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Orient East Med



Fifth Work Plan of the
European Coordinator

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Abbreviations

bn	Billion
C-ITS	Cooperative Intelligent Transport Systems
CEE	Connecting Europe Express
CEF	Connecting Europe Facility
CDT	Commercial Delivery Time (Rail)
CNC	Core Network Corridor
DG MOVE	European Commission – Directorate General for Mobility and Transport
DNSH	Do not significantly harm (see EU Taxonomy)
EC	European Commission
EDP	ERTMS Deployment Plan
EIB	European Investment Bank
ERTMS	European Rail Traffic Management System
EU	European Union
GKE	Gesamtkonzept Elbe (overall Strategy for the Elbe IWW)
CINEA	European Climate, Infrastructure and Environment Executive Agency
ITS	Information Technology System
IWW	Inland waterway
km	kilometre
KPI	Key performance indicator
m	metre
mn	Million
MoS	Motorway(s) of the Sea
MoT	Ministry of Transport
MS	Member States of the European Union
n.a.	not available / not applicable
n.L.	nad Labem (Czech place name), at Elbe River
OEM	Orient / East-Med (Corridor)
OPS	On-shore Power Supply
p.a.	per year / annual
RFC	Rail Freight Corridor
RRF	Recovery and Resiliency Facility
RU	Railway Undertaking
SSMS	Sustainable and Smart Mobility Strategy
SSS	Short Sea Shipping
SSTPA	Secure Truck Parking Areas
TEN-T	Trans-European Transport Network
TMS	Traffic Management System
WG	Working Group
WP	Work Plan
Country Codes after ISO 3166:	
AT	Austria
BG	Bulgaria
CY	Cyprus
CZ	Czech Republic
DE	Germany
EL	Greece
HU	Hungary
MK	North Macedonia
RO	Romania
RS	Serbia
SK	Slovakia
TR	Turkey

1 Towards the OEM Corridor 5th Work Plan

1.1 Introduction

Almost halfway between the time the TEN-T Regulation came into force defining the Core Network Corridors (CNC) and the first key milestone set –completing the core network by 2030–, I am issuing the **Fifth Work Plan for the Orient / East-Mediterranean (OEM) TEN-T Core Network Corridor**. The timing is particularly poignant as we are entering the final year of the 3rd Phase of the CNC studies that will also signify the end of my current mandate as European Coordinator. Most importantly, this is the last Work Plan adopted under the current TEN-T Regulation.

We are now called to address the TEN-T Core Network Corridor development and operation in a completely new transport landscape shaped from the unprecedented events of the COVID-19 pandemic, the visible impacts of climate change, the automation and digital revolution, as well as political developments such as UK's withdrawal from the EU.

The **COVID-19 pandemic** presented unparalleled challenges to all sectors across the globe, with transport being one of the most profoundly affected. European countries were no exception; with severely reduced mobility and restricted connectivity, passenger transport modes suffered a considerable slowdown, some indeed more than others, while the freight sector witnessed the disruption of entire supply chains. In comparison, rail freight transport remained a reliable backbone for transport of goods even during the strict lockdowns. At the same time, the resulting economic downturn forced several countries to delay, change or even put on hold infrastructure development plans.

Opting to obtain a first assessment of the basic challenges for on-going and future works including project preparatory studies along the Corridor, I held a series of bilateral talks with all nine OEM Member States. The interrupted flow of skilled labour and material supply through border closures or disrupted logistic chains lead to delays, which, however, proved to be manageable in all OEM countries, reducing the uncertainty of project delivery. An evident increase in force majeure claims for contractual coverage was reported, as well as cost claims to compensate for these delays and additional expenditures incurred.

In addition, in the period following the launch of the previous Work Plan, and in the context of the COVID19 travel and meeting restrictions, I maintained communication and operation of the OEM Corridor Forum instrument through the remote organisation of the **15th** and **16th Corridor Fora Meetings** (March and November 2021), as well as two dedicated Corridor Workshops (June 2020 and 2021). The Working Group on Rail Border issues also continued with the realisation of its 5th Meeting (Feb 2021), while the OEM was part of two Motorways of the Sea-Basins Workshops organised for the Black Sea (Oct 2020) and the East Med/Ionian/Adriatic Seas (Feb 2021).

This past autumn, I also had the pleasure of boarding the **Connecting Europe Express Train (CEE)**, designed for the occasion of the European Year of Rail 2021, in an effort to raise awareness of the benefits of the railways. The CEE train travelled for 36 days across 26 countries; it was a unique experience that highlighted in particular the challenges met in cross-border train service.

The pandemic has therefore, on the one hand, shown the importance of having a resilient transport system in place, while on the other, triggered a significant revisit of priorities. The need to turn towards the **twin green and digital transformation** is

reinforced even further as part of the agenda to boost post-pandemic recovery. To this end, the evolution of the OEM Corridor must focus on **accelerating the green, digital and modal shift**; the blueprint for this change was set by the **European Green Deal**¹, as well as one of its main delivery vehicles for transport, EU's **Sustainable and Smart Mobility Strategy**².

Given its high proportion of total greenhouse gas emissions, EU's goal of at least 55% greenhouse gas reduction target by 2030 and climate neutrality by 2050 will be reached only by introducing clear and ambitious policies. The Sustainable and Smart Mobility Strategy (SSMS) lays the foundation for how the European transport system will achieve: a) an irreversible shift to zero emission mobility, b) seamless, safe and efficient connectivity, and c) a more resilient single European transport area for inclusive connectivity. Among other, these must result in a considerable increase of the market share of the more sustainable rail and waterborne transport modes.

The TEN-T policy will be a catalyst for bringing its network closer to the above ambitious vision. In this regard, in line with the Action Plan included in the Communication on the Green Deal and SSMS, a proposal for a **revision of the TEN-T Regulation** based on an impact assessment was put forward by the Commission and adopted on December 14, 2021, following a public consultation. A few months earlier, EU's **Connecting Europe Facility (CEF) 2.0** programme was adopted to run from 2021 to 2027 with a view to fund the development of high-performing, sustainable infrastructure in the fields of transport, digital and energy. This second edition of the programme is also targeted at facilitating the post-COVID recovery and building a climate-neutral EU.

Moreover, in order to speed up the completion of the TEN-T, the Commission adopted the so called "**Smart TEN-T Directive**"³ in July 2021 that sets out measures aimed at reducing delays encountered in the implementation of projects related to the network. The Directive limits the entire permitting process to three years and provides greater clarity to project promoters regarding permit granting, public procurement and other procedures. The Commission also recently rolled out the largest ever legislative package of 13 proposals (8 revisions and 5 brand new), namely "Fit for 55", aiming to align EU policy with the mandates of the Green Deal and the EU Climate Law.

Last but not least, the OEM has long been at the forefront when it comes to the **cooperation of CNCs with Rail Freight Corridors** (RFC), particularly through the joint activities of its Working Group on Rail border issues. Looking ahead, a joint approach is deemed necessary; hence, an integration of CNC and RFC is envisaged in the proposal by the European Commission for a revised TEN-T to create the "European Transport Corridors" with consistent investment plans as well as clear operational objectives.

As a final note, in the future we shall also need to revisit the TEN-T's connection to the **Western Balkans**, based on the indicative extension of the OEM Corridor to selected countries, as this was agreed by the European Commission and the Western Balkans Prime Ministers back on the 21st of April 2015 in Brussels. The scope would be to analyse the extent to which a fully integrated transport network between the region

¹ COM (2019) 640 final

² COM (2020) 789 final

³ Directive (EU) 2021/1187

and the EU can be achieved, as well as the necessary level of convergence with the TEN-T transport infrastructure and operating standards.

1.2 Achievements along the Corridor (including expected ones before start of CEF 2)

In total, 114 projects have been completed between the beginning of 2019 and the first half of 2021, at a total investment cost of € 3.56 bn. An overview of the key projects is presented herein, with emphasis on those that contributed to the achievement of Key Performance Indicators (KPI), an essential aspect for the completion of the TEN-T Corridors.

In Germany, the extension of the railway line Rostock – Berlin was completed in 2020, upgrading the rail route to an axle load of 25 tons at a total cost of € 855 mn, together with the upgrade of the rail line in the area of Hamburg a year before (reallocation of Wilhelmsburger Reichsstrasse incl. construction of new lines, noise reduction measures and new junction) at a total cost of € 136 mn.

In 2019, the Athens – Thessaloniki main rail artery in Greece became fully electrified with the completion of the Tithorea – Domokos segment together with the electrification of the Pireas – Athens RS section and the electrification resetting between Inoi and Tithorea. Another important achievement is the line operation in mid-2020 of the Kiato – Diakopto – Rododafni segment of 71.5 km length, part of the missing link Kiato – Patras. The infrastructure works along the Rododafni – Psathopirgos section are also nearing completion (€ 260 mn).

A significant achievement was the completion of three rail-road terminal (RRT) projects in Germany, the most important being the “Megahub” Hannover-Lehrte terminal that commenced operations in June 2021. In addition, the second phase of the railway marshalling yard complex at Thriasio Pedio RRT in Greece was completed in 2019 at a cost of € 65 mn, opening the door to its future development as a logistic centre.

Notable progress was also recorded along the inland waterways in the Czech Republic, with the significant improvement of the navigability status on the Vltava Lateral channel (Vraňany – Hořín near Mělník); this is now navigable for large vessels. Also, via the recently completed project on Vltava River in 2021, the height under all 7 bridges of the channel and one bridge on Hořín lock has increased to 5.25m or higher (€ 13 mn).

Achievements in terms of road projects in 2020 include the construction of the link road connecting the Lemesos - Paphos Motorway with the port of Lemesos in Cyprus, significantly improving the last mile road access to the port (€ 115 mn), the construction of a 2nd lane on the section between Hegyeshalom and Rajka (HU/SK border) at a cost of € 85 mn, as well as the progress of the modernization of road I-8 "Kalotina - Sofia ring road" in Bulgaria in 2021 (Dragoman – Hrabarsko section completed, Serbian border – Dragoman section under construction and Hrabarsko – Sofia Ring Road planned), at a total cost of € 64 mn. Considerable progress was also made with the increased provision of clean fuels along Slovak highways and the completion of the German National policy framework on electric energy supply on the road infrastructure in 2020, at a cost of € 100 mn. Notably, another 112 road projects are expected to be finalised until the end of 2022 amounting to € 8.4 bn in total.

2 Characteristics of the OEM Corridor

2.1 The new alignment under CEF2

The **Orient / East-Mediterranean (OEM) Corridor** is one of the nine TEN-T Core Network Corridors (CNC) depicted in Figure 1, spanning across 9 Member States, namely Austria, Bulgaria, Cyprus, Czech Republic, Germany, Greece, Hungary, Romania, and Slovak Republic. It constitutes a key north-south intermodal transport corridor for Europe, connecting the North and Baltic Seas through road, rail, IWW and nodal infrastructure, across Central Europe and the Danube ports, with the seaports of the Black Sea, the Aegean Sea and the East Mediterranean.

Several segments of the OEM Corridor overlap with other CNCs, especially with the Rhine-Danube Corridor and on shorter sections, the North Sea - Baltic Corridor, the Scandinavian-Mediterranean Corridor and the Baltic - Adriatic Corridor.

The TEN-T Regulation (EU) 1315/2013 designates to the OEM Corridor 15 urban nodes and airports, 10 Inland ports, 12 Maritime ports, as well as 23 hubs with Rail-Road Terminals (RRTs).

The revised CEF Regulation (EU) 2021/1153 opts among other to add to the configuration of the Core Network's Corridors with a view to develop cross-border links between Member States and third countries and ensure a better connectivity between core nodes and cross-border projects. In the case of the OEM, new sections relate to 1,220 kilometres of **road and rail extensions** in Member States **Bulgaria and Greece**, as shown in Figure 2.

In Bulgaria, the OEM rail network is extended towards the borders with the Republic of Serbia (Sofia – Dragoman – RS border) and the Republic of North Macedonia (Radomir – Gyueshevo – MK border). Three new sections exist and are operational, while section Gyueshevo – MK border constitutes a missing link. Accordingly, the OEM road network in the Bulgarian territory is extended towards Serbia via Dragoman and North Macedonia via the Dupnitsa – Kyustendil – Gyueshevo link.

In Greece, the new alignment for rail provides for a long extension to Turkey following largely the existing alignment of the so-called “Eastern Egnatia Railway” and connecting the country’s northern ports of Thessaloniki, Kavala, and Alexandroupolis, before ending in Pithio. The latter includes the missing link Thessaloniki-Amphipolis-Kavala/Toxotes. An additional extension to North Macedonia is included from Thessaloniki to Idomeni. In a similar manner, the road network is extended from Thessaloniki towards the border with Turkey (Kipi), as well as North Macedonia (Evzoni). Finally, a direct connection via road to Albania is included, from Ioannina to Kakavija (Albania) at the border.

Figure 1: The Nine TEN-T Core Network Corridors

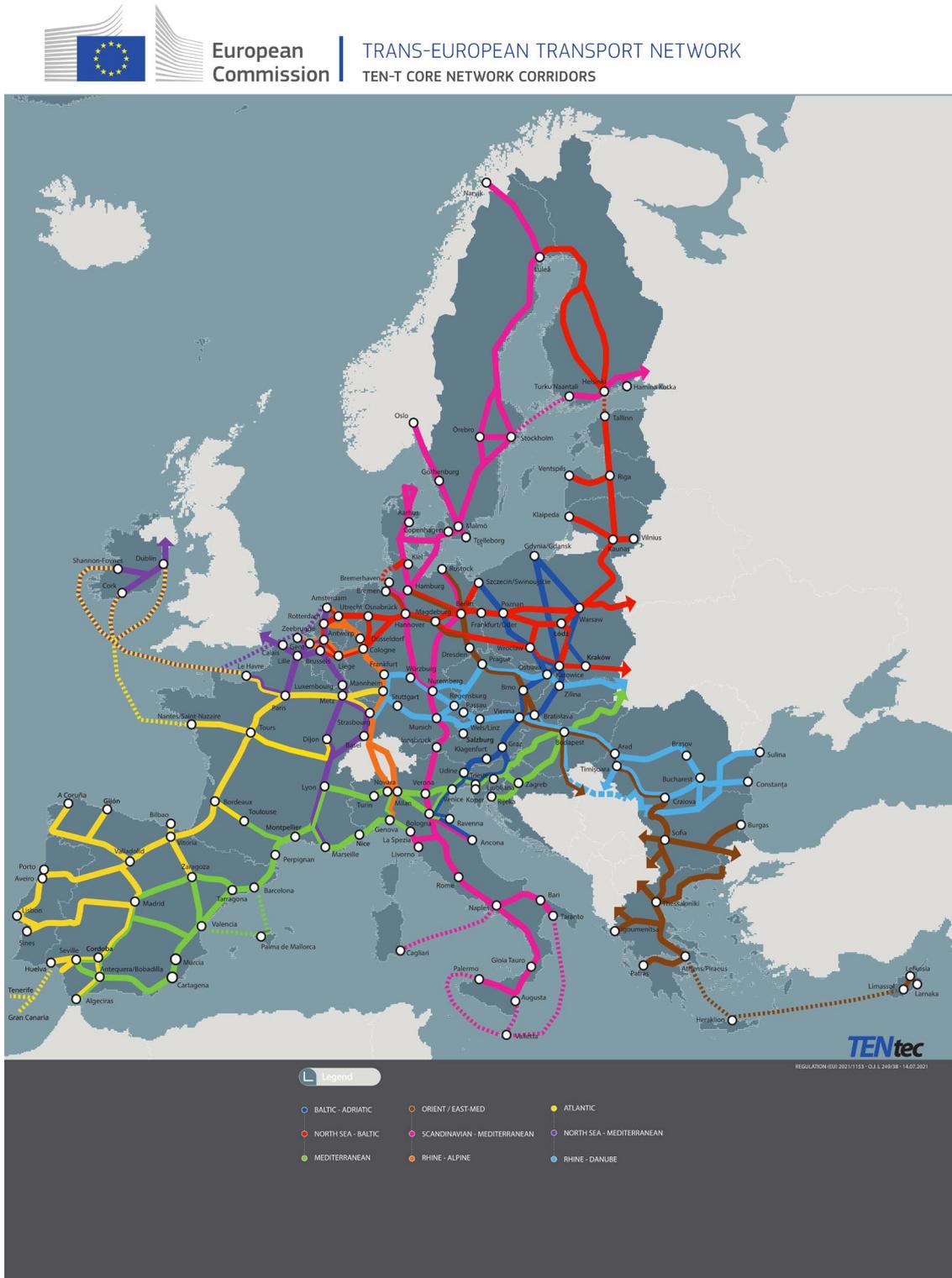
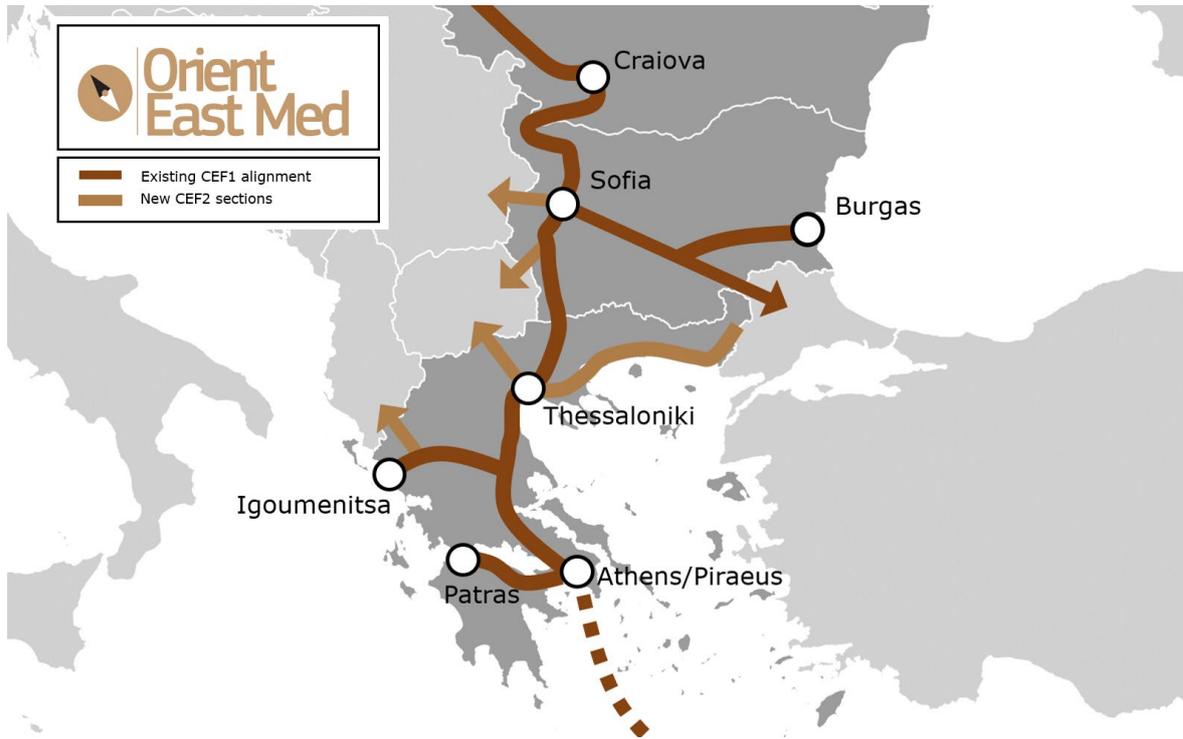


Figure 2: OEM (South) Corridor New Alignment



2.2 Current compliance with the technical infrastructure parameters of the TEN-T guidelines

TEN-T Regulation (EU) 1315/2013 puts forward binding minimum infrastructure targets for the Core Network Corridors' transport infrastructure that need to be met by December 2030, the latest. To assist the monitoring towards achieving these values, Key Performance Indicators (KPIs) are defined for all modes that measure the extent to which these are realised. This section provides an update to the characteristics of the Corridor by tracking and monitoring the achievements in terms of KPIs per section and node. Current compliance levels reflect the status of the infrastructure network as of June 2021.

Rail compliance

The Corridor compliance status is shown in Figure 3 and Figure 4, considering the rail parameters "Electrification", "Line speed ≥ 100 km/h" (freight), "Axle load ≥ 22.5 tonnes" and "Track gauge = 1,435 mm". Additionally, "Missing links" are pointed out. Referring to the above parameters, current compliance is summarised in the following:

- Most Corridor parts as well as the entire Corridor part between Hamburg/Bremen/Rostock and Craiova are completely electrified. Non-electrified parts are located in the North of Germany (Oldenburg – Wilhelmshaven incl. connection to the Jade-Weser Port) and south of Craiova: in Romania (Craiova – RO/BG border), Bulgaria (Gyueshevo – Radomir) and Greece (Promahonas – Thessaloniki, Toxotes – Alexandroupolis – Pithio and Palaiofarsalos – Kalambaka).
- All rail lines along the Orient/East-Med Corridor feature the standard track gauge of 1,435 mm⁴.
- A throughgoing line speed of at least 100 km/h is provided on nearly the entire northern part of the Corridor. Short non-compliant sections have been identified in Czech Republic (Děčín – Ústí n. Labem Střekov), Slovakia (Bratislava hl.st – Bratislava Petržalka – Rusovce/Rajka) and Hungary (Budapest area)⁵.

In contrast, large parts of the southern Corridor are non-compliant. This concerns Romania (all sections except Filiași – Craiova), Bulgaria (north-south route, parts of Sofia – Krumovo line, which are currently under modernisation and CEF2 extensions Sofia – Kalotina zapad and Gyueshevo – Radomir) and Greece (Thessaloniki – Promahonas and CEF2 extensions Thessaloniki – Idomeni and Toxotes – Alexandroupolis – Pithio).

- The compliance status regarding axle load also shows a north/south diversification: the northern part is compliant up to Slovakia, while Hungary shows several, albeit rather short, non-compliant parts (Rajka – Hegyeshalom,

⁴ With the exception of the existing Kiato – Patras line (EL), currently non-operational, displaying a gauge of 1000 mm. The connection will be replaced by a new double line of 1435 mm gauge following a new track alignment.

⁵ Some countries show small non-compliant sections within the nodes, particularly in the surroundings of big stations (e.g. Budapest, Vienna, Athens). Such cases must be evaluated separately with regard to potential measures to be taken.

Békéscsaba - Lókösháza and certain sections within the Budapest node, the upgrade of which is in progress).

The Romanian Corridor sections south of Arad only allow for 20 tons/axle, whereas Bulgaria is nearly compliant (except from the Gyueshevo – Radomir section). In Greece, the following lines are non-compliant: BG border/Promahonas – Thessaloniki (incl. port connection), Thessaloniki – Idomeni, Toxotes – Alexandroupolis – Pithio and Athens SKA - Inoi. A special situation is the section Pireas – Tris Gefyres, which does not fulfil the axle load criterion; however, according to information from the operator, there is no freight traffic on this section, and this is also not foreseen in the future⁶. Hence, relevance of the freight related KPIs is questionable.

Next to the parameters displayed on the compliance map, the permitted train length (TEN-T requirement of 740 m) and intermodal gauge (P/C 70/400 as market related benchmark) were also analysed:

- Regarding the train length, the Corridor shows a heterogeneous picture: in Germany, Austria and Hungary, 740 m train operation is permitted on all Corridor freight lines. In contrast, the entire part in Czech Republic and Slovakia is not yet compliant. Technically, 740m train operation on the Czech railway network is possible with constraints (not all time slots can be guaranteed).

In Romania, the sections between the HU/RO border and Timișoara as well as Filiași – Craiova fulfil the TEN-T requirement. In Bulgaria, the only compliant sections are on the line between Septemvri and Burgas. In Greece, the north-south route Thessaloniki – Inoi is compliant, together with the sections Palaiofarsalos – Kalambaka and Athens SKA – Kiato.

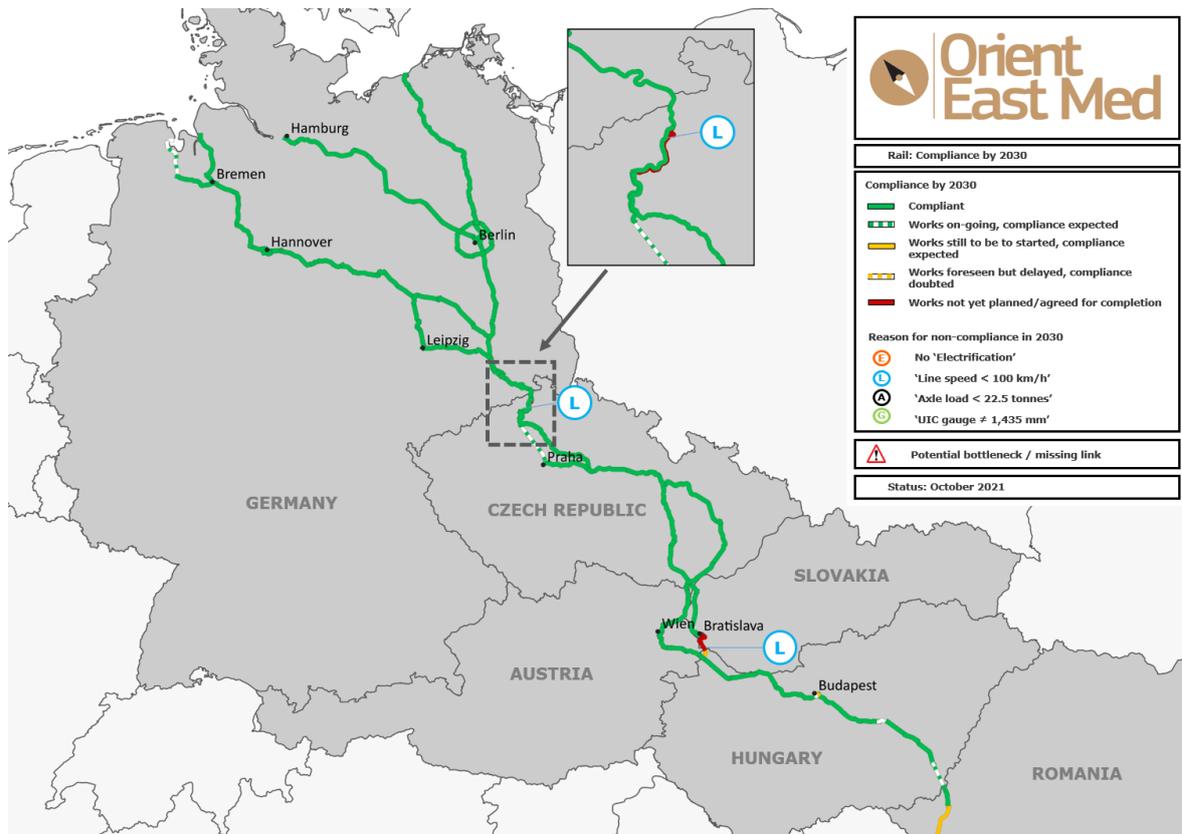
- Continuous train operation with at least P/C 70/400 intermodal profile is already possible today from Germany to Curtici (Romania). On this Corridor part, only the section Kolín – Pardubice does not fulfil in all situations this international standard. In contrast, the Corridor network south of Curtici is below P/C 70/400 (exception: sections on the Plovdiv – Burgas line in Bulgaria).

Finally, missing links with a view on the overall 2030 targeted Corridor alignment are found in:

- Germany/Czech Republic: New high-speed line Dresden – Praha (esp. Lovosice – Praha and cross-border tunnel),
- Bulgaria: Gyueshevo – Gyueshevo West (MK border),
- Greece: Thessaloniki – Toxotes and Kalambaka – Ioannina – Igoumenitsa. In addition, the line Kiato – Patras is currently counted as a partly “missing link”, since the upgrade follows an entirely new alignment and replaces the old, existing metric line.

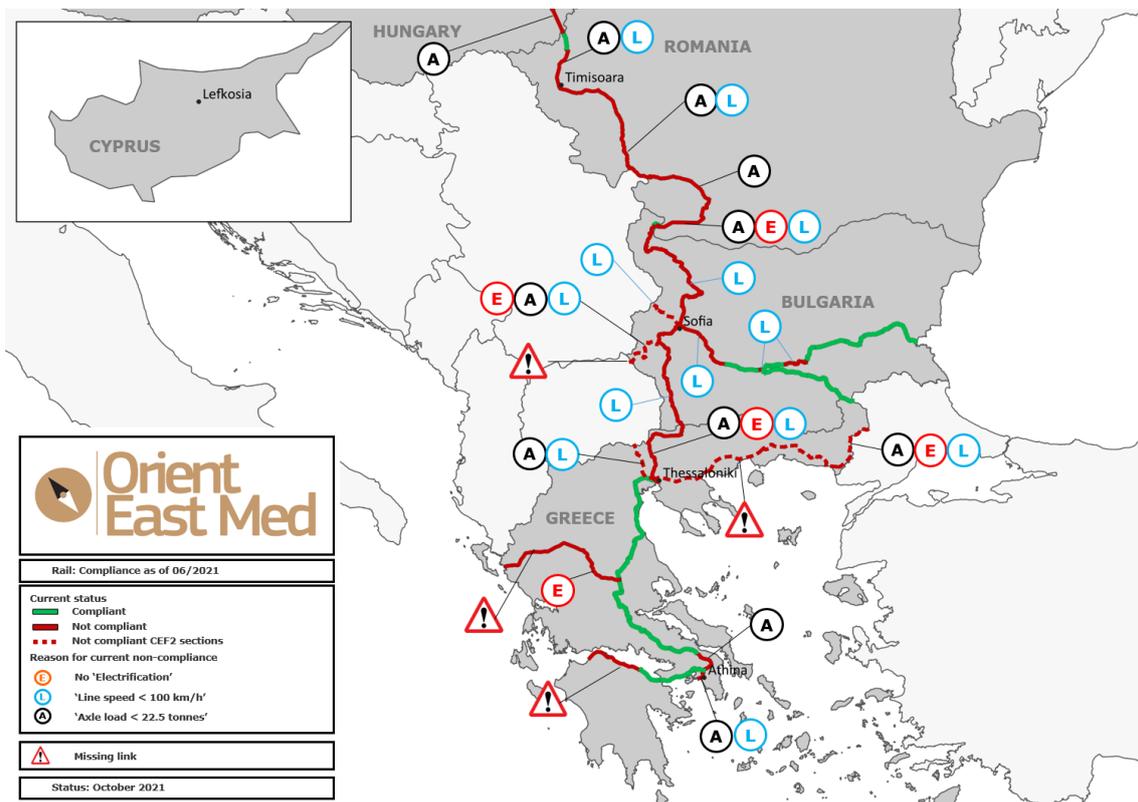
⁶ Freight traffic is ensured along the section Thriasio (Freight complex) – New Ikonio port (Freight port of Piraeus).

Figure 3: Rail Compliance 2021 - OEM North



Note: The German part of the new Dresden-Prague line is not formally part of the OEM Corridor but will become one once completed.

Figure 4: Rail Compliance 2021 - OEM South



Rail-Road Terminals compliance

The analysis of the RRT development since the last Work Plan revealed that on the one hand, substantial improvements have taken place in Germany, where the “Megahub” Hannover-Lehrte went into operation and upgrade measures of two other terminals were completed. Also, in Austria, the new terminal Wien-Süd is in operation, being compliant with all KPIs, except for the 740 m train length criterion (700m are under crane). On the other hand, a number of terminals were abandoned, such as Praha-Žižkov in the Czech Republic (replaced by the new rail-road terminal in Kolín and the new facility of the Port of Mělník – which are not part of the RRTs listed in the Regulation), and Timișoara Semenici in Romania. Compared to the requirements of the Regulation, there are four nodes that still lack of rail-road terminals, namely Craiova, Timișoara, Sofia and Patras.

The KPIs for rail-road terminals are not explicitly laid down in the Regulation; instead, they are derived from market needs to render intermodal transport competitive to road. Regarding the 24 RRTs that are currently in operation in the OEM core nodes, these market-driven parameters generally improved, albeit still on a rather low level:

- About 63% of the terminals provide the possibility to tranship all types of standard intermodal loading units (containers, swap bodies, semi-trailers). Non-compliance is mostly due to the respective market orientation (e.g. focus on maritime transport or on key customers with special logistics profiles).
- The compliance rate for electrified access is 42%. Even more, the limited length of the handling tracks creates a real burden for an efficient supply of intermodal transport services. Only 29% of the OEM terminals are accessible to 740 m long trains.

In general, the current RRT situation is not satisfactory. To a large part, this is due to the historical background: many of the existing rail-road terminals were constructed as re-use of obsolete sidings in the peripheral areas of marshalling yards or port areas. Thus, their railway infrastructure is characterised by a one-side connection to the main line, non-electrification and short usable length of the transshipment tracks. Moreover, due to their location within existing infrastructure, they show no or only very limited expansion options. Therefore, the layout of these terminals does not correspond to the requirements of market-driven transport services. Despite this fact, several of these “historically grown” terminals are still in operation and are only gradually/partially being replaced by modern facilities.

ERTMS compliance

The total length of the OEM Corridor is 6,480 km, including the CEF 2 extension. According to the ERTMS Deployment Plan (EDP), 1,960 km and 2,760 km are expected to be operational by 2021 and 2023, respectively. Overall, ETCS is in operation on 11% of OEM, while GSM-R on 51% of the Corridor. In June 2022, 24% of the OEM length planned in the EDP by 2023 is in operation with ETCS. Given the current deployment figures and considering that some Member States have already notified delays in implementation, it will not be possible to meet the EDP deadlines in this Corridor by 2023. Further information can be found in the last version of the ERTMS Deployment Management Plan.

IWW compliance

Figure 5: IWW Compliance 2021 (scenario <1.4m fairway depth)



The current compliance of the OEM IWW network, as depicted in Figure 5, can be summarised as follows:

- Non-compliant sections are found in the uppermost river section of Elbe / Labe between Týnec n.L. and Pardubice.
- The OEM IWW network is allowed for vessels of CEMT class IV or higher, based on the requirement of navigability for ships of 9.5 m horizontal width and a length of 80-85m, disregarding other parameters (such as draught and underpass height) that are not necessarily to be met.
- RIS in Czech Republic is reaching 90% due to the new section Týnec n.L. – Pardubice, which is not navigable. Furthermore, in the Czech Republic, basic RIS applications have been implemented. As a part of the international project RIS COMEX, the enlargement of AIS infrastructure, as well as the launch of mandatory AIS usage was performed. More RIS corridor services are in the last phase of implementation and will be available in 2022. All these services are being implemented jointly with Germany as part of the Elbe-Weser Corridor within the RIS COMEX project.
- Regarding the minimum height under the bridges (>5.25 m), this is fulfilled on 1,015 km of waterways, representing 61% of the OEM IWW network. Recent non-compliant section is the “CZ/DE border – Magdeburg” (332 km) with the historic Marienbrücke bridge (km 56.51) in Dresden. The height under bridges of the Marienbrücke is only 5.08m above the highest navigable water level. Based on the design water level, which is exceeded on 10 days a year on a long-term average, the bridge clearance height is 5.73m, so that the TEN-T minimum requirement is met for most of the year. In the context of the COMEX project, navigation aids, or physical AIS aids to navigation, were developed. In

case of critical water levels, the currently available bridge clearance can be measured and transferred to the ECDIS (Electronic Chart Display and Information System) as an application-specific message. The system was successfully tested at the Marienbrücke. Other non-compliant sections are the Labe River at Týnec n.L. – Pardubice (32 km), the entire navigable Vltava River (94 km) from Mirejovice lock upstream (74km) and the Elbe-Lübeck-Canal (68 km). Notably, the bridge height KPI increased to 77% after the upgrade of Vltava Lateral Canal (near Mělník) was completed in September 2021.

- A minimum draught of 2.5 m is fulfilled on 670 km (40%)⁷ of the OEM IWW network, whereas the free-flowing parts of Elbe are located between Ústí n.L./Střekov and Hamburg.
- Based on the ambitions set in the Gesamtkonzept Elbe (GKE), both riparian states consider it sufficient to improve the fairway depth on the non-tidal Elbe to at least 1.40 m below the 2010 Equivalent Water Level on a long-term average of 345 days. The equivalent water level is a low water level, which is reached or fallen below long-term average of 20 ice-free days per year. The fairway depth equals the sum of draught, squat and minimum net under keel clearance (without depth reserve). This initiative was acknowledged in July 2021 through the signing of a joint agreement between the Government of the Federal Republic of Germany and the Government of the Czech Republic on the Maintenance and Development of the Cross-Border Inland Waterway Elbe. A formal derogation in accordance with Article 15 (3) of the TEN-T Regulation is pending from both riparian states. The objective of transport-related maintenance on the Elbe is to permanently preserve the condition of the waterway in accordance with its designation as an inland waterway and to ensure proper transport-related water discharge to allow economical inland waterway transport operations.

Ports' compliance

The compliance of the 12 ports of the OEM Corridor has remained more or less unchanged to present. 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 Bremerhaven, Bremen and Hamburg ports that double as inland ports have waterway connections of CEMT IV.

Non-compliance is limited to the Regulation's requirements for rail connection and provision of publicly accessible Liquefied Natural Gas (LNG) refuelling points for maritime transport. More specifically, the seaport of Patras in Greece provides currently only access to passengers via suburban rail, while the other Greek port of Igoumenitsa remains to be connected to the country's railway network through the missing rail link in the western Greek territory. In addition, all ports are lacking the provision of alternative fuels refuelling points.

⁷ The total length of the OEM IWW TEN-T is 1659 km, while the total length of sections compliant to the minimum draught requirement is 670 km. The compliance percentage of minimum draught requirement is $670 \text{ km} / 1659 \text{ km} = 40\%$.

The planned core inland port of Pardubice does not exist yet, while the core inland port of Praha Holešovice is deemed to be out of operation for freight handling, risking losing its limited connection to rail.

Finally, no further RIS development plans are known for the Czech CNC ports (Děčín, Mělník and Praha-Holešovice) and the direct input to the service “Notices to skippers” and electronic reporting is not established yet.

Road compliance

Currently 87% of the total Corridor length, including new sections, qualifies with the motorway or express road standard. The total length of the non-compliant road sections is 782km, the majority of which are located in Bulgaria (318km or 41% of the total non-compliant road sections) and Romania (256km or 33%, all of which being common sections with the RD CNC). Capacity bottlenecks exist, predominantly in western parts of the Corridor and especially around big cities and suburban areas of the main nodes.

At least one type of alternative fuel is offered along 97% of the Corridor length. Special attention is needed only in Cyprus, where 79% of the road network is non-compliant regarding the provision of alternative fuels. Alternative fuels are widely available along the CNC motorways; however, the level of supply varies from country to country. There is good coverage with LPG stations in all OEM countries (except Cyprus), while the number of CNG stations is significantly smaller. Electric charging stations are available in urban nodes and have good coverage of intercity sections in Germany, Austria and Slovakia. Their number is yet limited in Czech Republic, Hungary, Romania, Bulgaria and Greece and also Cyprus.

Intelligent Transport Systems (ITS) deployed along the Corridor for road traffic and interface with other modes of transport are providing relatively limited real-time traffic and weather information. C-Road is the platform of Member States working on the deployment of C-ITS (Cooperative Intelligent Transport Systems) services, which allows vehicles to communicate with other vehicles, with traffic signals, roadside infrastructure as well as other road users. This system has the potential to improve road safety and road transport efficiency. Investments in C-ITS test infrastructures have been made in Austria, Czech Republic, Germany, Hungary and Greece for connecting the vehicle with the infrastructure, but these are not Corridor specific.

Safe and Secure Truck Parking Areas (SSTPA) hardly exist along the OEM Corridor. Two dedicated truck parking areas along the German OEM route are registered in ESPORG⁸, one in Hungary and one in Romania. The Romanian one is also the only (gold) certified⁹ SSTPA, which serves the traffic along the common section of OEM and Rhine Danube CNCs.

⁸ ESPORG is the organization within Europe for all parties interested in secure truck parking and navigation <https://www.esporg.eu/>

⁹ Four level certification scheme includes bronze, silver, gold, and platinum SSTPA.

Figure 6: Road Compliance 2021-OEM North

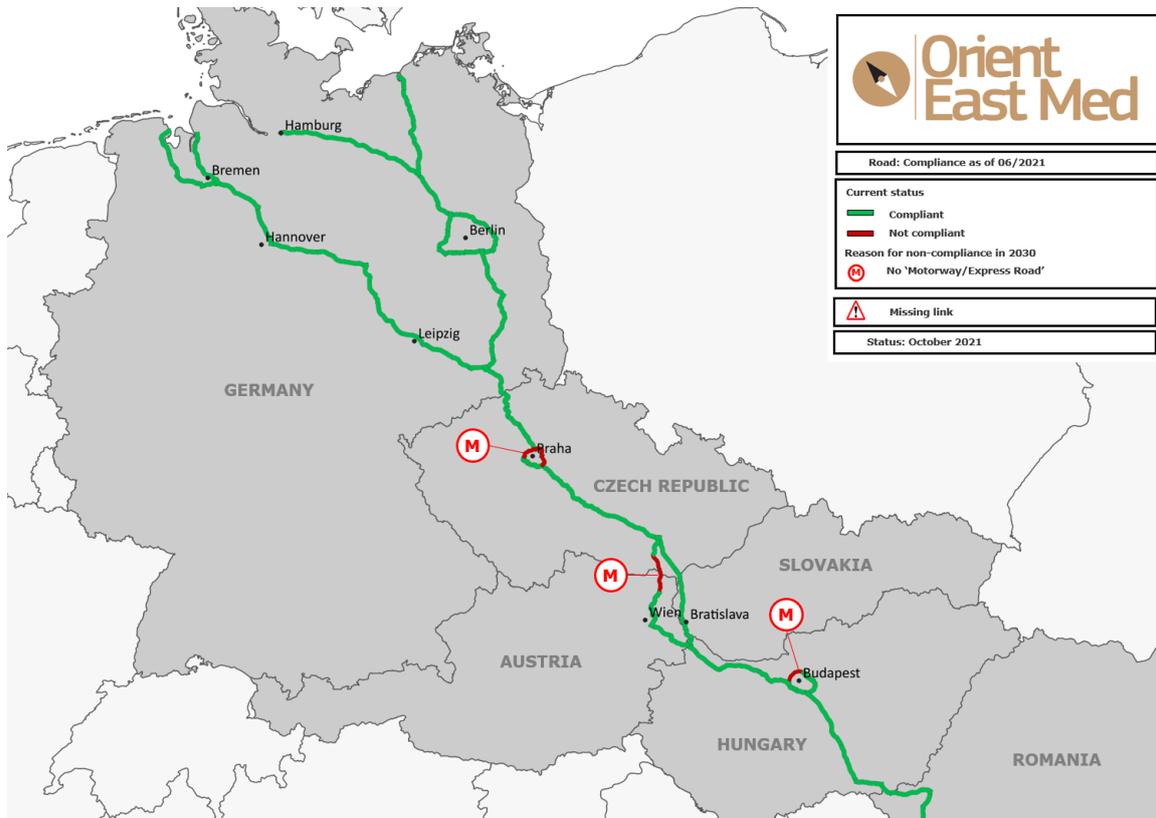
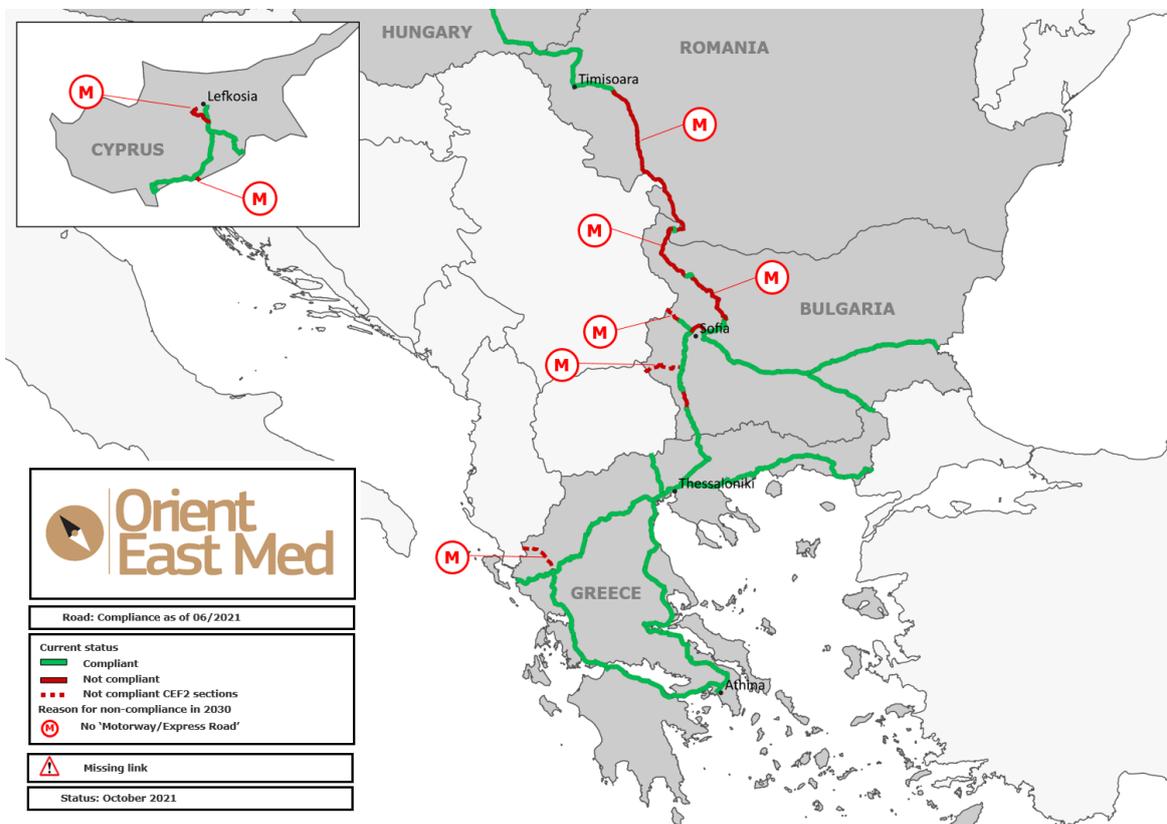


Figure 7: Road Compliance 2021-OEM South



Airport compliance

Alternative clean fuels are not available at airports as no fixed storage tank facilities for aviation biofuel are reported to be in use in any airport. Airports such as Hamburg and Vienna are though increasingly using alternative fuels in fleet for airport ground services (e-mobility, hydrogen, CNG, LPG), having also recently introduced charging or fuelling stations. Compressed 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. The Vienna Airport has an on-going project for developing a sustainable airport area - CO₂ neutral Airport.

Out of the six major core airports, three (Hamburg, Praha and Budapest) are not connected to “heavy rail”, i.e., not capable to operate high-speed passenger trains. In Budapest, a freight connection is operational. Also, Bratislava, Timișoara, Sofia and Thessaloniki airports miss entirely a direct connection to the rail network¹⁰.

2.3 Evolution over time of the KPI’s per Member State

2.3.1 KPI Analysis

With the arrival of CEF 2 and the addition of new links to the Corridor, it is an appropriate moment to take a look at the collective results achieved so far with regard to the compliance of its network with the technical parameters of the TEN-T Regulation. It is important to obtain a consistent historical evolution of KPIs from 2014 to 2020 on a Corridor level, as well as on an individual Member State level, the latter giving out a more comprehensive picture. Breaking down the KPI monitoring¹¹ on a country level will better highlight where problems exist, particularly when it comes to the rail infrastructure status and, consequently, potential for modal shift.

Accordingly, the tables below show how the technical parameters have developed between 2014 and 2020 for the OEM rail, road and IWW network¹². Table 1 presents the compliance percentage of the technical parameters per Member State in 2020 for the Corridor sections as defined under CEF 1¹³. The percentage difference in the “compliance with the technical parameters” between 2014 and 2020 is shown in Table

¹⁰ Connection required by 31 December 2050, as per TEN-T Regulation 1315/2013.

¹¹ The compliance percentage of a TEN-T technical parameter is calculated as follows: for each mode, the TEN-T is divided into several sections of varying length (ranging from 100 metres to more than 100 kilometres). If a section meets a TEN-T technical parameter in its entirety, the full section is considered to be compliant. In case a section is only partly compliant, the full section is considered as non-compliant. Subsequently, the compliance of the entire network is calculated by dividing the total number of kilometres of compliant sections by the total number of kilometres of the entire network.

¹² For the figures relating to the technical parameters, the following aspects should be taken into account: missing links are excluded in the figures; figures may slightly deviate from earlier reported figures due to data corrections, some of which have been corrected retrospectively; the figures are taken from a dataset constructed for the OEM Corridor and are based on TENtec, but not directly from TENtec; certain short sections could be subject to derogations from the standard, therefore, full compliance with the standard cannot be expected.

¹³ The compliance rates given in this section refer to those of the CEF 1 CNC sections. Only the CEF 1 sections have been used for this comparison, as no historical data is available for the newly added CEF 2 sections.

2. The figures reveal progress in the southern part of the OEM Corridor, with large increases in the KPI percentages in Hungary, Romania, Bulgaria and Greece. In Germany, Austria, the Czech Republic and Slovakia, the growth in KPI percentages is lower, although it should be mentioned that the overall compliance percentage is higher in these countries. The specific situation in each country is discussed in the sections that follow.

Table 1: 2020 Status of CEF 1 rail, road & IWW technical parameters per OEM Member State

		AT	DE	CZ	SK	HU	RO	BG	EL	CY
Rail	Track gauge = 1,435 mm	√	√	√	√	√	√	√	√	
	Electrification	√	97%	√	√	√	80%	√	68%	
	Line speed ≥ 100 km/h	√	100%	96%	72%	97%	13%	43%	82%	
	Axle load ≥ 22.5 tonnes	√	√	√	√	83%	6%	√	77%	
	Train length ≥ 740 m	√	√	0%	0%	√	24%	16%	76%	
IWW	CEMT IV or higher		√	90%						
	Permissible Draught ≥ 2.5 m		51%	0%						
	Bridge height ≥ 5.25m		61%	72%						
	RIS fully available		√	90%						
Road	Express way/motorway	78%	√	85%	√	93%	37%	74%	√	95%

Note: Member States complying with a KPI are marked with a √. Grey cells indicate that the KPI is not applicable for these countries.

Table 2: Difference in compliance of technical parameters between 2014 and 2020 for rail, road & IWW, OEM CNC CEF 1 network per Member State

		AT	DE	CZ	SK	HU	RO	BG	EL	CY
Rail	Track gauge = 1,435 mm	√	√	√	√	√	√	√	√	
	Electrification	√	0%	√	√	√	0%	+ 6%	+ 27%	
	Line speed ≥ 100 km/h	√	√	0%	0%	0%	- 66%	+ 19%	+ 2%	
	Axle load ≥ 22.5 tonnes	√	√	√	√	+ 24%	+ 6%	√	+ 17%	
	Train length ≥ 740 m	√	√	0%	0%	+ 3%	+ 11%	+ 6%	+ 22%	
IWW	CEMT IV or higher		√	0%						
	Permissible Draught ≥ 2.5 m		0%	0%						
	Bridge height ≥ 5.25m		0%	0%						
	RIS fully available		√	0%				√		
Road	Express way/motorway	+ 3%	√	+ 4%	√	+ 5%	+ 14%	+ 11%	√	0%

Notes: Member States complying with a KPI are marked with a √. Grey cell indicates that the KPI is not applicable for these countries. % means percent-points.

2.3.2 Austria

The OEM alignment in Austria is rather short in comparison to other Member States, covering 145 km rail and 124 km road sections in the east of the country, as well as a core airport and 2 rail-road terminals in Vienna.

The rail sections fully comply with the KPIs, except for the ERTMS implementation on the section east of Vienna towards Hungary. Limitations for train length on the Austrian network occur depending on the schedule and the actual train path.

Apart from a short section in the Austrian-Czech border area (Drasenhofen – Mikulov), the road sections were already compliant. The full four-lane motorway extension to the Czech border depends on the progress of the adjacent Czech motorway project D52 and is currently unclear.

The connection of the Vienna airport to the long-distance rail network was finalised in 2014. Although there are no storage tank facilities for aviation biofuel, the airport is using alternative fuels in fleet for airport ground services.

At the terminal Wien-Süd, there is a direct entry possibility for freight trains with a maximum length of 750m, 700m of which are under crane. For the second terminal in Vienna (WienCont /Wien Freudenau), direct entries with 650m long freight trains are possible, 700m of which are under crane.

2.3.3 Bulgaria

The OEM Corridor is the main CNC that crosses the Bulgarian territory from north at the Romanian border at Vidin on the Danube River to south at the Greek border at Kulata. An additional west-east link connects the RS/BG border and MK/BG border with the capital Sofia and both with the Bulgarian main port of Burgas on the Black Sea.

In the 2014 – 2020 period, 33 projects have been completed at a total cost of € 1.393 bn. Regarding railway infrastructure, the biggest progress has been made in terms of:

- line speed - the share of the OEM compliant sections on Bulgarian territory increased from 22.2% to 42.8% and
- ERTMS – from 17.1% to 37.3%.

In 2013, 6% of the OEM railway lines' length in Bulgaria was not yet electrified, while 100% electrification was achieved in 2015¹⁴. The improvement in respect to the train length is slightly slower; the share of the compliant length increased from 8.9% to 16.1%. Persisting bottlenecks marked by low compliance values relate to line speed and train length.

Significant delays are observed in the implementation of the project for the modernisation of the Elin Pelin – Septemvri rail section (79 km). This section, which is the most traffic intensive, connects the two biggest population centres Sofia and Plovdiv and carries important international transit traffic between western and central Europe and Turkey. The preparation of this project started before 2010 and its completion was postponed to 2027. The modernisation of the Sofia – Vidin section is hampered by the very bad conditions of the Calafat – Craiova – Timișoara section in Romania, which delays the international traffic in this part of the Corridor (in this respect, Romania has finalised the feasibility studies for the modernisation of the entire Orient -East Med railway corridor).

Substantial progress has been made in the road sector; the share of motorway/ express roads increased from 54.4% of the OEM length in Bulgaria to 74.4%. The reconstruction of the Botevgrad – Vidin section to an express road is under way, but it seems this would not resolve the main problem. Missing a truly operational railway, the ever-growing cross border demand is served by the Vidin – Calafat bridge link over the Danube, where in 2020 / 2021 long queues and delays of 2-3 days were recorded. To improve the situation, the renewal of the Vidin-Calafat Ro-Ro line is under preparation.

¹⁴ Excluding the CEF2 extension to North Macedonia.

The availability of (at least one type of) alternative fuel improved from 94% in 2014 to 100%, currently. A dense supply of LPG is in place, with CNG and electricity available only in the bigger cities.

No progress can be reported in terms of rail-road terminals; still, there is only one terminal (Plovdiv), which is open to all operators in a non-discriminatory way and applies transparent charges. Two small private terminals are operating in the area of Sofia, but no open terminal exists and, for the time being, there are no plans to address the issue.

2.3.4 Cyprus

Cyprus constitutes the southern end point of the OEM Corridor connected to the mainland via an MoS link with the Greek ports. The country has no rail infrastructure. Cyprus shows historically no evolution in the related KPIs for the period under study.

Regarding the implementation of the road infrastructure, the majority of the existing network connecting the maritime port of Lemesos with the capital Lefkosia, as well as the city of Larnaka and its airport was as of 2014 already of motorway status. The "Lefkosia South Orbital" Motorway is the only missing link of the OEM Road Corridor in the island, whose construction began only recently. The first phase of this ring road is expected to be completed in 2023.

Moreover, progress is relatively slow on the provision of clean fuels in the designated road network, as the country's existing LPG fuel stations are located mainly within the vicinity of key nodes and urban agglomerations. Electric vehicle charging stations exist at each end of the A1 Motorway (entrance to Lefkosia, entrance to Lemesos) and also at Larnaka Airport. The installation of e-charging stations is on-going.

Finally, there are no installations so far for the provision of alternative clean fuels at the Port of Lemesos or the Larnaka airport.

2.3.5 Czech Republic

The Czech Republic is located in the north-western part of the Corridor. It connects Germany, Austria and Slovakia with rail and road lines. Although there are lengthy connections on the Czech OEM network, only slow progress in their technical characteristics has been made over recent years.

On the Czech rail network, there are major deficiencies, mainly in terms of delayed ERTMS deployment and insufficient train length along the entire Corridor. Several projects to address these bottlenecks have been implemented in recent years, but only minor improvements on short sections can be seen.

There is a persistent problem of the non-compliant draught on Elbe and Vltava rivers, and the issue with the insufficient height under bridges on the Vltava River is not solved. Nevertheless, the bridge height KPI increased to 77% after the upgrade of the Vltava Lateral Canal was completed in September 2021.

Also, slow progress has been made to link Praha Airport to the high-speed railway in recent years. The preparation for provision of clean fuels at the airport is still an issue.

Finally, capacity bottlenecks are a problem on the Czech roads, together with the small number of safe and secured parking areas for freight vehicles.

2.3.6 Germany

Germany is one of main contributors to the Orient/East-Med Corridor network. It boasts the biggest length of rail, road and inland waterway sections as well as the largest number of ports, rail-road terminals and airports.

Moreover, Germany has a central location within Europe and a strong economic footprint. For these reasons, infrastructure in Germany and its connections to neighbouring countries have always been of high quality and with adequate capacity, even before the TEN-T Regulation came into force. This is also reflected in the KPI values of 2014.

Regarding the evolution of the not yet fully achieved compliance rates of rail and IWW between 2014 and 2020, no quantitative progress can be stated. This is because compliance gaps are subject to on-going/planned projects.

Regarding the rail sector, certain electrification gaps are expected to close soon.

For the entire German River Elbe, the TEN-T requirement of 2.5 m minimum draught is currently not fulfilled and will not be met by 2030; instead, a fairway depth on the non-tidal Elbe of a least 1.4 m below the 2010 Equivalent Water Level on a long-term average of 345 days is proposed as maintenance target by the German IWW authorities in the Overall strategy for the Elbe (GKE). Acknowledging this initiative, a joint agreement between the Governments of the Federal Republic of Germany and the Government of the Czech Republic on the Maintenance and Development of the Cross-Border Inland Waterway Elbe was signed in July 2021 while an application for derogation in accordance with Article 15 (3) of the TEN-T Regulation is expected.

Moreover, all OEM road sections in Germany are compliant with the “motorway” criterion. The picture is also clear for airports and inland ports. All German airports were already connected to rail in 2014. The same applies to rail and waterway connections of the German inland ports. Availability of alternative fuels, however, remains an issue to be solved in the upcoming years.

Finally, regarding the market-driven indicators for rail-road terminals, the contribution of the German RRTs is comparably high against those of other countries. Nevertheless, the accessibility with electric traction and 740 m long trains in particular, needs to be improved to reach the envisaged goals of modal shift. This will be however a matter of the terminal operators and only be done if financially feasible.

2.3.7 Greece

Greece lies at the southeast end of the mainland OEM and, hence, all railway connections have a direct link to cross-border areas.

With a view to further modernise the rail infrastructure network, considerable progress has been made in the last decade, despite delays in the implementation on a number of rail projects. The above progress includes the complete electrification of the Athens-Thessaloniki rail artery, which forms the backbone of the Greek railway network, including a new fully-compliant section Tithorea–Domokos. These are mirrored in the growth of the rail KPIs, predominately that of “electrification” (+27%), followed by “train length” (+17%), and “axle load” (+22%).

In addition, there is the gradual construction of the Kiato – Patras missing link with a modern line. A continuously improving efficiency along the Thessaloniki – Athens – Patras route would contribute towards a modal shift to railways, whose share on a national level is low.

ERTMS is not yet operational along the Greek railway network, while some progress has been noted regarding the deficiencies associated with the RRTs. There is still the issue of the missing one in the city of Patras.

Regarding the road sector, following the completion of major motorway projects (i.e. Olympia Odos, Ionia Odos) the Greek road OEM part is as of 2017 fully compliant with the motorway status.

Greece shows no evolution in the KPIs for the maritime mode, as construction of the currently missing rail connections to its ports of Patras and Igoumenitsa has not begun yet. Also, no concrete LNG facilities have been installed to present in any of the country's five seaports.

Finally, Athens is the only airport connected to heavy rail, with the airport of Thessaloniki missing a direct connection to the rail network. As is the case with all other airports, there is no availability of alternative fuels for aircrafts.

2.3.8 Hungary

Hungary is crossed by three Core Network Corridors, the Orient-East Med, The Rhine-Danube and the Mediterranean.

Despite progress in the implementation of a number of projects, there has recently been no significant change in the state of KPIs (although construction started on the Budapest Southern railway link and on the upgrade of Békéscsaba-Lököshaza sections) and, consequently, in compliance data in this country, apart from that of axle load that grew by 24% percentage points. In addition, full compliance regarding train length was achieved. Earlier discrepancies can still be observed, as in the case of railways, the lack of ERTMS application on a great number of lines, the lower maximum axle load on certain lines and the lower maximum operating speed on a few lines.

Regarding RRTs, compliance is still low in terms of electrified access and 740 m train accessibility.

The western section of the circular (M0) motorway ring around the capital, Budapest, is still missing, however, preparation and planning is in progress. An additional problem is that the Hungarian TEN-T network has capacity bottlenecks on some sections (e.g., M1 Motorway with significant international traffic).

The Budapest airport also remains an unresolved issue with the absence of a passenger heavy rail connection despite existing project(s), mainly due to pending ownership/legal questions, permits and funding.

2.3.9 Romania

Romania is the connecting country from the north to south, having only a small section crossing its western part, which is also overlapping with a branch of the Rhine-Danube Corridor. Although short, the Romanian sections of the OEM play a key role for the overall operational efficiency of the Corridor.

The OEM rail network has still to be modernized in the next years. Delayed progress of projects for the rehabilitation and electrification of the important rail connection with Bulgaria, as well as the complete lack of RRT infrastructure keep KPIs compliance below 50% for most of the indicators; 95% of the rail line is in different phases of feasibility analysis, forcing the southern part from Arad to Timișoara and until the Bulgarian border to operate under specific conditions which include drastic speed

restrictions on both passenger and freight trains. Due to the big difference in the actual operational speed and the design line speed, the related KPI has been recalculated for the above sections in order to reflect the long-standing restrictions included in the yearly timetables. The infrastructure manager has an on-going study for schedule of works to improve traffic conditions and eliminate or improve speed restrictions on existing lines, including reconstruction works for increased speed, timetable and rail services. In this respect, Romania finalised the feasibility studies for the modernisation of the entire Orient -East Med railway corridor, namely: Craiova – Calafat, Craiova – Caransebes and Arad -Timisoara – Caransebes sections. Romania has secured the funding through RRF for the section Arad – Timisoara – Caransebes, while the other two sections shall be financed through requests to the Transport Operational Programmes and CEF 2.

Small progress has been achieved by taking administrative measures for allowing international trains with 740 m length on specific routes and completing additional road sections between RO/HU Border to Lugoj.

2.3.10 Slovak Republic

The OEM alignment in Slovakia is relatively short in comparison to other Member States, covering only 99km rail and 80km road sections of motorway D2.

The OEM Corridor is composed of rail and road links between the Czech Republic and Hungary. Bratislava airport is the only Slovak airport located on the OEM network.

Historically, there have not been any significant achievements along the Slovak section of the OEM Corridor, with almost no improvements of the relevant KPIs.

The rail network is mainly non-compliant with the maximum line speed, as well as maximum train length requirement and implementation of ERTMS along its entire length. Moreover, no improvements of these indicators have been recorded over the last years. The same applies to the KPIs for the rail-road terminals that remain rather low.

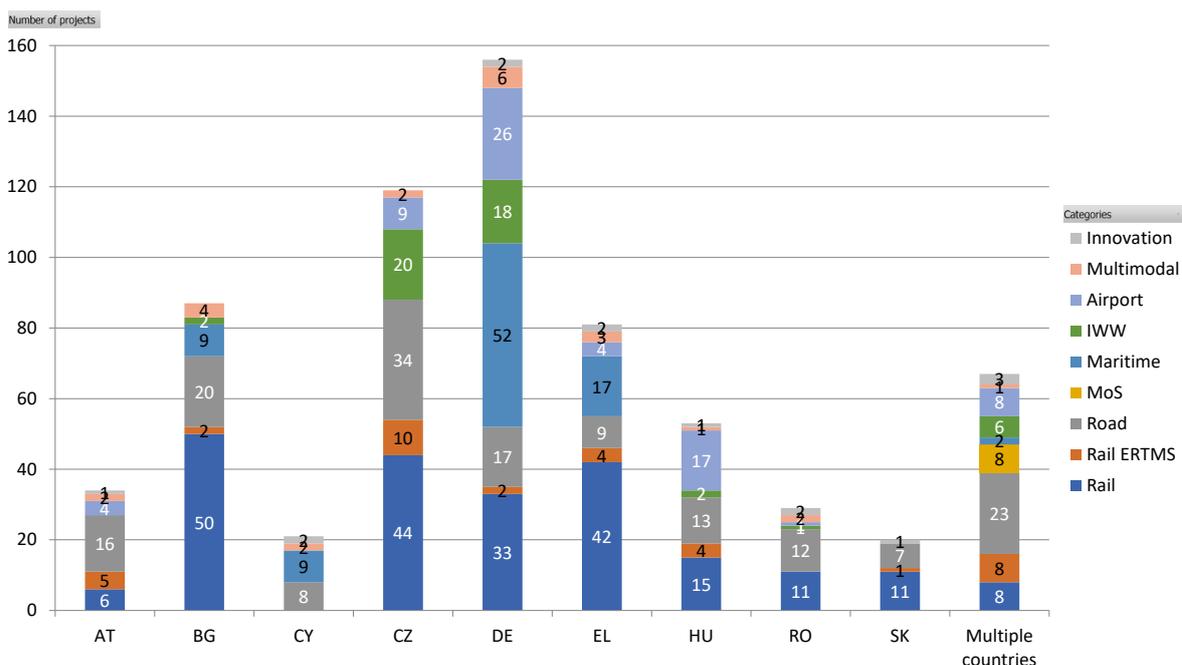
The road network does not present significant bottlenecks. The entire network is classified as motorway, with clean fuels available along its length.

3 Inventory of what has still to be realised by 2030

The OEM Project List is the central supporting tool for monitoring and coordinating the development of the Corridor and examining the degree to which implementation is on track for meeting the 2030 milestone. Results presented herein refer to a project implementation status as of June 2021. The Project List comprises 667 projects with total costs of € 90.7 bn. This figure represents “official” project costs that were verified and approved by Member States and stakeholders. For projects without official costs values, the Consultant provided estimations, leading to additional costs of € 16.9 bn.

Almost 40% of the projects (256) are assigned to project categories Rail + Rail ERTMS. The other categories are represented as follows: 159 Road, 97 Maritime + MoS, 69 Airport, 49 Inland Waterway, 23 Multimodal and 14 Innovation projects. Regarding geographical allocation, most projects come from Germany (156), followed by Czech Republic (119), Bulgaria (87), Greece (81) and Hungary (53). 67 projects are allocated to two or more countries, as shown in Figure 8.

Figure 8: Number of projects by country and category (project implementation status 06/2021), total = 667 projects

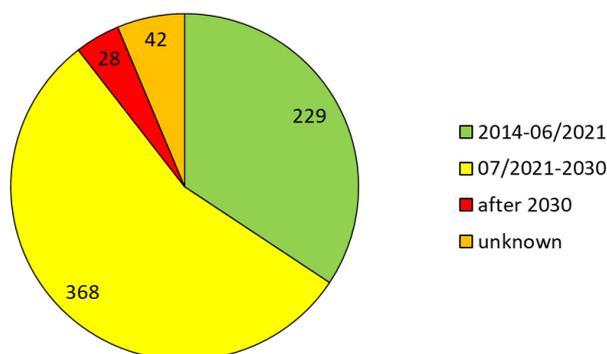


Source: Hacon analysis based on the 2021 updated project list (October 2021)

As Figure 9 depicts, about one third (229) of the projects were already concluded by June 2021. These completed projects are still included in the analysis to document the progress made on the Core Network Corridor since the implementation of EU Regulations 1315/2013 and 1316/2013. In the remaining time until 2030, 368 (55%) projects are planned to be finalised. 28 projects are scheduled to be completed after 2030, ten more than those presented in the previous Work Plan. This is in line with a tendency that became evident throughout the bi-annual monitoring: the finalisation of projects is increasingly shifted to a later date; this applies to postponements within the “07/2021-2030” time cluster and also towards a year beyond 2030. As large-scale projects are particularly affected by these delays, the financing and funding needs are being concentrated within an increasingly shorter period of time.

42 projects (= 6%) have no dedicated finalisation date. This missing information is either due to actual uncertainty about end dates or lack of data. The overall trend is that the number of such projects is decreasing.

Figure 9: Number of projects on the OEM Corridor by completion time cluster (project implementation status 06/2021), total = 667 projects



Source: Hacon analysis based on the 2021 updated project list (September 2021)

The “official” on-going and planned projects form the basis for the projected state of compliance for the Corridor in 2030.

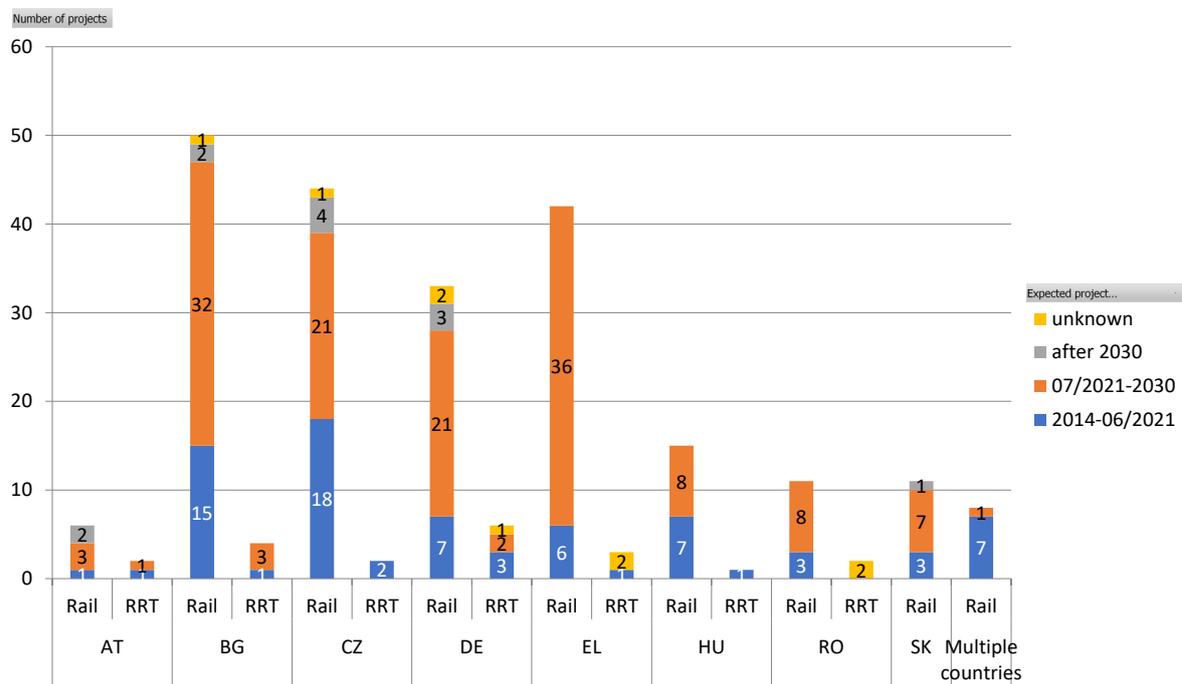
3.1 Rail & RRT

Current compliance levels for rail and RRT have been partly reached thanks to 67 rail¹⁵ and 9 RRT¹⁶ projects that were concluded between 2014 and June 2021 (see Figure 10). Yet, the majority of the 220 rail and 20 RRT actions included in the OEM project list are still on-going or have not even started. Most of these projects (137 rail + 6 RRT) are expected to be finalised by 2030. However, 12 rail projects will miss the 2030 deadline; these are the link between Vienna Airport and Bruck/Leitha, a part of the new high-speed line Dresden – Praha (not yet identified as Core), the “Optimized Alpha-E” in Germany, and upgrade measures along several sections in Austria, Bulgaria, Czech Republic and within the Bratislava nodes. For another 4 Rail and 5 RRT projects, the finalisation date is unknown.

¹⁵ This section provides main results on projects related to the category “Rail”. It excludes pure ERTMS projects, which are treated separately in section 3.2. However, some of the rail projects, especially large-scale upgrades and new constructions, often include ERTMS implementation too.

¹⁶ RRT projects are a subset of project category „Multimodal”.

Figure 10: Rail and RRT projects on the OEM Corridor by country and completion time cluster (total: 220 Rail, 20 RRT; project implementation status 06/2021)



Source: Hacon analysis based on the 2021 updated project list (September 2021)

About three quarter of the projects are located in four countries, namely Bulgaria, the Czech Republic, Greece and Germany. Eight projects are allocated to several countries; these are mostly pan-European studies or concern vehicle equipment (hybrid systems for locomotives, silent brakes for freight wagons).

The “official” costs of the 220 rail projects sum up to € 48.1 bn. For rail projects without such official values, the Consultant estimated additional costs of € 9.388 bn (see Table 3).

Compared to the number of projects, a larger share of these investments is expected to take place in the future: 60% of the official costs are assigned to projects with finalisation until 2030, another 30% even beyond.

In terms of country allocation, the cost distribution shows a similar picture to the number of projects. Here, too, the four countries mentioned above show the largest numbers, albeit in a different order. Germany takes the top position, followed by the Czech Republic, Greece and Bulgaria. Particular attention should be paid to the cost situation in Romania; all costs for rail projects have been estimated on feasibility studies level only.

Half of the total “official” investment is allocated to 14 large-scale projects, each with more than one billion Euro official budget: “Optimized Alpha-E” (DE), High-speed line Dresden – Praha, Node Hamburg (elimination of bottlenecks), Railway junction Brno, Link between Vienna Airport – Bruck/Leitha, Construction of new single railway line Kalambaka – Ioannina – Igoumenitsa, Upgrading railway line Leipzig – Dresden (ABS Berlin – Dresden), Optimization of the line Děčín – Všetaty – Lysá nad Labem – Kolín, Modernisation of Mezdra – Sofia section, Construction of new single railway line Thessaloniki – Amphipolis – Nea Karvali, Modernisation of Radomir – Kulata line and Upgrade of Northern Rail line Wien Süßenbrunn – Bernhardsthal. All these large-scale

projects are yet to be finalised; five are scheduled to the final deadline 2030, while another seven even after that.

Table 3: Rail and RRT project costs on the OEM Corridor by country and completion time cluster (project implementation status 06/2021, in € mn)

Project completion time cluster						
Country	Mode	2014-06/2021	07/2021-2030	After 2030	Unknown	Total
AT	Rail	997	200	2.753	-	3.950
	RRT	245	20	-	-	265
BG	Rail	767	4.293	2.223	214	7.497
	RRT	7	2	-	-	9
			+27 estimated			+27 est.
CZ	Rail	534	8,029	3.366	113	12.042
			+2.188 est.			+2.188 est.
	RRT	11	-	-	-	11
DE	Rail	1.057	7.837	5.432	-	14.326
			+93 estimated	+2,000 est.		+2.093 est.
	RRT	-	-	-	-	-
		+145 estimated	+10 estimated		+101 estimated	+256 est.
EL	Rail	337	7.273	-	-	7.610
	RRT	11	-	-	178	189
HU	Rail	169	663	-	-	832
	RRT	-	-	-	-	-
		+43 estimated				+43 estimated
RO	Rail	320	12	--	-	332
			+4.086 est.			+4.086 est.
	RRT	-	-	-	-	-
					+69 estimated	+69 estimated
SK	Rail	13	535	900	-	1,448
	RRT	-	-	-	-	-
Multiple countries	Rail	28	31	-	-	59
	RRT	-	-	-	-	-
Total	Rail	4.222	28.873	14.674	327	48.096
			+7.388 est.	+2.000 est.		+9.388 est.
	RRT	274	22	-	178	474
		+188 est.	+37 estimated		+170 est.	+395 est.

Source: Hacon analysis based on the 2021 updated project list (September 2021)

Official costs of RRT projects amount in total to € 0.47 bn. The lion's share of this amount is allocated to the new construction of the Cargo Centre Vienna South (AT) and the Thriasio Freight Complex (EL). Moreover, nearly the same amount (€ 0.395 bn) was estimated for terminal projects in Germany, Romania and Hungary with no official costs.

The future rail and RRT compliance with the Regulation requirements depends on the impacts of the on-going and planned (153 rail and 11 RRT) projects. Notably, not all of these projects contribute directly to the (infrastructure) TEN-T parameters, being either studies or targeting other parameters than those defined by KPIs, such as capacity enhancement, noise abatement, vehicle equipment, modernisation of infrastructure and market requirements (especially RRT projects), etc.

Rail OEM in 2030

Overall, the rail projects of the Orient/East-Med Corridor suggest significant progress on several Corridor parts by 2030. With respect to the KPIs, the on-going and planned projects shall enable full compliance with regard to electrification, axle load and line speed on the following long, connecting sections by 2030:

- West – east axis in Bulgaria (Dragoman – Sofia – Plovdiv – Burgas/Svilengrad).
- Entire Greek network; the only exception being the short section Pireas – Tris Gefyres, which will not achieve axle load compliance, but is operated by passenger traffic only.
- Entire Hungarian network; compliant if appropriate measures for axle load are executed.

On the Romanian TEN-T core route Timișoara – Craiova – RO/BG border, several projects are foreseen, aiming at compliance with electrification, axle load, line speed, train length and intermodal profile. A similar situation is met on the Bulgarian north-south route, where planned projects are addressing the line speed and train length criteria. In the case that these projects receive full commitment and secured financing, almost the entire OEM Corridor could be compliant at least with the axle load, electrification and line speed parameters. Nevertheless, the maturity of these actions is rather low, and financing is not secured; therefore, their realisation by 2030 is doubtful.

With regard to the other TEN-T parameters, the rail project portfolio leads to the following expectations for 2030:

- Regarding permitted train length, the situation is quite similar in the Czech Republic, Slovakia, Romania and Bulgaria: projects are planned for several sections, but financing is not secured; moreover, finalisation is partially scheduled only after 2030. Such problems apply to projects in the Czech Republic (Děčín – Lysá n. Labem – Kolín and Choceň – Ústí n. Orlici, Slovakia Bratislava hl.st. – SK/HU border), Romania (all incompliant sections) and Bulgaria (north-south axis and Radomir – Sofia). In Greece, however, remaining compliance gaps shall be closed by respective projects by 2030.
- Projects for achieving the intermodal gauge market standards are planned only in Romania on the Arad – Craiova section, albeit with the above-mentioned doubts regarding on-time realisation. For all other non-compliant sections, no projects are foreseen.

All missing links are addressed by one or a group of projects. In Greece, although the lines Kiato – Patras and Thessaloniki – Toxotes are expected to be operational by 2030, the situation regarding the link Kalambaka – Ioannina – Igoumenitsa remains problematic. The project for its construction is being revisited with CEF2 funding related final studies, planned to commence in 2022 and concluded in the first quarter of 2025. The cost of the project is still estimated at over € 1 billion, and given the challenging topography, it is highly doubted that it could be completed in time for the original milestone.

The high-speed rail line Dresden – Praha is addressed by different projects. The border-crossing part of the project (Heidenau – DE/CZ border – Ústí nad Labem) is scheduled for the period up to 2040. Only the southernmost part (Litoměřice – Praha) might be in operation by the end of 2030.

A high-speed-rail connection between Budapest-Bratislava-Prague and Warsaw is under planning. It will have a significant branch on the Orient-East Med Corridor. This will allow for shorter travel times between urban nodes and will increase freight capacity on existing lines.

In Bulgaria, a short section between Gyueshevo and the border with Northern Macedonia is missing. The project for upgrading the entire line Gyueshevo – Radomir has not started yet but is planned to finish by 2030. However, it is doubted whether this deadline can be met. The financing of this expensive project has not been secured yet, while its execution also depends on the progress of completing the 80 km missing section on the North-Macedonian side and a border crossing tunnel.

Finally, looking at the eleven on-going or planned RRT projects, the current situation might improve by new facilities to be built in Sofia, Timișoara and Craiova. For the “IMT Sofia”, a preparatory study is foreseen to start by mid-2022; the works shall then be completed by mid-2026. Regarding the new terminals in Timișoara and Craiova, no start and end date is yet available, nor are official costs and approved financing. Realisation of these Romanian RRTs is, therefore, doubtful from today’s point of view. Also, no project has been identified with regard to building the missing RRT in the Greek city of Patras.

In addition to the above, some upgrade measures are on-going or planned, mostly designed to enhance capacity. This concerns the RRTs Cargo Centre Wien Süd, Hamburg-Billwerder, and Hannover-Lehrte, while two large developments for logistic multimodal terminals are planned in Greece, namely Thriasio I and II.

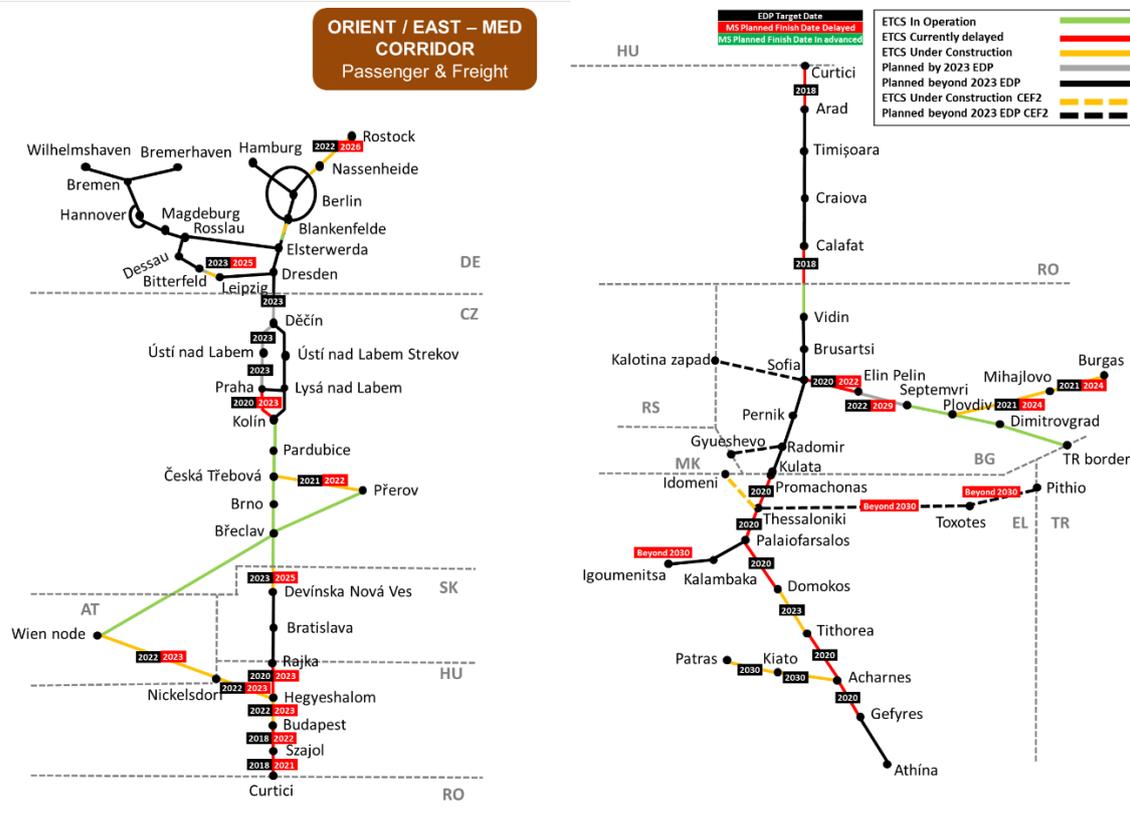
The continuous improvement of the infrastructure at Member State level, necessary to ensure that the required technical parameters shall be compliant by 2030, will help railway organizations reach new operational targets rendering them more efficient and financially sustainable, and in turn making rail transport a more attractive choice.

For routes with heavier traffic on the western part of the OEM Corridor, rail infrastructure modernisation can be an effective and efficient investment to increase speed, capacity, and reliability, reducing at the same time environmental impact. On the eastern part, solely the increase of the average commercial speed on the Romanian and Bulgarian network, which total over 1,100 km (20% of the entire Corridor), shall have an immediate impact on the quality and efficiency of the Corridor.

3.2 The ERTMS deployment 2023

The following figure shows the state of play and deadlines for the ERTMS deployment in the OEM Corridor, considering the dates of the ERTMS Deployment Plan.

Figure 11: ETCS deployment program on OEM CNC



All German sections planned in the EDP by 2023 will be delayed and their commissioning is expected by 2025 and 2026 according to the German plan. Regarding German sections planned in the EDP beyond 2023, and although the entire German network is planned to be equipped by 2035, there are no specific deadlines for OEM sections.

In the Czech Republic, most of the lines planned in the EDP by 2023 are currently in operation, including the cross-border sections with Slovakia and Austria. All OEM sections will be in operation by 2030 according to the Czech plan.

There are two Austrian lines belonging to the OEM, one of them is in operation (Bernhardsthal – Vienna), while the other (Vienna – Hegyeshalom) is planned by 2023 according to the Austrian investment plan.

All OEM sections in Slovakia and Bulgaria are planned to be in operation by 2030 according to their respective national plans.

OEM sections in Hungary already equipped with ERTMS are planned to be in operation by 2023 according to the Hungarian plan.

In Romania, the Curtici – Arad line is currently equipped with ETCS but is not yet in operation. The OEM sections have the feasibility studies finalised and ERTMS level 2 deployment is envisaged by 2030 on the entire Corridor, from Arad to the Bulgarian border (Calafat).

In Greece, sections planned in the EDP by 2020 are delayed. According to the Greek deployment plan, the OEM will be equipped by 2030, except for the lines from Thessaloniki to the Greek/Turkish border and from Kalambaka to Igoumenitsa (missing link).

3.3 IWW & inland ports including RIS Deployment Plan

21 projects relevant to inland waterways are on-going or planned, 7 in Germany and 14 in the Czech Republic, half of which with impact on the KPIs. Total costs of the on-going and planned projects for improving Elbe are estimated at some € 2.5 bn.

Important projects are still in the planning phase in Germany concerning the Elbe side channel (Elbe-Seitenkanal) and the Elbe-Lübeck Canal; more specifically, on the Elbe side channel, these include the replacement and construction of a new lock in Lüneburg Scharnebeck, which will improve qualitatively the lock navigability for vehicles greater than 100 m.

On the Czech side, 3 major projects with KPI impact are currently on-going and planned to be finalised by the end of 2024: on the Mělník – Praha section, securing underpass heights and increasing draught levels in order to extend and improve navigability on Vltava and adapting the Zbraslav and Stěchovice waterway.

Additional projects for deepening the fairway adjustment of Lower and Outer Elbe in Germany, improving navigation conditions on the Czech Elbe/Labe River in the section Ústí nad Labem Střekov – CZ/DE border and extending navigability from Mělník towards Pardubice are on-going. This extension projects will support the closing of the missing link on the Czech side via the construction of a new public port of Pardubice, for which basic infrastructure works are planned to start as late as the beginning of 2029. In Germany, RIS are implemented for all waterways of the Core Network. In addition, tests on AIS aids to navigation were carried out on the Elbe in cooperation with the Czech Republic as part of the COMEX project.

3.4 Road transport (including ITS, AF deployment)

94 road projects are being currently implemented or planned to start, out of which 32 refer to the OEM only and the rest are common to the OEM and one or more other CNCs. The predominant part of the OEM-only projects (88%) involves construction and/or reconstruction of road infrastructure, while three projects relate to the deployment of ITS (one in Cyprus and two in Greece), two projects to building SSTPA and two projects are only studies.

Given the relatively high level of compliance with the motorway / express road requirement and the projects already identified to address related non-compliant sections, the level of compliance is expected to reach 97% by 2030.

In addition, some 32 km of highways are planned to be brought to compliance past the 2030 milestone. This involves the A5 Schrick – Drasenhofen section in Austria towards the Czech border, planned to be completed in 2031.

It is important to point out that there are a number of projects for which their timely completion is doubted because, although these are scheduled to be finalised as of 2030, either the source/s of funding for the project is not identified/yet confirmed, or delays in the implementation are expected. These sections, with a total length of about 380 km, are the following:

- In the Czech Republic:

- D52 Border section from Pohořelice – Mikulov – AT/CZ border Drasenhofen (24.4 km).
- Two sections of D0 Praha Ring Motorway Sections (Řepy - Březiněves 32.5 km, Počernice – Jesenice 12.9 km)
- In Romania: section Lugoj – Drobeta Turnu Severin – Maglavit – Calafat (255.9 km).
- In Bulgaria: section of A3 Struma Motorway, Lot 3.2: Blagoevgrad – Kresna (24 km).
- In Cyprus: missing link of the planned Lefkosia South Orbital Motorway.

Considering the above, the expected compliance in terms of motorway/ express road criterion would be about 91.5%.

The provision of alternative fuels is a dynamic commercial process, expected to further expand and evolve in the future by providing 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, Greece and Cyprus. Thus, and considering the currently high level of provision of (at least one type of) clean fuels along the Corridor, it is expected that full compliance will be reached by 2030.

With regard to the availability of SSTPA, two projects are being implemented aiming to improve conditions for truck drivers. The interventions are located in Slovakia (project for improving parking areas along D2 Motorway) and Greece (developing SSTPA at several locations from the TEN-T network). Since the current availability of SSTPA in the southern part of the Corridor is very scarce, the issue requires the attention of stakeholders to boost the process.

In 2020/2021, congestion at border crossing points, especially in the southern part of the OEM CNC, increased dramatically because of anti-COVID-19 medical checks, as well as the thorough examinations for illegal immigrants. This situation disrupts logistic chains and affects considerably the working conditions of heavy goods vehicles' drivers.

3.5 Airports

Airport projects for modernisation, construction and extension works as well as technological improvements are included in the Corridor list with a total of 69 and more than 4.0 € billion of investment costs. The majority of the investments relate to infrastructure upgrades for passenger transport and operations. New rail connections or improvements are planned for Vienna, Praha and Timișoara airports, while cargo facilities expansions and connections are planned in Germany at Hannover and Leipzig airports.

One initiative has been identified at this stage for the promotion of alternative clean fuels, which is the "Sustainable airport area - CO₂ neutral airport" implemented at Vienna and aiming at fulfilling the requirements and standards of the "ACAS - Airport Carbon Accreditation" and "EMAS Eco Management Systems". There are no identified airports on the OEM where clean fuels are consistently used. Some alternatives of biofuels are available and under testing by specific airlines in Vienna and a co-operation project is on-going between Hamburg airport and a local refinery to use wind energy and atmospheric CO₂ to produce a climate neutral Sustainable Aviation Fuel (SAF), a type of synthetic kerosene that can be blended with conventional jet fuel

to bring down flight emissions. Other related initiatives are also on-going in Frankfurt, Paris, Stockholm and Oslo, as part of different corridors.

Two projects were postponed for completion past 2030, namely the construction of a high-speed rail link between Vienna Airport and Bruck/Leitha (towards Bratislava and Győr) and the improvement of road access to air cargo terminals and extension of the apron for air cargo aircraft at the Hannover Airport.

Finally, initiatives are currently on-going and planned for airports in Austria, Czech Republic, Germany, Hungary and Romania as part of the ongoing Single European Sky Air Traffic Management Research and Development (SESAR) project¹⁷, representing the technological pillar of the Single European Sky.

3.6 Maritime Ports on the OEM CNC

89 maritime projects have been recorded, out of which 21 have been completed, 48 are planned to be completed by 2030, while there are 6 whose completion is foreseen past 2030 and 14 for which the completion date is unknown. Their total cost amounts to approximately €8.5 bn. Moreover, 8 MoS projects are recorded, out of which 5 projects have been completed, with the remaining 3 expected to be completed by 2022. These amount to € 177.05 mn in total.

Projects mainly relate to works on port infrastructure and terminals to increase capacity and improve their hinterland road and rail connections. In this respect, various construction projects in Hamburg, Bremen and Rostock are intended to eliminate bottlenecks. Other capacity constraints being addressed by expansion projects are at the ports of Thessaloniki and Lemesos.

Regarding the provision of alternative clean fuels' facilities, it is worth noting that southern Corridor seaports are presently following their German counterparts (Hamburg and Bremerhaven being currently the only OEM seaports connected to rail that boast certain single pilot applications) by increasingly engaging in CEF co-funded preparatory studies and projects in view of successfully addressing 2030 requirements. Indicatively, the Ports of Pireas (EL) and Lemesos (CY) completed a conceptual study for the introduction of Onshore Power Supply ("OPS"). The Port of Igoumenitsa has awarded a similar design study. Small scale LNG installations are planned to be implemented by 2023 at the Greek Ports of Igoumenitsa and Patras, as a result of the POSEIDON MED II project, while the BLUEHUBS project is planning LNG and CNG bunkering and refuelling facilities in Lemesos (CY), Pireas and Heraklion (EL) ports by the end of 2022. The EALING project is under implementation as a study for the development and deployment of OPS in ports, including Burgas and Piraeus. Based on its results, a project for deployment shall be prepared next.

Finally, a few projects deal with the deployment of various types of ITS, e-maritime and telematics services such as Port Community Systems and VTMIS. Greece is currently taking significant steps in this respect with a project for the creation of a National Integrated Port Community System, which has been included in a new Maritime Policy Bill.

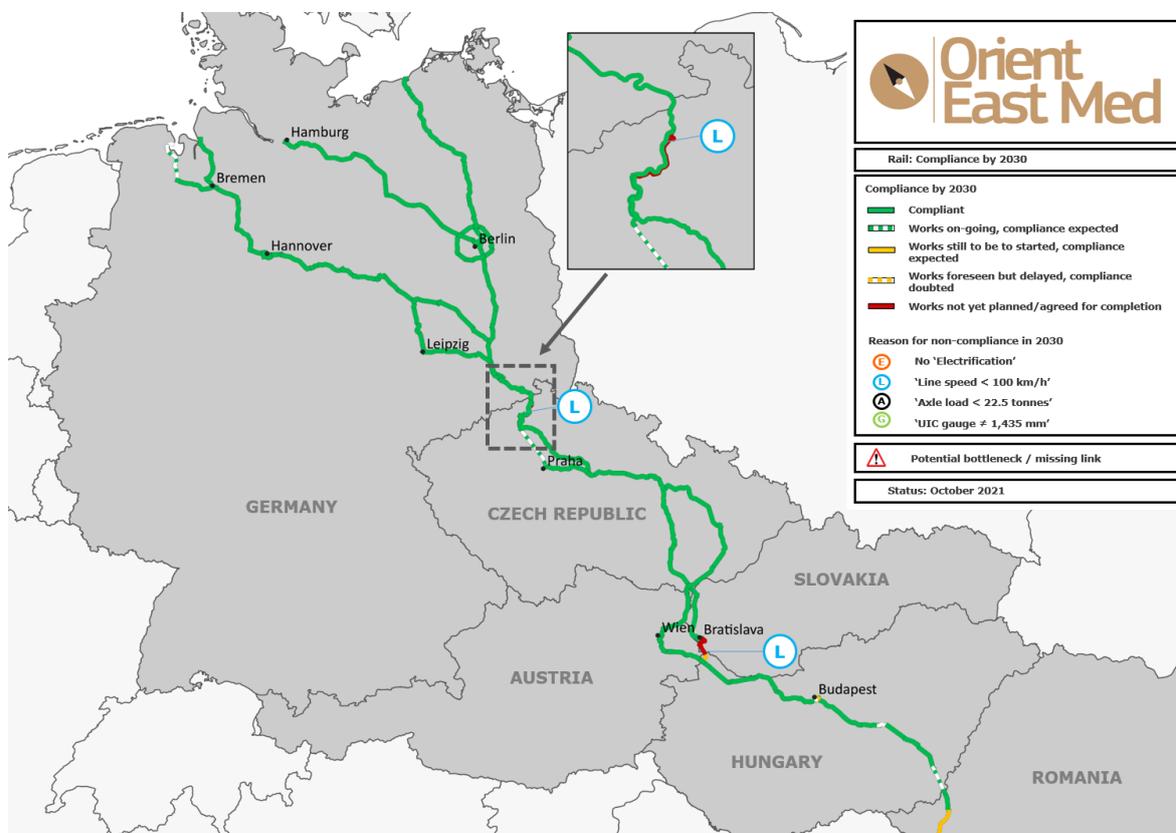
¹⁷ <https://www.sesarju.eu/index.php/node/3772>

3.7 Overview of Major persisting bottlenecks and missing links

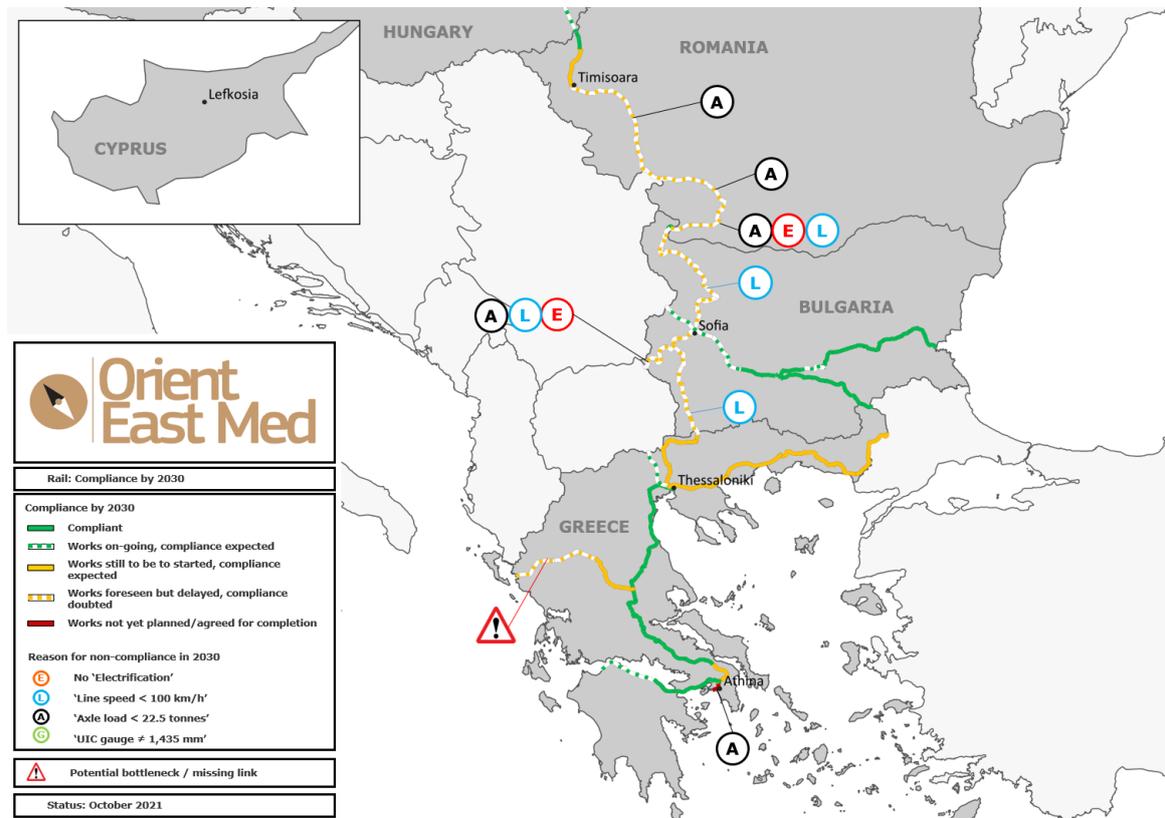
Despite the lengthy portfolio of on-going and planned infrastructure projects along the OEM Corridor, one can still identify persisting bottlenecks and missing links related to projects that are currently not on the agenda of the MS or stakeholders, projects that will not be completed by 2030 and/or projects that are subject to significant delays. With a dedicated view on the year 2030, therefore, a short overview of the identified gaps is provided together with a proposal for additional projects required for technical compliance. The latter is made without prejudice to Article 1 (4) of the TEN-T Regulation.

Railway network bottlenecks

Figure 12: Overview of Rail compliance by 2030 – OEM North



Note: The German part of the new Dresden-Prague line is not formally part of the OEM Corridor but will become one once completed.

Figure 13: Overview of Rail compliance by 2030 – OEM South


Remaining compliance gaps for the railway network are related to:

a) Missing projects; this applies to the following Corridor parts:

- Czech Republic:
 - Entire OEM Corridor freight network in the Czech Republic (except DE/CZ border – Děčín – Lysá n. Labem – Kolín - Choceň – Ústí nad Orlicí): train length,
 - Kolín – Pardubice: intermodal gauge.
- Slovakia:
 - Bratislava hl.st. – Bratislava Petržalka – Rusovce/Rajka: line speed,
 - Kúty – Malacky and Devínska Nová Ves – Bratislava hl.n.: train length.
- Romania:
 - Craiova – Rac. Golenți: Intermodal gauge.
- Bulgaria:
 - Plovdiv – Burgas (most sections) and Plovdiv – Svilengrad: train length,
 - OEM CNC freight lines (except Mihajlovo – Burgas line): intermodal gauge.
- Greece:
 - Entire OEM Corridor freight network: intermodal gauge.

- b) Projects whose finalisation until 2030 is doubted due to delays and/or unsecured financing:
- Czech Republic:
 - DE/CZ border – Děčín – Lysá n. Labem – Kolín and Choceň – Ústí nad Orlicí): train length,
 - Děčín – Ústí n. Labem Střekov: line speed.
 - Slovakia:
 - Bratislava hl.st. – Bratislava Petržalka – Rusovce/Rajka: train length.
 - Romania:
 - Timișoara – Orșova – Filiași: Axle load, line speed, train length, intermodal gauge,
 - Filiași – Craiova: Axle load, intermodal gauge,
 - Craiova – Rac. Golenți: Axle load, electrification, line speed, train length.
 - Bulgaria:
 - Vidin – Sofia – Pernik – Kulata (BG/EL border): Line speed, train length,
 - Gyueshevo – Radomir: Axle load, electrification, line speed, train length, missing link (only section Gyueshevo – Gyueshevo West (MK/BG border)).
 - Greece:
 - Igoumenitsa - Ioannina – Kalambaka: missing link.

Regarding ERTMS, the following bottlenecks have been identified:

- The German plan does not indicate a specific deadline for OEM lines planned in the EDP beyond 2023. German authorities envisage a full network equipped with ETCS by 2035, but there is no confirmation as to whether OEM will be equipped by 2030.
- In Romania, the modernisation of the line from Caransebeș (located between Timișoara and Craiova) to Bulgarian border (Calafat) will be financed through CEF 2 and Transport OP and will mandatorily include the deployment of ERTMS Level 2.
- In Greece, lines from Thessaloniki to the Greek/Turkish border and from Kalambaka to Igoumenitsa are planned beyond 2030 according to the Greek deployment plan.

In addition to the above KPI related issues, operational bottlenecks due to missing capacity deserve special attention. In this respect, Germany is particularly affected. The “Optimized Alpha-E” hinterland connection from/to the North Sea ports mainly foresees an upgrade of existing infrastructure; there is, however, controversial discussion as to whether this concept will provide the required rail capacity for passenger and freight traffic. Moreover, this project will be finalised only after 2030. The “Infrastruktur-Zustands- und Entwicklungsbericht 2020” (report on infrastructure condition and development) by DB Netze points out severe capacity constraints (today and in the next years) for the following Corridor sections:

- Berlin-Spandau – Nauen,
- Berliner Stadtbahn,
- Berlin-Spandau Ost / Berlin-Gesundbrunnen – Großbeeren Süd.

Furthermore, the current plans for the “Deutschlandtakt”, a German-wide clockface timetable, also address capacity bottlenecks in the network. The measures will eliminate capacity bottlenecks stepwise.

Finally, single track lines, which currently show no capacity problems with mostly regional traffic, might become severe bottlenecks with the predicted (long-haul) increase of traffic by 2030. In this respect, the following line sections should be monitored in particular:

- Slovakia: border-crossing sections between Bratislava and Austria/ Hungary,
- Hungary: Békéscsaba – Lőkösháza (works on the 2nd track and ERTMS have started since February 2022).

RRT bottlenecks

With regard to the RRTs, shortcomings range from missing electrification, one-side connection to the main line or short usable length of transshipment tracks. Nevertheless, the biggest bottleneck is related to the poor prospect for developing a modern and robust network of freight terminals that facilitate transshipment and multimodal transport in the southern part of the Corridor. As an indicative example, the construction of a bipolar freight village in close proximity to the Greek port of Igoumenitsa, was originally planned as part of an EC co-financed project but faced certain issues that led to its termination.

In conclusion, in order to ensure that the above remaining bottlenecks for the railway sector are addressed and in turn alleviated, the European Coordinator for the OEM CNC considers that 26 additional rail projects (not including ERTMS) have to be put forward. Most of them (16) address the parameter “Train length”, and others refer to “Line speed” and “Axle load”¹⁸. Four additional projects aim at achieving P70/400 intermodal gauge on the lines. The latter is not explicitly required by the TEN-T Regulation, but from the Coordinator’s point of view deemed necessary to improve the competitiveness of intermodal transport. In total, € 4.8bn are roughly estimated as additional costs to implement these 26 measures.

Next to rail, another 19 additional projects with a total of € 55 mn estimated costs have been proposed for RRTs. This means that about 80% of the core node terminals on the OEM Corridor would benefit from actions rendering them compliant with the three market-driven KPIs.

IWW network bottlenecks

For 2030, it must be expected that certain parts of the OEM IWW network will still fail to meet the CNC objectives. The minimum draught requirement of 2.5 m will not be met by 2030; instead, a fairway depth on the non-tidal Elbe of at least 1.4m below the 2010 Equivalent Water level on a long-term average of 345 days with variable fairway width is proposed as maintenance target by the German IWW authorities in the

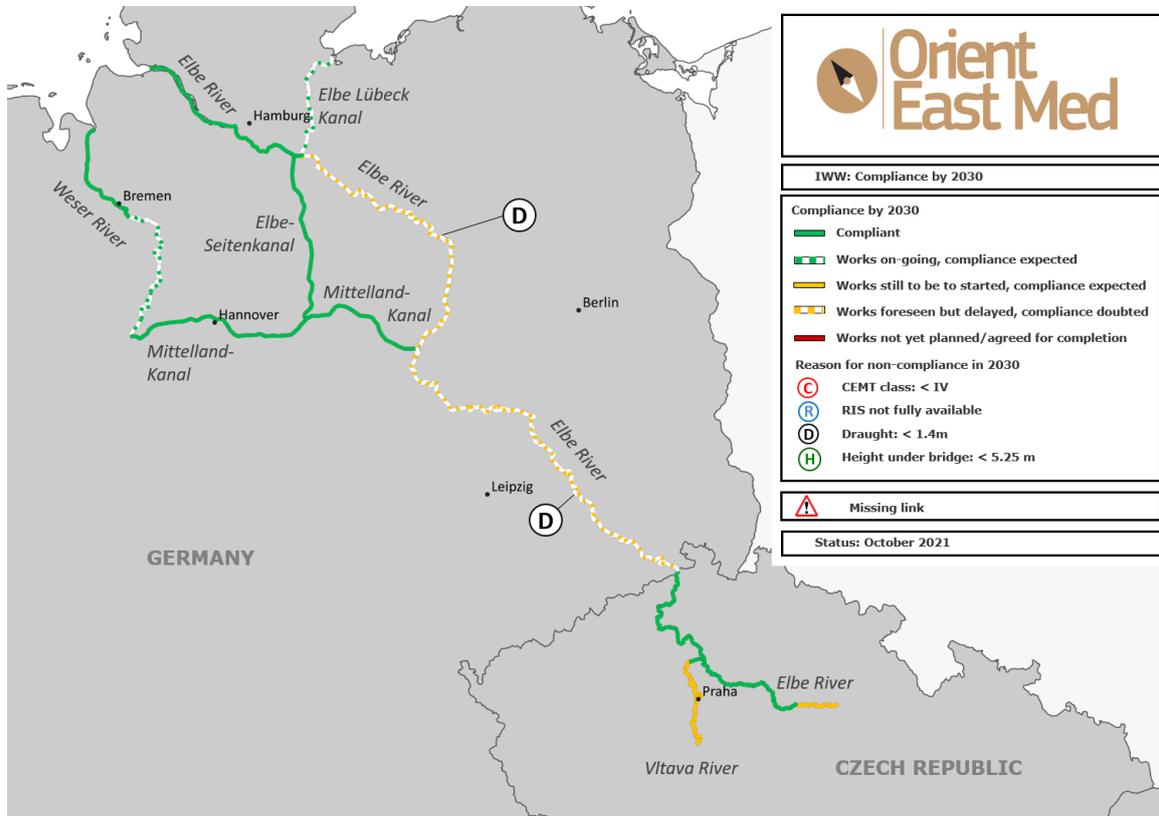
¹⁸ Partially multiple KPIs per project.

Overall strategy for the Elbe (GKE). This initiative was acknowledged by the Czech Republic through the signing, in July 2021, of a joint agreement between the Government of the Federal Republic of Germany and the Government of the Czech Republic on the maintenance and development of the cross-border Inland Waterway Elbe, which will be followed by the establishment of a Joint Commission to monitor the waterway parameters and propose measures for improvement. The purpose of the joint agreement is to coordinate and harmonise the waterway planning of both countries as far as possible. On the German side, care is taken to ensure that agreements concluded are in line with the overall concept Elbe. For exchange of information, the representatives of both countries received coordinated recommendations and statements on matters concerning the use of the International inland waterways Elbe by inland navigation. The overall concept for the Elbe, in which the Federal Government, the federal states (Länder) and environmental associations agreed on the guidelines, and which was thus adopted by the Parliament of the Federal Republic of Germany (Bundestag), has also been incorporated into the joint agreement with its maintenance targets. The maintenance target is reviewed by the government in the sense of the overall concept for the Elbe according to traffic, water management and nature conservation aspects, in principle every ten years.

The maintenance target to be defined depends strongly on the existing discharge conditions respectively available water volumes and may well be corrected downwards if figures indicate so. Thus, there is no direct dependence between the maintenance target of the Elbe and an available fairway depth for navigation at a certain point in time. The available fairway depth is still determined by the available water resources.

Furthermore, the Czech sections DE/CZ border – Ústí n.L. (39 km), Týnec n.L. – Pardubice of the Elbe (32 km), as well as the entire navigable Vltava River (Třebeňice – Mělník, 94 km), are not compliant in terms of minimum draught: there are projects scheduled to increase draught on these sections.

Figure 14: Overview of IWW compliance by 2030 (scenario concerning the Elbe River fairway depth <1.4m below the 2010 Equivalent water level on a long-term average of 345 days)



Road network bottlenecks

Potential delays in securing funds for certain motorway/express road projects may threaten the expected compliance with the technical requirements of the 300 km section Lugoj – Calafat in Romania and part of the Budapest ring road in Hungary. Also, special attention should be paid in the upcoming years to the road crossing the Köhlbrand Bridge in Hamburg, which will be replaced by a tunnel in the future. The project is currently still in the pre-planning phase.

In addition, given the mountainous terrain on both sides of the Bulgarian and North Macedonian border section, the costs for upgrading the connection to motorway/express road standard would be extremely high and thus, this bottleneck might likely persist after 2030.

The provision of alternative fuels for trucks remains to this day unsatisfactory, particularly when compared to the respective advancements being made for private users. The provision of SSTPA lags also behind, especially in the southern part of the Corridor. Finally, present times call for promoting the deployment of digital and smart solutions, i.e. intelligent transport systems and cross-border interoperable truck tolling systems, which should increase the efficiency of road infrastructure use, improve safety and contribute in general to the SSMS objectives.

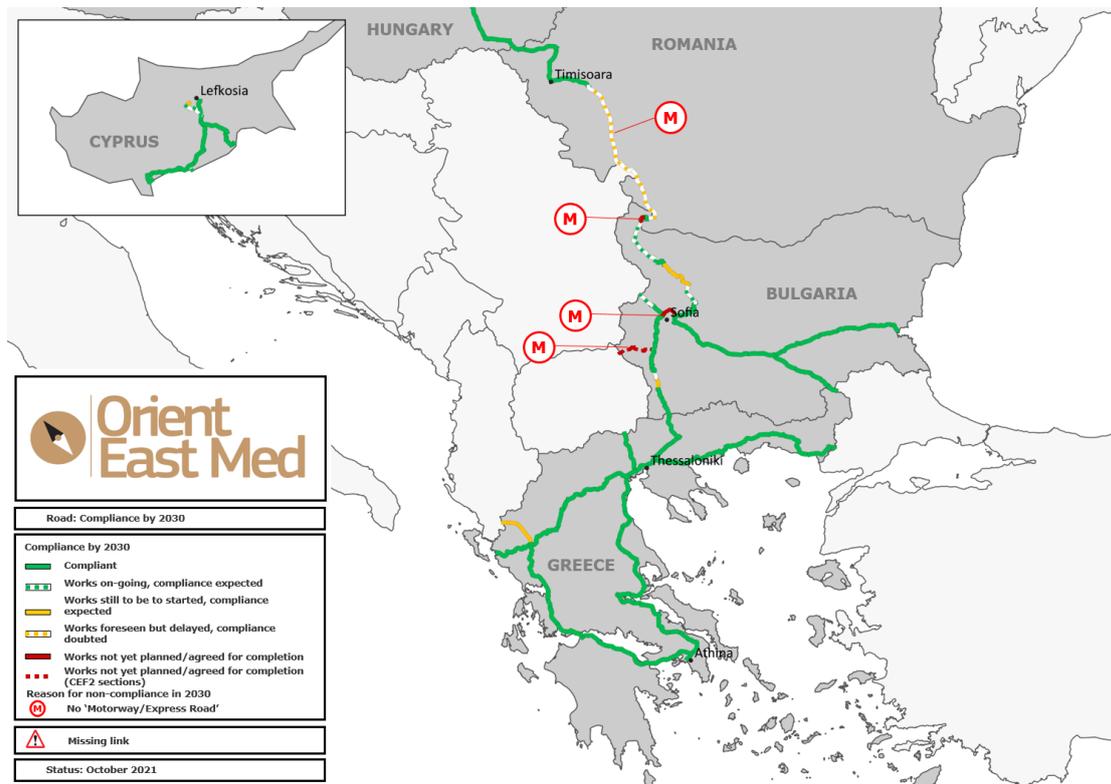
To address 2030 compliance, four projects are proposed to complete the Budapest ring road and upgrade the Sofia one, as well as the Vidin by-pass road and the section Dupnitsa – Kyustendil – Gyueshevo – BG/MK border to motorway or express road standard. The construction of the section Vidin-Montana has already begun, while the design of Montana-Vratsa section and the Vratsa bypass is planned to start in 2022.

Construction works are currently performed between Mezdra – Botevgrad and towards the Hemus motorway. The design phase for the connection to North Macedonia at Gyueshevo is planned to start in 2022.

In respect to the requirement for provision of alternative fuels on motorways, at least one related project is recommended to be implemented in Cyprus.

Figure 15: Overview of Road compliance by 2030 – OEM North



Figure 16: Overview of Road compliance by 2030 – OEM South


Airports bottlenecks

The main issue likely to remain unresolved by 2030 is the availability of alternative fuels for aircrafts. In the meantime, some airports have started introducing alternative fuels into their ground services fleets.

Also, the construction of a rail link between Vienna Airport and Bruck/Leitha and the improvement of road access to air cargo terminals at the Hannover Airport will be completed after 2030, while an additional project is required for connecting the Liszt Ferenc International Airport of Budapest to the railway network.

Maritime bottlenecks

The maritime ports of today are fast becoming logistical and industrial nodes of global supply chains and hence, pressure is mounting for developing infrastructure and services fit for a global market. At the same time, key challenges for the sector are now the digital transformation and adoption of the "smart port" model, the green transformation with environmentally friendly policies and provision of clean fuels and, finally, the construction and upgrade of port/hinterland infrastructure to deal with new capacity and synchro-modality demands.

A port is now obliged to raise its environmental footprint by delivering on EU's Green Deal, as well as other environmental and climate policy goals. The provision of bunkering facilities for alternative fuels progresses slowly, while there seems to be no such planning for the ports of Wilhelmshaven (DE), Burgas (BG) and Thessaloniki (EL). In this respect, additional related projects would need to be implemented at the above three ports. Attention should also be paid to the planned construction of a medium-scale multimodal LNG terminal at Rostock, for which the project promoter has made known certain issues that threaten its completion by 2030.

Another pertinent issue is the risk that the Greek port of Igoumenitsa will still lack a connection to the national railway network in year 2030 and onwards.

Last but not least, new bottlenecks might arise for the port sector through the evolution of vessels in size and loading capacity, such as those new types introduced lately at the port of Hamburg. Seaports and their respective hinterland terminals must be prepared to boast sufficient capacity to cater for this particular situation, especially as the number of containers is expected to grow.

Finally, Cyprus is theoretically connected to the OEM Corridor via an MoS link, which is not in operation from the Greek ports of Pireas or Heraklion. Following a failed first attempt at establishing a ferry link with Greece during the pandemic, the Cyprus government re-launched a tender for a subsidised route between the Lemesos / Larnaka ports and the port of Pireas, aimed among other to reduce the country's insularity and complete dependence on air transport. The route has just commenced operation (June 2022).

Administrative and Operational bottlenecks

Starting with the rail sector, the meetings of the regular **Rail cross-border issues Working Group** were continued. Work in this domain was done in close cooperation with the Rail Freight Corridor Orient/East Med, which implemented 12 task forces to work out solutions for eliminating the hampering factors to a smooth transit through the border crossing points. Under the traffic reducing impact of COVID in 2020, already 7 out of 12 border stations narrowed compliance with the two-hour goal in both directions. Continuous progress is on-going on all border crossings except for police control delays on some of the non-Schengen borders. Thus, a scheme on how to perform long-term monitoring was set up and one task force started its suspension.

Moreover, in the past 3 years (2018 to end-2020), following the Guidelines to the Core Network Corridor Consultants for the Special KPI on Commercial delivery times, the progress of over 1,000 trains running on a regular annual basis on more than 15 train routes along the OEM and Rhine Danube combined was analysed.

Data was received from a number of six independent European Railway Undertakings (RUs), albeit with certain difficulties:

- Data collection methodology and quality is very different across the RUs.
- It is difficult to install a consistent monitoring system, as data availability varies considerably (different routes might be used by RUs, routes are discontinued do to factories closing, RUs are changing, etc.)
- RUs often change at borders; thus, it is near impossible to receive continuous train data.
- Border dwelling times are not reported by RUs.

Despite the above, the analysis yielded the following conclusions:

- Planned and actual commercial speed varies widely among different routes and countries.
- Commercial speed of freight trains is affected by passenger trains traffic, fewer passenger trains contributed to higher commercial speeds for freight trains (e.g. during night hours or due to COVID-19). Different measures and procedures at Schengen borders affect the train transit times at cross border

points in a significant manner, influencing also negatively the commercial speed along the concerned sections.

- The north-western part of the OEM Corridor depicted reasonable and constant commercial delivery times (50 km/h).
- The opposite is true for the southern part, where existing trains run through Romania on a very low commercial speed of approx. 15 km/h.

With regard to **inland waterways**, the main issues include shortage of qualified personnel. Bulgarian inland waterway ports are the subject of feasibility studies for the deployment of a Port Community System.

Persisting operational and administrative barriers for **seaports** are related to the multiplicity of actors involved and the resulting higher administrative burden, particularly for customs declarations. A higher level of coordination and integration among the stakeholders involved is required, as well as interoperability between various data sharing systems. There is need to harmonize and standardize the information exchange between commercial and administrative stakeholders and provide fast, reliable, paperless, and efficient transactions. The EU supports the harmonised data exchange through the Regulation for the European Maritime Single Window environment ('EMSWe') adopted in 2019. The Port Community system in the port of Burgas is under implementation.

Concluding with the **road** sector, certain ITS projects (i.e. CROCODILE) have been successfully carried out. Nevertheless, road tolling systems for trucks and passenger cars remain fragmented and heterogeneous in terms of charging rules across Member States. At EU level, progress has been made with regard to setting standards for safe and secure parking areas. The progress of establishing and certifying such areas along the Corridor remains however slow; to present, there is still only one such facility in Romania.

4 The deployment plans of MoS, alternative fuels and development of urban nodes

4.1 Deployment plan of the Motorways of the Sea (MoS) ¹⁹

Maritime transport plays a key role for the European economy, transporting about 75% of its external trade and approximately 31% of its internal trade. Specifically, short sea shipping (SSS) makes up a majority (up to 60%) of the total maritime transport of goods to and from the main EU ports. With its large network of maritime ports on the TEN-T, the European maritime sector forms an important part of the intra-European transport system. The Motorways of the Sea (MoS) programme is a key instrument in this setting, working towards the ultimate vision of a European Maritime Space (EMS) that is **sustainable, seamless, smart and resilient**.

In the Detailed Implementation Plan (DIP) for MoS, the aim is to provide a sound analysis of priority investment needs to achieve the EMS, centred around four thematic pillars:

1. **Sustainable:** Emphasising on the reduction of GHG emissions and pollution of air, noise and water;
2. **Seamless:** enhancing the connectivity with the rest of the TEN-T (the CNCs in particular), other transport modes, peripheral and outermost regions, islands and European neighbourhood countries;
3. **Smart:** aligning maritime transport with the European digital agenda;
4. **Resilient:** ensuring the EMS is capable of facing exogenous shocks.

Maritime ports and their hinterland connections play a key role in achieving these goals. The port infrastructure and the hinterland connections must facilitate the transfer of the European economies to non-fossil fuels, providing appropriate handling and alternative fuels terminals, storage and hinterland infrastructure. Given that the future demand of new fuels is not yet known, investment plans need to be flexible and react quickly with regard to a developing demand and supply.

Due to its relatively high energy efficiency, maritime transport can also play an important role in reducing the climate impact of transport. Especially on long coastal routes, maritime transport should be considered as a serious alternative to road transport. Such coastal services with a reduced carbon footprint should be developed in cooperation with shippers and forwarders.

Ports and port communities are also natural digital hubs, exchanging data with seaborne and land-based transport from all parties involved in the transport chain. Simplifying procedures, harmonised data flows and a common approach to deploy interoperable ICT systems will further facilitate the use of maritime transport.

Finally, the resilience of maritime transport chains requires the cooperation of ship operators, ports and forwarders. Exogenous shocks such as extreme weather events may lead to a temporary breakdown of ports or parts of the hinterland transport chain. To address such possible shocks, alternative shipping routes should be

¹⁹ https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t/motorways-sea_en

identified for relevant transport flows. Such alternative shipping routes may involve stakeholders along the TEN-T Core Network Corridors with core and comprehensive network ports.

4.2 Plans for the deployment of alternative fuels infrastructure

The European climate law requires the Union to reduce its net greenhouse gas emission by at least 55% in 2030. Such emission reduction will require a significant contribution from the transport sector. There is now considerable momentum as regards the market uptake of zero- and low-emission vehicles in the EU. However, in order to facilitate transition to a mass market and develop a truly common EU transport market, full connectivity and a seamless user experience along the European transport network for low- and zero-emission vehicles, vessels and aircraft are needed. The TEN-T network has to provide the backbone of this endeavour.

The Commission report on the application of Directive 2014/94/EU of the European Parliament and of the Council on the deployment of alternative fuels infrastructure provides a comprehensive assessment of the state of play of alternative fuels infrastructure rollout in the EU²⁰. It shows that market maturity varies considerably, depending on the mode of transport. Although some Member States have raised their ambition, the EU still lacks a comprehensive and complete network coverage of easy-to-use alternative fuels infrastructure, for all modes of transport. The European Court of Auditors has also stressed the significant differences between Member States in deploying charging infrastructure²¹.

This evident difference in both target setting and deployment of alternative fuels infrastructure among Member States is attributed to the lack of a clear, well-defined and binding methodology for them to calculate targets and adopt related measures. The latter was not provided by the Directive 2014/94/EU, while no other obligations were stipulated under CEF1 or TEN-T Regulations.

The Commission is proposing a new Regulation on the deployment of alternative fuels infrastructure and repealing Directive 2014/94/EU. Being part of the “Fit for 55” Package of 14 July 2021, the proposal seeks to provide for a dense, widespread network of publicly accessible alternative fuels infrastructure in the EU.

The proposal for a new Regulation sets forth binding requirements for rollout of an infrastructure with a sufficient amount of minimum recharging and refuelling capacity to ensure full cross-border connectivity of light and heavy-duty vehicles throughout the EU. Distance-based targets for fast-recharging infrastructure along the TEN-T network complement national fleet-based targets for recharging light-duty electric vehicles. A combined approach of distance-based targets along the TEN-T network with targets for overnight recharging infrastructure for trucks in safe and secure parking places and targets at urban nodes should further support the electrification of heavy-duty vehicles.

Distance-based targets for deployment of hydrogen refuelling stations, including for each urban node, will also ensure necessary minimum refuelling infrastructure for light- and heavy-duty fuel cell hydrogen vehicles.

²⁰ COM (2021) 103 final

²¹ Special Report 05/2021: Infrastructure for charging electric vehicles: more charging stations but uneven deployment makes travel across the EU complicated (europa.eu).

Following the provisions of the proposal for a regulation on alternative fuels infrastructure, shore-side electricity supply should be provided in maritime and inland waterway ports. In addition, an appropriate number of refuelling points for LNG should be put in place at maritime ports and on the road network of the TEN-T core and comprehensive network. Finally, stationary aircraft at airports and commercial transport operation should be able to make use of external electricity supply while parked at gates or at outfield positions at TEN-T airports.

The upcoming proposal for the revision of the TEN-T Guidelines will provide per transport mode cross-references to the Regulation on the deployment of alternative fuels infrastructure and additionally address aspects of private recharging and refuelling infrastructure in certain cases such as freight terminals. Private recharging infrastructure is also likely to be addressed in the upcoming proposal for the revision of the Energy Efficiency of Buildings Directive.

4.3 The development of Urban Nodes by 2030

Urban nodes represent most of the points of origin and destination of transport flows on the Corridors. The effectiveness of the Corridors is therefore impacted by the effectiveness of the first and last miles of the journeys in those urban nodes and it is important to ensure sufficient multimodal connections. Urban nodes can also contain bottlenecks and missing links on the Corridors; conversely, they can be impacted by the negative aspects of traffic on the Corridors in terms of pollution, noise and safety.

In that perspective, such urban nodes receive sufficient attention in the work of the Corridors as well as in the TEN-T Regulation. On a case-by-case basis it could be appropriate to set up a Working Group on Urban Nodes in Corridor Fora and to organise meetings of that Working Group on a regular basis.

Regarding the TEN-T Regulation, the Commission adopted on 14 December 2021 a proposal for a revised Regulation which defines more clearly the role of the urban nodes on the network and their constituting elements and sets additional requirements that the Member States should ensure. Those additional requirements include the development of **Sustainable Urban Mobility Plans (SUMP)**s), the use of **sustainable urban mobility indicators** and the development of **multimodal passenger hubs** and **freight terminals**. In addition, the proposal extends the list of recognised urban nodes from the previously limited list of 88 “network defining urban nodes” to all cities of at least 100,000 inhabitants and, for NUTS2 regions without such a large city, the capital of those regions. Depending on the final version that will be adopted by Council and Parliament, the number of urban nodes per Corridor would thus significantly increase.

In this Work Plan, we are still referring to the current list of urban nodes and highlight the key points that still need to be addressed at their level to ensure a good effectiveness of the Corridor.

For rail transport, the seamless connection between the (long-distance) TEN-T infrastructure and the access points (e.g. terminals, ports, airports) plays a decisive role. In this respect, the **current situation of the OEM urban nodes is** that 11 out of 13 urban nodes with rail network are currently equipped with at least one RRT in operation; urban nodes in Bulgaria and Romania have no access points to high quality intermodal rail-road transport anymore. Moreover, the existing ports and terminals are often characterised by lower standards of the last-mile infrastructure. In particular, the train length is restricted on many access lines, requiring additional

splitting/composing procedures of the long-haul trains. Certain access lines are also not electrified or do not fulfil the 22.5 t axle load requirement. **Dedicated projects designed to improve the situation on the last-mile rail infrastructure are currently missing.**

Another issue is the ability of rail traffic to by-pass certain urban nodes. Such a bypass for freight traffic would relieve the inhabitants from the emissions and risks resulting from freight transit through densely settled metropolitan areas.

Regarding the road sector, a key challenge will be to offer sufficient capacities within the urban fabric. There are cases where ports and terminals are located in very densely populated urban areas with highly congested road links.

Considering the above, interventions should be examined to ensure a seamless connection of long-distance traffic with local traffic, relieve urban bottlenecks from the negative impacts of hinterland transport and also facilitate direct interconnections of the different transport modes within a single urban area.

5 Funding and Financing Tools

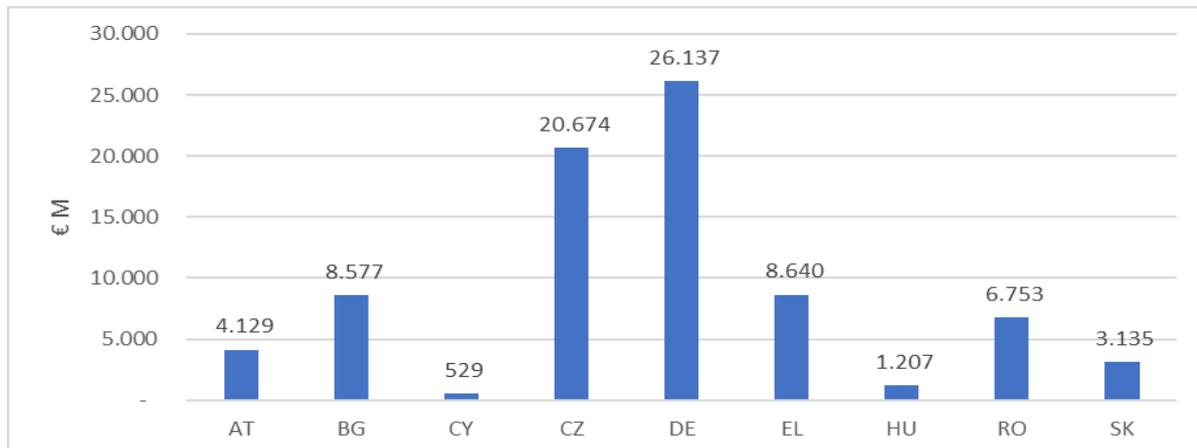
5.1 Update the Corridor funding needs

This section accounts for the economic and financial aspects of the projects included in the OEM Project List and, more specifically, information on the projects' cost, maturity and financial viability. First of all, the OEM Project List accounts for a total of 409²² projects, with a total cost of € 80.9 billion. Below is the modal split in terms of necessary funding (Consultant's analysis based on the Project List for the OEM Corridor, no financial commitment/obligation derived from this analysis):

- Airport 3.7% (€ 3 bn)
- Innovation 0.1% (€ 0.09 bn)
- IWW 2.4% (€ 1.9 bn)
- Maritime 8.2% (€ 6.6 bn)
- Multimodal 0.2% (€ 0.2 bn)
- Rail 65.8% (€ 53.2 bn)
- Rail ERTMS 2.0% (€ 1.6 bn)
- Road 17.6 % (€ 14.2 bn)

The total amount is divided among the Member States as shown in Figure 17.

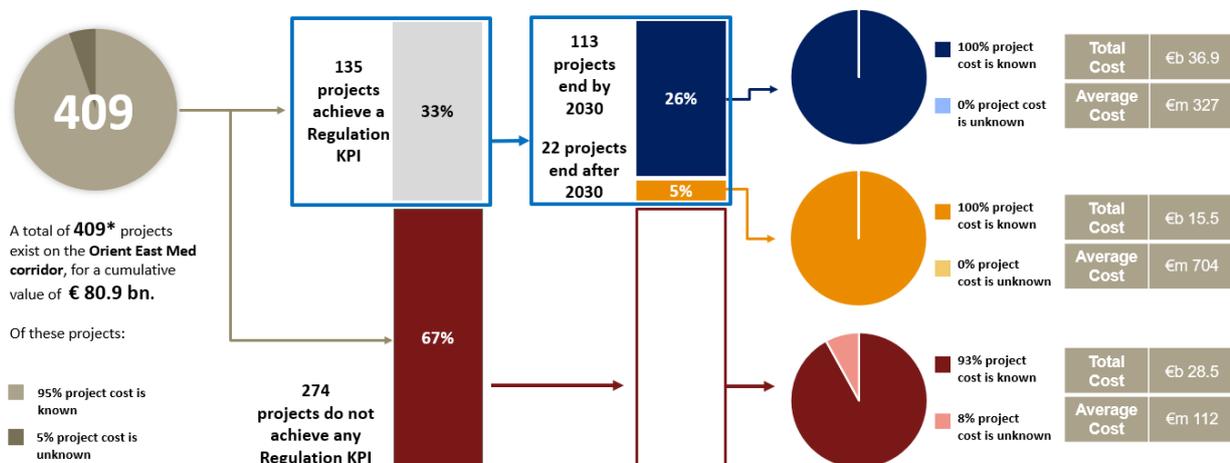
Figure 17: Cost allocation per Member State



The financial analysis assessed first the maturity status of the project pipeline, by counting the number of active projects and clustering them through different metrics, such as their contribution to at least one Regulation's KPI, their timing and the availability of an official cost figure. As depicted in Figure 18, the vast majority (95%) of the projects have information on cost, and this high share is reflected through the three subcategories.

²² The analysis only considers projects ending after 31/12/2021.

Figure 18: OEM Project List Cost Analysis



* The analysis does not consider projects ending before 31/12/2021

The next step was to determine the funding sources of the projects, with particular reference to the economic effort of the European Union. Figure 19 shows complete information on the funding sources of projects accounting for € 49.9 bn, or 62% of the list's value; of those, € 15.2 bn (30.4%) come from EU funding, with 44% accounting for CEF/TEN-T grants and the rest for ESIF and other EU funds. It should also be noted that only a fraction (37% or € 5.6 bn) of the EU funding has already been approved²³. The remaining share is still listed as "potential", i.e. yet to be applied and confirmed by Grant or Loan agreements.

Next to the EU grants is the private financing, notably coming from the EIB; the amount of money the EIB lent to projects in the OEM CNC might in fact not be fully represented by the 1.3%²⁴ (roughly € 525 mn) shown in the graph, due to various reasons, including incomplete reporting from project promoters or unavailability of information prior to the financial closing.

To this extent, it is important to note that the reported € 525 mn refer to a total of **two on-going projects** - the maturity of which allows for complete and reliable information, as EIB only includes mature projects in its pipeline - resulting in a final figure possibly undervaluing EIB's overall contribution to the CNC development. The same applies to other financial institutions.

Notably, the EC also recently disbursed funds, both via grants and loans, through the implementation of the Recovery and Resilience Facility (RRF). The RRF entered into force in February 2021 to mitigate the economic and social impact of the Covid-19 pandemic. So far, the RRF has disbursed € 12.3 bn²⁵ to Member States of the OEM CNC, as presented in Table 4.

To conclude, for 3.3 % of the total investments, information on funding is unspecified.

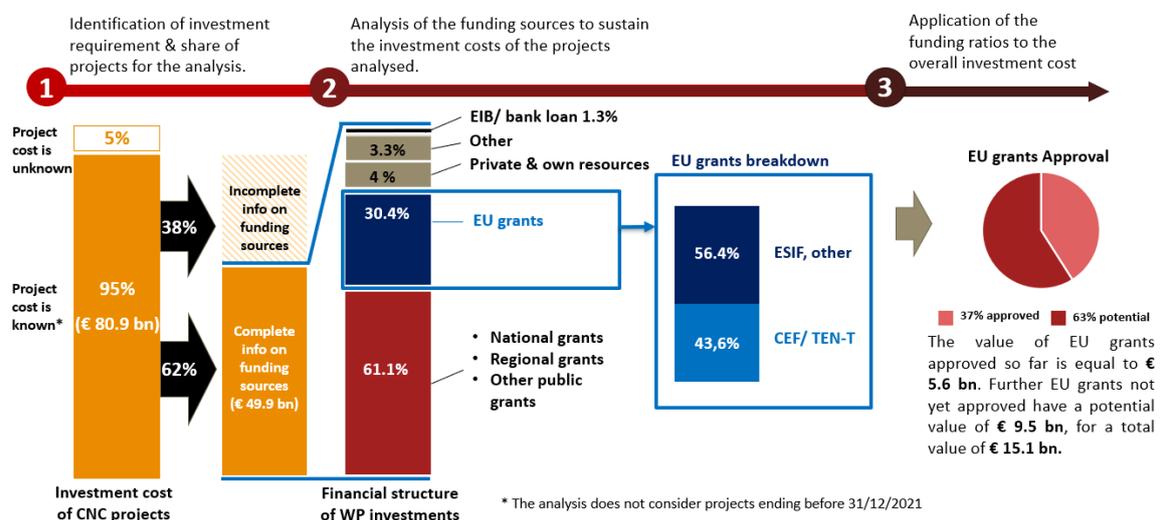
²³ Only CEF/TEN-T grants marked as approved have been evaluated and confirmed by CINEA. Amounts listed as "potential" have no assurance of being secured, and in some cases, they only represent the intention of the project promoter to submit the request for funding.

²⁴ The EIB was not involved in the data collection phase and has not yet disclosed official figures concerning its current and expected contribution to the OEM CNC development.

²⁵ https://ec.europa.eu/economy_finance/recovery-and-resilience-scoreboard/index.html

Table 4: Amount disbursed to OEM MS through the RRF (€ mn) – status mid 02/2022

MS	Grant	Loan
Austria	450	-
Bulgaria	-	-
Cyprus	131	26
Czech Republic	914	-
Germany	2.250	-
Greece	2.310	1.650
Hungary		
Romania	1.850	1.940
Slovakia	823	-
Total	8.728	3.616

Figure 19: Funding and Financing Sources Analysis of OEM CNC Project list


The final step of the analysis determined the financial sustainability of the OEM transport infrastructure projects, i.e. the number and value of OEM projects able to generate returns from the market to cover the operating costs and possibly a share of the capital expenditure. According to the findings, almost half (44.7%) of the projects are potentially financially sustainable as per the aforementioned definition. More specifically:

- 43% of the projects, for a total value of € 34.9 bn, are financially sustainable. Projects are classified in this group following either a direct assessment from the project promoter or an analysis by the Consultant.
- 1.7% of the project list, for a total value of € 1.4 bn, presents good potential for financial sustainability. Projects included in this category, are considered appropriate based on the Consultant's assessment.
- 55.3% of the project list, for a total value of € 44.7 bn, has low to non-existent potential for financial sustainability. This was based either on a direct assessment from the project owner or on the Consultant's analysis.

Financially sustainable projects are relevant because they can be developed with less - or no - impact on public finances, and/or supported with softer support measures (i.e.

soft loans, blending instruments, de-risk instruments, etc.) The more infrastructure is developed through projects generating returns from the market, the less the amount of grants and national public finance is needed to complete the TEN-T network. Projects in the transport sector – and in some sub-sectors in particular, i.e. rail, inland waterway, etc. – usually face difficulties being (fully) financially sustainable. Various factors, among which the presence of financing gaps, can indeed prevent the project promoter from meeting the desired returns. In this case, projects are potentially financially sustainable, but require some financial aid.

5.2 The Green Deal and the Recovery and Resilience Fund

The Recovery and Resilience Facility (RRF) Regulation has made available € 672.5 bn in loans and grants to support both reforms and investments undertaken by Member States in the framework of national recovery and resilience plans. The aim is to mitigate the economic and social impact of the coronavirus pandemic and make European economies and societies more sustainable, resilient and better prepared for the challenges and opportunities of the green and digital transitions.

The Annual Growth Strategy for 2021 (AGS) and the Commission's RRF guidelines have identified the development of sustainable, smart and safe transport as a priority for the European recovery and mentioned the deployment of alternative fuel infrastructure among the 7 European flagship initiatives national recovery plans are invited to contribute to.

In this framework and considering the national plans already submitted, the Commission expects Member States to dedicate significant parts of the RRF funding to transport, placing it among the top sectors of the economy to benefit from investments under "NextGenerationEU".

While the RRF will finance a large variety of projects, priority will be given to those contributing to the decarbonisation of the transport system in the framework of the European Green Deal. Investments in the rail sector, in particular on the TEN-T network, will therefore have a prominent place. Other priorities will include sustainable urban mobility solutions (including collective transport and active mobility), inland navigation and the electrification of road fleets. In addition, digitalisation of the European transport system will be accelerated by RRF support to investments in ERTMS, ITS or RIS.

5.3 The new Connecting Europe Facility (CEF2)

The CEF 2021-2027 Regulation entered into force on 14 July 2021, applying retroactively from 1 January 2021. The total **budget** for the CEF transport is € 25.807 bn²⁶ and its division between the envelopes as follows:

- General envelope: € 12.830 bn
- Cohesion envelope: € 11.286 bn
- Military mobility envelope: € 1.691 bn

The **main priorities** of the CEF are:

²⁶ All amounts are in 2021 prices.

- Completion of the network: supporting the completion of the TEN-T, with particular priority to cross-border sections and missing links of the Core Network Corridors (60% of general envelope and 85% of cohesion envelope).
- Modernisation of the existing infrastructure: tackle much more decisively the challenge of decarbonisation and digitalisation of the transport sector and support the transition to smart, sustainable, inclusive, safe and secure mobility (40% of general envelope and 15% of the cohesion envelope) both on core and comprehensive networks.
- In line with the Action Plan on Military Mobility, for the first time, support the critical development of civilian-military dual-use transport infrastructure.

The CEF will contribute at least 60% of its funding to the **climate objectives** (compared to 30% of the overall target of the MFF).

Building on the previous CEF blending facility, a dedicated Alternative Fuels Infrastructure Facility (AFIF) has been set up. It takes the form of a rolling call for proposals, including five cut-off dates until end of 2023. With a budget of EUR 1.575 billion (out of which ~20% are from Cohesion budget with higher co-funding rates), it funds alternative fuels infrastructure for renewable and low carbon fuels by the combination of CEF grants with financing from finance institutions to achieve a higher impact of the investment. The European Investment Bank (EIB) and other national promotional banks are implementing partners facilitating the combined operations.

The CEF will allow the implementation of **synergies** between CEF transport, energy and digital sectors. It will be applied either as “synergetic elements” (it will be possible for each sector to accept as eligible cost ancillary elements pertaining to another sector) or through joint work programmes jointly financed from each sector involved with the possibility to apply the highest co-funding rate of the sectors concerned and 10% top-up.

The Commission adopted the first multiannual work programme 2021-2027 on 5 August 2021. This specifies the funding objectives and budget of the calls for proposals for the years 2021-2023.

5.4 The inclusion of Military Mobility in the network development plans

As of 2021, military mobility will be taken into account in the Corridor Work Plans. The efforts addressing military mobility are based on the 2018 EU Action Plan on Military Mobility which aims to improve military mobility in 3 key areas of action: transport infrastructure, regulatory and procedural issues, and other cross-cutting topics.

Concerning transport infrastructure, in 2019, the Council of the EU approved the Military Requirements for Military Mobility within and beyond the EU. These requirements identify the geographical scope for military mobility and also define transport infrastructure standards necessary for the armed forces. The gap analysis performed in 2019 by the Commission services and the EEAS emphasises the synergies between TEN-T and military mobility: 93% of the military transport network is also part of TEN-T; and military transport infrastructure standards are mostly compatible with civilian transport infrastructure needs.

Owing to these synergies between civilian and military transport needs, actions aiming to complete TEN-T Corridors can also improve military mobility. The EU’s new long-term budget now includes a dedicated € 1.7 billion military mobility envelope as part

of the Connecting Europe Facility to co-fund such dual-use transport infrastructure projects. The first CEF call for proposals to improve dual-use transport infrastructure was launched on 16th September 2021. In order to be eligible, projects have to be on both the TEN-T and the military transport network, as well as to address dual-use transport infrastructure requirements identified in the Commission Implementing Regulation (EU) 2021/1328²⁷.

5.5 The TEN-T Revision

On 14 December 2021, the European Commission adopted a legislative proposal for a **revised Regulation for the development of the trans-European transport network (TEN-T)**. The proposal is the result of a comprehensive evaluation of the existing legal framework, extensive Member States and stakeholder consultation and an in-depth assessment of the impacts of the changes proposed. The revised TEN-T Regulation shall contribute to the objectives of the **European Green Deal (EGD)** and the **Sustainable and Smart Mobility Strategy (SSMS)**. The proposal is accompanied by an update of the 2013 TEN-T planning methodology, a report on the implementation of TEN-T during the years 2018 and 2019, as well as a communication on the extension of the TEN-T network to the EU neighbouring third countries.

In order to adequately address the objectives of the EGD and SSMS, the revision of the TEN-T Regulation aims at reinforcing the contribution of the TEN-T to the decarbonisation and digitalisation objectives of transport policy. In particular, the revised Regulation makes sure that the appropriate infrastructure basis to alleviate congestion and reduce GHG emissions is provided. To that end, the revised TEN-T Regulation includes firm incentives to shift transport demand towards more sustainable forms of transport. The aim is two-fold: a) to increase the number of passengers travelling by rail through the development of a competitive and seamless high speed rail network throughout Europe; and b) to shift a substantial amount of freight onto rail, inland waterways and short sea shipping.

The overall objective is to develop and complete a competitive and interoperable TEN-T network at highest standards, which is gradually developed in three steps: the core network by 2030, the extended core network by 2040 and the comprehensive network by 2050.

To that end, the proposed new TEN-T Regulation introduces a number of **new or reinforced infrastructure requirements**, which promote the development of infrastructure of sustainable forms of transport.

With regard to **rail transport**, the proposal foresees the requirement to enable the P400 loading gauge on the entire network and the extension of existing core network requirements to the entire comprehensive network (22.5 tons axle load, 740 m train length) or to the extended core network (100 km/h line speed). In addition, a minimum line speed of 160km/h is introduced for passenger lines of the core and the extended core network and the installation of ERTMS on the entire network by 2040, while decommissioning existing national class B systems could be made mandatory. In terms of **waterborne transport**, the revised Regulation defines a "good navigation

²⁷ Commission Implementing Regulation (EU) 2021/1328 of 10 August 2021 specifying the infrastructure requirements applicable to certain categories of dual-use infrastructure actions pursuant to Regulation (EU) 2021/1153 of the European Parliament and of the Council C/2021/5859, *OJ L 288, 11.8.2021, p. 37*.

status” through minimum requirements (2.5 m navigable channel depth and 5.25 m height under bridges) that shall be complemented by specific requirements per river-basin. **Short sea shipping** shall be promoted in a wider perspective by integrating all components of the maritime dimension into a new concept called European Maritime Space. In the field of **road transport**, the focus is on improving the quality of roads as to increase road safety and to augment the number of rest areas and safe and secure parking along the TEN-T network. Finally, the proposal for a revised Regulation foresees an increase in the number of **multimodal freight terminals** along the TEN-T in order to promote multimodality as well as the inclusion of all EU **urban nodes** of at least 100.000 inhabitants into the network, thereby also ensuring that each NUTS-2 region is represented by an urban node. For the latter, the requirement to implement a Sustainable Urban Mobility Plan (SUMP) and the development of transshipment facilities (multimodal freight terminals and passenger hubs) is imposed.

In order to achieve the targets and to fulfil the objectives of the EGD and the SSMS, an intermediary **deadline of 2040** is proposed to be introduced for the new standards on the core network and for advancing the existing standards to the comprehensive network, notably the deployment of ERTMS.

One major new element of the European Commission proposal is the integration of the nine Core Network Corridors with the eleven Rail Freight Corridors in a common set of **“European Transport Corridors”**. The alignment of these new corridors will be defined in the TEN-T Regulation and will thus repeal the existing alignment of corridors in the CEF II Regulation. While striving for maximum stability of the existing TEN-T network, this merger brings certain changes such as the identification of an extended core network which will fully integrate into the corridors.

Similarly, in the proposal, the current system of **European Coordinators** is reinforced. Based on their Work Plans, which shall be elaborated every four years, the Commission shall adopt an implementing act for each Work Plan, setting clear milestones to be implemented by the respective Member States. The elaboration of the Work Plans shall be complemented by annual status reports. Last but not least, the role of European Coordinators as observers in single entities for the implementation of cross-border projects would be institutionalised.

The proposal is now being negotiated with the European Parliament and the Council for a possible entry into force of the revised TEN-T Regulation in the course of 2023.

6 The European Coordinator's recommendations and future outlook

After almost 8 years the TEN-T Regulation came into force defining the Core Network Corridors (CNC) and 10 years away from the first key milestone set to complete the core network, this 5th Work Plan, which is the last of my mandate as Coordinator, is an interesting moment to assess past, present, and future challenges in the context, of course, of the crisis caused by the COVID pandemic.

A challenging Corridor

The OEM Corridor is the only one to link the Northern European seas with the Black Sea and the Aegean Sea and has the characteristic of passing through economically highly developed countries and seven cohesion countries. The "Corridor" approach, i.e., cooperation that goes beyond national interests, was to be built between neighbours that had also been separated by the history and evolution of Europe. This cooperation between "old" and "new" EU Member States is essential to avoid the North-South or East-West rift and to promote European cohesion and solidarity. It initially requires an ever-deeper knowledge of the different components of the Corridor, which are brought together by successive studies and Work Plans to achieve the mutual understanding and trust that are essential for a coherent approach to a Corridor cross-border cooperation. This is a long-term task which, beyond the political changes in the various countries concerned, requires stability and continuity to guarantee the preparation and execution of major transport infrastructure projects. As Coordinators, we are actors, but also dependent on this long work of mutual commitment for which the Corridor fora, the Working Groups, the individual meetings, and the field visits to the stakeholders concerned in the countries, play an essential role.

Achievements

We have been able to define together 667 projects which are essential to the realisation of the Corridor, of which 229 have been completed including among other the railway line Rostock – Berlin upgraded to an axle load of 25 tons, the electrification of the Athens – Thessaloniki main rail artery in Greece, the completion of three rail-road terminal (RRT) projects in Germany, the most important being the "Megahub" Hannover-Lehrte, as well as the construction of a 2nd road lane on the section between Hegyeshalom and Rajka (HU/SK border).

We have cultivated a strong spirit of cooperation demonstrated by the "Gesamtkonzept Elbe" and its acceptance by the Czech Republic, as well as the prioritisation of the new Dresden-Prague railway high speed connection, essential for the efficient and multimodal development of the Corridor.

Last but not least, in cooperation with the OEM RFC, we have initiated an analysis of delays at borders crossings and achieved time saving results (mainly via soft measures) essential for the efficiency of rail freight transport, having set at the same time the momentum for enhanced cooperation between the RFCs and the OEM Corridor. It will be essential to deepen and formalise this CNC/RFC cooperation after the foreseen revision of the TEN-T Regulation.

6.1 Critical issues and future challenges

Through our work and exchanges we have also detected weaknesses, which constitute the challenges of the future.

Too many **capacity bottlenecks** on roads and railways within the Corridor and in connection with their urban nodes reduce the efficiency of freight and passenger transport.

Especially for **rail**, the uneven achievement of the various KPIs and the slow or sometimes non-existent implementation of ERTMS are hampering the Corridor as a whole and have a direct negative influence on the operational efficiency of the OEM Rail Corridor.

As per the outcomes of the Rail Commercial Delivery Time analysis, the biggest challenges remain on Romanian and Bulgarian sections, and more specifically, from HU/RO non-Schengen border near Curtici to BG/EL border near Kulata. Evidence to the latter is that there are effectively almost no freight trains running on the sections north of Kulata with direction to Sofia and Calafat. Also, existing trains through other parts of Romania run on an extremely low average speed. The lack of central and accessible terminals on this route is another malus factor affecting operational efficiency. Low rehabilitation progress and project implementation delays are only exacerbating the situation.

Besides the completion of missing links, the absolute priority for single-track sections in the southern part on the Corridor is the ERTMS deployment and upgrades to achieve 740 m train length with 22.5 T axle load and P/C 70/400 intermodal gauge.

•**Railroad terminals** in southern OEM Member States remain a critical issue. Either they are non-existent or their use declines because they have outdated infrastructure and handling equipment.

RRTs are vital articulations for the efficiency of a corridor and its ability to meet growing freight transport demand through a multimodal approach. The shift from road to rail or IWW will depend on the creation or upgrading of existing RRTs

•**Inland navigation** must also contribute to the modal shift and become a reliable and regular mode of transport. In this sense, it is important to derogate the Elbe for a fairway depth of 1.40m (as described in previous sections of this document) and to finalise the procedure either by requesting a derogation or in the context of good navigability principles. In the meantime, I recommend analysing and preparing the necessary works in the problematic sectors predefined by the GKE and to guarantee an essential maintenance for the Elbe both from an economic and ecological point of view. It is also important to accelerate the provision of clean fuels and onshore power supply in ports and along the waterway, as well as RIS deployment.

Road transport will also remain the most used mode of transport in the future, so the road infrastructure on the Corridor must by 2030 make a greater contribution to the Green Deal by offering passenger and freight transport the guarantee of finding the necessary and sufficient infrastructure along the Corridor in alternative fuel. The creation of secure parking areas, the deployment of ITS and the improvement of the infrastructure will significantly increase safety and are projects that are feasible by 2030.

For all **airports**, heavy rail connections are lacking in five Member States, while the provision of clean fuel in all airports. Projects addressing this issue would contribute to multimodality and CO₂ reduction

The most important challenge in **maritime ports** remains the hinterlands' **missing/poor both road and rail last-mile connections**, together with insufficient intermodal infrastructure and level of services (adequate parking facilities, information, etc).

CEF II clearly represents opportunities for the south of the OEM Corridor. Most of the newly added sections aim at a link with the Balkans: this obviously constitutes an added value for transport in this region and underlines Europe's firm intention to finally occupy a strategic place in the transport infrastructure of the region. But just as a possible link in the future between Turkey and the Balkans, the Balkan Corridor may 'bypass' some of the countries of the OEM Corridor. We must be aware of this problem and support intensive cooperation between Corridors, avoiding any disadvantage to any of the countries concerned and put investments and political priorities in that direction.

The challenges are numerous, and time is short, so the above-mentioned priorities call for a rigorous selective approach based on the added value of the projects for the Corridor, aiming at the efficiency and reliability of the modes of transport, criteria that will also guide the evaluation of the projects submitted to the calls.

6.2 Beyond the technical criteria and standards

Beyond the technical standardisation criteria, efforts need to be made to progress in the uptake of new opportunities from digitalization and automation, including adaptation of measures to develop climate resilient infrastructure. These will reduce operational costs and increase efficiency.

The capacity to complete or speed up cross-border projects, such as the Dresden Prague connexion, is required. Given that many projects on the Corridor are national ones, we need to avoid a situation in 2030 of achieving a good patchwork of national corridors/lines that, however, lack cross-border links. Cross border projects deserve an absolute priority in calls and their evaluations.

Low commercial speed remains the main challenge for long-distance freight rail on the OEM. 100% KPI fulfilment does not guarantee the efficiency of a Corridor, since operational and legal issues could outweigh all achievements in upgrading infrastructure. Therefore, there is a clear need for improvements in operational procedures and infrastructure coordination, particularly for the rail sector. The Commercial Delivery Time analysis was a good first step to draw a snapshot of the operational efficiency. More benefits are expected from the stronger cooperation between CNC and RFC and their upcoming integration under the proposed ETC approach.

Many measures in addition to infrastructure or digitalisation projects play a key role in ensuring the efficiency of a corridor, such as infrastructure access costs, taxes, and energy prices. They are often the exclusive responsibility of Member States, yet cross-border coordination is essential to ensure that maximum benefit is obtained from infrastructure investments.

6.3 Project preparation and implementation

Human resources and competences in all project phases including planning, construction, operation, and maintenance are essential to guarantee correct preparation and implementation. All countries face this problem for varied reasons. Here, cooperation between Member States and the private sector can be a solution. It is important to remedy this situation, as some financing facilities are only available for a limited period.

This is one but not the only reason for the difficulty that the OEM CNC meets in the implementation deadline of the 31st of December 2030. With just nine years ahead, this time window will only be shrinking further. Currently, it appears that the Corridor is clearly lagging behind the set schedule. After half of the available implementation time, only a sixth of the planned investment has been spent, and mainly in smaller projects, while large-scale ones are repeatedly shifted into later periods or after 2030.

The remaining period 2022-2030, where most projects are now scheduled to be realised, will present difficulties in the coordination of construction works. It will be almost impossible to avoid disruption of large Corridor sections during many “construction years” in some areas especially for the Rail sector. It will be useful to spread over time some projects in a coordinated way to maintain the usefulness of the Corridor during the period before and after 2030.

By analysing these delays in preparation and implementation, we have detected the following causes:

- Limited planning capacities of project promoters.
- Lack of mature projects and approvals.
- Limited capacities of the construction industry.
- Limited transport network capacity to perform the upgrade projects in parallel to actual operations.
- Unsecure financing sources.
- Lack of synergy and synchronization between measures to realize the Corridor.
- Lack of support from Member States having their own national investment priorities and planning procedures.

Member States should be on high alert about delays and strive in a pro-active, coordinated, and continuous manner for efficient project implementation and financing, for which they have in most cases self-committed. I strongly encourage a clear dialogue, voicing implementation difficulties.

The implementation of the projects primarily requires political decision and commitment. National governments can ensure that any infrastructure and facilitation measures are embedded in a sound policy framework. All the TEN-T Corridor relevant projects should be incorporated in the Member States’ Transport plans and priorities. This plan must define the priorities putting first real CNC added-value projects that are also in line with the Paris Agreement. A continuous focus is required for border crossing facilitation, the management of large-scale transport investment programmes and the strengthening of institutional and human resources capacity.

This is not a lost cause, as the Member States can agree on priorities in this sense and the Commission can formulate calls for projects accordingly.

The human resources required for adequate project preparation and implementation as well as clear prioritisation of projects are not only a condition for the successful realisation of the Corridors, but also the key to the successful implementation of the RRF and the Regional Funds.

6.4 Project financing

The investment needs to complete the Corridor are vast; during the implementation period a mere 17% has only been consumed. Also, more funds will be required in the immediate future for bridging the “green and digital transformation investment gap,” as per the stipulations of the European Green Deal.

As demand for transport investment for the 2021-2030 period is significantly large relative to national governments and EU’s financing capacity, mobilizing private capital, particularly in terms of Public-Private Partnerships (PPP) schemes, would be a way to contribute to closing this critical co-financing gap.

In recent years, governments find it increasingly challenging to meet infrastructure needs and securing financing from traditional sources. In addition, given recent events, the focus of several national operational programmes was forced to shift from infrastructure needs to social issues.

Aligning the OEM with the Green Deal objectives will also have an impact on the priorities of the financing tools and the project selection on the Corridor. Green bonds, with DNSH criteria, will become increasingly important for financing.

To get an overall view of the evolution of the CNC’s, it is important to obtain a comprehensive and broader picture of all funds used by Member States for transport infrastructure apart from CEF, including DG Regio and RRF funds.

6.5 The non-EU Foreign Investments

From a strategical point of view, it is extremely important that key EU infrastructure and assets are not falling into non-EU ownership.

Since March 2019, the European Commission has taken several actions for strengthening and protecting the EU’s internal market and domestic policies through various instruments promoting transparent and open public procurement, screening foreign direct investment, and addressing the distortive effects of foreign subsidies on the internal market. These measures together would not only ensure that any foreign companies wishing to operate in the EU’s market would respect the EU’s rules and norms, but also offer the opportunity for concerned Member States to flag to the European Commission any specific foreign direct investment in their countries, including in the transport sector, if they consider that this investment is likely to affect security or public order.

The pandemic has shown, among other things, how important it is for Europe to keep decision-making power over strategically sensitive infrastructure such as seaports that need to manage the supply chain of medical equipment. Highly indebted member countries that are subject to budgetary restrictions and/or lack expertise in the design or implementation of their transport infrastructure projects are more likely to turn to foreign funding and aid. In addition to financial and economic dependence, political dependence is evident. The non-transparency of contract clauses or the exclusion of the “Paris Club” clause often demanded by China excludes China’s contribution to debt restructuring in the case of a country’s incapacity to honour its debts.

Under specific circumstances, the participation of third country undertakings in projects of common interest might compromise security and public order in the EU.

For these reasons, it is important that projects in Member States or cross-border projects with third countries which are financed by external funds ensure full transparency and that the Commission strictly controls the enforcement of European law and reacts accordingly to any non-compliance.

6.6 The green deal: greening Transport

The European Green Deal calls for a 90% reduction in greenhouse gas emissions from transport, in order for the EU to become a climate-neutral economy by 2050. To achieve this systemic change several legislative actions have been proposed the last years by the European Commission, in particular regarding the deployment of alternative fuels infrastructure in all modes of transport

The European Green Deal also calls for a substantial part of the 75% of inland freight carried today by road to shift to rail and inland waterways. Similarly, the Smart and Sustainable Mobility Strategy sets concise and ambitious targets for increasing the market share of sustainable modes: rail freight to increase by 50% by 2030 and double by 2050, while IWW and Short Sea Shipping (SSS) by 25% by 2030 and 50% by 2050.

The last years showed a significant expansion of the electric automotive market requiring higher need for ultra-fast recharging infrastructures along the network. The deployment of alternative fuels electricity for road on the Corridor does not focus only on ultrafast charging but integrates all types of recharging point: slow, rapid or ultra-fast.

The Core Network Corridors play a key role in the Green Deal, and we must all commit now more than ever to shifting to more sustainable modes of transport and adopting digitisation. Accelerating the modal shift calls for a major boost in the use of rail and waterborne transport. Therefore, "greening" the OEM Corridor will in turn necessitate shift-to-rail projects, increase in capacity, strengthening of cross-border cooperation and coordination of infrastructure and low-carbon technologies (e. g. electrification in rail transport, uptake of clean fuel technology).

The priorities of the projects must also be in line with the revision of the Alternative Fuels Directive which contributes to the necessary greening of Road transport.

At the same time, multimodality or, as of lately, "synchro-modality," must be fostered to reap the advantages of the combination of rail freight transport with maritime ports and inland navigation. There is potential to relieve the congested north-western Member States from transit freight transport by increasing the possibilities to use the maritime ports of the south to serve traffic demands of the Balkan region/Turkey and central Europe. Therefore, adequate hinterland railway connections from/to the seaports and the river ports are of the outmost importance.

6.7 CEF II and the revision of the TEN-T

Both require special efforts from the Member States.

With CEF II, especially the south of our Corridor has been enlarged with direct connections to the Balkans, which require significant additional investments. Without wishing to question the validity and logic of cooperation with the Balkans, it is important to keep the priorities of the OEM Corridor in its strategic North-South

connection and above all not to bypass it with new connections such as the Turkey-Balkans link.

The introduction of military mobility obviously also underlines the strategic importance of transport and the particular attention that the management and ownership of its infrastructure deserves.

The revision of the TEN-T explained earlier in my Work Plan is subject to the decision of the EP and the Council.

This debate will obviously stress the technical, economic, and ecological priorities of transport, but may also highlight the fundamental role that transport plays in the wider European project. The TEN-T's medium- and long-term vision underlines the need for medium- and long-term European funding as well and gives transport a dimension that goes beyond the traditional definition of the backbone of the economy.

6.8 Conclusion

We are standing at a crucial moment.

The pandemic has changed many priorities, but it has also demonstrated the indispensable value of secure and "borderless" transport, the importance of security, resilience, and independence of supply for European countries.

Climate change requires us all to act. Droughts or devastating floods remind us of the importance of a more responsible management of the soil, of our waterways, of our resources and of our energies. The different modes of transport are all concerned by these challenges which must be addressed without delay. Only a "transnational" approach can respond effectively.

The management of the CNCs and the use of the financial means made available by the EU will have to be organised accordingly: by delegated acts between the member countries to agree on the major common cross-border projects on the CNCs, by a budget and calls for proposals that are oriented more towards the Corridor approach than pure national projects, and by enhanced cooperation between countries according to their expertise. This may sound unrealistic, but as the French writer Eric-Emmanuel Schmitt said, "I did it because I didn't know it was impossible."

My final word in this 5th Work Plan must regrettably be about yet another devastating event. An already strained transport sector, struggling to overcome the dire impacts of the COVID-19 pandemic, was stricken by a new calamity. In addition to the tragedy of lost lives and injuries, the unprovoked and unjustified invasion of Russian troops in Ukraine in February 2022 and related sanctions imposed on Russia, has brought about a global food supply and energy crisis followed by soaring inflation. Transport is playing a strategic and vital role to maintain humanitarian and military objectives in these war circumstances.

The implications on EU transport cannot be but numerous and we are strongly committed to supporting Ukraine: first by working swiftly for the establishment of alternative logistics routes using all transport modes, the so called "EU-Ukraine Solidarity Lanes", linking the country to the Union. For its part, the OEM Corridor, with three of its countries, Slovakia, Hungary and Romania, bordering Ukraine, will need better cross-border procedures and digitalization, rolling stock availability and additional flexibility and capacity at ports.

Inflation coupled with growth in fuel prices has already affected the Corridor's transport infrastructure investments. No doubt, this war will have other medium- and

long-term deeper consequences that we do not yet know about, potentially redrawing the global trade map. In this uncertain geopolitical environment though, it is good to know we can fall back on an established and reliable network such as the CNCs. Our priorities will not change and now, more than ever, is the time to take advantage of what the TEN-T Corridor really stands for: connection, agility and resilience.

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https://transport.ec.europa.eu/transport-themes/infrastructure-and-investment/trans-european-transport-network-ten-t/orient-east-med-corridor_en





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