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# EVALUATION

***of the***

**Regulation (EU) N° 1315/2013 on Union Guidelines for the development of a trans-European transport network**

{SWD(2021) 118 final}

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## Glossary

| Term or acronym | Meaning or definition |
|---|---|
| ACI EUROPE | Airports Council International Europe |
| AFID | Alternative Fuels Infrastructure Directive |
| APRA | Association of Passenger Rights Advocates |
| ASECAP | Association Européenne des Concessionnaires d'Autoroutes et d'Ouvrage à Péage |
| A4E | Airlines for Europe |
| CBA | Cost-benefit analysis |
| CEF | Connecting Europe Facility |
| C-ITS | Cooperative Intelligent Transport Systems |
| CLECAT | European Association for Forwarding, Transport, Logistics and Customs Services |
| CEMT | Conference of European Ministers of Transport |
| CER | Community of European Railways and Infrastructure Managers |
| CLIA EUROPE | Cruise Lines International Association |
| CF | Cohesion Fund |
| CNC | Core Network Corridors |
| CCRE | Council of European Municipalities and Regions |
| DG MOVE | Directorate-General for Mobility and Transport |
| DG ENER | Directorate General for Energy |
| DTLF | Digital Transport and Logistics Forum |
| EASPD | European Association of Service Providers for Persons with Disabilities |
| EATMN | European Air Traffic Management Network |
| EBU | European Barge Union |
| EC | European Commission |
| ECA | European Court of Auditors |
| ECF | European Cyclists' Federation |
| ECG | The Association of European Vehicle Logistics |
| EDP | European Deployment Plan |
| EFIP | European Federation of Inland Ports |
| EIB | European Investment Bank |
| EIM | European Rail Infrastructure Managers |
| EMTA | European Metropolitan Transport Authorities |
| ERA | European Regions Airline Association |
| ERFA | European Rail Freight Association |
| EP | European Parliament |
| ERDF | European Research and Development Fund |
| ERF | European Union Road Federation |
| ERRIN | European Regions Research and Innovation network |
| ERTMS | The European Railway Traffic Management System |
| ESIF | European Structural Investment Funds |

| Term or acronym | Meaning or definition |
|---|---|
| ESPO | European Sea Ports Organisation |
| ETSC | European Transport Safety Council |
| EU | European Union |
| EUROPLATFORMS E.E.I.G. | The European Association of Logistics Platforms |
| EUROSTAT | Statistical Office of the European Union |
| EuroRAP | European Road Assessment Programme |
| FAA | Federal Aviation Administration |
| FEPORT | The Federation of European Private Port Operators and Terminals |
| FTA | Freight Transport Association |
| HSR | High-Speed Rail |
| IATA | International Air Transport Association |
| ICT | Information and Communication Technologies |
| INE | Inland Navigation Europe |
| IRU | International Road Transport Union |
| ITS | Intelligent Transport Systems |
| LTS | Long term strategy |
| MMTIS | Multimodal Travel Information Services |
| MoS | Motorways of the Sea |
| MS | Member State of the European Union |
| MFF | Multiannual Financial Framework |
| NGOs | Non-governmental Organisations |
| OPC | Open Public Consultation |
| PIARC | World Road Association |
| POLIS | European Cities and Regions Networking for Innovative Transport Solutions |
| PRM | Persons with reduced mobility |
| RIS | River Information Services |
| R&I | Research & Innovation |
| RFC | Rail Freight Corridor |
| SERA | Single European Railway Area |
| SESAR | Single European Sky's ATM Research project |
| SETA | Single European Transport Area |
| SMEs | Small and Medium Enterprises |
| SUMP | Sustainable Mobility Urban Plans |
| TEN | Trans-European Networks |
| TEN-T | Trans-European Transport Networks |
| TENs | Transport, Energy and Telecommunications |
| TFEU | Treaty on the Functioning of the European Union |
| UETR | European Road Haulers Association |
| UIC | International Union of Railways |
| UIP | International Union of Wagon Keepers |
| UIRR | International Union for Road-Rail Combined Transport |
| UITP | International Association of Public Transport |
| UNIFE | The Association of the European Rail Industry |
| VTMIS | Vessel Traffic Management Information System |

## 1. INTRODUCTION

### TEN-T policy: Legal context and policy background

The Treaty on the Functioning of the European Union stipulates the establishment and development of trans-European networks in the areas of transport, telecommunications and energy infrastructures[1]. Trans-European networks shall enable citizens of the Union, economic operators and regional communities to derive full benefit from an area without internal frontiers. They shall also take account of the need to strengthen economic, social and territorial cohesion of the Union and to promote its overall harmonious development.

The trans-European transport network (TEN-T) policy aims to develop a European multimodal and interoperable transport network of roads, rail, inland waterways and maritime routes which is linked to urban nodes, ports, airports and other terminals. The network shall enable smooth global transport flows of both freight and passengers, in particular by improving cross-border connections and removing bottlenecks and missing links. It shall also enhance accessibility and connectivity of all regions, including remote, outermost, insular, peripheral and mountainous regions as well as sparsely populated areas.

The first 'Community Guidelines' for the establishment and development of a trans-European network in the transport sector (TEN-T) were adopted in 1996[2]. Since then, TEN-T policy has been steadily advancing – marked by geographical network extensions arising from enlargements of the European Community / the European Union and by expanding the scope of TEN-T as to strengthen infrastructure quality. This development was supported by growing responsibility and commitment of EU Institutions and by an increasing 'ownership' behaviour of Member States and other stakeholders.

*Key elements and features of the TEN-T policy*

Regulation (EU) 1315/2013 on Union Guidelines for the development of the trans-European transport network[3], which is currently in force, has been the result of the first substantial revision of the TEN-T Guidelines since 1996. Following a broad consultation process and an impact assessment, it led inter alia to the following key changes in TEN-T policy with important new features:

- The introduction of a *Europe-wide dual layer network approach* which is based on a coherent EU-wide planning methodology[4] acknowledged by Member States. Indeed, instead of the prior focus on a certain number of priority transport projects across the EU, the current Regulation introduced a transport network of EU added-value composed of a 'comprehensive' network (i.e. the ground layer to ensure accessibility of all European regions) and a 'core' network (i.e. the part of the comprehensive

1 Treaty on the Functioning of the European Union, Title XVI, Trans-European Networks (Articles 170 – 172)

2 Decision n° 1692/96/CE of the European Parliament and of the Council of 23 July 1996 on Community Guidelines for the development of the trans-European transport network

3 Regulation (EU) N° 1315 of the European Parliament and of the Council of 11 December 2013 on Union Guidelines for the development of the trans-European transport network

4 The planning methodology for the trans-European transport network (TEN-T) of 7 January 2014, SWD(2013) 542 final

network of highest strategic importance and of highest implementation priority) (see chapter 3).

- The introduction of *ambitious and binding infrastructure standards and requirements* for all transport modes to achieve interoperability and quality of the network, with most ambitious standards established for the core network featuring high capacity and high quality standards.
- The introduction of *common completion deadlines* for the core (2030) and the comprehensive network (2050), accompanied by a strong new implementation instrument for the core network, i.e. the core network corridors (a subset of the core network representing between 70 and 80% of the core network length, depending on the transport mode). This instrument of core network corridors aims to facilitate the coherent and timely implementation of 'corridors' and is led by European Coordinators.
- Increased *focus on network nodes*, both transport nodes and urban nodes as important interfaces to enable seamless clean multi-modal transport, including sustainable and safe first and last mile connections in cities.

*TEN-T implementation structure and EU coordination and financing framework*

The introduction of the above key elements in a *new legal form* – a Regulation – has strengthened the legal base of the Union's infrastructure policy and, in line with the functionality-based network policy, reinforced the basis for the direct involvement of a broad range of stakeholders.

The TEN-T Regulation provides all relevant actors (i.e. Member States, regions, cities, transport industry, infrastructure managers of all transport modes, users etc.) thus with a common policy framework, binding standards and requirements as well as fixed deadlines for completion of the network. It works towards the gradual completion of the common and consistent European transport infrastructure network. As such, it adds a European perspective to national infrastructure planning and addresses needs and benefits beyond single national approaches.

However, the planning and construction of transport infrastructure projects is subject to sovereign responsibilities of Member States. In other words, the realisation of the TEN-T network is based on national infrastructure plans and programmes. The EU aims at aligning such national planning as much as possible with the TEN-T objectives. Over the more than 25 years of the existence of TEN-T policy[5], the interplay of Member States' sovereign planning responsibilities and established EU policy objectives has led to an increasing mutual alignment: EU planning both builds on and gives direction to national transport infrastructure planning and investment. Demand in terms of major transnational transport flows is duly reflected in this planning approach.

To ensure a better alignment of EU level and national planning, TEN-T policy has introduced a set of implementation instruments: first of all, European Coordinators have

[5] On 1 November 1993, with the entry into force of the Maastricht Treaty, infrastructure policy was introduced as a European policy with the trans-European networks for transport, energy and telecommunications.

been appointed as "ambassadors" for the nine core network corridors as well as the two horizontal priorities of the TEN-T (European Rail Traffic Management System, Motorways of the Sea). They monitor the implementation of the network in view of its compliance with the standards and assess whether network deficits are addressed by planned or ongoing infrastructure projects. To this end, they have established a database of around 3000 ongoing/planned projects on the TEN-T network which is regularly monitored and updated according to a wide range of criteria (such as financial maturity, permitting and procurement status, reach of KPI standards etc.). In addition, the European Coordinators push forward the implementation of the corridors by bringing the relevant stakeholders together in so called "Corridor Fora". They also push for and monitor progress of the implementation of the major cross-border projects, e.g. by being member of the respective project boards. Last but not least, they draw up so called "work plans" and where applicable also "implementing decisions" for specific projects as to set the priorities and milestones for the network.

Unlike in the energy and telecommunication sectors, transport infrastructure policy is strongly related to Member States' budget decisions. Indeed, the major share of the investments on the TEN-T network is made by Member States, in accordance with the relevant procedures and processes in place in each Member State. This also means that the main responsibility for the implementation of projects contributing to the achievement of the TEN-T objectives, standards and requirements has to be assumed by the Member States concerned and, as appropriate, other public and private actors.

The EU complements the TEN-T infrastructure implementation through support from the Connecting Europe Facility, the European Structural and Investment Funds as well as through instruments such as InvestEU or interventions from the European Investment Bank. Furthermore, in its external dimension, it establishes a basis for EU funding in the field of pre-accession, enlargement, foreign policy cooperation and development aid.

All projects contributing to the completion of the network qualify as 'projects of common interest'. So these could be a variety of projects, starting from physical or smart projects, projects filling a gap up to projects leading to an upgrade to target standards. Contrary to the preceding TEN-T Regulation, no selection of "priority projects" has been made. Indeed, all projects contributing to the TEN-T objective may benefit from EU support under the relevant EU financing instruments mentioned above. However, the CEF Regulation defines certain geographical sections (not projects) on the network which have a higher priority / relevance to be funded (see Annex I of Regulation (EU) 1316/2013).

In a nutshell: The competence to build transport infrastructure lies with the Member States and TEN-T planning is thus also based on Member States' national infrastructure plans and programmes. However, TEN-T planning adds the EU perspective and addresses needs and benefits beyond the single national approaches.

*Delegated Regulations*

Since the entry into force of Regulation (EU) 1315/2013, the European Commission adopted delegated Regulations, aiming to adapt the maps of the network to evolving conditions: Delegated Regulation (EU) 473/2014 was essentially a technical corrigendum of certain maps. Delegated Regulation (EU) 2017/849 of 7 December 2016 adapted the network to take account of certain changes resulting from the quantitative thresholds for

freight terminals, ports and airports and to adjust the maps to reflect implementation progress.

A second category of Commission Delegated Regulations was linked to the strengthened cooperation with third countries in TEN-T policy – one of the new fields of action introduced in Regulation (EU) 1315/2013. Based on high-level agreements on transport infrastructure networks between the Union and neighbouring countries, the TEN-T Regulation in its Article 49(6) empowers the Commission to adapt the TEN-T to include indicative maps of neighbouring countries. At this point in time, such indicative maps have been adopted for the EFTA (European Free Trade Association: Norway, Island, Switzerland, Lichtenstein), the Western Balkans, Turkey and the Eastern Partnership countries (Armenia, Azerbaijan, Belarus, Georgia, Moldova and Ukraine)[6]. The purpose of these extended TEN-T maps is that the TEN-T standards are applied also on the networks of third countries as to allow for seamless connections. As such, they also provide a sound basis for foreign investments in these countries in line with European objectives.

*Interaction with other relevant legislation*

TEN-T policy depends on complementary policies – even more – it is in combination with other policy areas a pillar of EU transport policy. As the EU transport infrastructure policy, TEN-T policy is not a purpose in itself. The standards and requirements set in the TEN-T Regulation are directly connected with the relevant objectives and needs in other transport sectors/fields and thus with other more sector-specific legislations (e.g. per transport mode).

This means, for example, TEN-T rail infrastructure – for the sake of seamless cross-border transport and mobility – has to incorporate interoperability legislation which is set in railway policy. Similarly, road infrastructure has to take up EU legislation on road safety.

TEN-T policy can thus not be separated from those policies. The comprehensive network is thereby the geographical basis for all related transport legislation through its standards and requirements and thus also the reference base for EU funding from different sources (CEF, ESIF, and others). The core network features higher standards and requirements as it is of highest strategic importance for transport policy overall and captures the major transport flows. Consequently, by implementing the core network the highest benefits can be gained for wider transport policy objectives (e.g. decarbonisation objectives; user benefits through lower transport costs and shorter travel times).

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- For all these countries: Commission Delegated Regulation (EU) No 473/2014 of 17 January 2014 amending Regulation (EU) No 1315/2013 of the European Parliament and of the Council as regards supplementing Annex III thereto with new indicative maps, OJ L136, 95/2014, p.10.
- In addition, for Norway, Island and the Western Balkans: Commission Delegated Regulation (EU) 2016/758 of 4 February 2016 amending Regulation (EU) No 1315/2013 of the European Parliament and of the Council as regards adapting Annex III thereto, OJ L126 of 14 May 2016, p 3.
- In addition, for the countries of the Eastern Partnership: Commission Delegated Regulation (EU) 2019/254 of 9 November 2018 on the adaptation of Annex III to Regulation (EU) No 1315/2013 of the European Parliament and of the Council on Union guidelines for the development of the trans-European transport network, OJ L43 of 14 Feb 2019, p.1.

In this respect, it seems not so much a matter of separating the impacts of the TEN-T Regulation against those of other transport legislation but of ensuring their complementarity and synergies for the overall purpose of sustainable transport. TEN-T performance on indicators such as for modal shift, better service quality, spreading of clean vehicle fleets etc. is depending on coordinated efforts in TEN-T and related policy fields.

**The evaluation: purpose and scope**

The present evaluation covers Regulation (EU) 1315/2013 including its related delegated acts concerning network adaptations in EU MS as well as in terms of indicative network extensions to third countries. In terms of geographical scope, the reports covers the EU 27 excluding the UK. Neighbouring countries have also been looked at in a specific case study (see Evaluation Question 13). In terms of time period, the evaluation looked at 2013 onwards.

This evaluation aims to assess if the implementation of the core and comprehensive networks by the 2030 and respectively 2050 milestone is well on track. In addition, it aims to assess whether its objectives and related standards and requirements are still relevant and coherent in view of the increased ambitions of the EU's environmental and climate change policies.

As such, this evaluation assesses on one side the implementation progress by highlighting and illustrating in particular a number of specific examples (see Chapter 3). On the other side the direct contributions to the specific objectives are outlined (see Chapter 5), in particular:

1. *Contributing to efficient transport flows in the internal market* through the removal of bottlenecks;

2. *Contributing to cohesion* through better interconnection between long-distance, regional and local traffic;

3. *Contributing to sustainability* of the TEN-T through standards and requirements enabling better conditions for zero and low emission transport along the TEN-T;

4. *Enabling increased user benefits* through infrastructure standards ensuring safe and secure transport as well as by enabling efficient and high quality service for freight and passengers.

It can be noted that these four objectives are mutually reinforcing each other and one does not need to be favoured to the detriment of the other.

Regulation (EU) 1315/2013 basically defines a horizon for its implementation. However, as this Regulation does not govern an EU programme with a corresponding budget allocation but sets the long-term framework for the development of an EU policy overall, there will be need for further action in the future (e.g. to take account of changing demand, ensure continuously high quality, adjust to innovation etc.).

Given the very broad scope of TEN-T policy, this evaluation has been a complex exercise. The evaluation looks backward at what has been achieved since 2013, and it looks forward at what would be achieved on the basis of the current TEN-T Regulation;

are there any initial objectives which will not be achieved and why, and what new challenges need to be taken up in TEN-T policy.

This evaluation is carried out almost at mid-term on the way between the last – substantial – revision of the Regulation and the first key milestone of TEN-T policy: The year 2030, when the Union will have to prove to its citizens and economic operators that TEN-T policy has been successful. It assesses to what extent the implementation efforts so far have led to the expected results and benefits and if implementation is on the right track towards the 2030 milestone.

In this context, "expected results" means that the ongoing and/or planned projects on the TEN-T network are at this stage in so much advanced in their implementation and sufficiently mature (also in terms of financial maturity) so that their full completion can be expected by 2030. It also means that all projects are ongoing and/or planned which are needed to fully address the lack of compliance issues on the network, i.e. that each section not yet compliant is being addressed by an investment planning project which will be realised in due time. To this end, a project database of around 3000 projects is regularly being monitored.

New developments in transport policy and the wider political environment of the EU require a thorough assessment of the existing Regulation in its entirety. Therefore, in spring 2019, the Commission services launched an evaluation of the Regulation.

**The evaluation: Expected deliverables and input for policy making**

The European Green Deal[7], adopted by the Commission in December 2019, aims at tackling climate change and reaching the objectives of the Paris agreement. Since transport accounts for a quarter of the EU's greenhouse gas emissions, the European Green Deal calls for a 90% reduction of transport emissions until 2050. The climate neutrality objective by 2050, which the Commission proposed in 2018[8] and the European Council[9] and Parliament[10] endorsed, is one of the central elements of the Green Deal. The Commission has proposed to enshrine climate neutrality into EU law[11]. In order to set the EU on a sustainable path to achieve climate neutrality by 2050, with the Climate Target Plan[12] the Commission has proposed an EU-wide, economy-wide net greenhouse gas emissions reduction target by 2030 compared to 1990 of at least 55%.

In this context, the TEN-T revision is expected to specifically address how these targets can be achieved. Thereby, the potential of TEN-T policy to contribute to the decarbonisation challenge rests upon two pillars:

1) Ensuring the integration of all modes and their intelligent components into a single network; thereby creating a unique basis for efficiency and sustainability enhancements of the transport system as a whole and

7 COM(2019) 640 final
8 COM(2018)773 final
9 European Council conclusions, 12 December 2019.
10 European Parliament resolution of 14 March 2019 on climate change and resolution of 28 November 2019 on the 2019 UN Climate Change Conference in Madrid, Spain (COP 25).
11 COM (2020)80 final
12 COM (2020) 562 final

2) Ensuring cross-border continuity and coherence of charging and refuelling infrastructure for alternative fuels in transport; thus helping to stimulate an accelerated market penetration of low and zero emission vehicles, aircrafts and vessels.

To address the main issues that are of key importance to inform policy making, content-wise, the evaluation work has been structured to cover 1) objectives and provisions of a more traditional transport infrastructure policy nature and 2) areas with a clear focus newer transport policy objectives such as decarbonisation, digitalisation or resilience.

**Key areas addressed by the evaluation**[13]

- **The form / design of the network**, i.e. its geographical structure of the network covering both rail, road and inland waterway links as well as ports, airports and other multi-modal terminals; addressing urban nodes as network components; considering the link with active transport modes; besides the strengthening of long-distance freight rail and the reinforcement of synergies between TEN-T and Rail Freight Corridors – looking at weaknesses and opportunities of passenger rail; at bottlenecks resulting from changing transport flows which may have an impact on demand and thereby on the network design.
- **The features / quality requirements of the network**, i.e. the setting of binding transport infrastructure standards in accordance with related EU transport legislation in fields such as interoperability, safety, security or accessibility for persons with reduced mobility; provisions on infrastructure requirements as a basis for seamless, sustainable and efficient transport and mobility solutions in line with broader transport policy objectives (e.g. equipment and connectivity of transport terminals, intelligent infrastructure components to enable transport telematics solutions, deployment of certain alternative fuel infrastructures, resilience of infrastructure); promotion of innovative solutions, stimulating the use of new technologies to enhance user services and advance decarbonisation;
- **The identification of infrastructure needs from the perspective of private and commercial users**, e.g. the needs of providers of sustainable freight transport services, of mobility services for passengers or of other multi-modal solutions; of transport operators seeking to enhance their service performance (e.g. railway undertakings), of infrastructure managers aiming to improve the efficient use of the assets under their responsibility (e.g. port authorities) or of regional and local authorities seeking smooth first and last mile connections.
- **The status of TEN-T implementation** at the moment of the evaluation and the prospects for achieving the network completion targets; the effectiveness of relevant EU instruments – notably of the core network corridors and the European Coordinators in their lead – and the coordination of such instruments; the responsibilities of Member States and other stakeholders in implementing TEN-T projects.

[13] Evaluation Roadmap, published in September 2018, https://ec.europa.eu/info/law/better-regulation/have-your-say/initiatives/1908-Trans-European-transport-network-Guidelines

To evaluate measures expected to help substantially modernising TEN-T policy in the light of the more ambitious decarbonisation objectives, a number of specific issues were studied in more detail (please refer also to the evaluation method under point 4). These address the role of urban nodes in TEN-T policy, digitalisation, new transport technologies including zero and low emission vehicles infrastructure, infrastructure resilience, high-performance passenger rail and seamless mobility for the "Trans-European passenger"[14]. Specific attention was also given to TEN-T cooperation with third countries, an area which is gaining increasing importance in view of changing global trade relations and progressing EU neighbourhood policy. Finally, given their vital role in ensuring an efficient and sustainable TEN-T policy overall, infrastructure standards and requirements for all modes and for multi-modal infrastructure were assessed more thoroughly, and a more in-depth evaluation was also undertaken for the functioning of the core network corridors as the key instrument to facilitate core network implementation.

**Evaluation criteria applied**

In line with the Better Regulation guidelines of the European Commission[15], Regulation (EU) 1315/2013 has been evaluated against five main criteria: relevance, effectiveness, efficiency, coherence and added value. These criteria have been applied to evaluate the entirety of the legal provisions of the Regulation as well as the approach to, and the intermediary results of, its implementation. Issues such as those set out above have been specifically in the focus of the evaluation, but they have not been its sole subject.

The '**relevance**' criterion has proven to be of critical importance, especially when comparing existing provisions of Regulation (EU) 1315/2013 with new needs related to the European Green Deal or to technological developments which were not foreseeable a decade ago. The preparedness of the TEN-T for a substantial progression to zero and low emission mobility, digitalization and automation or resilience clearly challenges the 'relevance' criterion in particular.

'**Coherence**' has been key in assessing the extent to which TEN-T policy is aligned with relevant transport policy needs and developments. Discrepancies may have occurred over the last years as a result of evolving transport policy, for example in areas such as urban nodes, railway policy, aviation or maritime transport. Coherence is certainly of vital importance when ensuring continuous equipment of TEN-T with charging and refuelling infrastructure for zero and low emission vehicles, aircrafts and vessels, in line with relevant EU initiatives. Similarly, 'coherence' may be at stake when assessing needs to adjust the network to climate adaptation, security or other new infrastructure resilience challenges; thus, 'coherence' between TEN-T policy and other policy areas beyond transport.

[14] "Trans-European passenger" is neither an official term nor an official concept. It has been used for the purpose of this evaluation to assess the potential of seamless and barrier-free mobility for cross-border travellers on the TEN-T.

[15] SWD(2017)350

‘**Effectiveness**’ is of major importance for assessing the ability of Regulation (EU) 1315/2013 to stimulate the achievement of the general TEN-T objectives – facilitation of the internal market and contribution to social and territorial cohesion – as well as the wide range of specific objectives. Chapter 3 below will showcase some representative examples, illustrating the implementation progress made since 2013, outlining success factors or obstacles related to the development to date and assessing strengths and weaknesses towards full completion targets. Such an evaluation can only be made in an exemplary way, given the broad scope of the TEN-T and the wide range of areas combined in it.

The implementation of the TEN-T core network is facilitated through a number of implementation instruments such as the core network corridors, European Coordinators, work plans and corridor fora involving a large number of stakeholders. Furthermore Regulation (EU) 1315/2013 empowered the Commission, subject to Member State approval, to draw up Implementing Acts for the cross-border and horizontal dimensions (ERTMS, MoS) of the core network corridor work plans. The evaluation has been looking into the ‘**Efficiency**’ of these instruments and assessed in how far they are deemed useful and appropriate by stakeholders. Furthermore the evaluation assessed if and in how far Member States fulfil their reporting obligations under Regulation (EU) 1315/2013 and the burden associated to this. Finally the evaluation looked at the efficiency of the integration between Rail Freight Corridors and core network corridors and explored whether the Regulation provided for an efficient use of the TEN-T to the benefit of freight and passenger transport.

Last but not least, the evaluation looked at the **added value** of TEN-T policy overall. In relation to future TEN-T policy challenges, notably in the fields of decarbonisation and digital/technological transition, new perspectives may be at stake to further strengthen the EU added value of TEN-T policy. Even more than the ‘traditional’ TEN-T infrastructure approach, such developments may imply unique opportunities to boost the European added value thanks to a well-established and integrated infrastructure policy.

## 2. BACKGROUND TO THE INTERVENTION (REGULATION (EU) 1315/2013)

### 2.1. Base line and points of comparison

The Impact Assessment accompanying the 2013 revision of the TEN-T guidelines[16] highlighted the success of the policy since its beginnings in terms of infrastructure development, interconnecting national networks, overcoming technological barriers across national borders and deploying intelligent transport systems. At the same time it concluded that the European Union does not dispose yet of a complete trans-European infrastructure network due to several factors:

- The **infrastructure network in the EU was still fragmented geographically**, i.e. connections between Member States (cross-border links) were insufficient and major European transport axes presented significant gaps and lacked continuity; TEN-T infrastructure availability and quality diverged between eastern and western parts of Europe; missing connections with neighbouring and overseas countries had negative impacts on international trade flows that fed the European internal market.
- The **network was fragmented in terms of infrastructure quality** levels of transport modes and lacked appropriate "multi-modal" infrastructure, hampering connections between modes and the development of integrated services.
- Interoperability was insufficient.
- The level of integration of "hard" and "intelligent" infrastructure to enable decent telematics services within and between all modes was insufficient.

Reasons for these persisting problems were identified in the Impact Assessment:

- An insufficient EU-level planning of the network and a spatial configuration that lacked a genuine European design.
- A predominantly bottom up approach to infrastructure development that no longer corresponded to the framework conditions (increasing mobility vs environmental and public budget constraints).
- An insufficient implementation of common standards.
- Lacking integration of binding rules for interoperability into the TEN-T.
- A limited cooperation among Member States in project implementation.
- A lack of sufficient priority setting and conditionality of TEN-T funding instruments.

The Impact Assessment concluded that without EU intervention, these problems would continue to affect transport flows within the internal market and between the Union and third countries, to impair social, territorial and economic cohesion within the EU, to constrain smooth accessibility of all regions of the Union (including peripheral, insular and outermost regions) and to hamper the achievement of sustainability and efficiency objectives in transport (see below on the expected impacts and Annex 3 for details on how the situation might have developed without TEN-T).

[16] Commission Staff Working Paper: Impact Assessment Accompanying the Proposal for a Regulation of the European Parliament and of the Council on Union Guidelines for the development of the Trans-European Transport Network, SEC(2011) 1212 final of 19.10.2011

With the adoption of Regulation (EU) 1315/2013 on Union Guidelines for the development of the trans-European transport network (TEN-T), the Union intended to reinforce the legal basis in order to overcome these problems and to further enhance this policy in view of its fundamental objectives enshrined in the Treaty on the Functioning of the European Union[17] (TFEU).

## Description of the logic of the EU Intervention and its objectives[18]

Taking the 2013 Impact Assessment as a starting point, this chapter describes the presumed logic underlying Regulation (EU) 1315/2013 (see Annex 4). It reflects the following categories, which have been endorsed by the Steering Group (see Annex 1) accompanying the main evaluation study and the overall evaluation process:

- General objectives of the 2013 TEN-T Regulation
- Expected outcomes (connected with specific objectives set out in the Regulation)
- Expected Outputs
- Actions needed
- Inputs needed

### General objectives

On 21 December 2013, Regulation (EU) 1315/2013 on Union Guidelines for the development of the trans-European transport network entered into force, about two years after the publication of the impact assessment and the submission of the Commission's proposal[19].

The TEN-T Regulation builds directly on Title XVI of the TFEU and abides to the fundamental objectives enshrined therein. Furthermore, it was guided by the Roadmap to a Single European Transport Area[20] (the 2011 Transport Policy White Paper setting out the overall EU Transport Strategy for the period until 2050) and the Europe 2020 strategy[21] (promoting sustainable and efficient transport as a cornerstone of sustainable growth and the flagship "Resource efficient Europe").

On this basis, the Regulation has aimed at generating positive impacts on the following overarching EU policy objectives:

1. To support the smooth functioning of the internal market;
2. To strengthen the social, economic and territorial cohesion of the Union;
3. To contribute to further economic growth and competitiveness in a global perspective as well as to sustainability.

### Specific objectives/outcomes

As an overarching objective TEN-T shall contribute to the creation of a single European transport area which is efficient and sustainable, increases the benefits for its users and supports inclusive growth and cohesion. These four specific objectives are further broken down as shown in the table below:

[17] Title XVI, Articles 170 - 172

[18] A graph of the Intervention logic as well as further details on the actions, inputs and external factors, identified as impacting on Regulation 1315/2013 since its adoption, are presented in Annex 3

[19] COM(2011) 650 final

[20] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:52011DC0144

[21] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52010DC2020&from=en

Table 3: Specific objectives and targets underpinning them, laid down in Regulation (EU) 1315/2013[22]

| **Specific objective /outcome** | **Contributing to efficient transport flows in the internal market** | **Contributing to cohesion** | **Contributing to sustainability of the TEN-T** | **Enabling increased user benefits** |
|---|---|---|---|---|
| **To be achieved through…** | Removed bottlenecks and bridged missing links across the EU | Geographically balanced infrastructure across the EU | TEN-T modes which are socially and environmentally sustainable and contribute to environmental objectives | Coherent and continuous infrastructure requirements as basis for high-quality, efficient and sustainable transport services in line with user needs |
| | Optimized interconnections and interoperability of national transport networks for all transport modes; | Connectivity and accessibility for all EU regions | Enhanced enabling conditions for zero and low emission transport along the TEN-T | Infrastructure standards ensuring safe and secure transport |
| | Promotion of efficient, high quality transport contributing to economic growth; | Reduced infrastructure quality gaps | Enhanced sustainability and inclusiveness in economic terms | Seamless mobility and accessibility for all passengers, with an additional focus on responses to natural and human-made disasters, unforeseen events etc. |
| | Enhanced connectivity between the EU and neighbouring and other third countries | Better interconnection between long-distance, regional and local traffic | | |
| | Enabling efficient use of infrastructure and cost-efficient application of innovative technologies | | | |

Source: Regulation (EU) 1315/2013, own elaboration

This matrix summarizes the four specific objectives of the TEN-T and the targets underpinning them, as set out in Article 4 of the TEN-T Regulation. However, this structuring must not be interpreted as a rigid attribution of individual targets to specific objectives. The four specific objectives of the Regulation - contributing to efficient transport flows in the internal market, contributing to cohesion, contributing to sustainability of the TEN-T and enabling increased user benefits - are intrinsically linked and complement one another. Taking the example of investments in cross-border railway infrastructures, it can be shown that these lead to more efficient transport flows benefitting the internal market and at the same time increase the sustainability of the transport system. Through improved connectivity, they also address the cohesion

[22] The outcomes are allocated to the specific objective they most contribute to, however it should be noted that most outcomes contribute to more than one specific objective e.g. "enhanced connectivity between the EU and neighbouring and other third countries" not only benefits the internal market but also the users of transport infrastructure.

objective and benefit users through improved transport services. As such, there is no trade-off between the different objectives but rather complementarity. In an approach which builds on a reinforced integration of infrastructure and related transport policy objectives as a key towards the achievement of the challenging decarbonisation objectives of transport, this complementarity of the objectives creates synergies for the whole transport system.

Outputs

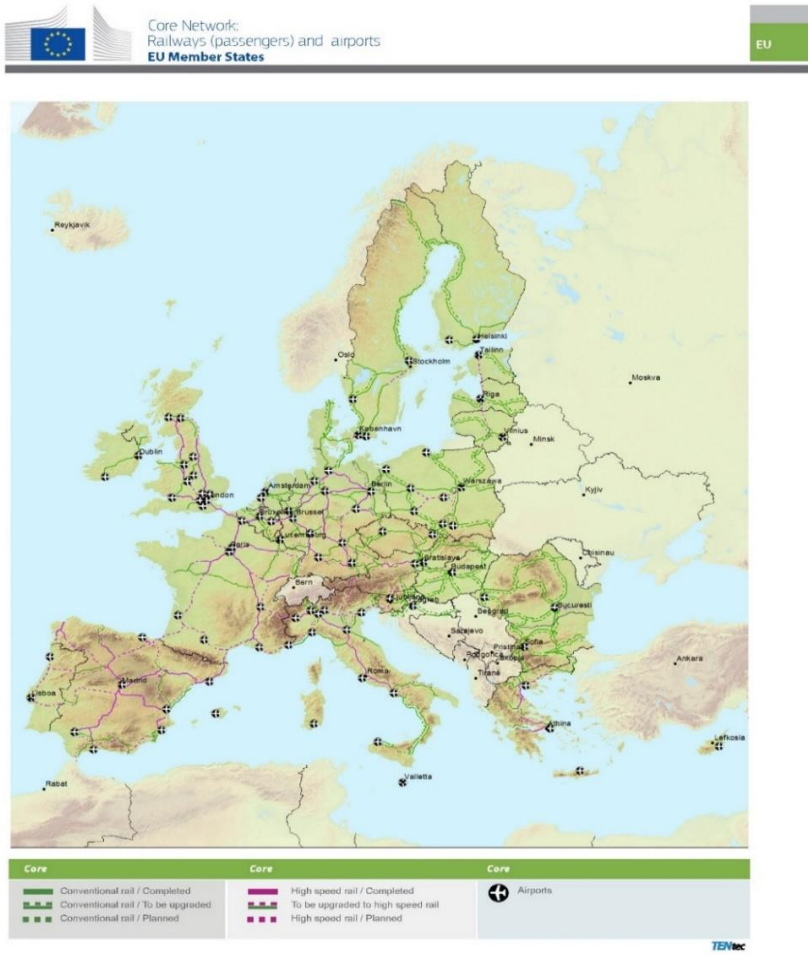
Pursuing these outcomes and specific objectives has been geared towards two key outputs of the initiative:

1. Two layers of the network structure

The dual layer TEN-T structure comprises the comprehensive and the core network which display strong functional interrelations. They result from a coherent and transparent methodological approach, enable a resource efficient infrastructure management, as well as the provision of seamless and sustainable transport services of high quality and user benefit.

While the core network is based on a more EU level approach based on major transport flows and key geographic criteria, the comprehensive network builds more a bottom up approach connecting national networks of the Member States. As such, both networks are complementary. In addition, the comprehensive network is the geographical basis for all related transport legislation (through its standards and requirements) and the reference base for EU funding from different sources.

Figure 1: TEN-T core network for passenger rail to be completed by 2030[23]




Source: Regulation (EU) 1315/2013

## 2. TEN-T Cooperation with neighbouring and third countries

Agreements with neighbouring and third countries have been signed in order to support cooperation, notably with a view to connecting the TEN-T with infrastructure networks of neighbouring countries. Amongst the main outputs in this area have been the indicative extension of the TEN-T maps to neighbouring regions through adoption of Commission Delegated Regulations (see chapter 1). Besides this adoption of indicative TEN-T maps, policy cooperation with different geographical areas of the world includes inter alia exchanges of experience and common analysis on subjects of mutual interest.

[23] The map illustrates – with the example of the passenger rail component – the TEN-T core network, to be completed by 2030. It gives an overview of the network sections (incl. connections to airports) which – when the Regulation was adopted were already completed and fully functional as well as of the sections which need to be upgraded or newly built.

**2.2. Expected impacts** (based on the 2011 Impact Assessment)

In order to address the problems identified in the 2011 Impact Assessment substantial changes were introduced to the 2013 TEN-T guidelines. The main impacts, which were expected to be generated from these changes (notably the genuine, dual layer network approach, coherent infrastructure standards and requirements including for smart, innovative and more efficient infrastructure management, core network corridors as an implementation tool) are the following:

**Expected impacts on the transport sector:** The changes were expected to lead to modal-shift towards the most sustainable modes of transport and to support a concentration of trans-national traffic and long-distance flows (freight and passengers) on major TEN-T axes as well as to enhance resource efficiency, both in infrastructure provision and use. Innovative information and management systems were expected to provide support for logistic functions, inter-modal integration and sustainable operation in order to establish competitive door-to-door transport chains in line with user needs. Increased multimodality and the introduction of the core network corridors was expected to contribute to a reduction in congestion.

**Expected impacts on the economy:** the new TEN-T approach was expected to further enhance the infrastructural basis for economic operators and citizens to benefit from the internal market and the free movement; to help stimulating balanced economic development in all regions of the Union; to contribute to the global competitiveness of the Union through enhanced connections with third countries and to stimulate economic development in innovative sectors. Overall: to contribute to economic growth, both during infrastructure construction and, in the long-term, through improved connectivity and efficiency of trade flows within Europe and with the rest of the world.

**Expected impact on economic, social and territorial cohesion:** The changes were expected to have positive impacts on connectivity and accessibility for all regions of the Union, including peripheral, outermost and insular regions – with benefits for territorial, economic and social cohesion within the Union. Notably the new network structure, ensuring complementarity between the core and comprehensive network layers, aimed at strengthening cohesion. In this context, the development of TEN-T was expected to overcome remaining differences in network structure and quality between States joining the Union before or after 2004 respectively.

**Expected social impacts:** the genuine network structure, including the introduction of coherent standards and enabling intelligent solutions, was expected to make a positive contribution to employment and jobs - not only in the short term through construction, but also long term through the enhanced efficiency of a real network. Furthermore, on the basis of the improved infrastructure policy, significant positive employment effects were expected in the transport sector overall, notably through the enabling of new service opportunities within and across all modes.

**Expected impacts on public health and safety:** positive impacts were mainly expected through a reduction in road accidents (through higher infrastructure safety standards), the implementation of intelligent transport systems as well as by modal shift.

**Expected impact on climate change:** Positive impacts were assumed to result especially from efficiency gains in the transport system overall brought by the new network structure, including its enhanced multi-modal basis and the promotion of sustainable

modes, as well as by a more coordinated approach to project implementation within this network; by the promotion of more sustainable modes of transport, the implementation of intelligent transport systems and the stimulation of technological innovation in transport and infrastructure development.

**Expected impact on air pollution:** Overall, the efficiency enhancements of the new TEN-T policy were expected to lead to reductions in greenhouse gas emissions (see above, impact on climate change) and of other air pollutants. Congestion reduction, as a benefit of the new network structure and the related efficiency gains, was expected to significantly contribute to this objective. Furthermore, the promotion of "greener" transport solutions, notably through the deployment of infrastructure enabling the use of renewable energy sources, was expected to strengthen this impact.

**Expected impacts on energy use:** These impacts were expected to be closely related to the impacts on climate change and air pollution, building on two pillars: efficiency gains and enabling cleaner vehicle technologies.

**Expected impact on noise emissions:** It was expected that positive impacts could be achieved - despite, an increase in transport activity - through the implementation of higher quality transport infrastructure, the promotion of more silent vehicles and to some extent through modal shift.

**Expected impacts on land use and biodiversity:** Transport projects may have negative effects on land use and biodiversity, resulting in particular from physical reduction of natural habitats, landscape fragmentation, migration barriers, collision of vehicles with animals, emissions of noise and air pollutants, changes to the water regime and others. However, the multi-modal core network / corridor approach, which is expected to lead to a concentration of traffic flows on major axes, was expected to contain these negative effects. Furthermore, at the level of individual projects, in any case the relevant EU legislation on environmental protection has to be complied with and, additionally, solutions which are generating positive environmental effects, are given increasing importance.

## 3. IMPLEMENTATION / STATE OF PLAY

**Description of the current situation** (progress between 2013 and 2020)

Since the entry into force of Regulation (EU) 1315/2013 on 21 December 2013, significant progress has been made by Member States and a wide range of other public and private actors (transport infrastructure managers, regional and local authorities, transport industry etc.) to implement projects of common interest which contribute to the gradual completion of the core and comprehensive networks.

As the short outline of TEN-T policy principles has shown, this trans-European network encompasses a broad scope of infrastructure fields. They range, for example, from the traditional railway infrastructure construction project to 'intelligent solutions' or to charging and refuelling infrastructure for low and zero emission mobility. The implementation efforts – both time- and budget wise – may vary significantly between the different project types.

A major cross-border construction project, usually, requires long preparatory times for intergovernmental agreements, budgetary decisions, permitting and procurement procedures, technical studies etc. and it is implemented in phases. For these kind of projects, the seven-year evaluation period at stake may have seen the deployment of enormous efforts (planning, permitting, construction) while there is no direct impact felt yet (no new sections on the network, no new user services) as preparation, construction or testing are still ongoing. The reporting of impacts – for example in terms of user benefits, modal shift and decarbonisation effects or economic development - remains therefore limited. Other project categories - of a shorter term nature - are implemented in large numbers and show more immediate effects.

In the following, the current status of the implementation of Regulation (EU) 1315/2013 shall be presented in two ways:

A. through a general overview of the progress and further prospects of TEN-T implementation, including the overall status of projects along the nine core network corridors and
B. through a specific demonstration of achievements or challenges in selected areas which illustrate the broad scope of TEN-T policy.

The information in this part essentially builds on the following sources: The work concerning the nine (geographical) core network corridors and the European Rail Traffic Management System (ERTMS) as a horizontal core network priority, which is facilitated by European Coordinators, designated by the European Commission (in agreement with the Member States concerned, and after consulting the European Parliament and the Council) and who are acting on its name and behalf[24]. This coordination instrument at EU level was introduced in the 2013 Regulation in order to streamline the implementation of the core network. Secondly, the information is based on sectoral work within the Commission, specifically in the fields of inland navigation[25] and 'Alternative Fuel

[24] see Regulation (EU) 1315/2013, Art 45(4)

Infrastructure'[26]. Lastly, the findings of the study on 'National Plans and Programmes in Member States' with a view to TEN-T development have been drawn upon (see Chapter 4 'data sources').

### A. General overview on the status and prospects of TEN-T implementation

*Member States' approaches to meeting TEN-T development objectives*

To enable the Commission to assess the status of network planning and implementation prospects for the TEN-T as a whole, Article 49(2) of Regulation (EU) 1315/2013 obliges Member States to inform the Commission about their national plans and programs, drawn up with a view to the development of the trans-European transport network.

Regulation (EU) 1315/2013 obliges Member States to fully implement their respective national sections of the network which - altogether - generate network benefits beyond the sum of gains at national level. From this perspective, as part of the TEN-T evaluation, a study was undertaken (see chapter 4 for details) which focused on two key questions:

- Are Member States (each of them individually) covering the corresponding TEN-T objectives, in their respective plans and programs, in a sufficient way?
- Are all major TEN sections / projects "secured", especially with regard to the 2030 completion target for the core network?

Concerning the first question, it can be concluded that existing national plans and programs on transport infrastructure development vary significantly between Member States. Differences relate to time horizons (from very short term to up to 12-year perspectives), nature (legally binding or non-binding, master-plan type or more project based approach) or reference to TEN-T objectives (identifiability of projects etc.). This diversity, which is related to traditional national approaches, makes it a challenge for the Commission to monitor planning and implementation of the network in a harmonized way. In spite of this diversity in formal terms, the study results show that, de facto, TEN-T policy objectives and corresponding commitments by Member States, are reasonably well addressed in national planning and programming approaches. The TENtec information system and the systematic stock taking in the framework of the technical analysis of the core network corridors has helped the Commission overseeing the situation. Nevertheless, some way of ensuring more coherence and strengthening commitment could enhance effectiveness in TEN-T implementation.

Member States' responses to the second question showed that, in spite of incoherence in the approaches to infrastructure planning and implementation, the key TEN-T policy milestone - the completion of the core network by 2030 - heads in the right direction: The analysis found that only between 5 and 10 major infrastructure construction projects are not covered in national plans. Between 40 and 50 projects out of the around 3000 projects of the project list face delays which may put at risk the achievement of the 2030 deadline, although most Member States concerned appear confident that they will be able to remedy this situation. Especially Cohesion States underline that their compliance with

[25] Work of an Expert Group assessing the needs of a Good Navigability Status

[26] Drawing on the implementation of Directive 2014/94/EU on Alternative Fuel Infrastructure as well as on the preparation of its revision

the deadline depends on the allocation of substantial contributions from the Cohesion Fund. A number of other projects - for justifiable reasons - are well underway but expected to be completed a few years after 2030. Even in case there are delays on certain sections, the investments and developments of the rest of the network remain useful as the development of infrastructure is a long-term activity and the benefits of such investments will be seen for very long time after finalisation.

Setting a common deadline for the achievement of the core network has proven to be very useful in mobilising authorities and infrastructure managers, giving also more reassurance that individual investments on the network will yield higher benefits through network effects of investments on other sections on the network.

Overall, this situation shows that the efforts made since 2013 to move from a fragmented project implementation approach towards a genuine Europe-wide network approach have been successful. The TEN-T has been a key framework for Member States to concentrate investment on. This alignment of national action with a common European objective can be seen as one of the principle achievements of this EU policy.

*The dual layer network approach*

Today the TEN-T network is based on a coherent EU-wide planning methodology that has been acknowledged by the MS. It consists of a dual layer network structure:

- The **comprehensive network** layer: The TEN-T Regulation (Chapter II) sets out a wide range of requirements, to be met by the infrastructure of the comprehensive network, so as to enable it to duly contribute to the above four specific objectives. Such requirements include, inter alia, binding rules on safety or interoperability, provisions on smart infrastructure equipment to generate telematics applications within and between all transport modes or infrastructural needs for the seamless integration of terminal infrastructure into the network.

- The **core network** layer: The core network must feature at least the same standards and requirements as the comprehensive network. In many cases, it is subject to higher standards and requirements – both in terms of quality and capacity needs. Given the high concentration of cross-border traffic flows on the core network, its contribution to the expected outcomes / the achievement of the specific objectives of the TEN-T Regulation is particularly high. Therefore, its completion is of particular priority for the EU, its Member States and other public and private stakeholders. This clearly justifies the binding target year 2030.

The overall status of TEN-T planning in Member States with regards to the coverage of TEN-T objectives and the completion deadline 2030 is described in chapter 3b. It is outlined there that TEN-T policy objectives and corresponding commitments by Member States, are reasonably well addressed in national planning and programming approaches and the completion of the core network by 2030 heads in the right direction (with only a small number of projects expected to miss this deadline see also point 4 below).

- *The comprehensive network*

The TEN-T bring together networks of all transport modes. The geographical scope of the three land transport modes is shown in the following overview table for the 27 EU Member States[27]:

Table 1: TEN-T network length by mode: comprehensive network

| | TEN-T Railway network | TEN-T Road network | TEN-T Inland waterway network |
|---|---|---|---|
| Length (km)[28]* | 113.000 | 106.600 | 15.700 |

* The respective modal network lengths, as adopted with Regulation (EU) 1315/2013, have been rounded up or off to hundred. The detailed network alignments are continuously monitored through the geographical information system TENtec, which is publicly accessible.

The 'comprehensive network' referred to in Table 1 includes, besides rail, road and inland waterway connections, also ports, airports and multi-modal transport infrastructure. It serves as the geographical reference for EU legislation and policy objectives in relevant fields of transport. Such legislation concerns, inter alia, railway policy (with interoperability as a key pillar of TEN-T policy, or with the integration of Rail Freight Corridors), inland navigation (with the taking over of standards agreed upon in international agreements) or road safety (with the integration of relevant EU legislation). Amongst the transport policy related requirements of TEN-T infrastructure are features to enhance multi-modal transport solutions (e.g. equipment and accessibility of nodes) as well as smart infrastructure equipment to facilitate efficient infrastructure use.

The particular importance of the 'comprehensive network' resides in its relatively dense structure as key basis for accessibility of all EU regions, in particular outermost regions recognised in article 349 TFEU[29], as well as other peripheral and insular regions Regulation (EU) 1315/2013 foresees its full completion by 2050.

The comprehensive network, through its geographical structure[30] as well as the set of infrastructure components, requirements and development priorities[31] provides the fundamental basis for the identification of '**projects of common interest**'. Any project, which aims at filling a missing network link or at reaching common TEN-T infrastructure

27 Network data excluding UK. To be noted, however, that in the backward-looking part of the evaluation (2013-2020), UK related aspects could not always be easily separated from the overall policy evaluation.

28 Basis: Annex 1 of Regulation (EU) 1315/2013

29 In its Communication 'A stronger and renewed strategic partnership with the EU's outermost regions' (COM(2017) 623 final), the Commission committed itself to "better meet the outermost regions accessibility needs and facilitate their participation in the Trans European Transport Network"; "; and to considering "how TEN-T policy, including the Motorways of the Sea Programme, can better meet the outermost regions' needs and take into account their geographic position"

30 Annex I of Regulation (EU) 1315/2013

31 Chapter II of Regulation (EU) 1315/2013

standards and requirements, is defined as a project of common interest[32]. Besides Member States, bearing the largest share of the responsibility, such projects may be identified, prepared, implemented and financed by any other relevant actor, depending on the projects' specific nature. While all projects of common interest have to comply with the requirements set out in the TEN-T Regulation, questions of detailed alignment, technical design, procedural approaches etc. belong to the respective national responsibility (subject to obedience to relevant EU legislation in fields such as interoperability, environmental protection etc.)

In order to ensure steady implementation of such projects of common interest, striving towards the completion of the common European transport infrastructure network by 2050, a combination and concentration of financial efforts is needed at various levels: public and private, European and national.

Projects of common interest may benefit from EU support under relevant EU financing instruments, notably the Connecting Europe Facility, the Cohesion Fund and the ERDF. The main responsibility for the implementation of TEN-T projects, however, has to be assumed by the Member States concerned and, as appropriate, other public and private actors.

- *The core network*

The TEN-T core network has been designed on the basis of the comprehensive network, i.e. it is a "selection" of comprehensive network infrastructure[33]. While the planning of the comprehensive network was significantly building on a bottom-up method, the core network results from a Europe-wide planning method which combines economic and territorial criteria. The core network emphasizes the TEN-T infrastructure of highest importance for major international transport flows and for a balanced interconnection of all EU regions. It links the major cities and transport nodes as economic centres and key transhipment hubs. The heavy concentration of EU-wide transport flows makes the core network both a critical factor for the interaction of infrastructure and transport policy and a possible showcase for its success. Therefore, in a number of cases, Regulation (EU) 1315/2013 sets higher quality and capacity requirements than for the comprehensive network, and it sets a much more ambitious completion target, namely 2030.

The following overview shows the scope of the core network in the 27 EU Member States[34], as adopted by Regulation (EU) 1315/2013, and it illustrates the extent of the upgrading and construction works needed for its full completion until 2030:

[32] The definition of a project of common interest, set out in Article 7 of Regulation (EU) 1315/2013, specifies further conditions for projects of common interest, notably their economic viability on the basis of socio-economic cost-benefit analysis and compliance with relevant Union and national law, in particular with Union legal acts on the environment, climate protection, safety, security, competition, state aid, public procurement, public health and accessibility.

[34] Network data for the network maps, as adopted with Regulation (EU) 1315/2013, excluding the UK. To be noted, however, that in the backward-looking part of the evaluation (2013-2020), UK related aspects could not always be easily separated from the overall policy evaluation.

Table 2: TEN-T core network length by mode and state of infrastructure

| | Total length (km)* | Existing infrastructure in line with core network standards and requirements | Existing infrastructure, to be upgraded to core network standards[35] or for capacity extension | 'Missing links' in core network |
|---|---|---|---|---|
| Rail | 63.100 | 32.800 | 22.000 | 8.300 |
| Roads | 47.800 | 33.700 | 10.800 | 2.300 |
| Inland Waterways | 15.800[36] | 14.000 | 900 | 900 |

*The respective modal infrastructure lengths, as adopted with Regulation (EU) 1315/2013, have been rounded up or off to hundred. The detailed network alignments are continuously monitored through the geographical information system TENtec, which is publicly accessible.

The necessary upgrading and new construction projects, including enhancements in transport nodes, represent a key challenge for the core network completion until 2030 – and thereby of TEN-T policy overall. The coordinated and timely completion of these projects entails genuine opportunities and generates substantial benefits beyond nationally-focused infrastructure policies. It sets the direction for public and private investment in infrastructure construction and upgrading along the TEN-T and contributes to an efficient use of financial resources. At the same time, it stimulates and channels innovative solutions which enhance the sustainable and efficient functioning of the core network as a whole. All this makes TEN-T policy vital as enabler of seamless cross-border-mobility and transport for private and public users.

Table 2 shows that there are differences in terms of reached compliances between the different transport modes. Indeed, there is far less non-compliant road infrastructure than rail or IWW infrastructure. This lies in the fact that a large part of the road core network was already existing upon the entry into force of the Regulation while this was less the case for rail and IWW. In addition, the standards required for road are far less ambitious than those for road.

*Core network corridors as the key instrument to stimulate and coordinate project implementation*

The revision of the TEN-T Regulation in 2013 introduced several instruments aimed at facilitating the implementation of the TEN-T as an integrated system. One of these tools are core network corridors (CNCs). The key objective of CNCs is to facilitate an efficient implementation of the core network, thereby concentrating in particular on a coordinated development of the TEN-T infrastructure (in particular cross-border sections and the removal of bottlenecks), the integration of transport modes as well as interoperability. In geographical terms, they cover nine corridors of a length between 3000 km (Rhine–Alpine) and more than 9000 km (Scandinavian–Mediterranean and Atlantic)[37]. In total, they represent between 70 and 80% of the core network overall. These corridors are complemented by two Horizontal Priorities, the European Railway Traffic Management

[35] Data are based on Member States' reporting, with the possibility of some incoherence in the assessment of the "compliance" status

[36] In the Inland Waterway sector, core and comprehensive networks are identical, i.e. all TEN-T inland waterway infrastructure must comply with the standards and requirements of the core network

[37] The length of rail infrastructure is referred to here; the length of road and inland waterways is mostly smaller

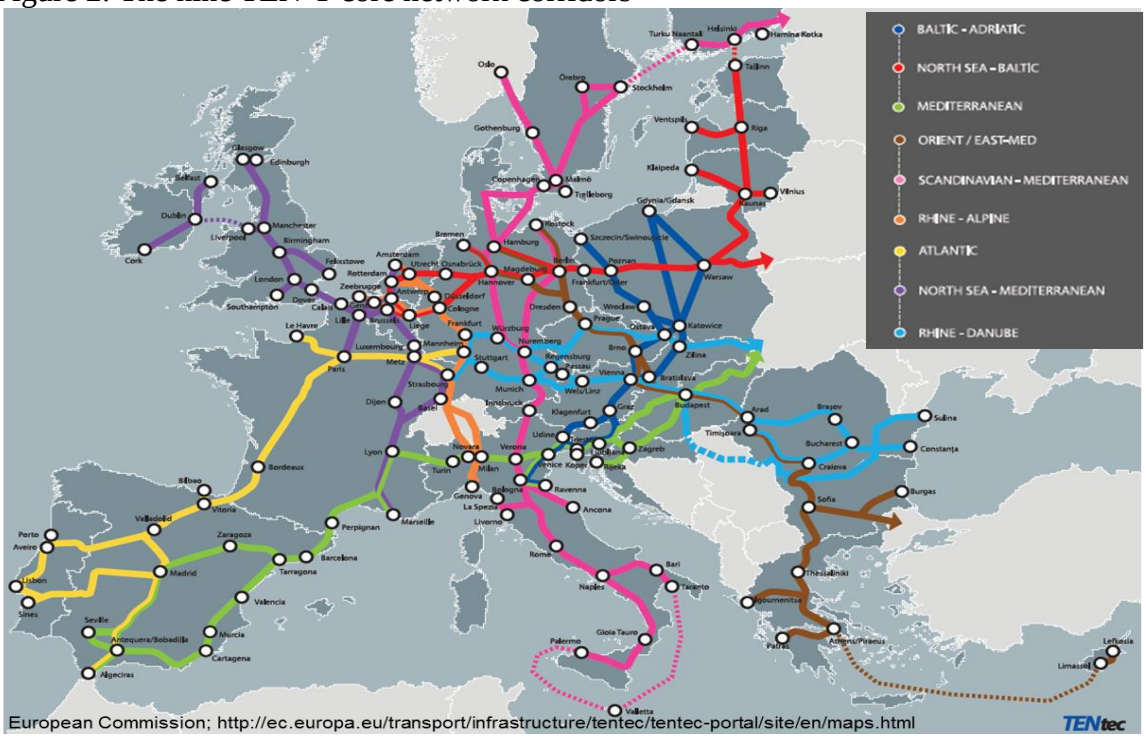
System (ERTMS) and the Motorways of the Sea concept (MoS) that support the network optimisation and which are both also supported by a respective European Coordinator. While MoS,[38] are introducing new intermodal maritime-based logistic chains, ERTMS deployment[39] is about introducing and enforcing a European wide rail traffic management, safety and signalling system.

Since each of the geographical CNCs represents an "extract" of the core network – with all its transport modes, nodes as well as standards and other requirements – coordination needs are enormous. They reach from efforts to harmonising investment in key projects to stimulating soft initiatives; from ensuring the smooth interconnection of transport modes for effective multi-modality to the corridor-wide implementation of coherent infrastructure standards. This requires strong lead by the European Coordinator respectively concerned (see chapter 4 for details); it depends on active involvement of a wide range of stakeholders directly concerned by the challenges at stake; it calls for comprehensive technical analysis to underpin decisions, which is ensured by the Commission with the help of external expertise.

The nine CNC (see figure 2 below) follow the most important long-distance transport flows along the core network. Integrating rail, road and (where available) inland waterway axes and connecting the major urban centres and transport nodes (ports, airports, terminals), they offer unique opportunities to enhance resource-efficient functionality and to advance sustainable transport solutions. This approach, aiming to optimise the functioning of the corridor for the benefit of major long-distance transport flows within the EU and beyond, allows to concentrate investment (public and private, including from EU sources) and to set priorities from a cross-national perspective. In work plans, published about every two years and approved by the Member States concerned, each European Coordinator takes stock of developments and defines action towards the respective corridor objectives until 2030. Since 2013, there have been rounds of exchanges with the TRAN Committee of the European Parliament on four work plan editions. Members of the European Parliament show strong interest in this process and support it in various ways.

[38] https://ec.europa.eu/transport/modes/maritime/motorways_sea_en
[39] https://ec.europa.eu/transport/modes/rail/ertms_en

Figure 2: The nine TEN-T core network corridors




Source: DG MOVE/TENtec

The CNC instrument has been implemented since the entry into force of Regulation (EU) 1315/2013 (see also chapter 5). Notably rail and inland waterway projects have been in the centre of the promotional efforts – both in terms of coordination and financial support. Financial support has been, in the first instance, provided from the Connecting Europe Facility and the Cohesion Fund. Especially in countries eligible for Cohesion Fund support, corridor work has also helped filling major gaps on the road network. Particular emphasis of Coordinators' work has been placed on key cross-border projects of the core network – such as the Lyon-Torino or Brenner base tunnel projects, the Fehmarn Belt fixed link, the Rail Baltica or the Seine – Scheldt inland waterway project. Today, there is confidence that all these projects will be completed until 2030. Such a positive prospect would have been unthinkable without the steady efforts of the European Coordinators concerned.

Although somewhat less in the limelight, European Coordinators have also been very successful in ensuring smooth connections between land transport and maritime and aviation infrastructure. The interconnection of maritime ports with rail, inland waterway and road links of the corridors, in particular, has been vital for their efficient overall functioning. Infrastructure quality enhancements in the transport nodes, such as maritime ports have also been in the focus of Coordinators' work. This has included infrastructure and equipment enabling smooth multi-modal operations, but also pilot action on alternative fuel infrastructure to contribute to cleaner transport solutions.

Last but not least: An efficient and sustainable functioning of core network corridors is only possible when due attention is paid to urban nodes along these corridors. They are origin, destination or transit sites for most freight or passenger movements on the core network. In this respect, corridor work has included efforts to enhance TEN-T transit infrastructure in major cities. This contributed to reducing congestion, which has negative effects on both urban mobility and the corridor. Another key issue of corridor

work in urban nodes relates to the inter-connection of TEN-T nodes, such as airports and rail stations or ports and the rail network. Finally, passenger hubs – such as major TEN-T railway stations – have been enhanced to facilitate transfer functions between long-distance and local or regional transport. Such last mile connections are key – both from a quality and a sustainability perspective: The most modern high-speed railway line will give away benefits when not smoothly connected with the users' final destination.

The latest version of the corridor work plans[40] consolidate the progress made with the development of the nine corridors since 2013. The work plans themselves and the analytical work underlying them show that a total of around 1200 projects have been completed along these corridors since 2013. They represent an overall investment of around 110 billion Euro[41]. In this context, it should be taken into account that 'projects' are defined from the perspective of organizational and procedural aspects in the Member State(s) concerned. This implies that a missing link on the TEN-T may be broken down in several such projects, and that the listing also includes a wide range of upgrading and quality enhancing projects of different type and size. Furthermore, it has to be kept in mind that – given the long-term nature of TEN-T policy – the cost of the completed projects cannot be directly attributed to the 2013–2020 period as implementation of part of the projects started before 2013. On the other hand, the cost overview neglects that fact that preparation on works are ongoing for other projects.

Looking towards the 2030 horizon, the work plans and the studies underpinning them show that around 3000 projects remain to be completed along the core network corridors. European Coordinators are making continuous efforts to facilitate this work. In the majority of the cases, they assess that the prospect for reaching the objectives are sound. Some specific problems (including delays for administrative or financial reasons) call for reinforced efforts.

*Infrastructure upgrading to reach common standards as a key part of corridor work*

The quality enhancement of TEN-T infrastructure to reach the standards and requirements set out in the TEN-T Regulation is a major challenge towards the full completion of the core network until 2030. The status of the compliance of the TEN-T infrastructure with such requirements has been assessed in the technical analysis supporting the core network corridor activities. Its results are published in the work plans of the European Coordinators and have been summarized in the latest Progress Report on TEN-T Implementation[42]. Figure 3 gives an overview of this status (reporting date: end of 2017) for 13 important requirements. It has to be taken into consideration that this overview is not directly related to implementation activities during the evaluation period. It reflects the overall status of the infrastructure of the TEN-T as it was adopted with Regulation (EU) 1315/2013. Large parts of this network were already existing; featuring the required quality levels at the time of the adoption of this Regulation (to a significant extent through TEN-T action under previous versions of the TEN-T Guidelines). The overview, concerning the nine core network corridors, shows that:

40 https://ec.europa.eu/transport/themes/infrastructure/ten-t_en

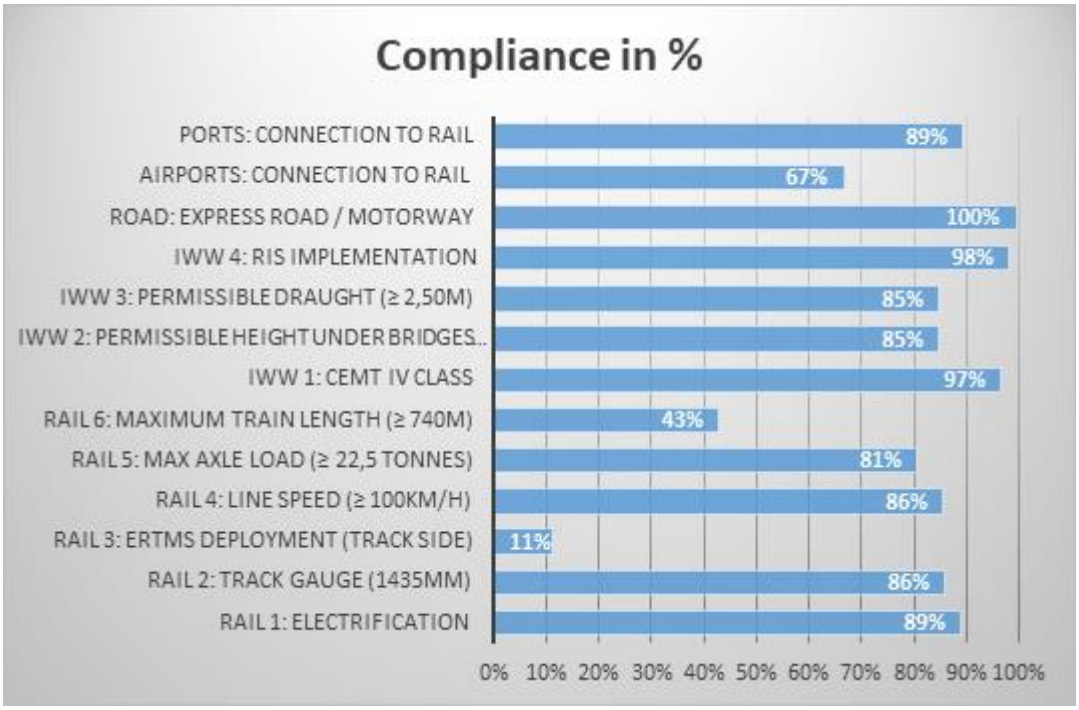
41 Source: Corridor studies and their related project lists.

42 Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions - Progress report on implementation of the TEN-T network in 2016-2017; COM(2020) 433 final, of 26.8.2020

For **rail**, the situation regarding binding infrastructure standards which are essential for the provision of continuous services along TEN-T corridors, is largely positive. This concerns especially electrification, the minimum line speed of 100 km/h and the minimum axle load of 22,5 tons for freight lines as well as the nominal European track gauge of 1435 mm (between 86 and 100% compliance rate). A significant challenge remains the improvement of infrastructure to enable the operation of freight trains with at least 740 m length – a key requirement to enhance the capacity for rail freight and thereby the potential for modal shift. Even more problematic is the situation regarding the track side deployment of the European Rail Traffic management System (ERTMS) – a key condition for interoperability and the enhancement of safety and more efficient capacity use.

For the TEN-T core network infrastructure in the **inland waterway** sector, 85% of the infrastructure meets the requirements of a minimum draught of 2.5 m and of a minimum height of 5.25 m under bridges. One of the major challenges for the future will be to ensure good navigability conditions on free flowing rivers, also because of increasingly frequent periods of extreme weather events. The high coverage of inland waterways with the European River Information Services (RIS) may contribute to address this problem, and in particular it improves safety, quality and efficiency of inland navigation.

Figure 3: Compliance Status 2017 of main TEN-T requirements on the core network corridors[43]




Source: Progress Report on TEN-T implementation 2016-2017

[43] The detailed evaluation of the compliance with standards per transport mode and per country and/or corridor can be found in the TEN-T implementation reports, in the corridor studies as well as on the TENtec database.

For **road infrastructure**, the TEN-T Regulation requires express road or motorway standard, which is achieved to 100%. Besides this requirement of a rather structural nature, the Regulation includes some specific quality related standards and requirements, such as compliance with EU legislation on road safety. It also requires equipment with safe and secure parking areas, traffic management (intelligent transport systems) as well as alternative fuel infrastructure. The status regarding safety standards will be assessed separately in this chapter.

Concerning the infrastructural conditions to enhance **multi-modal transport**, a positive situation has been reached already with regard to the interconnection of ports to rail (89%). Nevertheless, in the light of the unprecedented challenges of decarbonisation, efforts may need to be accelerated – also in the framework of a reviewed approach to the maritime dimension of TEN-T policy, which aims at a reinforced integration of shipping routes, ports and land corridors. Concerning the interconnection of airports with rail, the situation is less advanced at this stage. An area which clearly calls for more attention is the integration of airports in freight transport chains – a need which has also become particularly evident in the Covid-19 situation.

## B. Selected areas illustrating specific challenges

*The filling of missing links*

While many of the major infrastructure projects of the TEN-T underwent long periods of decision making and preparation without having got ready for use at the time of this evaluation, for others the long-lasting efforts have yielded results recently. An example is the high speed railway line between Berlin and Munich, which is part of the Scandinavian - Mediterranean Corridor. The project was conceived after the German reunification as one of the "German unity transport projects[44]". The € 10bn project was approved as early as in 1991 and includes the upgrade and new construction of railway lines between the two cities. First parts where inaugurated already in 2003 and the complete line was put in operation in December 2017.

The project is cutting travel times between Munich and Berlin by more than 2 hours (from 6h to under 4h) making rail a viable alternative to air travel. Within one year of its operation rail passenger numbers between Berlin and Munich doubled making rail the dominant mode on the relation with a modal share of 46% (air 30%, car 24%) and saving a considerable amount of CO2. Significant contributions from the TEN-T funding programme and CEF have been made with co-funding rates of up to 20% for works on certain sections of the line since the mid-nineties. In summary this project shows on the one hand the complexity and time intensity of such major transport projects and on the other hand it showcases the concrete impact of EU and national investments into TEN-T and the direct benefits for citizens and the environment.

*Implementing the European Rail Traffic Management System (ERTMS)*

The overview in figure 3 above shows the extent of the efforts still needed to achieve the 2030 target in specific areas (only 11% compliance rate in 2017). In the light of this seemingly pessimistic status, however, the European Coordinator for ERTMS has set up work plan, which justifies confidence in the achievement of full ERTMS deployment by 2030, in line with the obligation enshrined in the TEN-T Regulation.

ERTMS is a key pillar of the "intelligent" components of the TEN-T infrastructure. It is a communicating system which includes elements for the equipment of tracks and of rolling stock. Its key benefits include:

Table 4: Key ERTMS benefits

| Objective | Specific benefits |
|---|---|
| Contributing to interoperability of railway transport along the TEN-T, as an objective enshrined in the TFEU and in relevant Technical Specifications on Interoperability[45] | Enabling full and TEN-T-wide provision of seamless cross-border railway services; strengthening competitiveness of rail as a sustainable transport mode; stimulating competitiveness of EU industry in the supply sector |
| Increasing capacity of the rail system | ERTMS allows the reduction of minimum distances or times between trains, leading to capacity gains of up to 30%. |

[44] Verkehrsprojekte Deutsche Einheit – VDEare

[45] TSI adopted pursuant to Article 6 of Directive 2008/57/EC of the European Parliament and of the Council of 17 June 2008 on the interoperability of the rail system within the Community

| | |
|---|---|
| Higher performance | Reduced likelihood of failure; enhanced reliability of the system and punctuality of services |
| Safety increase | Increased overall protection level compared to the majority of national protection systems, thanks to continuous supervision of the speed of train |

While first discussions on the development of ERTMS started as early as 40 years ago, progress has been steady in an area where national systems have long-standing tradition and transition costs are high. In the 1990s and the first years of the new millennium, Europe spent significant efforts in Research and Development to make this system ready for deployment (Between 2007 and 2013, deployment was stimulated with EU Funds 1.2 billion Euro from TEN-T and Cohesion Fund together).

ERTMS has become a big success story outside Europe already, with 51.000 km of lines being equipped on the trackside and 5180 vehicles being in operation or having been contracted as of 2020. Within the EU since the entry into force of Regulation (EU) 1315/2013, more 5000 km of TEN-T tracks have been equipped with ERTMS along the nine core network corridors.

The TEN-T Regulation stipulates full ERTMS deployment for the core network by 2030, and for the comprehensive network by 2050. In 2017, the European Commission adopted an ERTMS Deployment Plan which set deadlines for some sections of the core network corridors for the period 2017 – 2023.

The measures to implement this plan included the attribution of new powers to the European Railway Agency, concerning the fields of trackside approval and vehicle authorization. Furthermore, as regards funding, 2.7 billion Euro (grants from the Connecting Europe Facility and the Cohesion Fund) were allocated to ERTMS between 2014 and 2020 which represents an increase of 125% compared to the previous funding period. This has been complemented by the introduction of innovative financing mechanisms (in 2017), which attracted notably projects for on-board equipment.

Building on these plans and their implementation, the new European Coordinator, Matthias Ruete, was in a position to summarize in his work plan published in June 2020[46], past progress and future objectives with regard to ERTMS equipment of the nine core network corridors as follows:

Table 5: ERTMS deployment on the core network corridors

| | 12/2016 | 12/2017 | 12/2018 | 12/2019 | 05/2020 | 2023 (planned ) | 2030 (planned |
|---|---|---|---|---|---|---|---|
| ERTMS in operation | 7 % | 9 % | 10 % | 11% | 12% | 31% | 97% |

Source: First work plan of the European Coordinator for ERTMS

It shows that considerable efforts still need to be undertaken to reach compliance with the ERTMS requirements. To meet such challenges, the European Coordinator for ERTMS already made considerable efforts that ERTMS is finally widely accepted by Member States, rail infrastructure managers and rail operators. In addition, detailed milestones

[46] https://ec.europa.eu/transport/sites/transport/files/work_plan_ertms_2020.pdf

and objectives are laid down in the work plan of the European Coordinator which have been agreed upon with Member States. Overall, the work plan underlines that the achievement of this objective is vital for the transport sector overall to meet its zero and low emission objectives, as laid down in the European Green Deal, and – not least – to make a significant contribution to the digital transition in transport. At the same time, the Coordinator calls for reinforcement of the TEN-T Regulation to ensure achievement of the 2030 objective. This should notably address a reinforced focus on existing gaps and full implementation of highest track side standards as well as the appropriate encouragement of relevant on-board equipment of rolling stock.

*Inland Waterways in TEN-T*

The TEN-T inland waterway network consists to a large extent of free flowing rivers and to a smaller extent of canals. For inland waterway transport, coherent infrastructure standards are a key condition for smooth transport operations which cross to a large extent national borders. Besides rail, well performing inland waterways are vital for the shift of long-distance freight transport to sustainable modes.

However, in spite of the fact that 85% of the TEN-T inland waterway infrastructure (including locks, bridges etc.) meets key requirements of Regulation (EU) 1315/2013 (including through implementation efforts before 2013), performance of inland navigation does not achieve its full potential, notably for the following reason: The current parameters for Inland Waterway Infrastructure (see above, table 3) do not guarantee coherent performance for all waterway stretches, as waterways in Europe are characterised by a heterogeneous hydro-morphology. This suggests that "navigability" could be more appropriate as a TEN-T parameter in order to enable the provision of good continuous navigation services along waterways.

An Expert Group set up by the Commission assesses needs for an adjusted approach. It addresses both a more mode-specific solution on infrastructure and its complementing with "navigability" requirements. Especially the long draught period in 2018 led to a sharp drop in inland waterway transport on all major TEN-T inland waterways. This calls for a more tailored solution beyond fixed and uniform inland waterway standards.

Infrastructure requirements such as the depth of the navigable channel and the clearance under bridges, which refer to reference water levels, may require more flexibility. Increasing attention may also need to be given to locks and movable bridge availability. The level of flexibility related to Good Navigation Status can be matched with coherent performance through the definition of a non-deterioration and protection principles for navigable channel depth, bridge height and lock availability, the full use of River Information Services or an adequate density of inland ports in order to ensure that target values are not falling below the values implemented today by Member States but help to shift more freight transport to inland waterways.

*Enhancing road safety*

Regulation (EU) 1315/2013 integrated relevant legislation, setting binding standards for the safety of the TEN-T Road Network. This included:

- The Road Infrastructure Safety Management (RISM) Directive[47] which sets requirements for audits (of new roads), inspections and hot spot identification (of existing roads). The 2019 revision of this Directive[48] extended these provisions, having proven to be very successful on the TEN-T, to other major EU roads. For TEN-T roads, it brought an additional quality requirement, namely the obligation for Member States to carry out network-wide safety risk assessments which must feed into a prioritised action plan. This enhanced TEN-T standard, related to the revised RISM Directive, is expected to save 3 200 lives and prevent 20 700 serious injuries by 2030.
- The Tunnel Safety Directive[49] which sets minimum safety requirements for road tunnels on the TEN-T and clarifies the organisation of safety management and operating procedures for tunnels. As these provisions were introduced in response to a number of serious crashes in major EU road tunnels in recent decades, it can be assumed that the new binding standards have helped avoiding accidents.

Overall, TEN-T policy has triggered substantial investment in the safety of road infrastructure (refurbishment, safety upgrading of existing roads etc.) and – not least – the filling of missing links, leading to significant safety enhancements especially in newer Member States. Support from EU sources, including from the Cohesion Fund and EIB loans, has been important in this respect. Road safety related TEN-T action has clearly helped to reduce road fatalities and serious injuries. It contributed to the 43% decrease of road death in Europe between 2010 and 2019, in spite of increasing mobility. However, 22,800 people still lost their lives on EU roads in 2019 and about 135,000 were seriously injured. To achieve the EU's ambitious "Vision Zero" objectives by 2050, measures in the TEN-T need to be further significantly reinforced. The digital transition, one of the key pillars to be reinforced in the future TEN-T policy, may significantly contribute to this objective.

*Promoting charging and refuelling infrastructure for zero and low emission mobility*

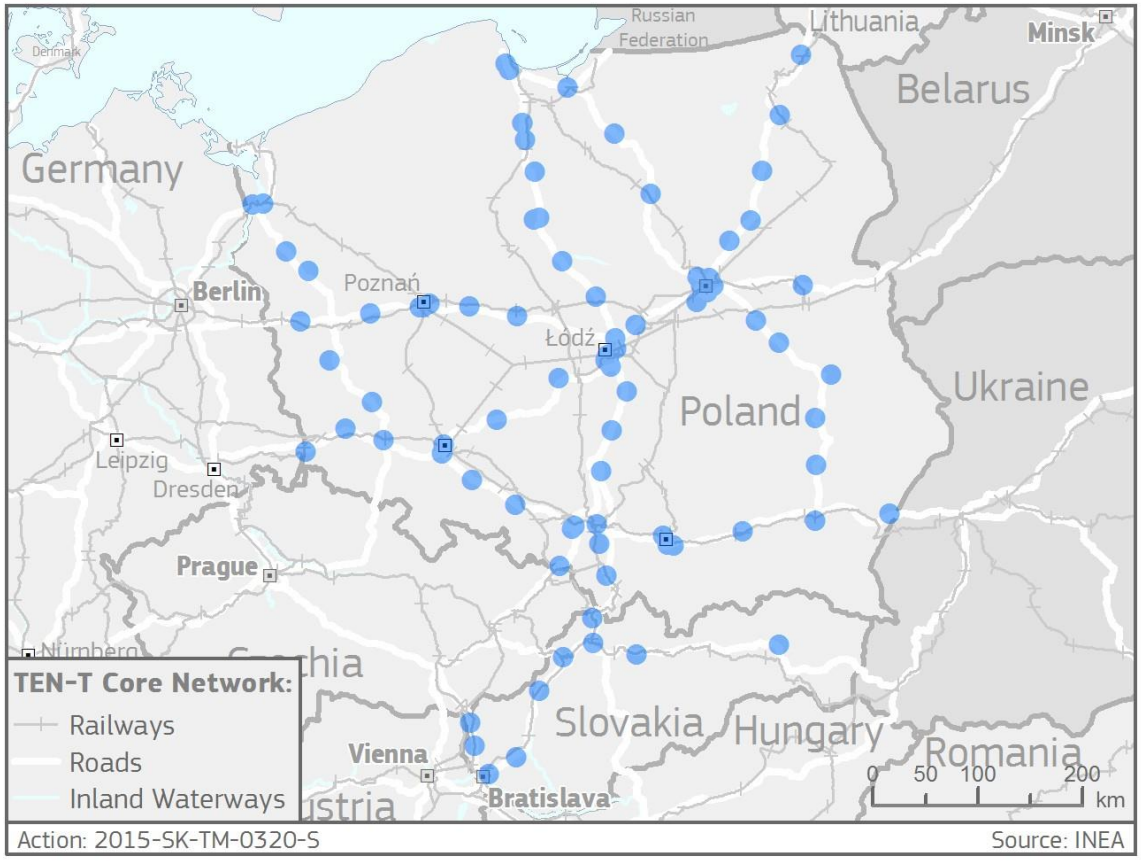
Regulation (EU) 1315/2013 includes the objective of promoting low carbon transport. As one important measure to help achieving this objective, it stipulates the provision of infrastructure to facilitate the energy supply for alternative propulsion systems. These provisions address notably electricity supply systems for road transport as well as Liquid Natural Gas (LNG), inter alia in the maritime sector. An EU Directive concerning the deployment of alternative fuel infrastructure – with a close connection to the TEN-T infrastructure – was adopted 10 months after the entry into force of the TEN-T Regulation (AFID)[50]. This Directive sets certain requirements for the equipment of TEN-T infrastructure, which had to be reflected in relevant National Policy Frameworks.

47 Directive 2008/96/EC
48 Directive (EU) 2019/1936
49 Directive 2004/54/EC
50 Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure

The provisions of the TEN-T Regulation, aiming to stimulate and facilitate developments in this area, allowed – for the first time in TEN-T policy – for EU funding of relevant projects under the Connecting Europe Facility. This resulted in a considerable number of projects - both on e-mobility and alternative fuel solutions – having been supported since 2014. In the e-mobility sector, for example, the following pilot actions mobilized actors across national borders and helped paving the way for a clean mobility future:

- A study on a pilot deployment of 29 multi-standard fast chargers along the TEN-T corridors in Slovakia and the Czech Republic, gathering data about market needs, the planning of charger networks and the link with ICT solutions (aiming at an Electric Vehicle Rollout Masterplan for the two States); a study and pilot deployment of 38 fast charging stations along TEN-T corridors in Belgium, France, Italy and the United Kingdom (focusing on issues of interoperability in an EU-wide non-proprietary open standard system as well as on EU-wide business readiness).
- Pilot deployment of 85 multi-standard fast charging stations along TEN-T corridors in Poland and Slovakia, addressing the issue of battery storage to cover peak demand, interoperability in terms of roaming and customer service management and business models (see figure 4 below).
- A study and pilot deployment of 221 multi-standard fast charging stations along TEN-T corridors in Germany in Belgium to stimulate an increased coverage of chargers in these States, in view of future roll-out; including the development of an open source ICT-platform across the entire electric vehicles' value chain to facilitate integrated end-to-end services, available to all market participants.

Figure 4: Promotion of re-charging infrastructure for e-mobility in Eastern Europe




Overall, these actions mirror the advancement of electro-mobility charging infrastructure along the TEN-T during the period 2014 – 2020 through pilot action, towards the preparation for mass markets. Under point 5, more details are provided on the effectiveness of TEN-T action during the evaluation period in terms of broad scale deployment.

This development, however, has now reached a point where further progress towards the ambitious EU commitments for zero and low emission mobility is hampered by the lack of binding standards for charging and refuelling infrastructure for all modes along the TEN-T. Standards, aligned with the ongoing revision of the Alternative Fuel Infrastructure Directive as well as the FuelEU Maritime and the ReFuelEU Aviation initiatives, are expected to strengthen cross-border continuity and to facilitate and accelerate coherent implementation, facilitated by the European Coordinators.

## 4. METHOD

### Short description of methodology and data sources

The evaluation of Regulation (EU) 1315/2013 on Union Guidelines for the development of the trans-European transport network started in September 2018 with the publication of the evaluation Roadmap. An Inter-service steering group accompanied and oversaw the exercise (details in Annex 1). The evaluation builds in particular on the Support study for the TEN-T evaluation by Coffey consultants[51], on the support study for the TEN-T policy review, by Panteia[52] and experiences in implementing Regulation (EU) 1315/2013 notably the work carried out in the framework of the core network corridors since 2013. A standard triangulation approach was applied to address the evaluation questions, through different angles: desk research, interviews and surveys.

*Baseline:* The aim for developing the baseline scenario is to assess what would happen in the medium (2030) and long-term (2050) if the TEN-T core and comprehensive network did not develop. The starting point for developing the baseline scenario has been the baseline scenario underpinning the Impact Assessment accompanying the revision of the TEN-T Regulation[53]. Building on this scenario, the macro-economic and technological assumptions have been updated in line with those used for the modelling underpinning the strategic long-term vision for a prosperous, modern, competitive and climate-neutral economy by 2050 (LTS/Clean Planet for All communication). In addition, policy measures adopted by the end of 2019 have been considered in the baseline scenario, except for the implementation of the TEN-T regulation. In addition, a counter-factual scenario has been developed that assumes the completion of the TEN-T core and comprehensive network. By comparing the two scenarios, this shows the impacts of the revised TEN-T regulation.

**1. Evaluation support study**[54]

The main evaluation study was launched in April 2019 and builds on two pillars: Desk research as well as open and targeted stakeholder consultations.

**Desk research:** an in-depth desk-based review of existing literature and data (global desk research) relevant to the evaluation topics was carried out collecting and analysing data from:

- Legal documents, including relevant Directives, Regulations, Delegated Regulations and legislative proposals;
- Studies, documents, work programmes, reports, evaluations and impact assessments linked to TEN-T policy and funding;
- Existing data/statistics available at national and EU level;
- Additional sources retrieved through the exploratory interviews and an initial mapping exercise.

[51] Support study for the evaluation of Regulation (EU) 1315/2013 on Union Guidelines for the development of the trans-European transport network.

[52] Support study for the TEN-T policy review, concerning relevant national plans and programmes in member states.

[53] SEC(2011) 1212 final

[54] Not yet published

**Open Public Consultation:** the Commission as the first step of the formal revision process between the 24th of April and the 17th of July 2019 carried out an Open Public consultation. The questionnaire was available in all official EU languages. This consultation generated more than 600 responses from a wide range of stakeholders, including public authorities (from international to local), infrastructure managers, commercial transport users, civil society and citizens. Importantly, more than 150 stakeholders - including a number of Member States and key European Associations - used this initial step already to submit position papers highlighting strengths and weaknesses of the policy and – notably – its future opportunities and needs. The OPC results were analysed in detail by Coffey consult and fed into the overall evaluation process.

**Targeted stakeholder consultations:** the approach to consult expert stakeholders designed by the consultant consisted of three main elements: online surveys, interviews and case studies on issues of specific importance. The aim of the targeted consultations was to collect data from specific stakeholder groups at local, national and EU level.

It has to be underlined that this evaluation report presents the stakeholder views at an aggregate level. Generally, stakeholder views showed a very coherent perception of views and no noteworthy distinction could be found between different stakeholder groups, unless otherwise specified in this report.

*Online surveys:* A survey questionnaire (global survey) was designed on the basis of the revised evaluation questions matrix and preliminary findings from the tasks carried out as part of the inception phase. It has been implemented between 20 January and 16 March 2020 in order to collect data on stakeholders' perceptions of and experiences with the TEN-T Regulation, its implementation and outcomes to date, and their views on recommendations for future EU policy developments in this area. Overall, more than 2000 stakeholders with expertise in the subjects at stake have been contacted for online surveys. In total 198 valid responses were received. Part of the stakeholders had used the OPC phase already for elaborate and consolidated contributions (e.g. European Associations having sought common positions amongst their members in targeted conferences.) In other areas (e.g. commercial infrastructure users), the involvement through more specific questions triggered significant response rates at the stage of the targeted consultation.

*Interviews:* In total 44 stakeholders have been interviewed (global interviews) with cross-sections of respondents to the survey and representatives of relevant stakeholder groups. A discussion guide for the interviews has been tailored to the stakeholders interviewed. The main aim of these semi-structured interviews was to gain in-depth insights into the implementation of the TEN-T Regulation, progress achieved and success factors/challenges from the perspective of different stakeholders. The global interviews complemented the desk research, open public consultation and global survey to explain the quantitative data obtained and fill in any gaps, support the thematic case studies, and elaborate on key issues where data from other sources were unclear or needed further explanation. Specific interview guide modules and samples have been developed for each case study.

*Case studies:* In addition to the general evaluation of the TEN-T Regulation the contractor has designed and implemented **nine thematic case studies** on selected TEN-T policy areas (for details see Annex 2). They were undertaken in areas in which the Commission's work during the implementation phase of the TEN-T Regulation has produced evidence that there might be a lack of relevance, both in light of developments over the last years and of foreseeable future developments. Each case study has been tailored to address specific evaluation questions and issues, which were further reviewed and updated during the inception and interim phases. The approach to each case study included a combination of desk review of secondary sources, specific survey modules, in-depth interviews and discussions with relevant stakeholders (which complemented the global interviews and global survey carried out as part of the consultation). Three online workshops with stakeholders comprising EU officials, transport stakeholders and social partners have been developed and implemented to validate the findings, and to discuss conclusions and recommendations of case studies 1 (urban), 6 (digitalisation) and 7 (innovation and new technologies). The format and content of the workshops follow an introductory webinar, consultation via an online bulletin board, and a wrap-up session to consolidate the feedback received.

*Representative examples:* In the light of the complexity of the policy, representative examples have been chosen at several instances in the report to illustrate the implementation state of play to date. Those representative examples can be seen as an illustrative evidence of the effectiveness of the Regulation.

The large consultation programme involving all relevant stakeholders provides for a robust and cross-checked evidence base for this evaluation.

## 2. Core network corridor process

As laid out in chapter 3 above, Article 45 of the TEN-T Regulation states that in order to facilitate the coordinated implementation of core network corridors, ERTMS and motorways of the sea, the Commission shall, in agreement with the Member States concerned, and after consulting the European Parliament and the Council, designate European Coordinators.

The work of the Coordinators and the corridor process have allowed the Commission to gain a very detailed overview of the status of TEN-T implementation along the core network corridors and has given stakeholders the possibility to be directly engaged in this process. It has brought authorities and stakeholders from different Member States together who were not necessarily or sufficiently exchanging about the developments in their network. In addition, the Corridor Forum meetings have gathered representatives of different transport modes around one table to discuss about the respective needs and challenges.

Since 2013, the European Coordinators have drawn up four iterations of corridor work plans[55] (based on Art. 47) for each corridor as well as detailed implementation plans for ERTMS[56] and MoS[57] giving an overview of corridor development, identifying gaps and bottlenecks and setting the priorities for the future. The Corridor Work Plans are unique

[55] https://ec.europa.eu/transport/themes/infrastructure/downloads_en
[56] https://ec.europa.eu/transport/sites/transport/files/work_plan_ertms_2020.pdf
[57] https://ec.europa.eu/transport/sites/transport/files/2020-mos-dip.pdf

instruments in that they provide transparency on the situation on the corridors, the projects which are ongoing and planned, and even the need to foresee further projects in order to achieve compliance with the standards. The work plans are informed by an in-depth analysis of external consultants that maps the advancement of the corridors according to the TEN-T parameters.

Stakeholders have been involved all along the way especially via the corridor fora (based on Art. 46) that bring together representatives of member states, regions, ports, airports, road/rail infrastructure managers, terminal operators etc. In total, 15 such meetings have been held so far. In addition, Coordinators have set up dedicated working groups looking more in detail into specific issues along their corridors (urban nodes, ports, airports, roads, railways, maritime, cross-border cooperation etc.).

Beyond the work in the Corridor Forum and the working groups, the Coordinators have been instrumental in engaging with stakeholders and national decision makers (meetings with ministers, site visits, seminars etc.). Their work has already led to the adoption of three implementing decisions on crucial cross border projects (see efficiency section). Finally, the Coordinators regularly hold seminars between themselves and DG MOVE to exchange on best practices along their respective corridors and to provide policy input to the DG.

### 3. TENtec

TENtec is the database for the monitoring of infrastructure development on the TEN-T network. It shows for instance the compliance of the network for a high number of indicators. The latest data introduced in this system is however from 2017/2018. TENtec is the main source for the corridor work plans and the TEN-T implementation report which have been widely used in this evaluation.

### 4. In-house activities and working groups

Numerous activities across the modes of transport that have been and currently are ongoing within DG MOVE, have a direct Impact on TEN-T and consequently have fuelled this evaluation exercise. This is for example, the work with regards to alternative fuels where an impact assessment is currently ongoing or the work on the Rail Freight Corridors, the ITS Directive and on urban mobility currently being evaluated as well as the work on Road Safety with two new initiatives recently adopted. Furthermore the evaluation has been drawing on the work of various modal working groups such as the Digital Inland Navigation Area – DINA expert group, the Digital Transport and Logistics Forum – DTLF or the NAIADES sub-group on Good Navigation Status – GNS sub group. Different reports of the European Court of Auditors have equally been taken into account in the evaluation this concerns in particular: the 2016 report on maritime transport[58], the 2018 report on a European high-speed rail network[59], the 2020 report on EU transport infrastructures[60] and the 2020 report on the EU road network[61].

[58] https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=37734
[59] https://www.eca.europa.eu/en/Pages/DocItem.aspx?did=46398
[60] https://www.eca.europa.eu/en/Pages/DocItem.aspx?did={28F30B2D-1A5F-45D0-B2D4-F007F2F3811F}
[61] https://www.eca.europa.eu/en/Pages/NewsItem.aspx?nid=13709

## 5. Support study on relevant national plans and programs in Member States[62]

The general objective of the study has been to assess the national transport and infrastructure plans and programmes of Member States and to examine in how far they are coherent with and aligned to TEN-T objectives and implementation. In a first step the study compiled information on the status of national transport plans and programmes and established an overview of national planning systems through a comprehensive desk research. The second step consisted of an in-depth assessment of national plans and programmes in each individual EU Member State. Main questions answered have been:

- Are national plans and programmes (including corresponding financing decisions) duly reflecting the obligations under the TEN-T Regulation with regard to network planning and implementation?
- Is the TEN-T – notably the core network – sufficiently covered by national planning and programming?
- Based on the previous aspects, what are "good practice" approaches? Where are the gaps and which factors are underlying these gaps?

The review and assessment of the national plans and programmes has been complemented by a survey addressed to all member states to validate the findings.

### Limitations and robustness of findings

The main limitation of the evaluation lies in the complexity of the TEN-T policy e.g. through its integrated approach to address all transport modes, in the huge number of projects to be implemented to reach the TEN-T goals and in the variety of their nature as well as in the long-term vision of TEN-T policy (2030/2050 deadlines). Indeed, decisions and regulations during the evaluated period of 2013-2020 have covered only a limited period of time which represent just an "extract" of the way to go to reach full completion of the TEN-T network. In return, this makes it often difficult to define clear-cut results for the specific evaluation period (i.e. 2013-2020) as project preparation and implementation has started sometimes well before 2013 and will continuously go on until 2030/2050.

Moreover, the broad scope of the Regulation i.e. its applicability to all member states, to all modes of transport, different technologies and infrastructure standards leads to a huge amount of available literature and diversity of data sources. Consequently there is also a large number of stakeholders involved with naturally diverging interests and views on the functioning of the Regulation.

This diversity in data sources and viewpoints posed a challenge when synthesizing findings into a coherent narrative especially with a view to incorporating the case study findings. Thus the consultants used a systematic and iterative approach to data collection, quality control, analysis, validation, triangulation and synthesis which the Commission complemented with its own analysis. This should help mitigating the effects of different types of bias, help resolve contradictions in the analysis or provide a transparent means of explaining why they occur.

[62] not yet published

*Public consultations*

A general problem throughout the consultation activities has occurred due to the fact that this evaluation, as outlined earlier, is carried out at the half way point between the entry into force of the regulation and the first major milestone in 2030 (completion deadline for the core network). Thus stakeholders, in view of the 2030 deadline, found it difficult to make a mere backward looking assessment of the provisions of the regulation and tended to rather make suggestions for future changes, thus diminishing the evaluative value of their responses.

*The open public consultation*

A challenge with public consultations is that they may have limited evaluative value due to the self-selection of respondents and often uneven or skewed participation in the survey from different stakeholder groups and/or countries. In order to mitigate any potential bias in the findings, the consultant has taken due care when using the results of the public consultation in the final evaluation report. This included the assessment of the need for weighting techniques and triangulating the responses to the public consultation with results obtained from the evaluation surveys, interviews and case studies.

In addition, the wording of some questions introduced a bias in the responses provided. Typically, the yes / no questions can bias the results as it looks like the responses are positive or negative. In open questions, it was noticed that some respondents provided the exact same response. This seemed to indicate that stakeholders belonging to the same organisation (e.g.) were consulting on the position to put forward in the OPC.

Lastly, the OPC generated a very high volume of responses. This reflects the strategic interest in the TEN-T and in the consultation on its key features. But the large number of answers, the number and lengthiness of open-ended questions, as well as the lack of structure of the answers to open-ended questions proved to be an additional challenge in processing the data and ensuring the analysis took into consideration all important aspects mentioned by respondents.

## 5. ANALYSIS AND ANSWERS TO THE EVALUATION QUESTIONS

### 5.1. RELEVANCE

Relevance looks at the relationship between the needs and problems that a particular intervention aims to address. The evaluation aims to establish that the intervention, in this case the TEN-T Regulation, is appropriate to address identified needs both when the intervention was first adopted in 2013 and when it is being evaluated. The evaluation questions also explore how fit the Regulation seems to be to tackle future and foreseeable challenges.

#### 5.1.1. Evaluation Question 1:

**Evaluation Question 1:** To what extent are the specific objectives set in the TEN-T Regulation still relevant to achieve the general objective of the TEN-T policy, as set out in the TFEU, as well as broader transport policy objectives? To what extent correspond these objectives to current needs, and in how far does the development of the core and comprehensive networks - contribute to their achievement?

The four specific objectives of the TEN-T Regulation, as outlined in point 2, derive directly from the general TEN-T policy objectives established in the TFEU. Their relevance with regard to current problems and needs has been a key element of the assessment undertaken in the main evaluation study, with the global desk research, surveys and interviews having paid significant attention to it. Reactions to the Open Public Consultation, especially in a large number of position papers, also contributed to this assessment. Not least, the various activities led by the Commission in analysing, monitoring and promoting the implementation of TEN-T policy under Regulation N° 1315/2013 as well its interrelation with other relevant transport policy action generated rich evidence of the strengths and weaknesses in relation to the four specific objectives. Overall, the benchmark for the relevance of the specific objectives as well as for the targets and measure underpinning them, is the contribution to the development of the core and comprehensive network layers.

*The specific objective: Efficiency of the infrastructure network in support of the functioning of the internal market*

Stakeholders agree with the continuous relevance of TEN-T policy in facilitating and enhancing transport flows within the Internal Market - in an inclusive way that involves all regions of the Union – and in supporting broader transport policy objectives. For example, about two third of the respondents to the Open Public Consultation found that TEN-T policy has positively contributed to the facilitation of the free movement of citizens and goods. This outcome is underpinned by the Commission's own experience, gained in comprehensive technical analysis and in expert meetings, conferences and other dialogues with the wide range of stakeholders involved in TEN-T policy.

The focus on the interconnection and interoperability of national networks, the integration and interconnection of all transport modes as well as the removal of bottlenecks and missing links remains fully relevant. This is continuously confirmed by Member States, transport infrastructure managers, regional / local authorities and other stakeholders: They participate actively – and support strongly – all action related to core network corridors which concentrates on such issues. Also, the findings of the study on National Plans and Programs in Member States document – through Member States' commitment to address TEN-T bottlenecks and missing links in their national infrastructure planning, programming and financing processes – the relevance of this

specific objective. This is also underpinned by the agreement, in the targeted stakeholder consultation (84% of respondents), that the concentration of support from EU Financial Instruments (notably the Connecting Europe Facility and the Cohesion Fund) on bottlenecks and missing links of the TEN-T has been appropriate.

While there is thus broad agreement with the relevance of the direction the TEN-T Regulation sets for a coherent and concentrated development of transport infrastructure towards the completion of the core and comprehensive networks by 2030 and 2050, desk research, stakeholder consultations (including specific case studies) and relevant expert work of the Commission also point to certain areas where current problems call for adjustment of provisions. In the light of the huge number of projects to be implemented to ensure timely completion – in the first instance - of the core network, and the increasing connection with sustainability objectives and an enhanced user perspective, analytical and governance tools may need to be strengthened. This should also contribute to further enhancing coordination between actors across geographical border and sectors. Not least, this should help addressing concerns raised by the European Court of Auditors.

Concerning urban nodes in TEN-T policy: A very large number of stakeholders – both in the specific case study (n° 1) as well as in all forms of open and targeted consultations (overwhelmingly regional and local authorities, furthermore various user groups, both in the passengers and freight sectors, mobility service providers, transport planners, NGOs (in fields such as people with reduced mobility or environmental protection, climate change, active transport promotion), industry in innovative sectors – including zero and low emission mobility and others – call firmly for increased attention being given to the integration of urban nodes' action in TEN-T policy. Presupposing the successful implementation of this area in TEN-T policy since 2013 (see EQ 4), they claim advancement of the provisions of the Regulation to meet current needs and – more importantly – be ready for future challenges. Sources refer to insufficient relevance, notably in the light of new challenges such as decarbonisation, digitalisation/innovation, demographic change, inclusiveness, efficiency and territorial cohesion. Case study n° 1 evaluated a wide range of urban nodes of different size, geographical location and socio-economic importance, while paying particular attention to their functionality from a TEN-T perspective. Its key conclusion was the insufficient complementarity between TEN-T policy and Sustainable Urban Mobility Plans, including their innovative dimension. Furthermore, the case study called for more openness about the number of urban nodes to be addressed with TEN-T policy.

The area of urban nodes also clearly demonstrates the interrelation between the four specific objectives as the provisions on urban nodes are relevant for i) the completion of infrastructure projects within the network, ii) the enhanced accessibility of all regions though urban nodes transfer function between long distance and regional / local networks, iii) sustainability through complementarity with urban mobility / urban innovation and iv) improved user benefits through the enabling of seamless mobility solutions.

*The specific objective: Cohesion*

The objective of cohesion is equally addressed through the actions and efforts outlined in the efficiency chapter above. Member States and a wide range of other stakeholders with a strong direct interest in the territorial, economic and social cohesion are fully committed to these broad and common efforts. The alignment of EU support under the

Connecting Europe Facility and the Cohesion Fund under the common TEN-T policy objective is essential in this respect.

However, there have been calls – in the Open Public Consultation, the Targeted Stakeholder Consultation and in various expert fora – to reinforce provisions for accessibility of the most remote EU regions – the outermost regions recognised by art 349 TFEU – as well as peripheral and insular regions. Accessibility and connectivity of such regions can also be enhanced by expanding TEN-T policy on urban nodes to the comprehensive network, as highlighted in case study n° 1. Also the Own Initiative Report of the European Parliament on the revision of the TEN-T regards it as important to "further develop the TEN-T to focus on the interconnection between the core and comprehensive networks in rural, peripheral and outermost regions[63] and islands".[64]

Regional needs in general were highlighted by certain stakeholders as an area to be better reflected. The importance of further strengthening cohesion between Member States with different economic power was recalled as was the need to make better use of the economic potential of peripheral regions. Responding to such issues seems to be a matter of both strengthening specific targets, reinforcing the implementation of the current objectives and strengthening coherence between TEN-T and Regional Policies including the outermost regions' policy which commits the Commission to "better meet the outermost regions accessibility needs and facilitate their participation in the Trans European Transport Network".[65]

*The specific objective: Sustainability*

The specific objective of sustainability aims at ensuring an efficient transport infrastructure in Europe while at the same time enabling low carbon and clean transport. The findings of the literature review highlighted the indispensable role played by the TEN-T Regulation as an enabler for decarbonisation of the transport system as a whole. Projections show that the completion of the Core Network Corridors could lead to significant CO2 reduction from 2015 - 2030. The literature also points out that the completion of projects along the TEN-T corridors stimulates modal shift, especially through the implementation of major rail and inland waterway projects, as well as through the enhancement of a multi-modal transport network and the inclusion of components such as alternative fuels infrastructure, intelligent and innovative transport systems, etc.[66] However, the modal shift in practice will only be achieved once the projects are finalised, especially for the major cross-border projects which can be seen as a game changer in making modal shift possible.

About one third of the respondents of the stakeholder consultation, however, believe that the relevance of the provisions underpinning the "sustainability objective" are insufficient in the light of new climate targets, notably those as set in the European Green

63 Regular and reliable connections with neighbouring third countries is particularly important to the EU regions located in the Caribbean basin, Latin America, the Atlantic and the Indian Ocean (the EU outermost regions), and can stimulate growth and job creation by attracting business, tourists and service operators.

64 Revision of the Trans-European Transport Network guidelines (2019/2192(INI)), 2020, EU Parliament, Committee on Transport and Tourism

65 Communication 'A stronger and renewed strategic partnership with the EU's outermost regions' (COM(2017) 623 final

66 The impact of TEN-T completion on growth, jobs and the environment, 2018, EC

Deal[67], the European Strategy for Low-Emission Mobility[68] and the Climate Target Plan. In strengthening the relevance of the TEN-T objectives in this respect, particular importance should be given to the full and binding equipment of TEN-T infrastructure with charging and refuelling infrastructure for zero and low emission vehicles, aircrafts and vessels. This need for adjustment of the sustainability objective is expressly underpinned by the new political priorities of the European Commission, and also by the United Nations Sustainable Development Goals (SDGs). An adjustment of objectives on TEN-T urban nodes, which are hotspots for greenhouse gas and other harmful emissions, also further supports the sustainability objective.

*The specific objective: Benefits for users*

Stakeholders seem to be less in agreement that TEN-T policy objectives address the current and foreseeable infrastructure needs from the perspective of users (34% in the targeted survey disagreed or strongly disagreed). Interviewees noted that TEN-T policy should take a more nuanced approach to meeting user needs by catering to different categories of users, both commercial and individual. Also case study n° 8 (on enabling passenger services) clearly supports this assessment. According to this evidence, and not least to a variety of expert work undertaken by the Commission (in fields such as freight logistics, sustainable mobility, passenger rights), TEN-T infrastructure lacks appropriateness to enable – in a better integrated way - seamless, sustainable and efficient freight logistics and mobility chains for passengers. This should take account of innovative technological solutions and changing user expectations. Furthermore as confirmed in the urban nodes' case study, it should also include seamless 'last mile connections for TEN-T users, including with active transport modes.

*Network structure*

The TEN-T, consisting of the comprehensive and core network layers which result from a single European a planning methodology[69], constitutes the key output of TEN-T policy. It can be seen as unanimously accepted by Member States and stakeholders, and their planning and programming since 2013 - towards the 2030 / 2050 - has been geared to this network. Not least, the dual layer network structure is in the centre of a wide range of EU action. Departing from it now would negate significant value generated from efforts spent so far. Given the role of the TEN-T as an important reference basis for various EU legislation on transport, significant network changes could also entail legal ambiguities.

Significant changes to the network would not only hamper the value of the investments and connectivity gains already realised but would also very likely reduce the economic and employment benefits assessed for the completed network (see question n° 4). On the other hand, minor network adjustments - compliant with the methodology applied for the 2013 network design - may be justified. Changing transport flows (for example in relation to the UK's decision to withdraw from EU membership or changing global transport flows) may entail a need for network adjustment in order to avoid economic loss for the Union or part of its Member States.

Findings from the desk research underline the importance of the comprehensive network in reaching greater territorial cohesion and linking peripheral, insular and outermost European regions. According to the Passenger Transport Executive Group[70], the

[67] The European Green Deal Communication from the EC to the EP, 2019
[68] A European Strategy for Low-Emission Mobility, 2016, EC
[69] Planning methodology for the trans-European transport network (TEN-T), SWD(2013) 542 final
[70] The Trans-European Transport Network, Passenger Transport Executive Group, September 2014

comprehensive layer of the TEN-T is essential to ensure the access function of the core network, being crucial for easing congestion as well as for reaching other overarching objectives set out in the TEN-T Regulation.

**5.1.2. Evaluation Question 2**: explores the appropriateness of the Regulation to respond to new technological needs (in particular in relation to the digital transition), to the demand for new mobility solutions, to the uptake of research and innovation results as well as to the adaptability to changing trends and needs

This question, both with regard to the relevance of the TEN-T Regulation in relation to the needs and problems faced between 2013 and 2020, as well as to foreseeable future needs, has been covered by the global survey and interviews of the main evaluation study. In the first instance, however, this question has been in the centre of two specific case studies undertaken in the context of this evaluation study: n° 4 on *the TEN-T as an enabler of a future-oriented mobility system* and n° 6 on *Digitalisation.* The findings of these "external" assessments are complemented by some reference to related internal work of the Commission.

Megatrends, such as climate change, demographic and technological change, including increased digitalisation and automation, bring significant opportunities to the mobility. Some fast-moving trends in those areas have emerged since the current version of the TEN-T Regulation entered into force in 2013. They are expected to gain pace in the future. The evaluation acknowledges the key role of the TEN-T Regulation in enabling transport solutions, and in this respect, its capacity to keep abreast with new trends and developments requires in-depth assessment.

The literature review, undertaken in the framework of the evaluation support study, suggests that transport activity and mobility of passengers and transport of goods will increase further in the years to come. TEN-T policy tries to owe up to these developments by focussing on two main areas: a) the full and timely completion of the core and comprehensive network in its physical dimension (i.e. the removal of bottlenecks and missing links, interconnection of modes, interoperability) and b) new and innovative solutions (technological and organisational) along this full-scale network. This should enable step changes in transport and mobility for freight and passengers, thereby making substantial contributions to the sector's ambitious objectives on greenhouse gas emission reduction.

Respondents to the Open Public Consultation for example, expressed the view that TEN-T policy still has to deal, to a large extent, with more "traditional" infrastructure in order to complete the physical network. At the same time, foresight experts saw a need to focus more on the digital layer of infrastructure in the future as this could significantly help to make a better use of existing infrastructure.

*TEN-T policy and digitalisation*

Looking into the appropriateness of the current TEN-T Regulation for digitalisation, the assessment found that the objectives and provisions of Regulation N° 1315/2013 TEN-T Regulation have already enabled the deployment of a wide range of digital projects in all transport sectors. It has allowed to promote a number of projects at EU level (with the support of CEF funding) which are intended to pave the way towards a more systematic approach to digitalization in TEN-T, aligned with relevant objectives in broader transport policy and other related policy fields.

Regarding digitalisation, the case study (including desk research, interviews and an expert workshop), looks into projects across the different transport modes, which are referred to in the TEN-T Regulation (Article 31) as "telematics applications", and which have been subject to significant CEF support under its 'horizontal priorities'. These projects include the European Railway Traffic Management System (ERTMS), the Single European Sky Air Traffic Management Research (SESAR), the Vessel Traffic Management and Information System (VTMIS), River Information Services (RIS) as well as projects in the field of Intelligent Transport Systems in the road sector (ITS). The case study confirms that, in these areas, the borderline between "telematics" and digital solutions has been, or is about to be, passed. Such projects have been progressing well in line with continuously evolving developments and needs, independently of a certain stagnation in the relevant TEN-T terminology. .

New – and genuinely digital - projects are generated, building on extensive work of expert fora set up by the Commission such as the Digital Transport Forum, or on initiatives of stakeholder consortia supported by EU bodies such as the European Railway Agency. Amongst such digital "forerunner" TEN-T projects are:

- ***ELETA***[71] *is a rail specific and targeted project that tackled the particular issue of Estimated Time of Arrival (ETA) data within the whole rail supply chain management.*
- ***FEDeRATED*** *builds upon the work of the Digital Transport and Logistics Forum (DTLF). It aims to contribute to the development of a federated network of platforms for data sharing in the freight transport and logistics domain at EU level (and beyond) and to enable a smooth and effective public involvement with logistic chains for the execution of public duties.*[72]

With a view to the future,, the digital transition involves unprecedented new challenges and opportunities for TEN-T policy, which need to be seized in a more comprehensive way. Hence, case study on digitalisation concludes that there is a need to update the concept of digitalisation in TEN-T policy (e.g. its components, coverage and objectives) and to pass from individual actions to a coherent network-wide approach. Besides the technological side, this is vital to boost the efficiency of TEN-T infrastructure use, the generation of new and attractive user services for passengers and freight and, thereby, to substantially enhance the "efficiency pillar" of transport decarbonisation.

*TEN-T policy as enabler of a future-oriented mobility system*

Case study N°4, looking into the "TEN-T as an enabler of a future-oriented mobility system", concentrated on understanding whether the current provisions of the Regulation are future-proof in more general terms. Results showed that stakeholders generally agreed or strongly agreed that the TEN-T Regulation has enabled innovation in the mobility system across all modes and at a multi-modal level (77%), although the effectiveness varies across modes. The current provisions were particularly appropriate to support future developments in the aviation (72% agreement ratio) and road (65%) sectors.

However, with a view to future opportunities, the case study has shown some elements of rigidness in the Regulation that might limit the development of new and forward-looking transport solutions of relevance to TEN-T policy. One challenging issue in this respect concerns the adequateness of the current TEN-T provisions to enable an appropriate integration between infrastructure, vehicles and connected services across all modes.

[71] For more information see https://www.railfreight.com/tag/eleta/
[72] Project website - http://www.federatedplatforms.eu

Less than half of the respondents from the case study survey (46%) responded positively to this question.

Three examples of future-oriented mobility solutions have been explored in more detail; examples from three areas that have the potential to create significant breakthroughs in the EU transport policy, namely Connected and Automated Mobility, the Single European Sky Air Traffic Management System (SESAR) and the Hyperloop. As explained in literature, connectivity and automation are not only complementary technologies. Instead, they reinforce each other and may merge completely over time. The same underlying principle might be applicable to vehicles, which, with growing communication and connectivity with the infrastructure and supporting services, might become part of the infrastructure at large over time. This scenario will challenge the "traditional" layout of hard and digital infrastructure components. Moreover, automation and digitalisation are key enablers for all modes of transport. Therefore, experts interviewed in the frame of Case Study N°4 considered that a high level of flexibility is needed to incorporate transport concepts that might disrupt the current mode-oriented structure of the Regulation.

Desk research in the framework of this case study makes the case for a flexible regulation with regard to upcoming road automation (as the requirements for road automation are not yet clear), new transport solutions (e.g. Hyperloop) and further developments in the SESAR programme (where artificial intelligence has already been playing a significant role). In this regard the Regulation should be more appropriately linked with the White Paper on Artificial Intelligence (2020)[73] and consistently build on EU data sharing policies, such as the Open Data Directive (2019)[74] and the Inspire Directive (2007)[75].

Regarding innovative mobility solutions overall, there was agreement in stakeholder interviews that automation and digitalisation components need to be better addressed in the TEN-T Regulation. Requirements and priority targets should be set out for comprehensive and core networks. Interoperability is crucial in this respect not only for the effective deployment of digital solutions for both passenger and freight transport but also in order to ensure that different systems can communicate, thus avoiding a situation where a multitude of independent solutions are developed in silos.

Desk research on Hyperloop, for example, showed that this mode of transport results from a combination of technologies used in other modes of transport. In reality, most fundamental technologies required for Hyperloop have an equivalent technology in either the rail (Maglev) or aviation sector, combining efficiently components from aerospace, railway and the vacuum industries. Therefore, Hyperloop systems correspond to another example that challenge the mode-oriented structure and layout of the TEN-T Regulation.

As far as the adaptability of the TEN-T Regulation to changing needs is concerned, most evidence collected through the several data sources and tools pointed out that the 2013 Regulation has been sufficiently flexible and adaptive so far. However, the transport ecosystem is changing very rapidly, which suggests needs for adjustment to keep the TEN-T abreast with future changes. This should take account of the specific nature of such new technologies compared to more traditional infrastructure. Possible particularities in terms of requirements have been referred to in the stakeholder workshop under case study 6, including issues such as openness for unforeseeable developments, data needs etc.

[73] https://ec.europa.eu/info/sites/info/files/commission-white-paper-artificial-intelligence-feb2020_en.pdf
[74] https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1561563110433&uri=CELEX:32019L1024
[75] https://eur-lex.europa.eu/legal-content/EN/ALL/?uri=CELEX:32007L0002

Core network corridors have been identified as being an instrument able to act as test-bed for new technologies, working across borders and connecting systems and services, as well as facilitating knowledge exchange and cooperation. Furthermore pilot projects for real business cases may be deployed on the corridors which can later be used in the rest of the network.

Infrastructure for alternative fuels (enabling zero and low emission mobility and transport) has been covered in the TEN-T Regulation essentially as a new technology (Article 33) and a call upon LNG refuelling stations, without however setting specific requirements. All evidence (from the main evaluation study as well as from initiatives in DG MOVE on alternative fuels solutions in the road, maritime and aviation sectors), the European Green Deal and Climate Target Plan objectives) confirm that the TEN-T regulation has become irrelevant in this field. The current Regulation has enabled the promotion of a wide range of pilot action to prepare for large scale rollout. However, the challenge is now to ensure continuous network-wide coverage of alternative fuel infrastructure, which is coherent (see chapter 5, question of coherence) with relevant EU legislation; legislation being prepared in parallel with this evaluation process but for which clear orientations are already available (for further details, please refer to question.

#### 5.1.3. Evaluation question 3: How relevant is the set of infrastructure standards and requirements, as included in the TEN-T Regulation, to help achieving TEN-T and transport policy objectives? To what extent are the provisions on standards and requirements appropriate to incorporate market developments, to enable an efficient use of the TEN-T infrastructure and to achieve new, high-quality transport infrastructure and transport innovation / reduce infrastructure quality gaps?

Network-wide infrastructure standards, introduced in Regulation N°1315/2013 are fundamental enablers for a well-functioning European Single Transport Area. The adequate implementation of these infrastructure standards is seen as key for a more sustainable, seamless and smarter network[76]. Network infrastructure standards in TEN-T cover both:

- the binding transport infrastructure standards resulting from the EU legislation in relevant transport policy fields (i.e. technical standards for interoperability, safety); and
- the transport infrastructure requirements enabling the achievement of various transport policy objectives (such as modal connections in transport nodes, safe and secure parking, intelligent transport systems, provisions for equipment to facilitate use functions, etc.).

Chapter II of the TEN-T Regulation sets out the current standards applicable to the comprehensive network, while Chapter III sets higher-level requirements for the infrastructure of the core network – which constitutes the most strategic part of the comprehensive network.

The TEN-T Regulation has brought new opportunities for infrastructure development, promoting safer and more efficient sustainable development for all modes. By setting infrastructure standards and requirements, the TEN-T has taken up relevant legislation and policy objectives in various transport sectors, namely on road safety, interoperability or equipment for innovative, smart and clean transport solutions. About two third of the

[76] Progress report on implementation of the TEN-T network in 2016-2017

respondents to the Open Public Consultation supported the promotion of harmonised standards and other common infrastructure qualities in TEN-T policy, given their importance for the free movement of citizens.

However, with a view to new challenges in transport, interviewees – in fields such as intelligent transport systems and innovation – pointed to the particular need for strengthening infrastructure requirements enabling decarbonisation. In line with this, global survey results suggested furthermore that a more efficient use of the infrastructure could be achieved through reinforcing provisions for soft infrastructure in the TEN-T Regulation, notably in the field of future-oriented mobility schemes (digitalisation, automation, smart mobility chains, as well as other transport infrastructure requirements related to EU policies on environmental protection and climate).

The main evaluation study included in particular two case studies (n° 3, on standards and requirements of TEN-T infrastructure and n° 7 (on infrastructure quality / resilience and the connection between R&I and the deployment on TEN-T) which looked in more detail into the relevance of standards and requirements in general, as well as into the specific aspect of infrastructure quality requirements from the perspective of resilience.

*Relevance of TEN-T infrastructure standards and requirements in general (case study n°3)*

In the online survey of case study 3, a large majority of stakeholders (80% of the respondents) agreed or strongly agreed that the setting of a wide range of other infrastructure requirements[77] – aiming to advance the TEN-T towards a broad basis for an efficient and sustainable transport policy overall – has been relevant in relation to different objectives.

There was broad consensus among stakeholders who confirmed the relevance of TEN-T infrastructure requirements notably in the following areas:

- advancing the basis for an efficient and sustainable transport policy: While there was a high agreement on the need for such standards, only slightly more than half found them sufficiently clear
- enhancing infrastructure interconnections in urban nodes and facilitating last mile connections (84% agreement)
- safety enhancement (87% agreement)
- Accessibility for all users (82% agreement)
- Security (80% agreement)

On the contrary only between 50 and 60% of the respondents found the provisions relevant in relation to the needs of users of transport nodes, such as ports, airports or multi-modal terminals, as well as of the providers of cross-border transport operations – which confirms the outcome from evaluation question n°1, namely that there is a lack of relevance of the TEN-T objectives in relation to the needs of users, especially in relation to integrated door-to-door services across modes.

Hence, as also confirmed by the Commission services own work, there is a significant need to advance certain infrastructure standards and requirements to better align them with various new transport policy objectives. Besides the areas referred to above, this is in particular the case in areas such as railway policy, inland navigation, charging and refuelling infrastructure for zero and low emission vehicles, aircrafts and vessels as well

[77] "Other" referring to those infrastructure requirements aiming for an efficient and sustainable transport policy (innovative infrastructure components, safety, security, infrastructural requirements to strengthen climate mitigation, etc.)

as smart and digital infrastructure features. On the hand the standards on tunnel safety will remain relevant in their current form as confirmed in a recent impact assessment.

The case study assessed the approach to setting higher infrastructure standards and requirements for the core network, compared to lower level standards for the comprehensive network – which may be seen as some kind of "dual layer approach" in terms of TEN-T standards and requirements. Survey results and interviews with stakeholders (to a large extent European Associations representing all transport modes at stake, as well as user representations) show that this approach is seen as relevant by a large majority of the survey respondents and interviewees. This is supported notably for the following reasons:

- Ensuring continuity of standards throughout the network (94% agreement)
- Strengthening quality and capacity of the core network where the highest volumes of inner-EU traffic are concentrated (96% agreement)
- avoiding disruptions which may result from exemptions enshrined in related legislation, for example on interoperability (90% agreement)
- allowing a smooth absorption of increasing transport flows from and to third countries (84% agreement)
- advancing solutions to enhance efficiency and sustainability of the transport system overall (89% agreement)
- making the core network the forerunner of innovation and new technologies in transport (80% agreement).

Nevertheless, according to the Commission's own expert work (based on various working groups, involving Member States and expert groups), there is a need to extend certain (higher) standards from the core to the comprehensive network. This is expected to address shortcomings which have been identified in areas such as urban nodes, enhanced railway services or user requirements. Not least such an approach appears also necessary to address innovative and sustainability objectives – such as charging and refuelling infrastructure for alternative fuel or digitalisation / automation – which are more of a horizontal scope.

With the specific example of maritime transport, it shall be demonstrated that the current Regulation lacks relevance in the light of new challenges, although it can be stated that the current provisions have been relevant and yielded good results.

Concerning **maritime transport** and Motorways of the Sea, a wide and intense consultation process both inside the Commission services and outside with Member States' representatives and EU maritime associations, the relevant section of the TEN-T Regulation (Articles 20 – 23) 4 present relevance problems in relation in relation to new emerging trends (e.g. new market realities and societal challenges) and new legal drivers of the maritime sector.

Most importantly, all experts agreed on the fact that the concept of Motorways of the Sea is overly complex and poses implementation problems. It could greatly benefit from simplification and integration in an overarching and integrated concept of the TEN-T covering ports, shipping and all other maritime infrastructure elements for the benefit of the entire 'European Maritime Space'. Both sea-shore and port-hinterland connections lack coherence and strong focus on multi-modal connectivity in ports. The role of maritime ports as strategic multimodal nodes, energy and digital hubs are insufficiently recognised in the Regulation. According to the maritime experts, representing Member States and Associations, also a particular view on maritime links with islands, peripheral and outermost regions as well as third countries would help addressing remaining problems.

Finally, the evaluation undertaken by these experts shows that the inclusion of eligibility criteria into the TEN-T Regulation (Article 21) has proven to be inappropriate. They

therefore strongly call to remove them from the Regulation and to incorporate them instead in a CEF 2 multi-annual work programme or in specific call texts – in line with what is already done for other funding priorities. Such elements of inappropriateness of the current TEN-T Regulation could be overcome by fostering a more holistic and harmonised approach of the TEN-T maritime dimension.

*Infrastructure quality / resilience and connection between R&I and TEN-T policy (case study n° 7)*

Stakeholder consultation, interviews and a workshop undertaken in the framework of this case study points to lacking relevance in the TEN-T provisions in relation to climate adaptation / infrastructure resilience. Analysis in different policy sectors within the Commission services also highlights the need for a revised approach, with the introduction of additional infrastructure standards and requirements, in fields such as security, climate adaptation, civil protection or structural infrastructure quality.

The provisions of the Regulation appear insufficient in relation to the different facets of resilience of the TEN-T. The Regulation refers to such issues in a scarce and unspecific way (notably in Articles 34 and 35 with references to safe and secure infrastructure and to resilience to climate change and natural and environmental disasters). The period since the adoption of Regulation N° 1315/2013, however, has seen a number of developments which suggest adjustment in the field of infrastructure resilience.

The continuity of transport flows within the Union may be suddenly interrupted for a number of reasons: extreme weather events which become increasingly frequent, security challenges or severe accidents on critical sections of the TEN-T infrastructure. Preparedness of TEN-T infrastructure for such situations needs to be enhanced, in line with relevant EU action in fields such as civil protection, military mobility, cyber security and climate adaptation. This assessment has been confirmed through various initiatives, including inter alia, the military mobility action plan[78] or the preparation of an EU strategy on climate adaption.

**Examples of challenges to TEN-T resilience**

*One recent event has particularly highlighted the need to enhance the relevance of the Regulation on structural infrastructure quality: the collapse of the **MORANDI Bridge** in Genova in 2018. Case study n° 7, has looked into this aspect in more detail. It proposes to pay increased attention to minimum requirements for particularly vulnerable parts of the TEN-T, such as bridges. This is complemented by calls from stakeholders to foresee alternative routes for particularly critical infrastructure sections. The case study also highlights the need for a life-cycle approach, making sure infrastructure assets are maintained at a high structural quality level throughout the time of their use. It is recommended to draw on new technologies (such as drones etc.) for regular monitoring of critical TEN-T infrastructure assets and to streamline maintenance procedures on this basis.*

*The **COVID-19** outbreak has led to a disruptive impact on transport and mobility, jeopardising the transport of essential goods across borders. Therefore, in March 2020, as part of the EU's response to the coronavirus crisis, the European Commission issued a communication on green lanes regarding a cross-border management tool for freight transport by road and rail. It also issued other guidance documents aimed at easing the impacts of the health crisis on transport across the EU[79]. The guidance regarding green*

[78] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=JOIN%3A2018%3A5%3AFIN

[79] Communication from the Commission on the implementation of the Green Lanes under the Guidelines for border management measures to protect health and ensure the availability of goods and essential services, March 2020

*lane border crossing points was heeded in respect of relevant internal border-crossing points of the TEN-T, ensuring the supply of essential goods and the seamless functioning of the Single Market for goods and essential services. This can be seen as example to demonstrate that even unspecific provisions of the TEN-T Regulation, seen in the context of the general and specific objectives of TEN-T policy as a whole, have been highly relevant to undertake successful action in a case of crisis.*

### 5.2. EFFECTIVENESS

Effectiveness looks into the successfulness of the TEN-T regulation in achieving or progressing towards its objectives. It assesses the progress made to date and the role the TEN-T regulation has played in delivering the observed changes. Furthermore it looks at areas where progress is lagging and the underlying reasons for that.

#### 5.2.1. Evaluation Question 4:

**Evaluation Question 4:** To what extent has the Regulation delivered to date in relation to its specific objectives as well as to the dual layer network structure? Which factors have hindered or promoted the achievement of these specific objectives? To what extent has the Regulation been effective in relation to the following areas: urban nodes, the promotion of new technologies and innovation as well as cooperation with third countries? To what extent have implementing tools, reporting and monitoring provisions been effective in achieving of the objectives of the Regulation?

The latest two Progress Reports on TEN-T implementation which, according to Article 49(3) of the TEN-T Regulation, have to inform the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions every two years about the delivery of TEN-T policy on its objectives, provide an overview of the two reporting periods 2014/2015[80] and 2016/2017[81]. They show that substantial investments have been concentrated on the core and comprehensive networks, namely in the order of 90 billion Euro respectively. (This combines national and European, public and private sources). These investments reflect the gradual advancement with the implementation of the wide range of projects of common interest under the common EU-wide TEN-T policy objective.

For the core network more specifically, the work of the European Coordinators has been instrumental for effective progress. During the period 2013 – 2020, a total number of more than 1200 projects has been completed along these corridors, representing a total investment of around 110 billion Euro. They include a wide range of activities of varying size and nature, and they cover the whole project life-cycle, from studies or geographical explorations to implementation work. On all corridors, the overwhelming part of the investment was concentrated on rail, with the completion and entry into operation of major projects such as the full high-speed railway line Paris – Strasbourg in 2016, of the Tours – Bordeaux high-speed railway line in 2017 and of the full Berlin – Munich high-

[80] COM(2017) 327 final of 19.6.2017: Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Progress Report on the Implementation of the TEN-T in 2014 - 2015

[81] COM(2020) 433 final of 26.8.2020 : Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Progress Report on the Implementation of the TEN-T in 2016-2017

speed railway line as well as of the Treviglio – Bresica and Antequera – Granada high-speed rail sections.

Besides these achievements, which led to travel time reductions and facilitated modal shift from air and road to rail, a large number of projects concerned smaller action such as the improvement of rail access to freight terminals, ports and airports, rail capacity upgrades in urban centres, the extension of sidings for freight trains, electrification, modernization or upgrading for 740m trains in terminals. For other major railway projects, such as the Karlsruhe – Basel line (connecting the North Sea ports in the Netherlands with Italy via the Swiss Alpine tunnels) or the "EuroCapRail" line Brussels – Strasbourg – Luxemburg, significant sums have been spent to ensure steady implementation progress. The financial efforts made by Member States for such projects have been substantially supported from the Connecting Europe Facility. The share of the total CEF contribution, attributed to rail, is generally high. It differs from corridor to corridor and reaches, for example, 86% on the Mediterranean corridor (where the Cohesion Fund envelope of CEF has allowed high co-funding rates in part of the States concerned.)[82]

Also in the inland waterway sector, important achievements can be reported for the 2013 – 2020 period. Upgrading has been completed in the Western German Canal system as well as on inland waterway locks in the Netherlands. Good progress has also been made with the implementation of the Seine – Scheldt project (in particular in Belgium), with further inland waterway upgrades in the Netherlands or with lock modernisations in Romania.

The achievements with projects in these two transport modes (partly building on investments under previous TEN-T Guidelines) have contributed to enhancing efficiency, quality and sustainability of services. However, they will bring their full benefit only once the core network as a whole is completed. In line with the multi-modal dimension of the TEN-T, appropriate investment in road and multi-modal infrastructure have been – and will continue to be – of no less importance for the gradual network completion and its efficient and sustainable functioning. In the 2013 – 2020 period, Corridor work has also included activities in fields such as intelligent transport systems / digitalization or alternative fuels. Unlike for 'physical' projects, however, such action has been more isolated and less subject to a coherent and corridor wide project identification and implementation. To draw full benefit from such and other innovative approaches, more continuity along the whole network (with its full completion as vital precondition) will be vital for the future.

With regard to the further project identification and implementation towards the 2030 deadline, the work related to the core network corridors shows that core network projects (based on technical analysis and Coordinators' work plans) shows at this stage that, to date, up to 3000 projects remain to be completed for full core network completion until 2030. This includes all (potential) projects at decision-making, preparatory or construction stage. The adoption of the Directive "Streamlining Measures for Advancing the Realisation of the TEN-T" (based on a Commission proposal from 2018, at an

[82] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport

advanced stage of negotiation[83]) is expected to facilitate and accelerate preparatory processes for the most critical of these projects. The Coordinators' Work Plans[84], regularly assess the development of the corridor under the respective Coordinator's responsibility and get the approval of the Member States directly concerned. All four series of work plans adopted so far have been subject to exchanges of views with the Committee on Transport and Tourism of the European Parliament, and received strong support. A large part of the identified corridor projects concerns upgrading of the infrastructure towards TEN-T standards and requirements set out in the TEN-T Regulation and will lead to infrastructure quality enhancements. Furthermore, particular efforts are concentrated on key cross-border projects, which involve high cost, not least as they at the same time cross major natural barriers (mountains or water). Overall: Continuous efforts are going on – coordinated between the Commission, Member States concerned, infrastructure managers and other public stakeholders – to steadily deliver milestones on the different types of projects. Depending on the type and size of the projects concerned, they generate continuously positive impacts on parts of the network. Besides the work plans of the European Coordinators, further evidence for the effectiveness of TEN-T implementation is provided in many sources and on a regular basis: online reports of the work of the European Coordinators, project promoters' and national governments publications on project completion and reports of European Associations etc.

The specific category of urban nodes' projects shall be referred to here again, given the particular attention attributed to it by individual stakeholders and stakeholder associations as well as the good coverage by literature. While the provisions, which were newly introduced in 2013, proved to be rather effective in a number of respects, they lack appropriateness in the light of foreseeable new needs to boost sustainability and to enhance seamless mobility services for the benefit of users (see EQ n° 1). However, the introduction of urban nodes into TEN-T policy in 2013 has generated a strong momentum, stimulating commitment amongst cities, other stakeholders and experts in relation to relevant TEN-T objectives. This enhanced, for example, the interrelation between urban nodes and TEN-T corridors, put emphasis on the challenging issue of multi-level governance in urban nodes and on the importance of seamless last mile connections as a key TEN-T interest, highlighted the decarbonisation potential in urban nodes, addressed their freight dimension and – not least – made it possible to fund a significant number of urban nodes' projects under the Connecting Europe Facility, with a substantial share concerning decarbonisation and innovation. TEN-T action on urban nodes developed into a sound policy basis for activities in related areas, such as research and innovation (e.g. the Vital Nodes project, initiatives like CIVITAS[85] or websites like ELTIS[86]) or promotional activities through organisations like Eurocities[87].

In conclusion: The impacts thus generated support all of the specific objectives of Regulation N° 1315/2013: 1) The efficiency of the network in support of the internal market, 2) Cohesion, 3) Sustainability and 4) User benefits. This has been clearly

[83] Agreement between European Parliament and Council reached in June 2020, pending formal adoption (See Council document 8726/20)
[84] https://ec.europa.eu/transport/themes/infrastructure/ten-t_en
[85] https://civitas.eu/
[86] https://www.eltis.org/
[87] https://eurocities.eu/

confirmed in the various stakeholder consultations, literature review and further analysis both by external experts and within the Commission.

#### 5.2.2. Evaluation Question 5: Have the current provisions for the identification and definition of projects of common interest achieved their purpose? To what extent have they enabled the identification and definition of projects of common interest in all areas covered by the TEN-T Regulation (physical and others, including traffic management, nodes etc.), and to what extent have these projects contributed to the specific priorities of the Regulation, including the tackling of capacity problems? To which extent have the implementing tools foreseen in the Regulation helped implementing these projects?

Article 7 of Regulation N° 1315/2013 defines the meaning of a "project of common interest". Essentially, a "project of common interest" (within the spirit of the TENs Title of the TFEU) is any project that contributes to the completion of the trans-European transport network. Given the wide range of objectives to be achieved, and of requirements to be fulfilled, projects of common interest encompass a broad variety of categories of action, notably including:

- filling missing links; removing capacity bottlenecks
- upgrading infrastructure in line with the established common TEN requirements
- enhancing multi-modal infrastructure, intermodal connections well as the access to them
- equipping infrastructure to enable telematics applications / the provision of intelligent transport services
- introducing innovative solutions to TEN-T infrastructure; enhancing and equipping the TEN-T infrastructure in any way that helps enabling its sustainable, efficient, high-quality performance within the European transport system.

The definition of such projects has been most clear and coherent, and the identification most straightforward, in the fields of filling missing links and of infrastructure upgrading to ensure compliance with the standards and requirements This is also reflected in the various reports issued by the Commission (Two-Years Progress Reports and – in particular – the work plans of the European Coordinators), which document high levels of effectiveness especially in relation to the coherent and successful implementation of common TEN-T standards and, as a result, positive impacts on targets such as interoperability and continuity. This has been instrumental in enabling seamless transport and mobility across national borders and along the TEN-T infrastructure more generally. Thereby, it contributed to all of the specific objectives of the Regulation. At the same time, the evaluation has also increasingly brought out views claiming that technical standards, and compliance with them, is not in all cases sufficient. In specific cases, it may need to be complemented by key performance indicators guided by service objectives.

The identification and prioritisation of projects addressing capacity needs from a TEN-T (rather than national) perspective – often in situations where international, national, regional and local traffic overlap and where smart solutions may help enhancing the efficient use of infrastructure resources – has been more difficult. The analytical assessment that underpins the work of the European Coordinators in relation to their

respective corridors (the so called corridor studies[88]) addresses this issue by using the best available methodological approaches. When identifying and prioritising projects from an overall corridor perspective, beyond the perspective of national infrastructure plans, due account is taken of national plans as well as of relevant stakeholder initiatives, input from corridor fora and working groups.

In this way, lists of projects of common interest are established, which are to contribute to core network completion by 2030 and which underpin the respective work plans of the European Coordinators. In a more discontinuous and diverse way (so far) these lists also include projects in smart or innovative sectors which may positively influence the optimal corridor functioning. This approach has been of key importance for the identification of funding priorities from EU sources The effectiveness of this approach so far, including its benefits for transport, trade, economic development, cohesion and the environment have been continuously endorsed over the 2013 – 2020 period by Member States, EU Institutions, professional stakeholders or NGOs.

A different type of challenge has been inherent in the identification of projects of common interest in the field of telematics/intelligent transport systems. In this area, the situation depends on whether there is a single Europe-wide policy that drives action all across the TEN-T, ensures interoperability and coherent user benefits. This is notably the case in the aviation (Single European Sky Air Traffic Management – SESAR), railway (European Rail Traffic Management System – ERTMS) and river information services (RIS) sector. The identification and development of individual projects in these areas is guided in a coherent and complementary way by a single European concept throughout the different parts of the Union.

Such projects have been the result of long EU-driven preparatory processes. They all started as EU research projects and led – via pilot deployment on the TEN-T – gradually to larger scale implementation. In the case of ERTMS, for example, the objective is full-scale deployment along the core network – as the only solution considered. This approach to transport telematics – which is now quickly moving towards digitalisation and automation – generates significant benefits in economic and environmental terms, enhances safety or quality and reliability of services.

In these areas, the instrument of the European Coordinators has been supportive. However, it would need to develop further in the coming years to be ready to take up new challenges – in the first instance to boost the different dimensions of transport decarbonisation (efficiency enhancement and the binding equipment with infrastructure for low and zero emission mobility) and digitalisation.

#### 5.2.3. Evaluation question 6:

**Evaluation question 6:** To what extent has the Regulation, and the investments made on its basis, enabled smooth, safe, secure and sustainable transport flows in all transport modes and at a multi-modal level; i.e. to what extent has it facilitated the generation of transport services of high quality and in line with the needs of users? Have the needs of all users (including PRM) been sufficiently covered? Have the following issues, as key enabling factors for high quality user services, been effectively tackled: the removal of infrastructure quality gaps / coherent infrastructure quality status, multi-modal infrastructure and the application of digital solutions?

[88] https://ec.europa.eu/transport/themes/infrastructure/downloads_en

Amongst the goals of the trans-European transport network (TEN-T) is to ensure efficient transport flows and to enable services providing seamless, safe and sustainable mobility of persons and goods. With regard to infrastructural developments, this builds to a large extent on performant trans-national transport axes, free of bottlenecks and missing links. It is, furthermore, dependent on strong multi-modal infrastructure and its smooth network integration, encompassing – besides the physical interconnection - also the smart / digital TEN-T dimension.

Evidence from the evaluation indicates that, overall, the TEN-T is very effective in facilitating trans-national transport flows. However, stakeholder consultations in the evaluation study as well as the Commission's own analysis suggest that there is significant room for TEN-T policy to improve its capacity to stimulate the generation of high-quality services such as:

- Services for individual and commercial users,
- Services for freight transport and passenger mobility (encompassing journeys from users' origin to their final destination),
- Services across transport modes (including components such as the organisation and delivery of actual transport operations as well as planning, ticketing and real time information tools for clients / users)

To achieve this objective, a traditional infrastructure approach resting strongly upon the delivery of major infrastructure connections and ensuring continuity of standards, comes to certain limits. It calls for enhancing the effectiveness of TEN-T policy by gearing it more towards the stimulation of seamless multi-modal transport and mobility chains for freight and passenger transport. This requires a more effective combination of TEN-T elements, varied in scale and nature and coordinated from the user benefits' angle.

On the 'traditional' infrastructure side, the enhancement of multi-modal infrastructure (ports, airports, rail/road terminals, railway stations) and its smooth network integration – an important condition for high-level services across modes - has been pretty much in the focus of TEN-T policy already. Multi-modal infrastructure has been given due attention in the Core Network Corridor approach, which contributed to enhancing multi-modal services along these corridors. This observation has been supported by 83% of the stakeholders in the targeted consultation.

Nevertheless, the evaluation shows that there is a need to further boost the effectiveness of the multi-modal infrastructure of the TEN-T as a key basis for better and more sustainable user services. In the Open Public Consultation, only 39% of the respondents saw the TEN-T Regulation as being sufficiently effective in promoting modal shift towards the most sustainable transport modes. EU funding, which has been largely concentrated on sustainable transport modes (notably on rail and inland navigation axes) has been indispensable but can deploy its full benefits only when linked with a strong policy on multi-modal infrastructure. This situation led the Commission already to strengthening the connection between land transport corridors and the maritime dimension of the TEN-T; thus to better integrate core network corridors and ports / motorways of the sea. Amongst the further paths for improvement, which have been identified and put on track by the Commission already, is the strengthening of freight terminal infrastructure in the context of the revision of the Combined Transport Directive and its integration with the TEN-T Regulation.

In the field of passenger mobility, it should be noted that infrastructure improvements through TEN-T are only one of the means to improve passenger mobility. Indeed, pricing and ticketing, timetabling and availability as well as reliability of services play an important role. When it comes to infrastructure, the Commission still expects a more in-depth assessment of the effectiveness of air–rail connections and suggestions for possible enhancement, resulting from an ongoing study. Stakeholders participating in

consultations (OPC and surveys), finding from case study n° 8 as well as from specific expert work of the Commission hint to possibilities for enhancing effectiveness by addressing weaknesses in seamless mobility chains for passengers. Inter alia they see important potential in the strengthening of railway stations as genuine transfer hubs between TEN-T and last mile journeys.

In the framework of the main evaluation study, the case study on "Seamless and barrier-free mobility for the trans-European passenger" (case study n° 8) has explored the effectiveness of the TEN-T Regulation in stimulating sustainable user services of high-quality in more detail. Furthermore, the case study on "Digitalisation" (case study n° 6) has addressed aspects of importance to the facilitation of seamless and sustainable user services.

*Seamless and barrier-free mobility for the trans-European passenger (Case study 8):*

Regulation n° 1315/2013 includes, in the Article on New Technologies and Innovation (Article 33), references to issues such as integrated ticketing or the coordination of time tables; thus to – service related requirements which should be enabled by TEN-T action. Some pilot action has been promoted on this basis, for example in fields such as Mobility as a Service, promoting data sharing between companies.

Case study n° 8 found that TEN-T policy has been quite effective in enabling passenger hubs to fulfil their transfer function (around 75% agreement rate in surveys). However, only 30% of survey respondents saw the TEN-T as sufficiently effective in enabling them to carry out the entirety of trips along the TEN-T in accordance with their expectations.

The case study led to the clear suggestion that TEN-T policy should adopt an integrated approach under the user's perspective, taking into account service requirements. Examples for such requirements given by stakeholders included: provision of complete and reliable information across all modes of transport from door-to-door; user-oriented design of hubs, also in intermodal transport; integrated ticketing for the complete traffic route; coordinated travel chains. In addition stakeholders highlighted that stronger connections with the ITS Directive and other relevant EU policies would ensure that developments on passenger services are harmonized and not overlapping, as well as guarantee greater focus on user needs. Furthermore strengthening the role of urban nodes would enable a seamless flow of passengers between the core and local networks and strengthen more sustainable transport modes in urban areas.

A specific dimension of case study 8 addressed the accessibility and mobility of all transport users. In this respect, the TEN-T Regulation aims to ensure, inter alia, accessibility for elderly people, persons with reduced mobility and disabled passengers. Furthermore, Article 37 on accessibility for all users includes a provision that the design and construction of TEN-T infrastructure should comply with the relevant requirements in Union law, to allow seamless mobility and accessibility for all users. However, at present, besides Member States' procedures, there is no system or framework to check or to monitor whether these standards are systematically implemented (e.g. along the core network or at multimodal connecting points or terminals), and if not where these issues are located and how severe these are[89].

[89] It should be noted that for railway stations, the PRM-TSI "Technical specification for interoperability relating to accessibility of the Union's rail system for persons with disabilities and persons with reduced mobility" (Regulation (EU) 1300/2014) impose the legal obligation to use the European register for the accessibility of the rail stations. This registry is being managed by ERA, but the timeframe for MS to populate data spans for several years, starting from new or upgraded infrastructure and to progressively be introduced to the remaining stations.

However, the full implementation of technical specifications for interoperability related to accessibility of the Union's rail system for persons with disabilities and reduced mobility (PRM-TSI)[90] will give a boost in this situation[91]. More generally, online survey respondents to case study 8 were divided on the appropriateness and effectiveness of the TEN-T Regulations provisions on accessibility (specifically for elderly people, passengers with reduced mobility and passengers with a disability).

*Digitalisation (Case study n° 6)*

Digitalisation plays an increasingly important role in enabling smooth, safe, efficient and sustainable user services in the passengers and freight sector. In particular on freight, the work of the Digital Transport and Logistics Forum (DTLF) aims at enhancing the effectiveness of services (building on current TEN-T provisions on sustainable freight transport services, innovation and telematics).

Findings from Case Study 6 showed mixed views on the contribution of digital aspects to the achievement of the Regulation's objectives of ensuring smooth, safe and sustainable transport flows. For freight and logistics, respondents did see a clear contribution of digitalization aspects to safe and smooth transport flows mainly as a result of the combined contribution of TEN-T and other initiatives ongoing in parallel.

For passenger transport, the situation was slightly less positive. The main barrier identified was the lack of 4G and high-speed mobile internet availability in a number of areas which restricts the use of digital solutions. Given that many solutions for passengers are mobile phone based, this basic connectivity is an important condition for the effective deployment of digital solutions (Even though it is outside the scope of the TEN-T Regulation).

On the other hand, the evaluation pointed to positive examples of digital technologies in air transport. The desk research suggested that the SESAR project has so far contributed to promoting a common vision towards reaching the goals established for improving Air Traffic Management (ATM). The emergence of drone-related services is also prompting a surge of innovation in air traffic management, which the European Commission is championing through its U-space initiative for the safe and secure integration of drones alongside manned aviation.

### 5.2.4. Evaluation Question 7: How effective has the Regulation been in enabling and stimulating investment in a sustainable and decarbonised transport system? More specifically (in addition to more system-efficiency focused side addressed in question n° 6): To what extent has the implementation of alternative fuel infrastructure along the TEN-T been effective? How effectively has EU funding stimulated this process?

The European Green Deal[92] sets out ambitious targets for decarbonisation, calling for and proposing legal ways to ensure the European Union becomes carbon neutral by 2050. In

[90] Commission Regulation (EU) No 1300/2014 of 18 November 2014 on technical specifications for interoperability related to accessibility of the Union's rail system for persons with disabilities and reduced mobility.

[91] According to Commission Regulation (EU) No 1300/2014 as amended by Commission Implementing Regulation (EU) 2019/772, Member States are required to collect accessibility data by June 2022.

[92] COM(2019) 640 Final - Communication from the Commission to the European Parliament, the European Council, the Council, the European Economic and Social Committee and the Committee of the Regions - The European Green Deal

this context, the transport sector is committed to reach a 90% reduction of greenhouse gas emissions by 2050, compared to the 1990 level. TEN-T policy plays a key role as provider of an integrated and all-encompassing infrastructure network and as the "hard" basis for the provision of charging and refuelling infrastructure for low and zero emission vehicles, aircrafts and vessels.

From evaluation question n° 6, it comes already out rather clearly that investments in TEN-T have been successful notably in one respect: Removing bottlenecks and filling missing links along major TEN-T axes and – in a reasonable way – integrating urban and transport nodes into the network and enhancing their connectivity and functionality. The overwhelming part of TEN-T financing, both investment from Member States and relevant funding from EU sources, have contributed to this objective. In the course of the evaluation period, roughly 40 billion Euro have been spent every year for this purpose along the core network, both from national and EU sources (also including EIB loans). By focussing funds from EU sources, notably from the Connecting Europe Facility and the Cohesion Fund, on the highest network development priorities and the most sustainable transport modes, effective contributions have been made to enhancing the physical basis for sustainability and decarbonisation. Besides this, Member States and a broad range of public and private investors have implemented – with or without EU support – a large number of complementary "soft-type" TEN-T projects in support of decarbonisation and sustainability objectives (e.g. intelligent transport systems).

However, the findings from question n° 6 above show also that potential benefits remain unused, given that infrastructure development possibilities from the perspective of user services are not yet fully exploited. Ultimately, decarbonisation effects are generated from an efficient use of the infrastructure; from innovative and sustainable transport and mobility solutions along the TEN-T and from a strong shift to sustainable modes. Reasons behind effectiveness shortages in this area are varied and include: a lack of a broader user perspective in the TEN-T Regulation (see question n° 6 above); difficulties in generating and implementing relevant action due to complex governance issues; unlike for larger infrastructure projects - funding frequently based on individual projects rather than on more holistic approaches which reflect broader transport policy objectives.

This suggests that: Indeed, investments have been strongly concentrated on the development and gradual completion of the physical network structure and on coherent and interoperable technical standards. Nevertheless, this has not yet been sufficiently translated into a strong boost of integrated, highly efficient and sustainable services and may have given away efficiency gains with a view to decarbonisation. Intelligent transport services in all modes, however, have been already quite effective in this respect.

Quantifying the specific impacts of ITS deployment is not easy, as so many different factors can contribute to improvements in road safety, traffic congestion and emission reductions. Thankfully, specific evaluations of ITS implementations along the ITS corridors and TEN-T Core Network Corridors, harmonised and coordinated by the EU EIP project, have researched and highlighted the benefits of ITS for road users, in terms of less hours spent in (congested) traffic, reduction of injuries and fatalities, but also the reduction of CO2-emissions to the benefit of everyone. The returns on investment for these projects were achieved between 3 to 5 years.

The EU EIP has developed common KPI definitions, levels of service definitions and an Evaluation Toolkit[93] to support any ITS-related project in gaining a better understanding of the effects of their implementation. The Toolkit has been developed into a publicly

[93] (https://evaluation.itsplatform.eu/EvalLib).

accessible online tool for searching ITS Evaluation results by 6 key criteria (Deployment KPI, Benefit KPI, Location, Corridor, ITS Directive Priority Area and ITS Directive Priority Action) and enables users to directly locate Evaluation Reports. The Toolkit was launched in 2019 and will continue to be periodically updated as new results become available.

The second key pillar of enhancing sustainability and contributing to greenhouse gas reductions in transport concerns the provision of recharging and refuelling infrastructure for zero and low emission mobility along the TEN-T. The findings of the main evaluation study as well as a wide range of other evidence from expert associations and the Commission's own analysis show one particularity in TEN-T policy: a quite general provision in Regulation n° 1315/2013 (under "innovation", in Article 33) has triggered enormous action to stimulate alternative propulsion systems, in particular electro-mobility. In the early phase of the time-period under evaluation, a number of pilot projects was stimulated with support from the Connecting Europe Facility.

Gradually, the scope of such action was growing. In addition to CEF, the Blending Facility (bringing together CEF grants, financing from implementation partners and project promoters as well as, where appropriate, from International Financial Institutions), has contributed to a massive increase in the deployment of charging points. Between 2013 and today, 12100 charging points where deployed with EU support in the field of TEN-T, covering both the TEN-T road network as well as urban nodes. In spite of the absence of specific TEN-T standards, EU funding was granted on the basis of a number of basic conditions, including open access, data sharing arrangements or the availability ad hoc payment possibilities. While the large number of charging points appears impressive, it masks the fact that there is a lack of balanced geographical coverage across the Union. Commitment for charging correlates with vehicle market prospects.

The advancement in high-level political agreements towards a carbon neutral economy has entailed fast developments on legislative initiatives in transport in relation to recharging and refuelling infrastructure for zero and low emission mobility. In particular the Alternative Fuels Infrastructure Directive (AFID) as well as the Fuel EU Maritime Initiative and the ReFuel Aviation Initiative– - all in the process of preparing new legislation - are directly related with TEN-T policy. Relevant binding requirements would have to be integrated into a revised TEN-T Regulation, thereby ensuring a coherent coverage of recharging and refuelling infrastructure along the whole TEN-T.

Both stakeholder consultations and literature review, undertaken in the main evaluation study, also clearly underpinned this conclusion. There are strong calls for more specific, binding requirements in the new TEN-T Regulation which set a clear framework for action and ensures continuity and coherence along the trans-European network.

### 5.3. EFFICIENCY

Efficiency considers the relationship between the resources used by an intervention and the changes generated by it. Efficiency analysis aims to assess whether the benefits of the TEN-T Regulation are perceived as proportionate and reasonable when compared to the costs of its implementation, governance and compliance. Costs are understood in a broad sense, considering not just monetary costs, but also the administrative burden.

#### 5.3.1. Evaluation Question 8: Are the costs of the Regulation (mainly governance and advice mechanisms of the CNCs) and the sharing of responsibility between the different actors reasonable and proportionate in relation to the benefits? Are the reporting and monitoring provisions clear, simple and easy to report? To what extent was the application of innovative, technological and operational concepts cost efficient?

*Extent to which cost of governance and advice mechanisms (Coordinators, stakeholder fora, committees, work plans etc.) of the Core Network Corridors are reasonable in relation to the benefits*

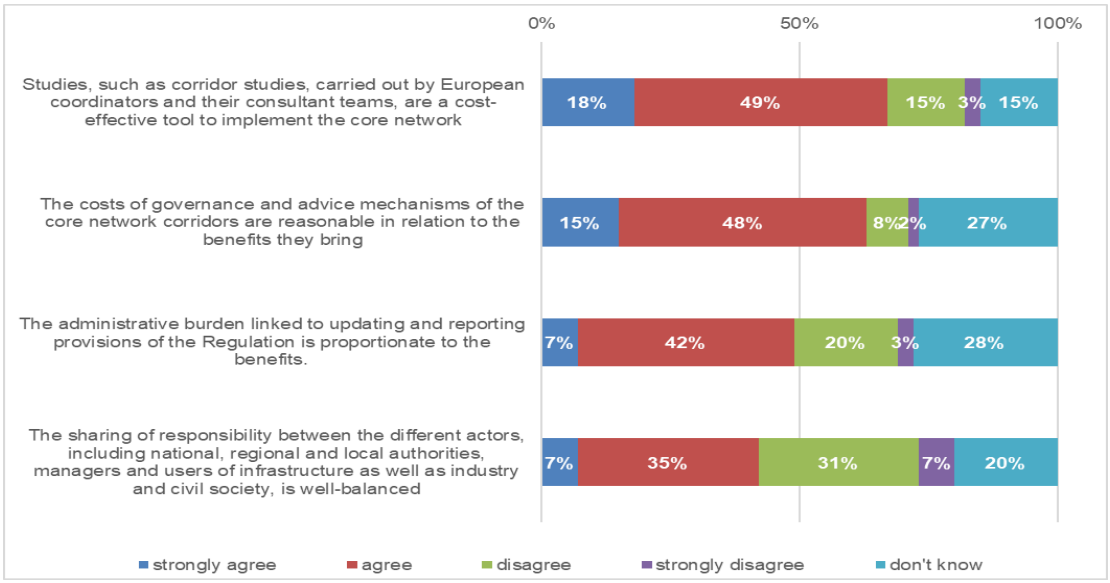
Evaluation findings suggest that the cost of governance and advice mechanisms are generally reasonable, but suggestions were made to improve their efficiency. Evidence from the global desk research pointed out that the TEN-T corridor approach is recognised as a multi-level governance system which has brought transport stakeholders (such as representatives of EU regions and infrastructure managers of all modes) to work together and has effectively focused on delivering EU added value.[94]

Most respondents from the global survey (67%) agreed or strongly agreed that studies, such as corridor studies, carried out by European coordinators and their consultant teams and the related corridor fora and working groups, are a cost-effective tool to implement the core network. Furthermore they stressed that the cost of governance and advice mechanisms of the core network corridors are reasonable in relation to the benefits they bring (63%). These findings were confirmed in Case study N°2.

Interviewees from the global interviews expressed a more nuanced view on this question. Some mentioned that they found that costs and workload are appropriate and echoed the sentiment that the "benefits have outweighed the costs by far". Other interviewees felt that the governance and advice mechanisms are time-consuming (participation in corridor fora, revisions of work plans) and did not see added value of certain reporting provisions, such as regularly updating project lists. Personnel and travel costs (mainly to attend meetings of the corridor fora) were highlighted by interviewees as the main costs with regard to governance and advice mechanisms.

[94] Delivering TEN-T – Facts & Figures, 2017, EC

*Figure 5: Cost effectiveness of different elements of Regulation 1315/2013 (n=198)*




*Source: Support study for the evaluation of Regulation (EU) N° 1315/2013 – global survey*

Given the length and complexity of the core network corridors in their geographical representation (above 9000 km in some cases, including all transport modes and hundreds of important transport and urban nodes), the capacity deployed (staff and time) in relation to the analytical and coordination challenges involved is modest. In spite of this constraint, the identification and prioritisation of projects from a corridor-wide perspective has been seen as effective and beneficial. This was, amongst others, endorsed in regular exchanges of views between European Coordinators and the Committee on Transport and Tourism of the European Parliament.

Requests especially in the OPC, from regional authorities and economic operators (business associations or transport service providers), to complement, adjust or combine corridor alignments, hint to certain difficulties in matching geographical corridor routes with transport demand[95]. Related to this, also the overlapping of corridor alignments (about 15% for rail) entails some questions when it comes to identifying, prioritizing and implementing projects from the perspective of the overall corridor functionality and use. In the case of the study on the impact of TEN-T completion on growth, jobs and environment, for example, the assessment of economic impacts of TEN-T investment was confronted with methodological difficulties and the risk of project double counting resulting from corridor overlaps. This problem may possibly increase when – as it is called for in the global survey and in interviews as well as in several case studies - the focus of TEN-T infrastructure on zero and low emission mobility, digitalization and new technologies or urban nodes would be reinforced. It should be noted that at least in the case of member states, which have the highest reporting burden of all actors, costs related to TEN-T governance (travel, personnel) can be covered by so called Programme Support Actions financed through the CEF programme.

Looking at these PSAs over the last years allows to get a rough impression of MS financial burden with regard to the participation and contribution in the governance of the TEN-T regulation. From 2014 – 2017 figures show that MS on average claimed costs of

[95] This demand relates to corridor alignments and not to the TEN-T network as identified in the TEN-T Regulation.

84.500 EUR annually for participation in corridor fora, working groups and TEN-T days as well as delivering input to corridor studies and corridor work plans. Only some Member States use these support actions to support their filling of the TENtec database. When putting these figures into relation with the number of TEN-T corridors per MS one gets to approximate costs of 20.000 EUR annually per TEN-T corridor per MS.[96]

*Extent to which the sharing of responsibility between the different actors is reasonable in relation to the benefits*

The way responsibilities between the actors involved in implementing the TEN-T regulation are shared were generally seen as an area were improvements would be needed. Among the respondents to the global survey, only 42% agreed or strongly agreed that the sharing of responsibility between the different actors (including national, regional and local authorities, managers and users of infrastructure, as well as industry and civil society) is well-balanced, while 38% disagreed or strongly disagreed with this statement (see figure 5 above). Interviewees where more positive on this topic and added that the sharing of responsibility between the different actors promotes an effective and efficient way of working towards achieving the TEN-T objectives.

Nevertheless, a few national authorities held a more critical view, noting that a disproportionate share of responsibility rests on national governments and other public authorities in contrast to stakeholders from the private sector. At the same time, Member States' paramount responsibility for planning, financing and implementing TEN-T projects (notably the filling of missing links and the removal of bottlenecks along rail, inland waterway and road axes) is inherent in the basic principles of TEN-T policy. The results of the study on national plans and programmes (see chapters 3 and 4), assessing Member States' compliance with their responsibilities in ensuring the achievement of TEN-T objectives respectively at national level, provide a sound evidence that the majority of Member States acknowledges this responsibility and is fully committed to it.

On the other hand, in the broad range of survey activities, interviews, the different case studies and the Commission's expert work, significant responsibilities of non-state actors are appreciated. Stakeholders like the European Seaport Organisation (ESPO) or INE, as well as CPMR of individual ports (participating in the OPC and being very active in the targeted stakeholder consultation) show that they are strongly and actively committed to contributing to TEN-T policy. In contrast, with a view to the current lack of appropriateness of the TEN-T in areas such as infrastructure for zero and low emission mobility as well as for digitalisation and other innovative technologies (coming out from a broad range of stakeholder opinions) private sector actors are indeed called upon to assume much stronger responsibility.

While Member States largely stand by their (formal) responsibility for TEN-T implementation, case study n° 2 also enquired about the extent to which Member States feel accountable for their respective contribution to the common objective of completing the TEN-T fully and within the agreed time horizon. In this respect, interviewees agreed that there is a lack of accountability. Part of the Member States still seemed to undervalue the incentive and additional benefits of aligning action across all Member States.

This was underpinned by the opinion of an interviewee who felt that the TEN-T Regulation gave limited powers to the Commission for ensuring that Member States effectively implement projects in line with the agreed planning. In cases where political

[96] It shall be noted that these are very rough estimates. Not all MS make use of PSAs and the items financed by the grants varies greatly. Although the co-financing rate is at 100% some MS cover additional costs through their own budget.

will or funding are limited, the Commission lacks the means to effectively enforce the implementation of projects. This has also been highlighted in a recent European Court of Auditors report[97]. Consequently, in case study n° 2, interviewees saw possibilities for improving the accountability of Member States through agreements with the Commission on binding timelines for the implementation of individual projects, including a stronger role of European Coordinators in enforcing such agreements. This would also help setting a clearer perspective and commitment in terms of national financing and EU support. Not least, this could also strengthen the political responsibility for TEN-T project implementation at national level, in response to certain tendencies (as perceived by some interviewees) of blaming Europe for failure and claiming success at national level.)

In principle, Article 47(2) of the current TEN-T Regulation allows such agreements already. It grants the Commission the power to adopt implementing acts for the cross-border and horizontal dimensions of the core network corridor work plans. However, it has been used only to a limited extent. So far there are Implementing Acts for three such projects: for the Evora-Merida[98] railway line between Portugal and Spain, for Rail Baltica between Estonia, Latvia, Lithuania and Poland[99] as well as for the canal Seine-Scheldt[100] between France and Belgium.

In addition to this assessment, and to first responses at the level of cross-border sections and significant corridor sections, the study on 'national plans' and programs assessed the sharing of responsibility – especially between Member States and the Commission – at a more strategic level. In spite of a good coverage of TEN-T objectives in relevant national plans and programmes, it also identified some shortcomings in the alignment. On this basis, this study suggests to consider means of reinforcing legal obligations for Member States in order to ensure complete coverage of TEN-T objectives at the level of Member States.

*Extent to which reporting and monitoring provisions are clear, simple and easy to report*

About half (49%) of all global survey respondents agreed or strongly agreed that the administrative burden linked to updating and reporting provisions of the TEN-T Regulation is proportionate to the benefits. While 23% disagreed or strongly disagreed with this statement, 28% reported that they "did not know". Member states authorities interviewed were more critical on this point especially when asked about the existing reporting tools. While recognising the need and usefulness of reporting and monitoring tools, interviewees mentioned existing issues in relation to TENTec such as:

- sections defined in TENTec not matching sections defined at the national level, making data entry complex[101];
- data for reporting and monitoring not being available in the required format, so often not included;

[97] https://www.eca.europa.eu/en/Pages/DocItem.aspx?did={28F30B2D-1A5F-45D0-B2D4-F007F2F3811F}

[98] https://ec.europa.eu/transport/sites/transport/files/c_2018_2356_f1_commission_implementing_decision_v2_p1_972036_en.pdf

[99] https://op.europa.eu/en/publication-detail/-/publication/75c54c39-e867-11e8-b690-01aa75ed71a1/language-en/format-PDF/source-105190645

[100] https://op.europa.eu/en/publication-detail/-/publication/87fc6dc1-9bd4-11e9-9d01-01aa75ed71a1/language-en/format-PDF/source-search

[101] The issue of sectioning within TENtec is due to technical developments which happened at different speeds at EU and at national level. The Commission is currently preparing a revision of the TENtec system which will among others address such issues (e.g. "dynamic sectioning").

- duplication with other reports (e.g. those submitted to the Innovation and Networks Executive Agency - INEA)

Interviewees agreed that there is scope to improve the system, for example automating and better linking the information. However, many also recognised that as a new system, it requires time for familiarisation and that in the future reporting and monitoring on TENTec should become less burdensome. Although not necessarily involved in TEN-T reporting 42% of Open Public Consultation respondents had previously used the TEN-Tec system. Of those, the majority (59%) reported that they found it 'very useful' or 'useful' while (36%) considered it only somewhat useful.

*Extent to which application of innovative technological and operational concepts were cost efficient*

There was limited information from the evaluation on this sub-question due to a lack of information in literature as well as limited stakeholder understanding.

### 5.3.2. Evaluation Question 9: How efficiently is the integration of Core Network Corridors and Rail Freight Corridors based on the Regulation on a "European rail network for competitive freight" working[102]? To what extent has, the TEN-T regulation addressed key efficiency measures and enabled efficient use of TEN-T infrastructure for freight transport and high quality and innovative passenger mobility services[103].

*Extent to which the integration of the Core Network Corridors and Rail Freight Corridors have addressed key efficient measures*

The RFCs and CNCs are two complementary EU transport policy tools, pursuing the same objectives, in particular modal shift. Since entry into force of the TEN-T Regulation, the RFCs are considered as the rail freight backbone of the CNCs.

Cooperation between the two structures is already addressed in legislation, in Article 48 of the TEN-T regulation ("adequate coordination shall be ensured") and in recital 10 of the RFC Regulation (which requests consistency between the implementation of the RFCs and the TEN-T network, at a time when the CNC concept did not exist).

Cooperation and coordination between the two structures and their stakeholders have been set up as from the creation of the CNCs. There have been many initiatives, good practices, past or ongoing, going from mere exchange of information to defined activities to achieve a commonly agreed goal. Such cooperation has been done mainly on a corridor basis - although there have been a few horizontal and harmonised initiatives over the years – with the Coordinators' involvement.

In this respect, a few observations can be done:

- The competences and areas of intervention of the two corridor governance structures are largely of different nature. The RFCs are mainly focused on operations and dealing with timetabling, traffic management, removal of administrative and

[102] There is an ongoing evaluation of the RFC Regulation, which should, when available, provide specific findings on this particular topic that could complement the findings from the current TEN-T evaluation.

[103] This final sub-question might be more adequate to contribute to another evaluation question with a focus on passenger transport, as the present evaluation question is more connected to freight transport. Nevertheless, it has been decided to maintain the question structure as the sub-question also falls under the evaluation criterion of efficiency

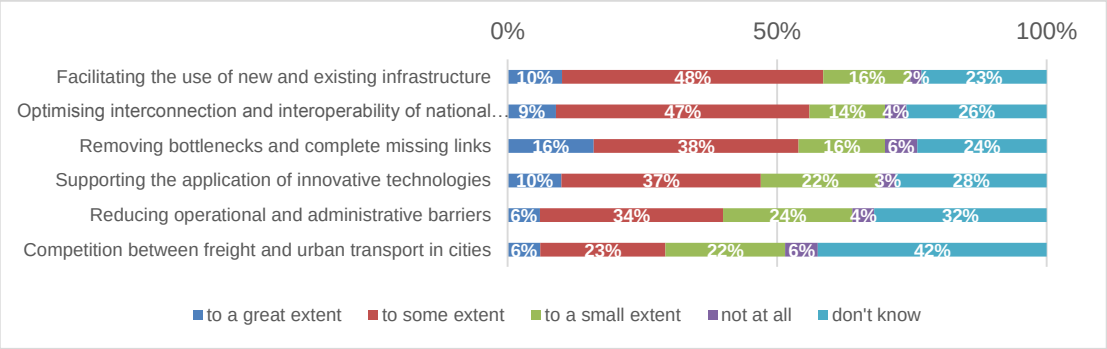
technical barriers, performance monitoring and development of services. In particular, the RFCs need to be close to market needs, while TEN-T infrastructure development requires long-term project and investment planning. This obviously justifies differences in organizational structures and stakeholder involvement.

- The RFCs have a competence as regards infrastructure development and its coordination across borders (Article 11 and recital 16), in particular the drawing up of an investment plan of medium and long-term investment for infrastructure, including a list of projects and a plan for removing identified bottlenecks. The entry into force of the TEN-T Regulation and the creation of the CNCs has raised and raises questions on the status of those provisions. Besides, given the on-the-ground expertise of the RFC stakeholders, there is potential for increased synergy RFC/CNC in terms of identification of investment needs and investment planning for rail freight.
- Although the geographical alignment is largely the same, since the TEN-T Regulation has aligned in 2013 the nodes of the RFCs with those of the CNCs, there are still differences. These differences makes coordination more complex, for instance when it comes to planning the deployment of the TEN-T parameters for freight, or to determining the scope of the transport market studies.
- There are two main reasons for this misalignment. First the RFC Regulation allows for the creation of new corridors and the extension of existing corridors, upon request of the Member States. Second, there can be different railway lines linking a given pair of nodes resulting in a different choice for the RFC and for the CNC (especially when a line is more dedicated to freight traffic).
- Linked to the above, despite Article 48 of the TEN-T Regulation, there is a certain degree of overlapping of activities (e.g. as regards transport market studies or studies for the deployment of the TEN-T parameters).
- In terms of overall visibility and communication of the Commission transport policy, vis-à-vis the sector, citizens and public authorities, the co-existence of two different concepts of corridors is sometimes difficult to explain.

However findings from the global survey, interviews and case studies also confirmed broad agreement that cooperation of the Core Network Corridors and Rail Freight Corridors has addressed key efficiency measures, namely the removal of bottlenecks, the bridging of missing links as well as the optimisation, interconnection and interoperability of national transport networks.

Looking at the sources individually most respondents from the **global survey** agreed or strongly agreed that cooperation between core network and rail freight corridors has addressed key efficiency measures in a number of areas. More specifically, more than half agreed or strongly agreed that the cooperation between the CNCs and RFCs has facilitated the use of new and existing infrastructure (58%); helped to optimise interconnection and interoperability of national networks within the European transport network (56%); and has contributed to removing bottlenecks and bridging missing links (54%).

*Figure6: In your view, to what extent has the cooperation between core network and rail freight corridors addressed key efficiency measures in the following areas (n=198)*




Source: Support study for the evaluation of Regulation (EU) N° 1315/2013 – global survey

There was less agreement that the cooperation between core network and rail freight corridors supported the application of innovative technologies (47%), reduced operational and administrative barriers (40%) and addressed the issue of completion and thus capacity between freight and urban transport (29%).

There were significant differences between EU regions, with global survey respondents from Western Europe rating the extent to which cooperation between core networks and rail freight corridors addressed key efficiency measures pronouncedly lower in all areas, compared with respondents from the remaining regions.

Additional contributions to the OPC highlighted that the responsibilities between RFCs and TEN-T CNCs in the field of investment planning indeed need clarification. Furthermore activities between the two should be better coordinated and promoted at EU level, to enable an efficient functioning of the networks across the Union.

Findings from case studies 2, 3 and 4 show mixed opinions regarding the degree to which the integration between CNCs and RFCs has been efficient (see box below). While stakeholders generally confirm that, there is a very close relationship between the RFCs and the CNCs they also highlight the need for clarification of the different roles and competences of CNCs and RFCs, and thus confirm the observations above:

- The RFCs geographical alignments reflect market needs for rail freight. Therefore, the alignments are partly different from the alignments of TEN-T-corridors.
- Provisions should be included in the new TEN-T Regulation, enabling the RFCs to provide input into the development of the CNC work plan, including their investment needs for all core lines and core terminals designated to a specific RFC.
- Provisions concerning the relation between RFCs and CNCs should not undermine the CNCs' main responsibility for drafting the investment plans and should in no way infringe on the roles and competencies of the RFCs.

In summary, RFCs are broadly aligned with the TEN-T corridors in geographical terms. However, their objectives differ and are complementary. While the TEN-T deals with infrastructure construction and project identification, the RFC look at the operational and customer side (timetabling, slot allocation etc.). Alignment of investment planning and project identification between the two legislations shall be ensured. The full benefit of the RFC will only materialize once the underlying network has been developed.

*Extent to which the Regulation enables efficient use of TEN-T infrastructure for freight transport*

Freight transport and logistics are key for European industry competitiveness and sustainable growth but depend on a high-quality transport infrastructure network that

allows efficient, seamless, cross-border co-modal transport. In this regard the TEN-T Regulation establishes that in order to ensure the international mobility of passengers and goods, the capacity of the trans-European transport network and the use of that capacity should be optimised by removing infrastructure bottlenecks and bridging missing infrastructure links, thus enabling the efficient use of TEN-T infrastructure. As has been shown in other parts of this document there has been significant progress in implementing the TEN-T network. In the corridor studies and work plans of the European coordinators it is widely acknowledged that implementing the requirements set in the regulation has made the network more efficient. However, given the completion deadline for the core network being 10 years away major bottlenecks and missing links still need to be addressed and the full network benefit has not yet been achieved. For example implementation rate of ERTMS (see chapter 3) remains low, the requirements for 740m trains and minimum 22.5t axle weight are not yet available throughout the network and sufficient multimodal terminal infrastructure is often still lacking throughout the territory. This is penalising the competitiveness of rail freight. In particular the possibility to run 740m long trains would create immediate capacity gains and trains productivity gains. In addition, while the completion of major infrastructure projects such as the HSL Munich-Berlin (see chapter 3), the HSL London-Paris-Brussels-Amsterdam-Cologne or the Oresund fixed link have greatly improved the efficiency of the transport system other major cross-border links such as the Brenner Base tunnel or Rail Baltica are not yet completed.

The efficient use of TEN-T infrastructure requires the development of the network as foreseen in the Regulation as a necessary conditions, but further conditions for the efficiency of the network are determined in complementary legislation. An example here are pricing and tolling approaches that can affect modal choice and thus the efficient use of the infrastructure available. However, such measures are determined by MS individually. Another example is the priority setting by Member States in infrastructure construction and maintenance investments.

The most noteworthy contributions on this question have been collected through the OPC. Here survey participants were asked to provide their feedback on the extent to which the TEN-T guidelines achieved a better and more efficient use of existing and new infrastructure while increasing benefits for the users. While thirty-two percent of respondents asserted that the Regulation either completely (10%) or mostly (22%) helped to increase the efficiency of infrastructure use and provision in the EU overall and 40% reported that it partly helped the picture for the freight sector was much more negative. Here only 7% of respondents indicated that the aim had been mostly met, while the broad majority was split between those who reported that the objective had been partially met (63%), those who believed that it had not been met (16%) and those who did not have an opinion on this particular aspect. In addition participants from the OPC recommended the adoption of a new EU KPI on infrastructure safety in TEN-T policy and along the TEN-T network in order to ensure a better and more efficient use of existing and new infrastructure.

*Extent to which the Regulation enables the efficient use of TEN-T infrastructure for high quality and innovative passenger mobility services*[104]

This question has been replied to under evaluation question N° 6.

### 5.4. COHERENCE

The evaluation of coherence involves assessing whether or not different actions work well together. It helps highlighting areas where there are complementarities or synergies, which improve overall performance; or sheds light on issues that are contradictory or cause inefficiencies. In the evaluation both the "internal" coherence - how the various provisions and requirements of the TEN-T Regulation to achieve their objectives – and the "external" coherence – the alignment of the TEN-T Regulation with other EU policies in transport and relevant areas - have been assessed.

#### 5.4.1. Evaluation Question 10: How coherent and consistent are the requirements and provisions set out in the Regulation with one another and with related transport policy fields? To what extent are there differences, overlaps and/or inconsistencies?

*Coherence of provisions with one another*

Most respondents to the global survey agreed or strongly agreed that the different provisions of the TEN-T Regulation are coherent among themselves (79%). Also stakeholders taking part in the global interviews did not see major contradictions or overlaps. Respondents to the Open Public Consultation came to a similar conclusion but also considered that there are a number of gaps and inconsistencies in the TEN-T Regulation.

68% of the respondents to the global survey, for example, saw incoherencies between the provisions for the different transport modes Stakeholders from the maritime sector (notably from ports) who took an active part in the different consultations, pointed to the complexity of the eligibility criteria for Motorways of the Sea and underlined their strong similarity with cross-border projects for land transport modes. They also questioned the differentiation between "tourists" and "passengers" - which is made in no other sector. Stakeholders from the inland waterway sector saw incoherencies. Especially the findings in the maritime sector are strongly confirmed by expert work within the Commission, which is underpinned by external expert groups around definitions such as "core" and "comprehensive" inland ports.

In spite of the fact, that the majority of the respondents to the different surveys saw a large level of inner coherence between the provisions of the Regulation, the disagreement rate remains high and calls for efforts to enhance this coherence.

**Gaps and inconsistencies in the Regulation as seen in the OPC, various targeted stakeholder consultations and internal analysis of the Commission**

- Incoherencies between the provisions for the different modes, for example in terms of priority setting (very challenging on inland waterways; lacking attention for national specificities in rail, different levels of detail and clarity – for example lack of clarity around power supply and LNG terminals in seaports).
- Incoherent provisions for the enabling of services for passengers on the one hand and for freight on the other (the lack of a passenger perspective is, for example, highlighted in case study n° 8)
- Repetition around multi-modal infrastructures, where many of the provisions apply in a similar way to the different terminal types and could benefit from horizontal streamlining (support in OPC and strongly underpinned by the Commission's own expert analysis)
- Incoherencies between objectives, measures and priorities within the provisions of the Regulation

- Incoherencies between common provisions of the TEN-T Regulation, in level of detail and clarity or applicability/relevance, e.g. in relation to urban nodes, safety, security, resilience or freight services (results from case study findings, for example n° 1, 3, 4, 6, 7, 8 as well as from own expert work of the Commission, backed by expert group input).
- Need for clearer links between Motorways of the Sea and the Core Network Corridors;

Besides the assessment of the current provisions of the Regulation, stakeholders also looked for coherence with new developments, notably on military mobility and infrastructure for zero and low emission mobility. In such areas, the Regulation lacks relevance (see EQs 2 and 3), and the evaluation recommends adjustment of the Regulation to ensure coherence in the future.

*Coherence of provisions with other transport policy fields*

As outlined in previous chapters the TEN-T infrastructure policy is directly linked to most other transport policy areas such multi-modality, alternative fuels, digitalisation, freight and passenger transport services, automation etc. Indeed, TEN-T does not only complement such initiatives but is rather the infrastructural basis for them to function. For example, there cannot be modal shift without the respective infrastructure in sufficient capacity in place. However, looking at the coherence with those other transport fields the evaluation has found that even though the provisions of the TEN-T Regulation are mostly coherent with developments in other transport fields, rapid developments in some areas are putting this coherence into question.

In this vein, most respondents to the global survey agreed or strongly agreed that the provisions in the TEN-T Regulation are coherent with other ongoing and expected developments in most transport policy areas such as multi-modality (69% agreement); alternative fuels (68%); digitalisation (68%); new technologies (65%); freight transport services (64%); passenger transport services (60%); automation (54%). Agreement was less pronounced in the field of accessibility for all (49%) as well as in the area of new mobility schemes (46%). Respondents to the OPC, partly asked about the same policy fields (e.g. on alternative fuel infrastructure or an automation) and partly about different ones (e.g. urban mobility or new mobility patterns), on the contrary, saw a high degree of incoherence. Only one third found the Regulation to be coherent with ongoing and expected future developments. Interviewees called in particular for strengthened provisions to accelerate decarbonisation in transport and meeting the EU climate-neutral vision laid down in the "A Clean Planet for All" Strategy[105] (see also EQ 1 on Relevance).

Evaluation findings related to coherence with connected policy areas are further detailed below.

*Coherence with urban mobility policies*

Findings from the desk research carried out under Case Study 1 underpinned by stakeholders interviewed showed a certain degree of coherence between urban mobility policies and the provisions of the TEN-T Regulation on urban nodes, specifically highlighting Sustainable Urban Mobility Plans (SUMPs) as potential good practices for the connection between TEN-T network infrastructure and local/regional infrastructure. However, planning principles, such as the top-down approach adopted at TEN-T level

[105] https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=CELEX:52018DC0773

and the approach for SUMP planning, as well as the single project focus on TEN-T level and the integrated measure packages for SUMP planning, were seen as contrasting.

Comments from online survey respondents in Case Study 1 highlighted that the Regulation lacks a focus on functionalities of urban nodes as hubs for both passenger and freight transport. In addition, survey findings also suggested that the scope on transport nodes is too narrow, as it excludes other relevant local/regional transport hubs. Moreover, uptake of innovative solutions in urban nodes are not considered to be adequately addressed in the Regulation's provisions.

*Coherence with developments in the field of alternative fuels*

The TEN-T Regulation foresees that alternative clean fuels shall be made available along the core network for maritime and inland waterway, road and air transport. As could be seen from the Commission's own work, this focus on the core network is too narrow to really help promoting the uptake of alternative fuels across borders and in all regions of the EU. Furthermore, these provisions lack specificity (while generally respecting the principle of technological neutrality), which entails risks of isolated approaches, cross-border discontinuity or technological barriers. This is due to insufficient requirements in the current AFID Directive which is therefore currently under revision in order to fill this gap. The TEN-T Regulation shall provide the geographical and infrastructural basis for the deployment of alternative fuels, but will not include new standards or requirements for alternative fuels going beyond what the new AFID Directive will define.

Consequently, respondents to the global survey stated a general lack of attention in the TEN-T Regulation on the development of renewable energy (infrastructure) and highlighted the need to speed up the deployment of a coherent and accessible cross-border infrastructure for alternative fuels. In this respect, the Regulation was found to be outdated and in need to be brought in line with the aspirations of the European Green Deal. Respondents particularly emphasised that deployment of the alternative fuel infrastructure needed to be made a general priority of the Comprehensive Network as it already is for the Core Network and that the TEN-T Regulation needed to fully recognise the electrification needs in both networks.

Relevant ongoing initiatives in the Commission have already fully integrated such stakeholder assessment. The TEN-T Regulation reflects the status of 2013 - in the field of alternative fuels as in many other transport policy areas. The EU Directive on Alternative Fuel Infrastructure[106] (AFID), setting more specific requirements – with a direct link to TEN-T core network infrastructure – was only adopted in 2014. Therefore, it will now be an obvious matter of coherence, to take up requirements from the AFID as new binding requirements in TEN-T. More importantly, given the fast developments in this sector and their key importance for decarbonisation in transport, the AFID is currently in the process of revision (legislative proposal foreseen for mid-2021). In order to ensure coherence, the evaluation points to a need of aligning TEN-T Regulation and the AFID which will be revised in future. In this context, the work of the Commission also confirms the need for an extension of binding requirements from the core to the comprehensive network.

[106] Directive 2014/94/EU of the European Parliament and of the Council of 22 October 2014 on the deployment of alternative fuels infrastructure

*Coherence with research and innovation policies, new technologies and digitalisation*

More than half (65%) of the respondents to the global survey agreed or strongly agreed that the provisions in the TEN-T Regulation are coherent with expected developments connected to ***new technologies***. However, findings from the desk research showed that the implementation of new technologies and innovation in the TEN-T network still follows an ad-hoc approach[107]. The deployment of new technologies is at times fragmented and unsynchronised and, the level of research and innovation maturity tends to vary between Core Network Corridors. In this respect several stakeholders interviewed in Case Study 4 argued that Article 33 of the TEN-T Guidelines on 'New Technologies and Innovation' could be reinforced to better support innovation by including testing, standardisation, certification and deployment stages for autonomous modes of transport.

As regards ***digitalisation*** the majority of respondents to the case study 6 survey (65%) agreed or strongly agreed that TEN-T projects in the field of digitalisation are coherent with or complementary to relevant research and innovation projects. However, less than half (39%) agreed or strongly agreed that the provisions of the Regulation are sufficient to ensure coherence between the deployment of digital infrastructure across the TEN-T network, with a larger percentage of respondents (49%) disagreeing or strongly disagreeing with the statement. An example for the deployment of digital infrastructure across the TEN-T to promote an innovative technology and to stimulate sustainable and attractive user services is C-ITS. The lacking relevance of the TEN-T Regulation for such future-oriented transport and mobility solutions was also highlighted in EQ 3 (reference to case study n° 4).

*Coherence with **ITS (road)** policy, including the basis for multi-modal and new mobility patterns*

Opinions of respondents to the global survey were divided when asked whether the provisions in the TEN-T Regulation are coherent with expected developments connected to new mobility schemes, with 46% who agreed or strongly agreed, 33% who disagreed or strongly disagreed. Stakeholders consulted in the framework of Case Study 4 expressed more positive views on this issue with more than half (58%) agreeing or strongly agreeing

An example of such a new mobility scheme can be found in the ITS Directive, referred to in Article 3 of the TEN-T Regulation. It can for example serve as a basis for the adoption of a coherent set of rules at EU level in order to create a single market for cooperative, connected and automated vehicles. In addition, the Delegated Regulations adopted on the basis of the C-ITS Directive, for instance on road safety, real-time-traffic and multimodal travel information, provide the necessary legal and technical framework to steer and ensure the interoperability of deployed ITS services along the TEN-T network. The Evaluation of the ITS Directive[108], pointed out that the integration of ITS applications and cooperative systems with transport infrastructure can improve efficiency, usability and reduce costs.

*Coherence with passenger rights legislation*

Passengers Rights is a field where constant progress has been made over the last decade. Better protecting consumers and allowing for EU-wide rules and procedures in case of delays and cancellations of transport services has been a clear EU priority. Although TEN-T is an infrastructure policy, its final aim is to enable seamless mobility for

[107] Issue Papers of European Coordinators - TEN-T Corridors: Forerunners of a forward-looking European Transport System, DG MOVE, 2016

[108] Commission staff working document Ex post evaluation of the Intelligent Transport Systems Directive 2010/40/EU {SWD(2019) 369 final}, 2010

passengers and freight across the EU. It can thus be a bridge for the different passenger rights legislations, especially regarding persons with disabilities and reduced mobility.

In this regard some stakeholders interviewed for Case Study 8 pointed out that it is important that TEN-T policy acts as a bridge for the different passenger rights legislations, especially regarding persons with disabilities and reduced mobility. However less than half of respondents to the online survey (19 out of 42) agreed or strongly agreed that the definition of accessibility (Article 37) in the TEN-T Regulation is coherent with other European policies, such as the European Accessibility Act and the Regulations on passenger rights.

*Coherence between passenger and freight transport provisions across modes*

Findings on Case Study 3 highlighted different views in relation to the coherence between passenger and freight transport in the different modes of Transport. Maritime, inland waterways and multimodal transport stakeholders argued that passengers are not duly taken into account in the TEN-T Regulation. On the other hand, stakeholders related to air transport emphasised the opposite, meaning that passengers are well covered while the same does not happen with air cargo.

### 5.4.2. Evaluation Question 11: How coherent is the TEN-T Regulation with other EU policy areas and other Trans-European network policies?

*Coherence with other relevant EU policies*

While the TEN-T Regulation naturally links to cohesion, internal market, urban and neighbourhood policies it also links to Digitalisation, Climate, Environmental, Energy, public health and Research policies via its provisions on Intelligent Transport Systems, Innovation and Alternative Fuels. Since adoption of Regulation 1315/2013, these policy areas have been quickly evolving especially with a view to Energy, Climate and Digitalisation policies and the political context has been dramatically changing most notably with the European Green Deal Agenda and the Climate Target Plan. For example the Green Deal calls for GHG emission reductions in the transport sector of 90% between 1990-2050 on the path towards climate neutrality of the economy overall.

Literature sources clearly point to the fact that the trans-European networks can help to deliver on long-term green and inclusive growth for the EU[109] and contribute to achieving European climate goals and the objectives from the COP 21 Paris Agreement.[110]

The results of the consultation activities undertaken in the course of the evaluation show that the TEN-T Regulation is perceived as coherent with regards to other EU policies to a certain extent, but further alignments are recommended to increase the impact of the Regulation going forward.

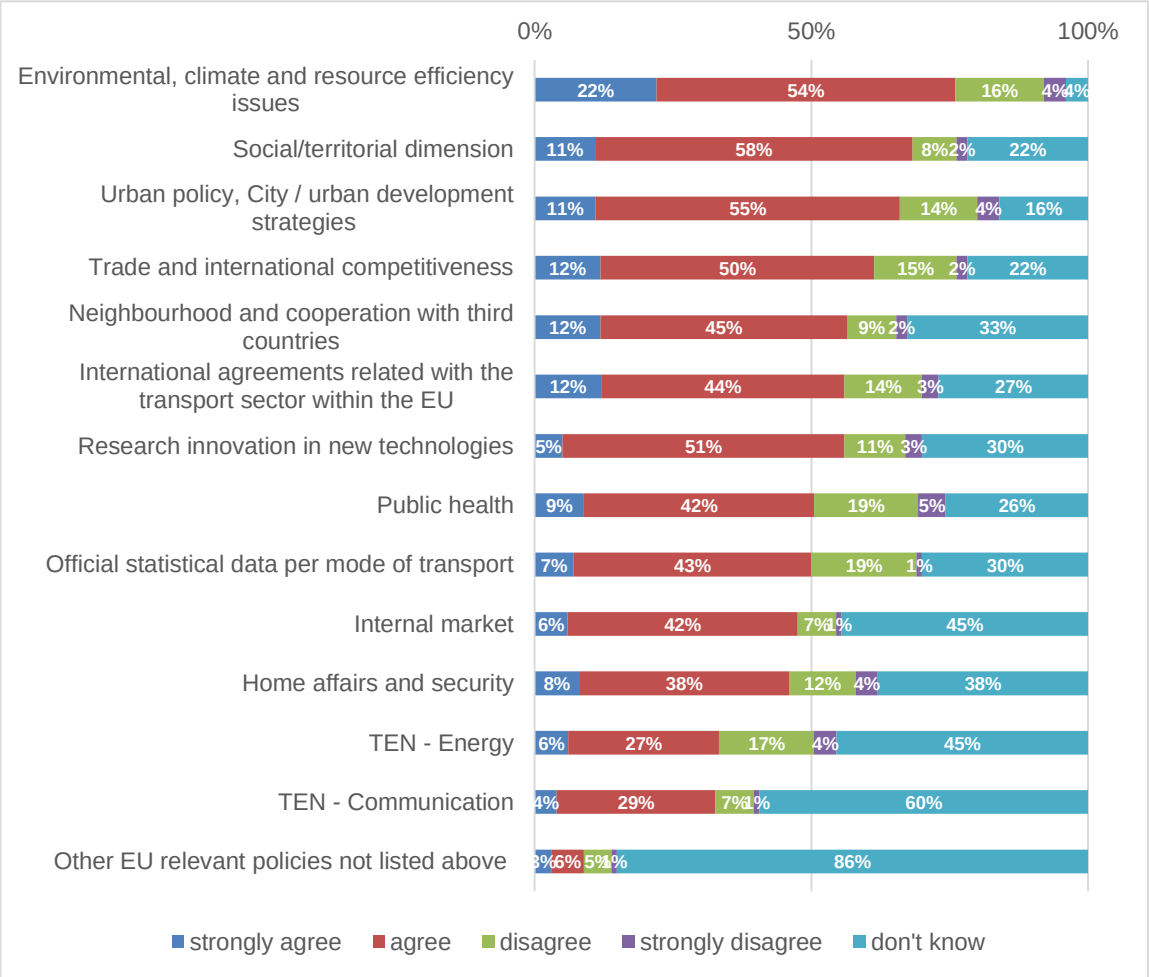
This is confirmed by stakeholders in the global survey who agreed or strongly agreed that the TEN-T Regulation is coherent with other EU policies in the areas of: environmental, climate and resource efficiency (76%); social/territorial policy (69%); urban policy (66%); trade/ international competitiveness (62%); neighbourhood and cooperation with

[109] Reflection Paper – Towards a sustainable Europe by 2030, EC, 2019

[110] European Parliament resolution of 19 January 2017 on logistics in the EU and multimodal transport in the new TEN-T corridors (2015/2348(INI))

third countries (57%); international agreements related (56%) and research/innovation (56%).

Figure 7: To what extent do you agree that the TEN-T Regulation is coherent with other relevant EU policies (n=198)




Source: Support study for the evaluation of Regulation (EU) N° 1315/2013 – global survey

However, when asked to specify their answers respondents most frequently centred on the topic of environmental, climate and resource efficiency, emphasising the need for a closer alignment between the TEN-T Regulation and the Renewable Energy and Alternative Fuels Infrastructure Directives, and calling for stronger coherence between the TEN-T Regulation and the new proposal for a European Green Deal.

The responses to the global interviews point in the same direction. While acknowledging the coherence of the Regulation with other EU policies and initiatives, interviewees called for further alignment with the EU Green Deal; Road safety; Alternative fuels; CO2 emission standards; Clean Vehicles Directive. Furthermore respondents mentioned that synergies with other sectors, such as the energy sector, the defence sector (military mobility), the environmental sector and urban mobility (SUMPs) could be better developed. Whereas TEN-T policy provides the strategic framework for a wide and long-distance traffic network, which includes urban nodes as transfer points, urban policy as such addresses local transport within urban nodes. As such there is no inconsistency between TEN-T and urban policy but instead a high complementarity.

Answers to the OPC on this question were mixed and in some instances contradictory to the results of the global survey and the interviews. Areas in which more respondents noted that there was sufficient coherence compared to insufficient coherence included: structural and cohesion policy (45%), economic/trade policy (40%), and sustainable urban mobility policy (37%). Areas in which more respondents reported that there was insufficient coherence included: environmental policy (41%), cooperation with third countries (32%), and social/employment policy (23%).

*Coherence with other trans-European networks' policies*

This section looks at the coherence of the TEN-T Regulation with regards the other two trans-European networks, Energy and Telecommunications. As specified in Article 5 of the TEN-T Regulation the network shall be planned, developed and operated in a resource-efficient way taking into account possible synergies with other networks, in particular trans-European energy or telecommunication networks. While the three regulations objectives are broadly aligned and coherent with each other the evaluation has found very little evidence that those synergies have occurred to the extent anticipated.

Consequently, the majority of stakeholders consulted on this question stated that they did not know whether TEN-T Regulation was coherent with TEN-Energy (45%) and TEN-Telecom (60%) as can be seen from figure 7. In case of TEN-Energy 33% expressed agreement or strong agreement that TEN-T was coherent while 21% disagreed or strongly disagreed. In the case of TEN-Telecom, those numbers were 33% and 8% respectively. This hints to a potential for a better alignment and the creation of more synergies between the trans-European policies. The new CEF will rectify this to some extent. More synergies can also be expected due to the revised TEN-E Regulation (e.g. on alternative fuels).

Some further evidence on this question could be obtained from the case studies although with a more forward looking angle.

According to case study 4 stakeholders, discussing the growing relevance of ITS systems for the completion of the network, and taking into consideration resilience principles, it is important to recognise that the digital layer of infrastructure will allow to expand the benefits beyond the TEN-T network and corridors design, spilling effects over regional and local streets.

Nevertheless, 82% of Case Study 4 survey respondents considered that expected future challenges in transport call for more synergies with the other TEN policies, with 40% arguing that the TEN-T Regulation is not coherent with the objectives and priorities laid down in energy and telecommunications. Foresight experts also advocated editing the text of Article 31 (telematics applications) making a direct link to TEN-Telecom. Moreover, further alignment between these three areas has been highlighted by Hyperloop promoters, who confirmed that they are discussing standards with stakeholders from the energy and telecommunication sectors for their prototypes.

#### 5.4.3. Evaluation Question 12: To what extent is the overall concept of the TEN-T, as set in the Regulation, complementary to relevant EU instruments?

The ambitious goals to complete the core TEN-T network by 2030 and the comprehensive network by 2050 demand significant efforts to close gaps between the Member States, removing bottlenecks and overcoming technical barriers. The TEN-T provides the policy framework for EU funding in particular from the Connecting Europe

Facility (CEF) and the European Structural and Investment Funds (ESIF), as well as for interventions from the European Investment Bank (EIB). Furthermore, in its external dimension, it establishes a basis for EU funding in the field of pre-accession, enlargement, foreign policy cooperation and development aid.

More than half of the respondents to the global survey were positive about the contribution of these EU instruments to TEN-T implementation. Furthermore, most stakeholders agreed or strongly agreed that TEN-T policy, besides the main instruments CEF, ESIF and EIB interventions, provides a very good basis for the combination of relevant EU resources. There are, in particular, strong potentials for complementary and the generation of synergies with Instruments such as Horizon 2020 and other EU Research and Innovation programmes (COST or LIFE). Despite these positive views, work still needs to be reinforced in terms of strengthening synergies between programmes and instruments and their alignment with the policy orientation of the TEN-T Regulation.

*Extent to which TEN-T is complementary to EU funding instruments and programmes supporting transport infrastructure*

As has been shown in chapter 3 and as outlined in the 2014-2015[111] and 2016-2017[112] Progress Reports on implementation of the TEN-T network significant progress has been made in implementing the TEN-T network since the entry into force of this regulation.
While the majority of the funding for the TEN-T network is provided by the member states, the support from the main EU funds available for TEN-T policy has been important. These funding instruments and programmes include:

- the Connecting Europe Facility (CEF)
- The European Structural and Investment Funds (ESIF) i.e. the European Regional and Development Fund (ERDF) and the Cohesion Fund (CF).
- European Fund for Strategic Investments (EFSI) and traditional
- European Investment Bank (EIB) lending.

In addition, blending of EFSI with CEF and ESI funds was facilitated in order to maximise the use of the different forms of EU support[113].

*Complementarity with the Connecting Europe Facility*

A broad majority of respondents to the global survey (82%) agreed or strongly agreed that the funding opportunities under the Connecting Europe Facility (CEF) are aligned with TEN-T priorities (82%). There was consensus that CEF is an important funding mechanism and that the CEF transport blending facility is very useful. However, stakeholders noted that the CEF budget alone was insufficient to fulfil the TEN-T requirements in the Member States. This sentiment was mirrored in the interviews complemented by the criticism that most CEF funding in the current programming period 2014-2020 has been invested in rail networks, leaving insufficient funding for other transport modes.

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111 Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Progress report on implementation of the TEN-T network in 2014-2015 https://ec.europa.eu/transport/sites/transport/files/com20170327-progress-report-tent-2014-2015.pdf

112 Report from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions: Progress report on implementation of the TEN-T network in 2016-2017, August 2020, https://op.europa.eu/en/publication-detail/-/publication/ea150c2a-e796-11ea-ad25-01aa75ed71a1/language-en

113 Opportunities for the transport sector under the Investment Plan: Non-paper to Ministers for 8 October 2015 Transport Council

*Complementarity with other EU instruments*

Global survey respondents expressed high levels of agreement on the complementarity between TEN-T and other EU funding instruments, including with Horizon 2020 (75%), ESIF (67%) and other EU Research and Innovation programmes (63%). Although some regional differences could be identified.

- While most respondents from all regions agreed or strongly agreed that TEN-T is complementary to ESIF, this proportion was smaller among respondents from Western Europe (52%), compared with Central and Eastern (82%), Southern (72%) and Northern Europe (69%).
- Contrarily, the proportion of respondents who agreed or strongly agreed on the complementarity of EU Research and Innovation Programmes with TEN-T was smaller in Central and Eastern Europe (52%), compared with Southern (72%), Northern (69%) and Western Europe (61%).

These regional differences can be explained by the fact that ESIF funds are especially relevant for cohesion countries, most of them Member States from Central and Eastern Europe which joined the EU in 2004 and 2007. The participation of these countries in Research and Innovation projects is increasing but is still lower in comparison to Member States in other regions.

### 5.5. EU ADDED-VALUE

EU-added value looks for changes that can reasonably be argued are due to the EU intervention, and that exceed what could have been expected from national actions by the Member States. Under the principle of subsidiarity (Article 5 TFEU), and in areas of non-exclusive competence, the EU should only act when the objectives can be better achieved by Union action rather than action by the Member States alone. In this evaluation we have explored if the same results would have been achieved in the absence of the TEN-T Regulation, what would have been the impact of its discontinuation, and what value brings an EU-wide approach to the development of a trans-European transport network.

#### 5.5.1. Evaluation Question 13: What is the EU added value of TEN-T policy as set in the Regulation? Could the results have been achieved at national/regional level without the Regulation and what would have been the impacts of its discontinuation? What is the added value of the broadened stakeholder community in the implementation of TEN-T?

*Achievement of results at national and/or regional level*

The 2011 White Paper on Transport identifies TEN-T as the infrastructure pillar of the Single European Transport Area. The network approach of the TEN-T policy was designed to remove bottlenecks and allow seamless and interoperable mobility throughout high capacity corridors. This ambition could not be addressed by Member States alone, since their jurisdiction ends at national borders.

Within TEN-T, the Core Network Corridors are considered the backbone of the TEN-T, connecting international hubs and economic areas, being key to the free circulation of goods, services and workers in the international market, as well as connecting with other national, regional and local infrastructures. By that they are improving the accessibility

of regions for citizens throughout the European Union. In the time since the implementation of this approach, the Core Network Corridors have reached maturity, having become an important tool to facilitate trade and international cooperation, which is also strongly driven by the unified efforts for reaching common infrastructure standards.

The stakeholder consultation has shown a high level of agreement with regard to the EU added value of the TEN-T Regulation. The vast majority of respondents to the global survey (85% and 84%, respectively) disagreed or strongly disagreed that the results of the TEN-T policy could have been achieved at the regional level and at the national level without the TEN-T Regulation. This assessment was mirrored throughout the Case studies and in the global interviews.

*Effects if TEN-T policy would have been / would be discontinued*

As explained in chapter 1, TEN-T policy is a well established policy for almost three decades. It has constantly been evolving and broadened in scope. As has been shown earlier Member States have aligned their infrastructure transport plans to TEN-T priorities and objectives acknowledging the need for better pan-European transport connections in order to enhance passenger and trade flows within the internal market. The expected socio-economic effects of a discontinuation of TEN-T policy have been explored in the 2015 study on the cost of non-completion of TEN-T[114].

This study analysed the impact of non-completion of the core TEN-T network by 2030 assuming that core network implementation remains at the status of 2015. This means investment would not be made and transport time and cost savings of the TEN-T would not be achieved. The study found that the economic impacts of non-completion of the core TEN-T would be very substantial. The GDP of the EU would remain 1.8% lower and about 730,000 jobs would not be created in 2030. The study also found that discontinuing TEN-T investments in cross-border projects and in the deployment of innovative technologies would have the highest adverse effects in terms of GDP growth and employment. This confirms the added value of TEN-T in terms of creating cross-border transport links and filling missing links as well as deploying innovative transport solutions along the network.

In addition to those findings, a model-based analysis was carried out as part of the evaluation support study (see Annex 3 for details). The baseline scenario developed for this exercise is drawing on the baseline scenario underpinning the Impact Assessment accompanying the revision of the TEN-T Regulation of 2013 but updating the macro-economic and technological assumptions. In addition, policy measures adopted by the end of 2019 have been considered, except for the implementation of the TEN-T regulation. This shows how the situation as regards transport activity and emissions would develop from end 2019 to 2050 in absence of the TEN-T policy. In comparing those results with the counterfactual (see EQ 15 for details) shows the impacts of the TEN-T regulation as revised in 2013.

In the Baseline scenario (without the TEN-T Regulation in place) total **passenger transport activity** is projected to follow a steadily increasing trend from 2010 to 2050. The modal share of road transport (i.e. passenger cars, public transport, 2-wheelers) is found to slightly decrease from 83% in 2010 to 78% in 2050. The reduction in the modal share of road is due to the increase in the growth of aviation. As regards the developments in the passenger railway sector, model results indicate a rather stable modal share throughout the projection period, in absence of railway infrastructure investments related to the core and comprehensive network.

[114] Cost of non-completion of the TEN-T, Final Report, Schade et al., 2015

In the Baseline scenario, the total **freight transport activity** is projected to grow in the period 2010-2050 driven by GDP growth. The absence of the TEN-T core and comprehensive network implementation fails to provide sufficient transport infrastructure coverage and inter-modal integration (road, rail and inland navigation) and, as a result, road freight continues to hold a relatively stable modal share until 2050. The modal shares of freight rail and inland navigation (incl. inland waterways and national maritime) are also projected to remain stable throughout the projection period.

Overall CO2, NOx and PM emissions would be higher in the Baseline scenario as compared to the scenario with the TEN-T in place.

When asking stakeholders on this specific point the vast majority of respondents to the global survey (95% and 92%, respectively) agreed or strongly agreed that through TEN-T European regions and cities and their citizen's benefit from enhanced connectivity and accessibility (see examples in chapter 3). The sentiment was echoed by interviewees who felt that if the Regulation were discontinued the negative impact would be particularly felt in relation to cross-border sections, interoperability and finally the internal market. Ongoing projects would be affected as their progress would be slower, they would be reduced in scope or even fully discontinued. Stakeholders also pointed to the added value in the coherent set of standards and requirements promoted by the Regulation which not only fosters interoperability but is also beneficial to industrial actors. In this respect discontinuing TEN-T would risk creating/maintaining a patchwork of national and regional solutions hampering cross-border interoperability and negatively impacting competiveness of the European industry.

*Effects of the Broadened TEN-T community on the development of TEN-T*

Through the tool of corridor fora led by the European core network corridor coordinators TEN-T has brought together a variety of different stakeholders from different levels of government, different modes and different member states with a common interest to drive the development of their respective corridor (see also chapter 4). In the view of interviewees, this has facilitated the exchange of views and good practice and has fostered collaboration, especially along cross-border sections. Consequently, also 90% of respondents to the global survey agreed or strongly agreed that the broadened TEN-T community adds value to the establishment and development of trans-European networks.

*Effects in relation to the cooperation with neighbouring and third countries*

As outlined in chapter one the 2013 revision of the TEN-T regulation newly included indicative maps of the trans-European transport network extended to specific neighbouring countries. Moreover it empowered the Commission to adopt delegated acts extending those indicative maps to further neighbouring regions. From the experience gained with this exercise the indicative maps helped providing a reference point for cooperation on planning transport infrastructure development in those countries, with a view to guaranteeing continuity and fostering transport connectivity of the EU. They have been of strong mutual interest for the enhancement of strategic multi-modal transport connections between the EU and the neighbouring regions concerned as well as for the promotion of economic development and exchange.

Their planning is based on the same methodology as that of the TEN-T within the EU and covers both the core and comprehensive network layers. Although these indicative network extensions do not automatically imply mandatory applicability of all TEN-T standards and requirements which have been set for the EU Member States they have helped sharing the EU's methodology for transport infrastructure deployment and for promoting EU's technical standards, regulatory aspects and best practices in terms of financing. They have furthermore given orientation to International Financial Institutions,

relevant EU sources as well as national and private investors on where to focus their funding and activities in these region.

A further new element is the enhanced cooperation between the EU and especially Asia in order to re-inforce the land transport corridors between those two regions in line with the EU Strategy on Connecting Europe and Asia. Also in this respect the TEN-T regulation including the indicative maps to third countries and the infrastructure standards has proven to be a valuable reference basis in order to align those connections in geographical as well as in technological terms.

#### 5.5.2. Evaluation Question 14: What is the added value of the broad 'infrastructure' scope as defined in the Regulation? To what extent is it adequate to incorporate ongoing and expected future societal, economic and technological developments? To what extent are the binding infrastructure standards sufficient to establish a high-quality infrastructure?

As laid out earlier the TEN-T Regulation defines infrastructure in a very broad sense. In addition to the items related to the physical infrastructure which are clearly defined (such as railway lines, bridges, tunnels, stations, waterways, docks, airports, terminals etc.), it includes much more flexible terms such as "associated equipment" or "telematic applications".

*Extent to which the 'infrastructure' scope is adequate to incorporate ongoing and expected future societal, economic and technological developments*

Desk research and interviews confirmed that the main areas where societal, economic and technological changes are expected to impact the current provisions of the regulation relate to digitalisation (including automation), and interoperability.

Thus in the framework of the evaluation support study a dedicated case study on digitalisation was carried out. A large majority of respondents agreed or strongly agreed with statements relating to the added-value of addressing digitalisation at the EU level as related to the TEN-T Regulation. In particular, 77% of survey respondents agreed or strongly agreed that the TEN-T Regulation is more effective than similar national policies for the deployment of digital technologies across the TEN-T network. According to the stakeholders the reasons for this include:

- The need for cross-border cooperation in developing standards, specifications and interoperable systems along the network. One example was the creation of eCall call emergency centres (aka PSAPs – Public Safety Answering Points). The funding of eCall call centres under CEF Transport, while a measure covered by TEN-T, benefits the whole road network and not simply the TEN-T corridors;
- The need to develop a European community of users in order to define needs and help shape solutions.

Digitalisation efforts require a common understanding, common semantics, and agreements on data types and formats in order for the system to function as a unified and seamless one. Accordingly, it is important to have a pan-EU understanding, and in view of the majority of interviewees, TEN-T would be the right policy instrument to facilitate their development.

Looking more ahead interviewees argued that digital infrastructure[115] should be seen as part of the physical infrastructure rather than as an add-on, which is currently the case. For the TEN-T network to take full advantage of the efficiency gains brought about by digitalisation, a minimum level of digital infrastructure needs to be put in place. The need to ensure connectivity along the network was also mentioned as an aspect where synergies with TEN-Energy and TEN-Telecom could be explored.

*Extent to which binding infrastructure standards are sufficient for establishing a high-quality infrastructure*

The desk research, the interviews and the survey found that the definition of harmonised standards to reach greater interoperability, sustainability and efficiency of the transport infrastructure network have been generally appropriate and of EU-added value. However, standards are currently applied in case of new construction, renovation and modernisation projects. There are currently no provisions in the TEN-T Regulation that allow for monitoring that the high-quality of the infrastructure, once attained, is being kept over time. While the maintenance of the TEN-T network is the responsibility of Member States, the (predictive) monitoring of infrastructure should be a focus of TEN-T policy.

The issue of Monitoring and infrastructure standards has been further explored in case study 7. From the findings, it could be concluded that while TEN-T policy has played an important role in the development and improvement of infrastructure along the TEN-T network, the situation is less positive with regards the **reduction in the quality gaps**, **monitoring** and **infrastructure** maintenance between Member States. Each Member State has a specific inspection regime in place for the monitoring of infrastructure.[116] On the other hand, important strides have been made in the research relating to the monitoring of key infrastructures (such as bridges, tunnels or retaining walls). National and European research have helped develop a number of technologies which are being deployed. As has happened in other fields the TEN-T Regulation could support the sharing of good practices and the rolling-out of these technologies by introducing minimum standards for the monitoring of key infrastructure along the TEN-T network.

Case Study 7 found furthermore that in terms of infrastructure **construction**, there are no binding standards set out in the TEN-T Regulation. Therefore, different standards are being used along the TEN-T network. While the result on the quality might arguably not differ much, the lack of harmonisation in these quality standards can have an adverse effect on the effectiveness of TEN-T objectives relating to infrastructure quality. The most widely used technical specifications are Eurocodes, a set of ten European standards specifying reference design codes for buildings and civil engineering works. They apply to the structural design of these works including geotechnical aspects, structural fire design and situations including earthquakes, execution and temporary structures. The Eurocodes standards are voluntary, but some Member States include them as part of their national legislation. Some interviewees were of the opinion that Eurocodes would be a

[115] Digital infrastructure in the context used here refers to the physical assets required for the technologies to operate. In its widest definition, this includes unmovable sensors (on the road, rail and waterways infrastructure), sensors on vehicles, connectivity solutions, servers and data centres as well as the device used by the final user (mobile phone, GPS device, computer etc).

[116] To take the example of bridges, inspections are an important element of the life-cycle approach to these infrastructures. Different procedures are in place to ensure the monitoring of infrastructure in Member States. In France, they are governed by the ITSEOA (Instruction Technique pour la Surveillance et l'Entretien des Ouvrages d'Art). In Spain, there are three levels of inspections, which take place at different intervals, and in Germany, periodical structural health monitoring of bridges take place every 3 to 6 years to grade their structural health.

good basis for technical specification for TEN-T infrastructure. However, there are some barriers to using Eurocodes. In particular, Eurocodes are technical specifications and not standards. As such, they are not compulsory. The case study also found that there were disagreements amongst stakeholders as to whether the introduction of some form of technical requirements for new infrastructure monitoring were necessary.

#### 5.5.3. Evaluation Question 15: To what extent are there socio-economic benefits of the EU-wide network approach as compared to an approach focussing on a 'patchwork' of disconnected projects?

This questions aims to establish whether the EU-wide network approach driven by the TEN-T Regulation (see chapter 3) has generated socio-economic benefits that would not have been possible to the same extent in the absence of the Regulation.

The positive socio-economic benefits of the TEN-T regulation have been widely acknowledged in literature such as in the aforementioned 2018 study on the impact of TEN-T completion on growth, jobs and the environment. As highlighted above this study concludes that in 2030 by implementing only the TEN-T core network EU-GDP would be 1.6% higher and 800.000 people more would be employed compared to a scenario without TEN-T. The predecessor study on the cost of non-completion of TEN-T (see EQ13 for details) additionally concludes that the implementation of the core network, including the cross-border projects and the innovative technologies, has been key for the growth of Europe's economy during the 2008 post-financial crisis period.

Economic impacts of the completion of the core network by 2030, for example, have been assessed in a study undertaken on behalf of the Commission and completed in 2019. This study has estimated that the full completion of the TEN-T core network generates – cumulatively – 7.5 million person years of employment until 2030. It is expected that the impacts may even increase after 2030, once the entire network is completed and the impacts from improved connectivity and accessibility will fully materialise. Significant employment impacts are expected, besides the direct and indirect effects during construction as well as the stimulation of regional economic activities, in innovative areas. Furthermore, the same study has shown that, thanks to the completion of the TEN-T core network, a 1.6 percent GDP increase will be achieved by 2030 compared to 2017. Furthermore the study showed the positive effects of the TEN-T Regulation on the efficiency of transport flows in the internal market, on social, economic and territorial cohesion (improved accessibility of all regions, entailing new economic opportunities), sustainability (congestion reduction through removal of bottlenecks) and on user benefits.

In addition to that a modelling exercise has been undertaken in the framework of this evaluation (see EQ13 and Annex 3 for details). The current trends and policies scenario developed for this exercise assumes the completion of the TEN-T core and comprehensive network by 2030 and 2050 respectively. Comparing it to the baseline scenario (scenario without TEN-T implementation) shows the impacts of the revised TEN-T Regulation by 2050 in terms of transport activity and emissions.

In terms of **passenger transport activity** the model results indicate a shift towards railways starting from 2020 onwards. Railways (i.e. aggregate of conventional and high-speed rail and tram-metro) are projected to increase their modal share by 1.1 p.p. in 2030 and 1.8 p.p. in 2050 compared to the baseline scenario. High-speed rail was found to significantly increase its modal share to 38% of the rail transport activity by 2030 (relative to 34% in the baseline scenario). In absolute terms, the difference in the transport activity of high-speed rail between the two scenarios is projected to be around 48 billion-pkm, in 2030 and 100 billion-pkm in 2050.

In terms of **freight transport activity** the current trends and policies scenario sees the modal share of rail freight transport increasing by approx. 2 p.p. (compared to the baseline in 2030), and by more than 4 p.p. (compared to baseline in 2050) to the detriment of road freight transport. Inland navigation also shows some limited increase in its modal share by 2030 between the two scenarios.

Model results indicate higher **CO2 emissions** in the baseline scenario compared to the current trends and policies scenario, by about 14 and 31 Mtons CO2 by 2030 and 2050, respectively (i.e. 1.8% and 5.4% increase in 2030 and 2050, respectively). In cumulative terms, the baseline scenario shows higher CO2 emissions relative to the current trends and policies scenario of about 73 and 530 Mt CO2 in 2030 and 2050, respectively (i.e. 0.6% and 2.1% increase in 2030 and 2050, respectively).

**NOx emissions** would be about 22 and 36 ktons higher in the baseline scenario compared to the current trends and policies scenario by 2030 and 2050, respectively (i.e. 1.4% and 3.6% increase in 2030 and 2050, respectively). **PM** emissions are projected to be 2 and 3 ktons higher in the baseline scenario compared to the current trends and policies scenario by 2030 and 2050, respectively (i.e. 1.7% and 5.6% increase in 2030 and 2050, respectively). In cumulative terms, the baseline scenario shows higher NOx emissions of about 138 and 680 ktons NOx in 2030 and 2050, respectively, compared to current trends scenario (i.e. 0.4% and 1.2% increase in 2030 and 2050, respectively). PM emissions in cumulative terms are projected to be 10 and 53 ktons above current trends scenario in the baseline in 2030 and 2050, respectively (i.e. 0.5% and 1.6% increase in 2030 and 2050, respectively).

These two examples show the positive socio-economic effects of the TEN-T regulation in terms of employment and GDP growth. It is furthermore shown that the Regulation positively contributes to reductions in emissions (mainly through modal shift, by enabling low and zero emission mobility as well as innovative transport solutions) and thus to the overall decarbonisation of the transport sector, even though the transport activity is overall increasing.

Respondents to the global survey also corroborated the findings from the literature review. Asked on the extent to which the EU-wide network approach contributes to socioeconomic benefits, the vast majority indicated that it did so to a great or to some extent. Areas specially highlighted were; improved access to goods and services by users and economic operators (90%); improved mobility and accessibility (90%); time and cost savings (86%); increased competitiveness and attraction of economic activities (84%); wider range of suppliers and market networks (69%). Most respondents also indicated that the EU-wide network approach contributes to socioeconomic benefits to a great or to some extent in the areas of reduction of GHG emissions (69%) and wider access to labour and other social opportunities (69%).

## 6. CONCLUSIONS

The overall evaluation of Regulation (EU) 1315/2013, including two external studies as well as a wealth of internal work of the Commission services leads to the following conclusions:

**Elements of the Regulation that work well**

The application of the evaluation criteria shows that the TEN-T Regulation displays important strengths which are summarized as follows:

*Relevance*

- All four specific objectives of the Regulation remain relevant. Individually and as a package of interdependent and mutually reinforcing objectives, they make relevant contributions to the general objectives of TEN-T policy guided by Title XVI of the Treaty on the Functioning of the EU (facilitating transport flows in the internal market, contributing to social, economic and territorial cohesion and integrating sustainability objectives).

- The specific objective "enhancing efficiency of transport infrastructure to facilitate transport flows in the internal market": Concrete targets, such as the removal of bottlenecks and missing links within and between all transport modes, the ensuring of interoperability and continuity of TEN-T infrastructure and the setting of common infrastructure standards for both existing and new infrastructure along the whole network, have been highly relevant so far, allowing to make steady progress with the implementation of projects on the core and comprehensive networks. These targets remain fully relevant with a view to completing the core and comprehensive networks by 2030 and 2050.

- The specific objective "contributing to social, economic and territorial cohesion": This objective, substantiated by targets such as the ensuring of a balanced infrastructure coverage of all EU regions, the interconnection between long-distance and regional/local traffic or the ensuring of accessibility for all EU regions constitutes a cornerstone of the implementation of the integrated TEN-T network approach. It has also been fully relevant for the further process towards the completion of the core and comprehensive networks. .

- The specific objective "sustainability": The sustainable and efficient development of transport modes or the promotion of innovative measures to encourage low-carbon and clean transport, as targets substantiating this objective, have been relevant, but not specific and targeted enough. The combination of infrastructure enhancements (including binding quality standards), the facilitation of multi-modal solutions through strong focus on nodes, the broad coverage of 'telematics' as well as a – rather open and flexible – approach to innovation have provided an adequate basis for the achievement of the specific sustainability objective. They have provided an appropriate basis for efficiency enhancements or for the promotion of pilot action, but not for the deployment across the TEN-T network. On the other hand, the evaluation clearly shows that a TEN-T that shall keep pace with the new ambitions on decarbonisation until 2030 and beyond, depends on a substantial

reinforcement of the concrete targets, measures and requirements underpinning the sustainability objective.

- The specific objective "user benefits": Targets such as the meeting of mobility needs of users in good quality, safety and security conditions or the consideration of needs for people with reduced mobility have been relevant so far. New types of user demand both in the passenger and freight sectors, enabled through technological progress, called for by decarbonisation challenges and stimulated through changing user behaviour, however, will necessitate significant adaptations of targets and measures to keep up with changing challenges towards the 2030 TEN-T policy objectives.

- The development of the dual layer trans-European transport network with the core and the comprehensive networks – the key output of TEN-T policy overall – remains relevant on the path towards completion aimed at for 2030 / 2050. The complementarity of the two network layers is most appropriate to address notably the "internal market" and the "cohesion" objectives in a mutually reinforcing way.

- The core network, which results from a single EU wide planning method and where major international transport flows are concentrated, has been highly relevant in setting a coherent basis for the identification and implementation of major infrastructure projects. This has given clear direction to investment at national and European level, aiming to fill missing links, remove bottlenecks and improve quality standards. Any substantial deviation from the design of this network layer or from its completion date would risk to diminish the efforts already spent since 2013 and reduce benefits. Given the long-term nature of TEN-T policy, furthermore, significant work is continuously carried out already now, with a view to meeting the 2030 completion objective.

- Core Network Corridors, a governance instrument introduced in 2013 to facilitate the identification and implementation of projects along such geographical corridors (representing between 70% and 80% of the core network), have been extremely relevant in enhancing cooperation across modes, Member States, regions, public and private actors. Indeed, the TEN-T corridor approach is recognised now as a multi-level governance system which has brought transport stakeholders (such as representatives of EU regions and infrastructure managers of all modes) to work together and has effectively focused on delivering EU added value. This has not been the case in the period before 2013. In addition, the identification and prioritisation of projects from a corridor-wide perspective has been seen as effective and beneficial. As a result and given the challenges ahead towards the 2030 objective, the evaluation concludes that this instrument fully maintains its relevance.

- The comprehensive network, as the 'lower level' network layer, also fully demonstrated its relevance so far. Its role as the reference basis for various EU transport policy legislation (such as on rail interoperability) emerged already in the first Guidelines in 1996. This capacity has been steadily advancing over time, along with progress in the Acquis in relevant transport sectors. The relevance of this dimension of TEN-T policy is expected to significantly grow in the future, towards the 2030 and 2050 time horizons. Especially the objective of zero and low emission

mobility necessitates a wide range of new initiatives within and across all transport modes, which can only deploy their full benefits when built on a strong EU-wide infrastructure policy.

- As set out in the EU Connectivity Strategy on Connecting Europe and Asia, the cooperation with neighbouring and third countries as the second key output of the TEN-T Regulation has also been very relevant. It has been important to facilitate trade between the EU and neighbouring as well as other regions of the world. Third country cooperation on TEN-T policy (for example with China) has also been appropriate in promoting high European environmental and social standards as well as financial sustainability along land corridors to Asia. Common network planning activities with neighbouring countries, leading to indicative TEN-T extensions, on the other hand, are appropriate in setting a stable framework for concentrated transport infrastructure investment supported by EU sources and global international financial institutions. Again, recent international developments (such as the progress in the accession negotiations and signature of the Transport Community Treaty for the Western Balkans region) suggest that this approach remains relevant towards the 2030 / 2050 horizons and could further expanded.

*Effectiveness*

- With the completion of more than 2000 projects along the nine core network corridors between 2013 and 2020, and with the identification of around 3000 projects (mostly already ongoing) towards the completion of the core network corridors by 2030, the implementation of the TEN-T Regulation works effectively. It demonstrates that, led by a single and strong European policy, action at national, regional and local, public and private as well as European level is aligned and implemented in an effective way.

- The steady completion of individual TEN-T projects generates gains in terms of travel time, service quality or model distribution; leading to economic, social and environmental benefits in the geographical areas directly concerned. The sum of such individual positive effects is, however, expected to be significantly exceeded once the network as a whole will be completed. A study carried out on behalf of the Commission estimated that 7.5 million person-years of jobs will be created cumulatively until 2030 – both during construction and operation, thanks to enhanced connectivity and accessibility. Furthermore, for 2030, an additional GDP increase of 1.6% compared to 2017 is expected. These effects may even accelerate after 2030, once the network is fully operational.

- Areas and instruments that were newly introduced in 2013 (for example TEN-T provisions on urban nodes, provisions on innovation or – not least – the core network corridors' instrument) have been very effective so far. The new reference to "innovation", for example, led to the promotion of 12.000 charging points for e-mobility since 2013 (with the strong support of CEF funding). On urban nodes, the strengthened focus on the interconnection of major transport terminals in cities (e.g. rail and air or maritime terminals) as well as on infrastructure enabling smooth through traffic helped containing harmful emissions and reducing disruption of transport flows along corridors. With a view to the 2030/2050 horizons – especially

in relation to new zero and low emission mobility objectives – however, further effectiveness gains depend on reinforced relevance of the TEN-T Regulation.

*Efficiency*

- Governance across Member States and sectors has reached a completely new level of quality which helps to make administrative gains through multilevel governance. The most evident example in this respect are the core network corridors.

- The coordination between core network corridors (focusing on infrastructure development) and rail freight corridors (focusing on operational aspects) has also led to efficiency gains. This streamlines cooperation between different actors and leads to additional benefits on substance, namely through more efficient management of long distance rail freight services.

*Coherence*

- The paramount strengths of the TEN-T Regulation on coherence lies in its close integration with all relevant transport policy areas (modal policies, i.e. rail, inland waterways, ports, airports, transport strategies).

- Coherence was also found to be good in linking the TEN-T as the policy framework with relevant financial instruments (notably CEF, ESIF and EIB loans and Financial Instruments). With a view to new challenges towards the 2030 / 2050 objectives, stronger coordination with related EU instruments in fields such as R&I, urban mobility or environmental protection, however, was found to be appropriate.

*Added value*

- Since its establishment as an EU policy in 1993, the added value of TEN-T policy overall has always been strongly affirmed by Member States, regions, cities and industrial stakeholders. Concentrating efforts towards the creation of a common, Europe-wide transport network is clearly acknowledged as a vision (and well progressing achievement) whose benefits go beyond isolated national action. TEN-T policy also attracts increasing interest outside the EU, notably in neighbouring States but also in other regions of the world, for example in relation to the extension of land transport connections to Asia[117].

- Ensuring a common and coherent EU-wide basis for the identification of 'projects of common interest' and, correspondingly, for the alignment of planning and

[117] Joint Communication to the European Parliament, the Council, the European Economic and Social Committee, the Committee of the Regions and the European Investment Bank: Connecting Europe and Asia - Building blocks for an EU Strategy, JOIN(2018) 31 final of 19.9.2018

implementation efforts of a wide range of actors is a clear and widely recognised added value. This was made possible due to the introduction of the full (dual layer) TEN-T network approach in 2013. Such a concentration of efforts towards a common EU objective in transport infrastructure policy, in combination with key ambitions of broader transport policy, would not have been possible without Regulation (EU) 1315/2013.

- TEN-T cooperation with third countries, as one of the areas which were newly introduced in 2013, also generated significant added value which would have been unachievable through Member States' action alone.

**Elements of the Regulation that work less well**

*Relevance*

- In the light of new political and societal challenges – notably in the fields of decarbonisation, digitalisation and increasing risks of unforeseen crisis events – the relevance of the TEN-T Regulation was found to be insufficient, especially with a view to the 2030 and 2050 policy objectives. Most importantly under the two specific objectives "sustainability of the network" and "increased benefits for users", the evaluation identified a lack of concrete targets and measures needed to ensure the appropriate infrastructural basis for the achievement of the challenging objectives of the transport system as a whole and of the European Green Deal overall.

- More concretely, in relation to the specific objective "sustainability", the Regulation lacks relevance in fields such as digitalisation, automation and other forms of innovation which go hand in hand with infrastructure development and are vital enablers of efficiency enhancements and the massive spreading of zero and low carbon mobility. In this respect, also interoperability needs are insufficiently addressed. Openness for new and unforeseeable developments is inadequately considered. Current provisions are inappropriate to ensure network-wide continuity of relevant requirements (to overcome the present rather isolated approach, largely building on pilot action). Step changes in the digital transition, entailing increasing integration of infrastructure, vehicles and connected services across all modes are not duly reflected in the TEN-T Regulation.

- The above shortcomings not only hamper the achievement of the "sustainability" objective but also the generation of "increased benefits for users" which – both in the passengers and freight sectors – are increasingly connected with digitalisation and innovation. The increase of user benefits through technological progress depends in a particular way on a fully developed 'physical' infrastructure network (including strong complementarity between core and comprehensive networks), and it also challenges the mode oriented structure of the TEN-T.

- The evaluation found also shortcomings in relation to the functioning of urban and transport nodes (insufficiencies in network integration, design of transfer hubs, accessibility conditions for all users, last mile connections, smooth information services, complementarity between TEN-T and sustainable urban mobility planning, including clean and innovative solutions). They hamper up-to-date responses to new user needs for integrated door-to-door services, building on a seamless and efficient

combination of various TEN-T elements. This category of problems again, weakens the achievement of the "sustainability" and "user benefits" objectives. Although this applies to both passenger and freight solutions, it was found to be more evident in the passengers' sector.

- Finally, some specific quality requirements for rail, road and inland waterways as well as requirements for the maritime dimension of TEN-T were found to be insufficient or inappropriate. Such problems (for example a lack of coherent equipment of terminals to accommodate 740 m long trains) may affect the continuity and sustainability of services, or they undermine improved social conditions (for example through a shortage of safe and secure parking areas for heavy goods vehicles). Such problems also put the preparedness of TEN-T infrastructure for extreme weather events, security threats or other unforeseen events at risk. Adaptation to climate change, international developments or pandemics, however, require a more resilient TEN-T infrastructure. The increasing functional complementarity of core and comprehensive network layers challenge the sometimes differing ambitions with regard to standards and requirements of both network layers.

*Effectiveness*

- While the TEN-T Regulation, overall, has been very effective in identifying thousands of projects on the basis of a single Europe-wide policy framework, and while a large number of them is completed and brings benefits in terms of connectivity, accessibility, sustainability and user improved user services already, there remain problems of delays for a number of projects. It should be recognized that the time horizon for the completion of the core network is still nine years ahead and even 29 years for the comprehensive network. On the other hand an in-depth analysis of the implementation of the projects is needed in view of the 2030 horizon for the completion of the core network, in view of identifying the possible measures needed to help Member States reaching this objective (taking into account the limited EU and national budgetary means).

- As causes for project implementation delays, the evaluation found factors such as complex preparatory procedures, remaining divergences between agreed European objectives and national infrastructure and investment planning or limited EU level governance tools compared with the challenges at stake. There remains a challenge to ensure full alignment of national interests and responsibilities with TEN-T objectives, and in particular the priorities identified in the corridor work plans, while respecting subsidiarity. In addition, delayed projects are very closely monitored and several measures are already taken to reduce such delays (e.g. through the streamlining initiative or via a firm engagement of European Coordinators).

- Effectiveness was also seen at risk as a result of financial constraints. As far as the TEN-T Regulation is concerned, the latter can be addressed by further boosting resource efficiency and strengthening priority setting, while the provision of budgetary resources is not subject to TEN-T policy.

*Efficiency*

- While the instrument of the core network corridors, including the European Coordinators, has been found to be both highly relevant and effective, their future efficiency could be hampered by an obvious shortage of capacity/ resources in relation to the coordination challenge at stake.

*Coherence*

- A major potential incoherence between the provisions of the TEN-T Regulation and other relevant policy areas was found in the field of infrastructure for low and zero emission transport and mobility. In these areas, concrete legislative initiatives are in preparation (the revision of AFID Directive, FuelEU Maritime and the ReFuel Aviation initiatives). The TEN-T evaluation highlights the importance (in line with the European Green Deal) of alignment of the requirements for the TEN-T infrastructure with the future legal requirements that may be adopted as a consequence of these new initiatives. At the same time, this 'coherence' problem also presents a lack of relevance of the TEN-T Regulation with regard to the need for continuous availability of charging and refuelling infrastructure for low and zero emission mobility along the whole TEN-T.

- Some gaps were also identified in relation to the inner coherence of the different provisions of the TEN-T Regulation. While the provisions for the different transport modes follow a coherent structure (components, requirements, development priorities), the coverage of transport nodes lacks coherence in this context. Although most of the references to nodes refer to the freight sector, commonalities between the different terminals in functional terms were considered to be insufficiently addressed. The functionality dimension for passengers is basically lacking for waterborne transport and rail (including its key role as transfer points to local and regional transport in cities). Generally, also from the user benefits perspective, freight and passenger transport are treated incoherently. The evaluation also identified some incoherence between the different horizontal provisions of Chapter II on the comprehensive network, e.g. on accessibility for all users, safety, security or 'telematics'.

- While it has been proven that coordination between core network corridors and rail freight corridors has also led to efficiency gains, potential synergies between the two instruments, e.g. as to ensure better coherence between the infrastructural side of the core network corridors and the operational side of the rail freight corridors, have not been sufficiently exploited. Indeed, the coexistence of two separate structures with sometimes even different geographical alignments or overlapping activities is not optimal. Striving for further synergies between and better alignment of the two instruments would thus certainly be beneficial in terms of investment planning, project identification and governance.

**Lessons learnt**

In the following, the main lessons learnt are grouped in accordance with the five evaluation criteria while, at the same time, taking account of the four subject areas which were identified at the beginning of the evaluation (network design, network features/quality, network use and implementation instruments).

*Relevance*

- All four specific objectives of the TEN-T Regulation remain relevant. Especially for the objectives "efficient infrastructure to facilitate the internal market" and "territorial, economic and social cohesion", the targets and measures substantiating these objectives remain also widely relevant. The two objectives "sustainability" and "increasing benefits for users", on the other hand, require substantial reinforcement of underlying targets and measures. It also needs to be underlined that all objectives remain equally important since there are complementary to each other.

- Nevertheless, with regard to the specific objectives "efficiency of infrastructure development to facilitate the internal market" and "social, economic and territorial cohesion", there is a strong need to advance on requirements enhancing the quality of the TEN-T infrastructure. This is essential to cope with future challenges, also in the context of sustainability and improved user benefits. Some reinforcement may also be needed in relation to the accessibility of peripheral, outermost and insular regions.

- For the specific objective "sustainability", the lack of appropriateness to enable decarbonisation in line with the objective of the European Green Deal, to cope with the digital transition and with challenges of natural and human-made disasters or other unforeseen challenges needs to be overcome. This necessitates adjusted targets and reinforced / extended requirements. The reduction of transport emissions by 90% by 2050 cannot be achieved without a proper TEN-T network allowing for greener transport.

- For the specific objective "increasing user benefits", the TEN-T Regulation could be advanced to strengthen the identification, combination and implementation of projects from the perspective of integrated door-to-door user services. This current lack of appropriateness seems to be particularly evident in the passengers' sector. In addressing this relevance issue, digitalisation and other new technologies should play a key role.

- For the dual layer trans-European transport network, the design structure (in accordance with the existing network planning methodology) as well as the completion deadlines of 2030 and 2050 have proven their appropriateness.

- To achieve the full and timely completion targets, notably for the core network, the evaluation shows the need to reinforce implementation instruments at EU level and to stimulate a stronger commitment of Member States.

- Complementarity between core and comprehensive networks could be strengthened. This could help overcoming some remaining accessibility and connectivity gaps. Not least, it is expected to help ensuring the broadest possible and most effective coverage of new infrastructure quality parameters, especially for zero and low emission mobility or digitalisation, and it could facilitate a larger reach of innovative user services. Where necessary, strengthened complementarity between core and comprehensive networks could also be ensured through an alignment of standards and requirements in fields such as railway infrastructure, rail safety or urban nodes.

*Effectiveness*

- Effectiveness of TEN-T implementation – especially in the light of the new challenges and objectives that could be correspondingly extended – could be further enhanced through a strengthening of EU instruments (e.g. European Coordinators, delegated acts, accountability of Member States).

*Efficiency*

- The TENtec system works relatively well and is mostly appreciated by stakeholders. In relation to the reporting and monitoring obligations set out in the TEN-T Regulation more generally, the evaluation suggests that there is some need for streamlining and strengthening these tools of TEN-T policy.

*Coherence*

- Achieving the objectives of the European Green Deal would require that the TEN-T infrastructure requirements are fully aligned with the provisions resulting from the other policy initiatives in the fields of AFID, FuelEU Maritime and the ReFuel Aviation.

- In an appropriate way (by taking account of their new qualities in relation to TEN-T policy), there is a need to enhance coherence with the challenges of the digital transition and other new technologies. This requires attention to be given to a proper balance between fixed / long-term infrastructure requirements and fast progressing developments building strongly on industrial innovation; between infrastructure development objectives and changing user needs.

- There is some need for enhancing the inner coherence between the provisions of the TEN-T Regulations.

- Synergies between trans-European network policies in transport, energy and digitalisation are important for higher user benefits, efficiency and the strongest possible contribution to transport decarbonisation.

To conclude: Both the work on core network corridors and the relevant procedures in Member States show that the planning and decision making process on TEN-T has been largely suitable to achieve the policy's objectives, in spite of a need for specific reinforcements.

When the 2013 revision of the TEN-T Regulation saw a shift from a largely priority projects' based approach to a full network approach, this did not disrupt the continuous transport infrastructure development the EU had embarked on under preceding TEN-T legislation. Key projects (notably the former priority projects, often in pivotal geographical positions) remained vital elements of an overall European network. The additional strong focus on the functional side of the network, through a wide range of common standards and requirements, reinforced the link between infrastructure and transport policy objectives as well as service quality. Member States reflect TEN-T development objectives reasonably well in their transport infrastructure related

procedures. All this suggests that TEN-T policy, between 2013 and 2020, has well paved its way as the infrastructural enabler for the achievement of transport policy objectives. However, future challenges of the European transport system overall – with ambitious climate change objectives, the digital transition or a significantly enhanced focus on user expectations as embedded in the European Green Deal and more specifically in the Smart and Sustainable Mobility Strategy – will place increasing demand on TEN-T policy towards 2030 / 2050. In this regard, focusing only on a recalibration of certain standards or requirements would not be sufficient to meet the overall objectives of greening, digitalisation and modal shift; instead, an integrated network approach centred around interoperability and efficiency increase and addressing all shortcomings and lessons learnt identified above is needed.

A thorough assessment of the state of implementation of the projects, in particular the projects located on the core network which should be completed by 2030, is also needed. Based on this assessment possible measures to ensure completion of the network on time and according to the EU standards could be identified.

## Annex 1: Procedural information and response to RSB comments

- **LEAD DG, D*e*CIDE PLANNING/CWP REFERENCES**

  - DG MOVE is the lead DG
  - DECIDE Planning Reference: PLAN/2018/2897

- **ORGANISATION AND TIMING**

  The evaluation of the Regulation was coordinated by an Inter-Service Steering Group, which was established early in the evaluation process. Representatives from Secretariat General (SG), Legal Service (LS), Directorate-General for Mobility and Transport (MOVE), Directorate-General for Budget (BUDG), Directorate-General for Informatics (DIGIT), Directorate-General for Research and Innovation (RTD), Directorate-General for Energy (ENER), Directorate-General for Employment, Social Affairs and Inclusion (EMPL), Directorate-General for Regional and Urban Policy (REGIO), Directorate-General for Environment (ENV), Directorate-General for European Statistics (ESTAT), Directorate-General for Economic and Financial Affairs (ECFIN), Directorate-General for Communications Networks, Content and Technology (CNECT), Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs (GROW), Directorate-General for Climate Action (CLIMA), Directorate-General for European Neighbourhood and Enlargement Negotiations (NEAR), Directorate-General for Maritime Affairs and Fisheries (MARE), the External Action Service (EEAS) and the Joint Research Centre (JRC) were appointed to this ISG.

  The Inter-Service Steering Group met 3 times from September 2018 to October 2020.

| Meeting Date | Activity |
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| 18 September 2018 | **1st meeting** of the ISG: roadmap, ToRs external study, consultation strategy |
| March 2019 | Consultation of ISG on OPC questionnaire (online) |
| 24 April -17 July 2019 | Open Public consultation |
| 08 May 2019 | **2nd meeting** of the ISG: kick-off external study |
| April 2020 | Consultation of ISG on first interim report of external study (online) |
| July 2020 | Consultation of ISG on second interim report of external study (online) |
| September 2020 | Consultation of ISG on draft final report of external study (online) |
| 12 October 2020 | **3rd meeting** of the ISG (online): draft staff working document and draft final report of external study |
| March 2021 | Inter-service consultation on the Staff Working Document |

- **EXCEPTIONS TO THE BETTER REGULATION GUIDELINES**

  The Better Regulation Guidelines and Toolbox were followed without any exceptions.

- **CONSULTATION OF THE RSB**

  The evaluation has been selected for scrutiny by the RSB. The RSB received the draft version of the evaluation Staff Working Document on 20 October 2020. Following a hearing held on 18 November 2020, the RSB issued a negative opinion on 20 November 2020. A revised version has been resubmitted to the RSB on 5 February 2021 and a positive opinion has been received on 2 March 2021.

- **EVIDENCE, SOURCES AND QUALITY**

  The evidence findings of two external support studies prepared by Coffey (Support study for the evaluation of Regulation (EU) N° 1315/2013 on Union Guidelines for the development of the trans-European transport network) and Panteia (Support study for the TEN-T policy review, concerning relevant national plans and programmes in member states.) fed into the analysis of the evaluation SWD.

  The evidence collection for the SWD is also based on the Commission's experience in monitoring and implementing the Regulation and more specifically on the work of European coordinators on the core network corridors.

- **RESPONSE TO RSB COMMENTS**

| Main issues to be discussed | |
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| **ISSUES** | **COMMENTS** |
| **(1) The report does not explain well how the TEN-T policy functions, as a combination of national and EU transport infrastructure policies and an EU coordination framework. It does not describe how policies concerning transport demand, and relevant spending programmes complement TEN-T.** | Two sub-chapters added to chapter 1 'Introduction': 'Key elements and features of the TEN-T policy' and 'TEN-T implementation structure and EU coordination and financing framework' |
| **(2) The report is not clear about what the TEN-T policy was expected to achieve by now. It does not sufficiently assess what it has achieved in terms of planning and project completion and if the contribution to its objectives is in line with expectations. It does not draw clear conclusions on the extent to which the planning and decision-making process has been suitable to achieve the policy objectives.** | Expected results and benefits are addressed in chapter 1 under 'purpose and scope of the evaluation'. |
| **(3) The evaluation does not sufficiently discuss how the TEN-T framework manages trade-offs between its different objectives and to what extent it has been successful in doing so. It does not come to a clear conclusion on whether a change or a reprioritisation of these objectives is warranted in light of the current progress and an evolving political agenda, particularly in the context of the Green Deal.** | Included in chapter 2, sub-chapter 'Description of the logic of the EU Intervention and its objectives' |
| **(4) What competences do the EU and Member States have in the TEN-T planning and investment? Does the Regulation interact with other relevant legislation? (boxes 1 and 2)** | Two sub-chapters added to chapter 1 'Introduction': 'TEN-T implementation structure and EU coordination and financing framework' and 'Interaction with other relevant legislation' as well as graphic illustration |
| **(5) Does the report aim to assess implementation progress or also the direct contributions to the specific objectives? (boxes 1, 2 anot add 4)** | Addressed in chapter 1 under 'purpose and scope of the evaluation'. |
| **(6) Is the TEN-T planning and decision-** | Addressed in the Conclusions under 'Elements |

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| **making process suitable to achieve the policy objectives? How does it manage trade-offs between the specific objectives? Does it select the right projects? How well are national interests and responsibilities balanced against the EU's objectives? (boxes 1, 2 and 3)** | of the Regulation that work less well' (under Relevance) as well as under 'What works less well' (Effectiveness) |
| **(7) Are the transport networks on track to achieve the 2030/2050 TEN-T targets? What should have been achieved by now? Is what has been achieved due to Member State action, EU funding or to the EU governance measures? What are the greatest challenges or risks to not fulfilling the targets? (boxes 2 and 5)** | Chapter 3 has been entirely reworked. |
| **(8) With greater political focus on the green agenda, is there a need to streamline TEN-T objectives or install greater prioritisation? What contribution can TEN-T make to reduce transport emissions by 90% by 2050? What are the main obstacles to this under the current TEN-T? Is there a link with the forthcoming green taxonomy? (boxes 3, 4 and 5)** | Addressed in the conclusions chapter (lessons learnt) |

| **1. Design and methodology (includes scope, baseline, consultation, reliability of data, intervention logic)** | |
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| – The report should clarify the scope of the evaluation: does it cover only the Regulation or does it also consider the related implementing and delegated acts? It would be useful to provide an overview of the different related pieces of legislation, which might have an impact in the same area (e.g. Connecting Europe Facility, the Alternative Fuels Infrastructure Directive, etc.). | Scope in terms of legislative acts has been addressed under the sub-chapter 'purpose and scope of the evaluation' of chapter 1.<br><br>Annex 9 'overview of legislation relevant to TEN-T' added. |
| – The report should clarify the scope of the assessment in terms of geography (all Member States? UK coverage? neighbouring countries?) and period considered. | Geographical and time scope has been addressed under the sub-chapter 'purpose and scope of the evaluation'. |

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| – When it comes to the background description and the intervention logic, the report should explain briefly the differences between the current Regulation and its predecessor. It should briefly explain the difference between the comprehensive and core network, as well as how projects considered of common interest are selected. The report should also explain the roles of different actors in implementing the policy. | The differences between the current and past legislation as well as the roles of different actors in implementing the policy is addressed in sub-chapter 'TEN-T implementation structure and EU coordination and financing framework' of chapter 1 'Introduction'.<br><br>The difference between the core and comprehensive network as well as the iteration with projects of common interest is now further explained in chapter 3 'the dual-layer network approach'. |
| – The initiative is quite complex with various layers of objectives, priorities and requirements. The report should present how the policy was supposed to work. What weight do user benefits (lower transport costs and shorter travel times) have relative to sustainability (lower emissions)? What role does modernising road transport (supply of alternative fuels) play compared to modal shift (efforts to increase rail transport)? Does infrastructure investment depend on complementary policies to work as an "enabler" of sustainable transport? | Addressed in chapter 1 under 'Interaction with other relevant legislation' and 'The evaluation: purpose and scope'. |
| – Stakeholder views are presented in aggregate. The report should provide information on whether different groups hold different views. If they do, the report should discuss why this might be the case. | Explanation provided in chapter 4 under 'targeted stakeholder consultations'. |
| – The report should systematically cite the evidence to support its statements. It should use evidence from the effects of completed links to inform expected achievements. The report should explain what is collected through the TENTec system and whether this served as basis for any of the findings. Moreover, several connected files are currently being evaluated or revised with accompanying impact assessments (e.g. river information systems, rail freight corridors, alternative fuels infrastructure, passenger rights, etc.). The report should clarify when and if it uses preliminary findings from such | References introduced throughout the document.<br><br>TENtec as data source has been further explained in chapter 4. |

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| analyses. | |
| – Concerning the implementation section, the report should be more factual, explaining the basis for statements made and distinguishing between what comes from the TEN-T policy and what from other related legislation. For instance, on page 8 the report puts forward the idea that the TEN-T Regulation will contribute to the European Green Deal because of alternative fuels deployment. This, however, is covered by a separate act as well (a directive currently under revision). | The relation between the different instruments has been clarified in chapter 1. In addition, chapter 3 has been fully revised in order to address the Green Deal aspect more clearly. |
| – The report should be clearer on its limitations. Is the fact that projects have such long lead times problematic in terms of progress and objectives achieved? Why is this? To what extent could the evaluation consider the results of finalised projects that were launched under the preceding Regulation? How do the different pieces of legislation that apply in the same area influence outcomes? For example, on page 25 the report claims that TEN-T policy triggered investment in safety. However, this is also covered by a separate act; how to distinguish between the effects of the two? The Connecting Europe Facility and other EU sources of funding support many of the actions covered by the TEN-T Regulation. These should be better distinguished in a discussion of effects and outcomes. | Integrated in sub-chapter 'limitations and robustness of findings' of chapter 4.<br><br>The interaction with different pieces of legislation is also outlined in chapter 1 under 'interaction with other relevant legislation'. |
| – The report should explain more clearly how the European Court of Auditors' reports in this area have been considered. For instance, the 2020 report on transport infrastructure projects estimates that 6 out of 8 examined projects will not be finalised by 2030, while the evaluation gives an overall positive impression that 2030 target for core network will be met. Such seemingly divergent conclusions should be explained. | Partly addressed in the report.<br><br>In addition, it has to be noted that the Commission as well as Member States did not accept most of the findings of the 2020 Court of Auditors report especially with a view to the cited delays. Thus findings from this report have only been used to a limited extent. |

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| – The report should find a way to better present/integrate case study findings. How were the case studies selected? Are these the "representative examples" referred to on page 10? Is there a risk that the choice of case studies introduces a bias in the analysis and conclusions? For example, many references are made to the urban nodes case – how important is this issue compared to other objectives and for TEN-T's future development? | Selection of case studies as well as their distinction with representative examples now explained in chapter 4.1. |

| **2. Effectiveness and efficiency** | |
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| – The report should clarify what has been achieved so far, if this is satisfactory and whether the policy is on track to deliver in 2030/2050. Judgements on effectiveness and efficiency are largely based on stakeholder perceptions. There should be a greater attempt to establish objectively what has been achieved and why (not). The report should assess the extent to which progress so far is due to the TEN-T Regulation and assess the contribution of other factors (other legislation, national action, national and European funding). | As explained in chapter 4 ('data sources') this evaluation has been based on a wide variety of data sources, including stakeholder consultations, corridor studies and work plans, TEN-T implementation reports, TENtec database, case studies and representative examples among others. Judgements in the report are therefore not only based on stakeholder perceptions but also underpinned by concrete data (e.g. on compliance indicators).<br><br>Chapter 4 further refined accordingly. |
| – Is there any tension between the two overarching objectives (ensuring the key flows for competitiveness and connecting remote regions)? Are there any objectives that have been largely achieved and that may be less relevant in a future TEN-T revision? | The objectives are complementary to each other, as reiterated in chapter 2 (see 'trade-offs'). |
| – The report should be clearer on the differences in achievements across TEN-T requirements and discuss the reasons. | Cross-reference to relevant data sources added to chapter 3 A. |
| – Table 2 (page 6) shows what was missing or not yet upgraded from the core network in 2013. What about for the comprehensive network? What are the implications of the differences between modes? The table shows for instance that almost half seemed to be missing/not ready for rail. The report should explain this in light of such statements as the one on page 20 that core | Table 2 and related paragraph now moved to chapter 3 as to provide for better coherence and readability of the report.<br><br>Explanations provided in chapter 3 (in relation to table 2) as regards the different to the comprehensive network data, implications of the differences between the modes etc. |

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| network corridors are a successful instrument in particular for rail (and waterways). As regards rail, table 5 (2020 data) seems to show that a considerable change would need to happen to reach the 2030 goals (12% deployment in 2020 and 97% in 2030). The report should explain whether this is feasible under the current framework. | Explanations for ERTMS now provided below table 5 in chapter 3. |
| 1. What are the problems with capacity projects. What are the implications? How frequent is this problem? Is it a problem of implementation or of the framework or both?<br>2. What have the European Coordinators achieved? What are the problems?<br>3. TEN-T has not been sufficiently effective in promoting modal shift (page 49). Why? What is the magnitude of the issue? What are the implications for TEN-T's contribution to the European Green Deal?<br>4. Do problems identified as regards passenger mobility relate to implementation or a lack of physical infrastructure or other factors? | 1. Addressed in Evaluation Question 5.<br>2. See section 'Core network corridors as the key instrument to stimulate and coordinate project implementation' under chapter 3<br>3. Addressed in Evaluation Question 1.<br>4. Addressed in Evaluation Question 6. |
| – The report points to difficulties matching geographical corridor routes with transport demand (page 54). What does that say about whether the right projects are selected? Is there a need to revise network maps? | Addressed by footnote 112. |
| – When it comes to efficiency, there seem to be some complaints from stakeholders regarding TENTec. The report should explain its role and how it collects data. If it is from Member States, why does the following problem occur: 'sections defined in TENTec not matching sections defined at the national level' (page 56)? | Addressed in chapter 4.3 and footnote 118. |

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| – More clarity should be provided on the link between TEN-T and the rail freight corridors legislation and actions. It seems stakeholder views on the extent to which TEN-T guidelines helped with rail freight are not so positive. Beyond views, what is the evidence on what is missing and what is still needed? How much of that depends on TEN-T and how much on other legislation? | Addressed at the end of Evaluation Question 9. |
| – The report acknowledges that 'many developments that would enable the efficient use of TEN-T infrastructure are outside the scope of the regulation'. What does that mean for judgement on the effectiveness of the Regulation? | Addressed in Evaluation Question 9. |
| – Major projects require a long time to plan, implement and deliver their effects. Given that, the report should explain what the Commission does to determine whether the policy is on track, the right projects are selected and the policy objectives are being achieved. | Addressed through the iteration on the corridor work plans and the analytical work on the project list, see chapter 3 'core network corridors' and chapter 1 'TEN-T implementation structure'. |
| – The report should provide a frank assessment of how far ownership and commitment from Member States has been ensured under the TEN-T policy. How far has planning and investments priority setting at national level hampered the coordinated approach towards a connected network that spans the whole EU? What instruments does the Commission have to get Member States on board to deliver specific projects in line with the EU's investments objectives? How effective have they been? | See added paragraph on 'TEN-T implementation structure' in chapter 1. |
| – In this context, the report should substantiate (beyond the consultant's assessment) the rather positive view on the Member States' plans and programmes on TEN-T implementation. The report for instance refers to 5 to 10 major infrastructure construction projects not covered by the national plans, and between 40 and 50 facing delays (page 19). What does that mean in terms of overall progress? In a another section of the report, a different figure of around 3000 projects that remain to be completed for full core network completion by 2030 is presented (page 45). What does that mean for the | See chapter 3.A (Member States' approaches to meeting TEN-T development objectives) |

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| achievement of the goals? | |
| – The report should be clearer on the problems it identifies, their relative importance, magnitude and consequences. This should, for instance, be improved for the following issues: | |

| **3. Relevance and EU added value** | |
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| – The report finds the sustainability related provisions in the TEN-T guidelines insufficient in light of the European Green Deal and its increased ambitions (page 34). Since modelling was used to show what would happen with and without the TEN-T policy, it would be useful if the report presented what is likely to happen if we continue with the current policy framework. Also in terms of environmental and climate change policy, the report refers to a study forecasting considerable benefits from implementing the core network fully (page 35). What does the forecast say in terms of possible increases in traffic that would increase emissions? | Addressed in Evaluation Question 15. |
| – In light of TEN-T achievements so far and greater political focus on the green agenda, do all TEN-T objectives remain relevant? How far do the current objectives incur trade-offs and how effective has the TEN-T been at managing these? Can any lessons be drawn for the future? | The objectives are complementary to each other, as reiterated in chapter 2 (see 'trade-offs'). |
| – In this context, the report should justify the role of urban nodes in Trans European networks. To what extent is urban transport a matter for the core and the comprehensive network? | See Evaluation Question 1. |
| – When it comes to technological developments and digital tools, the report | See revised chapter 'conclusions'. |

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| points to diverging views among stakeholders with some in favour of focusing on finalising the physical network first, while others support focusing on the digital layer to make best use of existing physical network. What is the Commission's judgement on this issue? Should the approach continue with a focus on delivering infrastructure projects or is there a need for priorities for projects and funding to shift? | |
| – Many of the statements under evaluation question 1 concern effectiveness rather than relevance. For example, the statement that 'TEN-T policy has positively contributed to general objectives, such as the facilitation of the free movement of citizens and goods' clearly is a statement on effectiveness (meeting objectives). The fact that an initiative has been successful in meeting objectives is not an indication of relevance. On the contrary, if objectives are fully met, there is no need for further action, which implies that the initiative is no longer relevant. | Evaluation Question 1 revised. |
| – The report points to cooperation with third countries and mentions delegated acts producing tentative maps for linking our network with theirs. It would be useful to provide some explanation of how these maps are generated and how they are used. | Amended in chapter 1 'Delegated Regulations'. |

| **4. Coherence** | |
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| – The report needs to be clearer about the problems it identifies. For instance, when it comes to internal coherence, it suggests inconsistencies between measures and priorities. More explanation would help the reader understand the issue and its magnitude. | Addressed in Evaluation Question 10. |
| – While the report highlights the differences in approach between urban policy and the TEN-T policy, it should explain better whether this in itself causes problems and if so, their consequences. | Addressed in Evaluation Question 11. |
| – The report finds that TEN-T provisions on alternative fuels lack specificity (page 62). | Addressed in Evaluation Question 10. |

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| It is not clear however why the Alternative Fuels Directive is not sufficient and why the TEN-T policy requires further provisions on something that is legislated under a different act. | |
| – The report should better argue how the initiative complements other initiatives to shift transport from roads to other modes, or to reduce the external costs of road transport. Against this backdrop, it should give a critical view of infrastructure investment as an enabler of sustainable transport, and the risks of a mismatch between capacity and user demand. | Addressed in Evaluation Question 10 ('Coherence of provisions with other transport policy fields') |
| – The report could further elaborate on coherence between the TEN-T and the various Green Deal initiatives adopted or under development. For instance, how does it relate to the green taxonomy? Will it have an effect on the current project selection process and methods? | As this initiative was conceived as a backward looking evaluation, it did not yet look too much into the different Green Deal initiatives. However, this will be done in a possible Impact Assessment.<br><br>As regards green taxonomy, this is linked to the investment decisions taken under the Connecting Europe Facility. |
| – The report should better explain what inconsistencies it finds between TEN-T and passenger rights. | Addressed in Evaluation Question 10. |
| – More clarity could also be provided on the lack of evidence of synergies between TEN-T and the other two trans-European networks. | Addressed in Evaluation Question 11. |

| **5. Validity of conclusions and relevance for future action** | |
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| – The report should be clearer about the robustness of the findings in the two support studies. When quoting the case studies for instance or the assessment of the Member States' national planning for TEN-T network implementation, it would be useful to have an idea of the level of confidence implied. | Addressed in chapter 4 'limitations and robustness of findings'. |
| – The tone of the conclusions is overly positive. The report concludes – without presenting evidence – that respecting the 2030 and 2050 deadlines will not be problematic, despite concerns raised by ECA. The report should explain what this finding is based on and explain why an | Chapter 6 'Conclusions' completely reworked. |

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| initiative was needed to speed up the network's implementation (Directive on streamlining measures for advancing the realisation of the TEN-T)? What is that initiative supposed to bring in terms of measures and what does it say about the effectiveness of the policy and the progress so far? The report considers that the 'completion deadlines 2030 and 2050 should remain unchanged'. Is this in line with the renewed ambitions under the European Green Deal? Should it not be for the impact assessment accompanying the future revision to determine whether the reinforced climate dimension would not require adapted processes and timelines? | |
| – Conclusions should build on the evidence and analysis, without bringing new elements. The conclusions on efficiency refer to a possible shortage of capacity and resources, which is not sufficiently covered in the analysis. This is also the case for the finding that there is a need to reinforce individual targets underpinning certain specific objectives. | Chapter 6 'Conclusions' completely reworked. |
| – The language of the conclusions should focus on the issues identified and the reasons for them and should not prejudge the outcome of the future revision. The report should therefore avoid being prescriptive about next steps. | Chapter 6 'Conclusions' completely reworked. |
| – The conclusions should discuss whether efforts need a reallocation, given the substantial differences in compliance and progress. They should explain whether the Green Deal or other political commitments require a refocusing of the current TEN-T objectives. | Chapter 6 'Conclusions' completely reworked. |
| – The report should explain whether the conclusions are based on what has been delivered so far or on estimates and forecasts. If the latter is the case, then the language of the conclusions should be more cautious. | Chapter 6 'Conclusions' completely reworked. |
| – The report's conclusions should point to any missing data or data needs not adequately covered that hinder monitoring on whether the policy is on track. | Chapter 6 'Conclusions' completely reworked. |

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| – Conclusions should help decision-makers determine what to focus on, what are the priorities, what should be usefully changed and why. As such, the report should avoid general statements such as 'there is some need for enhancing the inner coherence between the provisions of the Regulation'. | Chapter 6 'Conclusions' completely reworked. |

| **6. Presentation** |
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| – The report reads well and presents the evaluation of a complex piece of Regulation is an accessible way.<br><br>– Nevertheless, the report should spell out acronyms, explain jargon and generally not assume pre-existing specialised knowledge on the part of the reader.<br><br>*Amended.*<br><br>– The report should systematically provide references to sources underlying statements and ensure cross-references are completed (in a few places 'please see question x' does not indicate where to look).<br><br>*Corrected.* |

The evaluation was further improved based on the recommendations of the RSB in its positive opinion of 3 March. In particular, the conclusion of the evaluation has been redrafted to highlight:

- the need to revise the Regulation to support the EU climate and environment ambitions and the fact that the improvement of standards on digitalisation and interoperability of the network are not sufficient;

- the need for further assessment of the gaps in the implementation of the network, in particular the core network which should be completed by 2030, and the need to analyse possible measures to ensure such completion in time and according to the EU standards.

# Annex 2: Stakeholder consultation

## 1. Overview of consultation activities

To ensure transparency and the validity of results, the evaluation used complementary methods to collect data from numerous stakeholders. These included public authorities at national, regional and local levels, academics and research institutions, non-governmental organisations, business associations and organisations, trade unions, sectoral organisations, and citizens in general, as well as European Commission officials within DG MOVE and other relevant DGs with links to the TEN-T Regulation. More specifically, the consultation activities consisted of the following:

An **Open Public Consultation** on the TEN-T Guidelines was launched on 24 April 2019 by DG MOVE and remained open until 17 July 2019. In total, 604 responses were received to the questionnaire, in addition to 140 documents with evidence supporting the responses. The evaluation processed, analysed and presented the results of the Open Public Consultation in a stand-alone report. Specifically, the data generated by the consultation has been used as input in the process of designing the approach and tools for the evaluation case studies; evidence to include in the assessment of the evaluation questions and sub-questions; input in the process of formulating conclusions and recommendations based on emerging results and lessons learned.

**Targeted consultations** enabled us to collect data from specific stakeholder groups at local, national, EU level, as well as from third countries, and to gather feedback on their awareness, perceptions and experiences of the TEN-T Regulation, its implementation and outcomes to date, as well as their recommendations for future EU policy developments in this area. These data have fed into our responses to the evaluation questions and assessment of the relevance, effectiveness, efficiency, coherence and EU added value of the Regulation. The data will also inform the conclusions about the Regulation's impact and causal effects, and the recommendations. The targeted consultations consisted of:

- the design and implementation of a **global online survey** that has received total valid sample of 198 respondents;
- the design and implementation of 44 **in-depth interviews** with cross-sections of respondents to the survey and representatives of relevant stakeholder groups to further explore views and issues in more detail;
- the design and implementation of nine **thematic case studies**, including desk research, in-depth interviews, online survey modules, and online workshops for three of them. The findings from the case studies have also fed into the general evaluation study in line with the Evaluation Questions Matrix. Although each case study had a specific purpose and targeted evaluation questions, the interconnections between the case studies has been exploited to maximise the synergies between them, notably in relation to consultations with key stakeholders, and to arrive at detailed findings.

## 2. Consultation challenges

The scale of the consultation programme has presented conceptual and logistical challenges which we addressed at different stages of the evaluation, resulting in an

appropriate coverage of the consultation activities.
At a conceptual level, our lists of proposed stakeholders and related tools have been designed to achieve the best possible balance between interest groups and topics. We have designed a global survey questionnaire with skip logic that directed stakeholders to relevant questions based on their profiles and familiarity with key elements of TEN-T. The global survey was complemented by specific survey modules linked to the thematic case studies which were administered only among informed / relevant stakeholders for each topic.
Likewise, we have developed a global interview guide with general questions on TEN-T and have complemented this with tailored guides for each case study. The stakeholder samples and tools have been discussed extensively with DG MOVE. The sampling strategies were updated as the evaluation progressed and preliminary findings from the initial tasks were made available.
Our survey questionnaires and interview guides have been designed in a user-friendly way. The questionnaires have been piloted internally to ensure that the questions are clear, and that the length of the questionnaires is manageable. DG MOVE have also provided a letter of introduction that has been attached to the invitation emails. The strong networks in the transport sector developed by consortium partners have also proved instrumental for engaging with stakeholders in a meaningful way.
At a logistical and practical level, the COVID-19 crisis impacted during the data collection phase of the evaluation, leading to the cancellation of the TEN-T days and to the reconfiguration of field work, including workshops that had to be adapted to take place online. Stronger and more tailored dissemination efforts were deployed to increase response rates for the case study surveys and interviews launched during the targeted consultations. For example, we have adapted to stakeholders' requirements (e.g. written input with follow-up conversation with national authorities, interviews in national languages). We have also asked for referrals where the stakeholder was not the appropriate one to interviewees and DG MOVE.

## 3. Synthesis of consultation Results

The following sub-sections provide a brief synthesis of the main consultation tools and key results.

### 3.1. Open Public Consultation

A total of **604 respondents** completed the questionnaire with varying levels of response rates for individual questionnaire items (this total number includes the questionnaires completed online and questionnaires submitted by direct email). Responses were collected from 32 different countries, the vast majority from EU Member States. The top three contribution types were from public authorities at national and regional level (37%), followed by EU citizens (20%) and companies/business organisations (16%).
In addition, a total of **140 documents** were submitted as a complement to the questionnaire launched in the frame of the Open Consultation. These documents were split per level of detail, in opinion pieces (essentially less structured documents), position papers (more in-depth and well-structured analyses and reasoning) and others, which include surveys, articles and presentations among the main contributions.

**Key findings from the Open Public Consultation**

Regarding the **general questions on the TEN-T Regulation**, the vast majority of respondents declared it was very important to have an EU transport infrastructure policy. The main focus areas in transport infrastructure policy at EU level were around removing physical and other bottlenecks in the network as a whole, facilitating multimodal transport chains, establishing physical cross border infrastructures and ensuring connectivity and accessibility of all regions in the EU.

The main areas identified for improvement in EU transport infrastructure policy were eliminating missing links in physical infrastructure, further improving the continuity of the TEN-T network and enabling a better use of existing infrastructure and enhancing multimodal connecting points.

The main expected benefits of the EU transport infrastructure policy were identified as the development of a European transport network with uniform standards across the region, increased focus on environmental and sustainability issues and improvement in coordination between different governance levels.

On the **form of the TEN-T network**, the majority of respondents considered the TEN-T corridors as a suitable tool to complete the TEN-T network by 2030. However, they were rather critical regarding complementarity of the comprehensive TEN-T network with the core network, and regarding the adequacy of the core network to meet the needs of the sector and its users. There were also concerns expressed regarding the clear identification of bottlenecks and constraints.

Safety and security issues were rated as the most adequate characteristics of the comprehensive TEN-T network, followed by the availability and adequacy of alternative fuels infrastructures. Many participants however declared that the comprehensive TEN-T network was not adequate in terms of its required characteristics, particularly in terms of equipment for automated transport, the above-mentioned availability and adequacy of alternative fuels infrastructures and equipment for ITS and digital mobility solutions.

In terms of the **features of the TEN-T network**, half of respondents had favourable views on the completeness of the standards and requirements for all modes of transport. Those who responded negatively most often indicated missing elements of the standards such as lack of complete standards for waterways and ports or absence of a fully integrated European transport network with uniform standards across the regions.

Regarding the achievement of different features of the TEN-T network, stakeholders were most positive about the stimulation of innovative technologies and operational concepts and fostering the uptake of alternative fuels and propulsion systems. They were least in agreement that the TEN-T Regulation helped to promote a clean and low carbon transport system overall, promoting a modal shift and mitigating noise emissions and other harmful impacts on citizens.

In relation to **infrastructure use**, the majority of respondents considered the infrastructure objectives as partly achieved. This was particularly the case of the aim to increase the efficiency of infrastructure use and provision in the EU, as well as the aim to enable attractive sustainable and efficient multimodal transport in both the passenger transport and freight sectors.

When asked to reflect on the **implementation tools**, stakeholders provided mixed responses regarding the coherence between the TEN-T policy and other EU policies. Areas considered to be more coherent with TEN-T policy included structural and cohesion policy, economic and trade policy and sustainable urban mobility policy. On the other hand, areas in which more respondents reported that there was not sufficient coherence included environmental policy, cooperation with third countries, and social and employment policy.

More than half of respondents were familiar with the European coordinators and their role. Most respondents who were familiar perceived the usefulness of the coordinators' role in facilitating and accelerating the implementation of the TEN-T core network.

### 3.2. Global online survey

Overall, 204 respondents contributed to the global survey, although the total valid sample is **198 respondents**. Respondents from Italy, Belgium, Sweden and France were the most numerous. There were no responses received from Cyprus, Latvia, Lithuania, Luxembourg, and Slovakia. The top three contribution types were from public authorities at national level and company/business organisations, and public authorities at regional level.

**Key findings from the global online survey**

In terms of the **relevance of the TEN-T Regulation**, most respondents agreed or strongly agreed that the TEN-T policy objectives address current and foreseeable challenges in the areas of growth in transport / mobility demand (87%), growth in congestion (78%), changes in freight transport concepts and corresponding transport solutions (74%) and climate change and (71%).

More than eight in every ten respondents also agreed or strongly agreed that TEN-T policy objectives address a range of current and foreseeable policy needs, such as ensuring high levels of safety and security, supporting TEN-T implementation through EU instruments, identifying and removing bottlenecks and missing links for all modes and defining clear priorities for TEN-T development and boosting their implementation.

However, over one third of respondents disagreed or strongly disagreed that the TEN-T policy objectives address challenges related to scarcity of natural resources, infrastructure needs from the perspective of users, and in terms of supporting enhanced transfer between TEN-T and local / regional transport.

In relation to the **effectiveness of the TEN-T Regulation**, most respondents indicated

that the current provisions for the development of the nodes in the network achieved their objectives to a great extent or to some extent in the areas of freight transport nodes (61%), passenger transport nodes (57%) and logistic / railroad / combined transport terminals (52%).

Most respondents also indicated that the TEN-T Regulation achieved its objectives in a number of other areas to a great or to some extent, notably in facilitating the free movement of people and goods within the EU (73%) and boosting the creation of a single, Europe-wide infrastructure network as the basis for continuous, seamless and interoperable transport and mobility (72%).

The wide majority of respondents agreed or strongly agreed that the implementation of TEN-T projects contributed to enhancing the overall European transport network (92%). Most respondents also agreed or strongly agreed that the TEN-T Regulation has promoted increased benefits for users (79%), improved transport connections and / or transport flows between Member States (78%) and support to the decarbonisation of all transport modes (68%).

Half of all respondents (49%) disagreed or strongly disagreed that the completion of the Core Network until 2030 would be met if no changes to the provisions of the TEN-T Regulation are introduced, and respondents were split on the issue of the completion of the Comprehensive Network until 2050, with 45% of respondents who agreed or strongly agreed and 40% of respondents who disagreed or strongly disagreed.

When consulted about aspects related to the **efficiency of the TEN-T Regulation**, most respondents agreed or strongly agreed that studies, such as corridor studies, carried out by European coordinators and their consultant teams, are a cost-effective tool to implement the core network (67%) and that the cost of governance and advice mechanisms of the core network corridors are reasonable in relation to the benefits they bring (63%).

Most respondents also agreed or strongly agreed that the cooperation between core network and rail freight corridors addressed key efficiency measures in the areas of: facilitating the use of new and existing infrastructure (58%); optimising interconnection and interoperability of national networks within the European transport network (56%); and removing bottlenecks and complete missing links (54%).

In relation to the **external coherence of the TEN-T Regulation**, most respondents agreed or strongly agreed that the provisions in the TEN-T Regulation are coherent with other ongoing and expected developments in the transport policy areas concerned which are directly connected with TEN-T policy, particularly as regards multi-modality / combined transport (69%), alternative fuels and digitalisation (68%, respectively).

Most respondents also agreed or strongly agreed that the TEN-T Regulation is coherent with other relevant EU policies, such as environmental, climate and resource efficiency (76%), social / territorial dimension (69%) and urban policy, city / urban development strategies (66%).

Most also agreed or strongly agreed that it is complementary to other EU instruments, such as the Connecting Europe Facility (82%), Horizon 2020 (75%), the ESIF (67%) and EU Research and Innovation programmes (63%).

With regards to **internal coherence**, most respondents agreed or strongly agreed that the different provisions of the TEN-T Regulation are coherent among themselves (79%), and a slightly lower percentage considered that the different provisions are coherent across modes (68%).

When consulted about the **EU-added Value of the TEN-T Regulation**, most respondents (85% and 84%, respectively) disagreed or strongly disagreed that the results of the TEN-T policy could have been achieved at the regional level and at the national level without the TEN-T Regulation.

The vast majority of respondents (95% and 92%, respectively) also agreed or strongly agreed that European regions and cities and their citizens benefit from enhanced connectivity and accessibility and that the discontinuation of the TEN-T Regulation would negatively impact the establishment and development of trans-European networks.

More than nine in every ten respondents agreed or strongly agreed that the TEN-T Regulation is essential to achieve the objectives of EU Transport policy and that the broadened TEN-T community adds value to the establishment and development of trans-European networks. The broad majority of respondents also indicated that the EU-wide network approach contributes to socioeconomic benefits to a great or to some extent, particularly in the areas of access to goods and services by users and economic operators (90%), improved mobility and accessibility (90%), time and cost savings (86%), and increased competitiveness and attraction of economic activities (84%).

### 3.3. Global interviews

**44 in-depth interviews** were conducted with representatives of 25 EU Member States, 9 regional authorities[118], and 8 transport stakeholders representing national and European transport federations and associations, and relevant programmes and interest groups.

**Key findings from the global interviews**

In terms of the **relevance of the TEN-T Regulation**, there was consensus that all four specific objectives of the Regulation should remain at the forefront of EU transport policy-making. However, interviewees suggested that some aspects need stronger prioritisation in the Regulation. This was particularly the case for environmental issues such as decarbonisation and alternative fuels, as well as digitalisation. Approaches to tackling these issues were also found to require harmonisation across Member States.

[118] The public authority from Cyprus was interviewed both as a national and regional authority.

Interviewees found that the specific objectives are still relevant to the current context in their Member State, region or sector, and emphasised environmental aspects (such as greenhouse gas reduction, decarbonisation and alternative fuels) and the COVID-19 crisis as changing needs in their transport sectors. They considered the TEN-T Regulation to be flexible to cope with these changing developments and needs but noted that new environmental challenges require more weight and priority in the Regulation.

Interviewees found that the definitions of infrastructure standards and requirements in the Regulation are generally appropriate to achieve TEN-T and wider transport policy objectives but found them limited in the case of alternative fuels and also felt that more alignment is needed between the TEN-T Regulation and the ITS Directive.

Interviewees found that it is too soon to assess the **effectiveness of the TEN-T Regulation** in delivering specific objectives and saw its main achievement at this time in fostering cooperation between Member States and promoting a European perspective in infrastructure development. The main challenges to overcome in this context are limited resources and the prioritisation of national infrastructure strategies over TEN-T objectives in some Member States.

Interviewees found that current provisions have achieved their purpose for identifying and defining "physical" projects of common interest but noted that more flexibility in the definition would be desirable.

In terms of promoting investments, interviewees found that the Regulation has a much stronger emphasis on physical infrastructure rather than user services. Views were also split on the issue whether the Regulation has promoted investments that enhance sustainability and decarbonisation.

The Core Network Corridors were found to be very effective at facilitating the implementation of the TEN-T core network. The development of the core network was deemed to be progressing well in line with 2030 targets, but the challenge of funding is a recurrent issue that needs to be overcome. The comprehensive network was considered paramount for achieving connectivity and cohesion in the European Union, but interviewees noted that in terms of completion, priority has been given to the core network due to the more imminent deadline.

In terms of the **efficiency of the TEN-T Regulation,** interviewees were split on the extent that costs of governance and advice mechanisms of the Core Network Corridors have generally been reasonable. Some felt that the costs and workloads are appropriate, while others felt the process is time consuming, did not see added value of reporting annual budgetary planning, and criticised the need to regularly update project lists in particular.

In relation to the **coherence of the TEN-T Regulation**, interviewees found that the requirements and provisions set out in the Regulation are coherent with one another, but not coherent across transport modes given the way that funding is allocated. They also found that the Regulation is coherent with other EU policies and initiatives (e.g.

Alternative Fuels Directive, Clean Vehicles Directive, etc.), but also identified gaps such as not enough synergies with other sectors (energy, defence, environment), and limited deployment of ITS solutions beyond the core network.

As regards the overall concept of the TEN-T being appropriately supported by relevant EU funding instruments, interviewees considered the Connecting Europe Facility (CEF) to be the most important funding mechanism, and appreciated the CEF transport blending facility, but noted the CEF budget alone is insufficient to fulfil the TEN-T requirements in their Member States. Some interviewees noted coherence between H2020, CEF and TEN-T and considered EIB to be a useful funding mechanism. Using ESIF and cohesion funds was mentioned as a significant source of funding particularly by interviewees from Eastern Europe.

When consulted about the **EU-added value of the TEN-T Regulation,** interviewees found that results could not have been achieved at national or regional level without the TEN-T Regulation, and that the Regulation has a strong added value as regards investments, international cooperation, and developing a pan-European transport infrastructure. If the TEN-T Regulation were to be discontinued, impact would most greatly be felt in the areas of cross-border sections, cross-border issues, progression on projects, and in terms of territorial cohesion and the internal market.

### 3.4. Thematic case studies

Nine **thematic case studies on selected TEN-T policy areas** have been designed and implemented as part of the evaluation. Each case study has been tailored to address specific evaluation sub-questions and issues, which were further reviewed and updated in discussions with DG MOVE during the inception and interim phases. The approach to each case study includes a combination of desk review of secondary sources, specific survey modules, in-depth interviews and discussions with relevant stakeholders (complementing the global survey and interviews carried out as part of the consultation). Online stakeholder workshops were organised as part of case studies 1, 6 and 7 to validate the findings, and to discuss conclusions and recommendations.

**Overview of the thematic case studies**

In total, more than 80 interviews have been conducted with stakeholders and representatives of the different policy areas covered by the case studies, and more than 40 stakeholders have participated in online workshops organised by selected case studies. The case study online surveys have collected more than 680 responses. The table below presents an overview of the objectives and focus of each case study and a synthesis of the consultation approach. Findings from the case studies are provided in the respective case study reports and integrated in the answers to the evaluation questions in the main report.

Table A2-1. Overview of the nine thematic case studies

| Overview | Consultation approach |
|---|---|
| **Case study 1: The role of urban nodes in TEN-T policy** | |
| Focuses on how appropriate and clear the role of urban nodes is in the TEN-T framework, the effectiveness of the set-up of urban nodes in the TEN-T Regulation and on possible challenges arising between TEN-T and urban nodes in terms of coherence with local to EU-wide policies of various sectors. | 20 interviews with representatives of selected urban nodes<br>89 responses to dedicated online survey<br>Online workshop with 17 attendees |
| **Case study 2: Core Network Corridors** | |
| Assesses the relevance, effectiveness and efficiency of the core network corridors for the achievement of the objectives of the TEN-T Regulation. The Core Network Corridor approach is a means to facilitate the coordinated implementation of the core network and to promote inter-European transport links vital to the economic and social development of the EU. | 11 interviews with representatives and stakeholders of Core Network Corridors<br>131 responses to dedicated online survey |
| **Case study 3: Infrastructure standards** | |
| Evaluates whether the current provisions of the Regulation are still relevant, efficient and coherent with the TEN-T policy as well as with the verified progress in other legislative and binding documents. This case study is mainly focused on the TEN-T infrastructure requirements and standards. | 4 interviews with representatives of rail mode (interviews with other modes ongoing / in the process of being scheduled)<br>238 responses to dedicated online survey, including: Road (34), Rail (62), IWW (37), Maritime (48), Air (15), and Multimodal (42) *(NOTE: survey is still open to encourage additional responses)* |
| **Case study 4: TEN-T as an enabler of a future mobility system** | |
| Aims to understand how well adapted the current provisions of the Regulation are to incorporate expected future policy, technological and scientific innovation and to clarify whether the current version of the Regulation unlocks future mobility concepts and systems or can be better adapted to plausible future changes. To better frame this discussion, we selected three representative areas of the future-oriented mobility system, including road automation, the SESAR project, and the Hyperloop. | 15 interviews with representatives of CCAM, SESAR, Hyperloop and foresight experts<br>65 responses to dedicated online survey |
| **Case study 5: High-speed rail** | |
| Focuses on the specific role of high-speed rail within the TEN-T, paying attention to the effectiveness and relevance of the provisions of the TEN-T Regulation (including the network planning) and their implementation, as well as their coherence with other relevant EU action – notably in fields such as railway policy, territorial development or urban nodes. | Desk-based approach to the case study |

| Overview | Consultation approach |
|---|---|
| **Case study 6: Digitalisation** | |
| Evaluates the extent to which TEN-T Regulation provisions are able to bring the potential of the digital revolution to the TEN-T, and to help define a concept of digitalisation fit for the TEN-T context. To achieve this, we have approached the horizontal issue of digitalisation from two distinct angles: i) digitalisation in passenger transport; and ii) digitalisation in freight transport. | 8 interviews with TEN-T stakeholders in the field of digitalisation<br>52 responses to dedicated online survey<br>Online workshop with 17 attendees |
| **Case study 7: Innovation and new technologies** | |
| Assesses the way new technologies and innovation have been stimulated and implemented in TEN-T policy. The case study also addresses the coherence and complementarity between R&I (notably European but also other R&I) and TEN-T policy. The assessment is done both in general terms and for the example of the quality of TEN-T infrastructure. The case study focuses on the quality of road infrastructure and the methods and standards to ensure the structural quality of the infrastructure; and the difficult transition of innovative solutions and research into practical implications. | 7 interviews with TEN-T stakeholders in the field of innovation and new technologies<br>Online workshop with 10 attendees |
| **Case study 8: Seamless and barrier-free mobility for the trans-European passenger** | |
| Focuses on the passenger experience when travelling through the TEN-T network. It is concerned with the question of how seamless and barrier-free mobility can be established for these passengers. Although some relevant provisions are included in the TEN-T Regulation (e.g. Article 37), this is not an area that is extensively or comprehensively covered by the Regulation, particularly with respect to multimodality and the subsequent issues of equal accessibility for all users, integrated multimodal ticketing, coordinated timetables between modes, provision of travel information and consideration of passenger rights in the context of multimodal transport. | 13 interviews with key organisations and groups representing passenger services<br>43 responses to dedicated online survey |
| **Case study 9: The external dimension of TEN-T** | |
| Explores the increased importance of fostering synergies between TEN-T policy and infrastructure network policies and plans in other countries and regions. It reflects new developments that have taken place and have an impact on TEN-T policy cooperation with neighbouring countries, in particular candidates and potential candidates to EU accession in the Western Balkans and Turkey, the Eastern Neighbourhood and the Southern Neighbourhood. It also looks at cooperation initiatives with other third countries. | 4 interviews with representatives of Southern Neighbourhood (interviews with representatives of other regions ongoing / in the process of being scheduled)<br>64 responses to dedicated online survey, including: Western Balkans and Turkey (29), Eastern Neighbourhood (19), and Southern Neighbourhood (16) *(NOTE: survey is still open to encourage additional responses)* |

# Annex 3 Global Survey Participants[119]

## PROFILE OF RESPONDENTS

Overall, **204 respondents** contributed to the survey. After cleaning the dataset to remove contributions (n=6) that were limited to contact details for interviews and case study research, but which provided no answers to any of the survey questions, the **total valid sample is 198 respondents.**

### Contribution type

The top three contribution types were from a national public authority in the EU and a company / business organisation, which each comprised 20% of the sample, followed by a regional public authority in the EU (17%), a business association (9%) and infrastructure managers (8%). The figure below shows the respondent sample broken down by stakeholder group.

***Figure 1: Sample by stakeholder group (n=198)***

| STAKEHOLDER group | n | % of total sample |
|---|---|---|
| **National public authority in the EU** | 40 | 20% |
| **Company / business organisation** | 40 | 20% |
| **Regional public authority in the EU** | 35 | 17% |
| **Business association** | 18 | 9% |
| **Infrastructure manager** | 16 | 8% |
| **Local public authority in the EU** | 12 | 6% |
| **Non-governmental organisation** | 9 | 5% |
| **EU citizen** | 3 | 3% |
| **Environmental organisation** | 2 | 1% |
| **Public authority in a third country (non-EU)** | 3 | 2% |
| **Transport operator** | 4 | 2% |
| **Academic / research institution** | 4 | 2% |
| **Other**[120] | 10 | 4% |
| **No response** | 2 | 1% |
| **Total** | **198** | **100%** |

### Scope of work, sector and organisation size

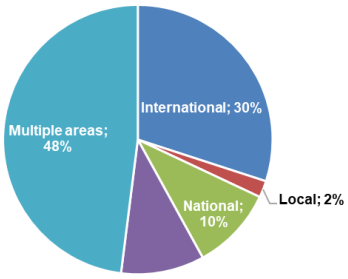
In terms of the scope of work, the largest proportion of respondents (48%) worked across multiple areas (international, local, national and regional)121, followed by 30% who indicated that they worked internationally. Fewer respondents confirmed an exclusively national (10%), regional (10%) or local (2%) scope of work (see Figure 2).

[119] This is an extract from the support study for the TEN-T Evaluation by Coffey consultants

[120] Other respondents include engineers, equality activists, representatives of other European networks and public state enterprises, and project managers

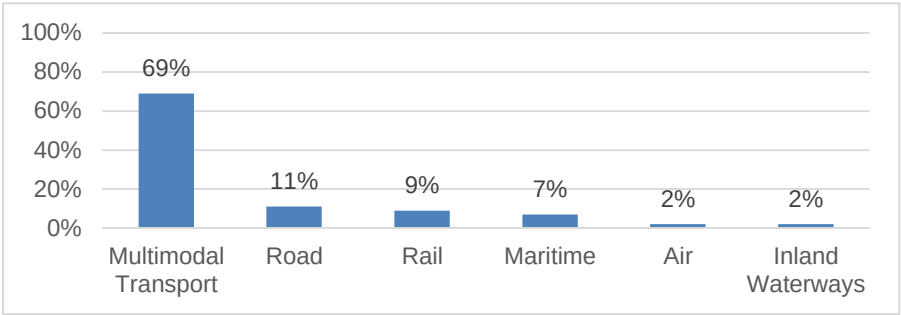
[121] Aggregated number of respondents who indicated working in more than one area

***Figure 2: Sample by scope of work (n=198)***



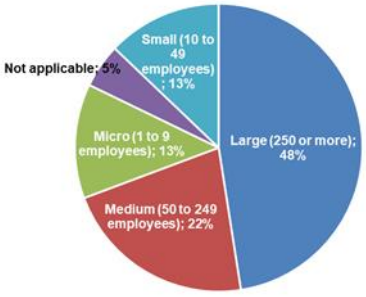

In terms of the transport sector that respondents worked in, most indicated multimodal transport[122] (69%), followed by road (11%), rail (9%) and maritime transport (7%). There were less respondents working on air transport and inland waterways (2%, respectively) (see Figure 3).

***Figure 3: Sample by transport sector (n=198)***




Half of all respondents (48%) indicated that they worked for a large organisation of 250 or more employees. 22% indicated that they worked for a medium-sized organisation (50 to 249 employees), and 13%, respectively, for a small or micro organisation (see ***Figure 4***).

***Figure 4: Sample by organisation size (n=198)***




**Geographical distribution**

The Member State with the largest representation of respondents in the sample was Italy (18%), followed by Belgium (11%), Sweden and France (9%, respectively). The Member States with the smallest

[122] Aggregated number of respondents who indicated working in more than one sector, as well as those who only indicated working in multimodal transport

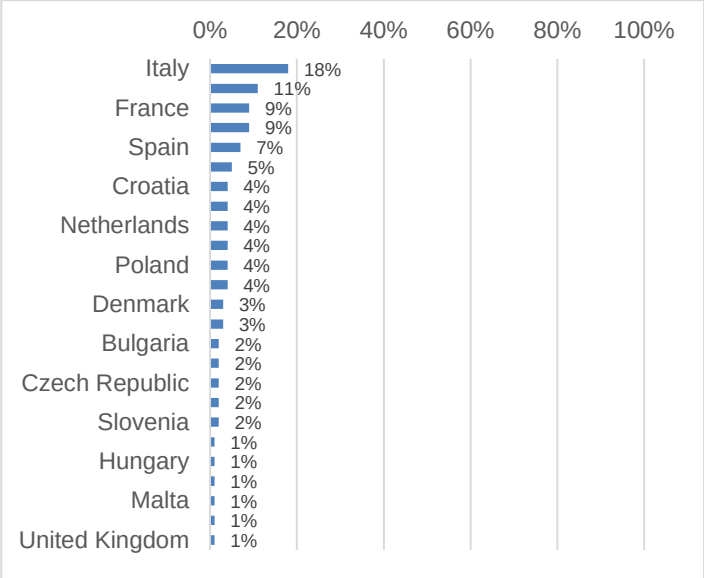
representation of respondents in the survey were Denmark, Estonia, Hungary, Ireland, Norway and the United Kingdom, at 1% respectively (see ***Figure 1*** There were no responses received from Cyprus, Latvia, Lithuania, Luxembourg, and Slovakia.

The survey was distributed widely and open to all relevant audiences across the EU Member States. While the response rate is not balanced across Member States, to ensure meaningful comparisons, we aggregated the data by EU regions and former and new EU Member States (see section 3.1.4).

***Figure 5***). There were no responses received from Cyprus, Latvia, Lithuania, Luxembourg, and Slovakia.

The survey was distributed widely and open to all relevant audiences across the EU Member States. While the response rate is not balanced across Member States, to ensure meaningful comparisons, we aggregated the data by EU regions and former and new EU Member States (see section 3.1.4).

***Figure 5: Representation of respondents by Member State (n=198)***



# Annex 4 Desk Research Sources[123]

| Title | Theme |
|---|---|
| Regulation (EU) No 913/2010 concerning a European rail network for competitive freight, October 2010 | Railway transport |
| European Disability Strategy 2010-2020: A Renewed Commitment to a Barrier-Free Europe, November 2010 | Linkages/coherence with other policy areas and initiatives |
| Impact Assessment Accompanying the document Proposal for Regulation on Union Guidelines for the development of the Trans-European Transport Network, December 2011 | All transport modes |
| Ports: an engine for growth, May 2013 | Marine Transport, Multimodal Transport, Linkages with other policies and initiatives, innovation |
| Commission Delegated Regulation (EU) No 885/2013 2013/885 on information services for safe and secure parking places for trucks and commercial vehicles, May 2013 | Road transport |
| Commission Delegated Regulation (EU) No 886/2013 on data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users, May 2013 | Road safety |
| Planning methodology for the trans-European transport network (TEN-T), SWD (2013), January 2014 | EU policy, all transport modes |
| Commission Delegated Regulation (EU) 2015/962 of 18 December 2014 on EU-wide real-time traffic information, December 2014 | Alternative fuels |
| Study on Logistics in the TEN-T Corridor, March 2016 | Multimodal transport and logistics |
| Directive (EU) 2016/797 on the interoperability of the EU's rail system, May 2016 | Railway transport |
| Directive (EU) 2016/798 on railway safety, May 2016 | Railway transport |
| Article 49.3 Study: Review of Existing Sources of Information / Data and Support for The Preparation of The Progress Report on the Implementation of the TEN-T Network, June 2016 | TEN-T implementation status and broad impact |
| TEN-T Corridors: Forerunners of a forward-looking European Transport System, Rotterdam, the Netherlands \| Issue Papers, June 2016 | Transport corridors and connection with non-EU countries |
| Strategy for low-emission mobility, {SWD(2016) 244 final}, July 2016 | All transport modes: Low emission |
| The implementation of the 2011 White Paper on Transport "Roadmap to a Single European Transport Area – towards a competitive and resource-efficient transport system" five years after its publication: achievements and challenges, July 2016 | Road, rail, air, inland waterways and maritime |
| The trans-European transport network – state of play in 2016, October 2016 | TEN-T implementation status and broad impact |
| A European strategy on Cooperative Intelligent Transport Systems, a milestone towards cooperative, connected and automated mobility, November 2016 | Cooperative intelligent transport systems in road transport |
| Common progress report of European Coordinators, December 2016 | Transport corridors and connection with non-EU countries |
| Study on permitting and facilitating the preparation of TEN-T | TEN-T implementation status and broad |

[123] This is an extract from the support study for the TEN-T Evaluation by Coffey consultants

| | |
|---|---|
| core network projects, December 2016 | impact |
| European Parliament resolution of 19 January 2017 on logistics in the EU and multimodal transport in the new TEN-T corridors (2015/2348(INI)), January 2017 | Multimodal transport and logistics |
| Motorways of the Sea: An ex-post evaluation on the development of the concept from 2001 and possible ways forward, April 2017 | Maritime Transport |
| Horizon 2020 Interim Evaluation, May 2017 | Research and Innovation |
| Delivering the Trans-European Transport Network: fact and figures, September 2017 | TEN-T implementation status and broad impact |
| Proposal for a Directive amending Directive 2009/33/EU on the promotion of clean and energy-efficient road transport vehicles, November 2017 | Road transport |
| Proposal for a Directive amending Directive 92/106/EEC on the establishment of common rules for certain types of combined transport of goods between Member States, November 2017 | Multimodal Transport |
| Towards the broadest use of alternative fuels - an Action Plan on Alternative Fuels Infrastructure under Article 10(6) of Directive 2014/94/EU, including the assessment of national policy frameworks under Article 10(2) of Directive 2014/94/EU, November 2017 | Alternative fuels |
| European Parliament resolution of 14 December 2017 on a European Strategy for Low-Emission Mobility (2016/2327(INI)), December 2017 | All transport modes: Low emission |
| Council conclusions on the progress of the Trans-European Transport Network (TEN-T) implementation and the Connecting Europe Facility for transport, December 2017 | TEN-T implementation status and broad impact |
| Research for TRAN Committee: The new Silk Route - opportunities and challenges for EU transport, January 2018 | TEN-T implementation status and broad impact |
| Report on Regulation 913/2010/EU (COM/2018/066 final; SWD/2018/044 final), February 2018 | International rail freight corridors |
| Mid-term evaluation of the Connecting Europe Facility (CEF), February 2018 | CEF, TEN-T related financial tools |
| Action Plan on Military Mobility, March 2018 | All transportations modes that relate to military transport |
| An EU that delivers: investments in smart, sustainable and safe mobility, April 2018 | TEN-T broad impact |
| Briefing Implementation Appraisal - Trans-European Transport Network (TEN-T), European Parliament, April 2018 | TEN-T implementation status and broad impact |
| Third Work plans of the European Coordinators, April 2018 | Multimodal transport, transport Corridors, Links to third countries |
| Europe on the move. Sustainable Mobility for Europe: safe, connected, and clean, May 2018 | Sustainability in all transport modes |
| Proposal for a Directive, amending Directive 2008/96/EC on road infrastructure safety management, May 2018 | Road transport |
| Proposal for a Regulation on streamlining measures for advancing the realisation of TEN-T, May 2018 | The core vs. comprehensive network |
| Special report n° 19/2018: A European high-speed rail network: not a reality but an ineffective patchwork, June 2018 | High-speed lines |
| Towards a successful transport sector in the EU: challenges to be addressed, December 2018 | Road, rail, air, inland waterways and maritime |
| Reflection Paper towards a Sustainable Europe by 2030, January 2019 | Linkages/coherence with other policy areas and initiatives |
| The wise person group on the future of the single European sky, April 2019 | Single European Sky and Air Traffic Management |
| Priorities of European Ports for 2019 – 2024: What ports do for Europe what Europe do for ports, Memorandum of the | Maritime Transport |

| | |
|---|---|
| European Sea Ports Organisation for the new Commission and European Parliament, May 2019 | |
| ERTMS business case on the 9 core network corridors, June 2019 | ERTMS, railway management system |
| Ex-post evaluation of the Intelligent Transport Systems (ITS) Directive, October 2019 | Intelligent Transport Systems for Roads |
| Sustainable Europe Investment Plan - European Green Deal Investment Plan, December 2019 | EU policy, Linkages/coherence with other policy areas and initiatives |
| Going Climate-neutral by 2050, a strategic long-term vision for a prosperous, modern, competitive and climate-neutral EU economy, December 2019 | EU policy, Linkages/coherence with other policy areas and initiatives |
| The first and last mile — the key to sustainable urban transport, January 2020 | Sustainability in all transport modes |
| Communication from the Commission on the implementation of the Green Lanes under the Guidelines for border management measures to protect health and ensure the availability of goods and essential services, March 2020 | TEN-T implementation status and broad impact |
| Proposal for a Regulation of the European Parliament and of the Council on streamlining measures for advancing the realisation of the trans- European transport network, June 2020 | EU policy |
| Draft Report on the revision of the Trans-European Transport Network (TEN-T) guidelines (2019/2192(INI)), from the Committee on Transport and Tourism, June 2020 | TEN-T implementation status and broad impact |
| Progress report on implementation of the TEN-T network in 2016-2017, August 2020 | TEN-T implementation status and broad impact |

# Annex 5: Evaluation Question Matrix (EQM)

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| **Relevance: To what extent does the TEN-T Regulation's objectives and priorities reflect the current context?** | | | |
| EQ1: To what extent are the objectives set in the TEN-T Regulation still relevant to achieve the general objective of the TEN-T policy, as set out in the TFEU, as well as broader transport policy objectives? | • EQ1.1: Extent to which the specific objectives in the Regulation (as per Article 4: cohesion, efficiency, sustainability and increasing the benefits for users) are still adequate in the current context;<br>• EQ1.2: Extent to which the specific objectives relate to current problems and needs;<br>• EQ1.3: Extent to which the network structure (dual layer, links and nodes) are still adequate to achieve wider objectives. | • Evidence and examples showing that the areas covered by the specific objectives in Art. 4 are still high in the European agenda and that they relate to current problems and needs<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the TEN-T policy objectives address current and foreseeable policy needs and challenges in the transport policy area and that they relate to current problems and needs<br>• Level of agreement among respondents to global interviews and/or case studies that the specific objectives of the TEN-T Regulation have been generally adequate and responded well to wider EU policy needs<br>• Evidence and examples showing that the different elements of the network structure (dual layer, links and nodes) are still adequate to achieve wider objectives<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the different elements of the network structure (dual layer, links and nodes) are still adequate to achieve wider objectives<br>• Level of agreement among respondents to | • Desk research, including TENtec assessment, corridor studies, work plans, other studies and evaluations<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1-9<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | global interviews and/or case studies that the different elements of the network structure (dual layer, links and nodes) are still adequate to achieve wider objectives<br><br>• Evidence and examples pointing out to areas for improvement to the network structure | |
| EQ2: How well adapted are the provisions of the Regulation to incorporate expected future policy, technological and scientific innovation? | • EQ2.1: Extent to which the Regulation is flexible and adaptive to respond to changing needs (e.g. future policy, technological and scientific innovation);<br><br>• EQ2.2: Extent to which the Regulation is flexible and adaptive to respond to new solutions that challenge the mere linear form of land transport connections and "traditional" modes of transport;<br><br>• EQ2.3: Extent to which the Regulation can accommodate the increasing need to deploy alternative fuels, alternative fuels infrastructure, passenger quality and new mobility schemes;<br><br>• EQ2.4: Extent to which the Regulation has enabled new technology to support infrastructure development;<br><br>• EQ2.5: Extent to which the Regulation supports the taking up of tested research results, including EU funded research results. | • Evidence and examples showing that the Regulation provisions have been flexible and adaptive to respond to changing needs and to new solutions challenging traditional" modes of transport<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation provisions have been flexible and adaptive to respond to changing needs and to new solutions challenging traditional" modes of transport<br><br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation provisions have been flexible and adaptive to respond to changing needs and to new solutions challenging traditional" modes of transport<br><br>• Evidence and examples of provisions that have been most and least flexible<br><br>• Evidence and examples that the Regulation provisions have been adequate for enabling the deployment of alternative fuels, alternative fuels infrastructure, passenger quality and new mobility schemes<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1-9<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | strongly agreed that the Regulation provisions have been adequate for enabling the deployment of alternative fuels, alternative fuels infrastructure, passenger quality and new mobility schemes<br><br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation provisions have been adequate for enabling the deployment of alternative fuels, alternative fuels infrastructure, passenger quality and new mobility schemes<br>• Evidence and examples of ways in which the Regulation has enabled or prevented the deployment of alternative fuels, alternative fuels infrastructure, passenger quality and new mobility schemes<br><br>• Evidence and examples that the Regulation has enabled new technology to support infrastructure development and that it has supported the taking up of EU funded research results<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation has enabled new technology to support infrastructure development and that it has supported the taking up of EU funded research results<br><br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation has enabled new technology to support infrastructure development and that it has supported the taking up of EU funded research results<br><br>• Evidence and examples of ways in which the | |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | Regulation has enabled or prevented new technology to support infrastructure development and the taking up of EU funded research results | |
| EQ3: How relevant is the set of infrastructure standards and requirements, as included in the TEN-T regulation, for the achievement of TEN-T and transport policy objectives? | • EQ 3.1: Extent to which the provisions of the Regulation have been adapted to enable efficient use of TEN-T infrastructure;<br>• EQ 3.2: Extent to which infrastructure standards and requirements are appropriate to achieve TEN-T and transport policy objectives;<br>• EQ 3.3: Extent to which the Regulation's standards are still appropriate to assure network continuity, interoperability and compliance with international agreements;<br>• EQ3.4: Extent to which provisions for standards and requirements are still adequate to incorporate market evolution developments across the different transport modes;<br>• EQ 3.5: Extent to which infrastructure standards and requirements including telematic provisions are up to date and sufficient in responding to digitalisation;<br>• EQ 3.6: Extent to which infrastructure standards and requirements are sufficient to achieve new, high quality transport infrastructure and transport innovation reduce infrastructure quality gaps. | • Evidence and examples that the Regulation has enabled the efficient use of TEN-T infrastructure and on the appropriateness of infrastructure standards and requirements for:<br>○ achieving TEN-T and transport policy objectives;<br>○ assuring network continuity, interoperability and compliance with international agreements;<br>○ incorporating market developments across the different transport modes;<br>○ responding to digitalisation;<br>○ achieving new transport infrastructure and reducing infrastructure gaps.<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation has enabled the efficient use of TEN-T infrastructure and on the appropriateness of infrastructure standards and requirements for:<br>○ achieving TEN-T and transport policy objectives;<br>○ assuring network continuity, interoperability and compliance with international agreements;<br>○ incorporating market developments across the different transport modes;<br>○ responding to digitalisation;<br>○ achieving new transport infrastructure and reducing infrastructure gaps.<br>• Level of agreement among respondents to global interviews and/or case studies that the | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1-8<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | Regulation has enabled the efficient use of TEN-T infrastructure and on the appropriateness of infrastructure standards and requirements for:<br>○ achieving TEN-T and transport policy objectives;<br>○ assuring network continuity, interoperability and compliance with international agreements;<br>○ incorporating market developments across the different transport modes;<br>○ responding to digitalisation;<br>○ achieving new transport infrastructure and reducing infrastructure gaps.<br><br>• Evidence and examples of ways in which the Regulation has enabled the efficient use of TEN-T infrastructure and on the appropriateness of infrastructure standards and requirements | |
| **Effectiveness: How well has the Regulation delivered against its objectives?** | | | |
| EQ4: To what extent have the specific objectives of the Regulation been achieved to date? | • EQ4.1: Extent to which the Regulation has delivered on specific objectives of the network relating to cohesion, efficiency, sustainability and benefits for users;<br><br>• EQ4.2: Identification of factors that have hindered or promoted the achievement of specific objectives;<br><br>• EQ4.3: Extent to which the dual layer network structure contributes to the achievement of objectives;<br><br>• EQ4.4: Extent to which: (i) the definition and role of urban nodes are appropriate and clear, (ii) the Regulation meets urban nodes needs, and (iii) the provisions are effective differentiating between core network | • Evidence and examples showing that the Regulation has delivered on the specific objectives of the network relating to cohesion, efficiency, sustainability and benefits for users;<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation has delivered on the specific objectives of the network relating to cohesion, efficiency, sustainability and benefits for users;<br><br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation has delivered on the specific objectives of the network relating to cohesion, efficiency, sustainability and benefits for users;<br><br>• Evidence and examples pointing out to factors promoting or hindering the delivery of the | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1-8<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | and comprehensive network nodes;<br><br>• EQ4.5: Extent to which current provisions for the development of the nodes of the network (urban and transport nodes) achieved their objectives;<br><br>• EQ4.6: Extent to which objectives on new technologies and innovation addressed in the Regulation have been achieved and promoted;<br><br>• EQ4.7: Extent to which: (i) implementing tools, reporting and monitoring provisions achieved their objectives and (ii) all parties fulfilled their obligations set out in Article 49 of the Regulation;<br><br>• EQ4.8: Extent to which Core Network Corridors' governance contributes to the achievement of policy objectives;<br><br>• EQ4.9: Extent to which objectives in relation to the cooperation with third countries have been achieved.<br><br>• EQ4.10: Extent to which infrastructure standards contribute to achieve interoperability and continuity of the network. | specific objectives of the network relating to cohesion, efficiency, sustainability and benefits for users;<br><br>• Evidence and examples confirming the effectiveness and/or fulfilment of:<br>o the dual layer network structure;<br>o the definition and role of urban and transport nodes;<br>o objectives on new technologies and innovation;<br>o the implementing tools, reporting and monitoring provisions;<br>o the Core Network Corridors' governance;<br>o objectives on cooperation with third countries;<br>o the interoperability and continuity of the network through infrastructure standards.<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed on the effectiveness and/or fulfilment of:<br>o the dual layer network structure;<br>o the definition and role of urban and transport nodes;<br>o objectives on new technologies and innovation;<br>o the implementing tools, reporting and monitoring provisions;<br>o the Core Network Corridors' governance;<br>o objectives on cooperation with third countries;<br>o the interoperability and continuity of the network through infrastructure standards. | |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | • Level of agreement among respondents to global interviews and/or case studies on the effectiveness and/or fulfilment of:<br>o the dual layer network structure;<br>o the definition and role of urban and transport nodes;<br>o objectives on new technologies and innovation;<br>o the implementing tools, reporting and monitoring provisions;<br>o the Core Network Corridors' governance;<br>o objectives on cooperation with third countries;<br>o the interoperability and continuity of the network through infrastructure standards. | |
| EQ5: Have the current provisions for the identification and definition of projects of common interest achieved their purpose? | • EQ 5.1: Extent to which the current provisions (especially under Article 7) have enabled the identification and definition of projects of common interest in all areas covered by the TEN-T Regulation (physical and others);<br><br>• EQ 5.2: Extent to which projects of common interest have contributed to specific priorities set out in the Regulation for the different transport modes and multi-modal transport infrastructure development, including capacity problems, related to:<br>o Railway infrastructure (Art. 13),<br>o Inland waterway infrastructure (Art. 16),<br>o Road infrastructure (Art. 19), | • Evidence and examples showing that the provisions for the identification and definition of projects of common interest achieved their purpose in relation to:<br>o enabling the identification and definition of projects of common interest in all areas covered by the TEN-T Regulation;<br>o contributing to specific priorities for different transport modes and multi-modal transport infrastructure development;<br>o enhancing traffic management.<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the provisions for the identification and definition of projects of common interest achieved their purpose in relation to:<br>o enabling the identification and definition of projects of common interest in all | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 3 and 4<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | o Motorways of the Sea (Art. 21),<br>o Maritime infrastructure (Art. 23),<br>o Air transport (Art. 26),<br>o Multimodal transport infrastructure (Art. 29);<br><br>• EQ 5.3: Extent to which current provisions for the identification and definition of projects of common interest reached their objectives in traffic management, nodes etc.;<br><br>• EQ 5.4: Extent to which implementing tools foreseen in the Regulation achieved their objectives. | areas covered by the TEN-T Regulation;<br>o contributing to specific priorities for different transport modes and multi-modal transport infrastructure development;<br>o enhancing traffic management.<br><br>• Level of agreement among respondents to global interviews and/or case studies that the provisions for the identification and definition of projects of common interest achieved their purpose in relation to:<br>o enabling the identification and definition of projects of common interest in all areas covered by the TEN-T Regulation;<br>o contributing to specific priorities for different transport modes and multi-modal transport infrastructure development;<br>o enhancing traffic management.<br><br>• Evidence and examples pointing out to factors promoting or hindering the effective identification and definition of projects of common interest<br><br>• Evidence and examples showing that the implementing tools have supported the effective identification and definition of projects of common interest<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the implementing tools have supported the effective identification and definition of projects of common interest<br><br>• Level of agreement among respondents to global interviews and/or case studies that implementing tools have supported the effective | |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | identification and definition of projects of common interest | |
| EQ6: To what extent has the Regulation enabled smooth, safe and sustainable transport flows in all transport modes and at a multi-modal level? | • EQ 6.1: Extent to which the TEN-T achieved high levels of services in line with user needs for accessible, safe, secure and high-quality transport including accessibility for all users;<br>• EQ 6.2: Extent to which investments have achieved smooth, safe and sustainable transport flows in all transport modes and at a multi-modal level;<br>• EQ 6.3: Extent to which digital technologies have contributed to smooth, safe and sustainable transport flows;<br>• EQ 6.4: Extent to which infrastructure quality gaps and maintenance issues have been addressed;<br>• EQ 6.5: Extent to which resilience of infrastructure to climate change and environmental disasters are sufficiently incorporated in the Regulation's provisions;<br>• EQ 6.6: Extent to which "multi-modal" components of the TEN-T (physical and soft) have enabled transport chains. | • Evidence and examples confirming the effectiveness of the Regulation in enabling smooth, safe and sustainable transport flows in all transport modes and at a multi-modal level through:<br>o high levels of services in line with user needs;<br>o investments;<br>o digital technologies;<br>o "multi-modal" components of the TEN-T.<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed on the effectiveness of the Regulation in enabling smooth, safe and sustainable transport flows in all transport modes and at a multi-modal level through:<br>o high levels of services in line with user needs;<br>o investments;<br>o digital technologies;<br>o "multi-modal" components of the TEN-T.<br>• Level of agreement among respondents to global interviews and/or case studies on the effectiveness of the Regulation in enabling smooth, safe and sustainable transport flows in all transport modes and at a multi-modal level through:<br>o high levels of services in line with user needs;<br>o investments;<br>o digital technologies;<br>o "multi-modal" components of the TEN-T. | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1, 3, 4 and 6<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | • Evidence and examples confirming the effectiveness of the Regulation in identifying and addressing:<br>  ○ infrastructure quality gaps and maintenance issues;<br>  ○ resilience of infrastructure to climate change and environmental disasters.<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed on the effectiveness of the Regulation in identifying and addressing:<br>  ○ infrastructure quality gaps and maintenance issues;<br>  ○ resilience of infrastructure to climate change and environmental disasters.<br>• Level of agreement among respondents to global interviews and/or case studies on the effectiveness of the Regulation in identifying and addressing:<br>  ○ infrastructure quality gaps and maintenance issues;<br>  ○ resilience of infrastructure to climate change and environmental disasters. | |
| EQ7: How effective has the Regulation been as an enabler of a sustainable and decarbonised transport system? | • EQ7.1: Extent to which the Regulation has facilitated investment focused on sustainability and decarbonisation of the transport system;<br>• EQ7.2: Extent to which investments have resulted in increased sustainability and decarbonisation of the transport system;<br>• EQ7.3: Extent to which: (i) the | • Evidence and examples confirming the effectiveness of the Regulation in:<br>  ○ facilitating investment focused on sustainability and decarbonisation of the transport system;<br>  ○ contributing to increased sustainability and decarbonisation through these investments;<br>  ○ contributing to the implementation and deployment of alternative fuels' infrastructure along the TEN-T. | • Desk research<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1 and 5<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | implementation of alternative fuels' infrastructure by Member States and industry and the implementation of CEF-supported projects along the TEN-T have been effective; and (ii) a coherent, harmonised and interoperable deployment of alternative fuels infrastructure across Member States' borders along the TEN-T have been achieved;<br><br>• EQ7.4: Extent to which Regulation objectives and projects are present in existing Sustainable Urban Mobility Plans (SUMPs) of urban nodes. | • Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed on the effectiveness of the Regulation in:<br>○ facilitating investment focused on sustainability and decarbonisation of the transport system;<br>○ contributing to increased sustainability and decarbonisation through these investments;<br>○ contributing to the implementation and deployment of alternative fuels' infrastructure along the TEN-T.<br><br>• Level of agreement among respondents to global interviews and/or case studies on the effectiveness of the Regulation in:<br>○ facilitating investment focused on sustainability and decarbonisation of the transport system;<br>○ contributing to increased sustainability and decarbonisation through these investments;<br>○ contributing to the implementation and deployment of alternative fuels' infrastructure along the TEN-T.<br><br>• Evidence and examples pointing out to factors promoting or hindering investments contributing to the sustainability and decarbonisation of the transport system<br><br>• Evidence and examples pointing out to factors promoting or hindering the implementation and deployment of alternative fuels' infrastructure along the TEN-T<br><br>• Evidence and examples confirming that the TEN-T Regulation's objectives and projects are well | |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | integrated in SUMPs of urban nodes<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the TEN-T Regulation's objectives and projects are well integrated in SUMPs of urban nodes<br>• Level of agreement among respondents to global interviews and/or case studies on the effective integration of TEN-T Regulation's objectives and projects in SUMPs of urban nodes | |
| **Efficiency: To what extent has the Regulation been cost-effective?** | | | |
| EQ8: Are the costs of the Regulation reasonable and proportionate in relation to the benefits? | • EQ8.1 Extent to which cost of governance and advice mechanisms (Coordinators, stakeholder fora, committees, work plans etc) of the Core Network Corridors are reasonable in relation to the benefits;<br>• EQ8.2: Extent to which the sharing of responsibility between the different actors is reasonable in relation to the benefits;<br>• EQ8.3: Extent to which reporting and monitoring are clear, simple and easy to report;<br>• EQ8.4: Extent to which application of innovative technological and operational. concepts were cost efficient.<br>• E8.5: Extent to which the costs to comply with quality infrastructure standards and requirements are cost efficient. | • Evidence and examples confirming that the costs of the Regulation are reasonable and proportionate to its benefits, in particular in terms of:<br>○ governance and advice mechanisms of the Core Network Corridors;<br>○ sharing of responsibility between the different actors;<br>○ reporting and monitoring through TENTec;<br>○ application of innovative technological and operational concepts;<br>○ quality infrastructure standards and requirements.<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the costs of the Regulation are reasonable and proportionate to its benefits, in particular in terms of:<br>○ governance and advice mechanisms of the Core Network Corridors;<br>○ sharing of responsibility between the different actors;<br>○ reporting and monitoring through TENTec; | • Desk research<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 2,3 and 4<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | ○ application of innovative technological and operational concepts;<br>○ quality infrastructure standards and requirements.<br><br>• Level of agreement among respondents to global interviews and/or case studies that the costs of the Regulation are reasonable and proportionate to its benefits, in particular in terms of:<br>○ governance and advice mechanisms of the Core Network Corridors;<br>○ sharing of responsibility between the different actors;<br>○ reporting and monitoring through TENTec;<br>○ application of innovative technological and operational concepts;<br>○ quality infrastructure standards and requirements.<br><br>• Evidence and examples pointing out to shortcomings hindering the cost-effectiveness of the Regulation, and suggestions for improvements | |
| EQ9: How efficiently is the integration of Core Network Corridors and Rail Freight Corridors based on the Regulation on a "European rail network for competitive freight" working? | • EQ 9.1: Extent to which the integration of Core Network Corridors and Rail Freight Corridors has addressed key efficiency measures, including:<br>○ Removing bottlenecks and bridged links;<br>○ Optimising interconnection and interoperability of national transport networks;<br>○ Optimal integration and interconnection of all | • Evidence and examples of an efficient integration of Core Network Corridors and Rail Freight Corridors through:<br>○ addressing key efficiency measures;<br>○ enabling the efficient use of TEN-T infrastructure for freight transport;<br>○ enabling the efficient use of TEN-T infrastructure for high quality and innovative passenger mobility services.<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed on the efficient integration of Core Network Corridors and Rail Freight | • Desk research, including ongoing evaluation of RFC Regulation and core network corridor studies<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 2, 3, 4 and 7<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | transport modes;<br>○ Efficient use of new and existing infrastructure;<br>○ Application of innovating technologies;<br>○ Contribution to economic growth.<br><br>• EQ 9.2: Extent to which the Regulation enables the efficient use of TEN-T infrastructure for freight transport;<br>• EQ 9.3: Extent to which the Regulation enables the efficient use of TEN-T infrastructure for high quality and innovative passenger mobility services. | Corridors through:<br>○ addressing key efficiency measures;<br>○ enabling the efficient use of TEN-T infrastructure for freight transport;<br>○ enabling the efficient use of TEN-T infrastructure for high quality and innovative passenger mobility services.<br><br>• Level of agreement among respondents to global interviews and/or case studies on the efficient integration of Core Network Corridors and Rail Freight Corridors through:<br>○ addressing key efficiency measures;<br>○ enabling the efficient use of TEN-T infrastructure for freight transport;<br>○ enabling the efficient use of TEN-T infrastructure for high quality and innovative passenger | |
| **Coherence: How coherent is the Regulation internally and with other EU actions?** | | | |
| EQ10: How coherent and consistent are the requirements and provision set out in the Regulation with one another and with related transport policy fields? | • EQ 10.1: Extent to which the Regulation is internally coherent;<br><br>• EQ 10.2: Extent to which the corresponding provisions of the Regulation are coherent with developments in areas which are directly connected with TEN-T policy;<br><br>• EQ 10.3: Extent to which there are differences, overlaps and/or inconsistencies. | • Evidence and examples showing that the requirements and provisions set out in the TEN-T Regulation are coherent and consistent with one another and with related transport policy fields, such as urban mobility policies, research and innovation policies, new mobility patterns and passenger rights<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the requirements and provisions set out in the TEN-T Regulation are coherent and consistent with one another and with related transport policy fields, such as urban mobility policies, research and innovation policies, new mobility patterns and passenger rights<br><br>• Level of agreement among respondents to global interviews and/or case studies on the | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1, 5, 6 and 7<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | coherence and consistency of the requirements and provisions set out in the TEN-T Regulation with one another and with related transport policy fields, such as urban mobility policies, research and innovation policies, new mobility patterns and passenger rights<br><br>• Evidence and examples pointing out to differences, overlaps and/or inconsistencies between:<br>○ transport modes and relevant policy areas;<br>○ passenger and freight transport across transport modes. | |
| EQ11: How coherent is the Regulation with other EU policy areas | • EQ11.1: Extent to which the Regulation is coherent with other relevant EU policies;<br><br>• EQ11.2: Extent to which the Regulation is coherent with other trans-European networks' policies. | • Evidence and examples showing that the Regulation is coherent with other relevant EU policies<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation is coherent with other relevant EU policies in the following policy areas:<br>○ environmental, climate and resource efficiency;<br>○ social / territorial dimension;<br>○ urban policy, city / urban development strategies;<br>○ trade and international competitiveness;<br>○ neighbourhood and cooperation with third countries;<br>○ international agreements related with the transport sector within the EU;<br>○ research innovation in new technologies;<br>○ public health;<br>○ official statistical data per mode of | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1 and 7<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | transport,[124]<br>○ internal market;<br>○ home affairs and security.<br><br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation is coherent with other relevant EU policies in the following policy areas:<br>○ environmental, climate and resource efficiency;<br>○ social / territorial dimension;<br>○ urban policy, city / urban development strategies;<br>○ trade and international competitiveness;<br>○ neighbourhood and cooperation with third countries;<br>○ international agreements related with the transport sector within the EU;<br>○ research innovation in new technologies;<br>○ public health;<br>○ official statistical data per mode of transport,[125]<br>○ internal market;<br>○ home affairs and security.<br><br>• Evidence and examples pointing out to suggestions for improving alignment and coherence with other relevant EU policies | |

[124] The question on coherent reporting of official statistical data per mode of transport was formulated in light of the coexistence of different statistical sources (at national and EU level) to report on progress achieved across different modes, and the fact that divergences are sometimes identified between different statistical sources.
[125] The question on coherent reporting of official statistical data per mode of transport was formulated in light of the coexistence of different statistical sources (at national and EU level) to report on progress achieved across different modes, and the fact that divergences are sometimes identified between different statistical sources.

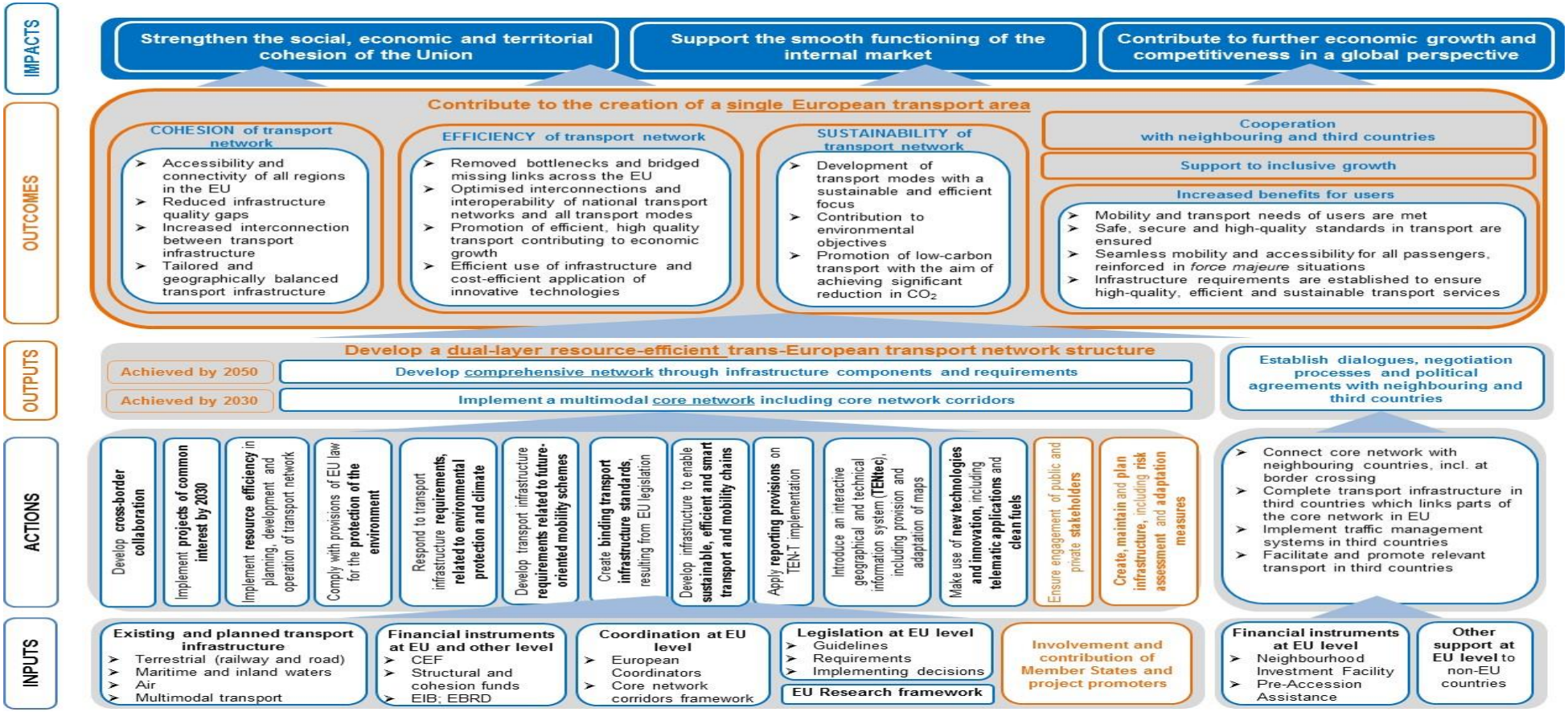
| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | • Evidence and examples showing that TEN-T Regulation is coherence with relevant EU policies in the fields of TEN-Energy and TEN- Telecom<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation is coherent with relevant EU policies in the fields of TEN-Energy and TEN- Telecom<br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation is coherent with other relevant EU policies in the fields of TEN-Energy and TEN-Telecom | |
| EQ12: To what extent is the overall concept of the TEN-T, as set in the Regulation, complementary to relevant EU instruments? | • EQ 12.1: Extent to which TEN-T is complementary to EU funding instruments and programmes supporting transport infrastructure;<br>• EQ 12.2: Extent to which other EU instruments have the potential to contribute to TEN-T. | • Evidence and examples showing that the Regulation is complementary to EU funding instruments and programmes supporting transport infrastructure<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the Regulation is complementary to EU funding instruments and programmes supporting transport infrastructure, including:<br>○ Connecting Europe Facility (CEF);<br>○ other EU funding instruments, such as Horizon 2020, ESIF, other EU Research and Innovation programmes, and others.<br>• Level of agreement among respondents to global interviews and/or case studies that the Regulation is complementary to EU funding instruments and programmes supporting transport infrastructure, including:<br>○ Connecting Europe Facility (CEF);<br>○ other EU funding instruments, such | • Desk research<br>• Analysis of OPC results<br>• Targeted surveys<br>• Targeted interviews<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | as Horizon 2020, ESIF, other EU Research and Innovation programmes, and others.<br><br>• Evidence and examples pointing out to ways in which other EU instruments have the potential to contribute to TEN-T | |
| **EU added-value: What is the EU added value of the Regulation?** | | | |
| EQ13: What is the EU added value of TEN-T policy as set in the Regulation? | • EQ13.1: Extent to which the results could be achieved at the national and/or regional level without the Regulation, and the impact of a discontinuation of the Regulation on the establishment and development of trans-European networks;<br><br>• EQ13.2: Extent to which the broadened TEN-T community adds value to the establishment and development of trans-European networks.<br><br>• EQ13.3: Extent to which the Regulation foresees EC action over Member States, including capacity to initiate infringement procedures. | • Evidence and examples showing that:<br>○ the results could not be achieved at the national and/or regional level without the Regulation;<br>○ the discontinuation of the Regulation would impact negatively on the establishment and development of trans-European networks;<br>○ the broadened TEN-T community adds value to the establishment and development of trans-European networks.<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that:<br>○ the results could not be achieved at the national and/or regional level without the Regulation;<br>○ the discontinuation of the Regulation would impact negatively on the establishment and development of trans-European networks;<br>○ the broadened TEN-T community adds value to the establishment and development of trans-European networks.<br><br>• Level of agreement among respondents to global interviews and/or case studies that: | • Desk research<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1 and 7<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | ○ the results could not be achieved at the national and/or regional level without the Regulation;<br>○ the discontinuation of the Regulation would impact negatively on the establishment and development of trans-European networks;<br>○ the broadened TEN-T community adds value to the establishment and development of trans-European networks.<br><br>• Evidence and examples pointing out to ways in which European Commission action could be further strengthened (through for example the use of Implementing Acts) in order to prevent further delays, especially at cross-border sections of the network. | |
| EQ14: What is the added value of the broad 'infrastructure' scope as defined in the Regulation? | • EQ14.1: Extent to which it is adequate to incorporate ongoing and expected future societal economic and technological developments;<br><br>• EQ14.2: Extent to which binding infrastructure standards are sufficient for establishing a high-quality infrastructure. | • Evidence and examples showing that the broad 'infrastructure' scope is adequate to incorporate ongoing and expected future societal, economic and technological developments<br><br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the broad 'infrastructure' scope is adequate to incorporate ongoing and expected future societal, economic and technological developments<br><br>• Level of agreement among respondents to global interviews and/or case studies that the broad 'infrastructure' scope is adequate to incorporate ongoing and expected future societal, economic and technological developments<br><br>• Evidence and examples of the main areas where | • Desk research<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 3, 4, 6 and 7<br>• Corridor and in-house work |

| Evaluation Question | Judgement Criteria/Sub-questions | Indicators | Data Source |
|---|---|---|---|
| | | societal, economic and technological changes are expected to impact<br>• Evidence and examples showing that the binding infrastructure standards are adequate for establishing a high-quality infrastructure<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that the binding infrastructure standards are adequate for establishing a high-quality infrastructure<br>• Level of agreement among respondents to global interviews and/or case studies that the binding infrastructure standards are adequate for establishing a high-quality infrastructure | |
| EQ15: To what extent are there socio-economic benefits of the EU-wide network approach as compared to an approach focussing on a 'patchwork' of disconnected projects? | • EQ15.1: Extent to which EU-wide network approach demonstrates socio-economic benefits compared to a 'patchwork' of disconnected projects including:<br>○ wider access to labour or customers,<br>○ improved mobility and accessibility,<br>○ increased social opportunities,<br>○ wider range of suppliers and markets,<br>○ attraction of economic activities and increased competitiveness. | Evidence and examples showing that the EU-wide network approach demonstrates socio-economic benefits compared to a 'patchwork' of disconnected projects<br>• Proportion of respondents to the OPC, global survey and/or case study surveys who agreed or strongly agreed that EU-wide network approach demonstrates socio-economic benefits compared to a 'patchwork' of disconnected projects<br>• Level of agreement among respondents to global interviews and/or case studies that the EU-wide network approach demonstrates socio-economic benefits compared to a 'patchwork' of disconnected projects<br>• Examples of ways and areas where the EU-wide network approach contributes to socioeconomic benefits | • Desk research<br>• Baseline scenario exercise<br>• Targeted surveys<br>• Targeted interviews<br>• Case studies 1, 3, 4, 5, 6, 7<br>• Corridor and in-house work |

## Annex 6: Intervention Logic of Regulation 1315/2013




Source: Support study for the evaluation of Regulation (EU) N°1315/2013; Coffey 2020.

**Further Elements of the Intervention Logic**

Actions

A selection of actions, contributing to the generation of the expected outputs – concretely to the completion of the core and comprehensive networks and its indicative extensions – is listed below:

- Implement resource efficiency in planning, development and operation of the two transport network layers, and in particular of the core network;
- Implement projects of common interest, contributing to core network completion, in accordance with their respective priority and maturity status; ensure completion of all projects by 2030;
- Strengthen and facilitate cross-border collaboration to overcome particular difficulties, and give highest attention to the timely completion of these most critical core network sections;
- Integrate binding transport infrastructure standards, resulting from EU legislation, such as on interoperability or safety
- Develop infrastructure in line with TEN-T requirements which enable sustainable, efficient and smart transport and mobility chains; which stimulate and support the decarbonisation of transport
- Develop transport infrastructure requirements related to future-oriented mobility schemes;
- Make use of new technologies and innovation, including telematics applications and clean fuels;
- Respond to transport infrastructure requirements, related to environmental and climate protection;
- Ensure engagement of public and private stakeholders (including contribution of Member States and project promoters); at the level of individual projects, ensure the respect of relevant EU legislation, in fields such as environmental protection etc.
- Cooperate with neighbouring and third countries, in particular on network planning and the implementation of projects
- Introduce an interactive geographical and technical information system (TENtec) to monitor the status of infrastructure planning and implementation (including the upgrading to standards and other requirements)
- Apply reporting provisions on TEN-T implementation;

Inputs

In order to execute the policy actions needed to generate the key output (notably to complete core and comprehensive networks; to facilitate indicative network extensions to neighboring countries), various inputs are necessary. Building on the TEN-T infrastructure assets which are already available – namely in the form of existing lines and nodes compliant with the required quality standards – the following main inputs are needed:

- Coverage of 'projects of common interest' (i.e. projects for new construction or infrastructure upgrading) by relevant national infrastructure plans, programs and financing procedures;
- Engagement of various public and private stakeholders to develop, implement and finance projects of common interest;
- Stimulating and supporting the action of Member States and other public and private investors: Financial instruments at EU and other levels, including the Connecting Europe Facility (CEF), the Structural and cohesion funds, the contribution of the European Investment Bank and the European Bank for Reconstruction and Development;
- Coordination at EU level through the European Coordinators and the core network corridors framework;
- Legislation at EU level, including relevant guidelines, requirements and implementing decisions;
- Specific financial instruments at EU level (such as the Neighbourhood Investment Platform and Pre-Accession Assistance) and other (non-financial) types of support for neighbouring and third countries for actions related to international cooperation.

External factors impaction on Regulation 1315/2013

To complete the Intervention Logic, reference should also be made to a number of external factors, suitable to have an effect on transport and the related infrastructure development. These include notably:

- New commitments on zero and low emission mobility and transport, in the framework of the Commission's vision towards a climate-neutral economy (to be addressed notably through efficiency enhancing measures within the integrated network approach)
- Reinforced commitments on accessibility for all users and social commitments relating to inclusiveness, gender equality etc. (to be addressed through relevant infrastructure quality requirements)
- Increased safety challenges, for example in the light of initiatives such as the Vision Zero on road safety (to be addressed through relevant infrastructure quality requirements)
- New security challenges relating to new global risks (to be addressed through relevant infrastructure quality requirements)
- Increased risks for TEN-T infrastructure in relation to natural and human-made disasters (to be addressed through relevant infrastructure quality requirements, with a particular focus on adaptation to climate change)
- Changing global trade relations, entailing changing transport flows (to be addressed through network adjustment as necessary)
- Path-breaking technological innovation and digital transition (to be addressed through new infrastructure requirements reflecting the step change in European transport infrastructure policy.

## Annex 7: Baseline Scenario and modelling results

This section presents the modelling exercise carried out by E3Modelling as regards the development of the baseline scenario of the present evaluation study.

The structure of this section includes the methods for the development of the baseline scenario, using the PRIMES-TREMOVE transport model. Key results of the baseline scenario are also provided in an aggregate way for the EU27; more detailed results are also provided in dedicated tables. Further, a comparison of key transport indicators is presented between the baseline scenario and the scenario under current trends and policies (including the implementation of the TEN-T regulation).

Finally, the section concludes by providing some high-level findings on the impact of Covid-19 on the EU transport activity. Nevertheless, we note that the baseline scenario does not consider the impact of Covid-19, as this modelling exercise had started before the virus outbreak.

### 1 THE PRIMES-TREMOVE MODEL

The PRIMES-TREMOVE transport model projects the evolution of demand for passengers and freight transport, by transport mode, and transport vehicle/technology, following a formulation based on microeconomic foundation of decisions of multiple actors. Operation, investment and emission costs, various policy measures, utility factors and congestion are among the drivers that influence the projections of the model. The projections of activity, equipment (fleet), usage of equipment, energy consumption and emissions (and other externalities) constitute the set of model outputs.

The PRIMES-TREMOVE transport model can therefore provide the quantitative analysis for the transport sector in the EU, candidate and neighbouring countries covering activity, equipment, energy and emissions. The model accounts for each country separately which means that the detailed long-term outlooks are available both for each country and in aggregate forms (e.g. EU level).

In the transport field, PRIMES-TREMOVE is suitable for modelling *soft measures* (e.g. eco-driving, labelling); *economic measures* (e.g. subsidies and taxes on fuels, vehicles, emissions; ETS for transport when linked with PRIMES; pricing of congestion and other externalities such as air pollution; accidents and noise; measures supporting R&D); *regulatory measures* (e.g. $CO_2$ emission performance standards for new passenger and heavy duty vehicles; EURO standards on road transport vehicles; technology standards for non-road transport technologies, deployment of Intelligent Transport Systems) and *infrastructure policies for alternative fuels* (e.g. deployment of refuelling/recharging infrastructure for electricity, hydrogen, LNG, CNG). Used as a module that contributes to the PRIMES model energy system model, PRIMES-TREMOVE can show how policies and trends in the field of transport contribute to economy-wide trends in energy use and emissions. Using data disaggregated per Member State, the model can show differentiated trends across Member States.

The PRIMES-TREMOVE has been developed and is maintained by E3Modelling, based on, but extending features of, the open source TREMOVE model developed by the TREMOVE[126] modelling community. Part of the model (e.g. the utility nested tree) was built following the TREMOVE model.[127] Other parts, like the component on fuel consumption and emissions, follow the COPERT model.

Data inputs

The main data sources for inputs to the PRIMES-TREMOVE model, such as for activity and energy consumption, comes from EUROSTAT database and from the Statistical Pocketbook "EU transport in figures[128]. Excise taxes are derived from DG TAXUD excise duty tables. Other data comes from different sources such as research projects (e.g. TRACCS project) and reports.
In the context of this exercise, the PRIMES-TREMOVE transport model is calibrated to 2005, 2010 and 2015 historical data.

## 2 DEVELOPMENT OF THE BASELINE SCENARIO

The following presents the methodology and the key results of the Baseline scenario in an aggregate way for the EU27. The modelling has been carried out at the EU MS level.

### 2.1 METHOD FOR THE DEVELOPMENT OF THE BASELINE SCENARIO

This section presents the approach taken to develop the baseline scenario to support the evaluation of Regulation 1315/2013 on trans-European Network Guidelines. The aim for developing the baseline scenario is to assess what would happen in the medium (2030) and long-term (2050) if the TEN-T core and comprehensive network would not be completed by 2030 and 2050, respectively.

The starting point for developing the baseline scenario has been the baseline scenario underpinning the Impact Assessment accompanying the revision of the TEN-T Regulation[129]. Building on this scenario, the macro-economic and technological assumptions have been updated in line with those used for the modelling underpinning the strategic long-term vision for a prosperous, modern, competitive and climate-neutral

[126] Source: https://www.tmleuven.be/en/navigation/TREMOVE
[127] Several model enhancements were made compared to the standard TREMOVE model, as for example: for the number of vintages (allowing representation of the choice of second-hand cars); for the technology categories which include vehicle types using electricity from the grid and fuel cells. The model also incorporates additional fuel types, such as biofuels (when they differ from standard fossil fuel technologies), LPG, LNG, hydrogen and e-fuels. In addition, representation of infrastructure for refuelling and recharging are among the model refinements, influencing fuel choices. A major model enhancement concerns the inclusion of heterogeneity in the distance of stylised trips; the model considers that the trip distances follow a distribution function with different distances and frequencies. The inclusion of heterogeneity was found to be of significant influence in the choice of vehicle-fuels especially for vehicles-fuels with range limitations.
[128] Source: https://ec.europa.eu/transport/facts-fundings/statistics_en
[129] SEC(2011) 1212 final

economy by 2050[130] (LTS/Clean Planet for All communication). In addition, policy measures adopted by the end of 2019 have been considered in the baseline scenario, except for the implementation of the TEN-T regulation. A counter-factual scenario has been additionally developed that assumes the completion of the TEN-T core and comprehensive network. By comparing the two scenarios, this shows the impacts of the revised TEN-T regulation by 2050.

In liaison with PRIMES-TREMOVE, E3-Modelling utilized the PRIMES-TAPEM131 sub-module (part of the PRIMES-TREMOVE model) which calculates the evolution of the transport activity by transport mode until 2050 using an econometric approach which correlates transport activity with GDP, fuel prices, length of motorways and railways sections.

Once the transport activity projections are derived based on the econometric approach, they were fed to the PRIMES-TREMOVE model to quantify the baseline scenario. The quantification of the baseline scenario using PRIMES-TREMOVE allowed to derive the evolution of key transport system indicators (final energy demand by transport mode and fuel, CO2 emissions by transport mode, etc.) until 2050, by each EU MS. PRIMES-TREMOVE also features the COPERT methodology (i.e. average speed-based functions) for the estimation of the specific fuel consumption in the road transport by transport mode and technology and has captured the effects of increased congestion and average speeds in the road network (i.e. urban roads, motorways and non-urban links).

As regards the limitations of the present methodology, we acknowledge that the quantification of this baseline scenario (which focuses on the TEN-T infrastructure) would need to combine the merits of a transport network model along with a detailed energy economic model like PRIMES-TREMOVE. The transport network model, which would need to cover the time horizon until 2050 in 5 or 10-year time steps for the whole EU, would provide a finer representation of the implied changes in transport activity due to the absence of the core and comprehensive transport network. A transport network model requires however detailed specifications for the projects to be implemented at section level. These detailed project specifications are not known yet up to 2050, considering the long term horizon. This was the reason for using the current approach.

## 2.2 PRESENTATION OF THE MAIN RESULTS OF THE MODEL FOR THE BASELINE SCENARIO

In the following, key results of the baseline scenario are presented.

### 2.2.1 Transport activity

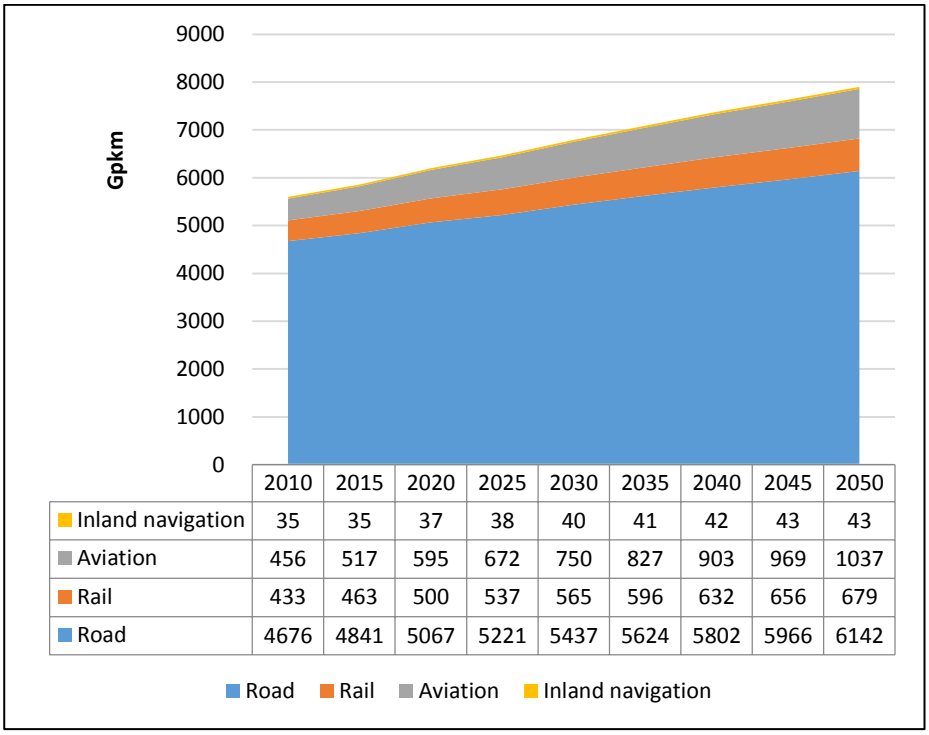
The total passenger transport activity is projected to follow a steadily increasing trend from 2010 to 2050. The GDP and population growth drives the increase in the activity of all passenger modes, albeit at different rates. The modal share of road transport (i.e.

[130] https://op.europa.eu/en/publication-detail/-/publication/aed45f8e-63e3-47fb-9440-a0a14370f243/language-en/format-PDF/source-106883045

[131] https://op.europa.eu/en/publication-detail/-/publication/aed45f8e-63e3-47fb-9440-a0a14370f243/language-en/format-PDF/source-106883045

passenger cars, public transport, 2-wheelers) is found to slightly decrease from 83% in 2010 to 78% in 2050. The reduction in the modal share of road is due to the increase in the growth of aviation. Aviation refers in the figure below to domestic (national) and international intra-EU flights. As regards the developments in the passenger railway sector, model results indicate a rather stable modal share throughout the projection period, as a result of the absence of railway infrastructure investments related to the core and comprehensive network. The modal share of the inland navigation remains relatively unchanged at 1% for the projection period.

**Figure 2.2-1: Passenger transport activity in the EU27 in the Baseline scenario**

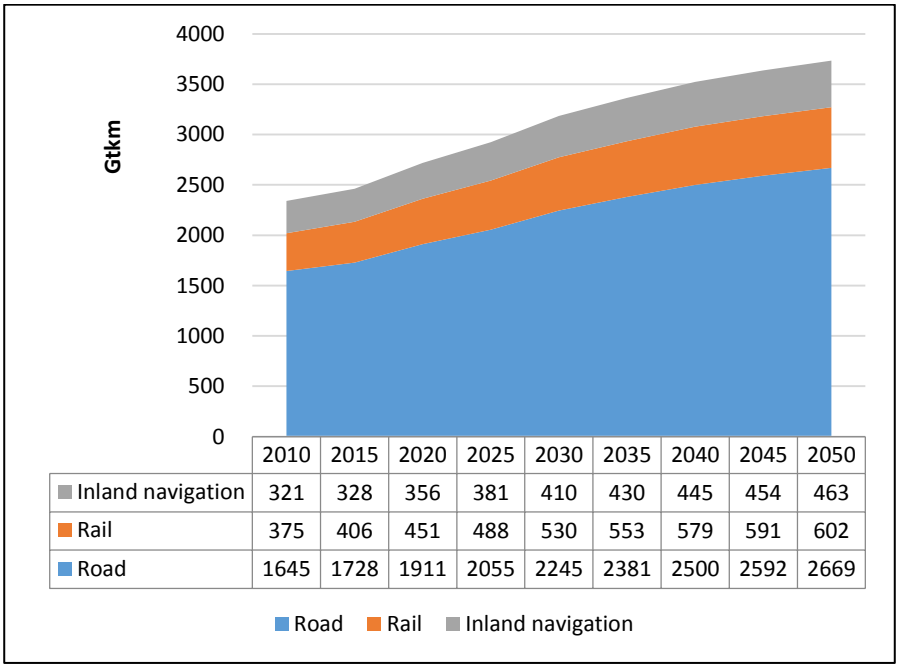



| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Inland navigation | 35 | 35 | 37 | 38 | 40 | 41 | 42 | 43 | 43 |
| Aviation | 456 | 517 | 595 | 672 | 750 | 827 | 903 | 969 | 1037 |
| Rail | 433 | 463 | 500 | 537 | 565 | 596 | 632 | 656 | 679 |
| Road | 4676 | 4841 | 5067 | 5221 | 5437 | 5624 | 5802 | 5966 | 6142 |

Source: PRIMES-TREMOVE model, E3Modelling

Driven, again, by the GDP growth, the total freight transport activity is projected to grow in the period 2010-2050. The rate of growth is greater in the period between 2015-2030 than in the 2030-2050 period. The absence of the TEN-T core and comprehensive network fails to provide sufficient transport infrastructure coverage and inter-modal integration (road, rail and inland navigation) and, as a result, road freight continues to hold a relatively stable modal share until 2050. The modal shares of freight rail and inland navigation (incl. inland waterways and national maritime) are projected to remain stable throughout the projection period.

**Figure 2.2-2: Freight transport activity in the EU27 in the Baseline scenario**



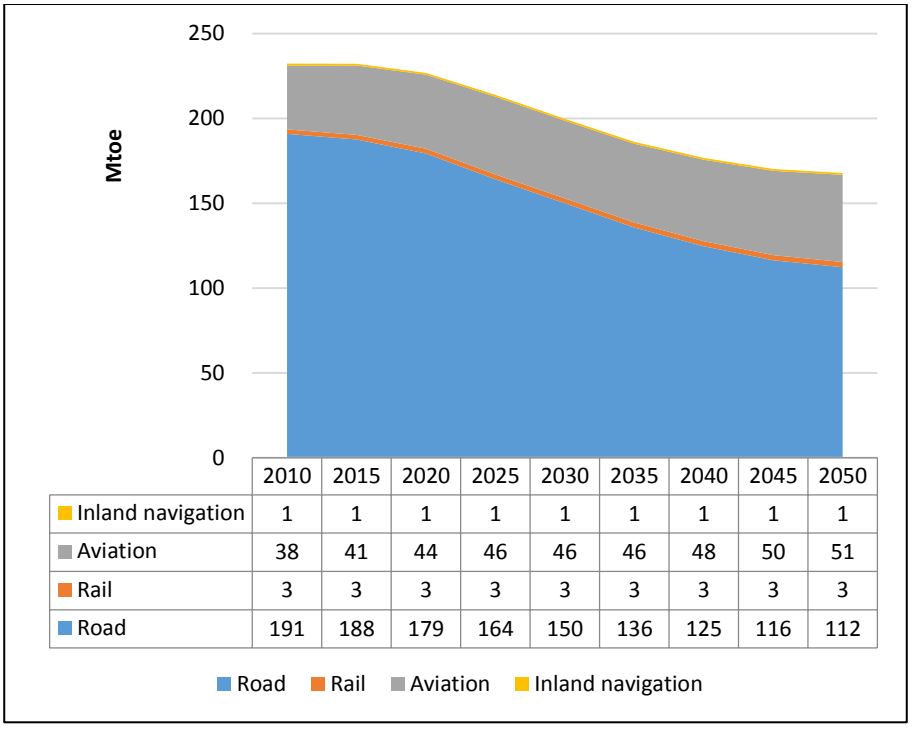

| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Inland navigation | 321 | 328 | 356 | 381 | 410 | 430 | 445 | 454 | 463 |
| Rail | 375 | 406 | 451 | 488 | 530 | 553 | 579 | 591 | 602 |
| Road | 1645 | 1728 | 1911 | 2055 | 2245 | 2381 | 2500 | 2592 | 2669 |

Source: PRIMES-TREMOVE model, E3Modelling

### 2.2.2 Final energy demand in transport

The total energy demand for passenger transport is projected to decrease from 2010 to 2050. Such reduction is driven by the policy assumptions included in the baseline scenario adopted by end of 2019 (but excluding the TEN-T regulation and including the 2030 climate and energy targets). These mainly relate to the implementation of the CO2 standards for light duty vehicles for 2030 but also other policy measures driving the improvements in the efficiency of the transport system and the uptake of sustainable alternative fuels and low- and zero-emission vehicles (e.g. the implementation of 4th Railways Package, Clean Vehicle Directive and Directive on alternative fuels infrastructure, etc.). The energy consumption of road passenger transport is almost halved from 191 Mtoe in 2010 to 112 Mtoe in 2050, as a result of the uptake of more energy efficient technologies and advanced powertrains such as electric ones. The energy consumption of passenger rail and inland navigation remains relatively unchanged at 3 Mtoe and 1 Mtoe respectively through the projected period and hold a small share of the overall passenger transport energy mix.

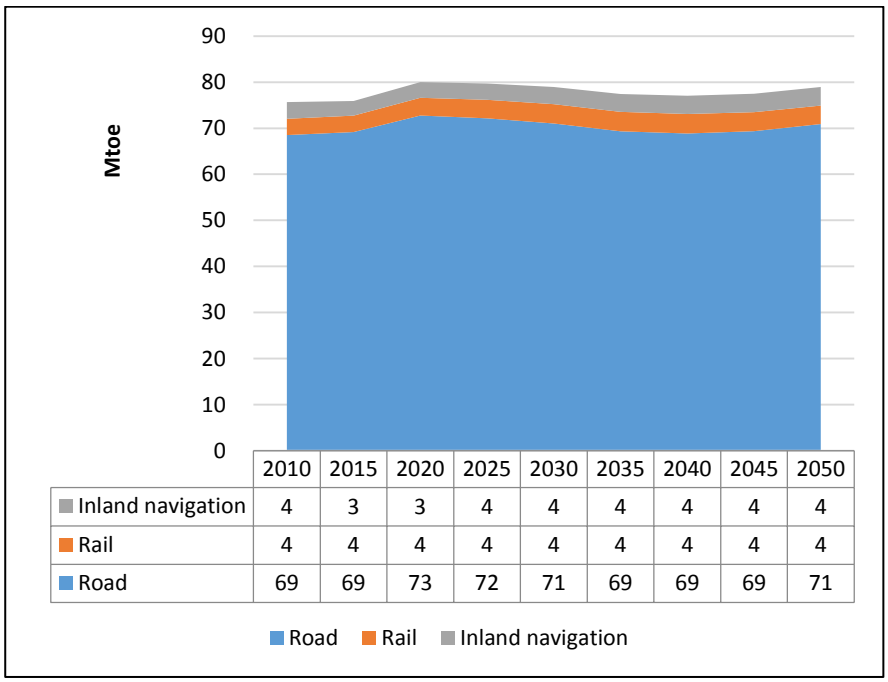
**Figure 2.2-3: Final energy demand by passenger transport mode in the Baseline scenario**




| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Inland navigation | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Aviation | 38 | 41 | 44 | 46 | 46 | 46 | 48 | 50 | 51 |
| Rail | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| Road | 191 | 188 | 179 | 164 | 150 | 136 | 125 | 116 | 112 |

Source: PRIMES-TREMOVE model, E3Modelling

**Figure 2.2-4: Final energy demand by freight transport mode in the Baseline scenario**




| | 2010 | 2015 | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|---|---|
| Inland navigation | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 |
| Rail | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 |
| Road | 69 | 69 | 73 | 72 | 71 | 69 | 69 | 69 | 71 |

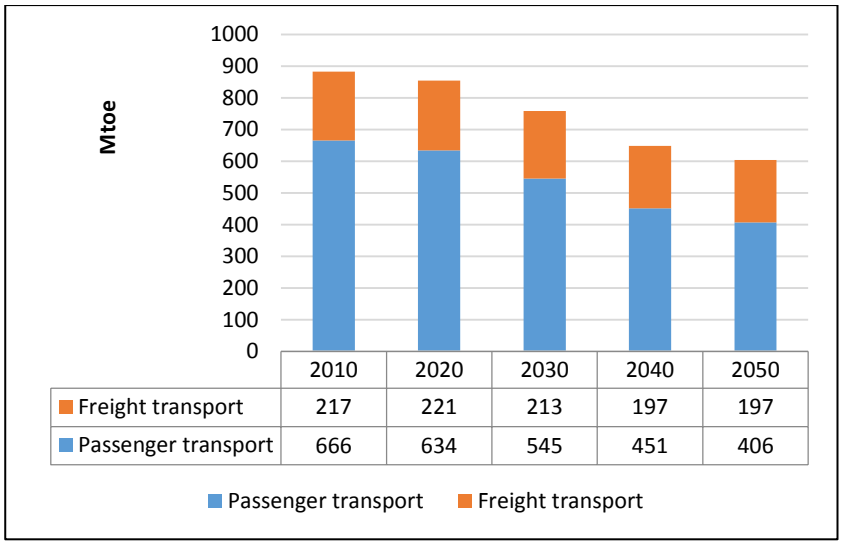
Source: PRIMES-TREMOVE model, E3Modelling

The energy consumption of freight transport displays a relatively stable trend despite the growing activity, due to measures driving the improvements in the efficiency of the transport system and the uptake of low- and zero-emission vehicles (e.g. the implementation of e-documents for freight, CO2 standards for heavy goods vehicles, Clean Vehicles Directive, etc.). Road freight is projected to continue to hold the largest share of the final energy demand in total freight transport throughout the projection period, also as a result of the relatively stable modal shares in total freight transport activity. Final energy consumption in freight rail and inland navigation is also projected to remain relatively stable.

### 2.2.3 CO2 emissions

The total CO2 emissions in transport reduce from around 900 Mtons in 2010 to about 600 Mtons in 2050. The main driver of this outcome is the reduction in the emissions of passenger transport and, in particular of passenger cars, due to the uptake of efficient and cleaner technologies. Despite the absence of the development of the TEN-T core and comprehensive network, the baseline scenario considers the implementation of other existing initiatives like the post-2020 CO2 emission targets on car, van and truck manufacturers as well as the Alternative Fuel Infrastructure Directive, Renewable Energy Directive and Clean Vehicles Directive. Such initiatives are driving the market uptake of low and zero emission fuels in the transport mix by 2030 and onwards. Some reduction in CO2 emissions also takes place in freight transport (mainly to road freight because of the CO2 emission standards for heavy goods vehicles); yet not at the extent of that in passenger transport.

**Figure 2.2-5: $CO_2$ emissions by transport mode in the Baseline scenario**



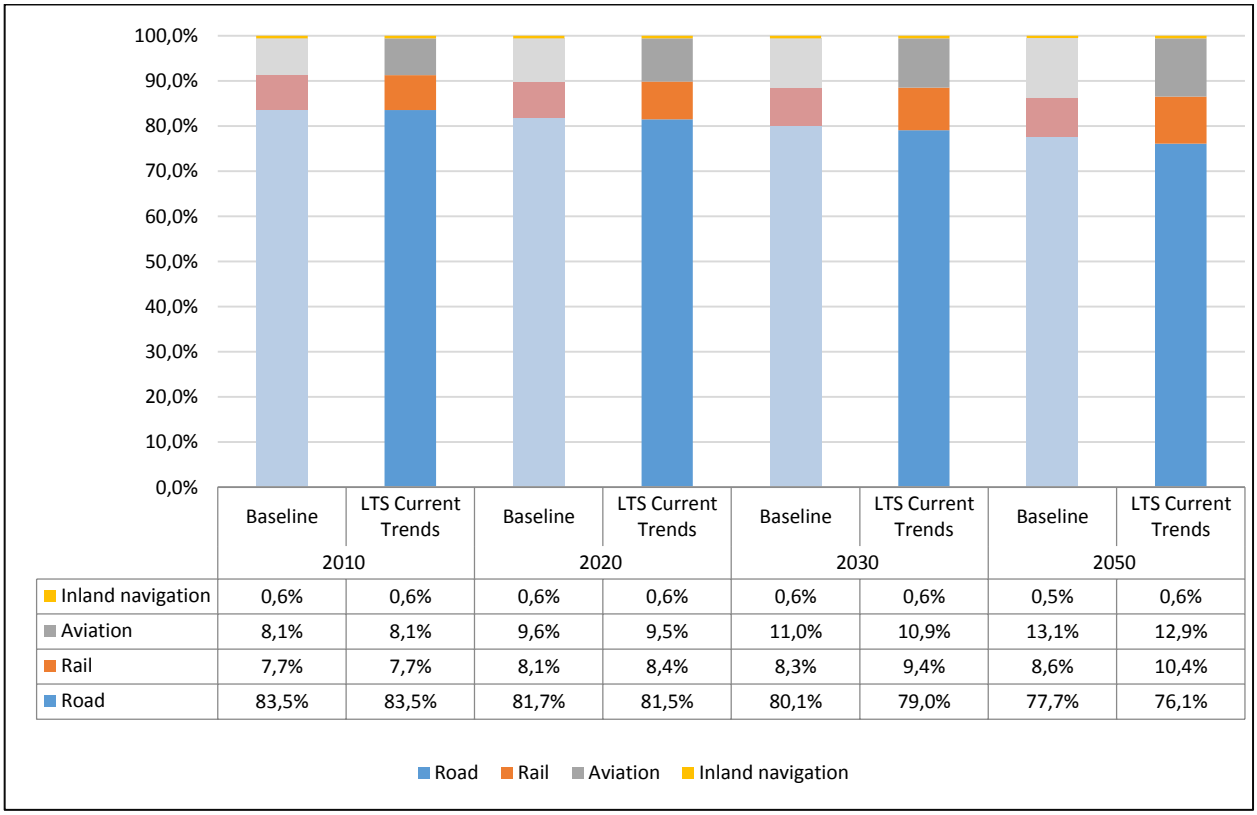

Source: PRIMES-TREMOVE model, E3Modelling

# 3 COMPARISON OF THE BASELINE SCENARIO WITH THE SCENARIO UNDER CURRENT TRENDS AND POLICIES

This section presents a comparison of the key results of the Baseline scenario against the scenario under current trends and policies (including the implementation of the TEN-T regulation). Hence, the comparison between the baseline and the current trends and policies scenario (so-called "LTS current trends" below) indicates potential impact of the TEN-T implementation by 2030 and 2050. The results are compared at the EU27 level, unless stated otherwise.

For passenger transport, the model results indicate a shift towards railways starting from 2020 onwards. Railways (i.e. aggregate of conventional and high-speed rail and tram-metro) are projected to increase their modal share by 1.1 p.p. in 2030 and 1.8 p.p. in 2050 compared to the Baseline scenario. In contrast, road passenger transport is projected to reduce its modal share by about 1 p.p. in 2030 and 1.5 p.p. in 2050 relative to the Baseline. Notably, some small reduction in the national and international intra-EU flights transport activity is taking place in the current trends scenario relative to the Baseline, mainly driven by competition from high-speed rail.

**Figure 3-1: Modal shares in passenger transport activity in the EU27 in the Baseline and the current trends and policies scenario**

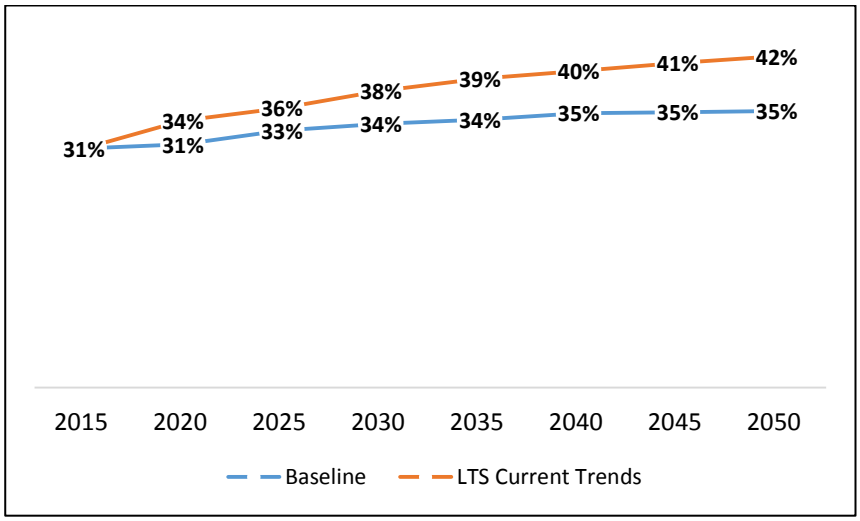



| | Baseline 2010 | LTS Current Trends 2010 | Baseline 2020 | LTS Current Trends 2020 | Baseline 2030 | LTS Current Trends 2030 | Baseline 2050 | LTS Current Trends 2050 |
|---|---|---|---|---|---|---|---|---|
| Inland navigation | 0,6% | 0,6% | 0,6% | 0,6% | 0,6% | 0,6% | 0,5% | 0,6% |
| Aviation | 8,1% | 8,1% | 9,6% | 9,5% | 11,0% | 10,9% | 13,1% | 12,9% |
| Rail | 7,7% | 7,7% | 8,1% | 8,4% | 8,3% | 9,4% | 8,6% | 10,4% |
| Road | 83,5% | 83,5% | 81,7% | 81,5% | 80,1% | 79,0% | 77,7% | 76,1% |

*Source: PRIMES-TREMOVE model, E3Modelling*

High-speed rail was found to significantly increase its modal share to 38% of the rail transport activity by 2030 (relative to 34% in the baseline scenario). In absolute terms, the difference in the transport activity of high-speed rail between the two scenarios is projected to be around 48 billion-pkm, in 2030 and 100 billion-pkm in 2050.

**Figure 3-2: Share of High-Speed rail in total EU27 rail passenger transport activity in the Baseline and the current trends and policies scenario**




*Source: PRIMES-TREMOVE model, E3Modelling*

In the following, we present the reduction in the passenger rail transport modal share in the Baseline scenario compared to the current trends and policies scenario in 2030 and 2050 at the core network corridor (CNC) level. For this assessment, we considered the mapping between the various EU MS and the 9 core network corridors (Table 3-1). The modal share of passenger rail refers to conventional and high-speed passenger rail and has been calculated by aggregating the specific EU MS which are mapped to a specific corridor.

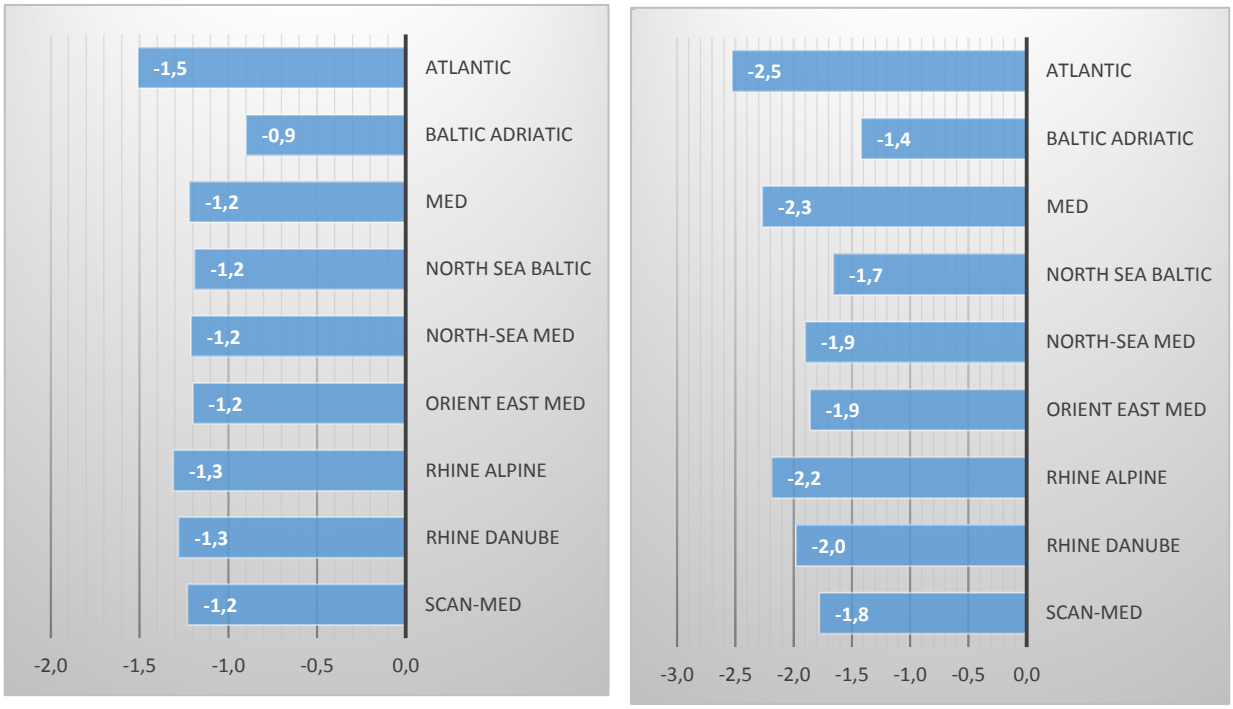
**Table 3-1: Mapping of EU Member States by core network corridor**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Atlantic core network corridor (ATL)** | PT | ES | FR | DE | | | | |
| **Baltic Adriatic core network corridor (BAC)** | PL | CZ | AT | IT | SI | SK | | |
| **Mediterranean core network corridor (MED)** | ES | FR | IT | HR | SI | HU | | |
| **North Sea Baltic core network corridor (NSB)** | EE | LV | LT | PL | DE | NL | BE | |
| **North-Sea Mediterranean core network corridor (NSM)** | IE | UK | FR | BE | NL | LU | DE | |
| **Orient East Med core network corridor (OEM)** | DE | CZ | AT | SK | RO | BG | GR | HU |
| **Rhine Alpine core network corridor (RALP)** | NL | BE | DE | FR | IT | LU | | |
| **Rhine Danube core network corridor (RHD)** | DE | AT | CZ | SK | RO | HR | BG | HU |
| **Scandinavian Mediterranean core network corridor (SCM)** | IT | AT | DE | DK | SE | FI | MT | |

Model results indicate a reduction in the modal share of passenger rail in all core network corridors. The highest reduction is observed in the case of the Atlantic CNC, which is mainly influenced by the large reduction in the high-speed rail in France, Germany and Spain in the baseline scenario compared to the current trends and polices scenario. The respective modal share is found to decrease by 1.5 p.p. in 2030 in the baseline scenario compared to current trends and policies. The smallest reduction is projected to take place in the Baltic Adriatic CNC (i.e. 0.9 p.p. reduction in 2030), as all the (related to this specific CNC) EU MS except for Italy and Austria show a relatively smaller reduction in passenger rail transport activity compared to other MS like France or Germany.

The modal share of passenger rail in the core network corridors is found to further decrease between the two scenarios in 2050 compared to 2030, in lack of the comprehensive TEN-T network implementation after 2030. The share of passenger rail is projected to decrease in the Atlantic CNC by 2.5 p.p. in the baseline scenario compared to LTS current trends and policies scenario, as a result of significant reductions in the high-speed rail in France, Germany and Spain in 2050. The second largest reduction is projected to take place in the Mediterranean CNC (2.3 p.p. reduction in the baseline scenario compared to the LTS current trends scenario), which is driven by the significant reductions in high-speed rail transport activity in Spain, France and Italy (and to a much lesser extent in the rest of the MS related to this CNC).

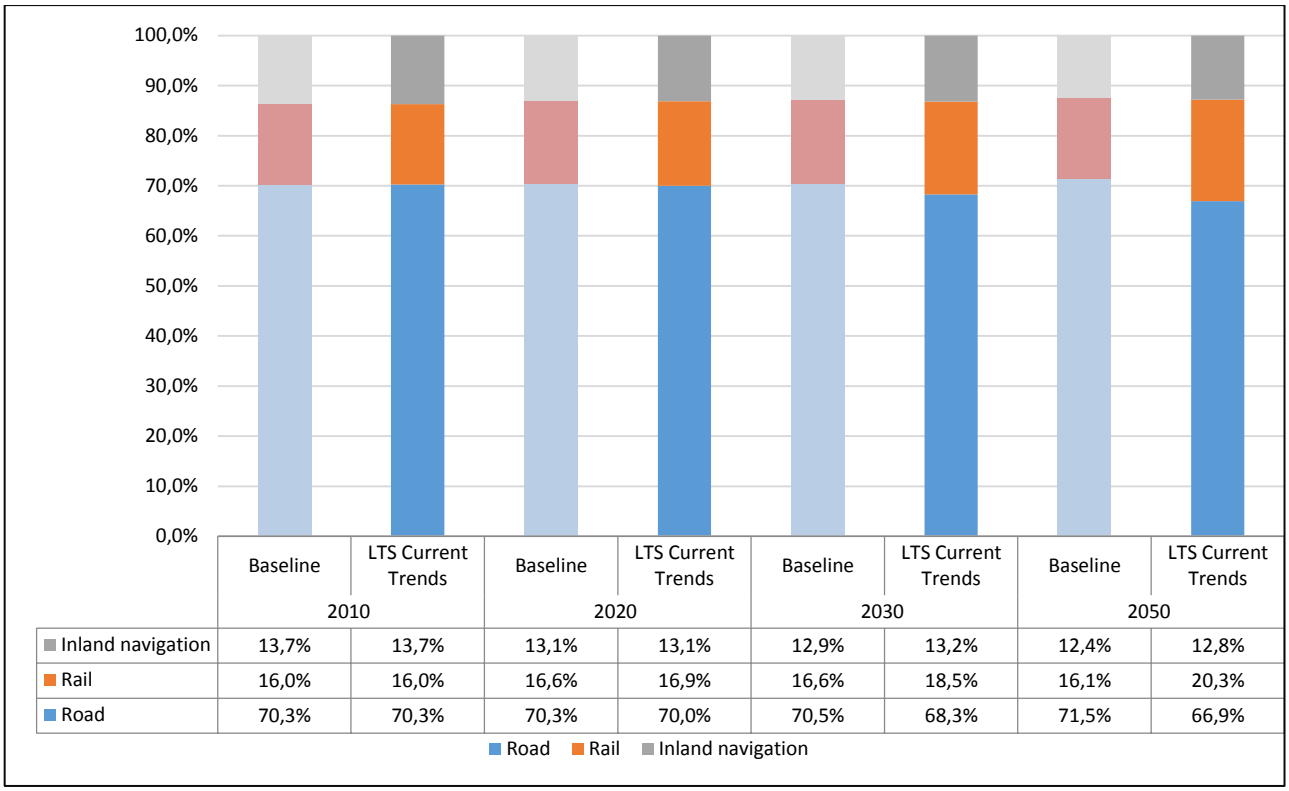
**Figure 3-3: Reduction in the passenger rail transport modal share in the Baseline scenario compared to the current trends and policies scenario (in p.p.), at core network corridor level, in 2030 (left) and 2050 (right)**




*Source: PRIMES-TREMOVE model, E3Modelling*

As regards freight transport, the current trends and policies scenario indicates a shift towards freight rail transport compared to the baseline scenario excluding the TEN-T regulation. The modal share of rail freight transport is projected to increase by approx. 2 p.p. in the LTS current trends scenario compared to baseline in 2030, to the detriment of road freight transport. Inland navigation shows some limited increase in its modal share by 2030 between the two scenarios. The modal shift towards freight rail is projected to amplify when looking at the developments by 2050. The modal share of freight rail is found to increase by more than 4 p.p. in the current trends and policies scenario compared to baseline in 2050. The baseline scenario indicates a relatively stable (and slightly reducing in 2050) modal share of freight rail in total freight transport, while the current trends and policies scenario denotes an ever-increasing modal share from 2020 onwards driven by the completion of the core and comprehensive TEN-T network.

**Figure 3-4: Modal shares in freight transport activity in the EU27 in the Baseline and the LTS current trends and policies scenario**



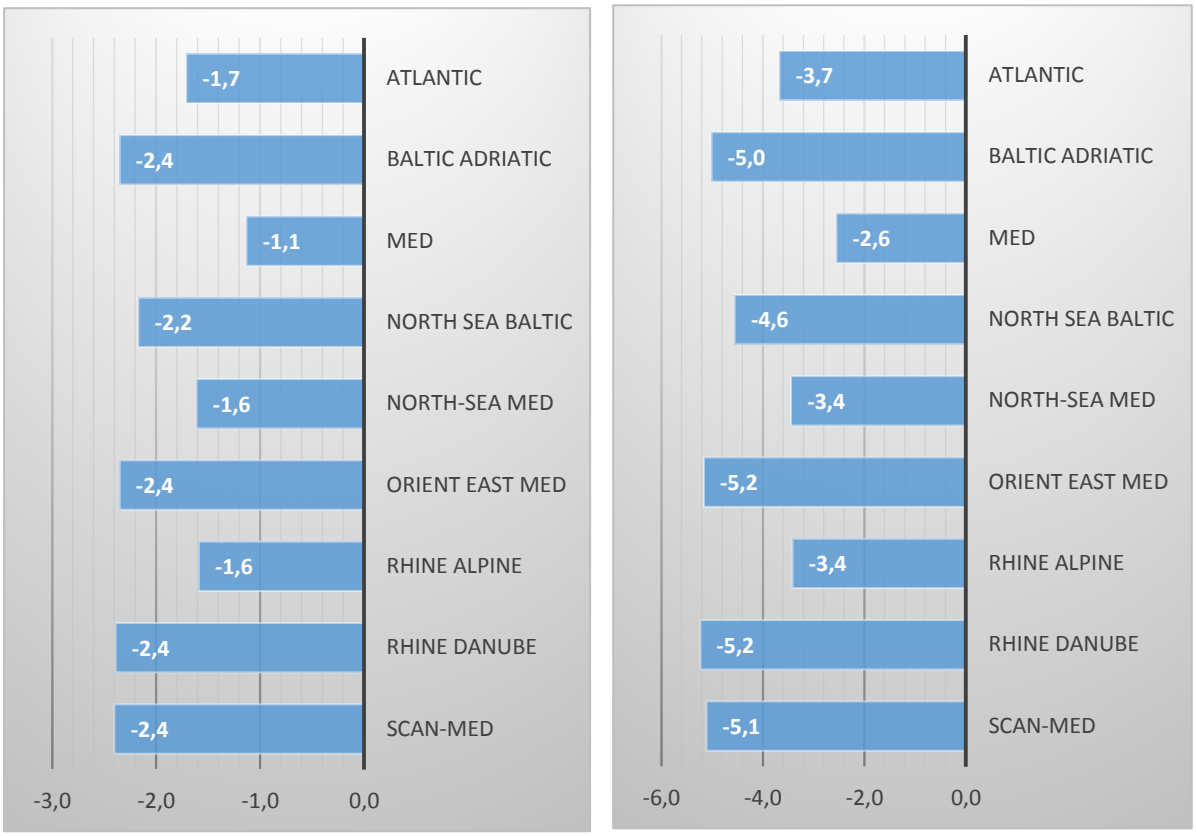

| | Baseline | LTS Current Trends | Baseline | LTS Current Trends | Baseline | LTS Current Trends | Baseline | LTS Current Trends |
|---|---|---|---|---|---|---|---|---|
| | 2010 | | 2020 | | 2030 | | 2050 | |
| Inland navigation | 13,7% | 13,7% | 13,1% | 13,1% | 12,9% | 13,2% | 12,4% | 12,8% |
| Rail | 16,0% | 16,0% | 16,6% | 16,9% | 16,6% | 18,5% | 16,1% | 20,3% |
| Road | 70,3% | 70,3% | 70,3% | 70,0% | 70,5% | 68,3% | 71,5% | 66,9% |

*Source: PRIMES-TREMOVE model, E3Modelling*

Figure 3-5 presents the reduction in the freight rail transport modal share in the Baseline scenario compared to the current trends and policies scenario in 2030 and 2050 at the cnc level, using the mapping between the various EU MS and the 9 core network corridors (Table 3-1).

Model results indicate a reduction in the modal share of freight rail in all core network corridors. The highest reduction is observed in the case of the Baltic Adriatic, Orient East Med, Rhine Danube and Scan-Med CNC, which are mainly influenced by a large reduction in the freight rail transport activity in Germany, Austria and Finland in the baseline scenario compared to the current trends and policies scenario. The respective modal share is found to decrease by 2.4 p.p. in 2030 in the baseline scenario compared to current trends and policies scenario. The modal share of freight rail in the core network corridors is found to further decrease between the two scenarios in 2050 compared to 2030, in lack of the comprehensive TEN-T network implementation after 2030.

**Figure 3-5: Reduction in the freight rail transport modal share in the Baseline scenario compared to the current trends and policies scenario (in p.p.), at core network corridor level, in 2030 (left) and 2050 (right)**




Source: PRIMES-TREMOVE model, E3Modelling

**Energy demand** in the EU-27 passenger transport sector is projected to be higher in the Baseline scenario relative to the current trends and policies scenario (assuming the implementation of the TEN-T regulation) by 2030 and 2050 (by 2% and 4% or 2.4 and 4.8 Mtoe, in 2030 and 2050, respectively), due to higher energy use in the road transport sector and aviation. Such developments are the result of higher road and air passenger transport activity in the baseline compared to the current trends scenario, due the detriment of rail (including high-speed rail).

The picture is relatively similar in the freight transport sector. The baseline scenario shows higher energy use in road freight compared to the current trends scenario (approximately 2% and 5% higher in the baseline scenario compared to current trends scenario in 2030 and 2050, respectively), due to the higher road freight transport activity.

**Table 3-2: Comparison of energy demand in the EU27 transport sector in the Baseline and the current trends and policies scenario**

| | | absolute diff. (in Mtoe) | | relative diff. (in %) | |
|---|---|---|---|---|---|
| | | 2030 | 2050 | 2030 | 2050 |
| Passenger transport | Road | 2.4 | 4.8 | 2% | 4% |
| | Rail | -0.3 | -0.3 | -8% | -9% |
| | Aviation | 0.4 | 0.7 | 1% | 1% |
| | Inland navigation | 0.0 | -0.1 | -4% | -7% |
| | | 2030 | 2050 | 2030 | 2050 |
| Freight transport | Road | 1.6 | 3.5 | 2% | 5% |
| | Rail | -0.4 | -0.9 | -9% | -19% |
| | Inland navigation | -0.1 | -0.2 | -4% | -5% |

*Source: PRIMES-TREMOVE model, E3Modelling*

Oil products consumption is projected to be higher in the baseline scenario compared to the current trends and policy scenario as a result of the higher modal share of road transport in the total passenger and freight transport in the baseline scenario. The baseline scenario indicates a higher consumption of oil products by approx. 5 and 12 Mtoe in 2030 and 2050 compared to the current trends and policies scenario. Electricity use is projected to be lower in the baseline scenario compared to the current trends and policies scenario, driven by the reduced transport activity of railways. In addition, the non-completion of the TEN-T core and comprehensive network is driving some lower electrification of the railways sector in the baseline scenario compared to the current trends and policies scenario from 2020 onwards.

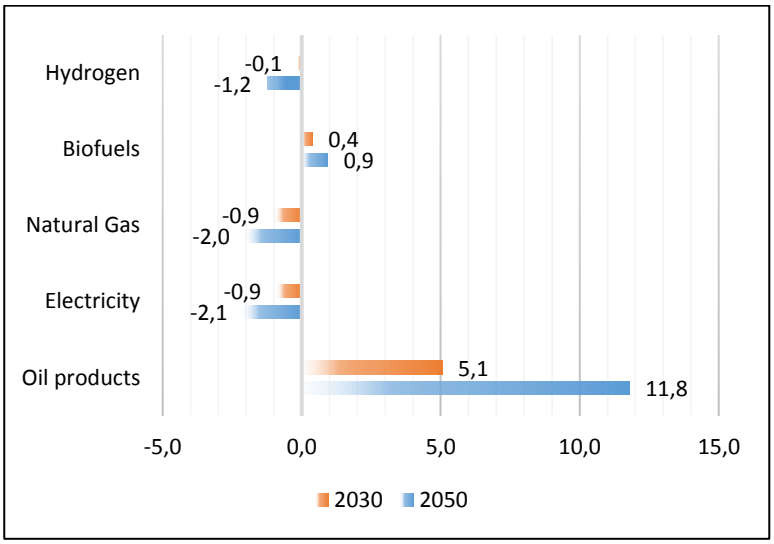
The non-completion of the TEN-T core and comprehensive network negatively impacts the uptake of alternative fuels such as natural gas and hydrogen in the baseline scenario, because of the lower or limited availability of alternative fuels infrastructure on the core TEN-T network (e.g. hydrogen refuelling stations, LNG terminals and LNG stations, as well as electricity recharging points). Natural gas consumption is projected to be lower by around 0.9 and 2 Mtoe in 2030 and 2050, respectively in the baseline scenario compared to the current trends and policies scenario, as a result of a reduced demand in road freight and shipping, due to the limited refuelling infrastructure.

Total transport CO2 emissions are projected to be higher in the baseline scenario compared to the current trends and policies scenario by 2030 and 2050. The driver of this outcome is mainly associated with the higher energy consumption of the more energy intensive transport modes (e.g. cars and trucks) and the lower availability of alternative fuels in transport because of the lower availability of refuelling/recharging infrastructure along the TEN-T core network.

Model results indicate higher **$CO_2$ emissions** in the baseline scenario compared to the current trends and policies scenario, by about 14 and 31 Mtons $CO_2$ by 2030 and 2050, respectively (i.e. 1.8% and 5.4% increase in 2030 and 2050, respectively). In cumulative terms, the baseline scenario shows higher $CO_2$ emissions relative to the current trends and

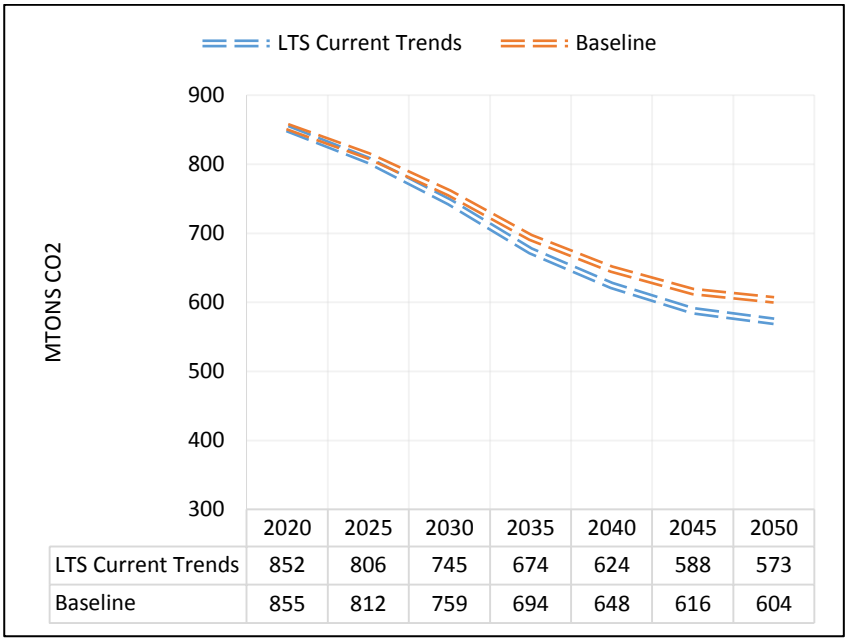
policies scenario of about 73 and 530 Mt $CO_2$ in 2030 and 2050, respectively (i.e. 0.6% and 2.1% increase in 2030 and 2050, respectively).

**Figure 3-6: Difference in the energy demand by fuel in the Baseline scenario compared to the LTS current trends and policies scenario in the EU27 (in Mtoe)**




*Source: PRIMES-TREMOVE model, E3Modelling*

**Figure 3-7: Total transport $CO_2$ emissions in the Baseline scenario compared to the current trends and policies scenario in the EU27**




| | 2020 | 2025 | 2030 | 2035 | 2040 | 2045 | 2050 |
|---|---|---|---|---|---|---|---|
| LTS Current Trends | 852 | 806 | 745 | 674 | 624 | 588 | 573 |
| Baseline | 855 | 812 | 759 | 694 | 648 | 616 | 604 |

*Source: PRIMES-TREMOVE model, E3Modelling*

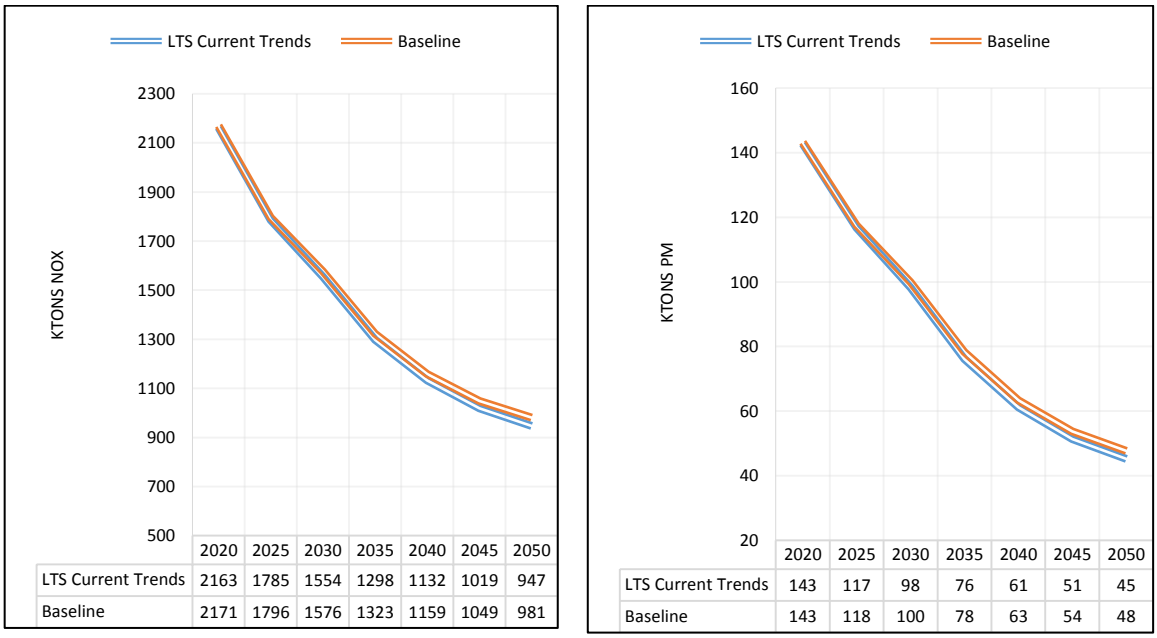
**Table 3-3: Comparison of cumulative $CO_2$ emissions in the EU27 transport sector in the Baseline and the current trends and policies scenario**

| Mton CO2 | 2015-2030 | 2015-2050 |
|---|---|---|
| Baseline | 12471 | 25742 |
| LTS Current Trends | 12398 | 25213 |
| absolute diff. | 73 | 530 |

*Source: PRIMES-TREMOVE model, E3Modelling*

NOx emissions would be about 22 and 36 ktons higher in the baseline scenario compared to the current trends scenario by 2030 and 2050, respectively (i.e. 1.4% and 3.6% increase in 2030 and 2050, respectively). PM emissions are projected to be 2 and 3 ktons higher in the baseline scenario compared to the current trends and policies scenario by 2030 and 2050, respectively (i.e. 1.7% and 5.6% increase in 2030 and 2050, respectively).

**Figure 3-8: (left) NOx and (right) PM emissions in transport (excl. intern. maritime) in the Baseline scenario compared to the current trends and policies scenario in the EU27**




*Source: PRIMES-TREMOVE model, E3Modelling*

In cumulative terms, the baseline scenario shows higher NOx emissions of about 138 and 680 ktons NOx in 2030 and 2050, respectively, compared to current trends and policies scenario (i.e. 0.4% and 1.2% increase in 2030 and 2050, respectively). PM emissions are projected to be 10 and 53 ktons above current trends and policies scenario in the baseline in 2030 and 2050, respectively (i.e. 0.5% and 1.6% increase in 2030 and 2050, respectively).

**Table 3-4: Comparison of cumulative NOx emissions in the EU27 transport sector (excl. intern. maritime) in the Baseline and the current trends and policies scenario**

| kt NOx | 2015-2030 | 2015-2050 |
|---|---|---|
| Baseline | 31507 | 55854 |
| LTS Current Trends | 31369 | 55173 |
| absolute diff. | 138 | 680 |

*Source: PRIMES-TREMOVE model, E3Modelling*

**Table 3-5: Comparison of cumulative PM emissions in the EU27 transport sector (excl. intern. maritime) in the Baseline and the current trends and policies scenario**

| kt PM | 2015-2030 | 2015-2050 |
|---|---|---|
| Baseline | 2038 | 3410 |
| LTS Current Trends | 2028 | 3357 |
| absolute diff. | 10 | 53 |

*Source: PRIMES-TREMOVE model, E3Modelling*

# 4 HIGH-LEVEL FINDINGS ON THE IMPACT OF COVID-19 ON THE EU TRANSPORT ACTIVITY

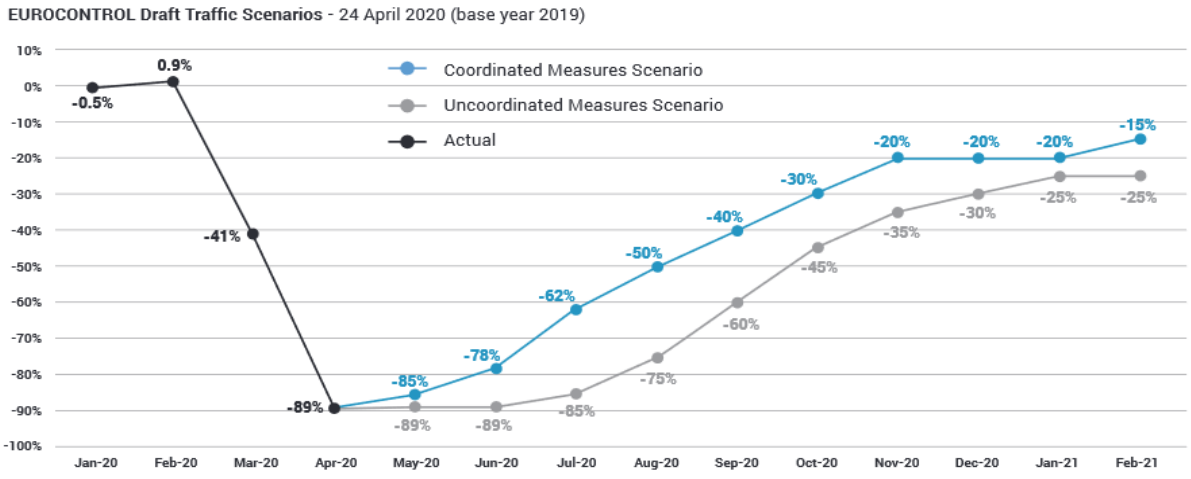
This section aims to present some high-level impacts of the Covid-19 outbreak on the EU transport activity. Nevertheless, more in depth analysis would be necessary to assess the impact of the Covid-19 on the EU transport sector and the overall EU economic activity, considering that newer data are also becoming available.

Since the Covid-19 outbreak, several governments took drastic measures to contain its wider expansion to the population. As a result, the activity in several economic sectors has slowed down. Particularly, the transport sector has been greatly affected due to international travel bans, confinement measures, stay-at-home requirements, and restricted access to public transport. In addition, global trade between countries and consequently freight transport, decreased to some extent due to lower economic activity and reduction in manufacturing output[132].

International travel restrictions led to a steep decline of domestic, intra- and extra-EU air traffic, through February, March and April (up to almost 90% less than 2019 levels, the lowest throughout the year). From June onwards, analysts anticipate that there will be a gradual recovery of flight activity first from domestic and intra-EU flights, as a result of increased international intra-EU mobility. Moving towards the last quarter of 2020, and assuming no second wave, extra-EU flights are also assumed to recover, but to lower levels than 2019.

[132] https://unstats.un.org/unsd/ccsa/documents/covid19-report-ccsa.pdf

**Figure 4-1: Reduction of intra- and extra-EU flight activity in 2020 compared to 2019**

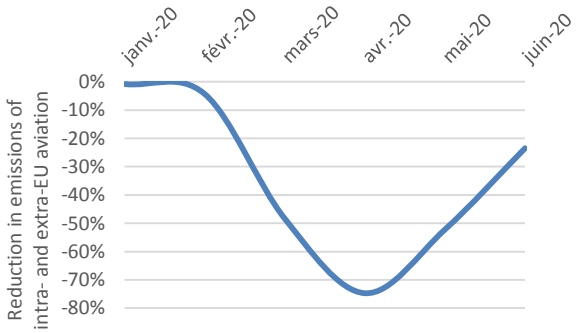



Source: EUROCONTROL[133]

The activity of the sector can also be determined by looking at the emissions of the sector.

Figure 4-1 indicates a steep reduction in aviation CO2 emissions in the months of March and April and to some extent May. Preliminary data for June were indicating a recovery of the CO2 emissions and the activity of the sector.

**Figure 4-2: Estimated reduction in $CO_2$ emissions from aviation compared to 2019**



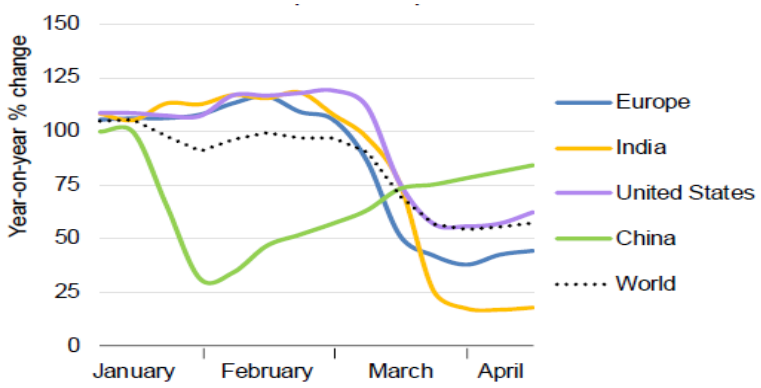

Note: Estimates based on total number of departing flights by aircraft on ground until 11 June 2020. Source: E3Modelling based on ICOS data[134]

During the first months of 2020, Covid-19 outbreak containment measures were aimed at ensuring social distancing in public transport and limiting personal mobility by all modes as EU citizens were increasingly being asked by their governments to stay at home. As such, a reduction in passenger transport activity was observed. Assuming that in the course of 2020 containment measures will be gradually lifted, an overall recovery of passenger transport activity is expected, but to lower levels than before the outbreak.

[133] Available at: https://www.eurocontrol.int/covid19

[134] Le Quéré et al. 2020, available at: https://www.icos-cp.eu/gcp-covid19. Accessed: 19/06/2020.

**Figure 4-3: Estimated reduction in road transport activity in Europe by the IEA during the first months of the Covid-19 outbreak**




Source: IEA[135]

Different passenger transport modes are expected to recover at different rates, as norms induced by social distancing may not be fully lifted (e.g. occupancy factors of public modes of transport), particularly demonstrating a preference towards private compared to public transport modes. High speed rail transport activity (in terms of pkm) has also been substantially decreased during the first months of the Covid-19 outbreak, mainly because of the reduction in the number of passengers travelling as a result of a preference of a private transport mode or tele-working.

The impact of the Covid-19 outbreak on the EU freight transport sector has been less severe than on the passenger transport. Road freight transport, which largely represents intra-EU trade, experienced the lowest reduction in its activity compared to other modes, such as passenger transport modes, because the trade and logistic operations continued during the months of the lockdown. The impact on the Covid-19 on the non-road freight transport is expected to be larger in magnitude than in the road freight transport sector.

[135] IEA (2020), Global Energy Review 2020 - The impacts of the Covid-19 crisis on global energy demand and $CO_2$ emissions (Revised version April 2020), International Energy Agency (IEA). Available at: https://www.iea.org/reports/global-energy-review-2020

**Annex 8: Costs and Benefits of Regulation 1315/2013**

| ***I. Overview of costs – benefits identified in the evaluation*** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Citizens/Consumers | | Businesses | | Administrations | | [Other…] | |
| | | Qualitative | Quantitative / monetary | Qualitative | Quantitative / monetary | Qualitative | Quantitative / monetary | Qualitative | Quantitative / monetary |
| Cost | Recurring administrative costs for participating in the TEN-T governance (committees, corridor fora, TEN-T days etc.) that had to be expected following the 2013 revision | N/A | N/A | N/A | N/A | Negligible as reported by MS in the consultations | Rough estimations from the Programme Support Actions point to costs of annually € 20.000 per corridor per MS | N/A | N/A |
| | costs for compliance with the TEN-T regulation e.g. upgrading of infrastructure to TEN- standards, filling of missing | N/A | N/A | N/A | N/A | High<br><br>Source: TEN-implementation reports | It has been estimated that implementing the TEN-T core network results in | N/A | N/A |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | links and removal of bottlenecks | | | | | | annual costs of around € 40bn across the 27 MS | | |
| Benefits | Recurring economic and social benefits related to economic growth and employment that were somewhat expected following the revision | High<br><br>Sources: 2018 study on the impact of TEN-T completion on growth, jobs and the environment; 2015 study on the non-completion of the TEN-T | 7.5 million additional job years are estimated due to the implementation of the TEN-T core network between 2018 and 2030 | High<br><br>Sources: 2018 study on the impact of TEN-T completion on growth, jobs and the environment; 2015 study on the non-completion of the TEN-T | 1.6% additional GDP in 2030 due to the implementation of the TEN-T | N/A | N/A | N/A | N/A |
| | Recurring environmental, changes in pollution that were somewhat expected following the revision | High<br><br>Sources: Modelling exercise undertaken for the evaluation study | Non – implementation of the TEN-T would lead to higher CO2 emissions of about 73 and 530 Mt CO2 in 2030 and 2050, respectively (i.e. | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | 0.6% and 2.1% increase in 2030 and 2050, respectively)<br><br>NOx emissions of about 138 and 680 ktons NOx in 2030 and 2050, respectively, compared to current trends scenario (i.e. 0.4% and 1.2% increase in 2030 and 2050, respectively).<br><br>PM emissions in cumulative terms are projected to be 10 and 53 ktons above current trends scenario in the baseline in 2030 and 2050, respectively (i.e. 0.5% and 1.6% increase in 2030 and 2050, respectively). | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | recurring economic, social benefits due to better connectivity and accessibility expected following the revision | High<br><br>Sources: Stakeholder opinions and data from completed projects (see chapter three) | Time savings and better accessibility for passengers on completed network projects. However full network effect will only occur upon network completion | High<br><br>Sources: Stakeholder opinions and data from completed projects (see chapter three) | Time savings in freight transport, access to larger labour market through better accessibility and shortened travel times for employees. However full network effect will only occur upon network completion | | | | |
| | Recurring, social benefits due to reduction in road accidents expected following the revision | High<br><br>Source: statistics | In total road deaths have seen a decrease of 43% in Europe between 2010 and 2019 partially due to higher standards on TEN-T roads and motorways. | | | | | | |
| | Recurring, social benefits due to reduction in noise | Medium<br><br>Source: | As traffic volumes have increased over the | | | | | | |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | emissions expected following the revision | stakeholder opinions (OPC) | implementation period also noise levels have been on the rise. However completed projects, the concentration of transport on major access and high quality infrastructure on the TEN-T somewhat countered these developments however they are difficult to measure | | | | | | |

# Annex 9 – Overview of legislation relevant to TEN-T

## Legislation in force with relevance to the TEN-T Regulation

| Legislation | Summary |
|---|---|
| **Directive (EU) 2016/797 on the interoperability of the EU's rail system** | This Directive establishes the conditions to be met to achieve interoperability within the Union rail system in accord with Directive (EU) 2016/798. The goal is to **define an optimal level of technical harmonisation, to facilitate, improve and develop rail transport services within the Union and with third countries**. This, in turn, is expected to contribute to the completion of the single European railway area and the progressive achievement of the internal market. |
| **Directive (EU) 2016/798 on railway safety** | This Directive lays down provisions to **ensure the development and improvement of the safety of the Union rail system and improved access to the market for rail transport services** through 1 harmonising regulatory structure in MS; 2) defining responsibilities between the actors in the Union rail system; 3) developing common safety targets ('CSTs') and common safety methods ('CSMs'); 4) setting out the principles for issuing, renewing, amending and restricting or revoking safety certificates and authorisations; 5) requiring the establishment, for each MS, of a national safety authority and an accident and incident investigating body; and 6) defining common principles for the management, regulation and supervision. |
| **Directive (EC) 2008/57 on the interoperability of the rail system within the Community (Repealed by Directive 2016/797)** | This Directive sets out to establish the conditions to be met to achieve **interoperability within the Community rail system** in a manner compatible with the provisions of Directive 2004/49/EC. These conditions concern the **design, construction, placing in service, upgrading, renewal, operation and maintenance of the parts** of this system as well as the professional qualifications and health and safety conditions of the staff who contribute to its operation and maintenance. |
| **Directive 2012/34/EU** | This Directive establishes the single European railway area laying down the rules applicable to the management of railway infrastructure and to rail transport activities of the railway undertakings, the criteria applicable to the issuing, renewal or amendment of licences by a Member State intended for railway undertakings and the principles and procedures applicable to the setting and collecting of railway infrastructure charges and the allocation of railway infrastructure capacity being applicable to the use of railway infrastructure for domestic and international rail services |
| **Regulation (EU) No 913/2010 concerning European rail network for competitive freight** | This Regulation lays down rules for **the establishment and organisation of international rail corridors for competitive rail freight** with a view to the development of a European rail network for competitive freight. |
| **Directive 2002/59/EC establishing a Community vessel traffic monitoring and information system** | This Directive establishes a Community vessel traffic monitoring and information system with a view to enhancing the safety and efficiency of maritime traffic, improving the response of authorities to incidents, accidents or potentially dangerous situations at sea, including search and rescue operations, and contributing to a better prevention and detection of pollution by ships, being applicable applies to ships of 300 gross tonnage and upwards, |
| **Directive (EU) 2019/883 on port reception facilities for the** | This Directive aims to protect the marine environment against the negative effects from **discharges of waste from ships using ports** |

| Legislation | Summary |
|---|---|
| **delivery of waste from ships (amending Directive 2010/65/EU and repealing Directive 2000/59/EC)** | located in the Union, while ensuring the smooth operation of maritime traffic, by improving the availability and use of adequate port reception facilities and the delivery of waste to those facilities. It applies to all ships, irrespective of their flag, calling at, or operating within, a port of a Member State. Member States have to ensure the **availability of port reception facilities** adequate to meet the need of the ships normally using the port without causing undue delay to ships. |
| **Directive (EU) 2010/65 on reporting formalities for ships arriving in and/or departing from ports of MS and repealing Directive (EC) 2002/6** | The purpose of this Directive is to **simplify and harmonize the administrative procedures applied to maritime transport** by making the electronic transmission of information standard and by rationalising reporting formalities. These provisions apply to maritime transport for ships arriving in and ships departing from ports situated in EU MS. |
| **Regulation 2019/1239/EU establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU** | This Regulation establishes a framework for a technologically neutral and interoperable European Maritime Single Window environment ('EMSWe') with harmonised interfaces, in order to facilitate the electronic transmission of information in relation to reporting obligations for ships arriving at, staying in and departing from a Union port. |
| **Directive (EU) 2014/94 on the deployment of alternative fuels infrastructure** | This Directive establishes a common framework of measures for the **deployment of alternative fuels infrastructure in the Union to minimise dependence on oil and to mitigate the environmental impact of transport.** The legislation sets out minimum requirements for the building-up of alternative fuels infrastructure. |
| **Directive (EU) 2010/40 on the framework for the deployment of Intelligent Transport Systems in the field of road transport and for interfaces with other modes of transport** | This Directive establishes a framework in support of the coordinated and coherent deployment and use of **Intelligent Transport Systems (ITS)** within the Union, in particular across the borders between the Member States, and sets out the general conditions necessary for that purpose. It provides for the development of specifications for actions related with four priority areas:<br>I. Optimal use of road, traffic and travel data (referring to priority actions a, b and c);<br>II. Continuity of traffic and freight management ITS services;<br>III. ITS road safety and security applications (referring to priority actions d, e and f) and<br>IV. Linking the vehicle with the transport infrastructure. |
| **Regulation (EC) 886/2013 with regard to data and procedures for the provision, where possible, of road safety-related minimum universal traffic information free of charge to users** | This Delegated Regulation establishes the specifications necessary to ensure compatibility, interoperability and continuity for the deployment and operational use of data and procedures for the provision, where possible, of **road safety-related minimum universal traffic information** free of charge to users on a Union level in accordance with Directive 2010/40. It applies to the provision of information services located in the trans-European road network |
| **Regulation (EC) 885/2013 on the provision of information services for safe and secure parking places for trucks and commercial vehicles** | This Delegated Regulation establishes the specifications necessary to ensure compatibility, interoperability and continuity for the deployment and operational use of information **services for safe and secure parking places for trucks and commercial vehicles** on a Union level in accordance with Directive 2010/40/EU. It applies to the provision of information services located in the trans-European road network |
| **Regulation (EC) 2017/1926 on EU-wide multi-modal travel information** | This Delegated Regulation, supplementing Directive 2010/40/EU on ITS, establishes the necessary specifications to ensure that **EU-wide multimodal travel information services are accurate and available across borders to ITS users**. It applies to the entire transport network of the Union. |
| **Regulation (EC) 2015/962 on** | This Regulation establishes the specifications necessary to ensure the |

| Legislation | Summary |
|---|---|
| **EU-wide real-time traffic information** | **accessibility, exchange, re-use and update of road and traffic data by road authorities, road operators and service providers for the provision of EU-wide real-time traffic information services.**<br>It applies to the TEN-T comprehensive road network, as well as motorways not included in this network, and priority zones identified by national authorities where they consider this to be relevant. |
| **Directive (EC) 2008/96 on road infrastructure safety management** | This Directive on road infrastructure safety management procedures **ensures that the road network is safe.** The Directive's application to the TEN-T road network is binding, but MS can extend its scope on voluntary basis. |
| **Directive 2004/54/EC on Minimum safety requirements for tunnels in the trans-European Road Network** | This Directive establishes the minimum level of safety for road users in tunnels in the Trans-European Road Network by the prevention of critical events that may endanger human life, the environment and tunnel installations, as well as by the provision of protection in case of accidents. The Directive is applicable to all **tunnels in the Trans-European Road Network with lengths of over 500 meters**, but MS can extend its scope on voluntary basis |
| **Directive 2004/52/EC on Interoperability of electronic road toll systems** | This Directive establishes the requirements for the interoperability of electronic road toll systems in the Community. It applies to the **electronic collection of all types of road fees**, on the entire Community road network, urban and interurban, motorways, major and minor roads, and various structures such as tunnels, bridges and ferries |
| **Single European Sky legislative framework (Regulations (EC) 549/2004, 550/2004, 551/2004 and 552/2004)** | The Single European Sky framework covers the **provision of air navigation services (ANS), the organisation and use of airspace and the interoperability of the European Air Traffic Management Network (EATMN**). The four Regulations adopted in 2004 (the SES I Package) were revised and extended in 2009 with Regulation (EC) n° 1070/2009. This framework also includes more than 20 Implementing Rules and Community Specifications ("technical standards"). |
| **Directive 2005/44/EC of the European Parliament and of the Council of 7 September 2005 on harmonised river information services (RIS) on inland waterways** | This Directive establishes a framework for the establishment and further development of technical requirements, specifications and conditions to ensure **harmonised, interoperable and open River Information Services (RIS)** with a view to enhancing safety, efficiency and environmental friendliness and to facilitating interfaces with other transport modes.<br>It applies **to all inland waterways of the Member States of class IV** and above which are linked by a waterway of class IV or above to a waterway of class IV or above of another Member State, including the ports on such waterways. |

*Source: Evaluation team's compilation based on legislative documents listed in the table*