



Study on Orient / East-Med TEN-T Core Network Corridor

2nd Phase

EN
Executive Summary

1 December 2017

Abstract

The Study on the Orient/East-Med TEN-T Core Network Corridor (OEM) contributes to the Corridor Work Plan according to TEN-T Regulation No. 1315/2013 and the CEF Regulation No. 1316/2013 for one of the 9 TEN-T Core Network Corridors (CNC). It was elaborated between 2015 and 2017 by a Consultant team on behalf of the European Commission DG MOVE, comprising of iC consulenten (Austria), ITC (Bulgaria), Panteia (Netherlands), PwC Advisory (Italy), Railistics (Germany) and SYSTEMA (Greece).

The hereunder presented results formed the major input to the Second and Third Work Plan of the European Coordinator and were presented and discussed with the OEM Corridor Forum.

In this 2nd phase of the comprehensive CNC study, the analyses focused on the identification of existing and expected future gaps in the Corridor's multimodal transport infrastructure against the Regulations' stipulations, based on a status quo inventory of the Corridor's infrastructure and a record of all on-going and planned infrastructure projects.

For the first time, the study examines the potentials of transport innovation, emission reduction and decarbonization, as well as climate-change related impacts. Methods to estimate socio-economic impacts of Corridor investments and also to cluster mature projects and projects suitable for sustainable financing sources were presented.

Disclaimer

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Scope and Structure of the 2nd Study

The present study contributes to the further refinement of the Corridor Work Plan for the TEN-T Core Network Corridor "Orient/East-Med" (OEM) that is regularly to be updated according to TEN-T Regulation No. 1315/2013¹, taking also into consideration the CEF Regulation No. 1316/2013². It was elaborated during 2015-2017 by a multi-national study team led by iC consultants on behalf of the Directorate-General Mobility and Transport of the European Commission.

The results of the study established the basis for the European Coordinator for the OEM Corridor, Mathieu GROSCH, to draw up the Corridor's Second and Third Work Plan, benefiting also from the support mechanism of the OEM Corridor Fora and dedicated Working Groups' meetings, whereby interim results and topics of specific interest to the Corridor were presented and discussed on a regular basis.

Being a comprehensive corridor study, it primarily entailed the identification and description of the Corridor's characteristics, a demand forecast and a compliance check of the Corridor's technical parameters with the standards set by Regulation No. 1315/2013, in order to identify bottlenecks that actually hamper the operational efficiency and seamless functionality of the Corridor. These were subsequently compared against a project list of accomplished, on-going and planned projects, leading to the identification of persisting gaps by 2030. Corridor related project lists also allowed the projects' clustering according to their maturity. Finally, the Corridor was examined in terms of its modal shift and innovation deployment potential, socio-economic impact and impact to decarbonisation and climate change adaptation.

The Alignment of the Orient/East-Med Corridor

According to Regulation No. 1316/2013 and clarifications agreed with Member States, the Orient/ East-Med Corridor, as depicted below, consists of the following multi-modal parts:

Figure 1: OEM Corridor Alignment



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

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 inland waterway (IWW). It is expected that the Corridor length will further adapt, e.g. with the construction of new by-pass roads, the

¹REGULATION (EU) No 1315/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 on Union guidelines for the development of the trans-European transport network...

²REGULATION (EU) No 1316/2013 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 11 December 2013 establishing the Connecting Europe Facility...

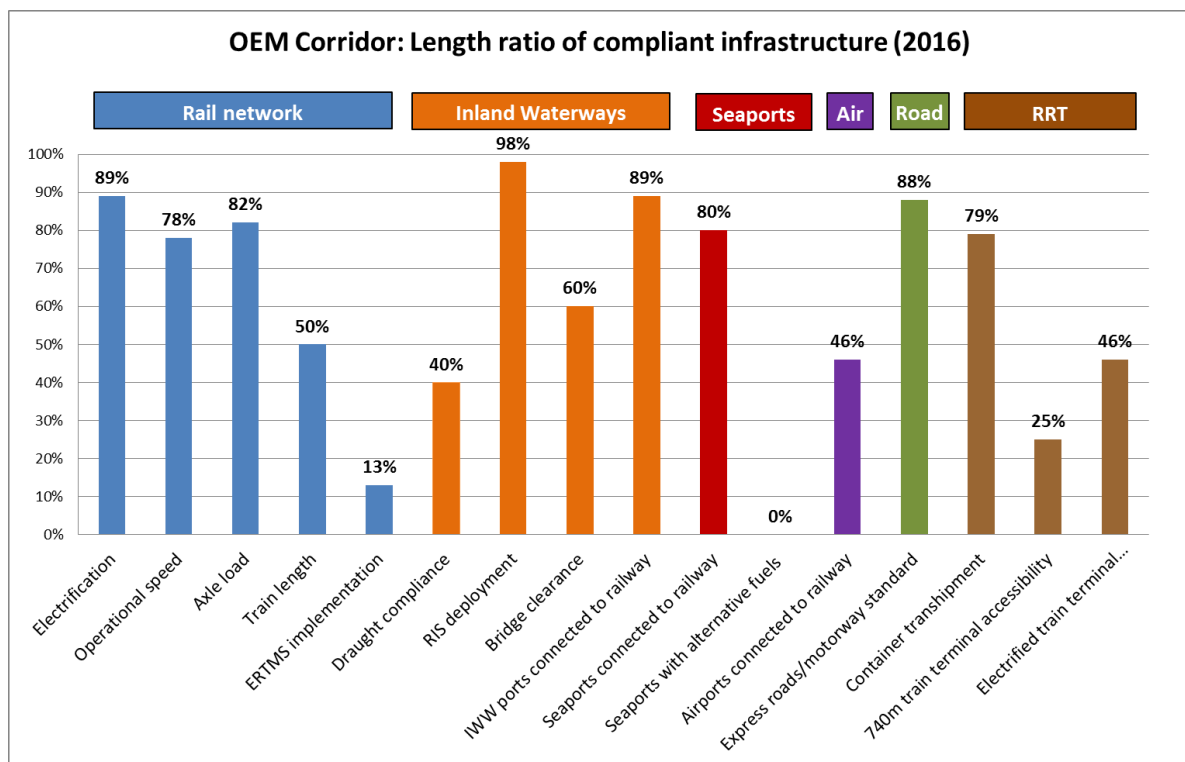
length will increase. The OEM Corridor is tangent to 15 urban nodes and 15 core airports of the core network, from which 6 are main airports to be connected with high-ranking rail and road links until 2050. Furthermore, 10 Inland ports and 12 Maritime ports are assigned to the Corridor, as well as 25 Rail-Road Terminals (RRTs). In Cyprus, no rail infrastructure is deployed. OEM related maritime infrastructure exists in 4 countries, namely Bulgaria, Cyprus, Germany and Greece. The Danube IWW and its ports were analysed in the Rhine-Danube CNC study.

Several segments of the OEM Corridor are coinciding with other of the 9 Core Network Corridors, such as the Rhine-Danube Corridor (approx. 1000 km) and on shorter sections, the North Sea / Baltic, the Scandinavian-Mediterranean and the Baltic-Adriatic Corridors. Finally, the OEM Corridor includes sections of ERTMS Corridors³. The partially overlapping main routes of Rail Freight Corridor RFC 7 "Orient/East Med" and RFC 8 "North Sea / Baltic" are defined through Annex II of Regulation No. 1316/2013⁴.

Status of the Orient/East-Med Core Network Corridor-2016

Summarizing the information on the multimodal OEM 2016 infrastructure, Figure 2 depicts the rate of compliance for key technical parameters with regard to the explicit target values set to be met by 2030 in accordance with Regulation No. 1315/2013. Low compliance rates can be observed for the ERTMS and train length criterion (740 m), the IWW draught (2.5m) and clearance (5.25m), while the underdeveloped availability of alternative fuels is an issue in all modes of transport.

Figure 2: OEM compliance rates of selected TEN-T parameters



In more detail, the following deficiencies are identified on a modal basis:

³ Commission Implementing Regulation (EU) 2017/6 of 5th of January 2017 on the European Rail Traffic Management System European Deployment Plan (ERTMS EDP)

⁴ RFC 7 alignment: Praha – Wien/Bratislava – Budapest – București – Constanta/ – Vidin – Sofia – Thessaloniki – Athina; RFC 8 alignment: Wilhelmshaven/Bremerhaven – Bremen – Hannover – Magdeburg – Dresden and Hamburg / Rostock – Berlin – Dresden – Praha.

- Railway network: ERTMS non-compliance in 87% of the OEM rail network; train length is a major issue along the entire Corridor; minimum axle load of 225 kN is an issue for Romania; maximum operating speed of lower than 100 km/h is a barrier for freight trains in Slovakia and Bulgaria; non-electrification at small parts in Germany, Romania and Greece, as well as traction system breaks.
- RRTs: only 4 RRTs (located in Germany) fully compliant with all requirements set out in Regulation No. 1315/2013.
- IWW network and ports: permissible height and draught are not compliant mostly on the Elbe river (Germany and Czechia); locks reliability not met at the Lüneburg-Scharnebeck and Vltava sections, mainly within Praha and at the Upper Elbe (between Mělník and Přelouč); River Information services (RIS) not completely implemented in Czechia; lack of facilities for the provision of alternative fuels at all ports.
- Maritime: missing rail connection at Ports of Igoumenitsa and Patra (EL); lack of facilities for the provision of alternative fuels at all seaports.
- Road network: ITS (southern part of the Corridor: RO, BG and EL) fail to transmit cross-border data; fragmented road charging schemes; uneven density of safe and secure parking areas with long sections missing suitable facilities in the southern part of the Corridor.
- Airports: three major core airports (Hamburg, Praha and Budapest) missing connection to "heavy rail"; Bratislava, Timisoara and Thessaloniki airports missing connection to rail; no fixed storage tank facilities for aviation biofuel in use in OEM airports.

Future demand for the Corridor

The Multimodal Transport Market Study analysed the OEM Corridor-related transport system and assessed the capacity and traffic flows on the respective parts of the infrastructure for the time period 2010 - 2030. Annual transport volumes since 2010 depicted a stable development for freight transport in the OEM countries for road, rail and inland waterway.

In the 2030 reference scenario⁵, 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 shares 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 modes of transport. Notably, the passenger demand for the period under study remains almost stable with a growth rate of 0.05% per year.

The modal shift potential is mainly related to the inland waterway network; the forecasted capacity in 2030 is limited on the railway network and a shift towards rail would further exacerbate capacity problems. The inland waterway transport is considered to be reliable, energy efficient, "greener" and – most importantly – has the capacity for expansion. Accordingly, a top-down approach was employed to determine the total modal shift potential for the northern OEM Corridor under three alternative scenarios for 2030, that is, the current road volumes that can be containerised and shifted to inland waterways on the river Elbe. The analysis demonstrated that a large potential is indeed 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. The 2010 volume on the OEM IWW network was 18.7 mln tonnes.

The OEM Infrastructure Project Pipeline

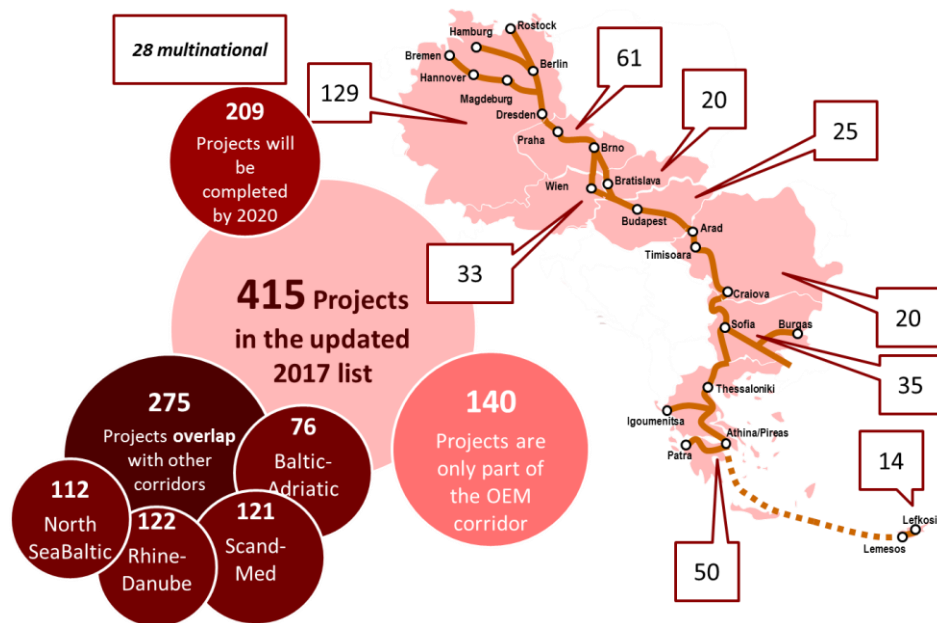
The OEM project pipeline forms the basis for the implementation of the Corridor by 2030. The 2017 **updated** project list is composed of 415 non-finalized projects,

⁵ Assumes that none of the projects of the OEM Project list will be implemented until 2030 (status quo).

belonging to more than 9 countries and 9 different categories⁶. 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. In summary:

- 92 (48 OEM only) projects have been completed in 2014-2016
- 41 (14 OEM only) projects 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
- 203 (83 OEM only) planned actions with start date after November 2017 amounting to €40 bln (€17.3 bln OEM only).

Figure 3: Number of projects per Member State and overlaps



Source: OEM CNC study, May 2017

The total cost of on-going and future investments amounts to **€ 68.188.290.000** (cost information made available for 376 projects), with 82% of the projects falling in a cost class ranging between €0 and 500 mln. OEM-only projects amount to a total of € 30 bln.

The first 4 years of the Connecting Europe Facility implementation marked a very intensive period of new infrastructure and study projects launched in the Corridor, whereby:

- Investments supported by CEF on the OEM Corridor amounted to €2.83 bln.
- CEF financing grants for these investments amounted to € 1.95 bln.
- ITS, ERTMS and railway noise reduction improvements accounted for €24.7 mln.

Looking at the greater picture, for the nine Member States of the OEM Corridor, and for the total investments of € 68 bln for 415 identified projects (resp. of € 77 bln for 507 projects on-going since 2014), there is still a need to mobilise € 38.5 bln for the 183 projects that have yet to commence.

Given that a fair percentage of projects have not secured financing, a 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. The latter refers to the above planned 183 projects. Out of these, 70 are pure OEM actions, thus only impacting the OEM CNC, while 113 are shared with one or more other CNCs. The total investment value of pure OEM projects which still have to start is €16 bln, with the remaining €12.5 bln accounting for projects shared among the OEM and at least another CNC. As a result of this analysis, it has been concluded

⁶ 140 projects are exclusively part of the OEM CNC, not appearing in the project lists of other CNCs ("OEM only"). 275 projects are located on overlapping sections with other Corridors.

that the number of projects which already have secured complete financing is 84 out of 179⁷, almost 50%, corresponding to an investment of €18.7 bln. Of these 84 actions, 32, accounting for €3.1 bln, are only part of the OEM Corridor. The number of projects that are deemed eligible for innovative financial instruments is 72, equalling to 22% of the analysed projects.

Future challenges

The list of on-going and planned infrastructure projects defines the prospects for the compliance with Regulation No. 1315/2013 and the alleviation of other identified key barriers related to cross-border issues, intermodality, interoperability, etc. Table 1 summarises the expected bottlenecks per mode in 2030, for which further actions (additional to Project List) would be required.

Table 1: Selection of expected bottlenecks and network gaps in 2030

Mode	Section	Bottleneck / Network Gap
Rail	Dresden – Praha (DE, CZ)	Capacity bottleneck (New high-speed railway line not be operable before 2035)
	Brno, Bratislava area (CZ, SK, HU)	Capacity bottleneck, technical non-compliance with train length standard
	Arad – Sofia – Promahonas (RO, BG, EL)	Technical non-compliance regarding axle load, train length, operating speed, traction, low international traffic volumes
	Various sections	Delayed ERTMS deployment
	Urban Nodes	Capacity bottleneck
IWW	Elbe River (DE, CZ)	Non-compliant draught (<2.5 m)
	Magdeburg – DE/CZ border and Tynec– Pardubice (Elbe) (DE, CZ)	Non-compliant underpass height (<5.25 m)
	Vltava River (CZ)	Insufficient locks, non-compliant draught and underpass height
	Lüneburg, Anderten, Geesthacht (DE)	Lack of Lock capacity
Sea-ports	Igoumenitsa (EL)	Missing rail connection
	Thessaloniki, Heraklion (EL)	Delay in VTMIS deployment
	Pireas, Thessaloniki, Patra, Igoumenitsa, Heraklion (EL)	Missing National Single Window or e-maritime services (PCS)
	Wilhelmshaven (DE), Burgas (BG), Greek ports (EL), Lemesos (CY)	Non-availability of alternative clean fuels
Air-ports	Hamburg (DE)	Missing connection with heavy rail ⁸
	All 9 OEM core airports	Non-availability of alternative clean fuels ⁹
Road	Vidin – Montana, Mezdra – A2 (BG)	No motorway / expressway standard
	Various sections	Capacity bottleneck, lack of safe parking areas

⁷ This figure excludes the 4 studies, as they are usually funded through different mechanisms than works, and their impact is rather small.

⁸ Connection with rail is only required by 31 December 2050 according to TEN-T regulation no. 1315/2013 Art. 41 (3).

⁹ The regulation requires from core airports by 31 Dec 2030 only the capacity to make alternative clean fuels available.

Administrative & Operational barriers to be alleviated

Rail: Administrative and operational barriers often cause significant competitive disadvantage for rail transport on the Orient/East-Med Corridor. Through the three meetings of a dedicated **Rail Cross-Border Issues** Working Group of the OEM Corridor Forum, comprising of all main stakeholders and decision makers, such as Ministries, Infrastructure Managers, private and public freight and passenger operators, the following main administrative and operational barriers were identified: long waiting times in stations for both passengers and freight trains due to operational issues; unnecessary double border police and technical controls; lack of harmonised operational rules, normative differences between Member States; lack of coordination of operations at current modernisation and rehabilitation works along the Corridor; lack of a consistent and updated information exchange system allowing for capacity planning, train operations and document transfer across borders; information gaps and barriers in communication largely affecting the planning of activities, personnel and rolling stock, as well as current operation of international freight trains; low level of ERTMS implementation.

Pilot Initiative - the Rail Border Two Hour Goal

During the three Rail Cross-Border Working Group meetings, held in March 2016 (Budapest), April 2017 (Vienna) and October 2017 (Brussels), with strong cooperation with the Rail Freight Corridor "Orient/East-Med" (RFC 7), Coordinator GROSCH set up the strategic goal of reducing significantly the freight trains border waiting times and achieving the so called "Two-Hour Goal".

On the 21st June 2016, in Rotterdam, at the initiative of the 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, Czechia, Slovakia, Hungary, Romania, Bulgaria and Greece. These 8 EU Member States committed officially to set measures in order to reduce each rail border transit time to a maximum of 2 hours by mid-2018. As a result, an initiative was developed with the aim to simplify the cross border technical and administrative operations, to enhance and to harmonise coordination of infrastructure works, capacity and path arrangements, as well as to improve governance and communication.

IWW: Three main groups are distinguished: barriers in RIS implementation, workforce related barriers and operational barriers.

Maritime: Key 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.

Road: Road tolling systems along the Corridor remain fragmented 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. An additional issue is long waiting times for heavy goods vehicles at border crossings due to inefficient organization of procedures.

Environmental and socio-economic effects / innovation

The implementation of the OEM Corridor is expected to yield cumulative effects to the *environment, economy and society*. Firstly, the implementation of the OEM projects will lead to an increase of GDP over the period 2016-2030 of € 517 bln in total, while investments will also stimulate additional employment in terms of 1,494,000 additional job-years created over the same period. It can be expected that also after 2030, further benefits will occur. As a result of modal shift and various decarbonisation initiatives, energy efficiency is predicted to increase, while related emissions are expected to decrease. The OEM Corridor is susceptible to various climate change effects; nevertheless, adaptation measures are taken by a number of countries mainly to reduce vulnerability against floods as well as rail track buckling.

Finally, there is a clear need to further roll out innovation on all parts of the Corridor in order to further stimulate adaptation to climate change, decarbonisation and modal shift.