TEN-T Core Network Corridors
Atlantic Corridor

3rd Phase (extension)
Final Report 3

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Acronyms and Abbreviations

AFIR	Alternative Fuels Infrastructure Regulation
ATL	Atlantic core network corridor
bn	Billion
CEF	Connecting Europe Facility
C-ITS	Cooperative Intelligent Transport Systems
CEF	Connecting Europe Facility
CNC	Core Network Corridor according to Regulation (EU) 1316/2013
CEMT	Classification of European Inland Waterways
DE	Germany
DG MOVE	European Commission – Directorate General for Mobility and Transport
EC	European Commission
ERTMS	European Rail Traffic Management System
ES	Spain
EU	European Union
FR	France
GPSO	Grand Projet Sud-Ouest
IE	Ireland
ITS	Intelligent Transport Systems
IWW	Inland waterway
km	kilometre
KPI	Key Performance Indicator
MS	Member States of the European Union
PT	Portugal
RFC	Rail Freight Corridor
TEN-T	Trans-European Transport Network
TENtec	Information system of the European Commission to coordinate and support the TEN-T Policy
ToR	Terms of reference

1. Introduction

The present report constitutes the 3rd Final Report of the 3rd Phase of the Atlantic Corridor Study (ATL). It summarises the results of the Key Performance Indicators (KPIs) updated in TENtec OMC (Task 3.6) for the Atlantic Corridor and a qualitative analysis and problem analysis of the Corridor resulting from this update. It demonstrates the current state of implementation per infrastructure section and transport node.

2. Compliance of the Corridor with the technical infrastructure requirements of the TEN-T Regulation

2.1. Corridor Overview

The Atlantic Corridor, when defined and until now, has an important maritime dimension and offers significant potential to increase its modal share of rail, especially for passenger freight transport. The Corridor has also been among the frontrunners in the field of innovation, especially regarding projects on alternative fuels, e-maritime/e-freight and Cooperative ITS (C-ITS). The main strategic goals of the development of the Atlantic Corridor have always remained enhancing modal integration, having further exploited maritime connectivity, and addressing railway interoperability, notably the track gauge in Iberian Peninsula.

The adoption of CEF2 Regulation in January 2021 (Regulation (EU) No 1153/2021) included additional sections to the CNC Corridors. For the Atlantic Corridor, in particular, this meant a larger maritime dimension, with maritime connections to Ireland and to the Canary Islands, besides a greater rail and inland waterway connectivity. Through this, the new alignment of the Atlantic Corridor included 10 new maritime ports, 2 inland ports, 4 airports and 4 railroad terminals, as well as four urban nodes, besides the addition of a fifth Member State in the Atlantic Corridor - Ireland. Overall, the Atlantic Corridor, in its current alignment, counts with 18 maritime ports, 8 inland ports and 3 inland waterways.

The last round of Corridor Studies has also been marked by unprecedented challenges at a European and global scale, ranging from Brexit (which had a considerable impact on connectivity between the UK, Ireland and the rest of Europe), the COVID-19 pandemic, as well as Russia's war of aggression against Ukraine. In particular, Brexit brought into sharp focus how vital the Irish port network is to the maintenance of the country's lifeline supply chains and to its economy's resilience. In turn, the sanitary crisis brought by the COVID-19 pandemic had a significant impact in transport and society as a whole in 2020 and 2021, stressing the importance of a more resilient transport network at a European scale. Finally, the ongoing Russian war of aggression against Ukraine has brought a considerable humanitarian, as well as a food and energy, crisis, and the TEN-T is essential to ensure the smooth movement of goods and people throughout Europe, highlighting the importance of connectivity to neighbouring countries. In this regard, the role of the ports of the Atlantic Corridor as energy hubs is further reinforced. Moreover, the war of aggression reinforced the need to ensure track interoperability throughout the entire TEN-T network in order to safeguard the smooth transport of both passengers and goods.

Figure 1: Alignment of the Atlantic Corridor, 2023

The proposal for the TEN-T Regulation, which is reaching its final stages of trilogue discussions before being adopted in early 2024 will bring further challenges and opportunities to the Atlantic Corridor, namely reinforcing the integration of important sections of the Atlantic Rail Freight Corridor. In addition, the extended core network will also bring the opportunity to include important cross-border sections in the Corridor, namely the Porto-Vigo rail section, the core rail and road network to the port of Brest, as well as the extended rail network to the comprehensive port of La Rochelle, in the addition to the Tagus River as part of the Corridor's IWW network. Besides, there will be different alignments for passengers and for freight (i.e. the new Lisboa-Porto high-speed as core for passengers and Linha do Norte core for freight in Portugal; the Extremadura line for passengers and the connection via Manzanares - actual alignment of the RFC - for freight).

2.2. Key Performance Indicators to be updated

The state of implementation of the Corridor's infrastructure has been characterised by assessing the compliance rates with the requirements laid down in Regulation No. 1315/2013. This Final Report 3 focuses on 11 Corridor KPIs, following the TENtec updates for the years 2021 and 2022. The 11 KPIs[1] are outlined in the table below.

[1] As outlined in the ToR.

Table 1: KPIs updates in TENtec OMC in Phase 3

Key performance indicators
(1) Rail: Loading gauge (≥ P400)[2]
(2) Rail: Maximum train length (≥ 740m)
(3) Rail: Max axle load (≥ 22.5 tonnes)
(4) Rail: Line Speed (≥ 100km/h)
(5) Rail: Track gauge (1435mm)
(6) Rail: Electrification
(7) Airports: Connection to rail
(8) IWW: RIS implementation
(9) IWW: Permissible height under bridges (≥ 5.25m)
(10) IWW: Permissible draught (≥ 2.5m)
(11) IWW: CEMT IV class (≥ IV)

The update was performed for the existing sections (excluding planned sections), which are not yet compliant, taking into account the data from the latest narrow project list update (reflected in PIR 2023-1), as well as considering data from the consultants and network statements of infrastructure managers whenever relevant. The work was also carried out in close cooperation between the 9 CNC between July and August 2023.

The following sections present a qualitative analysis and problem analysis provide per mode of transport resulting from this update. It is also important to add that the assessment of the of the **KPIs for rail** updated in this phase focuses on an evolution of the respective KPIs from 2014 and 2022 (the last update year)[3]. We have also carried out an assessment of the evolution of the TEN-T requirements for other parameters beyond those included in the ToR, thus providing a broader picture of the compliance of the Corridor in terms of compliance with TEN-T requirements[4].

2.3. Railway infrastructure

Rail compliance is considered for the following parameters: train length (freight lines), line speed (freight lines), electrification, maximum axle load (≥ 22.5 tonnes) and track gauge.

The Atlantic Corridor's compliance with the requirement of train length ≥ 740 m (freight trains) has decreased from 57% in 2014 to 41% in 2022. This was mainly due to the increase in the Corridor's length as a result of CEF2 extensions. At a Member State level, the compliance level with train length is particularly low in both Portugal and Spain, though with the completion of the new lines and upgrade of existing lines, full compliance is expected by 2030. The evolution of the compliance levels with train length for freight lines is outlined below (2014 vs. 2022). Please note that lines depicted as not yet in operation in Figure 2a characterises the status as of 2014.

[2] Although this parameter was updated in TENtec for 2021 and 2022, the analysis of the levels of compliance at a Corridor level has not been reflected in the present report, as this does not constitute a requirement of the TEN-T Regulation in force. Nonetheless, the consultants presented a brief analysis on the compliance with the loading gauge parameter in the 19th Corridor Forum meeting.

[3] As minimum changes have been observed in the KPIs between the update years of 2020 (reflected in the 5th Work Plan of the European Coordinator), 2021 and 2022, the analysis presented herein focuses on the compliance rates considering the latest update reference year of 2022.

[4] As of Regulation 1315/2013.

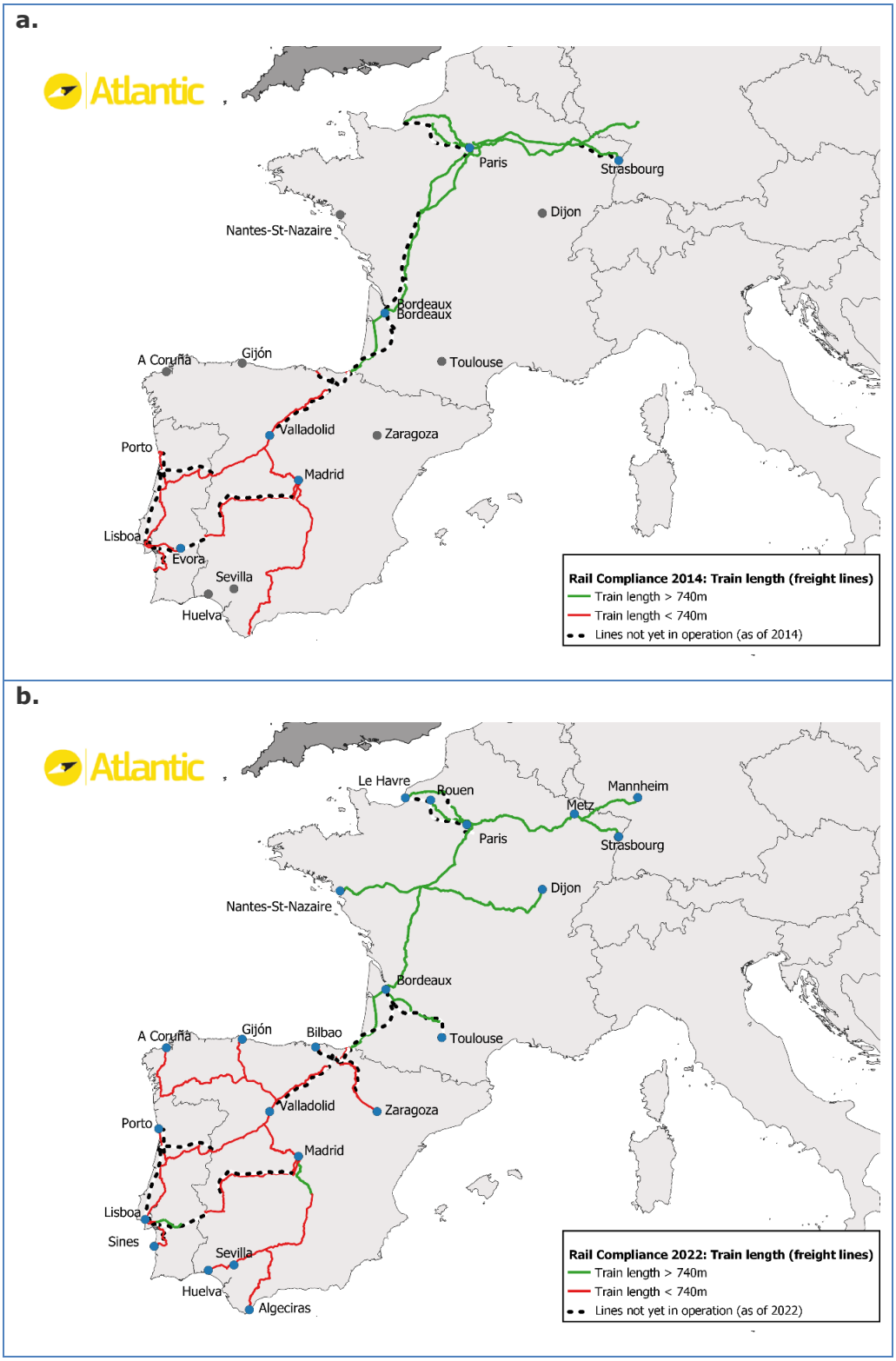


Figure 2: Compliance with train length parameter for freight lines (status as of: a. 2014; b. 2022)

In turn, for compliance with line speed ≥100km/h for rail freight lines, the level of compliance of the Corridor presented a slight increase, raising from 86% compliance in 2014 to 89% in 2022, mainly with the upgrade of the section from Le Havre until Estouteville-Ecalles and the section Serqueux – Gisors in France (the latter in 2021), as well as the connection between Kaiserslautern – Ludwigshafen, in Germany, as well as

Pampilhosa-Guarda in Portugal. Nonetheless, bottlenecks still remain in the connection between Contumil and the Port of Leixões, as well as in the connection between Guarda and Vilar Formoso, towards the border between Portugal and Spain. In Spain, bottlenecks in terms of compliance with train length are present in the connection between Antequera-Santa Ana and Algeciras, as well as in a small section between Madrid and Villaverde Bajo and in short rail sections around Paris. Nonetheless, full compliance is expected to be reached by 2030. The figure below illustrates the compliance rate of the parameter of 100 km/h line speed for freight lines as of 2014 (Figure 3a) and as of 2022 (Figure 3b).

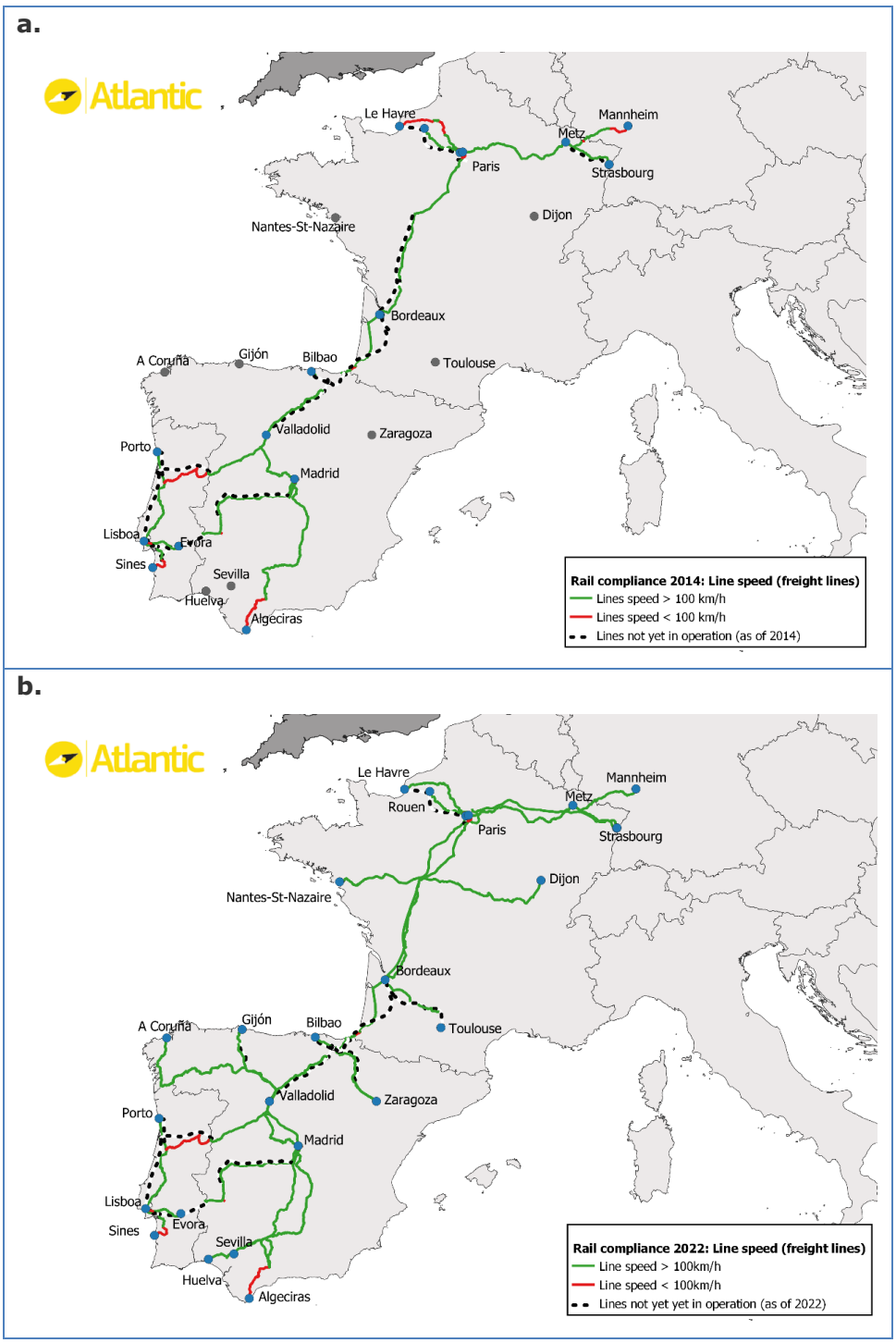
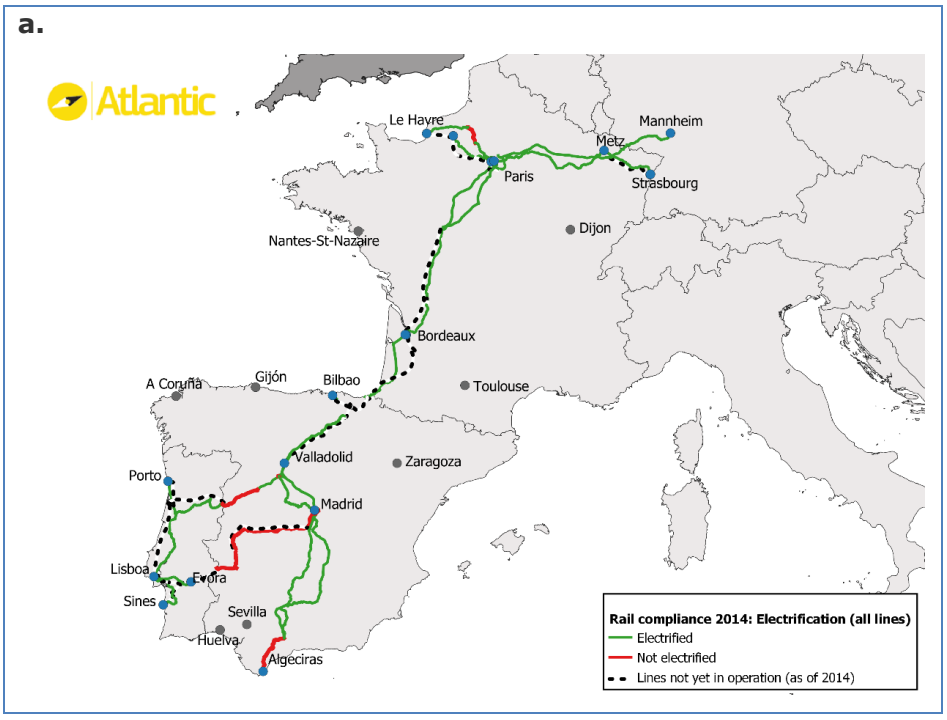


Figure 3: Compliance with line speed ≥ 100 km/h for freight lines (status as of: a. 2014; b. 2022)

As for line electrification, the state of compliance at a Corridor level increased from 87% in 2014 to 90% in 2022. As of 2022, electrification is still missing in some rail sections, namely in France: Nevers – Montchain. In Spain, Algeciras-Bobadilla has been delayed and in the two cross-border sections with Portugal: Fuentes de Oñoro-Salamanca (though works in the Medina del Campo-Salamanca section were completed in 2019), for which works are still delayed and only expected to be completed by the end of 2025; and Badajoz – Merida, though works on this latter section have already been completed as of 2023. Overall, compliance with electrification requirements by 2030 is not compromised, with full compliance for electrification foreseen to be reached closer to 2030. In addition, it is also worth noting that the Atlantic Corridor is fully compliant with the requirement of maximum axle load ≥ 22.5 tonnes). Figures 4a and Figure 4b depict the evolution of the compliance rates with electrification of railway lines along the Atlantic Corridor.

a.



b.

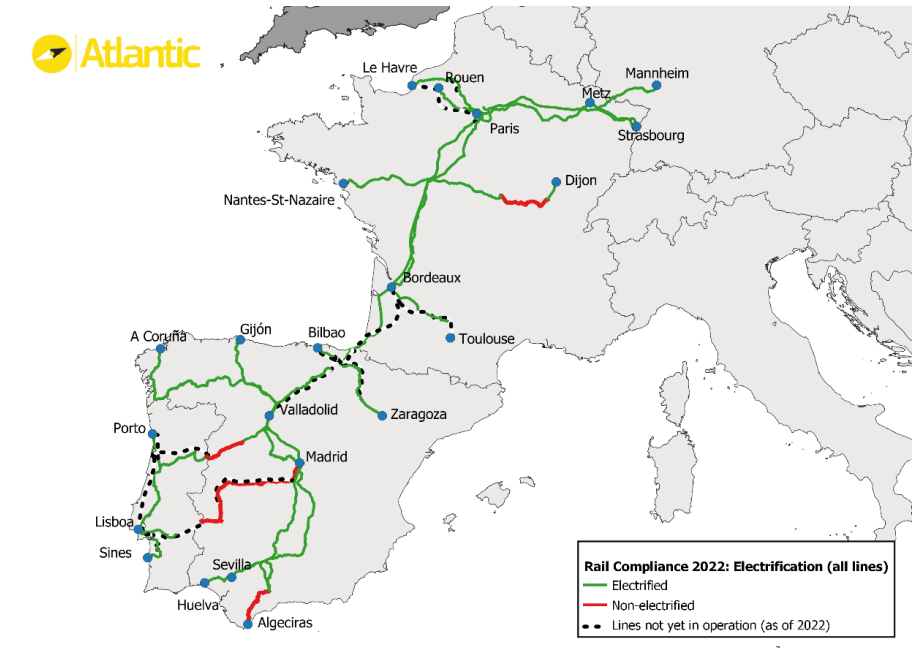


Figure 4: Compliance with line electrification (status as of: a. 2014; b. 2022)

Regarding the compliance with the deployment of European standard track gauge of 1435 mm, sections equipped with polyvalent sleepers or with third rail have been considered as compliant along the Atlantic Corridor. It is important to note that such sleepers enable changing the gauge from Iberian gauge to European standard track gauge. Thus, all the Iberian lines equipped with polyvalent sleepers have been classified as European standard track gauge compliant, since this technique prepares for the migration to this track gauge. As of 2014, the compliance rate of the Atlantic Corridor with the deployment of standard track gauge was of 58%. This slightly decreased to 53% as of 2022, especially due to the increase in the length of the railway network of the Corridor. However, when considering the sections with polyvalent sleepers this level of compliance increases to 77%. The figures below outline the evolution of the standard track gauge KPI in the Atlantic Corridor for 2014 and 2022.

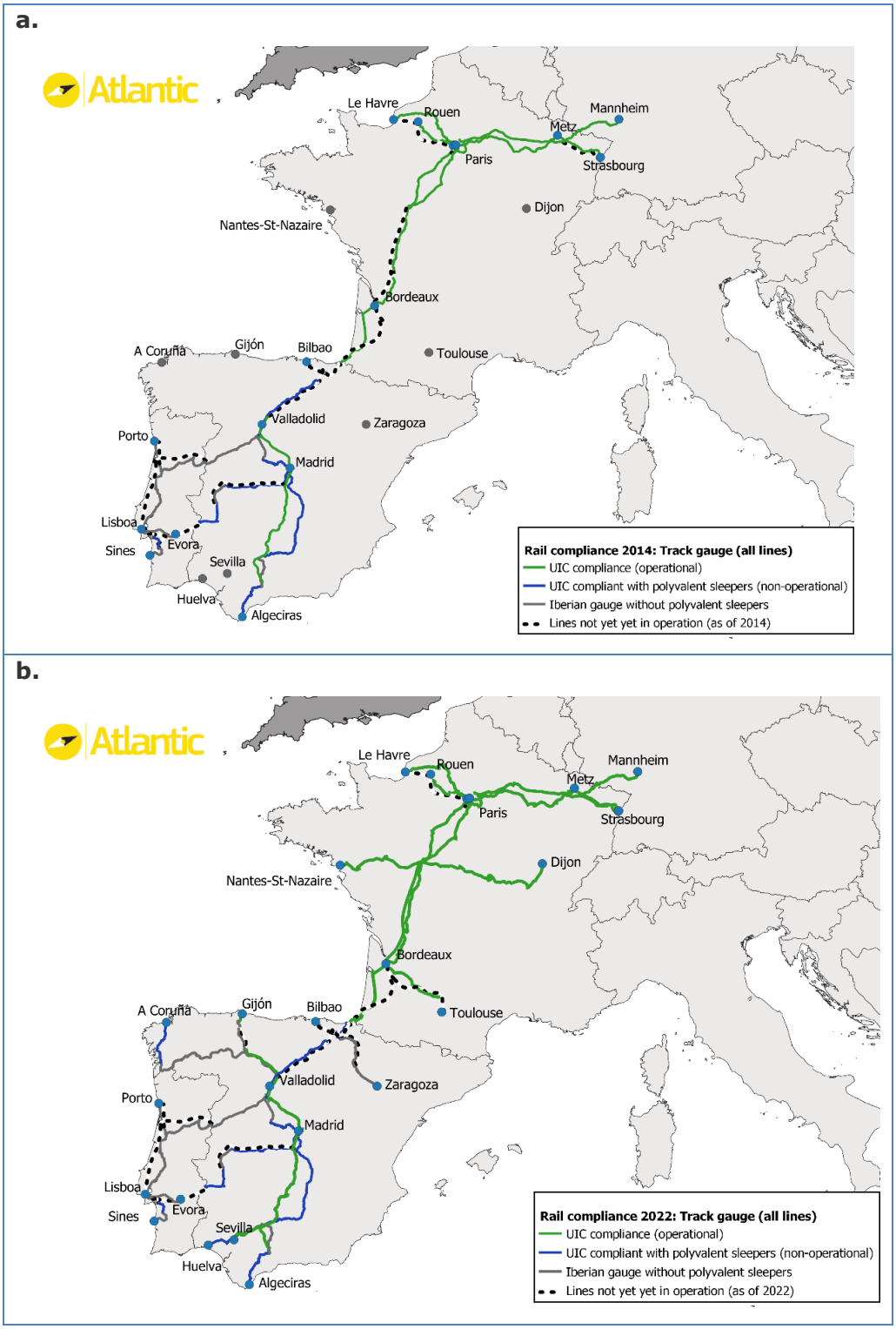


Figure 5: UIC compliant railway lines (polyvalent sleepers) and Iberian railway lines of the Atlantic Corridor (status as of: a. 2014; b. 2022)

Remaining gaps:

The main remaining gaps in the Atlantic Corridor can be outlined as follows:

- The completion of the electrification of the borders between Spain and Portugal and the section between Algeciras-Bobadilla;

- The missing links between Lisboa-Poceirão, Poceirão-Évora and the third Tagus bridge in Portugal, as well as the high-speed line sections of Caía-Badajoz, Badajoz-Talayuela and Talayuela-Madrid in Spain, to enable the completion of the Lisboa-Madrid high-speed railway line;
- The completion of the Y-Basque in Spain and of the second phase of the GPSO Project, connecting Bordeau-Dax, in France, as well as the connection between Dax and the Spanish border;
- The non-achievement of 740 m freight train length lines (especially in Portugal and Spain);
- The lack of full of European standard track gauge interoperability along the Iberian Peninsula.

2.4. Rail-Road Terminals

Following the CEF2 extensions, the Atlantic Corridor now has 14 RRTs, out of which 12 are in operation. Regarding the compliance with TEN-T requirements, as of 2022, 71% of the Rail-Road terminals (RRTs) have electrified access (compared with 70% in 2014), while 36% allow 740m train access (vs 40% in 2014) and 86% have an intermodal capacity (compared to 80% in 2014). In the Atlantic Corridor, the main issues revolve around the terminals of Poceirão (Portugal) and Valladolid (Spain), which have not yet been constructed. The table below outlines the compliance rates with these TEN-T requirements as of 2014 and 2022.

Table 2: Compliance of RRT in the Atlantic Corridor with TEN-T requirements (2014 and 2022)

TEN-T Requirement	KPI 2014	KPI 2022
No. of core RRT	10	14
Terminals in operation	8	12
Electrified access	70%	71%
740 m train access	40%	36%
Intermodal capacity	70%	71%

Compliance by 2030 with TEN-T requirements still remains unclear, especially due to the uncertain role of Poceirão RRT in Portugal. The map below illustrates the RRTs along the Atlantic Corridor as of 2022.

Figure 6: RRTs in the Atlantic Corridor (as of 2022)

2.5. Inland waterways

With the Corridor extensions, the Atlantic Corridor increased its IWW network, with the inclusion of the Guadalquivir River in Spain and the Douro River in Portugal, representing an 80% increase in the size of the Corridor's IWW network. Nonetheless, as of 2022, the Atlantic's IWW network is fully compliant in terms of RIS implementation, permissible height under bridges (min. 5.25m), permissible draught (min. 2.5m) and CEMT Class IV, as outlined in the figure below.

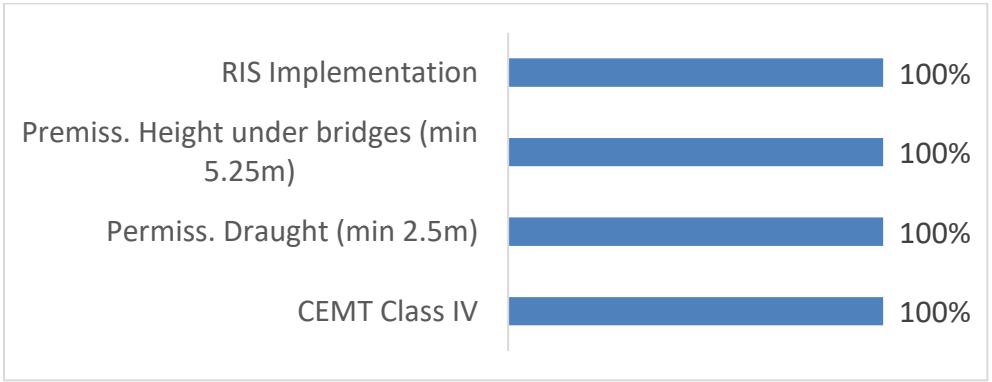


Figure 7: Compliance with IWW TEN-T requirements in the Atlantic Corridor (as of 2022)

Nonetheless, restrictions still remain around Paris concerning height restrictions in historical bridges along the Seine River, as well as the obsolescence of some locks along the Douro River which cause safety concerns. The map below provides an overview of the IWW network of the Atlantic Corridor.

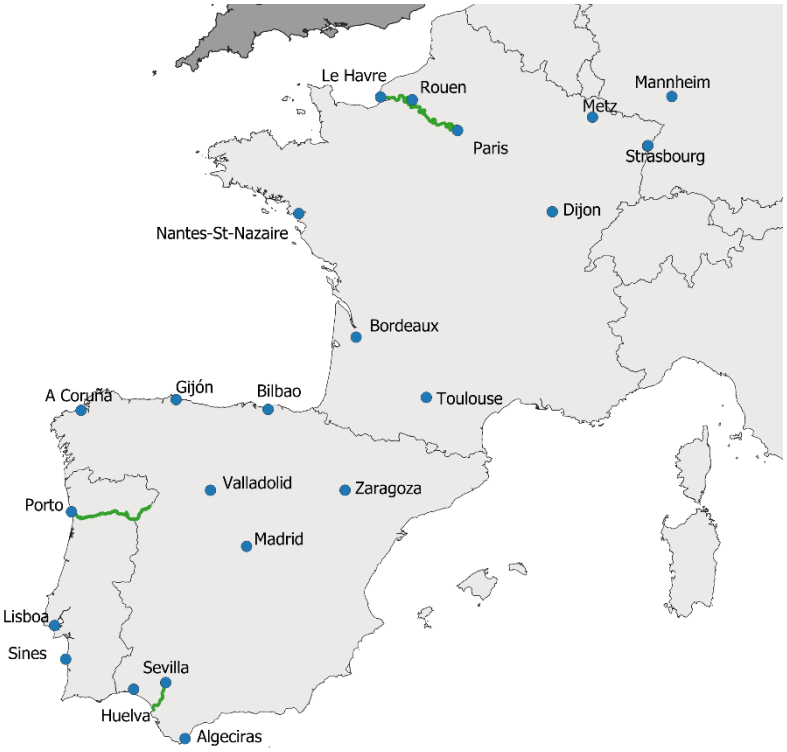


Figure 8: IWW network of the Atlantic Corridor (as of 2022)

2.5. Maritime and inland ports

With 18 maritime ports and 4 inland ports, the Atlantic Corridor has a strong maritime role, with all inland ports being compliant with the requirement of rail connectivity (100% compliance) and 94% of the seaports of the Atlantic being compliant with this requirement. In turn, 39% of seaports and 25% of inland ports comply with the requirement of ensuring the availability of clean fuels. Nonetheless, specifically regarding the provision of publicly accessible LNG refuelling points for maritime transport, such option is already available in the ports of Nantes Saint Nazaire and Le Havre (France), Bahía de Algeciras, Santa Cruz de Tenerife, Huelva and Bilbao (Spain). In Portugal, for Sines and Leixões there are no LNG stations, though LNG truck to ship supply is provided. It is also worth noting that LNG projects are ongoing in Bordeaux, Gijón and Las Palmas and in Sevilla for hydrogen, with all expected to be concluded before 2030. The graph below provides an overview of the compliance with the main TEN-T requirements for maritime and inland ports of the Atlantic Corridor.

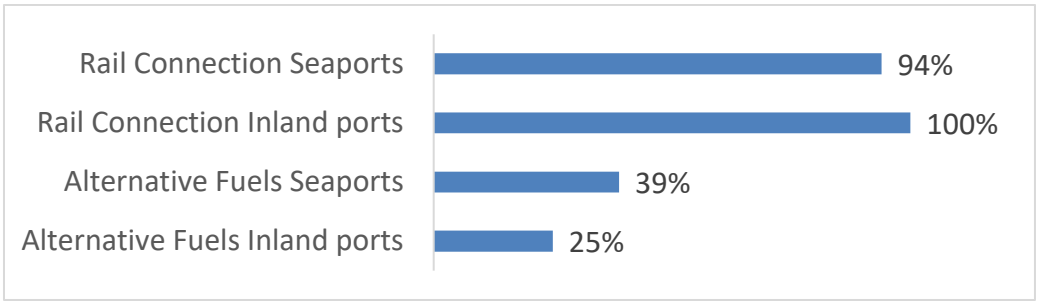


Figure 9: Compliance with maritime and inland ports TEN-T requirements in the Atlantic Corridor (as of 2022)

The main remaining issues in the Atlantic Corridor remain the need to restore last-mile rail connectivity to the Irish port of Cork and to establish the last-mile rail connection to

the port of Shannon Foynes. In the same vein, issues regarding train length, rail speed and gradients need to be overcome in order to ensure seamless last-mile connectivity to the ports of the Atlantic. In addition, capacity bottlenecks in ports should be tackled. The map below provides an overview of the network of maritime and inland ports of the Atlantic Corridor.

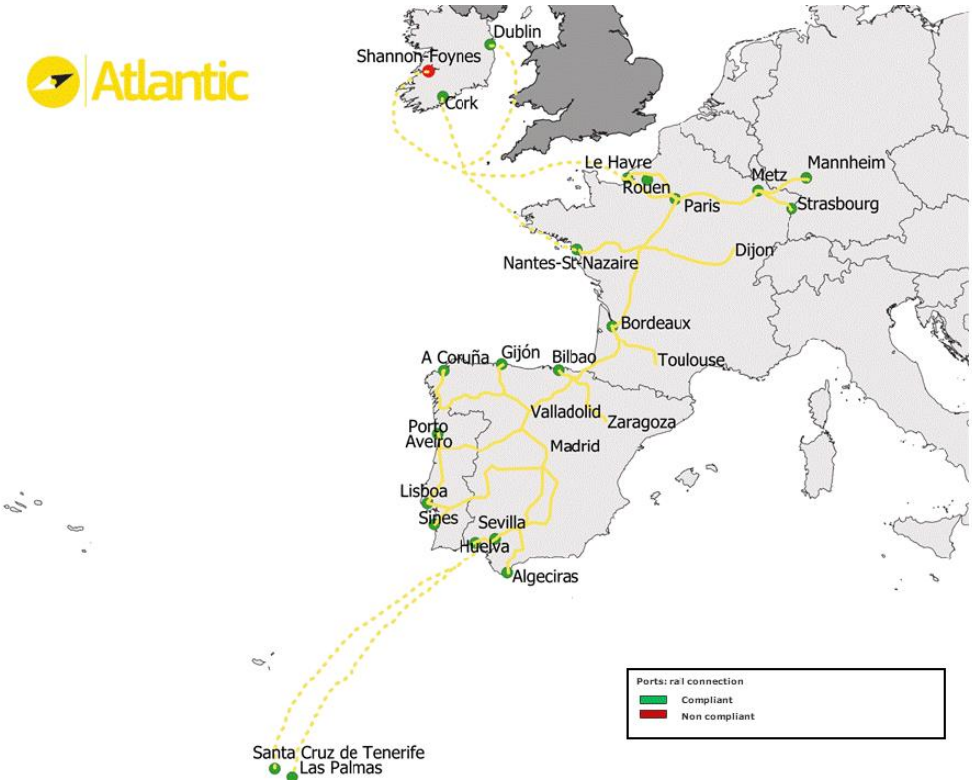


Figure 10: Maritime and inland port network of the Atlantic Corridor (as of 2022)

2.6. Road transport

The road network of the Atlantic Corridor is fully compliant with the requirement of motorway or express road, following the completion of the Portuguese/Spanish cross-border section in Vilar Formoso-Fuentes de Oñoro in 2021. Moreover, overall compliance for electric charging is high (based on distance), standing at 82% along the Atlantic Corridor. Nonetheless, when considering AFIR requirements, important sections along the Corridor do not reach yet the required power /distance.

In this regard, important issues on the road network of the Atlantic Corridor still remain, namely in terms of increasing the adoption rates of alternative fuels and the availability of recharging and refuelling infrastructure, as well as the increase of the availability of certified secure parking for lorries. The map below provides an overview of the road network in the Atlantic Corridor, namely in terms of the TEN-T requirement of motorway or express road.

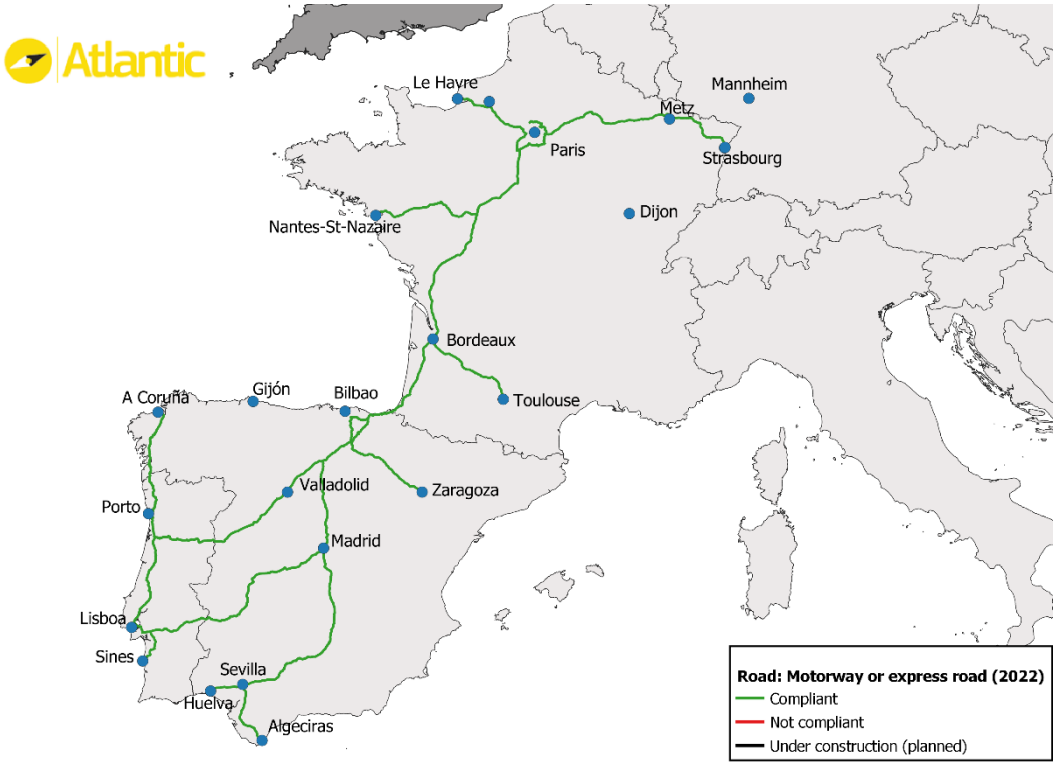


Figure 11: Compliance with road requirements in the Atlantic Corridor

2.6. Airports

Out of the 13 airports in the Atlantic Corridor, two have connection to rail – Madrid Barajas and Paris Charles de Gaulle, though only the latter has connectivity to high-speed rail. Thus, the level of compliance with the requirement of connectivity by rail to airports is of 31% at a Corridor level. It is also worth adding that five airports have projects foreseeing future rail and metro connections (Porto, Madrid Barajas, Paris Charles de Gaulle, Toulouse and Dublin airports). In particular, the airports of Porto and Madrid Barajas have ongoing projects foreseeing future high-speed rail connections, with the airport of Paris Charles de Gaulle carrying out a project to ensure the upgrade of its current rail connection. Nonetheless, the pending decision of the location of the future airport in Lisbon may still impact on this requirement of rail connectivity. It is also worth noting that the need to ensure the availability of sustainable aviation fuels (SAF) at airports poses an additional challenge that airports will need to be tackled in the near future.

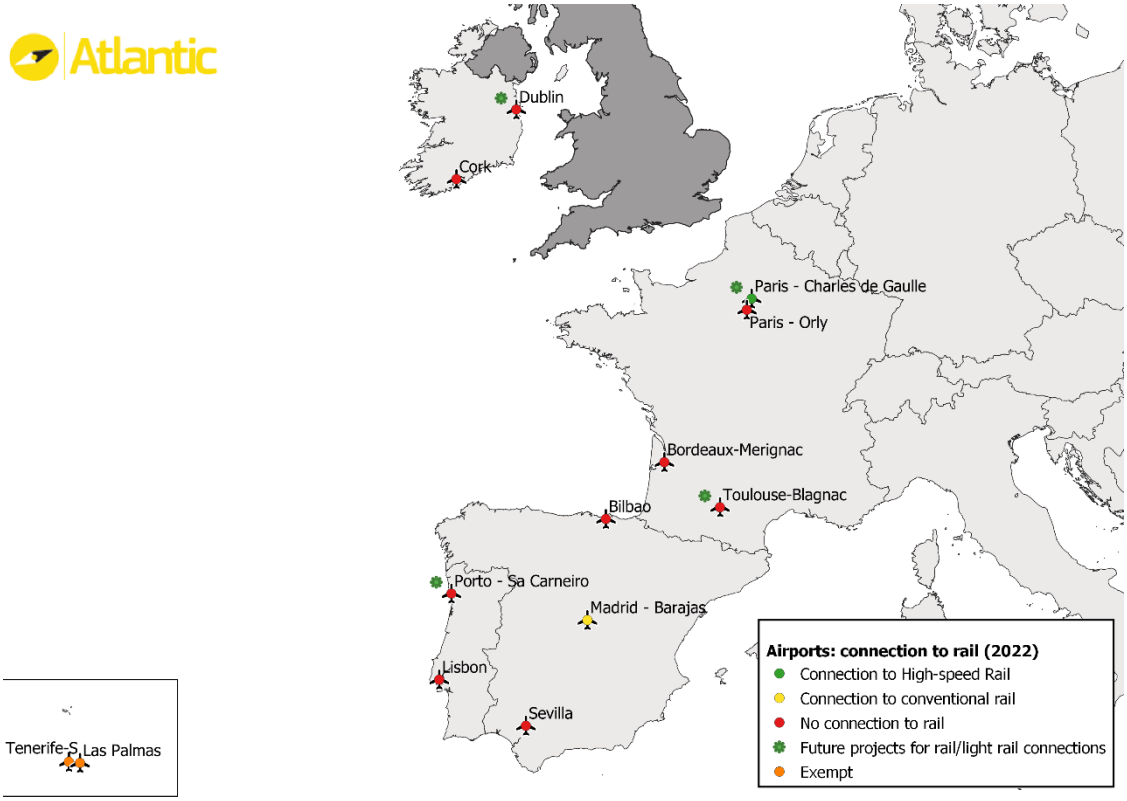


Figure 12: Compliance with airport requirements in the Atlantic Corridor

3. Outlook towards the future

Compared to the analysis performed in 2020, no significant changes are observed in terms of the compliance rates with the TEN-T requirements in the Atlantic Corridor in 2022. Overall, the Corridor is progressing well. However, some challenges still remain, namely the following:

- The completion of important rail connections along the Corridor, namely of the Lisboa-Madrid high-speed line, the Y-Basque and the GPSO.
- The electrification of the Algeciras-Bobadilla railway line.
- The need to ensure compliance with the requirement of train length ≥740m across the Iberian Peninsula, although full compliance is expected by 2030.
- The need to ensure interoperable standard track gauge across the Corridor, and how alternative solutions for simplified track gauge migration (e.g. polyvalent sleepers and third rail) can be considered.
- The need to ensure full ERTMS deployment along the Corridor by 2030.
- The deployment of alternative fuel infrastructure along the entire Corridor and the availability of alternative fuels for the different transport modes, in line with the provisions laid down in the revised Alternative Fuels Regulation (AFIR).
- Ensuring and improving last-mile rail connectivity to ports and airports of the Corridor.
- The need to increase the importance on urban nodes with the revised TEN-T Regulation.