant and functional OEM Corridor by 2030, for which further actions would be required.

The assumed progress of Corridor development is presented in selected maps for the OEM rail and IWW infrastructure, together with an analysis of the persisting gaps per transport mode.

5.2.1. Persisting Gaps in Rail & RRTs including ERTMS

The investment projects for Rail and Rail-Road Terminals are expected to address the majority of existing bottlenecks in the OEM rail network by 2030. Modernisation works to reach the TEN-T standards are on-going along main parts of the Corridor; major development projects are concentrated on the northern section of the Corridor and Bulgaria, addressing capacity issues as well as studies and projects for high speed lines, while in the south, and more specifically Romania, on-going projects are mainly studies, while works are planned after 2020 and are still lacking secured financing.

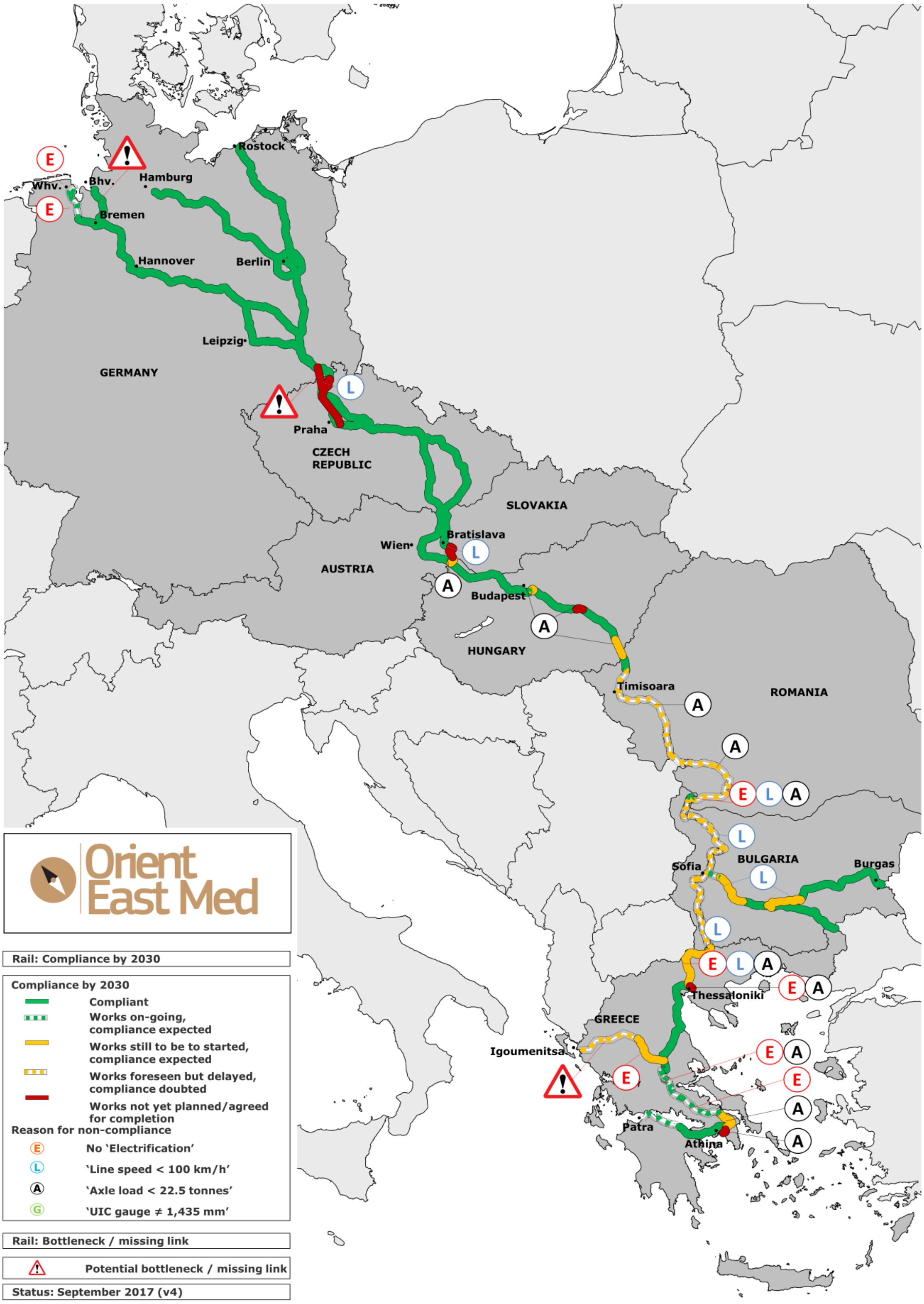
Nevertheless, there are still certain critical bottlenecks that will not be alleviated before 2030, particularly with regard to the technical non-compliance of certain sections in Bulgaria, Czech Republic and Romania. A minor share of the projects though, does not have an indicated timing, thus, creating an element of uncertainty.

Out of the 204 total non-compliant Corridor sections (in total 5,393 km), 61 sections (equalling 2,396 km) are covered by 157 studies and works projects, addressing at least one of the non-compliant parameters. Taking into account the list of on-going or planned Corridor projects to be implemented until 2030, a significant part (828 km) of the rail network in 6 of the related Member States will still be non-compliant by 2030, mainly due to the parameters of train length and ERTMS deployment (782 km). Regarding the remaining parameters (axle load, speed and electrification), the following key OEM CNC rail sections (389 km) are not yet addressed in national masterplans expected to remain non-compliant by 2030:

- Děčín – Ústí n. Labem Střekov (Speed)
- Petržalka – Rajka (Speed)
- Pireas (passengers port) – R.S Athens (Axle load)

As the German Federal Transport Infrastructure Plan 2030 (FTIP) has identified a High-Speed-Line Dresden - Ústí nad Labem – Praha (DE/CZ, 140 km) as economically viable, this section has become a first priority project in the national extension act and the requirement plan. However due to the comprehensive necessary preparatory works it is expected not to be operable in 2030. Anyway a Memorandum of Understanding (MoU) between the CZ and GER ministries of Transport has already been signed in August 2017.

Figure 5: OEM rail compliance map for 2030 (as per end of September 2017[11])



[11] The compliance map has been modified in comparison with the map presented in June 2016 due to the following reasons: (1) change in compliance for the Hungarian section Budapest-Cegléd regarding the axle load parameter (2) Bulgarian section Sofia – Elin Pelin is currently under modernization (ID 4021), section Septemvri – Plovdiv – Svilengrad is finalized/compliant (except ongoing works on Plovdiv – RP Krumovo, ID 4516). Works on Plovdiv Southeast – Skutare – Mihaylovo (ID 4516, 4218) are ongoing. Other parts of the rehabilitated Plovdiv - Burgas railway line are completed. (3) Greek section Pireas - Tris Gefyres - SKA is deemed to become compliant (ID 4309, 4317).and according to 2017 OSE network statement

The updated overview of the OEM railway Corridor identified the following **critical cross-border sections**:

The existing Dresden – Praha rail line (DE-CZ) is already highly used. Several studies for pre-planning services for the new high-speed rail line between Dresden and Praha have been conducted in the last years by joint action of Saxony and Czech Republic. In April 2016, a European grouping of territorial cooperation (EGTC) has been founded by Saxony, Czech Republic and adjacent districts in order to promote the planning. In the German Federal Transport Plan 2030 (BVWP 2030), the project is still listed under the category 'potentially required measure', but is expected to be upgraded within the next months.

In addition, immediate measures are required for the problematic long section Békéscsaba – Thessaloniki (HU-RO-BG-EL).

By 2030, the most notable improvements for the OEM rail network include the electrification and axle load KPIs almost reaching 100%, whereas large absolute increases are expected in the ERTMS implementation, from 13% to 71%, and 740 m train length, from 50% to 74%.

Table 12: Compliance of rail and RRT parameters 2016 and 2030 prospects

#	Mode	KPI	2016	2030 prospect
1	Rail network[12]	Electrification	89%	98%
2		Track gauge 1435mm	100%	100%
3		ERTMS implementation	13%	71%
4		Freight Rail Line speed ≥ 100 km/h	78%	87%
5		Axle load ≥ 22.5t	82%	98%
6		Train length ≥ 740m	50%	74%
7	Rail Road Terminals (RRT)[13]	Capability for Intermodal (unitised) transhipment	79%	88%
8		740m train terminal accessibility	25%	38%
9		Electrified train terminal accessibility	46%	54%
10		Availability of ≥ + freight terminal open to all operators in a non-discriminatory way and application of transparent charges	71%	79%

ERTMS deployment is at an advanced stage in the middle of the OEM axis, whereas in the German and Bulgarian/Romanian part, it is lagging behind. Greece has been heavily investing in its Corridor section for many years and might be able to complete ERTMS, concerning the existing lines of its corridor sections, by 2025.

Detailed actions on how to accelerate ERTMS equipment implementation along the CNCs are described in the separate European Deployment Plan by the European ERTMS Coordinator.

[12] Calculation is based on distances of operated sections and might in future slightly deviate.
[13] This compilation does not consider the still non-existing RRT of Patra (EL).

Table 13: Non-compliant rail sections by 2030

State	From	To	Length (km)	Non-compliant parameter
DE	Major part of DE rail network along OEM		1330	ERTMS
CZ	Entire CZ rail network along OEM		798	Train length
SK	Entire SK rail network along OEM		103	Train length
SK	Bratislava Petržalka	Rajka SK/HU	13	Line speed
HU				
	Szolnok	stationl	7	Axle Load
	Budapest Kelenföld	Hegyeshalom	176	ERTMS update
RO	Arad	Craiova	443	ERTMS, Axle load, Train length
	Craiova	Rac. Golenti	101	Electrification, ERTMS, Axle load, Train length
	Rac. Golenți	New Europe Bridge RO/BG	3	ERTMS
BG	New Europe Bridge RO/BG	Vidin	13	ERTMS (installed, not operated)
	Vidin	Sofia	267	ERTMS, Train length, Operating speed
	Sofia	Kulata BG/EL	209	ERTMS, Train length, Operating speed
EL	Kulata / Promahonas	Thessaloniki	136	Single track section*
	R.S Atens	Pireas (Passengers port)	9,7	Axle load

** Single track section might form a capacity bottleneck, but is compliant with TEN-T regulation.*

Table 14: Non-compliant Rail/Road terminals by 2030

State	Terminal	Non-compliant parameter
DE	Bremen	740m train terminal accessibility
	Hannover	Electrification and 740m train terminal accessibility
	Braunschweig	
	Magdeburg	
	Rostock	
CZ	Děčín	Electrification
	Mělník	Electrification and 740m train terminal accessibility
	Praha-Uhříněves	740m train terminal accessibility Availability open to all operators in a non-discriminatory way and application of transparent charges
	Pardubice	Electrification and 740m train terminal accessibility Availability open to all operators in a non-discriminatory way and application of transparent charges
	Přerov	New terminal planned to be built
SK	Bratislava	Electrification and 740m train terminal accessibility
RO	Timişoara	New terminals planned to be built to replace existing ones
	Craiova	
BG	Sofia	740m train terminal accessibility. Availability open to all operators in a non-discriminatory way and application of transparent charges
EL	Thessaloniki Old Freight Station	740m train terminal accessibility

5.2.2. Persisting Gaps in IWW & Inland Ports including RIS Deployment

For 2030, it must be expected that certain parts of the OEM IWW network will still fail to meet the Corridor objectives, as shown in the following table.

Table 15: Non-compliant IWW sections by 2030

State	From	To	Length (km)	Non-compliant parameter
CZ	Ústí nad Labem	Mělník	71	Minimum draught
	Mělník	Týnec nad Labem	97	>2,5m
	Týnec nad Labem	**Pardubice**	**32**	**RIS deployment**
DE	Lübeck (Elbe-Lübeck-Kanal)	Lauenburg (Elbe-Lübeck-Kanal)	68	Minimum underpass height
	Lauenburg	Wittenberge	115	Minimum draught
	Wittenberge	Magdeburg	116	Minimum draught >2.5m
	Magdeburg	Schmilka (DE/CZ border)	332	Minimum draught >2.5m

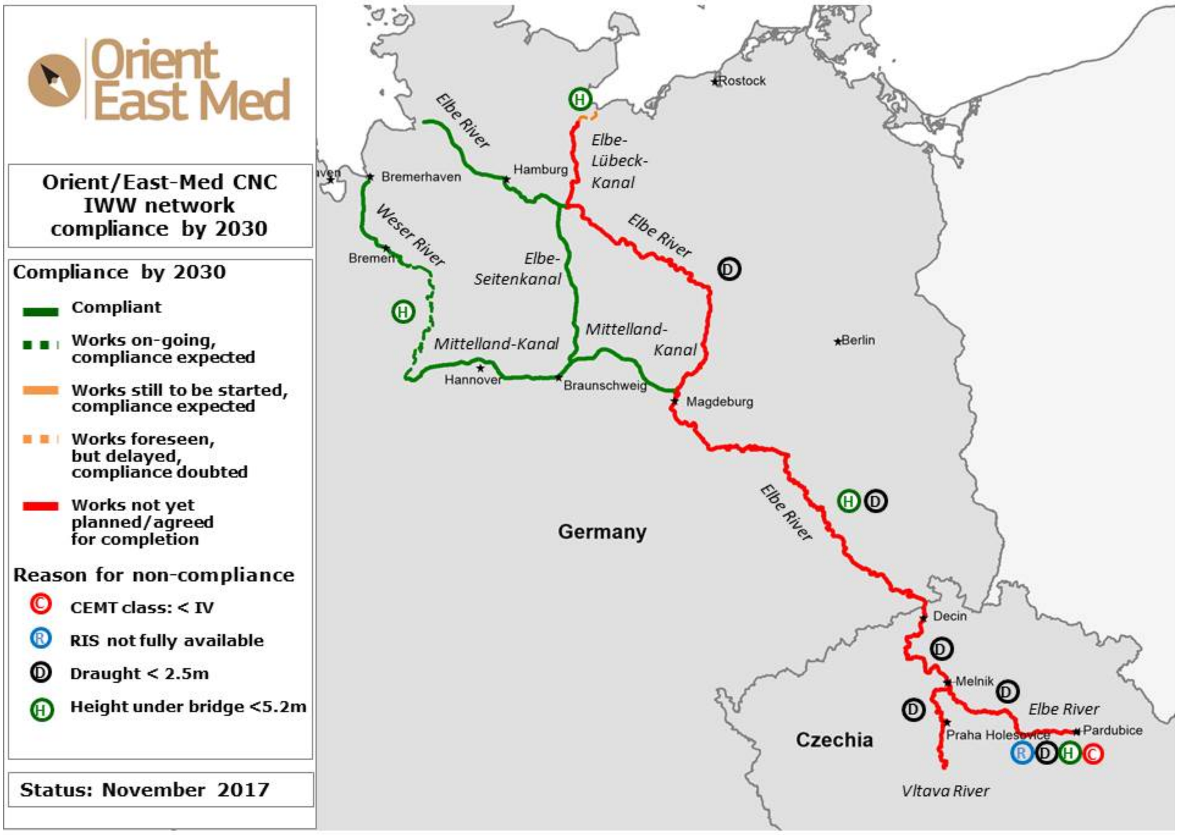
It must be noted, that only the RIS deployment is a TEN-T requirement, while minimum draught and minimum underpass height are sub-criteria of the CEMT IV requirement, which might be exempted due to local conditions according to CEMT resolution. According to the conclusions of the Bonn meeting of September 2017, the minimum draught requirement of 2.5 m will not be met by 2030. Efforts from the German inland waterway authorities will continue through the overall strategy for the

Elbe (Gesamtkonzept Elbe "GKE")[14], aiming to achieve a minimum draught of 1,4m during 345days/year

Furthermore, the IWW sections mentioned in Table 16 will not meet additional criteria related to the CEMT category IV by 2030; however, no interventions are considered to be needed:

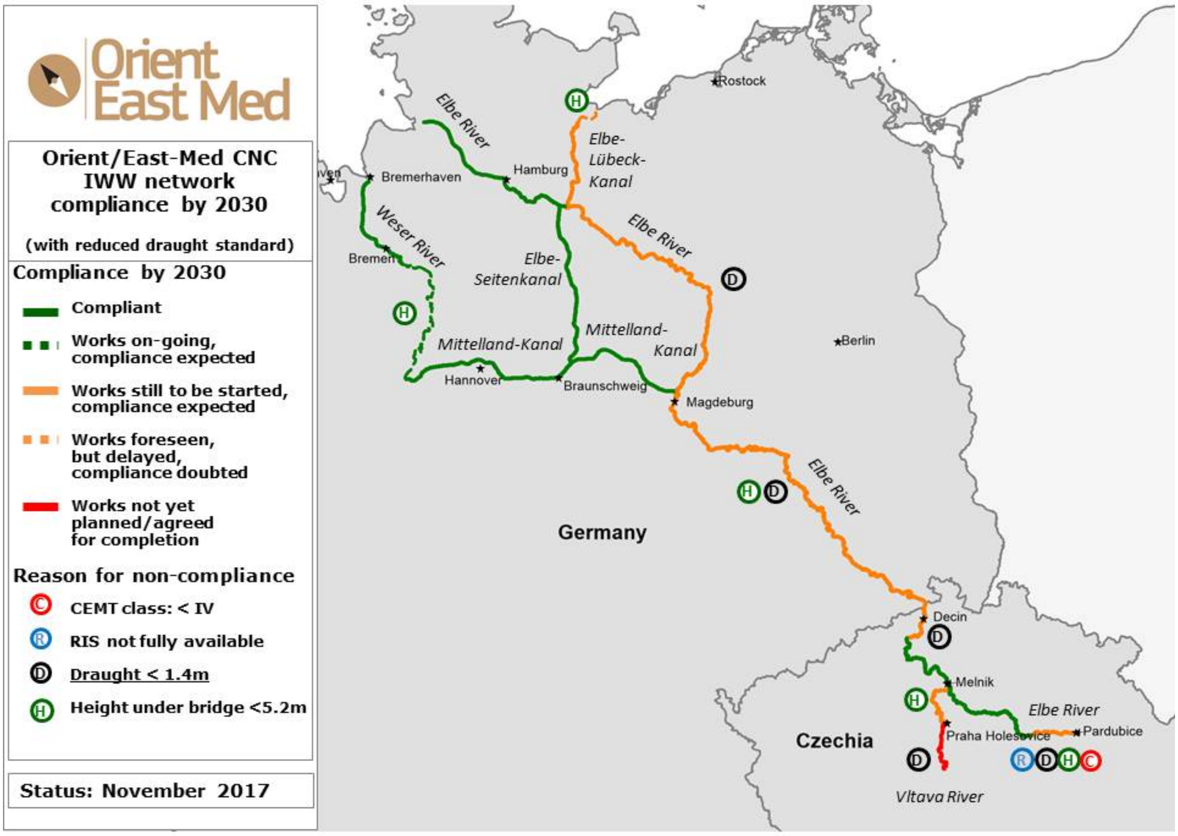
- The Czech sections DE/CZ border - Ústí nad Labem (39 km), Týnec nad Labem – Pardubice of the Elbe (32 km), as well as the entire navigable Vltava River, Třebenice – Mělník (94 km), are not compliant in terms of minimum draught: there are projects scheduled to increase draught on these sections, but not up to 2.5 metres.
- The German Elbe section Magdeburg – Schmilka (332 km) is not compliant in terms of underpass height because of three historic road bridges in Dresden: Interventions are not proposed, as this section is not compliant only in the case of highest navigable water level; at normal water level, the minimum required height of 5.25m is preserved.

Figure 8: Compliance Map 2030 of the OEM IWW network



14 Bundesministerium für Verkehr und digitale Infrastruktur / Bundesministerium für Umwelt, Naturschutz, Bau und Reaktorsicherheit (2017): Gesamtkonzept Elbe - Strategisches Konzept für die Entwicklung der deutschen Binnenelbe und ihrer Auen, 17 Januar 2017, http://www.gesamtkonzept-elbe.bund.de

Figure 9: Compliance Map 2030 of the OEM IWW network with respect to reduced draught targets (*Gesamtkonzept Elbe*)



The core inland port of Praha-Holešovice is deemed to be out of operation for freight handling and, thus, the location of the Praha core port might be re-defined. Based on the known projects, this situation will not significantly change in 2030. The full operation of the yet unbuilt Pardubice port by 2030 is doubted.

Table 16: Non-compliant IWW ports by 2030

State	IWW Port	Non-compliant parameter
CZ	Praha-Holešovice	Connection with rail Availability of alternative fuels Availability of at least one terminal open to all operators in a non-discriminatory way and application of transparent charges
	Pardubice	Full operation of port doubted (all parameters non-compliant)
	Děčín, Mělník	Availability of alternative fuels
DE	Hamburg, Bremerhaven, Bremen	Availability of alternative fuels
	Hannover, Braunschweig, Magdeburg	Availability of alternative fuels

Table 17: Compliance of IWW and Inland port related parameters 2016 and 2030 prospects

#	Mode	KPI	2016	2030 prospect
11	Inland waterway network	CEMT requirements for class IV IWW	98%	100%
12		Permissible Draught (min 2.5m)	40%	51%
13		Permissible Height under bridges (min. 5.25m)	60%	76%
14		RIS implementation (% of km on which the minimum requirements set out by the RIS directive are met)	98%	98%
15	Inland ports	Class IV waterway connection	100%	100%
16		Connection to rail	89%	90%
17		Availability of clean fuels	0%	0%
18		Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	89%	90%

NB: The KPI values only consider existing ports

This all indicates that there is a need to support the perspectives that ongoing digitalisation will increase inland waterway transport volumes on the Elbe River. The whole Elbe corridor provides optimal framework conditions as research area and a field laboratory for digital solutions.

5.2.3. Persisting Gaps in Maritime Ports & MoS

The integration of the 12 seaports into the OEM Corridor is vital for achieving the optimisation of the multimodal transport chain, as well as creating opportunities for modal shift towards more environmentally friendly modes along the Corridor. OEM ports are and will be facing to a varying degree several challenges, such as congestion, problematic or non-existent hinterland connections, delays due to administrative burdens, pollution, growing need for more advanced applications and systems, etc.

Key persisting bottlenecks for OEM seaports are mainly related to intermodality, and, more specifically, the existence and/or efficient operation of the ports' rail hinterland connections that will ensure the seamless intermodal transport along the supply chain of the Corridor. The rail connection of the Port of Igoumenitsa, is considered within the missing link of the western extension of the railway network of Greece (Igoumenitsa-Ioannina-Kalambaka). The latter is addressed by two projects, the completion of the required studies and the construction of works, albeit with no secured financing and estimated completion date for the works, year 2030.

Moreover, although all Corridor ports require the provision of alternative clean fuels' facilities, a substantial progress is mainly observed in the Northern OEM Ports, and more specifically, the German Ports of Hamburg, Bremen and Rostock. In Germany, a first LNG-powered hopper barge is expected to commence operation between the Ports of Bremerhaven and Bremen during 2017. On the other hand, southern ports are still in the preparatory stage, with the majority of Greek ports and the Port of Lemesos presently involved in related studies in order to acquire a maturity level that would allow for the subsequent implementation of works related to ports' infrastructure for bunkering operations. Along the same lines, the Ports of Piraeus (EL) and Lemesos (CY) are also participating in conceptual studies necessary for the introduction of onshore power supply as propulsion alternative for ships.

Based on the above infrastructure gaps, the target values for the two related KPIs are not expected to be met by 2030 due to the missing rail connection to the Port of Igoumenitsa and the absence of concrete plans for the deployment of alternative fuels facilities at the Ports of Wilhelmshaven, Burgas.

Table 18: Compliance of maritime parameters 2016 and 2030 prospects

#	Mode	KPI	2016	2030 prospect
19	Seaports	Connection to rail	80%	90%
20		Connection to IWW CEMT IV	100%	100%
21		Availability of alternative fuels	0%	33%
22		Availability of at least one freight terminal open to all operators in a non-discriminatory way and application of transparent charges	100%	100%
23		Facilities for ship generated waste	100%	100%

Additional bottlenecks hindering interoperability relate to the deployment of Traffic Management Systems and e-maritime services, with Greece being the only OEM MS that has yet to implement the National Single Window system of the country in accordance with Directive 2010/65/EU, while only pilot Port Community System (PCS) modules have been developed in a number of the country's seaports. The deployment of Vessel Traffic Management Information Systems (VTMIS) also constitutes an issue for Greek ports, particularly for the Ports of Heraklion and Thessaloniki, where it has yet to be implemented.

In conjunction with the above, Greek ports and the Port of Lemesos in Cyprus need to implement MoS quality standards to establish a potential viable maritime connection through Crete, which constitutes the final leg of the OEM Corridor. Reference is made to the Motorways of the Sea (MoS) Detailed Implementation Plan.

5.2.4. Persisting Gaps in Road Network, alternative fuels and ITS

The majority of non-compliant motorway/express road sections are addressed by projects in all respective countries and the expected level of compliance by 2030 is 96%. However, clear implementation schedule and/or financing sources have not been set up for a big part of these investments.

The supply of alternative fuels is expected to further improve by the provision of more different types of fuel. Strategies and/or national-scale projects for the deployment of alternative fuel facilities are planned in Germany, Czech Republic, Hungary and Cyprus. The level of safety and security of the rest areas along the Corridor should be further enhanced.

Table 19: Road compliance parameters 2016 and 2030 prospects

#	Mode	KPI	2016	2030 prospect
24	Road network	Express road/ motorway	88%	96%

Although road capacity has not been considered as a KPI, the issue is addressed in several projects aiming to enhance capacity on congested road sections. Several projects aiming to enhance the road capacity on congested road sections are identified. Inadequate capacity influences negatively traffic safety and thus, congestion, especially on road sections adjacent to urban nodes, requires further attention.

Special attention must be paid to the deployment of intelligent transport systems, which should play a major role in increasing the efficiency of road use, improving safety and enhancing the environmental performance of vehicles along the Corridor and within urban nodes. Where basic IT infrastructure for data transmission is not yet in place, the Member States should speed up its deployment, so to provide for the instalment and operation of relevant transport applications.

No progress is observed in the integration of road charging schemes in operation along the OEM CNC, which remain fragmentised. In the light of limited public financing to maintain high quality roads and the current patchwork of national road charging systems that hampers seamless transportation, measures are required for the establishment of interoperable systems.

Table 20: Non-compliant road sections by 2030

State	From	To	Length (km)	Non-compliant parameter
BG	Vidin	Montana West	100.9	motorway/ express road
	Mezdra	Botevgrad A2	37.4	motorway/ express road

5.2.5. Persisting Gaps for Airports

Connection of main airports to the rail network is fundamental to achieve the intermodality and interoperability objectives set by the TEN-T regulation obligatory until 2050, except where physical constraints prevent such connection. Hamburg airport, located within the urban area is connected with electrified (DC 1200V) suburban rail only; however, a technical feasibility study has been planned for the realisation of a new rail link, albeit with unknown implementation date. A multimodal train station has been planned for construction and completion by 2018 in the Timisoara airport; to present, there is no information on the actual construction works of the connecting rail line.

Moreover, the progress to provide capacity for alternative fuels for aircrafts should be monitored in all Corridor airports, as no project is yet in place and this remains an “open issue”.

Table 21: Airport compliance parameters 2016 and 2030 prospects

#	Mode	KPI	2016	2030 prospect
25	Airports	Connection to rail	46% (50% - for main core airports)	73% (92% - for main core airports)
26		Availability of at least one terminal open to all operators in a non-discriminatory way and application of transparent charges.	100%	100%
27		Availability of alternative fuels	0%	0%

Table 22: Non-compliant airports by 2030

State	Airport	Non-compliant parameter
DE	Hamburg	Connection with heavy rail *
All	All 9 OEM core network airports	Availability of alternative fuels **

) Connection with rail is only required by 31 December 2050 according to TEN-T regulation 1315/2013 Art. 41 (3).) The regulation requires from core airports by 31 Dec 2030 only the capacity to make alternative clean fuels available.*

5.3. Persisting Administrative & Operational barriers

Administrative and operational barriers often cause significant competitive disadvantage for an efficient, competitive and reliable transport on the Orient/East-Med Corridor.

5.3.1. Persisting Administrative & Operational barriers in Rail

Administrative and operational barriers often cause significant competitive disadvantage for rail transport on the Orient/East-Med Corridor.

The realisation of the CNC's meeting all the TEN-T requirements are long-term projects; since - in many cases - major infrastructure bottlenecks that need to be removed, require major investments over very long periods of time. At the same time, operationally, administratively and politically, there is a need to achieve **results which are tangible and visible in a shorter period of time**.

Two objectives could be reached with the realisation of quick wins: on the one hand it would be possible to show tangible results in the short term for railways and the real positive effect on the important investments which would be supportive for the upcoming MFF negotiations, while on the other hand, the existing railway infrastructure could be made more competitive towards other transport modes through an efficient and interoperable use. This would significantly contribute to a better modal share and the decarbonisation of transport.

There were a number of actions taken towards identifying potential barriers through the organisation of the **rail cross-border issues** Working Group, comprising of all main stakeholders and decision makers, such as Ministries, IMs, private and public freight and passenger operators, and resulting in the following main identified administrative and operational barriers:

- **Single track sections** with high traffic (especially in cross-border points) causing long waiting times in stations for both passenger and freight trains;
- The non-compliance of technical parameters (e.g. length of tracks in RRTs, profile of tunnels) can cause additional, secondary operational problems;
- Border-control and customs clearance in both sides on the same cross-border point;
- Schengen border – In relation to the handover of freight trains at border crossings, the standards necessary for applying the **principle of trust** (e.g as regard wagon handover between RU's) are often not met by cooperating railway undertakings, resulting in time-consuming double-checking (technical handover inspections), although Schengen/Non-Schengen status should be irrelevant;
- Certain traditional national **operational rules** are existing at cross-border points; some of these may not serve a specific purpose and should be jointly identified and eliminated (non-sense rules);
- Normative differences between Corridor countries. Although common regulations (UIC; TSI; COTIF) exist, these are not applied similarly or leave room for different national interpretation. Thus further harmonization is needed;
- Lack of coordination of operations and the planning of modernisation, rehabilitation and maintenance works along the Corridor, especially between neighbouring national IMs;
- Lack of consistent and updated information exchange system for capacity planning, train operations and document transfer across cross-borders;
- Information gaps and barriers in communication, which have high impact on the planning of activities, personnel and rolling stock, as well as on current operation of international freight trains;
- ERTMS implementation: projects are still in planning phase in all countries along the OEM Corridor, the overall status of implementation being still only 12% (as a percentage of line length); progress in implementation has been

achieved mainly in Austria, Czech Republic and Bulgaria.

To address and to overcome the above mentioned barriers, it is deemed as highly necessary to involve all relevant stakeholders, such as undertakings, authorities and legislative bodies. See section 7 – Pilot initiative.

5.3.2. Persisting Administrative & Operational barriers in Inland Waterways

A number of administrative and operational barriers are defined for the OEM Corridor inland waterways. Three main groups of barriers are distinguished: *barriers in RIS implementation*, *workforce related barriers* and *operational barriers*.

For the implementation of RIS in Germany and Czech Republic, the barrier is the lack of sufficient funding and the absence of data exchange between Germany and Czech Republic. The latter is caused by different technological applications and legal problems, especially because of data privacy issues. These problems are however currently being solved as a part of RIS COMEX project works. There are also a number of workforce related barriers. In Czech Republic, these include shortage of qualified personnel, the difference in the standards for professional training, language barriers with neighbouring countries and the lack of a harmonised system of professional qualifications related to operational functions on board a vessel. Language barriers and lack of a harmonised system of professional qualifications also relate to Germany. The language barrier is suggested to be improved.

In terms of operational barriers, for both countries the licence for Local knowledge requirements (LKR) is a key issue. A solution for this was provided on the 18th of February 2016. The proposed measures consist of a regulatory intervention for mutual recognition of professional qualifications for IWT workers at EU level, with minimum competence requirements for boatmen and boat masters. Furthermore, this allows Member States to organise exams and issue authorisation for all LKR in Europe, whilst leaving the responsibility for defining the criteria and exam content to Member States concerned by the river stretches for which LKR is required.

The remaining operational barrier refers to the permitted minimum number of people in a ship crew and the limited lock operating times in the Czech Republic. The latter requires additional research in order to verify that extending their operating times is economically viable. In Germany on the other hand, the fact that there are national German regulations and European ones to be followed as well as requirements from the different federal States make the process more bureaucratic and hence not efficient. One of the problems declared[15] by operators was that too many authorities and offices are involved in certification. This results in confusion about responsibilities and leads to unnecessarily high costs. It is expected that most of the barriers will be eliminated before 2020.

5.3.3. Persisting Administrative & Operational barriers in Seaports

Administrative and operational barriers hinder the effective and seamless operation of ports, as well as their full integration into the intermodal chain, resulting in port congestion and long transit and waiting times. This is a crucial element that affects the total time and cost of transport, with a direct influence on the reliability and competitiveness of the port services offered. Administrative and operational issues are also the cause of key interoperability bottlenecks. A review of the 12 OEM Core ports together with consultation with relevant stakeholders identified that the key operational and administrative barriers currently prevailing are related to the multiplicity of actors involved and the related fragmentation of responsibilities and jurisdictions, the added administrative and operational complexity that distinguishes maritime transport against other modes, as well as the issue of information exchange and documentation. Therefore, progress on strengthening operational efficiency must be made through the harmonisation and simplification of procedures, the establishment of an efficient coordination/cooperation modus operandi and increased

[15] Panteia, 2014

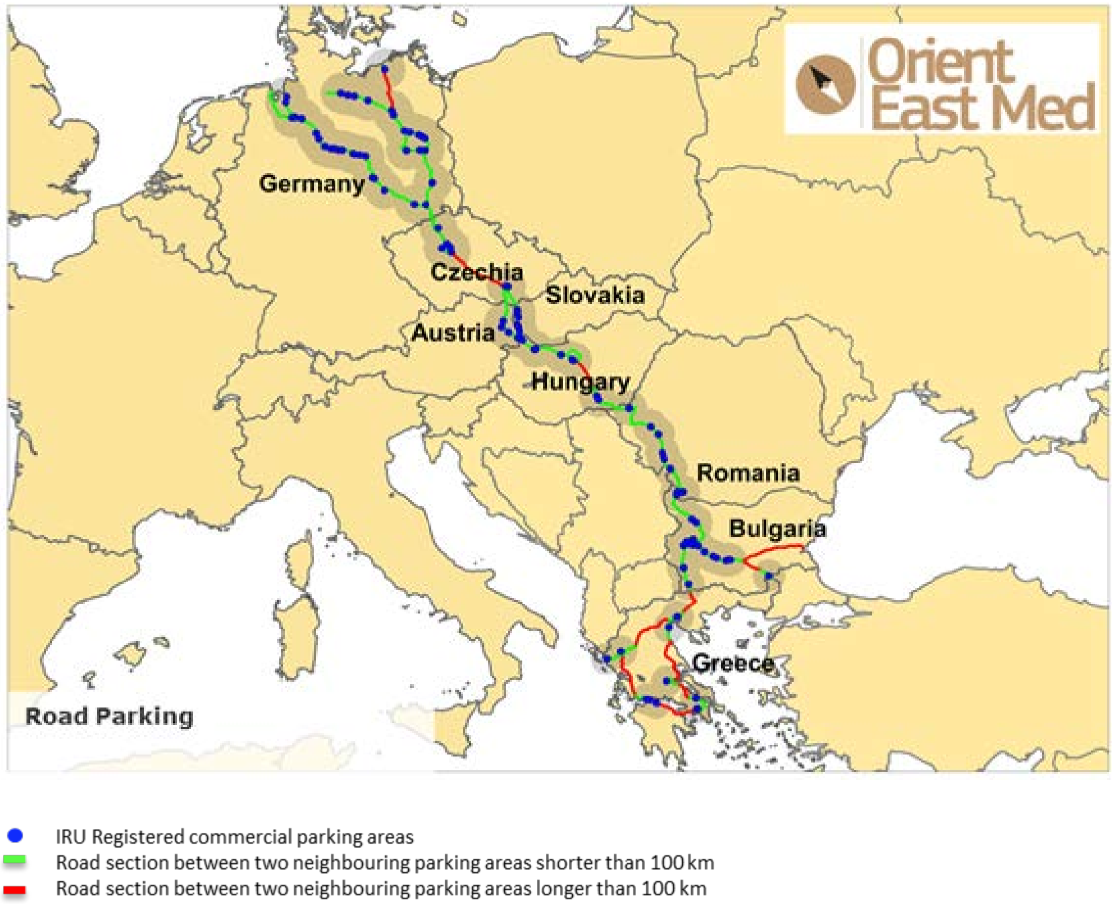
transparency embraced by all stakeholders involved, as well as the deployment of innovative “one-stop-shop” administrative tools.

5.3.4. Persisting Administrative & Operational barriers in Roads

Road tolling systems along the Corridor remain fragmentised and non-harmonized. The systems for the provision of real-time traffic and weather information are not yet capable of offering cross-border traffic information. Thus, it is explicitly recommended that special attention is paid to the deployment of intelligent transport systems, especially in the MS where basic IT infrastructure for data transmission is not yet in place.

Provision of safe and secure parking areas is also an issue to be considered. Although the provision of such facilities is market-driven, some regulation might be needed especially in setting clear definitions of the “safe and secure parking” notion. This would facilitate disputes between road hauliers and insurance companies and might trigger private initiative in offering adequate parking services.

Figure 10: Road – Compliance Map of IRU registered commercial parking areas



Source: ITC/OEM study 2017

Finally, in the analysed period, waiting times of heavy goods vehicles at border crossings increased visibly. This is only partially related to the charging systems, in most of the cases the reasons being thorough police and customs checks and/or inefficient organization of procedures. The latter implies a need for urgent optimization of procedures in order to minimise financial and economic losses associated with delays in supply and longer transportation times.

5.4. Links with neighbouring countries in the Western Balkan area

In June 2015, WB6 Transport Ministers and EU Transport Commissioner, Violeta Bulc, identified three **Core Network Corridors** to be extended to the six countries in the Western Balkan region as well as priority projects for possible EU funding. Subsequently, the scope of the corridor studies on the Mediterranean Corridor, the Orient/East-Med Corridor and the Rhine-Danube Corridor was broadened.

Figure 11: Indicative Extension to Neighbouring Countries

Comprehensive Network: Railways, ports and rail-road terminals (RRT)

Core Network: Railways (freight), ports and rail-road terminals (RRT)

The EU Connectivity Agenda, a high level agreement between the Union and the six Western Balkans countries (WB6) Albania, Bosnia and Herzegovina, Kosovo*[16], the former Yugoslav Republic of Macedonia, Montenegro and Serbia was endorsed on 27

[16] This designation is without prejudice to positions on status, and is in line with UNSCR 1244 and the ICJ Opinion on the Kosovo declaration of independence.

August 2015 at the Western Balkans 6 Summit in Vienna on the adaptation of the indicative extension of the comprehensive TEN-T maps, as well as on the identification of the TEN-T core network connections on the comprehensive network maps.

Since August 2015, two additional WB6 Summits have been realised in Paris (June 2016) and Trieste (July 2017), further focusing on improving the transport and energy links within the region, as well as between the Western Balkans countries and the EU Member States.

Within the framework of the Trieste Summit in particular, the Transport Community Treaty was signed, aiming at the deeper integration of the region with the EU transport market and also setting the grounds for common standards, in terms of transport services' quality and efficiency. The Transport Community will harmonise transport legislation in line with EU acquis and at the same time enhance the efficiency and connectivity of the underlying transport systems.

The WB 6 core transport network to be connected with the Orient/East-Med Corridor ("OEM related WB6 core network") comprises the following main axes:

- Budapest (HU) – Beograd (RS) – Niš (RS) – Skopje (MK) – Thessaloniki (EL)
- Beograd (RS) – Podgorica (ME) – Bar (ME)
- Beograd (RS) – Prishtine/Priština (XK) – Skopje (MK);

Including the urban/traffic/logistic core network nodes:

- Urban nodes of Beograd (RS), Podgorica (ME), Prishtine/Priština (XK), Skopje (MK)
- Port of Bar (ME)
- Rail/Road Terminals in Beograd (RS), Prishtine/Priština (XK), Skopje (MK)
- Airports in Beograd (RS), Podgorica (ME), Skopje (MK) and Prishtine/Priština (XK)

In view of the need for coherence in technical standards and infrastructure construction, a similar analysis to the OEM Corridor was carried out in 2016 and 2017[i]. (Western Balkans Intermodal Study (February 2016), by City Net Scientific Research Center for the Regional Cooperation Council and WBIF Connectivity Networks Gap Analysis (June 2017), by Mott MacDonald/IPF consortium)

The preliminary results of the analysis of recent theoretical compliance of transport infrastructure in the WB region with the requirements set out in the Regulation 1315/2013 for EU Member States, indicate that:

- 83% of the rail network is electrified,
- 79% of the rail network allows for axle load 22.5 t,
- 44% of the rail network has rail operating speed 100 km/h
- 7% of the rail network is compliant with the ERTMS deployment (ETCS) requirement
- 63% of the road network is classified as motorway or express road , while
- 25% of the road network if of motorway standard in (very) good condition.

All on-going and planned infrastructure projects known to date, as obtained from the Connectivity Agenda (Vienna Summit 2015; Paris Summit 2016; Trieste Summit 2017), the National Single Project Pipelines (SPPs), as well as the SEETO Multi-Annual Plan (MAP) 2016 were examined. 16 rail infrastructure projects, 17 road infrastructure projects, 1 seaport project and 1 airport project were recorded.

Taking into account the above projects and based on the TEN-T technical standards, two different scenarios were developed (Realistic: projects that have already secured financing have been included; Optimistic: all identified planned projects are taken into account) in order to forecast the evolution of the KPIs (target year 2030), which will allow the evaluation of the compliance levels against the infrastructure quality targets set out in Regulation 1315/2013. The results of the analysis are summarised in Table 24.

Table 23: OEM related network in West Balkan- Compliance of 2014 and 2030 prospects

KPI OEM-WB6	2014	2030 Realistic prospect	2030 Optimistic prospect
Rail network			
Electrification	83%	90,9%	98,9%
Track gauge 1435mm	100%	100%	100%
ERTMS implementation	7%	unknown	unknown
Freight rail line speed ≥100km/h	44%	76,1%	95,4%
Freight rail axle load (≥22.5t)	79%	87,5%	99,6%
Train length (740m)	14%	42,1%	95,4%
Road network			
Express road/ motorway	63%	85.5%	100%
Availability of alternative fuels	unknown	unknown	unknown
Ports			
Connection to rail	100%	100%	100%
Connection to IWW CEMT IV	n.a.	n.a.	n.a.
Availability of alternative fuels	0%	unknown	unknown
Availability of ≥ 1 freight terminal open to all operators in a non-discriminatory way and application of transparent charges	100%	100%	100%
Facilities for ship generated waste	0%	unknown	unknown
Airports			
Connection to rail	0%	0%	25%
Availability of ≥ 1 terminal open to all operators in a non-discriminatory way and application of transparent charges.	100%	100%	100%
Availability of alternative fuels	0%	unknown	unknown

At the same time, significant administrative barriers are identified along the examined links. The key areas of intervention necessary to alleviate non-physical barriers in customs and transport policy, according to previous studies, are:

- Administrative and institutional capacity in the regulatory and implementing agencies
- Adoption and implementation of inter-operable Information Technology (IT) systems in trade and transport
- Inter-agency cooperation both in trade and transport operations
- In transport: safety regulation and enforcement in all modes, especially in road transport; access to markets, especially in rail but also in air transport
- In customs: risk management systems and simplified customs procedures; adoption of inter-connected IT systems, such as the New Computerized Transport System (NCTS) in transit operations

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

6.1. What has still to be done

Parallel to the realisation of the required infrastructure implementation by 2030, there is also a vital need to render CNCs "forerunners" of a sustainable, smart and innovative European transport system in line with related EU Policies. In this respect and based on forecasts for 2030, the potential cumulative effects to the *environment*, *economy* and *society* of all OEM projects for the Corridor, resulting from the construction and operation of each individual infrastructure, are estimated.

The Corridor's potential performance of rolling out innovative solutions is primarily examined, followed by an approximation of the effects induced by the increase of economic activity in terms of growth and additional employment. The impact of the predicted modal shift to more sustainable modes as a direct result of the completion of the Corridor is estimated in terms of emission's reduction, while a risk assessment to climate change threats is performed and adaptation measures identified. Finally, given the distinct lack of financing securisation for a significant share of OEM projects, the financial sustainability of these is appraised with a view to identify funding gaps as well as the potential for other forms of financing.

6.2. Innovation Deployment

Innovative projects refer to projects across the EU Member States which involve the use of new technologies improving in some manner parts of the current transport system. In the OEM Corridor, around 20% of the projects have been identified as "innovative". Of the innovative projects, more than half have been categorised as *Catch-up innovation*, or otherwise known as projects being related to innovation which is transferable innovation across the EU, typically already implemented in one part/country and, due to its success, implemented in others too (e.g. CEF or Horizon 2020). This is a common trend found among all CNCs. In the OEM, the distribution of the innovation deployment projects indicates a pyramid, where at the tip lies a radical innovation project (only one) and at the bottom the catch-up innovation projects, indicating the need to roll out innovation on all parts of the Corridor.

Looking at the projects per project category, it is primarily evident that there are innovative projects present in each modal category identified in the project list. Road and Maritime hold the highest number of projects, whilst Rail and Rail ERTMS the lowest, due to the absence of Alternative Fuel projects (not applicable for rail), as well as the ERTMS definition.

Cost-wise, innovative projects account for solely 4% of the total cost of all recorded OEM projects. The latter demonstrates that innovation in itself is not costly compared to the infrastructure projects.

With regard to the characteristics of innovative projects for freight transport services, the majority of the projects address Data Sharing and Safety & Security, together. This demonstrates that the OEM still needs improvement in these two areas. There are no projects concerning the Integration of remote areas. For passenger and private transportation, most projects also deal with Data Sharing and Safety & Security, as well as Decarbonisation, while there are no Cybersecurity projects. Regarding project impacts, Safety improvement and Transport efficiency are the two most common ones. Decarbonisation, for all modes of transport, is addressed by around a third of the total, with the vast majority being related to the use of alternative fuels. Finally, funding is found to be the most common enabler for facilitating the success of an innovation project or accelerating the market uptake of its results.

6.3. Impacts to Jobs & Growth

A preliminary macro-economic analysis on the impact of OEM CNC projects resp. investments was performed based on two methods.

Based on a few CNC project samples[17], the number of generated direct construction-related jobs by total investment costs spent was estimated, being roughly 1 direct job per € 1 million investment.

Based on another approach developed by the Fraunhofer Study "Cost of Non-completion the TEN-T Core Network (2016)", multiplying factors (see Table 25) were derived, that were linked with the list of projects and their total costs.

Table 24: Job & Growth Multipliers for TEN-T CNC projects

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

Source: Fraunhofer Study on the Cost of non-completion of the TEN-T (2015)

Those OEM CNC projects for which cost estimates are available and that are planned to be implemented over the period 2016 to 2030 amount to an investment of € 69 billion. The implementation of these projects will lead to an increase of GDP over the period 2016-2030 of € 517 billion, 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 1,494,000 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.

6.4. Impact to decarbonisation and Climate Change Adaptation

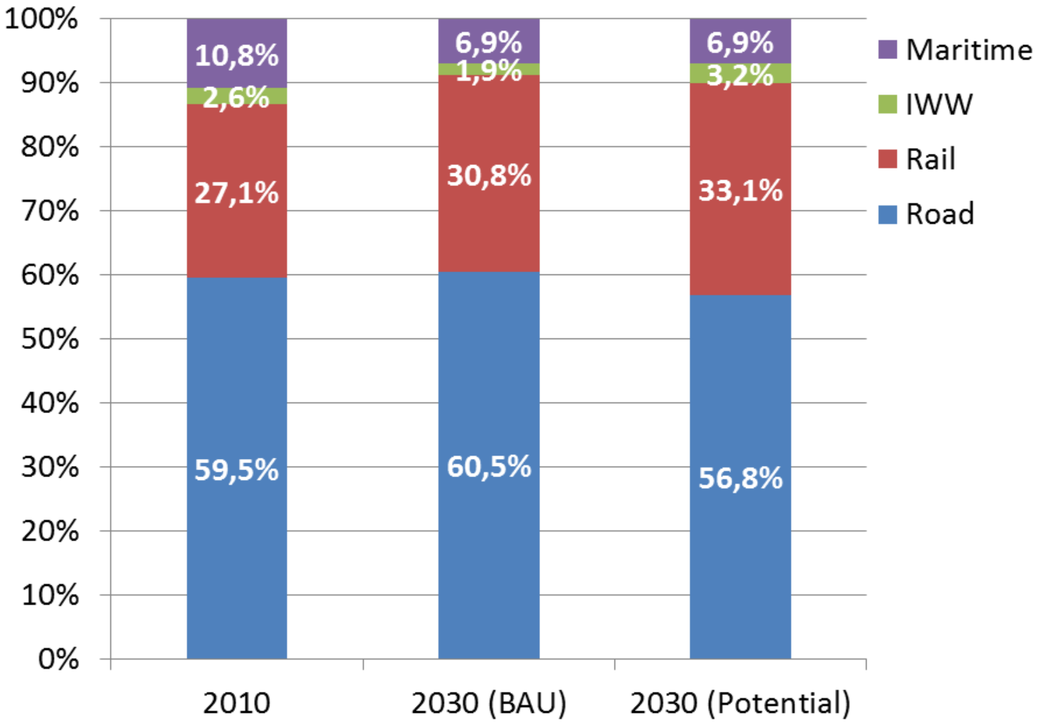
6.4.1. Emissions

The potential model shift has been analysed according to two scenarios – "BAU" (Business As Usual) and "Potential" as a result of the implementation of the OEM project list.

Following the trend of the baseline year 2010, Rail and Road transport volumes will increase and as a result Maritime and IWW transport volumes will decrease. For the Potential scenario for which the EU is aiming for, IWW and Rail shares will increase, whilst Road transport volumes will decrease and Maritime transport ones will remain the same. This would have an effect on the emissions produced, as illustrated in Figure 12.

[17] This value is based on job numbers of approx. 10 projects, including a seaport works project in Cyprus and two project clusters in Greece for rail investments.

Figure 12: Forecasted Freight modal share for 2030 scenarios



Taking the Potential scenario, the values per mode for 2015, 2030 and 2050 are used to calculate the modal shift and emissions for the different modes. For the period 2015 – 2050, the emissions for Road and Rail will decrease at the same time, as for both modes, passenger and freight traffic volumes will increase in the same period. The emissions from rail will slightly rise in 2030 but would decrease in 2050. For Inland waterway transport (IWT), they will remain at current levels.

As a result of modal shift and various decarbonisation initiatives, energy efficiency is forecasted to increase over the time period between 2015 and 2030, and emission factors are estimated to fall. Most of the 2030 decrease in CO_2 is attributed to greater efficiency in the passenger road sector, whereby relatively low expected growth is outweighed by increases in efficiency. In the freight sector and aviation, traffic growth outweighs efficiency gains. This is illustrated in the figures below.

Figure 13: Freight forecast (bln tonnes- kilometre) per mode of transport

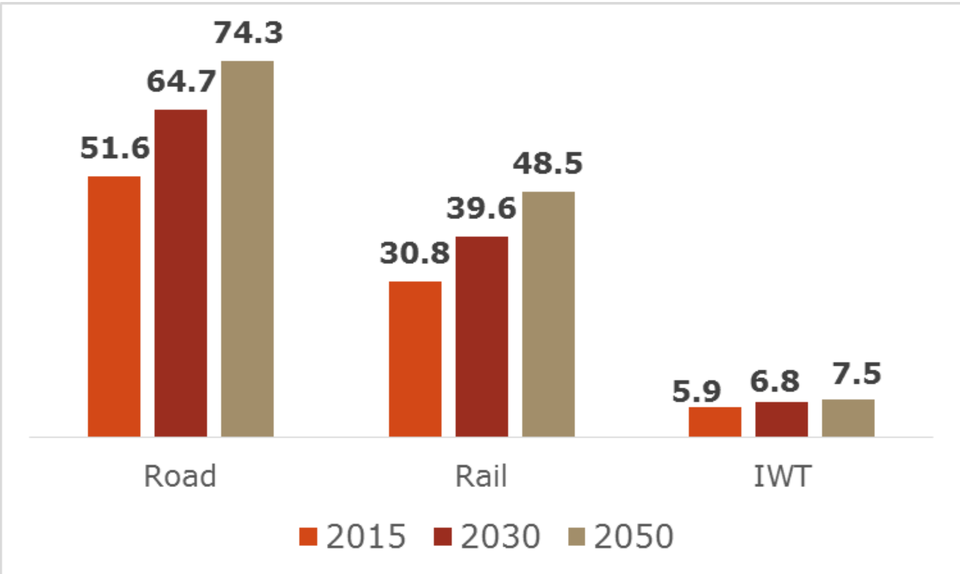


Figure 14: Passengers forecast (bln pkm) - per mode of transport

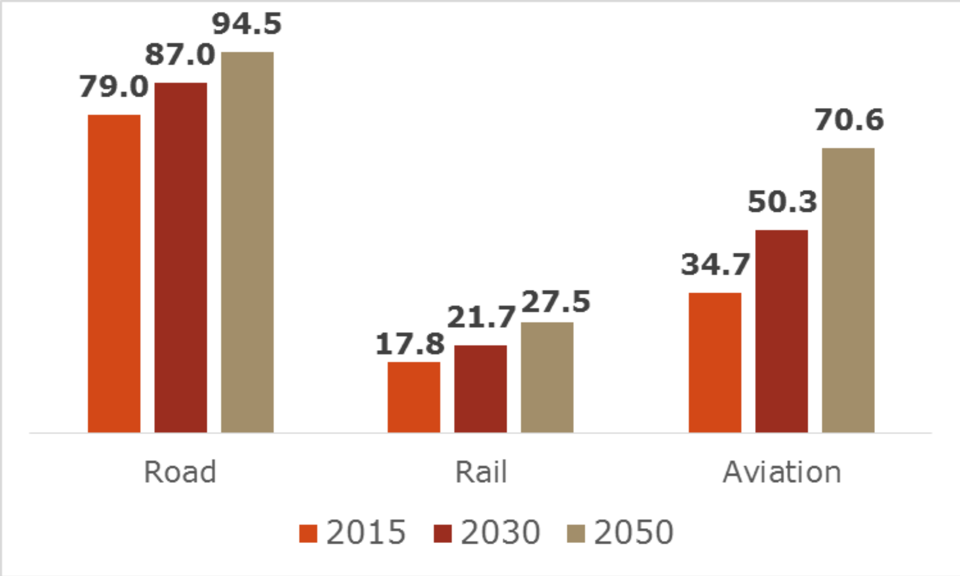
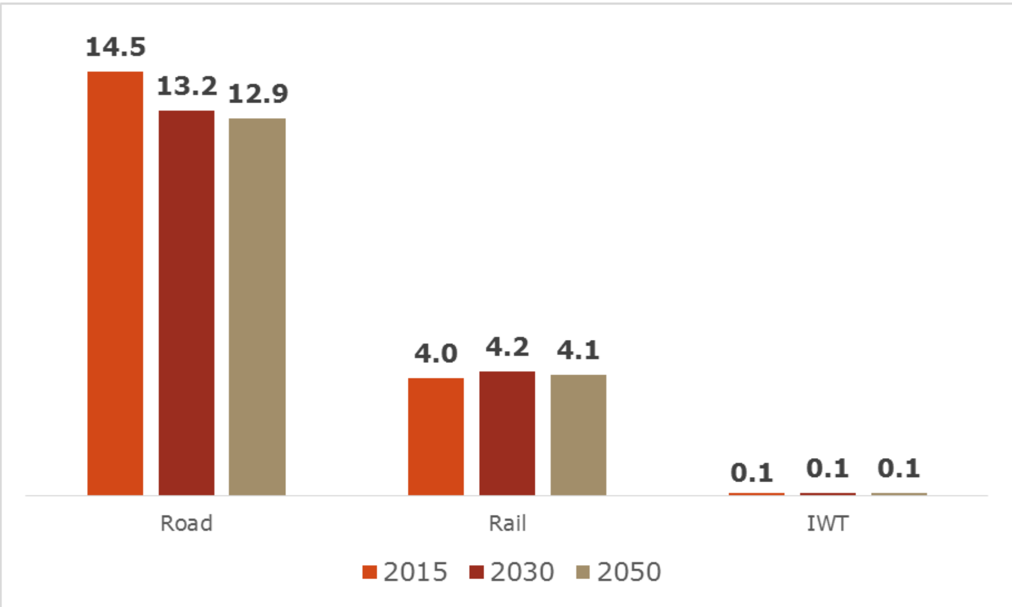


Figure 15: Emissions from freight and passenger transport (mln tonnes CO_2 equivalent)



6.4.2. Climate Change adaptation

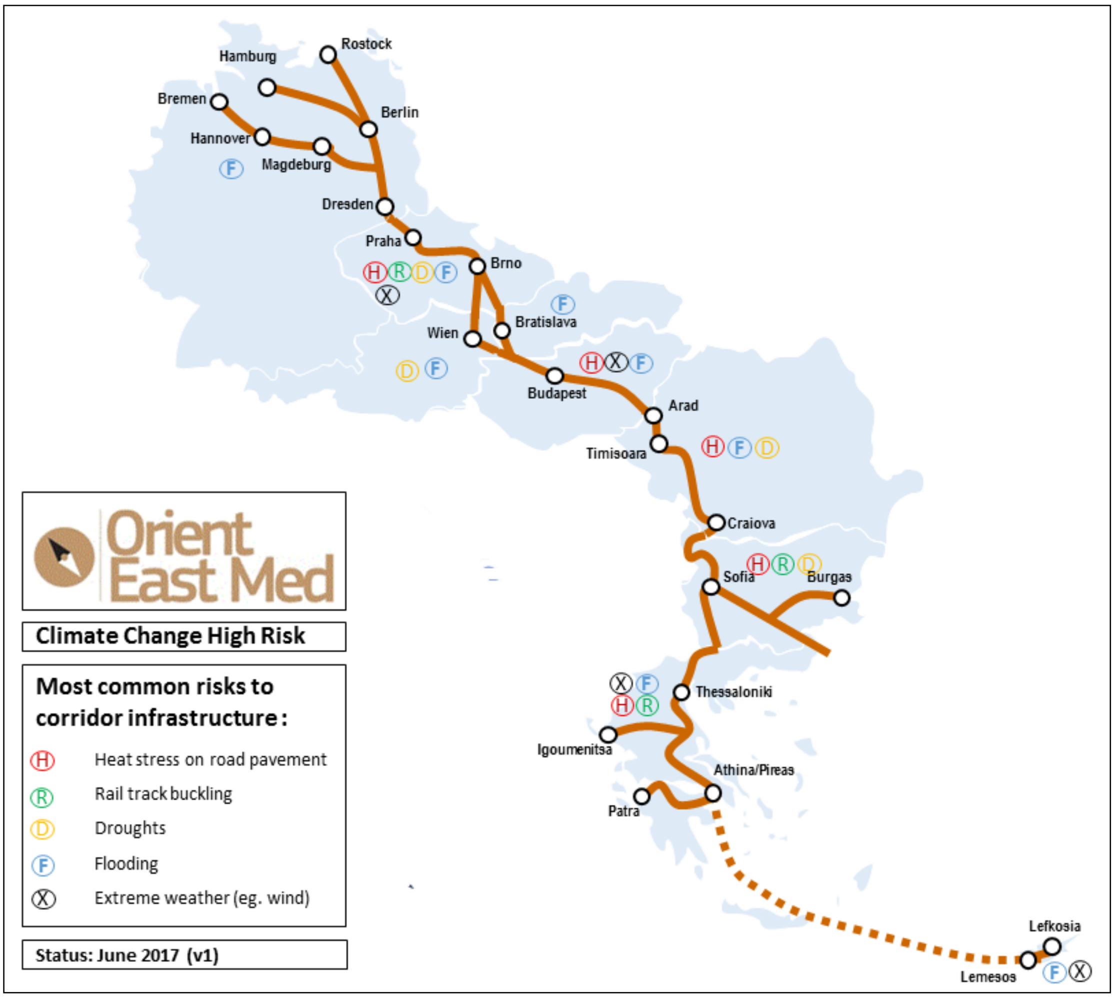
The OEM Corridor has a temperate continental climate in the north, while ending in a hot Mediterranean climate in the southeast. This means that for parts of Bulgaria, , Greece, Cyprus, Romania and Hungary, the vulnerability of road pavement to heat stress is expected to increase extremely in the upcoming century. The other parts of the Corridor will also experience some moderate increase in vulnerability. Rail track buckling is estimated to have an effect in Bulgaria and Greece, whilst the remaining parts of the Corridor will encounter only a small increase.

Furthermore, the northern part will likely become increasingly susceptible to heavy rains and flooding, while the southern part will experience more droughts in the upcoming century. The latter, in combination with increased summer temperatures, will also result in increased risk of forest fires. Risk of river and flush floods is expected to increase substantially in the northern part of the OEM, as well as Hungary.

Sea-level increase is also expected. This will most likely occur along the coasts of the northern and southern coastal countries of the Orient/East-Med Corridor, namely in Germany, Greece and Cyprus. Figure 16 presents an overview of the main risks identified in each OEM country.

Adaptation measures are taken by a number of countries. Among other, the railway sector in Greece includes works on new alignments expected to significantly reduce vulnerability against floods as well as rail track buckling. In Bulgaria, steel bridges are replaced by concrete ones in order to deal with rail buckling. In Hungary, guidelines for drainage design were revised and transport information systems are under development aiming to prevent and reduce potential damages caused by floods.

Figure 16: Climate Change Main Risks per OEM country



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

6.5.1. Background information

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

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

a. For several revenue generating projects "closer to the market" in terms of development (technological components, including large infrastructure of key European Interest, brownfield upgrade) or service provision (terminals for freight / passengers, enhancement of infrastructure capacity / performances), a substantial

component of the project funding can come from own resources (e.g. equity) and financing resources gathered by the project promoters on the market (e.g. in the form of equity, loans or bonds). The private investors would need to recover their initial costs of capital and receive a reward for the risk born (the higher the risk, the higher the return required).
The project may look at conventional lending from public and private banks, alternative financing from institutional investors (e.g. bonds) and at financial instruments for instance to cope with the unbalances of cash-flow during its construction and rump-up phase until a sustainable flow of revenues is secured, and also to address particular risks and market failures and secure lending with long maturity. Financial instruments could be provided in the form of credit enhancing and guarantees (be it a specific legal guarantee or a financial guarantee to ease access to financing).

b. Hard-infrastructure, greenfield, risky, long-term projects such as the majority of cross-border railway connections as well as inland waterways navigability improvements might require a substantial public support through public funding, even if innovative approaches can apply to project development and/or to specific components of the investment. Public funding can be structured in different ways (also depending on the budgetary constraints of the public authorities), such as lump sum subsidy (grant), fiscal incentives, operational deficit coverage and availability payment schemes.

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

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

For all these 3 different categories of projects, public intervention with different degree of intensity is justified on the ground that these projects of high socio-economic and EU added value substantially address overall public service obligations, suboptimal investment level, market failures and distortion due to externalities (positive, for the projects supported, including in terms of strategic added-value, and negative for competing modes), and, therefore, call for the transfer of resources.

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

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

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

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

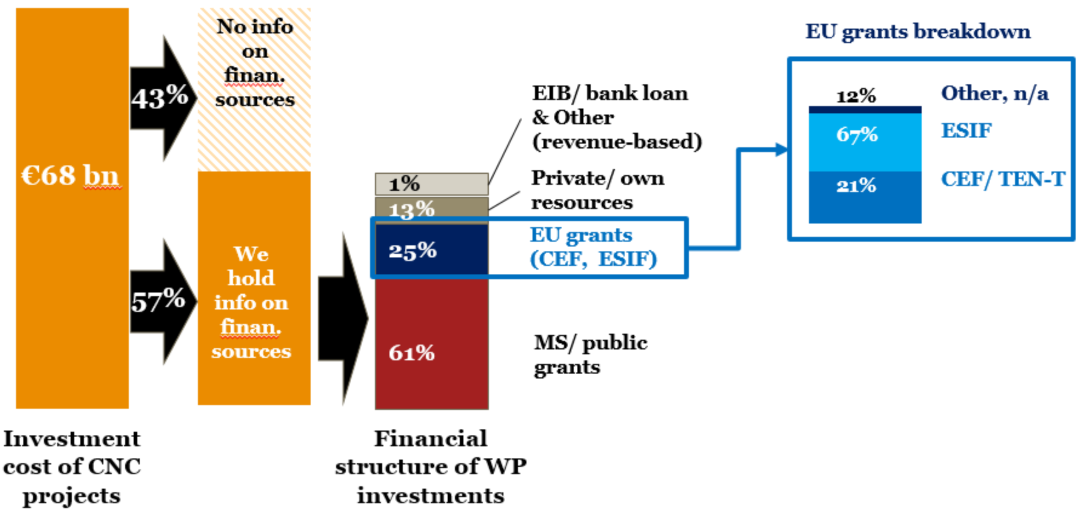
6.5.2. Corridor-related information

Within the OEM Corridor, an analysis was carried out to identify the funding sources of projects listed within the CNC project list with a view to determine the presence of funding gaps and the potential for other forms of financing than public grants.

Financial sustainability is a crucial factor in the assessment of a project, and more so when analysing a long project pipeline for a multinational transport Corridor, as is the case of the OEM. It should be taken into account that the funding possibilities of the European Commission are not infinite, and that mechanisms representing an alternative to grants (whichever the source), do contribute in a positive way to the complete development of the European transport network. The analysis presented in the following aims at giving an outline of the number of projects that can be financed in ways alternative to grants: examples of these alternative methods include, but are not limited to, the European Fund for Strategic Investments or private bank loans.

The analysis was performed excluding the studies (57 projects). 188 projects, or 57% of the total number of considered projects in the list, present complete financial information and hence were eligible for the analysis. Approved financing accounts for €4 billion, or 41% of the total, while the remaining €5.8 billion, or 59% of the total, is still not approved (i.e. "potential").

Figure 17: Analysis of the funding and financing sources



Would the EU funding ratio (25%) be applied to the entire OEM Project List investment amount, it can be expected that over the next years, €17.1 bln will be demanded from project promoters and Member States. Out of these €17.1 bln, and if the same rate of funding is approved (i.e. 41%), the total amount of EU funds to be deployed would be in the region of €7 bln over a period of 23 years. Of the 188, approximately 12% was identified as financially sustainable. It was also deemed that an additional 32% of the projects could be financially sustainable, if properly structured (i.e. potentially financially sustainable).

Financial sustainability does not necessarily mean that a project must generate revenues from user payments. Indeed, a project is financially sustainable if:

a. user payments exceed the operating costs (revenue generating);
b. the project receives availability payments (i.e. the public sector recognises to the infrastructure manager a pre-identified amount, which is paid during the operating phase on the basis of the infrastructure being compliant to a pre-determined set of KPIs, and irrespective of the demand/users of the infrastructure);
c. a combination of the two options above;

d. the project is not sustained by any cash-flows. However, it is part of a wider intervention and contributes to increasing a system's efficiency, ability to respond to increased demand, etc.

To be considered, a project may still require certain grants in order to be financially sustainable. The difference between non-financially sustainable projects and financially sustainable ones is that in the latter, the promoter could cover at least part of the investment costs with bank loans or by involving the private sector that invests own resources for a future benefit.

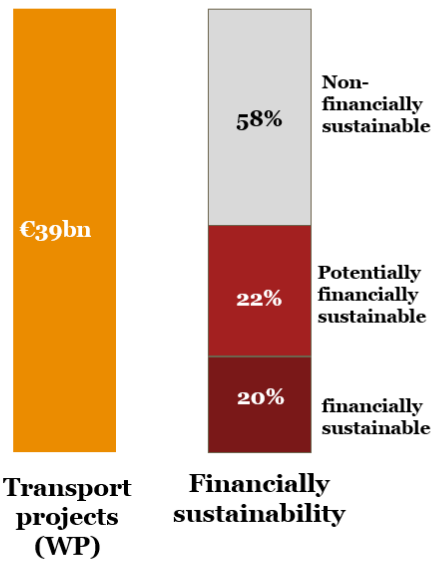
The analysis in this case requires a careful screening of the project's detailed information in order to make an educated guess on whether the project appears to fall into any of the above categories. In some cases, the experience in the transport sector comes at help (i.e. railway station developments are often sustainable, as leasing contracts with retail stores can be used to repay investment costs; ports and airports upgrades are generally financially sustainable; etc.).

How to structure a financially sustainable project

It is possible that potentially financially sustainable projects are structured in such a way that they ultimately become unsustainable. These generally refer to the following cases:

- Projects relative to one infrastructure can sometimes be broken down into smaller sub-projects that are not financially sustainable. However, the entire project may be structured as financially sustainable with a unique management. This is often the case with motorways, which are broken down into small sections; this way they can more easily access EU grants, but fail to be managed as a single infrastructure and, therefore, be sustainable.

Figure 18 Financial Sustainability of OEM projects



- Projects from the same promoter can be aggregated a structured to be overall sustainable. This is often the case with small projects with no direct financial benefits, but that enhance the operations and the business activities of e.g. ports, airports, stations, etc. These projects can often be supported with corporate loans.

For the OEM, it would not be possible to provide an assessment of the amount of investment that can be taken over by the private sector with the information at disposal; an estimate on the number of projects that could be at least partially sustained with other-than-grants resources can be however provided (Figure 18).

Consequently, the projects can be divided in two macro-categories: the on-going ones and those who have yet to start. The first category includes 212 projects, for a total value of approximately € 28 billion. The second category, of interest in this part of the analysis, as the funding possibilities can be effectively explored – and exploited, is composed by 203 projects accounting for € 40 billion. Out of these, 83 are pure OEM actions, thus only impacting the OEM CNC, while 120 are shared with one or more other CNCs. The total investment value of pure OEM projects which still have to start is € 17.3 billion, with the remaining € 22.7 billion accounting for projects shared among the OEM and at least another CNC.

Given that a fair percentage of projects have not secured financing, a further screening of the OEM list permitted the identification of the number of projects that can be financed in ways alternative to public grants, i.e. by making use of innovative financial instruments.

Studies are excluded from this assessment, as they are usually funded through different mechanisms than works, and their impact is rather small: the number of studies in the set of future OEM projects is 24, with 179 projects remaining to be further analysed.

The number of projects which already have secured complete financing is 84 out of 179, almost 50%, corresponding to an investment of € 18.7 billion. Of these 84 actions, 32, accounting for € 3.1 billion, are only part of the OEM Corridor. . Therefore, the number of projects that are deemed eligible for using innovative financial instruments is 72, equalling to 22% of the analysed projects.

7. Pilot initiative – the Rail border Two Hour Goal

During the three Corridor Forum's Working Group meetings on border-crossing rail transport, which were held in March 2016, April 2017 and October 2017, with strong cooperation with the Rail Freight Corridor "Orient/East-Med" (RFC 7), I set up the strategic goal of reducing significantly the freight trains border waiting times and achieving the so called "Two-Hour Goal".

Freight trains, operating along the OEM Corridor from Greece to Germany, have to pass 6 border crossing points. At most of these, time-consuming technical and logistical procedures involving infrastructure managers, railway undertakings and/or authorities are required, resulting in prolonged border crossing waiting time and significant decrease of the average train's O/D speed well below the level of road transport.

In August 2016, the European Court of Auditors (CoA) [18] complained on the poor performance of rail freight transport in terms of volume and modal share, also due to the very low average commercial speed of freight trains of approx. 18 km/h on many international routes. The paper underlined that cooperation between Rail IMs is crucial for a significant increase of both the speed and competitiveness of rail freight transport and that extra funding of rail infrastructure will not solve the problem.

On the 21st June 2016, in Rotterdam, at my initiative as CNC OEM Coordinator, a **Joint Ministerial Declaration** "On effective improvements to eliminate bottlenecks and facilitate international traffic on the Orient/East-Med Rail Freight Corridor" was signed by representatives of the Transport related national Ministries of Germany, Austria, Czech Republic, Slovakia, Hungary, Romania, Bulgaria and Greece. These 8 EU Member States committed officially to support and set measures in order to reduce each rail border transit time to a maximum of 2 hours by mid-2018.

The overall initiative's aim is to simplify the cross border technical and administrative operations, to enhance and harmonise coordination of infrastructure works, capacity and path arrangements and to improve governance and communication.

Main implementation steps (planned)

In the Joint Ministerial Declaration, the related Action Program includes more than 20 activities, among others: Cross border technical and administrative operations, coordination of Infrastructure works, capacity and Path arrangements and improved Governance and communication.

1. RFC7 Action Programme: - implementation on-going, PI – Cross border operations

    - Waiting time on border crossing
    - Harmonisation of operational and administrative rules
        - Mandatory technical checks
        - Required number of buffer wagons
    - Reauthorisation of the locomotives
    - Change of locomotive at the border (optimisation)
    - Calculation of braking percentages

2. TAF TSI Master Plan, followed up by yearly reports on degree of implementation. According to Article 5, Section 1, of Commission Regulation (EU) No 1305/2014 relating to the Telematics Applications for Freight subsystem (TAF TSI), the

[18] European Court of Auditors: Rail freight transport in the EU: still not on the right track – Special Report No. 2016-08; http://www.eca.europa.eu/Lists/ECADocuments/SR16_08/SR_RAIL_FREIGHT_EN.pdf

European Union Agency for Railways (ERA) shall assess and oversee its implementation. The Agency has established the 'TAF TSI Implementation Cooperation Group' in order to evaluate the reports of the sector.

3. ERA and the Member States are organising a number of the Regional Workshops for TAF TSI. The aim is to inform rail sector companies on the state of the art of TAF TSI deployment, the IT tool supporting the implementation, the medium and long term planning and how TAF TSI is becoming a reality in railway operations.

4. RNE Path Coordination System (PCS, formerly PATHFINDER) - PCS is a web application provided by RailNetEurope to Infrastructure Managers (IMs), Allocation Bodies (ABs) and Path Applicants, which handles the communication and co-ordination processes for international path requests and path offers.

5. European Deployment Plan and National Implementation Plans - The ERTMS European Deployment Plan (EDP) sets deadlines for the implementation of ERTMS and its aim is to ensure the progressive deployment of ERTMS along the main European rail routes. The currently applicable EDP is included in the Commission Implementing Regulation (EU) 2017/6 of 5 January 2017 on the European Rail Traffic Management System European deployment plan. This Regulation lays down the timetable for the deployment of the ERTMS on Core Network Corridors (CNC).

Proposed way forward

All existing initiatives in this field should be well coordinated, synchronised and clustered in order to produce the expected results and impacts until the 1st of July 2018, in the medium term. A bundling of efforts is needed to mobilize the limited resources to tackle the issues at hand.

Based on the recommendations of the EU Court of Auditors, for the CNC development and Corridor projects, it would be advantageous to introduce a regular assessment of rail freight performance by the help of corridor-tailored indicators, such as rail freight volumes, number of freight trains and average commercial speed of rail freight transport on representative relations. Setting up a specific KPI for commercial speed has to be planned the soonest possible.

8. Recommendations and Outlook by the European Coordinator

8.1. Over the period 2014 – 2017

During the first 4 years of the CEF implementation period, we have had a very intensive period of new infrastructure and study projects launching on the OEM Corridor. One may summarise this in the following information:

- The total investments supported by CEF on the OEM Corridor amounted to €2.83 billion.
- The CEF financing grant amounted to € 1.95 billion.
- ITS, ERTMS and railway noise reduction improvements accounted for € 24.7 million.

The above figures refer **explicitly** to the 78 projects, including 30 studies, 20 mixed projects (studies + works) and 28 infrastructure works, partly funded by CEF that belong to the OEM Corridor.

Those projects will contribute to the removal of 24 bottlenecks, the improvement of 4 cross-border links and the set-up of 282 alternative fuel filling stations (48 CNG, 16 LNG, 217 e-loading and one H_2 filling station).

These results could be reached thanks to a clear legislation in place, a multi-annual budget and a bottom/up – top/down governance system aiming at establishing a mutual trust between involved actors and decision makers. Projects have been prepared in respect of EU standards, EU added value, albeit taking into account national or regional particularities.

An important pipeline of mature projects has been identified and has translated into a huge success of all calls for proposals. This has led to a fast and efficient use of the available CEF financial means.

This approach will remain the key for the future success of upcoming programmes. We are able to measure and evaluate the needed means at € 47 billion to finalise the on-going projects. Over the period 2021 – 2030, the needs identified to finalise all 9 CNCs amounts to € 500 billion.

Looking at the greater picture, and for the nine Member States concerned by the OEM Corridor, for the total investments of € 68 billion for 415 identified projects (resp. of € 77 billion for 507 projects ongoing since 2014), we will still need to mobilise € 38.5 billion for the 183 projects that have yet to start. For those 70 projects, which are located solely on the OEM CNC (and not shared with other CNCs), the investment need is € 16 billion.

8.2. Recommendations per mode

By 2030, my concrete recommendations are to implement by mode the following projects:

8.2.1. Railway network improvements

a. The northern entry doors of the Corridor are subject to heavy congestion when it comes to an efficient management of the entry/exit flows of the maritime/inland ports. The need to upgrade the railway infrastructure capacity and quality of the Ports of Hamburg, Bremerhaven. Wilhelmshaven, Bremen and Rostock is vital for the Corridor development.

b. The existing railway line between Dresden, Ústí nad Labem and Praha is highly used and could be saturated in future years according to assumptions of certain studies. A new high speed line for passengers could be an option to improve the operations and might allow for a smoother interconnection between Germany and the Czech Republic. The construction of a new high speed line for passengers and the upgrade of the existing line for freight are considered. The representatives of the Free State of Saxony and the Czech Republic have repeatedly confirmed the priority of the project. It is, however, not expected that the entire high-speed railway line between Dresden and Prague would be in operation before the year 2035. Germany and the Czech Republic are therefore encouraged to continue with an ambitious project pipeline of the high speed rail connection from Dresden to the Czech Republic, by giving highest priority to the cross-border section from Dresden towards Ústí nad Labem. Legal and funding efforts shall be made to allow for an enhanced progress towards an earlier operation than 2030.

c. The capacity issues on certain Czech sections between Praha and Česká Třebová have to be considered. Various sections in the Praha area are under upgrade: Praha main st. – Praha Hostivar (CEF 2014), Mstětice - Praha-Vysočany (CEF 2016), Lysá nad Labem – Čelákovice (CEF 2016). Multiple actions are also under preparation for the section Pardubice - Česká Třebová (CEF 2015) with the constructions works planned for 2019-2020.

d. The upgrade of the Brno – Břeclav railway link as a high speed line will also increase the needed transport capacity between the Czech Republic, Austria and Slovakia. The ongoing trilateral planning cooperation between the Infra Managers is highly welcomed. An upgrade between the Czech section Lanžhot and CZ/SK border (CEF 2016), as well as studies for the adjacent Slovak section Malacky - Kúty are being prepared (CEF 2016)which is a potential candidate for CEF funding. Major CEF projects on the Slovakian portion of the OEM corridor have also been selected under CEF 2015. The modernisation of this section will remove bottlenecks and allow conventional express trains to travel faster and safer. The Austrian section between the CZ/AT border close to Breclav and Vienna will be upgraded till 2027, resulting in an increase in line speed and capacity.

e. The strategic development of the Budapest Rail node is currently studied, setting the path for alleviating its capacity bottleneck until 2030 (CEF 2016).

f. In Romania, the electrification and rehabilitation at TEN-T standards of the Craiova – Calafat link (Feasibility study funded by CEF 2014) to connect with the Bulgarian border is urgently necessary and related projects need to be accelerated in order to close this non-electrified corridor bottleneck. For the Carpathian mountain section between Craiova, Drobeta Turnu Severin and Caransebes results from the ongoing feasibility studies for rehabilitation (CEF 2014) are highly expected, even if the budgetary needs might be immense.

g. A similar challenge exists for the connecting link from the Romanian/Bulgarian border to Sofia via Vidin, Medkovets and Ruska Byala, where the efforts to overcome the non-compliance should be accelerated. The modernization of Sofia – Voluyak and Sofia – Elin Pelin sections has been awarded financing under CEF call 2014 and works have started. Works have started also for the section between Kostenets and Septemvri (CEF 2015). The development of the Plovdiv railway node (CEF 2016) has to start as the Grant Agreement has been signed in October 2017. As the above mentioned corridor railway sections in Romania and Bulgaria are highly connected and interdepending, the coordinated and gradual implementation is recommended and might be monitored by the Coordinator and the RFC.

h. The Bulgarian railway section leading from Sofia to Greece via Radomir and Kulata needs modernisation, as well as its cross border link between Kulata (BG) and Promahonas (EL), which still lacks electrification.

i. The new construction of the double track high speed railway between Tithorea and Domokos in Greece (CEF 2014), which will complete the connection of Thessaloniki with Athina, as well as the construction of the missing links between Athina and Patra (from Kiato to Patra port) are part of the completion of the southern access to the Corridor via the Greek ports. The sections Kiato – Rododafni, Rododafni - Psathopirgos (CEF 2014) and Psathopirgos – Patra/Bozaitika (CEF 2015) are under construction with additional funds from P.A 2014-2020. The studies for the connexion from Patra (Bozaitika) to Patra Port are elaborated. In addition, the construction of the quadruple railway in the section Athina RS – Tris Gefyres (CEF 2016) will solve a significant capacity and interoperability bottleneck in the Athina urban node and improve the hinterland connection of Pireas port.

j. ERTMS deployment is at an advanced stage in the middle of the OEM axis, but in the German and Bulgarian/Romanian part, it is lagging behind. Detailed actions on how to accelerate ERTMS equipment along the CNCs are described in the ERTMS Deployment Action Plan 2017.

k. Greece has been heavily investing in its Corridor section for many years and might be able to complete ERTMS, concerning the existing lines of its corridor sections by 2025.

l. A systematic development for existing and new Rail-Road Terminals ought to be continued, especially in the southern part of the OEM corridor, where new modern and intelligent terminals have to be built in order to ensure a sustainable and competitive multimodality for the Corridor traffic.

m. Concerning the Southern section of the Corridor: Romania should intensify the simplification of border-crossing procedures towards Hungary, also by modernizing its railway law. The on-going cross-border cooperation between Bulgarian and Greek railway infrastructure managers is highly welcomed. The remaining sections shall be finalised as a third step. The cross-border cooperation along the OEM Corridor, based on the Rotterdam declaration 2016 on improving cross-border cooperation for freight rail traffic should be continued in the years to come by strengthening the mutual cooperation between the CNC and the RFC. A pre-condition for the successful and timely implementation of the related Action Program by mid-2018 is the committed and long-term support of decision makers at all involved parties such as infra managers, railway undertakings, national governments and other stakeholders.

8.2.2. Inland waterways improvements

a. The main efforts in this field are to be oriented to an improved navigability of the Elbe River in conjunction with the environmental aspects. An important contribution therefore is the implementation of the Elbe 4.0 concept including a comprehensive digitalisation of the infrastructure (e.g. evolution of RIS) and the construction of modern ships adapted to the existing infrastructure.

b. The German Upper- and Middle Elbe areas are subject to the German development strategy "Gesamtkonzept Elbe", based on which, further actions will start during the next years. Further in-depth analyses and construction designs are required to give an economical and environmental impetus to an optimum use of the natural Elbe river capacities. Hereunder, a compromise for good navigation status on the Elbe has been found with a stepwise target of securing a draught of minimum 1.4 m on most days of the year.

c. Along the Czech Elbe/Labe part between the CZ/DE state border, Děčín, Ústí nad Labem, Mělník and Pardubice, studies and infrastructure works should be continued to increase capacity and performance. Of particular importance for the utilization of the inland navigation freight transport potential is the construction of the Děčín Weir lock complex to safeguard a permanent sufficient navigability in the northernmost part of Czech waterways. The project has been undergoing the EIA assessment and the application has been repeatedly returned for completion since the year

2010. Planned activities such as the Srnojedy and Přelouč lock chamber modernisations and draught improvements are meant to contribute to a better navigation status. Subsequently the Pardubice inland port can be established.

d. The non-sufficient parameters of the Vltava navigation from/to Praha need to be further addressed, lock upgrades (e.g. Horin and Praha Stvanice, CEF 2016 and Praha Stare Mesto) are being prepared as well as rebuilding of bridges to extend clearance and dredging (funding ensure though national budget) in order to safeguard the functionality of the Praha inland port.

e. The Coordinator welcomes the actual dialogue and consultation between the two countries towards a common positioning in order to achieve a waterway without bottlenecks. This allows also the Czech inland navigation sector to benefit from the actions to be derived from the German Gesamtkonzept Elbe (having a direct influence on the CBA of major investments).

8.2.3. Maritime ports improvements

a. Southern OEM Ports of Pireas, Igoumenitsa, Heraklion, Patra (EL) and Lemesos (CY) should fully exploit outcomes of currently on-going studies to acquire maturity for the subsequent implementation of infrastructure for LNG bunkering operations.

b. Projects for the provision of alternative fuels facilities in Wilhelmshaven (DE), Burgas (BG) and Thessaloniki (EL) ports should be designed.

c. A modern and efficient rail connection of the Greek Port of Patra to the OEM Corridor in order to increase its intermodal efficiency. Remaining studies should be concluded and implementation of works be safeguarded by securing financing.

d. The rail connection of the Port of Igoumenitsa in Greece by 2030. The completion of Phase C (Phases A and B were implemented by State funds) regarding the design maturity and the elaboration of the tender documents for the construction of the new single railway line Kalambaka-Ioannina-Igoumenitsa should secure financing. Works for the construction of the new line (global project) and its connection to the port have long faced the challenges of unfavourable terrain and related high investment costs; nevertheless, the implementation will fill in a key missing link for the country and the Corridor, contributing to intermodality and increasing modal shift potential.

e. The implementation of the National Single Window in accordance with Directive 2010/65/EU by Greece.

f. Works to increase port capacity and implement VTMIS and port community communication state-of-the-art infrastructure at the Greek ports of Thessaloniki and Heraklion, which have no secured financing. The use of financial instruments may be explored to finance part of the two ports required capacity expansion works.

g. The expansion of the cargo storage capacity with the associated enhancement of the access road network of the Cypriot Port of Lemesos and its second terminal at Vasiliko to meet growing demand. The improvement of the Vasiliko Terminal is co-funded by CEF 2016.The use of financial instruments may be explored to finance part of the works for the capacity expansion of the main port that would also include an LNG facility.

h. The improvement of the Port of Burgas' rail access and capacity, which is supported by CEF 2016, jointly with several works along the Burgas – Plovdiv railway line.

i. Greek ports and their links with Crete and Cyprus to implement MoS standards to improve maritime transport, which constitutes the main transport connection between the continent and the islands.

8.2.4. Roads projects improvements

a. The road connection between the Czech Republic and Austria (A5 / D52) needs a clear finalization date (studies and works were supported by CEF 2014), and a first section Schrick – Poysbrunn will be opened by end of 2017.

b. The last remaining section of A3 Struma motorway section in Bulgaria needs to be completed in order to solve safety and capacity issues. The project runs through environmentally sensitive areas; this extends project preparation period and risks absorption of the allocated investment funds.

c. The Lefkosia South Orbital ring Motorway in Cyprus and the bottlenecks on the Lemesos – Lefkosia Motorway need additional capacity. The phase A of the Lefkosia South Orbital Motorway is already supported by CEF 2016. With the full implementation of the Lefkosia South Orbital, the core network along the OEM CNC in Cyprus will be completed and fully functional.

d. ITS is deemed to contribute to more safety, capacity improvement and energy reduction in road transport. Related projects such as CROCODILE and C-ROADS are already being deployed in Austria, Cyprus, Czech Republic, but should be intensified in other parts of the Corridor, enabling smooth data transfer between Member States.

e. Alternative fuel deployment is a strongly growing topic, fostering the emission reduction on the roads. CEF 2016 is supporting various works and studies for LNG, CNG filling stations and EV fast-charging station networks along the Corridor. More attention could be paid to the deployment of EV fast-charging station networks along the Corridor outside the urban nodes. Also the issue of hydrogen stations deployment on corridor should be tackled in the future.

f. Several Highway PPP schemes along the OEM CNC are financially supported by EFSI, such as the Bratislava Highway Ring (D4, R7) in Slovakia, as well as the German A10/A24 motorways between Neuruppin and Berlin Pankow. Best practice for co-funding of transport infrastructure and maintenance might be used also for other parts of the OEM road transport infrastructure.

8.2.5. Airports intermodality improvements

a. Priority should be given to the development of heavy rail connection to the airports rail nodes of Budapest (Preliminary studies and works started under CEF 2014), Praha (CEF 2015: Negrelli viaduct and planned construction of the link connecting the city centre and the airport) and Hamburg.

b. In Cyprus, the construction of an Interurban multimodal terminal in proximity to the Airport of Larnaka may be a good candidate for the use of financial instruments or PPP. The initiative started with the support of CEF 2014.

8.3. Importance and proximity

As a TEN-T Coordinator for this first period of CEF Regulation, I noted a great interest of all actors towards these projects due to their commitment to contribute to a modern proposal for a mobility package for people and goods.

The CNC's are investing in new technologies and contribute to the economic and social development of regions and countries. They improve security of citizens as well as the environmental performances of a key sector in combatting climate change.

It is fundamental to keep proximity with citizens and economic actors allowing for a sound basis of acceptance of ambitious infrastructure projects or cross-border cooperation.

During my many contacts, site visits and meetings, I paid attention to some important elements to be discussed in this Work Plan.

8.4. The continuity and coordination

New projects require a lengthy preparation and construction phase. They need a stable policy and legal framework, as well as a sound funding system.

A good coordination between national and regional development plans on the objectives and implementation planning needs to be ensured. A common approach between EU funding programmes aiming at a better interconnection of countries should be based on a similar continuity and priority approach over time.

This continuity needs to be ensured in the regions and countries by a sound multi-annual infrastructure financing plan. This is the basis to guarantee viability of major infrastructure projects covering very often multi legislative periods. A stable financial perspective constitutes a major asset for co-financing by banks or private investment partners. This is often a weak element for some of the OEM countries.

8.5. The importance of a transnational and multimodal approach

The needed investments on the OEM CNC demonstrate the importance of insisting towards a cross-border and multimodal approach. Even if all countries recognise the vital importance for their citizens and economy of these cross-border relations, additional consequent efforts are expected to be made. More so, that they recognise that these cross-border links will have an important levy effect on their economies.

Even the most restrictive estimations call for an increased modal shift in transport, essentially towards rails and inland navigation, giving as such a clear impetus to economic efficiency and environmental progress. The transport flow bottlenecks located in the hinterland of maritime ports like Hamburg and Bremerhaven have a direct impact on the efficiency of the entire Corridor.

Reinforced cross border cooperation will contribute to lifting off several outdated operational, administrative and regulatory barriers inherited from the past and kept without any necessity and will show the impact of the implementation of EU legislation especially in the rail sector.

Those barriers to efficiency undermine the benefits of huge investments which are needed to improve the efficiency of the Corridor and compromise the good use of public money. The analysis and the efforts to compensate the problems should be an integral part of the evaluation of each project impact.

8.6. The financing adapted to the project and public interest

The analysis of the OEM project list shows several challenges to be tackled:

The need to invest in railways or inland navigation does not necessarily need to respond to financial profitability principles but rather to environmental benefit criteria, the economic development of the regions or peoples and freight mobility efficiency.

The benefits of these projects that one may evaluate in terms of job creations, diminution of GHG's, increase of GDP are fundamental for our future society.

These public interest criteria allowing such infrastructure projects must be taken into account more efficiently in a broad sense by: on one hand the banking sector benefiting from public money to cover partially their loan or guarantees risks, and on the other, through a direct EU financing (grants) or combined with loans and bank guarantees. The efficiency of the operational and administrative cooperation between stakeholders and the implementation of EU legislation could become conditionality for funding.

In a coordinated approach the available means of CEF, EFSI and regional funds including EIB support as well as the private banking sector will make infrastructure projects a reality.

On the OEM, we face the problems of many Member States with a high historical public debt ratio, hampering as such the possibility to go for additional loans to realise a project. The limitations brought by the public debt is heavily reducing their capacity of investments or borrowing.

A reflection on limited budget neutrality of some types of high EU added value investments may contribute to solving the challenges without compromising the budgetary balance needed for a sustainable development.

8.7. An efficient, pragmatic and complementary approach

The TEN-T and CEF Regulations constitute the excellent basis for a common approach between Member States. This efficiency has been demonstrated as well on the OEM Core Network Corridor with absorption between 2014 and 2017 of 99,8% of the limited in time "reserved CEF cohesion envelope" in new mature transport projects. With the global oversubscription, one could have spent around three times the available budget.

The TEN-T defined standards may be adapted to local circumstances linked to the environment, hydrology, and topography in order to remain pragmatic and allow for the implementation of complicated projects, such as for instance the Elbe River. A compromise like the "Gesamtkonzept Elbe" fostering a positive cooperation between all political, economic and societal actors to improve in a sustainable way the navigability of the Elbe River is a perfect example of what can be reached. In this respect, German and Czech Republic authorities have elaborated a strategy to cooperate closely on the basis of the Gezamtkonzept Elbe for further improvements. During a meeting in December 2017 between the German and Czech authorities, it has been considered as a sound ecologic and economical solution. I will support their willingness to present to the European Commission a request for standards to be adapted for the River Elbe according to Article 15 of Regulation (EU) 1315/2013.

In addition, one could envisage raising the limit of 10% of the budget for the construction of motorways as new investments are needed to improve the safety, reduce the number of accidents and improve energy efficiency.

Permitting, public market, spatial planning issues are also important elements in the overall difficulties faced by transport infrastructure project promoters and even more when it comes to cross-border projects. A clear support should be brought at EU level to facilitate solving such issues.

In addition, the evaluation of the projects maturity needs to take into account the environmental challenges, the state aid aspects as well as the future means needed to provide the appropriate maintenance to the new infrastructure.

8.8. The need for Rail breakthroughs over the period 2018 – 2023

The Core Network Corridors, under the guidance of the European Coordinators, are a key instrument in the European Commission's policy to improve overall mobility in Europe by optimizing the transport modes, in particular through: rail, road, inland and maritime waterways and air transport. The Core Network Corridors strive for an optimal balance and seamless connection between the different transport modes that need to be equally efficient and open to continuous technical developments in order to enhance mobility. The modal share of rail remains below expectations. Therefore a necessary prerequisite for balance between transport modes is a competitive railway sector. Its competitiveness can be significantly improved over the period 2018 – 2023 through the execution of short-term, operational or administrative actions, requiring lower level of investments – through so called 'rail breakthroughs' targeted in particular at the CNC's and RFC's. The complementarity of Core Network Corridors and Rail Freight Corridors is therefore self-explanatory; their cooperation should be steered politically by the European Coordinators, hand in hand with the RFC Executive Boards. The European Coordinators will seek to facilitate the CNC/RFC cooperation and ensure national high-level political support to the RFCs, so that they are able to implement the rail breakthroughs. In order to enhance this approach, future EU investments could be conditionally linked to the operational implementation of these breakthroughs.

Significant and measurable performance results of interoperability can be expected from the Rail Freight Corridors that have an integrated and regional governance structure gathering all stakeholders: the railway undertakings, the terminals, the infrastructure managers and the Ministries of Transport. They are therefore in a unique position to identify and implement the most urgent and efficient rail breakthroughs along their corridors, and should be encouraged to ensure that the entire corridor is able to allow interoperable operations. The European Union Agency for Railways has a key role to play to support this approach, for eliminating national rules which hinder interoperability and in the further development of technical specifications of interoperability (especially on operations, to support common operational procedures).

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Corridor website:

http://ec.europa.eu/transport/themes/infrastructure/ten-t-guidelines/corridors/orient-eastmed_en.htm

[i] Western Balkans Intermodal Study (February 2016), by City Net Scientific Research Center for the Regional Cooperation Council.and WBIF Connectivity Networks Gap Analysis (June 2017), by MottMacDonald/IPF consortium.

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