

Progress towards Federated Logistics through the Integration of TEN-T into A Global Trade Network

D1.7 Legislation and EU Policy to impact EGTN final version

Document Summary Information

Grant Agreement No	860274	Acronym	PLANET
Full Title	Progress towards Federated Logistics through the Integration of TEN-T into A Global Trade Network		
Start Date	01/06/2020	Duration	36 months
Project URL	www.planetproject.eu		
Deliverable	D1.7 Legislation and EU policy to impact EGTN final version		
Work Package	WP1		
Contractual due date	28/02/23	Actual submission date	23/02/23
Nature	Report	Dissemination Level	Public
Lead Beneficiary	UIRR		
Responsible Author	UIRR		
Contributions from	CERTH (co-author)		



Revision history (including peer reviewing & quality control)

Version	Issue Date	% Complete ¹	Changes	Contributor(s)
1.0	13.12.2022	50%	Draft ToC + insertion of existing content	Eric FEYEN (UIRR)
2.0	30.01.2023	90%	Adaptations of all chapters, summary tables and adding new content	Eric FEYEN (UIRR) Orestis TSOLAKIS (CERTH)
2.1	02.02.2023	95%	Updates of chapters 3, 5 and 6, draft of conclusions Editorial changes (all tables and figures)	Eric FEYEN (UIRR)
2.2	03.02.2023	98%	Adding the conclusions + executive summary	Eric FEYEN (UIRR)
2.3	09.02.2023	99%	Add chapter on national legislation	Eric FEYEN (UIRR)
2.4	10.02.2023	100%	Quality review and fine tuning	Eric FEYEN (UIRR) Orestis TSOLAKIS (CERTH)

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Glossary of terms and abbreviations used

Abbreviation / Term	Description
ADR	Agreement concerning the International Carriage of Dangerous Goods by Road
AGC	European Agreement on Main International Railway Lines
AGTC	European Agreement on Important International Combined Transport Lines and Related Installations
AI	Artificial Intelligence
ATP	Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage
B2A	Business to Authority
B2B	Business to Business
BPM	Business Process Model
CCAM	Connected, Cooperative and Automated Mobility
CIM	Contract of International Carriage of Goods by Rail
CIT	International Rail Transport Committee
CIV	Contract of International Carriage of Passengers by Rail
CNC	Core Network Corridors
COTIF	Convention concerning International Carriage by Rail
CSRD	Corporate Sustainability Reporting Directive
CT	Combined Transport
CUI	Contract of use of infrastructure in international rail traffic
CUV	Contract of use of vehicles in international rail traffic
DTLF	Digital and Transport Logistics Forum
EC	European Commission
e-FTI	electronic Freight Transport Information
EGTN	Integrated Green EU-Global T&L Networks
EGTN	Green EU-Global Trade & Logistics Networks
EMSWe	European Maritime Single Window environment
EO	Economic Operators
ERTMS	European Rail Traffic Management System
EU	European Union
GDP	Gross Domestic Product
GHG	Greenhouse Gases
GTC	General Terms and Conditions
ICT	Information and Communications Technology

IMO	International Maritime Organisation
IRU	International Road Transport Union
ITS	Intelligent Transport Systems
KPI	Key Performance Indicator
MB	Management Board
MMT	Multi Modal Transport Reference Data Model
NFRD	Non-Financial Reporting Directive
OSJD	Organisation for co-operation between railways
OTIF	Intergovernmental Organisation for International Carriage by Rail
PI	Physical Internet
RAG	Rail Advisory Group
REFIT	Regular Fitness and Performance Programme
RFC	Rail Freight Corridor
RID	Contract of International Carriage of Dangerous Goods by Rail
RNE	RailNet Europe
SMEs	Small and Medium-sized Enterprises
SMGS	Agreement on Direct International Goods Transport by Rail
SMPS	Agreement on Direct International Carriage of Passengers and Luggage by Rail
T&L	Transport & Logistics
TAG	Terminal Advisory Group
TCO	Total Cost of Ownership
TDM	Transport Data Model
TEN-T	Trans-European Transport Network
TIR	International Road Transports
TSIs	Technical Specifications for Interoperability
UN	United Nations
UN/CEFACT	The United Nations Centre for Trade Facilitation and Electronic Business
UNECE	United Nations Economic Commission for Europe
VTMISS	Vessel Traffic Monitoring and Information Systems
WCO	World Customs Organisation

1 Executive Summary

This deliverable D1.7 on ‘Legislation and EU Policy to impact EGTN’ addresses the results of the analysis of ongoing and forthcoming legislative and policy initiatives that might impact the design and realisation of the EGTN within the PLANET project.

The research on legislative initiatives focuses on the impacts of national, international and EU initiatives. For all these levels, the consortium has identified actions that regulate topics such as infrastructure, greening of transportation, digitalisation, operations and intermodality (modal shift). These measures might affect at least one of the EGTN dimensions (infrastructure, technology and governance). Most of the inventoried initiatives are impacting the infrastructure components and operations of the EGTN whereas some actions concentrated on the governing rules and on the digitalisation of transport-related documents (consignment notes, customs). The impact assessment demonstrates that nearly the entire catalogue is EGTN-relevant and will influence the EGTN attributes (Geo-economics aware, Innovation, Impact, Integrated, Inclusive).

The review of policy initiatives concentrated on the activities carried out under the Digital Transport & Logistics Forum (DTLF), the recently published Sustainable and Smart Mobility Strategy and the Sustainable Finance (EU taxonomy) policy. For the DTLF, the impacts of the e-FTI and of the development of federated platforms on the EGTN have been analysed: the collected evidences show a clear impact of those policies on the realisation of the EGTN. The same applies to the other identified policy initiatives.

The key implementation barriers per legislation and/or per EGTN dimension have proven that a full interoperable EU network does not exist currently and that additional actions need to be undertaken to reach the initial intended declared benefits of the legal and policy initiatives. A clear list of obstacles and barriers have been identified per EGTN layer and attributes.

Initially not planned within this task, a scenario 2030-2050 has been drafted for each transport mode considering vision and strategies published by recognised institutions and relevant stakeholders. For these scenarios, a prioritised list of legal and policy documents has been set up in order to evaluate their impacts. The purpose of this entire exercise was the provision of value changes per input parameter (total costs, load factor, reliability and speed) and per transport mode that can be used by the PLANET’s partners responsible for the simulation model in order to run enhanced future scenarios and to provide also this information to relevant other project activities within WP4 and WP5.

2 Introduction

The vision of PLANET is to advance the European Commission's strategy for Smart, Green and Integrated Transport and Logistics by efficiently interconnecting infrastructure (TEN-T, Rail-Freight Corridors) with geopolitical developments, as well as to optimise the use of current & emerging transport modes and technological solutions. The realization of this vision is what PLANET calls the **Integrated Green EU-Global T&L Networks (EGTN)**.

The main objective of this final version of this deliverable is to evaluate the potential impacts of various legislative and policy initiatives on the EGTN implementation and to assess the key implementation barriers.

2.1 Mapping PLANET Outputs

Purpose of this section is to map PLANET's Grant Agreement commitments, both within the formal Deliverable and Task description, against the project's respective outputs and work performed (see table 1).

Table 1: Adherence to PLANET's GA Deliverable & Tasks Descriptions

PLANET GA Component Title	PLANET GA Component Outline	Respective Document Chapter(s)	Justification
DELIVERABLE			
D1.7 Legislation and EU policy to impact EGTN v1	Revised and final version of D1.6.	Chapter 5	Chapter 5 details the impacts of the legal and policy initiatives on the EGTN layers, attributes and development. It includes as well the key barriers for implementation. For the legal context it is aggregated whereas for the policy documents it is described per initiative.
TASKS			
ST1.3.1 Analysis and preliminary impact assessment of forthcoming international, EU and national legislative initiatives on the development of the EGTN	<p>The analysis will focus on the main legislative initiatives at international, EU and national level that could have a significant impact on the realisation of the EGTN.</p> <p>The work to be undertaken will include the following steps:</p> <ol style="list-style-type: none"> 1. Provision of legislation factors to be considered in T1.1 2. identification of forthcoming international, EU and national legislative initiatives that could impact the development of 	Chapters 4, 5, 6	<p>Chapter 4.1 lists the initiatives on International and European levels. It includes also the national initiatives (China) and highlights the most relevant legislative initiatives for the EGTN development.</p> <p>Chapter 5 categories the initiatives by priorities and details the potential impacts on the various EGTN components.</p> <p>Chapter 6 describes the impacts of all initiatives on a 2030 scenario per transport mode. It includes the key figures to be used in the simulation model (linkage with T1.5).</p>

	<p>the EGTN, using experts' focus groups</p> <p>3. preliminary qualitative assessment of the impact of each initiative on the EGTN's attributes as defined in section 1.3.1 and the LLs using experts' focus groups</p> <p>4. prioritisation of the forthcoming legislative initiatives and selection of the ones to be used in Task T1.5</p>		
ST1.3.2 Analysis and preliminary impact assessment of EU policy initiatives affecting EGTN with particular reference to DTLF	<p>The analysis will focus on the main EU policy initiatives that could have a significant effect on the realisation of the EGTN, and which have not yet been translated into a specific legislative proposal. The DTLF II initiative is expected to serve as the focus of this Task by participants in both DTLF II subgroups (e.g. INLECOM, UIRR, CERTH, VPF). The work to be undertaken will include the following steps:</p> <p>1. identification of potential future EU policy actions that could impact the development of the EGTN, drawing from the ongoing DTLF results (especially from SG2 on optimising cargo flows along transport corridors)</p> <p>2. preliminary qualitative assessment of the impact of each potential future policy initiative on the EGTN's attributes as defined in section 1.3.1 using experts' focus groups</p>	Chapters 4, 5, 6	<p>Chapter 4.2 lists the policy initiatives that might impact the development of the EGTN.</p> <p>Chapter 5 categories the initiatives by priorities and details the potential impacts on the various EGTN components.</p> <p>Chapter 6 describes the impacts of all initiatives on a 2030 scenario per transport mode. It includes the key figures to be used in the simulation model (linkage with T1.5).</p>

	3. prioritisation of the potential future policy initiatives and selection of the ones to be used in T1.5		
ST1.3.3 List of key barriers arising from relevant legislation and policies	<p>This task will define the key implementation barriers faced by the prioritised forthcoming legislative initiatives (Subtask 1.3.1) and potential future policy initiatives (Subtask 1.3.2):</p> <ol style="list-style-type: none"> 1. identification of implementation barriers for each one of the prioritised legislative and policy initiatives 2. semantic alignment, removal of duplicate barriers and definition of final barriers' list 3. classification of barriers according to the main EGTN attribute they have an impact on (i.e. geo-economics aware, innovation embedding, impactful, integrated, inclusive) 4. linkage of each barrier to the main recommendation categories foreseen in WP4 (i.e. TEN-T Interfacing to Global trade routes – Task 4.1, guide on disadvantaged regions – Task 4.2, capacity building programmes – Task 4.3, technology roadmaps – Task 4.4, standardisation – Task 4.5. 	Chapter 5.2	Chapter 5.2 described the identified potential key implementation barriers for all prioritised legal and policy documents. It includes a linkage with WP4 and LLs.

2.2 Deliverable Overview and Report Structure

Figure 1 represents graphically the main elements of this deliverable. Besides the usual parts as the executive summary and the introduction, this document summarises the concept of EGTN (definition and possible impacts) as envisaged by the PLANET project partners. The core part of the document is the impact assessment of the selected relevant legislative and policy initiatives that might influence the design and realisation of the EGTN. The key implementation barriers of those actions are also included in this deliverable.

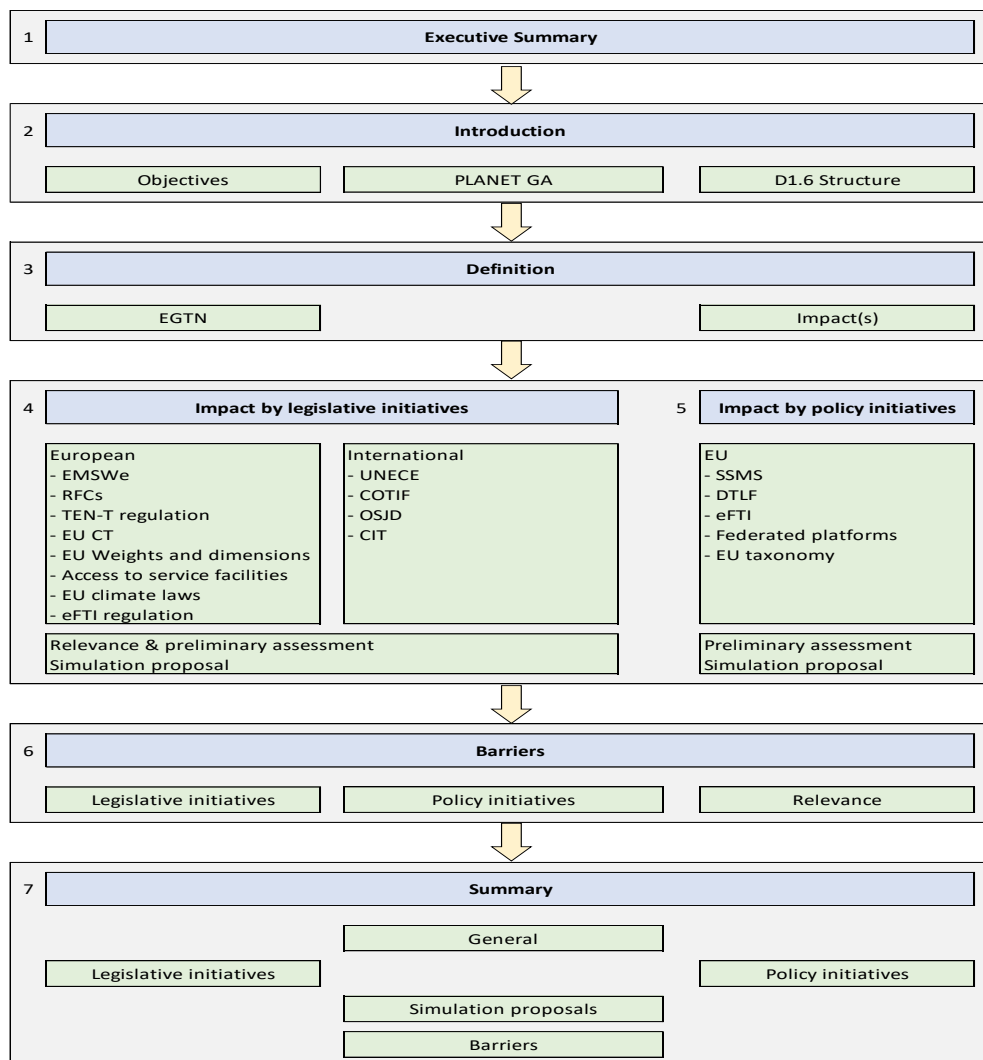


Figure 1: overall structure of the deliverable

Based on the figure 1, this deliverable has been structured in seven distinctive chapters:

- Chapter 1 includes the executive summary.
- Chapter 2 introduces the general objectives of the study on legislative and policy actions.
- Chapter 3 describes the definition of EGTN in the context of the PLANET project and how legislative and policy initiatives might potentially impact the development of the EGTN.
- Chapters 4 details the inventory of respectively the legislative and policy initiatives on the EGTN
- Chapter 5 summarises the key impacts and implementation barriers faced by the legislative and policy initiatives.
- Chapter 6 details the impacts of the prioritised legal and policy actions on the 2030-2050 scenario, including the input parameters for the simulation model.
- Chapter 7 contains the main conclusions.

3 EGTN and impact definition

3.1 The EGTN concept in PLANET

The vision of PLANET is to advance the European Commission's strategy for Smart, Green and Integrated Transport and Logistics by efficiently interconnecting infrastructure (TEN-T, Rail-Freight Corridors) with geopolitical developments, as well as to optimise the use of current & emerging transport modes and technological solutions, while ensuring equitable inclusivity of all participants, increasing the prosperity of nations, preserving the environment, and enhancing Citizens quality of life. The realization of this vision is what PLANET calls the **Integrated Green EU-Global T&L Networks (EGTN)**.

Therefore, EGTN are international logistics systems that:

- make use of physical and digital infrastructures;
- aim at operational excellence for customers and external stakeholders;
- incorporate geo-economic context;
- are enabled by (disruptive) transport & logistics concepts and technologies.

The **EGTN attributes** are:

- Geo-economics aware: A European T&L network that is aware of the geo-economics aspects driving the development of new trade routes and flows to/from Europe and their impact on the TEN-T;
- Innovation: A European T&L network that takes advantage of the potential of innovative logistics concepts (e.g. PI) and enabling technological innovations (Industry 4.0, blockchain, IoT, 3D printing, etc.) in its operation;
- Impact: A T&L network that is more economically, environmentally and socially sustainable than the existing TEN-T;
- Integrated: An EU T&L network integrated with the global network both in terms of hard & soft infrastructure;
- Inclusive: Accessible to disadvantaged regions, supporting the development of workforce skills & knowledge.

To satisfy the above attributes PLANET goes beyond strategic transport studies and also beyond transport ICT research, by rigorously modelling, analysing and assessing T&L interactions and dynamics. The aim is to generate and exercise the most important future scenarios from a T&L perspective. The EGTN technology workstream is not aimed at producing a 'platform' but instead focuses in a blueprint and best practices to help T&L actors to define and implement a clear digital strategy.

The development of EGTN in PLANET encompasses a three-layer structure: **physical, technological and governance dimensions**.

- The physical infrastructural layer of EGTN is defined as the TEN-T of the future in terms of T&L infrastructure. It consists of the revised and enriched existing rail/road/maritime TEN-T infrastructure (nodes & corridors) as a result of the new emerging routes which alter the significance of existing infrastructure and the criticality of current capacity bottlenecks, causing also the emerge of new important nodes/corridors. The EGTN is connected and operationally integrated to the new global corridors while at the same time the regional dimension of infrastructure will be enhanced in order to facilitate the development of disadvantaged regions.
- The technology layer of EGTN consists of the digital infrastructure of EGTN which aims to realize the innovation attribute of EGTN through leveraging emerging technologies and supporting its operation under the PI paradigm. In order to be able to do so, an open, cloud-based EGTN infrastructure is developed in the form of an online platform to support the planning of EGTN, meet its management requirements and also facilitate its governance.
- The governance layer of EGTN consists of the ecosystem of stakeholders interacting and collaborating for developing and sharing T&L infrastructure and participating in the decision making

of the EGTN. It also includes all the corridor governing schemes which will be developed within EU or between EU and non-EU countries as well as a possible overarching governance scheme similar to the concept of Single European Sky (SES) which delegated competences in air traffic management (ATM) to the EU and the decision-making process has moved away from an intergovernmental practice to the EU framework.

3.2 How legislative and policy initiatives could impact the EGTN

In the context of Task 1.3, the main aim is (1) to create an inventory of all legislative and policy initiatives and (2) to perform a qualitative impact assessment of those relevant actions on the EGTN developments and (3) to analyse the potential impacts of all actions on the 2030 scenario.

Legislation is a *“law which has been promulgated (or “enacted”) by a legislature or other governing body or the process of making it”* whereas policy can be defined as *“a set of ideas or a plan of what to do in particular situations that has been agreed to officially by a group of people, a business organization, a government, or a political party”*.

The core element of Task 1.3 is to evaluate the potential (qualitative) impacts of all the above-listed actions on the EGTN design and development. Impact assessments examine whether there is a need for action and analyse the possible impacts of available solutions. These are usually carried out during the preparation phase, before a governing body finalises a proposal for a new law or policy. They provide evidence to inform and support the decision-making process. In Europe, the findings are summarized in impact assessment reports which should contain at least the following elements: the environmental, social and economic impacts, including impacts on small and medium enterprises and competitiveness, and an explicit statement if any of these are not considered significant, who will be affected by the initiative and how the consultation strategy and the results obtained from it.

Another element is to provide the simulation input parameters of the impacts of legal and policy actions on the 2030 scenario. The parameters were obtained on desktop research (transport-related visions, evaluation of prioritised initiatives) and on the results of a workshop.

The different EGTN components (attributes and layers) as described in the previous section are fully integrated in the qualitative assessment approach that is reported in the next chapters of this deliverable.

4 Inventory of legislative and policy initiatives related to EGTN

The analysis will consider forthcoming initiatives, i.e. initiatives that are either in an ongoing legislative process, or having completed the legislative process and there is an agreed date of coming into effect in the near future, or have been placed as a priority in forthcoming legislative action plans.

4.1 Legal context

4.1.1 Introduction

The **inventory related to the legislative initiatives** has been focused on all acts taken by any governance bodies at international, EU and national level. For the EU level, it means the analysis of EU treaties, Regulations, Directives, Delegated and Implementing Acts. The international catalogue will concentrate on set of rules, norms and standards generally recognised as binding for nations. It covers treaties and standardization committees. In the national level, cases have been considered where differences exist on the relevant legislation of non-EU countries along the three emerging routes/corridors to/from Europe which were identified in Task 1.2, with a clear focus on China.

4.1.2 European level

Table 2 summarises all the identified forthcoming initiatives that are relevant for the development of the EGTN. At European level, 9 legislative actions have been listed. Most of them have been recently developed and updated (apart the Combined Transport Directive from 1992) and are covering a large variety of topics such as infrastructure (6x), greening (2x), digitalisation (5x), operations (4x) and intermodal transport (x7).

Table 2: Inventory of EU legislative initiatives

Name	Coverage	TOPICS					Year
		Infrastructure	Greening	Digitalisation	Operations	Intermodal	
Regulation (EU) 2019/1239 of the European Parliament and of the Council of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU	EU			x	x		2019
Regulation (EU) No 913/2010 of the European Parliament and of the Council of 22 September 2010 concerning a European rail network for competitive freight Text with EEA relevance	EU	x		x	x	x	2010
Regulation (EU) No 1315/2013 of the European Parliament and of the Council of 11 December 2013 on Union guidelines for the development of the trans-European transport network and repealing Decision No 661/2010/EU Text with EEA relevance	EU	x				x	2013
Council Directive 92/106/EEC of 7 December 1992 on the establishment of common rules for certain types of combined transport of goods between Member States	EU	x			x	x	1992
Regulation (EU) 2020/1056 of the European Parliament and of the Council of 15 July 2020 on electronic freight transport information (Text with EEA relevance)	EU			x		x	2020
Directive (EU) 2015/719 of the European Parliament and of the Council of 29 April 2015 amending Council Directive 96/53/EC laying down for certain road vehicles circulating within the Community the maximum authorised dimensions in national and international traffic and the maximum authorised weights in international traffic (Text with EEA relevance)	EU	x			x	x	2015
COMMISSION IMPLEMENTING REGULATION (EU) 2017/2177 of 22 November 2017 on access to service facilities and rail-related services	EU	x		x		x	2017
COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS Sustainable and Smart Mobility Strategy – putting European transport on track for the future	EU	x	x	x	x	x	2020
Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL establishing the framework for achieving climate neutrality and amending Regulation (EU) 2018/1999 (European Climate Law)	EU		x				2020

A detailed description (scope and key aspects of the document relevant for the EGTN development) of all identified EU legislative initiatives can be found in the first version of the deliverable (D1.6).

4.1.3 International level

For the catalogue of legislation at international level the analysis has been mainly concentrating on the following organisations:

- The United Nations Economic Commission for Europe (UNECE), based in Geneva, is one of five regional commissions of the United Nations. Its major aim is to promote pan-European economic integration. It sets out norms, standards and conventions to facilitate international cooperation, particularly for transport. The UNECE agreements cover topics like transport infrastructures, road traffic and vehicles, inland waterway, border crossing facilitation, transport of dangerous goods and perishable foodstuffs.
- Intergovernmental Organisation for International Carriage by Rail (OTIF) is an intergovernmental organisation based in Bern. COTIF, which gives rise to OTIF, defines the aim of OTIF as to promote, improve and facilitate international traffic by rail.
- The Organisation for Co-Operation between Railways (OSJD) is an inter-ministerial organisation based in Warsaw. One of its main tasks is to manage the Agreement on International Passenger Transport by Rail (SMPS) and the Agreement on International Goods Transport by Rail (SMGS).
- The International Rail Transport Committee (CIT) is an association of over 200 railway undertakings and shipping companies that operate international passenger and/or freight transport services.

Table 3 provides a summary of all relevant legislation regarding freight transport with a focus on rail.

Table 3: Legislative initiatives at international level

		TOPICS				
Name	Coverage	Infrastructure	Greening	Digitalisation	Operations	Intermodal
United Nations Economic Commission for Europe (UNECE)						
European Agreement on Main International Railway Lines (AGC)	INT	x				
European Agreement on Important International Combined Transport Lines and Related Installations (AGTC)	INT	x				x
Customs Convention on the International Transport of Goods under Cover of TIR Carnets (TIR Convention)	INT				x	x
Agreement on the International Carriage of Perishable Foodstuffs and on the Special Equipment to be Used for such Carriage (ATP)	INT				x	
European Agreement concerning the International Carriage of Dangerous Goods by Road (ADR)	INT	x		x	x	x
Organisation intergouvernementale pour les transports internationaux ferroviaires (OTIF)						
Transport of Dangerous Goods by Rail (RID)	INT	x		x	x	x
Contract of International Carriage of Goods by Rail (CIM)	INT				x	x
Organisation for co-operation between railways (OSJD)						
Agreement on International Railway Freight Communications (SMGS)	INT	x			x	x
International Rail Transport Committee (CIT)						
General Terms and Conditions of Eurasian carriage by rail (GTC EurAsia)	INT				x	x

A detailed description (scope and key aspects of the document relevant for the EGTN development) of all identified international legislative initiatives can be found in the first version of the deliverable.

4.1.4 National Level

1) Limitations and restrictions

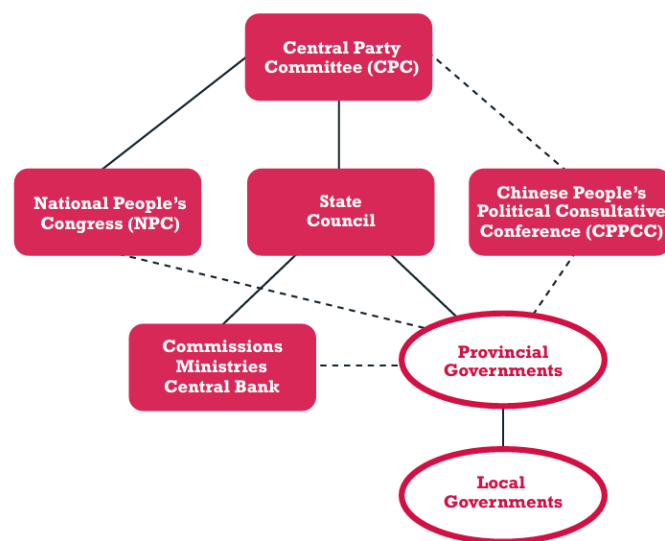
The aim of this task is to analyse if legal and/or policies might have an impact on the EGTNT layers, attributes and global development. As PLANET'S EGTN has the vision to create an enhanced version of the current TEN-T Regulation, the evaluation at national level should concentrate only on the 27 EU Member States.

Another aspect to be considered on the national evaluation is related to the aspects of improving the traffic flows between Europe and Asia (partially covered by the living labs). In this context, the project partners have

decided to concentrate this part of the analysis on the main actor for the Eurasian corridors: China. An evaluation of other countries such as Russia, Belorussia... was not deemed relevant due to the circumstances of the Ukrainian war. In the first part, the most important elements regarding the general decision-making process in China will be described and in a second part the relationship between China and EU will be detailed under the loop of the EU-China connectivity platform for transportation.

2) *China: the basics*

China has a very different form of government and decision-making process than other parts of the world. With a strong centralized government and central planning authority, much of what happens in China is strongly influenced by central government policy. There are also significant differences in landownership and how land is transferred to private developers by lease instead of purchase.



SOURCE: Liu, Z., "Planning and Policy Coordination in China's Infrastructure Development," Paper prepared for the ADB-JBIC-World Bank East Asia Pacific Infrastructure Flagship Study, undated.

Figure 2 - Chines governmental structure

Figure 2 shows the organizational structure of different levels of government in China. The Central Party Committee (CPC) is the most important participant in the broad policymaking process in China, providing leadership to the National People's Congress, State Council, and Chinese People's Political Consultative Conference. The CPC establishes national policy and often plays a critical role in making sure adopted policies are carried out. This is done primarily by having party members serve as heads of agencies (at the national level) or by having at least a party member and an administrator serve jointly as agency head (at the local level). Ministries and commissions report to the State Council. All ministries must submit an infrastructure development plan to the National Development and Reform Commission (NDRC) for approval.

The following are the most important transportation- related ministries:

- Ministry of Communications—Responsible for national roads and highways, inland waterways, ports, and ocean shipping
- Ministry of Railways—Responsible for the national railway system
- Ministry of Construction—Responsible for urban planning and urban transport
- Central Administration of Central Aviation—Responsible for planning and developing airports

At the provincial and municipal levels, each government has its own transportation agency, often with responsibility for all modes of transportation.

The following table provides an overview of the China's legal system categorised by types of laws and by hierarchy.

Classification by types of laws	Classification by hierarchy
<ul style="list-style-type: none"> • Constitutional Law • Civil and Commercial Law • Administrative Law • Economic Law • Social Law • Criminal Law • Lawsuit and Non-litigation Procedural Law 	<ul style="list-style-type: none"> • Law (passed by National People's Congress (NPC) and Standing Committee, decreed by President) • Administrative Laws and Regulations (passed by the State Council, Prime Minister's decrees) • Local Statutes (passed by local NPC and Standing Committee) • Regulations (passes by Ministries, Ministers' decrees)

Table 4 - China's legal system

3) China: the key provisions in transport

In general, China's efforts to bring its transportation laws in line with international standards are visible. China ratified some important international transport conventions or incorporated similar standards into national legislation. However, some vagueness remains concerning the implementation of the standards in practice – especially concerning the provisions on liabilities. Local applications, interpretations, regulations and measures may exist, which can decisively change the final result. A thorough investigation of the individual case is therefore always indispensable.

Irrespective of the mode of transport or the nature of the freight, China's general contract law, the Contract Law of the People's Republic of China of 1999, contains liability rules for freight transport contracts in its articles 288-292 and 304-316. These rules principally apply to all transport contracts in China, unless a more specific law demands application.

- Rail provisions

In the area of **international rail transportation**, China ratified the international SMGS convention, a treaty formed by China, Mongolia, North Korea, Vietnam, former Soviet republics and Eastern European nations such as Poland, Bulgaria, Hungary and Albania. Annex 1 to the SMGS contains a liability system for cargo transported by rail (General Provisions on the Contract of Carriage of Goods in International Traffic). However, China has not ratified the international COTIF (Convention Concerning International Carriage by Rail) and the CIM (Uniform Rules Concerning International Carriage By Rail, Appendix B to COTIF). Thus, rail transports between China and Europe occur between nations which either have ratified SMGS, COTIF or both conventions, which raises the question of the applicable rules of liability.

For **national rail transportations** in China or where the SMGS does not apply or fully regulates a matter, the Railway Law of the People's Republic of China contains further provisions.

- Maritime

The main transport mode for cargo to and from China still is carriage by sea. The largest Chinese container ports include in descending order Shanghai, Hong Kong, Shenzhen, Ningbo, Qingdao, Guangzhou and Tianjin. **Despite its importance, China has not ratified any of the international conventions in this field.** Nevertheless, the Maritime Code of the People's Republic of China largely complies with international agreements such as the Hague-Visby Rules, although formulations of the Hamburg Rules have also been adopted. The liability system contained in the Maritime Code applies to international carriage of goods by sea, but not if transport occurs between ports located in the People's Republic of China.

- Intermodal

The United Nations Convention on International Multimodal Transport of Goods of 1980 was drafted to provide rules for this determination. Although the convention never entered into force due to a lack of signatories, its provisions became the basis for national transportations laws, including those of China, as well as for multimodal transport contracts.

- Road

Together with the Highway Law and the Road Traffic Safety Law, the Road Transport Ordinance (RTO) is the key piece of legislation on the Chinese road transport industry. It came into force in July 2004. Its stated aims are to establish order in the transport markets, safeguard public safety and people's rights, while promoting the development of a healthy market for road transport services².

4) *The Belt and Road Initiative (BRI)*

China's Belt and Road Initiative (BRI) is a strategy initiated by the People's Republic of China that seeks to connect Asia with Africa and Europe via land and maritime networks with the aim of improving regional integration, increasing trade and stimulating economic growth.

The name was coined in 2013 by China's President Xi Jinping, who drew inspiration from the concept of the Silk Road established during the Han Dynasty 2,000 years ago – an ancient network of trade routes that connected China to the Mediterranean via Eurasia for centuries. The BRI has also been referred to in the past as 'One Belt One Road'.

The BRI comprises a Silk Road Economic Belt – a trans-continental passage that links China with south east Asia, south Asia, Central Asia, Russia and Europe by land – and a 21st century Maritime Silk Road, a sea route connecting China's coastal regions with south east and south Asia, the South Pacific, the Middle East and Eastern Africa, all the way to Europe.

The BRI has been associated with a very large programme of investments in infrastructure development for ports, roads, railways and airports, as well as power plants and telecommunications networks. Since 2019, Chinese state-led BRI lending volumes have been in decline. The BRI now places increasing emphasis on "high quality investment", including through greater use of project finance, risk mitigation tools, and green finance.

The BRI is an increasingly important umbrella mechanism for China's bilateral trade with BRI partners: as of March 2020, the number of countries that have joined the Belt and Road Initiative by signing a Memorandum of Understanding (MoU) with China is 138.

5) *EU reactions towards BRI*

Two main (re)actions of the European Commission towards the Chinese' BRI initiative can be pointed out

1) The EU-China Connectivity Platform for transportation

The European Union (EU) and the People's Republic of China (China) are committed to maintaining and developing strong and fruitful relations in the area of transport. To improve transport connectivity, the European Commission (DG MOVE) and the National Development and Reform Commission of China (NDRC) established a Connectivity Platform in 2015.

The main objective of the Platform – as agreed by both sides – is to explore opportunities for further cooperation in transport with a view to enhance synergies between the EU's approach to connectivity, including the Trans-European Transport Network (TEN-T), and China's Belt and Road Initiative (BRI). The platform is also used to work towards greater transparency, reciprocity in market access and a level playing field for businesses in transport infrastructure development.

² More details can be found in this IRU study: <https://www.iru.org/sites/default/files/2016-01/en-rt-in-china.pdf>

More specifically, this cooperation includes actions to:

- share information, promote seamless traffic flows and transport facilitation, and develop synergies between their relevant initiatives and projects;
- identify co-operation opportunities between their respective policies, including the Trans-European Transport Networks and The Belt and Road Initiative;
- explore business and investment opportunities open to both China and the European side, and;
- create a favourable environment for sustainable and inter-operable cross-border infrastructure networks in countries and regions between the EU and China.

Under the EU-China Connectivity Platform, annual Chairs' meetings and Expert Group meetings are held to concretise these objectives.

At regular Expert Group meetings, planned transport infrastructure projects are presented by both sides for possible cooperation. It is therefore important to bring together all key stakeholders at these meetings. Accordingly, in addition to relevant European Commission and Chinese counterparts, EU Member States, partner countries covered by the indicative extension of the TEN-T network as well as European and Chinese business representatives and international financial institutions are invited and actively participate.

Three main documents have been published since the creation of this connectivity platform:

- **Join Statement of the 21s EU-China Summit:** it includes engagements in issues like bilateral relations, global challenges and governance, foreign and security policy.
- **Projects presented at Expert Group meetings between 2016-2019:** list of projects in China, EU Member States and EU partner countries. The TEN-T related projects included in the attached list have been presented by the Member States concerned on a voluntary basis, in order to explore solutions to cover a potential financing gap, without prejudice of the final decision on financing which could be taken.
- **The 2019 action plan:** very light document with general actions such as the carrying of studies, promoting cooperation projects, technical discussions and expert workshops.

2) The EU Global Gateway: a reaction to the BRI

The European Commission and the EU High Representative have set out the Global Gateway, a new European strategy to boost smart, clean and secure links in digital, energy and transport sectors and to strengthen health, education and research systems across the world.

The European model of trusted connectivity in partner countries is long-term and in line with EU's interests and values: rule of law, human rights and international norms and standards. It is about:

- smart, clean and secure investments in quality infrastructure
- connecting goods, people and services around the world in a sustainable way

The Global Gateway will promote worldwide infrastructure investments that create sustainable, smart, resilient, inclusive and safe networks in all modes of transport. It will support networks such as the extension of the Trans European Transport Network.

Global Gateway will mobilise up to €300 billion in investments in global infrastructure between 2021 and 2027. In a Team Europe approach we will work with Member States, European financial institutions and the private sector to leverage investments.

4.2 Policy context

4.2.1 Introduction

The purpose of this chapter is to highlight specific policy initiatives of the EU which have not yet been translated to legislative actions or have become legislations only recently, and are expected to have an impact on the green and digitalisation aspects of the EGTN development. Starting from the presentation of the initiatives emerging from the recently published document of “Sustainable and Smart Mobility Strategy” and their relation to EGTN development, this chapter continues outlining the on-going policies deriving from the Digital Transport and Logistics Forum (DTLF) and also the EU taxonomy initiative for sustainable financing that may have an impact on the EGTN attributes.

More detailed descriptions can be found in the D1.6 submitted in Summer 2021.

4.2.2 The Sustainable and Smart Mobility Strategy

In December 2020, the European Commission published its ‘Sustainable and Smart Mobility Strategy’ together with an action plan comprising 82 initiatives drafted to guide the work that will be performed in the next four years. This strategy aims to lay the foundation for the EU transport system in order to achieve its green and digital transformation and make it more resilient to future crises, in alignment with the requirements of the Green Deal. According to these requirements, the objective is to reach a 90% cut in emissions by 2050, delivered by a smart, competitive, safe, accessible and affordable transport system.

In order to achieve this objective, there is a need for all transport modes to become more sustainable and the strategy has defined concrete milestones to ensure that the transition of the EU transport system towards a smart and sustainable future will remain on track.

4.2.3 Digital Transport & Logistics Forum (DTLF) initiative

Since 2015, a group of different stakeholders coordinated by the European Commission (EC) have been working together in the DTLF in order to reach this objective (see figure 2 for group structure). The DTLF supports the EC in implementing 100% digital information exchanges and a shared transport and logistics dataspace. The outcomes of the DTLF will have significant relevance to the vision of the Integrated EU-Global T&L Network (EGTN). The outcomes of the work of both DTLF subgroups have specific relevance to the EGTN’s vision. More specifically, e-FTI platforms (Subgroup 1) will lead to change from road transport to multiple modes of transport, thus optimizing the use of current and emerging transport modes in the EU which can later be transformed globally as part of the development of the EGTN. In addition, the development of a federated network of platforms (Subgroup 2) will leverage new and advanced technological solutions to enable seamless data exchange between different supply chain stakeholders at every stage of the supply chain within the EU, thus creating a solid platform network that could easily be enlarged with additional platforms outside the EU.

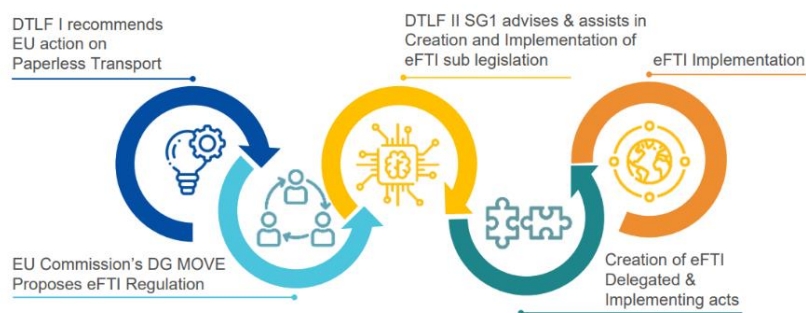


Figure 3: DTLF Subgroup 1 Mandate (Source: DTLF website)

4.2.4 Sustainable Finance (EU taxonomy for sustainable activities) policy impact

The EU, through the Green Deal, has recognized the importance of environmental sustainability, and in alignment with the Paris Agreement, has set ambitious climate and energy targets for 2030, with an overarching objective of making Europe the first climate-neutral continent by 2050. However, there is a need for a significant transformation of the EU economy to be able to deliver on these climate and environmental sustainability goals, a process which requires major investments. It is estimated that in the coming decades, additional yearly investments of between EUR 175 and EUR 290 billion will be required to reach the Paris Agreement targets³.

In order to respond to this challenge, the EU is developing the framework for the “Sustainable Finance” policy, aiming to make sustainability considerations an integral part of its financial policy, but also part of the financial decision-making process of private investments (see Figure 3). This Integration of sustainability considerations is expected to redirect private funds, as a complement to public money, towards more climate-neutral, energy- and resource-efficient and circular projects, helping to mitigate the impact of natural disasters as well as environmental and social sustainability issues that can affect the economy and financial markets.

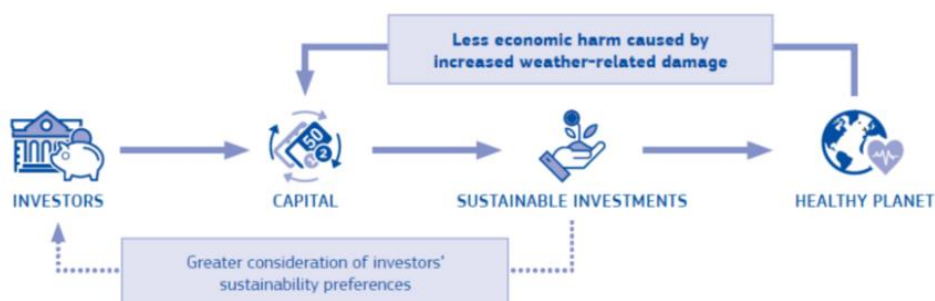


Figure 4: The Sustainable Finance policy rationale³

³ Factsheet: Financing sustainable growth, 18 June 2019. Available at: https://ec.europa.eu/info/files/190618-sustainable-finance-factsheet_en

5 Impact assessment and key implementation barriers

5.1 Impacts on EGTN layers, attributes and development

Based on the previous chapters, the next step of the analysis is to evaluate if those (legal & policy) initiatives will be or not impacting the EGTN development and how they will influence it (positively and/or negatively). This assessment includes mainly qualitative aspects (both for legal and policy actions).

5.1.1 Legal initiatives

The relevance and the qualitative impact assessment have been made under the following main scheme: Evaluation if each legislation has a relevance to at least to one of the three identified layers of the EGTN (physical, technological and governance – in case of one at least selected box it is assumed as relevant for EGTN).

1. Evaluation of the impacts of the relevant legislations on the five EGTN attributes (a global score per attribute is fixed: from ‘+ +’ = very positive to ‘- -’ very negative)
2. If relevant, the results of some EU impact assessments will be added to the consortium’s assessment.

The following tables summarises the outputs of the analysis (based on the first results published in D1.6 and fine-tuned during the second part of the project). This overview provides a summary for all international and European identified legal documents. The national context focusing on China, as described in chapter 4.1.4, has been excluded as the EGTN’s vision exclusively focuses on the development of a European resilient network on which Chinese national initiatives have minor or no impacts. A detailed text description per EGTN attribute can be retrieved from the D1.6.

<i>Legal Analysis</i>	EGTN Layers			EGTN Attributes				
	<i>INFRA</i>	<i>TECH</i>	<i>GOV</i>	<i>Geo-economics</i>	<i>Innovation</i>	<i>Impact</i>	<i>Integrated</i>	<i>Inclusive</i>
EUROPEN LEVEL								
Maritime Single Window Environment		X	X	+	+	+	++	0
Rail Freight Corridors	X	X	X	++	+	++	0	+
TEN-T Regulation	X	X	X	++	++	++	++	++
CT Directive	X			+	+	++	0	0
Weights & Dimensions	X			0	0/+	0/+	+	0
Access to rail-related services	X			+	0/+	+	+	0
EU Climate Law	X		(x)	The Commission published in September 2020 a staff working document as support document for steeping up Europe’s 2030 climate ambition.				

<i>Legal Analysis</i>	EGTN Layers			EGTN Attributes				
	<i>INFRA</i>	<i>TECH</i>	<i>GOV</i>	<i>Geo-economics</i>	<i>Innovation</i>	<i>Impact</i>	<i>Integrated</i>	<i>Inclusive</i>
INTERNATIONAL LEVEL								

European Agreement on Main International Railway Lines (AGC)	x			+	0	+	++	0
European Agreement on Important International Combined Transport Lines and Related Installations (AGTC)	x			0	+	+	++	0
TIR Convention	No direct relevance for EGTN. However, the operations at the borders are significantly improved (customs formalities).							
ATP	No relevance for EGTN. This Convention mainly ensures a safe transport of the perishable goods.							
ADR	No direct relevance for EGTN. This Convention mainly ensures a safe transport of dangerous goods by road (mainly operational/technical rules).							
RID	No direct relevance for EGTN. This Convention mainly ensures a safe transport of dangerous goods by rail (mainly operational/technical rules).							
CIM	No direct relevance for EGTN. However, for railway operations, the CIM consignment is the transport document to be used.							
SMGS	No direct relevance for EGTN but highly important for the railway operations on the Eurasian corridors with the CIM/SMGS consignment note.							
GTC Eurasia	No relevance for EGTN but interesting initiative to improve the contractual relations for railway transport between Europe and Asia.							

Table 5 - International legal initiatives (impacts on EGTN layers and attributes)

5.1.2 Policy Initiatives

In the case of Policy initiatives, the ones that have been included and analysed in D1.6 are all considered relevant to the EGTN development since they were selected based on the objectives that have triggered their development which are fully aligned to the objectives of the EGTN vision.

The methodology for defining the impacts of these initiatives was based on literature review and on available previous work (assessment reports) that has been collected. With respect to the DTLF policies which was the main focus of this activity, in order to assess their impact on the EGTN development a questionnaire survey was also sent to a group of experts and the results have been presented and analysed in the D1.6. The participants of the survey were carefully selected based on their expertise in the transport and logistics sector; many of them are DTLF members and they closely follow the actions of the second mandate.

The following table 6 summarises the key objectives of each policy initiative and the qualitative assessment of their impacts to the EGTN development.

Policy Initiative	Key Objectives	Relevance and Impacts on EGTN development
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Smart and sustainable mobility	<ul style="list-style-type: none"> (1) An irreversible shift to zero-emission mobility (2) Achieving seamless, safe and efficient connectivity (3) Achieving a more resilient single European transport area: for inclusive connectivity 	<ul style="list-style-type: none"> • A positive impact on EGTN development by facilitating the achievement of the environmental sustainability component of the EGTN attributes. • Facilitate the increase of the resilience of the network • help achieving the interoperability of rail infrastructure and processes across borders along EGTN global corridors component of the EGTN attributes • have a significant positive impact on EGTN development by facilitating the introduction and exploitation of innovative technologies (Blockchain, IoT, AI, 3D printing etc.) in logistics operations on the EGTN and also the implementation of the PI concept (PI containers, PI nodes, PI moves etc.) in EGTN corridors • help realising the interoperability of rail infrastructure and processes across borders along EGTN global corridors • increase the resilience of the EGTN through multimodality. • a positive impact is expected on social sustainability across the EU and on the promotion of social equity regarding employment opportunities in the Transport and Logistics sector across the EU and across the EGTN, including disadvantaged regions.
eFTI	<ul style="list-style-type: none"> • facilitate removing barriers to the smooth functioning of the EU market, to the modernization of the economy and to the greater efficiency of the T&L sector, through enabling wider use of innovation and digital technologies 	<ul style="list-style-type: none"> • the implementation of the e-FTI Regulation is expected to significantly improve the efficiency of the TEN-T network and facilitate the movement of goods within the EU, thus enhancing the economic and environmental sustainability attributes of the future development of the EGTN. • create a much more integrated EU T&L network which will be easier to be further integrated globally both in terms of hard and soft infrastructure • high economic benefits especially for SMEs while significant environmental benefits from CO2 emissions reductions are also expected, thus positively influencing the impact of the EGTN.
Corridor information systems	<ul style="list-style-type: none"> • to create a common understanding and solutions for data sharing in supply and logistics that will provide a basis for innovation and cost 	<ul style="list-style-type: none"> • The successful accomplishment of the goals of Federated Network of Platforms will provide a clear path and common grounds for multimodal logistics, which is the main target of the EGTN.

	reduction, and contribute to societal challenges such as safety, security, and sustainability.	<ul style="list-style-type: none"> • A migration path provided by supporting existing implementations with various international standards is needed in order to further enhance the future development of the EGTN and to have a significant impact across the global T&L network. • The Federated Network of Platforms approach for seamless data sharing will have a positive impact to “green” the supply chain.
EU Taxonomy	<ul style="list-style-type: none"> • provide access for investors to information about the taxonomy-alignment of their activities in order to make their investment decisions. 	<ul style="list-style-type: none"> • The implementation of the EU Taxonomy will have an impact on future private investment initiatives related to the TEN-T, regarding hard infrastructure (ports, inland terminals, road charging stations etc.) or the implementation of digital solutions. • It will facilitate the realization of the green aspect and the environmental sustainability and resilience attributes of the EGTN.

Table 6 - Policy actions (impacts on EGTN development)

5.2 Key implementation barriers

5.2.1 Legal initiatives

EU and international legislations are designed to set a fair and transparent framework for all transport modes (road, rail, inland waterway, maritime) in order to put them under the same playing field. More recently, legislations are also focusing at greening drastically the land transport modes through the publication of the Green Deal by the European Commission and the endorsement by the European Parliament. The following table summarises the key implementation barriers regarding the abovementioned EU and international legislative actions. These barriers are classified according to the three dimensions of the EGTN (infrastructure, technological and governance). More details can be found in the D1.6.

EGTN Layers	Key Barriers
Infrastructure	<ul style="list-style-type: none"> • Significant delays in the implementation of the legislation (or even no implementation at all) • No mandatory requirements but only voluntary agreements • Harmonised infrastructure parameters are defined in various legislations but would need some adjustments and alignments • Huge delays in the realisation • Single modal approach and lack of intermodal compliance
Technological	<ul style="list-style-type: none"> • Need for effective coordination between institutions on the Eurasia routes for data interoperability • No digital document platform (transport, customs) is in place on the Eurasian routes • Lack of adequate supervision by Authorities
Governance	<ul style="list-style-type: none"> • Limitation of the possibility for Member States to ask for derogations to the established TEN-T or RFCs parameters

	<ul style="list-style-type: none"> • Investors are reluctant to submit proposals as single European One-Stop-Shops are not yet in place at national level • Lack of business-oriented comparable harmonised set of KPIs on all corridors • Lack of communication and dissemination • Underestimated roles of some key actors
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Table 7 - Legal initiatives (key implementation barriers per EGTN layer)

5.2.2 Policy initiatives

EU policies may be established with the intention of them becoming future Regulations and legislations, but in practice there are some key implementation barriers that may affect the adoption of these policies in the near future. The following chapter presents the key implementation barriers arising from the abovementioned EU policies that may hamper their adoption in the future. In addition, the barriers to adoption of the DTLF policies are classified based on the results of a survey to 24 logistics experts and members of the DTLF.

A possible delay in the adoption of the DTLF policies within the EU will significantly influence the improvement of the existing TEN-T T&L network and subsequently hamper PLANET's vision on the future development of the EGTN.

Policy Initiative	Key Barriers*
eFTI	<ul style="list-style-type: none"> • Initial high compliance cost for the transition to paperless transport • Uncertainty as to whether or not an electronic transport document will be accepted by authorities, banks, insurance companies and courts • Delays in diverging national legislation provisions regarding acceptance of electronic transport documents across the Member States • Lack of development of interoperable standards (and IT solutions) for the exchange of transport documents and ITS data between businesses and authorities across different modes of transport and different Member States. • Lack of harmonized inspection requirements between and within Member States.
Corridor Information Systems	<ul style="list-style-type: none"> • A possible limited number of platform service providers implementing the federated platforms will cause low competition and high prices thus making them unaffordable for a significant number of smaller companies. • Low acceptance by the core players with high volume and/or first mover capabilities will slow down the process of wide implementation. • Resistance to change by companies regarding business processes • Financial or technical inability of organizations to amend their systems in order to implement their local interface for connecting to the federative platforms. • Trust issues regarding security of data.

Table 8 - Legal initiatives (key implementation barriers)

**Note: the list of the most significant potential barriers adoption was included in the questionnaire survey to experts in order to define the level of (negative) impact of each barrier to the implementation. The participants were requested to rate from a scale from 0 to 100 each barrier with 0 standing for a very low, 50 for a moderate and 100 for a very high (negative) impact. Detailed results can be found in D1.6.*

5.2.3 Liaison with other project activities

According to the Grant Agreement, Task 1.3 on legislation and EU policy to impact EGTN is mainly connected to the following other tasks/WPs of PLANET:

- Task 1.5 (EGTN Reference Specifications)
- WP4 (Steering innovation & building capacity towards EGTN)

For Task 1.5, it is foreseen that within the activities of Task 1.3 a prioritisation and selection of forthcoming Policy and Legislative initiatives will be made to be used in defining the EGTN Reference Specifications. In this context, it was decided to integrate in Task 1.3 the development of a scenario per transport mode including all prioritized legal & policy initiatives. The main results of the prioritization exercise and the methodology for defining the impacts of the scenarios on the EGTN development are described in chapter 6 of this deliverable.

For WP4, the initial intention was to link each key implementation barrier identified in task 1.3 to the main recommendation categories foreseen in WP4 (i.e. TEN-T Interfacing to global trade routes). It was decided during the methodological design phase of the qualitative assessment to structure the linkage either per EGTN layer (legal context) or by type of document (policy). The outputs as listed in chapters 5.1 and 5.2 have been provided to WP4 for further processing and utilisation by the subtasks of WP4.

In addition, some of the results presented in this deliverable can be utilised for the activities of drafting the policy recommendations of PLANET (WP5).

6 Development of 2030 & 2050 scenarios

6.1 Objectives and methodology

In order to provide substantial input regarding the Policy and Legislation initiatives which are expected to impact the development of EGTN to the activities of Task 1.5 and support the process of defining the EGTN reference specifications, it was decided to go beyond the initial requirement for prioritisation and selection of the Policy and Legislation initiatives. The purpose was to attempt to quantify the main impacts of the selected Policy and Legislation initiatives in a way that can be used as parameters to enhance the strategic scenarios simulations and thus provide a better vision of the future EGTN.

The methodological approach that was selected to achieve this goal included the drafting of scenarios for the 2030- and 2050-time horizons regarding the level of implementation of the selected Policy and legislation initiatives per mode of transport, building on the work that was undertaken in D1.6. In addition, in order to draft coherent and plausible scenarios, selected known existing visions and strategies per transport mode that have been developed by official institutions were also analysed and assessed, leading together with the analysis of the Policy and legislation initiatives to an initial estimation of the level of the expected impacts.

Following this process, the estimated impacts for the time horizon of 2030 were translated to parameters that can be utilised by the strategic modelling capability of the project and presented to a group of experts in the context of a workshop who were asked to provide quantitative estimations. The final results of this exercise will be provided to the responsible partners for enriching the future scenarios simulations that will feed the activities of Task 1.5.

The following sections detail the input that was collected and analysed as well as the results of this activity.

6.2 Transport-related vision and strategies

6.2.1 Rail

1) Europe's Rail Joint Undertaking

On 19 November 2021, the Council of the European Union adopted **the regulation establishing Europe's Rail Joint Undertaking** and nine other European Partnerships to accelerate the green and digital transition. It entered into force following its publication in the Official Journal of the European Union and marks the start of these partnerships.

Europe's Rail Joint Undertaking, the largest European rail research and innovation programme ever, and most probably at global level, will deliver activities worth 1.2 billion EUR realised by its selected Founding Members and other beneficiaries who will be joining via Open Calls. These activities will be funded by the joint undertaking with the resources provided by the Horizon Europe Programme of the European Union, up to 600 million EUR. Five areas of priority for EU-Rail have been determined: (1) European rail traffic management and supporting rail's key role in a multimodal transport system, (2) Digital and Automated Train Operations, (3) Sustainable and digital assets, (4) Competitive digital green rail freight and (5) Competitive digital green rail freight.








	Meeting evolving customer requirements EU-Rail will support the delivery of much more flexible approaches to planning and traffic management of rail services, and seamless operations, allowing rail to better serve customer needs.
	Improved performance and capacity Through the development of cutting-edge technologies and improved harmonised operational rules designed to be implemented across the whole EU rail system, EU-Rail will help increase capacity and make best use of available assets.
	Reduced costs EU-Rail outputs are expected to help improve the efficiency of the rail system and reduce overall lifecycle costs, including on less used lines.
	More sustainable and resilient transport EU-Rail will contribute to a more sustainable transport and mobility system by enabling an increase in the use of rail services and improving the sustainability and resilience of the rail sector itself.
	Harmonised approach to evolution and greater adaptability EU-Rail will work with the sector in coordinating on a common and interoperable evolution of the system, with a greater level of harmonisation, to support an overall adaptable Single European Rail Area, improving the rate of deployment of new technologies
	Reinforced role for rail in European transport and mobility EU-Rail work will support smart and cost-efficient rail connectivity, key to future sustainable mobility systems, to deliver better services for passengers and freight.
	Improved EU rail supply industry competitiveness Increasing the R&I intensity of the European rail supply industry will enhance its capacity to retain its global leadership. By supporting the transformation of the current rail system into a central transport mode of tomorrow's European mobility, EU-Rail will build unique capabilities in the European rail industry, including its SMEs, supporting its position in global markets.

Table 9 – Expected results of the new Europe's Rail Joint Undertaking

The objectives of EU-Rail have been set to address the EU policy objectives, rail sector vision, and the challenges inherent to the transformation of the rail system. Specifically, this will result in (see table 9 for details): (1) meeting evolving customer requirements, (2) Improved performance and capacity, (3) Reduced costs, (4) More sustainable transport, (5) Harmonised approach to evolution and greater adaptability, (6) Reinforced role for rail in European transport and mobility and (7) Improved EU rail supply industry competitiveness.

The objective of the Flagship area 5 (FA5) on sustainable competitive digital green rail freight services is to make rail freight more attractive through increased capacity e.g. with Digital Automatic Coupler (DAC) which is one cornerstone and is enabling more functionalities in freight (via power and data supply even more use cases can be realized which will positively impact SWL, block trains, combines transport, etc.) to increase network capacity in a smart way for all types of rail freight transport) as well as significantly improved cross-border operations (as around half of total rail freight in Europe is cross-border) and multimodal customer services. Increased capacity is the key factor to enable a shift of transport volumes to rail, reducing substantially the related GHG emissions. FA5 tackles these challenges by having 2 clusters which are interlinked but still distinct (see table 10 for detailed activities per cluster and TRL-level to be reached for 2025, 2027 and 2031):

- The first cluster **“full digital rail freight operations”** is focused on increasing substantially the productivity, quality and capacity of rail freight by full digitalization and automation of operational functions and processes incl. innovative freight assets.
- The second cluster **“seamless rail freight”** is focusing on important aspects to increase the efficiency of the immaterial (information/data) layer of transport and to gain time and save costs by ensuring a seamless environment.

Cluster	Technical enabler	2025	2027	2031
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Full digital freight train operations	Digital Automatic Coupling (backbone) <ul style="list-style-type: none"> DAC type4 (incl typ5 upgradability) DAC (hybrid) coupler for loco DAC energy supply & data/communication solution/backbone 	TRL 8-9		
	DAC based/enabled applications <ul style="list-style-type: none"> DAC type5 Automated parking brake system DAC based digital train preparation train composition detection/management Digital wagon inspection 	TRL7	TRL 8/9	
Seamless rail freight	Planning of rail freight services <ul style="list-style-type: none"> Integrated cross-border timetable planning, management and path ordering systems covering finally all planning horizons Integrating and connecting the last mile slot planning directly or via interfaces 	TRL6-7	TRL7-8	TRL8-9
	Dynamic dispatching tools <ul style="list-style-type: none"> Harmonized real-time interfaces between TMS and e.g. yard/terminal management systems and agreed data structure/quality Dynamic yard/terminal management systems upgrade with optimization functions Dynamic freight specific real time functions for the interaction of various TMS 	TRL6-8	TRL7-8	TRL8-9
	Intermodal monitoring and prediction systems <ul style="list-style-type: none"> Real-time gathering and processing of influencing data Connection with rail TMS systems and other resource management systems AI based prediction models Accuracy and computational learning functions 	TRL5-7	TRL6-8	TRL8-9
	Standardised European Railway Checkpoints at borders or other operational stop points <ul style="list-style-type: none"> Digitalisation and partial automation of manual processes through innovative sensors, video gates and handheld devices, based on a process analysis Interoperable IT-systems for data management and processing Harmonized procedures & regulation	TRL8	TRL8-9	
	Multi-country licensed loco driver <ul style="list-style-type: none"> Certified secured translation tools (incl. training) Simulators (local line knowledge) Harmonised cross-country operation and rostering concepts 	TRL7-9	TRL8-9	

Table 10- Extract of Table 30 from Europe's Rail JU Multi-annual work programme)

2) ERRAC

The European Rail Research Advisory Council (ERRAC) is the European Technology platform composed of representatives from most of the major European railway research stakeholders: manufacturers, operators,

infrastructure managers, the European Commission, EU Member States, academics and users' groups. ERRAC's mission is to deliver a vision of the railway's future enabled by Research and Innovation activities.

In its 'Rail 2030 – research & innovation priorities', three key challenge areas have been identified (see figure 1 for complete overview and list of key innovation areas):

1. attractiveness and convenience need to be provided in real-time, tailored within an end-users/citizens-centric environment, through an integrated door-to-door mobility system that provides a punctual, reliable, safe, secure and comfortable service;
2. maximised affordable capacity of the system is key to reducing congestion and providing efficient and economical transport solutions for cities and regions.
3. environment sustainability is essential to decarbonise the road transport and to make the use of road solution more energy efficient.

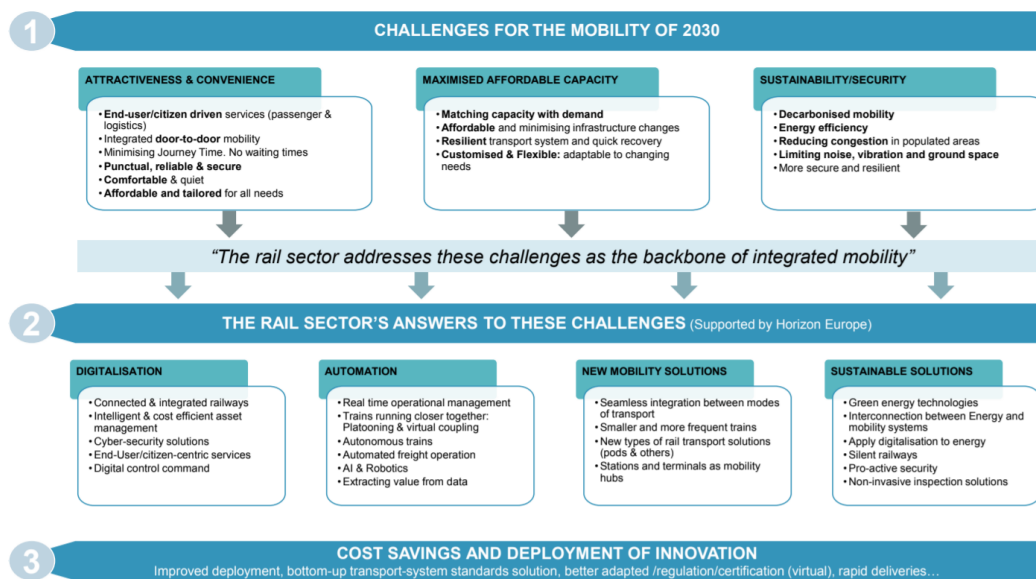


Figure 5 - ERRAC vision 2030 – key challenges

The ERRAC vision rail vision 2050 is 'In 2050, rail transport in Europe is the backbone of an intermodal "Mobility as a Service" within cities and beyond, for both passengers and goods, meeting the needs of customers, EU citizens and society. The suppliers and service organisations of the European rail industry are recognised as the world's thought leaders for railway products and services.

The innovation-powered transformation of the European rail sector gives it unprecedented technological and operational capabilities which enable it to serve society with new concepts, products and services.

- (1) **Innovative logistics services** are driven by customer demand. Shipments are moved effectively, efficiently, safely and securely through the "physical internet". The rail system is fully integrated with the automated multimodal logistic chain and forms the backbone infrastructure of the physical internet, comprising new intelligent, automated cross-modal shipment transfer nodes;
- (2) **Freight transport units are flexible**, interchangeable, multipurpose and autonomous, requiring minimal handling infrastructure while maximizing utilisation;
- (3) **Freight transport units can communicate** with one another as well as with infrastructure and operational facilities, minimising downtime.

6.2.2 Road

1) ERTRAC

ERTRAC is the European Road Transport Research Advisory Council. It is the European technology platform which brings together road transport stakeholders to develop a common vision for road transport research in Europe. ERTRAC is recognized and supported by the European Commission.

ERTRAC published in February 2019 a roadmap for system integration of road transport for long distance freight transport. The scope of the ERTRAC Roadmap is to study long distance and regional transport of goods on roads, taking a whole system approach (not only the vehicle but also infrastructures and services).

According to ERTRAC 'SRA vision 2050' and ALICE 'Integrated transport system Vision', the overall objective is to develop affordable and efficient freight delivery solutions for the European citizens. This will include intelligent logistics solutions, smart co-modal infrastructures and robotized freight delivery.

- Physical Internet 2030 will bring efficiency and sustainability to logistics (digitalization and connectivity)
- Focus on decarbonisation towards zero emission logistics by 2050

The needs are obviously different by vehicle usage and application domain. Also the stakeholders are different.

CONFINED AREAS	HUB-TO-HUB	OPEN ROADS	URBAN ENVIRONMENT
Increased transshipment efficiency by 30%* Increased automation up to level 4: Easy to maneuver and high security levels	Increase Load factor by 30%* Increased automation up to level 4: New solutions to enable a fast exchange of loading units	More than 3% CO ₂ reduction per year TTW	Urban commercial vehicles offering zero emission driving with suitable range and payload Noise reduction Increase Load factor by 30%*

Table 11 – ERTRAC's vision 2050 – target per application domain

There will be a mixed situation depending on the transport market segment with progressive extension of high-technologies to different use cases, from 'simple' environments to more and more complex environments (targets per application domain are summarised in table 3):

- **Confined Area:** ports and terminals => simple environment: repetitive tasks, private area, fully controlled traffic management
- **Hub-To-Hub:** from factories to ports or terminals => relatively simple environment: repetitive tasks, partly public road, partly controlled traffic management
- **Open roads:** highways, roads => complex environment: tailored tasks, public roads, no controlled traffic management
- **Urban Environment:** cities => very complex environment: made-to-order tasks, public roads, non-adapted infrastructure in dense cities, no controlled traffic management

6.2.3 Inland Navigation

1) NAIADES III Action Plan

EU desire for a dedicated policy for the development of inland waterway transport resulted in the creation of the Navigation and Inland Waterway Action and Development in Europe (NAIADES) action programme which started in 2006 and run until 2014 and was then followed by a revision (NAIDES II) which covered the period from 2014 to 2020.

On June 24, 2021, the European Commission has issued the NAIADES III Action Plan 2021-2027, through a document published under the title "Boosting future-proof European inland waterway transport", having

two core objectives; on the one hand to facilitate the shifting of more freight to inland waterways and the other hand to facilitate the transition of inland waterway transport towards the zero-emission vision, underpinned by a paradigm shift towards further digitalisation and supporting the current and future workforce. Inland navigation is recognised as one of the most CO₂-efficient modes of transport (per tonnes of goods carried) and along with rail, it is clearly seen as central to the Union's efforts to decarbonise the transport system.

In this context, this action plan is aligned to The European Green Deal which calls for decisive action to shift a substantial part of the freight transported by road (currently accounting for 75% of inland freight) to inland navigation and rail, namely through measures to increase the capacity of inland waterways from 2021. Similarly, the Sustainable and Smart Mobility Strategy adopted on 9 December 2020, which lays the foundation for how the EU transport system can achieve its green and digital transformation and become more resilient to future crises, underlined the need to increase the use of more sustainable transport modes, and indicated that inland waterway transport and short-sea shipping should increase by 25% by 2030 and by 50% by 2050. Finally, Zero-emission mobility is also the major objective of the Zero Pollution Action Plan adopted on 12 May 2021.

Expected impacts by 2027

The action plan foresees a significant advance in the completion of the TEN-T infrastructure for inland waterways along with the modernisation of fleet in terms of environmental and operational efficiency (low carbon/zero emission vessels, climate-adaptable vessels able to sail with low water levels, etc.) in order to address disruptions that significantly hinder the capacity of inland waterway transport. River navigation depends on precipitation and adequate water levels for its operations. Droughts and floods can severely disrupt transport activities by temporarily blocking waterway sections, imposing restrictions on the amounts of loads transported, and requiring additional vessels to compensate reduced load factors, or even a shift to other modes.

Moreover, the action plan aims to enhance the seamless integration of inland waterways to multimodal mobility and logistics systems and also to accelerate the digitalisation of the sector, mainly through supporting the deployment of harmonised River Information Services (RIS).

According to the document, further digitalisation can play a significant role in improving the efficiency and reliability of navigation and traffic management, better integrating inland waterway transport in logistics processes and multimodal chains, and reducing the administrative burden and costs of complying with and enforcing legislation.

Table 4 summarises the action plan which includes a set of initiatives aiming to facilitate the achievement of each of its objectives.

SHIFTING MORE FREIGHT TRANSPORT TO INLAND WATERWAYS		
1.	Continued support for innovative infrastructure and deployment through Horizon Europe and CEF	From 2021
2.	Revision of the TEN-T Regulation – Inland waterway transport requirements and role of coordinators	2021
3.	Deployment of cross-disciplinary digital information and operation systems for water- and waterway management through CEF	From 2022
4.	Transport crisis contingency plan(s)	2022
5.	Review of the regulatory framework for intermodal transport, including the Combined Transport Directive	2022
6.	Issue guidelines for operators and platforms on informing users about the carbon footprint of their deliveries and on offering sustainable delivery choices	2023
7.	Review the inland waterway transport market access legislation	2022
8.	Evaluation of the Directive (EU) 2016/1629 on technical requirements for inland vessels	

TOWARDS ZERO-EMISSION INLAND WATERWAY TRANSPORT		
9.	Specific actions arising from the Mission on Healthy Oceans, Seas, Coastal and Inland Waters and from the Zero-Emission Waterborne Transport Partnership/Green Hydrogen partnership	From 2021
10.	Support through CEF for the deployment of zero-emission inland vessels	From 2021
11.	Facilitate through the H2020 Platina III project the elaboration of an EU energy index methodology for assessing carbon intensity levels of inland waterways vessels	2022
12.	Evaluate the procedure for allowing derogations in the context of Directive (EU) 2016/1629 for encouraging the navigation of zero-emission vessels on EU waterways	2023
13.	Analysis to assess the need for measures for promoting low carbon/zero-emission vessels.	2025
14.	Revision of the railways State aid guidelines – possible inclusion of IWT and possible block exemption of aid for the coordination of transport	From 2021 to 2023
15.	Revision of the State aid guidelines for environmental protection and energy, as well as the State aid Framework for research, development and innovation	2021
16.	Technical Guidance document on climate proofing on infrastructure in the period 2021-2027	2021
17.	Study to support the greening of inland ports	2021
18.	Revision of the Alternative Fuels Infrastructure Directive and a roll-out plan with funding opportunities and requirements	2021
19.	Request the European Standardisation Organisation for harmonised standards for alternative fuels infrastructure for inland waterways and ports	2021
20.	Continuous support for innovative and alternative fuels infrastructure and deployment through Horizon Europe and CEF	From 2021
21.	An assessment of the needs of waste reception infrastructure and degassing facilities	2024
22.	Revision of the Delegated Regulation (EU) 2017/1926 on multimodal travel information services with inclusion of inland waterway transport	2022
SMART INLAND WATERWAY TRANSPORT		
23.	Revision of the Directive 2005/44/EC on Harmonised River Information Services	2022
24.	Technical assistance for a permanent operational structure for a single point of access for the provision of RIS-based Corridor Information Services	2024
25.	An integrated and operationalised vision for the digital transformation of the current traffic and transport related business models and processes in the sector	2023
26.	CEF technical assistance project to strengthen public-private cooperation in inland waterway transport and facilitate implementation of the digitalisation vision	2023
27.	Facilitate the Development, demonstration and the deployment of holistic Smart Shipping Concepts for the digital integration of inland waterway transport in the synchromodal supply chain, including RIS, through Horizon Europe and CEF	From 2022
TOWARDS MORE ATTRACTIVE AND SUSTAINABLE JOBS IN INLAND WATERWAY TRANSPORT		
28.	Regular information on the labour market structure through the inland waterway transport market observatory	From 2022
29.	Evaluation of social legislation in the context of the market access fitness check	2023
30.	Propose measures on digital tools for recording and exchanging information on inland crew and vessels	2021

31.	Propose measures on EU crewing requirements for inland navigation	2024
32.	Request development of standards for skills for alternative fuels' operations and for environment-friendly and efficient vessel operation (eco navigation)	2022
FINANCING		
33.	Facilitate the efforts of stakeholders and Member States to create a fund complementing EU and national financial instruments	2024
GOVERNANCE		
34.	Support the CESNI through the CEF technical assistance for the development of technical standards for inland waterway transport	2022
35.	Support the CCNR and the Danube Commission for ensuring, where appropriate, the coordination between EU policies and the policies of the respective international organisations	From 2022

Table 12 – Action plan for inland waterway

6.2.4 Maritime

1) International legal and regulatory developments

The purpose of this subchapter is to highlight the main international legal and regulatory developments related to the maritime sector, based on the UNCTAD review of maritime transport for 2021.

These developments can be summarised under three main pillars:

1. **The latest innovations in the maritime transport in terms of automation and digitalisation.** This pillar includes the developments regarding the regulatory framework for digitalization of the sector and the use of maritime autonomous surface ships (MASS) which have the potential to increase safety, improve environmental performance, and accelerate decarbonization. However, the increasing dependence of the maritime sector on online and automated systems while having many advantages, exposes the industry to new and unforeseen threats and vulnerabilities, notably the risk of cyberattacks. In this context, this pillar also includes the international instruments and developed tools adopted by the IMO for assessing the cybersecurity risks and vulnerabilities of the international maritime sector and strengthening the resilience of vital systems of shipping companies, ships and ports.
2. **The adaptation of the sector to the climate change.** This pillar includes the regulatory developments related to international shipping, climate change and other environmental issues. More specifically, it includes the adopted regulations aligned to the IMO strategy on reducing greenhouse gas (GHG) emissions from ships, the provisions for adapting transport infrastructure to the impacts of climate change and the regulatory actions for the protection of the marine environment and conservation and the sustainable use of marine biodiversity (implementation of the IMO 2020 Sulphur limit, amendments to the International Convention for the Control and Management of Ships' Ballast Water and Sediments, amendments to the IMO Convention for the Control of Harmful Anti-fouling Systems on Ships, possible revision of the issue of liability for bunker oil spills from ships other than tankers).
3. **The maritime trade and transport facilitation.** This includes the Trade Facilitation Agreement of the World Trade Organization and recent amendments to the FAL Convention for providing solid international standards to build automated systems such as the Maritime Single Windows which are catalysts for more efficient and paperless compliance processes at ports while ensuring interconnectivity and interoperability. Moreover, it includes the provision for the obligation of each country to set up a National Trade Facilitation Committee (NTFC) in order to facilitate resilience building and efficient logistic supply chains through public-private dialogue, considering that

cooperation from businesses involved in maritime trade and port operations foster successful trade reforms.

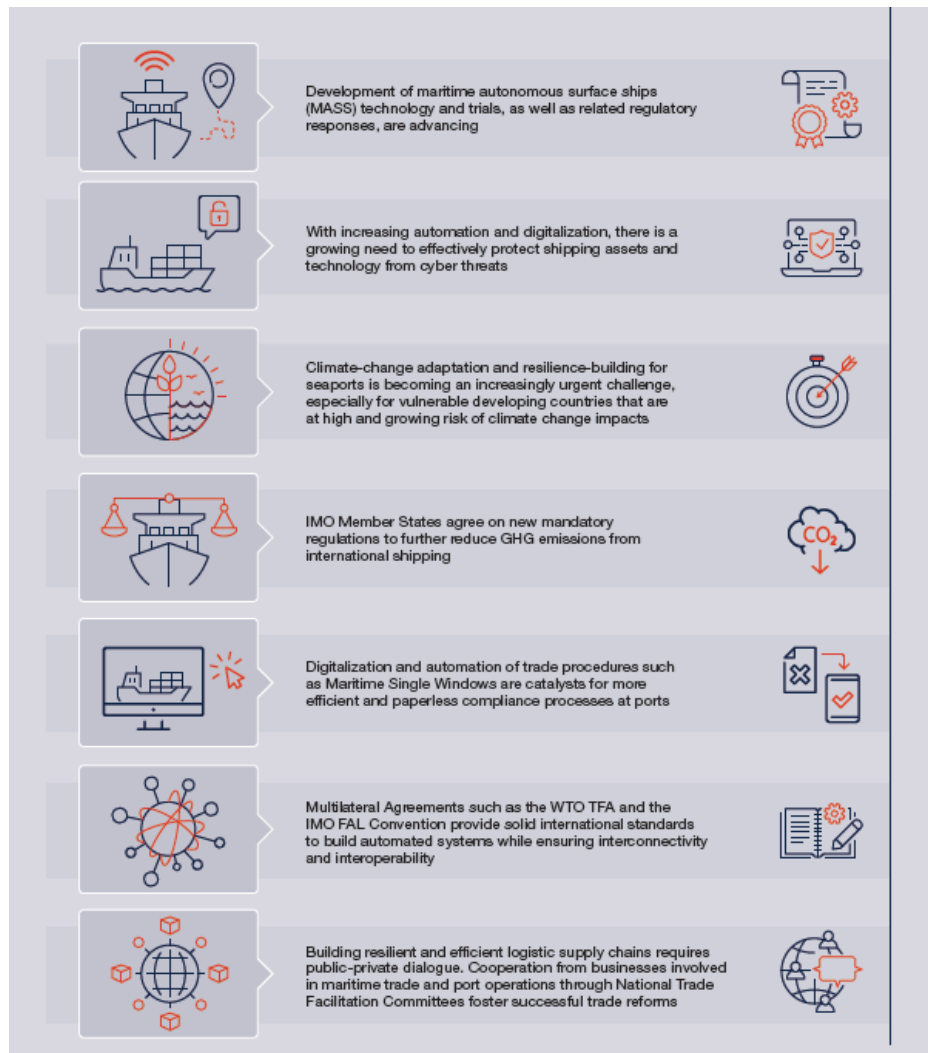


Figure 6 – Summary of maritime-related legal and regulatory developments and the facilitation of trade [40]

2) The vision of key EU ports

The **port of Barcelona** is located in the Northwest coast of Spain in the region of Catalonia, within the metropolitan area of Barcelona. With around 100 regular shipping lines connecting Barcelona with more than 200 ports on the five continents, Barcelona is Spain's principal port for international traffic, Catalonia's main transport and services infrastructure and a benchmark port in the Euro-Mediterranean area⁴.

⁴ <https://smartports.tv/port-of-barcelona>

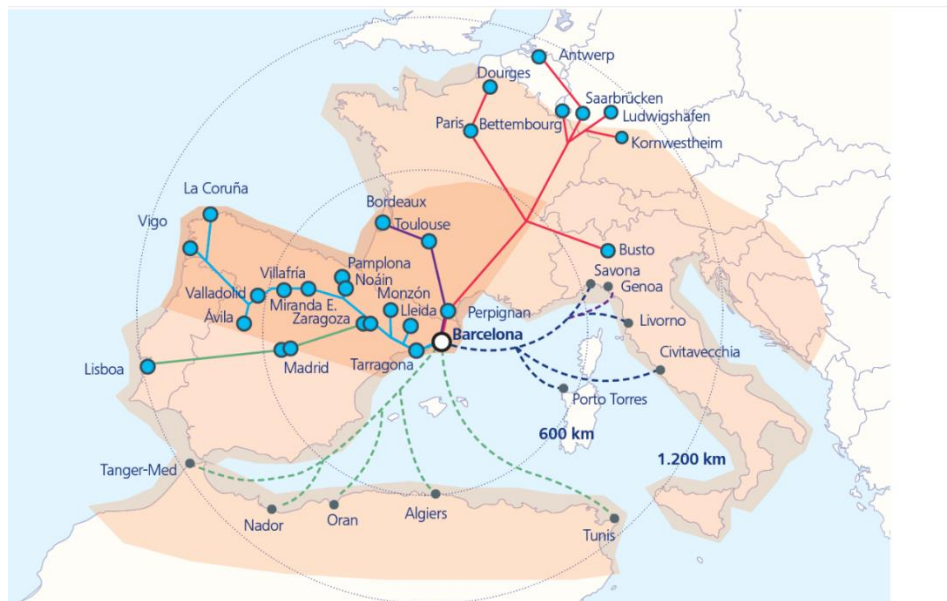


Figure 7 - Origin and destination of the Port of Barcelona's imports and exports

The port handles all types of bulk and general cargo goods, particularly those with a higher added value as a result of serving one of the two most industrialised regions of southern Europe. This is proven by the fact that it channels over €80 billion worth of goods (including transshipment) with only 65 million tonnes of traffic. The transportation of the cargo that is loaded and unloaded at the port's forty specialised terminals to/from the hinterland is realised through all the main land-based transport systems (pipeline, rail and road). With respect to passenger traffic, about 4.5 million cruise and ferry passengers pass through the port's dozen specialised terminals.

The port of Barcelona began its strategic planning in the mid-1990s with the preparation of the Green Paper published in 1997. Since then, it has continued to publish updated strategic plans leading to the most recent (fourth) strategic plan of the port. The new plan included a double time horizon; A short-term one with a group of goals and projects for the more immediate period from 2021–2025 plus a 2040 vision that sketches out the most plausible future scenarios and indicates the long-term lines of action required to guide the action of the Logistics- Port Community and ensure its competitive positioning in the most popular of the scenarios identified.

The ports' vision involves consolidating the Port as a hub, going beyond the classic role of a port oriented exclusively to the sea by growing and consolidating itself as a multidisciplinary space where all means of transport converge regardless of the origin and destination of the goods. This involves being a port as well as a railway hub and mainland and European land transport node for all types of goods and a connection point between the sea and the airport for goods and people. The logistics hub function distinguishes it from transshipment ports and also from gateway ports to which goods simply pass from or to a remote location where high value-added logistics processes (container cargo breaking, picking, packaging, postponement) take place.

According to the vision, this logistics hub will be characterised by five attributes that define the concept under the title "SMART". These are, in order of importance: Sustainable (in its three aspects), Multimodal (hub of all types of transport that must also include autonomous, intra-European trains, the rail motorway, drones and personal micro-distribution), Agile (flexible and fast), Resilient (ability to overcome disruptions and adapt to sudden changes and then quickly return to normal and efficient operation) and Transparent (towards customers and society).

Towards the achievement of the 2040 vision, the plan defines the main goal that the Port wants to achieve by the end of the period of validity of the Fourth Strategic Plan, in 2025. This milestone must be consistent with its long-term vision, to be a SMART Logistics hub, and it must also be quantifiable, measurable and allow for annual or biannual monitoring.

According to the plan, the main driver of the port's development for the period until 2025 is sustainability as it is understood in three dimensions; economic, in terms of increasing the port's competitiveness, social, in terms of focusing on the human capital inside and outside the port area and environmental, in terms of facilitating energy transition. For each one of these dimensions, the port has set specific strategic objectives:

Environmental sustainability:

- **Develop a new energy model**, through laying the foundations for an in-depth transformation that will pivot on the electrification of the wharves, the progressive development of clean fuels, the generation of renewable energy within the Port and the establishment of a smart electricity grid.
- **Decarbonise maritime-port activity**, through launching innovative initiatives to achieve a substantial reduction in GHG emissions from port activity with most important action in this area being the electrification of the wharves.
- **Reduce pollution** and more specifically reducing NO_x, PM_{2.5}, PM₁₀ and SO_x generated by port activity.
- **Increase intermodality**, through developing the necessary railway infrastructure and services to increase volumes of Port rail traffic with new continental, short-range, international and agri-food traffic. Moreover, it will promote motorways of the sea with Italy, the Maghreb and the Eastern Mediterranean.

Competitiveness:

- **Diversify the Port business**, through continuing to diversify port activity by incorporating new logistics and nautical activity and emerging sectors on port land.
- **Differentiate the offer of services**, through constant innovation in all areas of logistics and port activity and leading implementation to avoid the "commoditisation" of port offers and set the logistics-port offer in Barcelona apart from the competition.
- **Attract logistics activity**, through launching value proposals differentiated by market segment according to the main production areas to attract logistics activity, leveraging the conditions of Barcelona to act as a multi-country distribution platform. Activating logistics land in the first metropolitan belt.
- **Develop the necessary infrastructures**, in accordance with the conclusions of the strategic analysis, in order to be able to operate and guarantee the necessary conditions of safety, efficiency and sustainability.

Social sustainability:

- **Foster training, employment, entrepreneurship and talent attraction**, through promoting the employability of people in the immediate port surroundings, facilitating the creation of new companies through entrepreneurship and the development of an innovation ecosystem in the logistics and transport field to help attract talent and thus offset automation and digitalisation processes that involve a net destruction of jobs.
- **Promote equal opportunities**, through promoting and lead gender equality and ensure the socio-occupational integration of people with disabilities and those at risk of social exclusion.
- **Integrate the Port into the urban and metropolitan environment**, through rolling out actions to inform the public of the Port's knowledge and transparency and better integrate port facilities into the urban fabric.

- **Ensure the health, safety and security of people and facilities**, through rolling out actions and projects leveraging the new technological means available.

These objectives for 2025 can be summarized to the following figures:

- €70 billion value of foreign trade and cabotage (excluding transshipment) that is transported through the Port
- 50% electrified container and ro-ro wharves
- 40,000 people working at the Port physically, on a daily or regular basis

The Port of Antwerp (PoA) is in the heart of a vital economic (transport) gateway for intercontinental flows, European hinterland traffic and regional/local traffic. It is the second largest port in Europe for international shipping traffic and the fourth largest in the world. It is Europe's number 1 in the chemicals cluster (and second largest in the world after Houston), as well as the world's most important coffee port. Key figures are compiled in the figure 4).

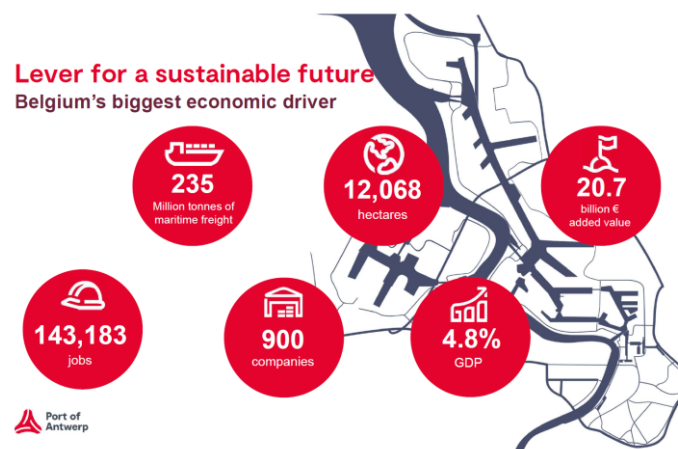


Figure 8 - Port of Antwerp - key economic drivers

The Antwerp Port Authority has a key role in the port's day-to-day operation. The 1,650 workers make sure the port functions and can grow. The Port Authority manages and maintains the docks, the bridges, the locks, the quay walls and the land. The personnel are also responsible for safe shipping traffic in the docks, the bridges and locks. In addition, the Port Authority provides tugs and cranes, carries out dredging work and promotes the port at home and abroad. With a view to the future, the Port Authority is working on the port's sustainable development and innovation.

In its 2018-2020 Business plan, the APA's mission has been translated into 5 strategic priorities which will anchor the Port of Antwerp's competitive position in the coming years: (1) sustainable growth by managing and developing the sites and infrastructure, (2) mobility for an open access of people and goods with a focus on modal shift, (3) transition with the implementation of innovation concepts and facilitate the digital transition, (4) safety and excellence as responsible for the safety and security of people, data, assets and the environment and (5) operational excellence by improving reliability, quality and price of its services.

In its 2018-2020 Business plan, the APA's mission has been translated into 5 strategic priorities which will anchor the Port of Antwerp's competitive position in the coming years: (1) sustainable growth by managing and developing the sites and infrastructure, (2) mobility for an open access of people and goods with a focus on modal shift, (3) transition with the implementation of innovation concepts and facilitate the digital transition, (4) safety and excellence as responsible for the safety and security of people, data, assets and the environment and (5) operational excellence by improving reliability, quality and price of its services. The figure XX provides an overview of the key targets linked to these 5 business priorities for the APA.

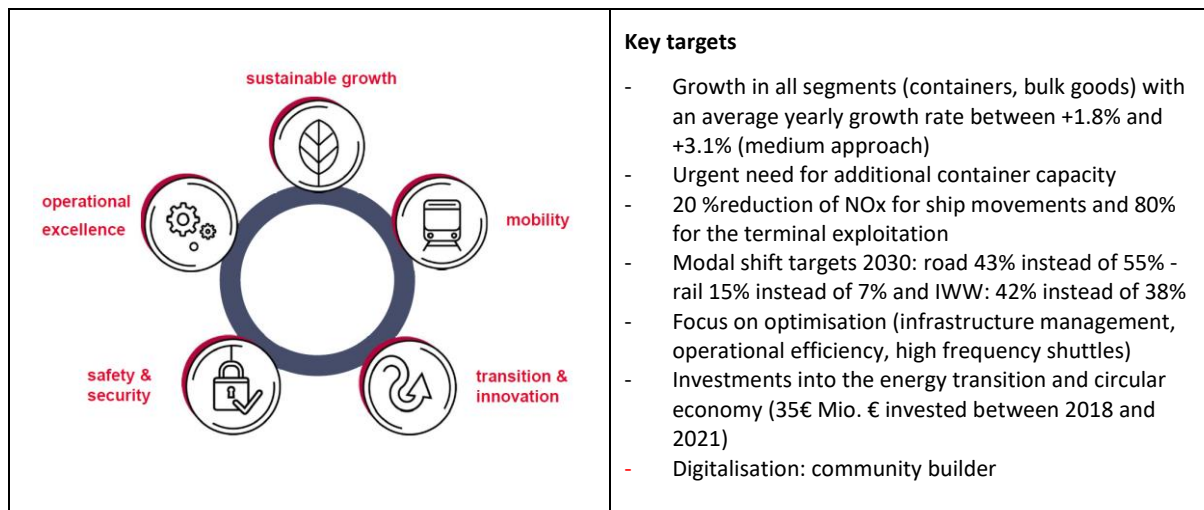


Figure 9 – Port of Antwerp – The 5 key strategic priorities

The Rotterdam port and industrial complex is strategically and economically important for the regional, national and Northwest European economies. As a Global Hub and Europe's Industrial Cluster, the complex determines prosperity in the Netherlands, now and in the future. The complex is important for wholesale trade, re-export, port-related business services and maritime manufacturing. Global developments such as the energy, raw materials and digital transitions require major changes to Rotterdam's port and industrial complex.

Throughput in the port of Rotterdam in 2021 matched the pre-pandemic level of 2019. Almost all goods types were up on last year; one of the sharpest rises was the increase in the throughput number of containers with a record number of 15.3 million TEU. An increase in revenue and lower costs led to an operating result before interest, depreciation and taxes of € 512.2 million (2020: € 477.5 million)⁵. The following figure 9 summarises the 2021 performance of the port of Rotterdam in brief.

⁵ <https://www.portofrotterdam.com/en/news-and-press-releases/port-of-rotterdam-operated-at-pre-corona-level-in-2021>

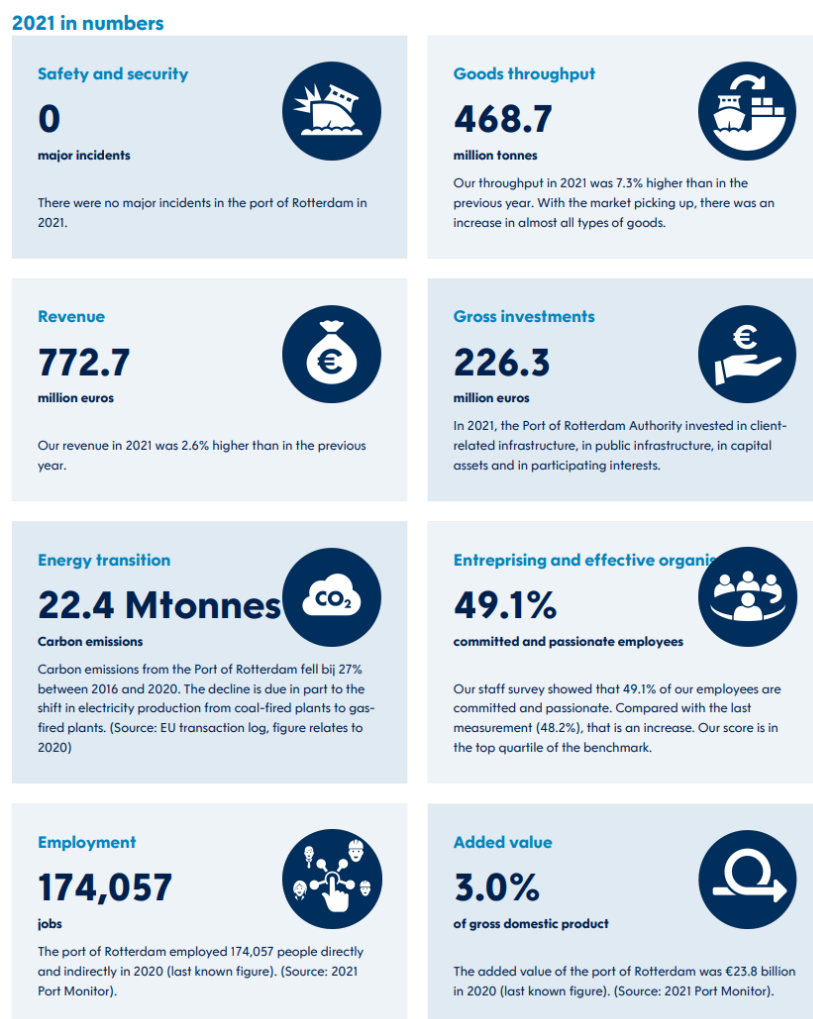


Figure 10 - Port of Rotterdam - 2021 key figures

The city council of Rotterdam has adopted in November 2019 the revised Port Vision⁶. The creation of economic and societal value and realising sustainable growth form the core of the revised Port Vision. This document replaces Port Vision 2030, which dated from 2011. The port and the region face three urgent challenges in the coming years: the economic transition, the social transition and increasing the appeal of the region. These challenges have a major effect on the achievement of the ambition and objectives. Priorities have therefore been identified for each challenge in which the focus will be placed in the years to come in order to generate economic and social value as a port, now and in the future. The figure 7 shows the links between the priorities and the key items of the Port Vision.

The Port Vision acts as a compass for making the port of Rotterdam future-resilient. The realisation of the vision contributes to the achievement of the Sustainable Development Goals, the global agenda of the United Nations. Five of the seventeen SDGs are particularly relevant for the port. They have been broken down into eight sub-goals (see figure 7).

⁶ <https://www.portofrotterdam.com/sites/default/files/2021-06/port%20vision.pdf>



Figure 11 - Port of Rotterdam - key priorities and quantitative objectives

The realisation of the vision should make Rotterdam, as Europe's most important port and industrial complex, future-resilient and allow it to continue generating significant economic and social value. Although it is still uncertain what the long-term implications of the transitions will be for the port and industrial complex, the covenant partners have, in this vision, decided on a course irrespective of external trends and developments. So that the size and nature of the economic and social value represented by the port and industrial complex is what it should be for society as a whole. The ambitions result in eight, partly new quantitative targets (table 13)

Objectives	UN (SDG)	Main Indicator
1 Increasing value added		The ambition is to keep the growth of direct value added in line with the development of Dutch GDP. Assuming €15 billion in 2017 and an annual GDP growth rate of 2%, this amounts to €19 billion in 2030.
2 Development of port-related employment		Jobs for more than 180,000 people in the port and industrial area, and the urban economy.
3 Decarbonisation		The Climate Agreement to be concluded at the national level is the framework that determines the contribution of the Rotterdam port and industrial complex to the carbon reduction target. In the sectors of Industry, Electricity, Mobility, Built Environment and Agriculture, the objective for 2030 in the Netherlands is to reduce carbon emissions by 49% by comparison with 1990. The target for 2050 is 95%.
4 Public-private investments		The ambition for the next 5 years is to attract approximately €2 billion in investments annually. In the period leading up to 2030, investments should attain €25-35 billion from companies that are leaders in their markets.
5 Connectivity		Rotterdam aims to be Europe's best connected port by 2030. This should be reflected in a leading position for the Netherlands in the Liner Shipping Connectivity Index of the United Nations Conference on Trade and Development (UNTAD), which ranks countries in terms of connectivity.

6	Safety	 	The objective for shipping traffic is an integrated safe port with no major nautical incidents. The companies on land implement their duty of care in order to minimise incidents.
7	Air quality	 	The aim is to maintain air quality in accordance with statutory standards.
8	Position of Rotterdam as a maritime capital	 	The objective is to achieve a higher position for Rotterdam in leading rankings for maritime capitals such as MENON or the Baltic-Xinhua Exchange.

Table 13 – Port of Rotterdam – The 8 quantitative targets of the port’s vision 2030

3) Port of Hamburg

The geographical location between the North Sea and the Baltic Sea as well as and the excellent performance of the port industry makes the Port of Hamburg the leading foreign trade hub of Germany. As Germany's biggest multipurpose port, it is of crucial importance for European inland markets with up to 450 million consumers. Hamburg generates a total annual gross value added of around 20 billion euros and directly and indirectly employs more than 260.000 people.

The port of Hamburg recorded in 2021 a total of 128.7 million tons, which represents a growth of 1.9% compared to 2020. At just under 88 million tonnes, containerised cargo will account for around 70 per cent of the total throughput in 2021. The share of containerised cargo in total general cargo handling (the so-called containerisation rate) is now almost 99 percent at the Port of Hamburg. Container throughput amounted to over 8.7 million TEU (20-foot standard containers) in Hamburg in the crisis year 2021.

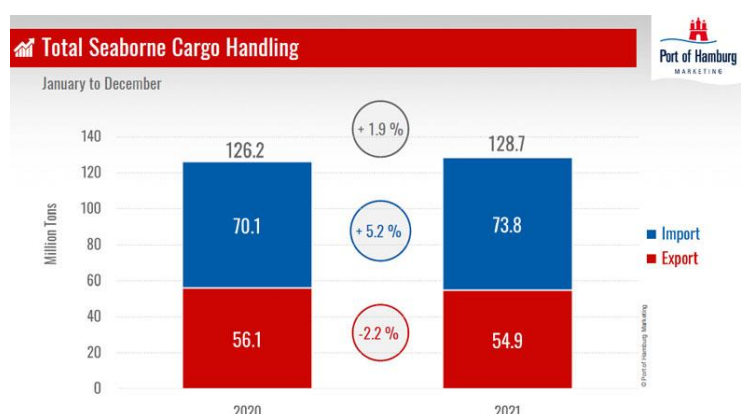


Figure 12 - Port of Hamburg - 2021 transported tons

In 2020, the final report on the potential volume increase up to 2035 has been released by the port authority of Hamburg. The main aim of this study was to evaluate the potential transport volumes to be expected for containers and bulk transport. Figure 5 summarises the projection for the containerised goods based on three different scenarios (low, basis, high) and on the 2019 volumes as reference year. For all analysed scenarios, the volume increase varies from 19.8% to 51.5%.

Bereich	2019 [Mio. TEU]	Veränderung gegenüber 2019 in den Szenarien bis 2035 [%]		
		Unteres	Basis	Oberes
Hinterland	5,86	+ 21,9 %	+ 37,6 %	+ 43,8 %
Transshipment	3,40	+ 16,2 %	+ 48,3 %	+ 64,8 %
Empfang	4,74	+ 21,9 %	+ 42,2 %	+ 55,7 %
Versand	4,52	+ 17,6 %	+ 40,8 %	+ 47,2 %
Europa	2,55	+ 26,4 %	+ 48,1 %	+ 66,4 %
Afrika	0,31	+ 31,8 %	+ 45,3 %	+ 67,2 %
Amerika	1,49	+ 10,1 %	+ 21,3 %	+ 39,6 %
Asien, Ozeanien und Sonstige	4,90	+ 18,6 %	+ 44,0 %	+ 46,4 %
Summe	9,26	+ 19,8 %	+ 41,5 %	+ 51,5 %

Figure 13 - Port of Hamburg - Container projection 2035

The latest official port development plan (with a horizon to 2025) has been released in October 2012⁷. The objectives and areas of action are based on three distinctive components (see figure 8 for overall structure):

- 1) Sharpening the profile of the growing port: focus on growing markets and regions (intercontinental trade), on growth and cargo commitment opportunities (dedicated terminals), on getting added-value industry (cooperation, value creation, integration)
- 2) Guaranteeing the quality of the port by providing optimized infrastructure facilities: optimization of transport connections and seaside accessibility, innovative transport systems, modern data and application management)
- 3) Shaping the port metropolis with sustainability in mind.

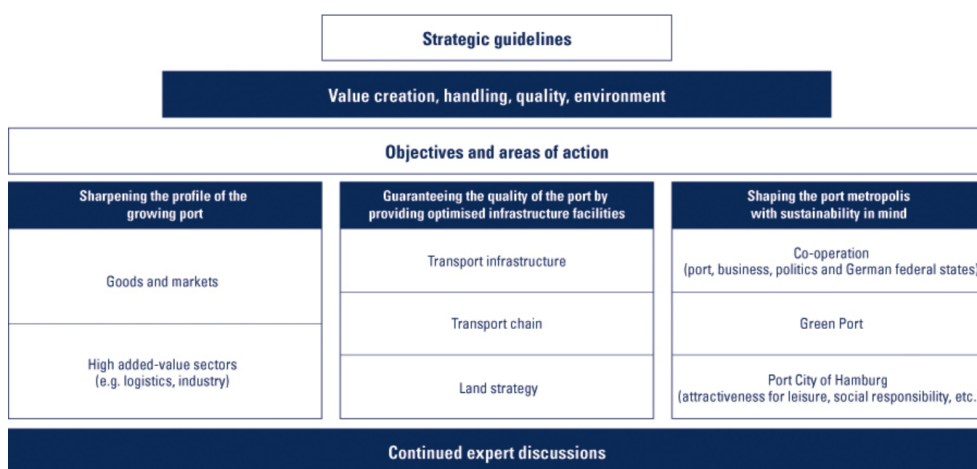


Figure 14 - Port of Hamburg - Strategic Guidelines

The port of Amsterdam, with a transshipment volume of 86.7 million tonnes per year (2019), is the largest seaport in its region which also includes the ports of Zaanstad, Beverwijk and Velsen/IJmuiden (Zeehaven IJmuiden NV and Tata Steel). The total transshipment in this port region was around 105 million tonnes in 2019 making it the fourth largest port in Europe. The Amsterdam port is part of the Hamburg-Le Havre range. The port and industrial estates in the North Sea Canal Area connect European goods flows via three major trans-European transport corridors (TENT corridors) with intercontinental deep-sea related trade flows. This strategic supply function makes Amsterdam a core network port for the European Union and also a port of national importance for the country.

⁷ <https://www.yumpu.com/en/document/read/22151432/the-port-development-plan-to-2025-hamburg-port-authority>

The port today is characterized by five strong clusters including real estate, Dry & liquid energy, Agri, building materials & logistics, Circular and renewable industry and cruise.

The Amsterdam port is the world's largest petrol port with high inbound and outbound flows of (fossil) fuels in the port, without however refining activities. Instead, alternative fuels are produced, such as second-generation biodiesel. Moreover, Amsterdam has traditionally had a strong position in the agricultural sector. In terms of cocoa imports, the Amsterdam port is the largest in the world supporting a large cocoa processing industry in the area as also other agri-food raw materials which are processed in Amsterdam.

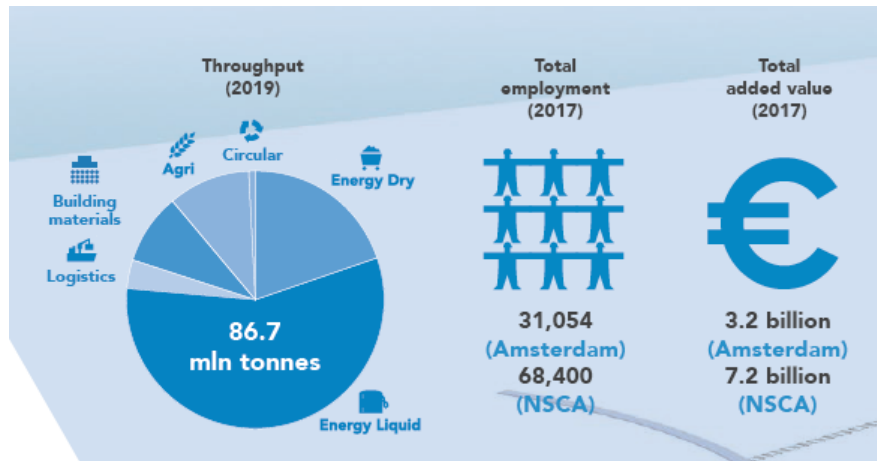


Figure 15 - Port of Amsterdam - key figures

The ports vision for 2030 is to be more than a transshipment and transit port and more specifically to transform to “a dynamic international metropolitan port where international industry and the local circular economy converge. The point where global cargo flows and regional recycling meet and a base for local energy production, manufacturing, logistics and business and financial services.”

In this context, the strategic plan for 2025 has set clear goals and measurable targets towards this direction:

- **Goal 1:** Strengthening the port's competitive position and maintaining market share
- **Goal 2:** Achieving growth in non-fossil turnover
- **Goal 3:** Ensuring that virtually all seagoing vessels arrive and depart on time
- **Goal 4:** Growing storage capacity for alternative fuels
- **Goal 5:** Attracting more circular process industry
- **Goal 6:** Reducing CO₂ emissions
- **Goal 7:** Creating space for development



Figure 16 – Measurable targets of the Port of Amsterdam for 2025

6.3 The impacts of the Legal and policy initiatives on the 2030-2050 scenario

6.3.1 Introduction

In the first version of the deliverable, a catalogue of legal and policy initiatives has been elaborated in order to evaluate (1) their relevance to the PLANET's EGTN vision based on the three layers (infrastructure, technological and governance) and (2) their impacts on the five EGTN attributes.

In the context of the simulation modelling as planned in Task 1.2, it was decided to create an inventory of legislative and policy initiatives as identified and compiled in the various transport-related visions (see the outcomes of the previous chapter). For each selected legal and policy action, the following aspects have been analysed:

- the potential impacts have been categorised per transport mode (road, rail, IWW and maritime).
- the relevance for the simulation modelling (YES/NO) and
- the prioritisation of the documents to be further investigated (1=top, 2=medium, 3=low)

Table 6 summarises the results of the research.

Legal & Policy	Road	Rail	IWW	Maritime	Relevance simulation	Priority
Combined Transport Directive	x	x	x	x	YES	1
Community guidelines on State aid for railway undertakings (extending the scope of the Railway Guidelines to cover all land transport operators that can contribute to the modal shift, including inland waterway operators)		x	x		YES	3
Digital Decade		x	x	x	NO	-
Digital Inland Navigation Area (DINA)			x		NO	-
Digital Transport and Logistics Forum (DTLF)	x	x	x	x	YES	1
Directive for laying down technical requirements for inland waterway vessels,			x		NO	-
Directive on River Information Services (RIS)			x		NO	-
Directive on the deployment of alternative fuels infrastructure			x		NO	-
EU Taxonomy Climate Delegated Act			x		NO	-
Europe's Rail Master Plan		x			YES	1
European Green Deal	x	x	x	x	NO	-
Fit for 55 package	x	x	x	x	NO	-

NAIADES			x		NO	-
Regulation (EU) No. 913/2010 concerning a European rail network for competitive freight		x			YES	1
Regulation establishing the Recovery and Resilience Facility	x	x	x	x	NO	-
Regulation on requirements relating to gaseous and particulate pollutant emission limits and type-approval for internal combustion engines for non-road mobile machinery			x		NO	-
Sustainable and Smart Mobility Package	x	x	x	x	YES	2
TEN-T regulation revision,	x	x	x	x	YES	1

The current selected parameters per transport mode for the simulation modelling are mainly covering aspects such as general system costs, speed and load factor. Based on these generic factors, the legal and policy documents have been prioritised according to their potential high, medium or low impact on the parametrisation of the simulation model. The documents with the highest scoring (=1) will be further investigated in the next chapter.

6.3.2 Legal context

1) Combined Transport Directive

The Combined Transport Directive was adopted in 1992 with the aim to shift road transport to underutilised and more environmentally friendly modes. The underlying objective of the Combined Transport Directive is to better utilise the existing transport infrastructure and resources and to reduce negative externalities of road transport to the environment by incentivising the use of other means of transport (rail, short sea shipping (SSS) and inland waterways (IWW)). To achieve this goal, the Combined Transport Directive attempts to foster the competitiveness of cross-border CT as compared to road transport by providing common rules and fiscal incentives for operators using combined transport. Figure XX summarised the intervention logic of the Commission when drafting and publishing the Directive.

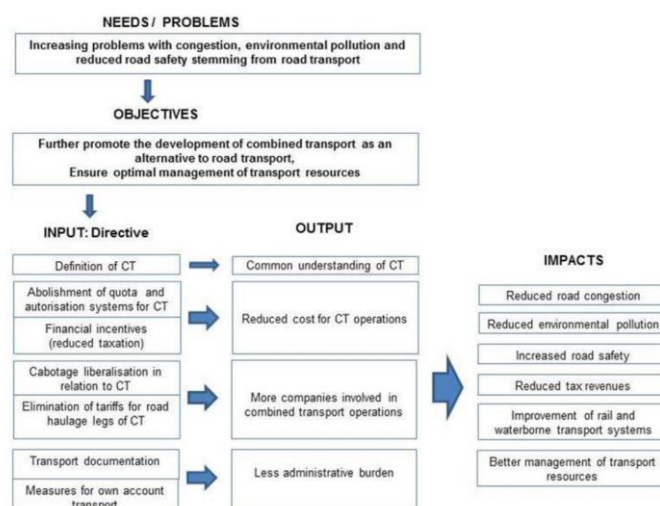


Figure 17 - The intervention logic of CT Directive

The Combined Transport Directive defines the CT as the transport of goods between Member States where the lorry, trailer, semi-trailer, with or without tractor unit, swap body or container of 20 feet or more, uses the road on the initial and/or final leg of the journey and, on the other leg, rail or inland waterway or maritime services.

The length of the road leg is limited in distance to ensure that long-distance road transport is limited. Road leg(s) combined with a maritime/inland waterway leg have to be each shorter than 150 km as the crow flies (in direct line). In case of rail-road combined transport, the road leg is limited to transport to the nearest suitable rail loading and unloading station.

A minimum length of the non-road leg (rail/sea/inland waterway) is also provided. The nonroad leg has to be longer than 100 km as the crow flies.

The definition does not cover CT operations within one Member State, or between one Member State and a third country.

The Combined Transport Directive liberalises the sector by establishing the exemption for CT from all quota systems and authorisation schemes as well as from compulsory tariff regulations (for road legs of CT operations).

The Combined Transport Directive also establishes that the road legs of a CT operation can be carried out by non-resident hauliers setting it at par with international road transport. According to Article 4 of the Combined Transport Directive, all road hauliers established in a Member State who meet the conditions of access to the occupation and access to the market for transport of goods between Member States can carry out initial and/or final road haulage legs which form an integral part of an international CT operation, including when the road legs do not cross of a border. This means that the cabotage restrictions applying to national road transport by non-resident road hauliers do not apply to CT road legs, because the CT road legs are an integral part of an international transport operation and not national transport.

Taking into account the more beneficial regime, the road leg operator has to be able to prove that the road leg is part of an international CT operation. In this regard Article 3 stipulates that a transport document is required to provide evidence that the road leg is being performed as part of a CT operation, specifying details of the rail station, inland port or seaport used for delivering or picking up a load unit. Other minimum requirements for information in the transport document are established in Regulation (EC) No 11/196016. A more liberal regime applies to own account transport.

In addition, the Combined Transport Directive provides two types of financial incentives for vehicles engaged in CT, namely: mandatory reduction or reimbursement of taxes for road vehicles in the country where the vehicles are registered, when these vehicles are transported by rail in CT operations (Article 6 (1)); optional exemption from taxes for road vehicles used exclusively in collection or final delivery of CT services (Article 6 (2)).

Lastly, the Combined Transport Directive requires the Commission to draw up a bi-annual report on the EU CT market. The report should assess the state of application of EU legislation in the field, as well as the economic development of CT, and propose, where necessary, further measures to promote CT

In the context of a REFIT process, the Commission has published in 2016 a staff working document on an ex-post evaluation of this Directive. The Commission's evaluation assesses to which extent the Combined Transport Directive has contributed to reaching its objectives of modal shift and a resulting reduction of negative externalities of road transport (congestion, accidents, pollution). The evaluation is based on standard evaluation criteria of relevance, effectiveness, efficiency, EU value added and coherence. Based on the above, the evaluation assesses whether the provisions foreseen by the Combined Transport Directive were and still are "fit for purpose" between 1992 and today. The evaluation covers the same geographical scope as the Directive that is the whole EU; however, some of the data comparison is carried out based on EU-15 as no comparable data exists for EU-28 for 1992.

The main conclusions of this evaluation exercise are summarised in the following table:

Parameters	Conclusions
Relevance	it is clear that the Combined Transport Directive continues to be as relevant today as it was in 1992 for two reasons: first the general objectives of the EU transport policy have not changed and still aim at fostering modal shift away from road to ensure less negative externalities for the society, and secondly, the road transport continues to be cheaper and more flexible for various reasons and hence support for the use of alternative modes is needed.

EU added value	By improving cross-border CT operations the Combined Transport Directive improves the functioning of the internal market and the competitiveness of the CT industry, which in turn helps to reduce negative externalities in the EU. Without EU level action, the cross-border CT services would be faced with barriers resulting from different legal systems making the cross-border CT services less competitive and possibly causing a reverse shift to road. Hence, it can be concluded that the Combined Transport Directive continues to add value at EU level.
Effective tool	The analysis shows that the CT operations in the EU measured in TEU have quadrupled during the last two decades and with that helped to shift a considerable amount of freight away from road. In tonne-kilometres, the average growth per year over the last 16 years has been 3.5%, while road transport has grown on average just below 2% annually. The current evaluation has estimated that the shift from road to CT transport has brought along an annual saving of €2.1 billion in external costs. It can be concluded that the Combined Transport Directive continues to be an effective tool in principle to support the modal shift.
Efficiency	As regards the efficiency of the Combined Transport Directive, it needs to be reiterated that the Combined Transport Directive does not create any absolute obligations to industry as it is aimed at establishing the eligibility for support measures and not at regulating the market. As such, it only creates additional information obligation to those undertakings who choose to use the benefits offered. In the public consultation, the stakeholders overwhelmingly believed that similar results could not have been achieved with less costly/burdensome measures . Inconsistent implementation by Member States and not enough enforcement by the Commission are the main elements causing efficiency loss. The provisions on the transport documents are also inefficient.
Coherence	The Combined Transport Directive is coherent with the EU approach to sustainable development and no contradictions could be observed with related legislation . Problems claimed by some stakeholders in the public consultation seem to mostly derive from the problems relating to the transposition and implementation of the Directive.

Table 14 - CT Directive - Conclusions of the evaluation by the Commission

2) TEN-T

The TEN-T Regulation provides a key legal basis for infrastructure-related measures for all forms of transport in the EU and aims at creating a multimodal network of rail, inland waterways, short sea shipping routes and roads which are linked to urban nodes, maritime and inland ports, airports and terminals across the EU. The TEN-T is hence the very basis for an infrastructural response to enable sustainable forms of transport, to provide for improved multimodal and interoperable transport solutions and for an enhanced intermodal integration of the entire logistic chain.

The TEN-T is a Europe-wide network indicated in the maps annexed to the Regulation and identified through a coherent EU-wide planning methodology. The current TEN-T covers around 30% of passenger inland traffic and close to 70% of freight inland traffic and is composed of two multimodal network layers:

- a 'comprehensive' network which is the ground layer to ensure accessibility of all European regions: it is comprised of 123,274 km of railway lines and 114,459 km of roads, 557 ports (294 maritime ports, 223 inland ports, 40 maritime/inland (mixed) ports), 220 Rail-Road-Terminals (RRT) and 353 airports;
- a 'core' network which is the part of the comprehensive network of highest strategic importance and of highest implementation priority because it captures the major transport flows across Europe. The core network is comprised of 67,448 km of railway lines, 49,741 km of roads and 15,732 km of inland waterways, 164 core ports (80 maritime, 60 inland ports and 24 maritime/inland (mixed) ports), 116 RRT and 93 airports.

The Regulation sets clear completion deadlines – 2030 for the core network and 2050 for the comprehensive network. Innovative implementation instruments are proposed to ensure the realisation of the core network by 2030, i.e. nine core network corridors (CNC) as well as two horizontal priorities (European Rail Traffic Management System (ERTMS) and Motorways of the Sea (MoS)) led by eleven European Coordinators.

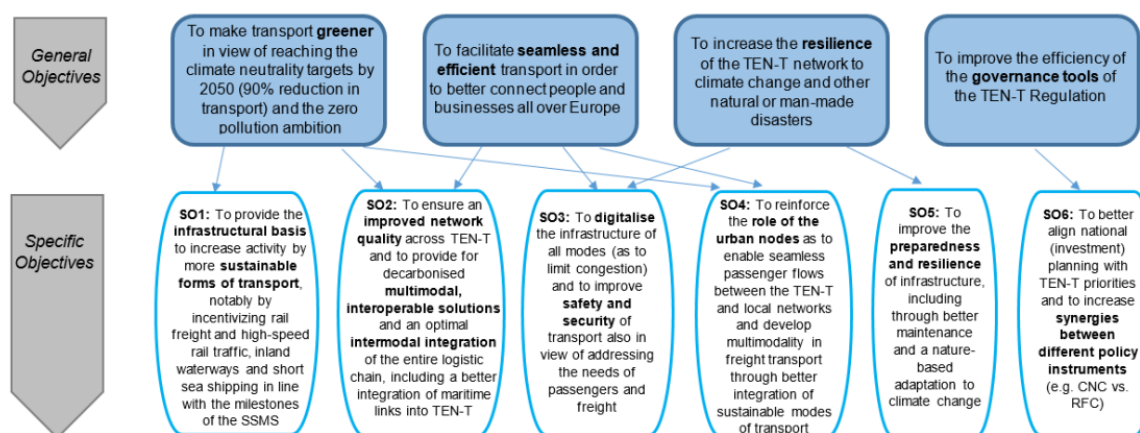


Figure 18 - Overview of general objectives and their interlinkages with specific objectives

The revision of the TEN-T Regulation aims at reaching four general objectives (see figure 13 for overview of objectives and interlinkages with specific objectives:

- (1) To make transport greener in view of reaching the climate neutrality targets by 2050 (90% reduction in transport) and the zero-pollution ambition
- (2) To facilitate seamless and efficient transport in order to better connect people and businesses all over Europe
- (3) To increase the resilience of the TEN-T network to climate change and other natural or man-made disasters
- (4) To improve the efficiency of the governance tools of the TEN-T Regulation

In December 2021, an impact assessment report was released as accompanying the legislative proposal for the revision of the TEN-T Union Guidelines. This report includes an evaluation of three different policy options (PO) based on a successively increasing degree of ambition and level of intervention linked to four aspects: 1) the introduction of new and/or more ambitious TEN-T standards, 2) new/accelerated deadlines for network completion, 3) increased network coverage and 4) governance (see Table 7).

	Policy option description	Degree of ambition	Level of intervention
PO1	This policy option introduces a number of updates of existing TEN-T infrastructure quality requirements and standards and provides for the adequate infrastructural basis for the deployment of AFIR and ITS. In addition, it includes measures to harmonise and streamline the existing TEN-T monitoring and reporting tools. In terms of TEN-T network, it also includes a review of the transport network and transport nodes.	+	+
PO2	This policy option represents a step change by introducing new and more ambitious standards and requirements for all transport modes as to contribute to the decarbonisation, pollution reduction, digitalisation, resilience and safety of the transport infrastructure system. In addition, a new focus on urban nodes policy is introduced. Finally, a boost of TEN-T implementation will be given by better aligning national (investment) planning with TEN-T priorities as well as with climate and zero-emission strategies.	+++	+++
PO3	This policy option adds considerable ambition in terms of the completion of the TEN-T by advancing the deadline of certain standards and sections of the network to 2040 whilst keeping the ambitious standards and requirements introduced through PO2. It also goes further in terms of network alignment and adaptation, e.g. by creating European Transport Corridors (replacing the existing Core Network Corridors and Rail Freight Corridors).	++++	++++

Table 15 - TEN-T policy option description (degree of ambition and level of intervention)

These three-defined POs have different times of implementation (see Table 8): certain measures are to be implemented as of adoption of the new Regulation (e.g. enhancement of the role of European Coordinators

whilst other measures such as the TEN-T standards are to be implemented depending on the geographical location (core / ETC versus comprehensive network) by 2030, 2040 or 2050 (depending on the PO)

Policy Option 1 "updated TEN-T"	Policy Option 2 "upgraded TEN-T"	Policy Option 3 "accelerated and better aligned TEN-T"
Deadlines for completion: 2030: - core network completion 2050: - comprehensive network completion	Deadlines for completion: 2030: - core network completion (with regard to 2013 TEN-T standards) 2050: - extended core network standards on comprehensive network - newly introduced standards on both core and comprehensive network - comprehensive network completion	Deadlines for completion: 2030: - core network completion (with regard to 2013 TEN-T standards) 2040: - newly introduced standards on core network - completion of comprehensive sections as part of European Transport Corridors - ERTMS deployment obligation on comprehensive network 2050: - Completion of rest of comprehensive network

Table 16 – TEN-T Impact assessment - Deadlines for the completion of the network per Policy Option

The same report summarizes the main expected economic, social and environmental impacts of each PO across all transport modes at EU27 level. Impacts are shown both at the level of the TEN-T and for the entire transport network. In terms of time horizon, the assessment has been undertaken up to 2050. The key impacts expected are summarised in annex A.

- PO1 will have no or negligible impacts on all transport modes
- PO2 will have for most of measures a positive impact on rail (1.1% more freight by 204 and 2.4% by 2050), on inland waterway (stable share but increase of 19% by 2030 and 44% by 2050 compared to 2015 levels), on road (safety decrease of 0.4% and 0.5%)
- PO3 will have a significant positive impact on rail (1.6% by 2040 and 3.5% by 2050 related to the baseline), a moderate influence on inland waterway (same growth rates as in PO1) and a moderate additional reduction of fatalities and injuries on road.

3) Rail Freight Corridors (RFCs)

The Regulation (EU) No. 913/2010 concerning a European rail network for competitive freight became effective on 9 November 2010. This Regulation required Member States to establish international market-oriented RFCs in order to meet three main challenges:

1. strengthening co-operation between IMs on key aspects such as the allocation of paths, deployment of interoperable systems and infrastructure development
2. finding the right balance between freight and passenger traffic along the RFCs, giving adequate capacity for freight in line with market needs and ensuring that common punctuality targets for freight trains are met
3. promoting intermodality between rail and other transport modes by integrating terminals into the corridor management process

In 2008, a preparatory study for an impact assessment for a rail network giving priority to freight has been officially released by the European Commission with the support of specialized transport consultants. The objective was to evaluate the potential of creating railway corridors for rail freight based on various policy options (three options: status quo, political initiative and legislative strengthening). The policy options and related intervention areas are summarized in the annex B.

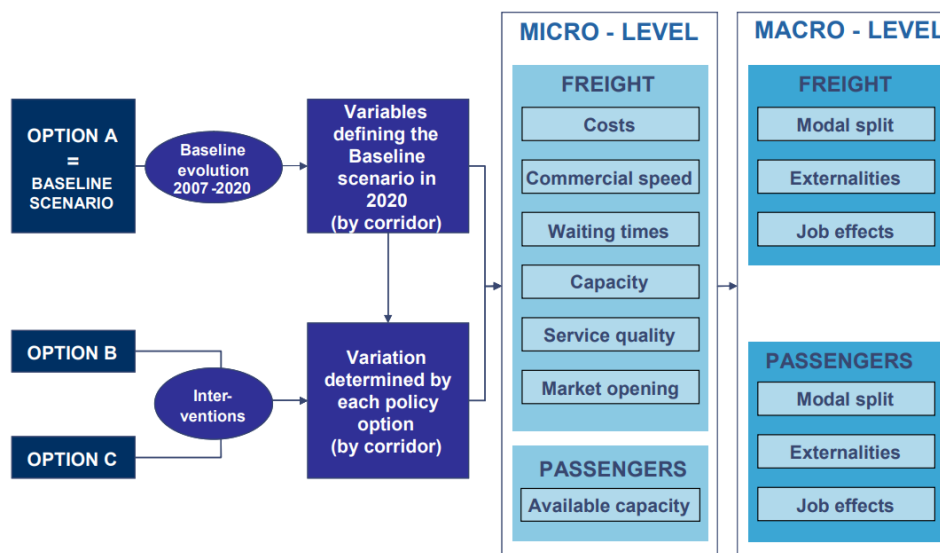


Figure 19 - RFCs - initial methodological approach for economic impacts (2008)

The policy options identified by the Commission have been translated into specific actions in the Report of the Strategic Group of Experts dedicated a specific analysis on the proposed measures. The subsequent impact analysis consisted of an examination of the likely impacts across the main policy dimensions (i.e. economic and social impacts) as well as potential trade-offs and synergies, of the short-listed options, including the ‘business as usual’ option. Figure 14 gives a picture of the methodological approach applied to estimates both micro and macro – level impacts. For each intervention area (investment planning, technical harmonisation, path allocation process, path allocation rules, traffic management, transparency, terminals, quality of service, corridors governance), qualitative and quantitative impacts have been considered. For the quantitative parameters, following indicators have been selected: operating costs, speed, waiting times, train size, line capacity, punctuality and administrative costs.

Article 19 (3) of Regulation (EU) 913/2010 concerning a European rail network for competitive freight requires the Management Boards of the RFCs to conduct a yearly satisfaction survey among users of the RFCs and to publish the survey’s results. RNE, as a coordination platform for the RFCs, has set up a project group consisting of RFC representatives. In 2014, this dedicated project group jointly created a harmonised survey questionnaire which is being revised and updated every year as changes occur in RFCs’ business and their internal processes. The fieldwork has been conducted by a professional, independent market research institute. The first survey was carried out in 2014 and the RFCs have since mandated RNE with the annual coordination of the survey until 2019. In 2020 the RFC project group relaunched the whole survey and since then conducted it without external partners. The summary results of the survey 2020 are included in the annex C. From the results the following qualitative assessment can be extracted: the most satisfying topics are covering general usability of CIP, information on social media channels and geographical coverage of CIP whereas the most important topics to be improved are the parameters of the pre-arranged paths (train length/weight), the protection of the PaPs from Temporary Capacity Restrictions and the adoption of efficient measures taken to improve punctuality.

The Commission intends to revise the RFC Regulation in 2023 based on public consultation and supported by an impact assessment as well. The evaluation will aim at assessing if the Regulation is still fit for its purpose on the basis of 5 criteria: relevance, effectiveness (improve cooperation, coordination of investments and guarantee of capacity...), efficiency, coherence and EU added value.

6.3.3 Policy initiatives

1) *eFTI*

In 2015, EC established a group of experts on electronic information exchange to support transport and logistics processes, the 'Digital Transport and Logistics Forum' (DTLF) aiming to assist the Commission in implementing the Union's activities and programmes to foster more efficient electronic exchange of information in transport and logistics, with the objective of removing technical, operational and administrative barriers between and within transport modes.

The work of the DTLF so far has been divided into two mandates. The first DTLF mandate (2015-2018) was split between two subgroups, focusing on the digitalization, acceptance and harmonization of electronic freight transport documents and the establishment of a digital corridor information systems. The first mandate concluded with the Electronic Freight Transport Information (e-FTI) Regulation proposal (Subgroup 1) to promote the use of digital technologies for fulfilling regulatory requirements related to the transport of goods within the EU which was adopted on 17 May 2018 as part of the Third Mobility Package.

The e-FTI concerns transport information required by EU and national legislation on different types of cargo carried through Europe via road, rail, air and inland waterways. It will allow economic operators to record cargo-related information only once at the beginning of the journey and share it electronically with the relevant authorities or with their business partners at any time.

The e-FTI Regulation has been approved by the EU and will be fully in place by 2025. It establishes a legal framework for road, rail maritime and air transport operators to share information with enforcement authorities in an electronic format. More specifically, e-FTI will include:

- Single data definitions for the electronic representation of the freight transport information;
- Interoperable systems or platforms where businesses may record and share transport information;
- Common rules and procedures for all competent authorities within the EU to access and process information on private e-FTI platforms.

The main problem in freight transport across Europe, is the number of documents used by all involved parties. It was detected that a large variety of different documents for each transport mode are used, such as: purpose, type of good transported, means of transport and combination, national vs international etc.), thus resulting in various problems and delays in transit time. More than 99% of freight transport operations within the EU still use paper documents, while more than 380 million business hours are spent yearly in processing paper-based transport information (whole EU, 2018 estimate). The impact assessment of the e-FTI Regulation proposal will be massive in terms of both money and time.

More specifically, the objectives of the e-FTI Regulation proposal can be summarized as follows:

- 1) **Acceptance** by public authorities of freight transport information made available electronically
- 2) **Uniform implementation** of the obligation of acceptance by the authorities and
- 3) **Interoperability** of the IT systems and solutions used.

The e-FTI policy proposes a harmonized EU general framework for Business-to-Authority (B2A) electronic exchange of freight transport information. The e-FTI policy initiative consists of five central tenets:

- 1) No new information requirements;
- 2) Obligation of authorities to accept the information electronically (only) if presented via certified platforms or certified service providers;
- 3) obligation for economic operators to present information electronically via certified platforms or certified service providers (only) when opting to use an electronic form, the information needs;

- 4) single sets of common general requirements for platforms' functionalities and, respectively, for providers' obligations to ensure authenticity, integrity, accessibility, security and interoperability of data;
- 5) EU harmonized certification scheme for platform and services providers.

Based on the comparison between the selected policy option (highest level of digitalisation for all transport modes starting with 2021, due to the clear obligation of acceptance by authorities and harmonised requirements for admissibility) and the baseline scenario where no policy intervention at EU level is made, the expected impacts of the implementation of the e-fti on the industry can be summarized to the following:

- The industry is expected to make savings worth EUR 20-27 billion over 2018-2040, thanks to the reduction in administrative costs. This is equivalent to 75-102 million work hours saved yearly.
- Positive environmental impacts are expected due to a decrease in road transport's modal share. In cumulative terms, CO₂ emissions savings are estimated to be cut by more than 1,300 thousand tonnes over 2018-2040*, equivalent to EUR 74 million in external costs savings. Congestion costs are projected to be reduced by almost EUR 300 million* over the same period. In addition, with an average of 1-5 copies of each document per shipment not printed anymore, about 2-8 billion sheets of paper would be saved, or the equivalent of 180-900 thousand trees annually.
- Costs for public authorities are estimated at about EUR 268 million over 2018-2040, of which EUR 17 million related to the certification of solution providers, and EUR 251 million to enforcement. National authorities will be expected to invest in new IT systems, or to adjust existing ones. For businesses, compliance costs are expected to be in the range of EUR 4.4 billion.
- Employment impacts can be slightly negative in case personnel is made redundant by reduced document management activities. This will be offset by overall sector growth. Greater demand for IT solutions and systems is likely to bring more opportunities for IT providers, leading to an increase in high-skilled employment.
- Slight negative externalities may occur from the increase of air pollution from waterborne transport, estimated at about 41 million over 2018-2040.
- Businesses, including SMEs, will have a choice on how fast to digitalise their paper-based processes. The certainty that electronic documents/information can be accepted will encourage digitalisation. One-off investments are expected to bring savings already within the first year, thanks to reduced time spent on regulatory compliance reporting activities and improved overall business efficiency. Road transport operators, about 99% of which are SMEs, are expected to benefit of about 60% of all industry administrative costs savings.
- National administrations will be expected to invest in new IT systems, or to adjust the existing ones. These costs are unlikely to be significant. At the same time, the EUR 268 million enforcement-related spending will lead to better enforcement and savings on everyday costs for businesses.
- Shipment of freight across borders and between modes is expected to become easier and cheaper. This may translate into faster delivery times and lower prices for consumers. For transport operators, operational cost savings would be about EUR 12 billion over 2018-2040.

2) *Federative platforms*

The Subgroup 2 of the first mandate concluded its work with an endorsement of a generic concept for “digital corridor information systems” in order to facilitate data sharing among different supply chain stakeholders.

In order to exploit the advantages of data sharing in logistics supply chains, the DTLF proposes a federation of decentralised information exchange platforms and peer-to-peer solutions, where organisations and authorities implement functionality of their systems themselves. The concept aims to interconnect the existing platforms and harmonise their services, rather than developing a new, overarching solution (system) managed from a central level.

More specifically, the federative network of platforms will offer interoperability for data sharing between individual platforms, which will be created by means of common (platform interoperability) protocols for supporting data sharing services. This solution will enable stakeholders to use any platform of their choice, offering one-time registration and one single point of connection to the entire network of platforms, which would apply a similar logic as it is currently for the access to the Internet.

In order to establish this interoperability, the federative platform will provide a set of standardised data sharing services as a basis for platform interoperability. The standardisation of platform services will result in important benefits for all the actors operating in the supply chain which can be summarized as follows:

- Shippers and consignees will exchange products across a reliable, sustainable multimodal logistics network according to goals that they have agreed among themselves. They will have full transparency/visibility regarding their product flow according to goods flows that meet their requirements.
- Logistics Service Providers will have full visibility of alternative multimodal transport solutions based on (predicted) available capacity and quality of the underlying physical infrastructure. With this, they can manage logistics chains via a single-sourced system, sharing data electronically with carriers and other players along the entire supply chain.
- Carriers will gain visibility of demand patterns, which will allow them to improve capacity utilization, align service design and capacity planning as well as advance dynamic chain scheduling. In this way they can optimize positioning of their assets according to predictable demands of shippers and consignees.
- Law enforcement agencies like customs and other inspection authorities will have direct access to and be able to receive (push) or retrieve (pull) relevant data for performing their tasks.
- Infrastructure providers will be able to optimally predict and coordinate traffic flows, allowing them to make timely investments in upgrading infrastructure.
- The emergence of multimodal transportation networks with full integration into capacity and production planning systems.
- Multinational companies will be able to effectively integrate multimodal transport systems into their production systems to provide advanced services and lower costs

3) *Europe's Rail Master Plan*

In 2022, the Commission has published a document called 'annex to the Commission Decision on the on the submission of the Europe's Rail Joint Undertaking Master Plan for adoption by Europe's Rail Governing Board.

Europe's Rail Joint Undertaking (EU-Rail) is the new European partnership on rail research and innovation. The Master Plan provides an overview of the ambitions and the objectives of this new partnership and defines a systemic, long-term and result-oriented delivery strategy for research & innovation in the railway sector.

With a view to translating the EU-Rail objectives into impactful result-oriented Research and Innovation, five areas of priority for EU-Rail have been determined:

- European rail traffic management and supporting rail's key role in a multimodal transport system
- Digital and automated train operations
- Sustainable and digital assets
- Competitive digital green rail freight
- Smart solutions for low density traffic lines (cost-efficient regional lines).

These priorities will be underpinned by a system view to ensure a harmonised approach to the evolution of the Single European Rail Area. EU-Rail will also work on forward-looking activities, integrating disruptive technologies and thinking, through performing exploratory research to accelerate the pace towards game-changing system innovations. Figure XX summarises the EU-Rail delivery strategy.

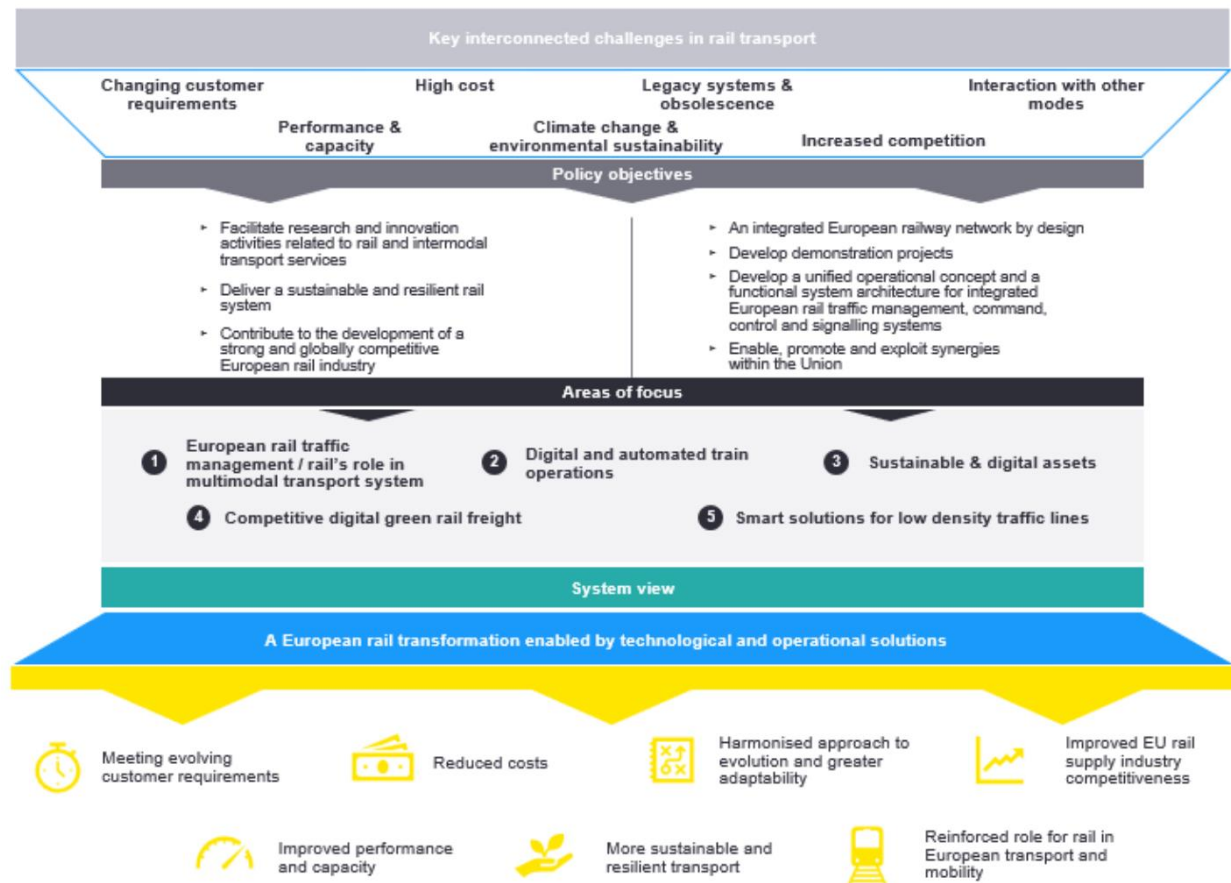


Figure 20 - EU Rail delivery strategy

6.3.4 Summary of potential impacts

Based on the previous chapters in which key (quantitative and/or qualitative) impacts have been collected and analysed per document type, the following table provides an overview of all potential impacts of individual legal & policy actions on the simulation input parameters as provided by other tasks of PLANET.

Table 17 - Summary of potential impacts per prioritised legal & policy documents

	Overall transportation cost				Transport Speed				Mode Load factor				Transshipment cost				Transshipment speed			
	Ro	Ra	IW	Ma	Ro	Ra	IW	Ma	Ro	Ra	IW	Ma	Ro	Ra	IW	Ma	Ro	Ra	IW	Ma
Legal & Policy																				
Combined Transport Directive (road= pre- and post-haulage)	-	--	--	0	0	0	0	0	0	+	+	0	0	--	-	0	0	0	0	0
Digital Transport and Logistics Forum (DTLF)	-	-	-	0	++	+	0	0	++	+	+	0	0	0	0	0	0	0	0	0
Europe's Rail Master Plan	0	---	0	0	0	+	0	0	0	++	0	0	0	-	0	0	0	+	0	0
Regulation (EU) No. 913/2010 concerning a European rail network for competitive freight	0	--	0	0	0	+	0	0	0	+++	0	0	0	--	0	0	0	+	0	0
TEN-T regulation revision	--	--	-	-	+	++	+	+	+	++	+	+	-	---	-	-	+	+	+	+

Symbol	Estimated impacts
0	No impact
+	+1 to +5%
++	+6 to +10%
+++	Over +10%
-	-1 to -5%
--	-6 to -10%
---	Over -10%

Symbol	Description
Ro	Road
Ra	Rail
IW	Inland Waterway
Ma	Maritime



6.4 Development of a 2030-2050 scenario per transport mode

6.4.1 Rail

The scenario 2030 - 2050 constitutes a credible vision for European freight markets along the major transport corridors. Under external pressure from markets and policy, the railways exploit every possible measure to improve their efficiency and gain market shares. This includes consistent digitalisation, automation, cooperative business models and proactive customer relations. Railway infrastructures may or may not be transferred from national to European responsibility, but in any case, we will see a transnational train control facility similar to Eurocontrol with its national subsidiaries for air traffic management. The rail scenario is based on the following narrative:

- Pressure from the production industry for more competitive and reliable transport alternatives will force national governments into cooperating more closely to open up and support the railway market and remove national protectionist policies. The Member States will develop and implement national plans to further promote rail freight and in particular intermodal transport, which will be the prominent market share in railway transport with more than 70% of the total rail freight in Europe.
- It is assumed that massive support programmes for niche markets, new players and alternative technologies will be proposed in the rail sector. Field tests allow progressive transshipment, loading / unloading, wagon coupling and train formation technologies to demonstrate their efficiency potentials and scalability. Digitalisation, automation and customer orientation will be integral parts of national and European investment plans stocked with dedicated funds for their implementation and enforcement. Open market regimes will give new players the chance to thrive in the fields of rail equipment provision or rail transport services.
- To cater for the additional demand for rail expected in the Pro Rail scenario, we assume that the annual investments in rail projects and network rehabilitation (passenger and freight) increase by 20 per cent between now and 2030. Accordingly, rail dominates the investment activities in transport networks of the EU and the member states. Most rail investments are in extra capacity, the development and full rollout of the European Train Control System (ETCS) Level 3 and preparing the network for longer and heavier trains with a common loading gauge (e.g. P400) along all corridors and relevant access routes.
- All freight trains can operate partially autonomously. Locomotives and wagons are connected to the internet for full control of functionality, cargo conditions, remote positioning, etc. Wagons are equipped with digital automated coupling (DAC programme) and transshipment terminals can handle the transfer of ILUs from truck to train and vice versa 24 / 7 without large crews. Maintenance and servicing of locomotives and wagons (as well as infrastructures) reduce downtimes and costs.
- Diesel as a locomotive fuel is partially phased out by 2030. Significant parts of the network are electrified, including access lines to the major corridors with medium relevance. Hybrid locomotives operating with a pantograph plus battery or fuel cell propulsion serve all non-electrified routes or sections.
- Terminals: The available capacity of the transshipment terminals in Europe will be significantly increased thanks to huge investments based on national and European funding schemes. The RFC and TEN-T Regulations have been revised (with a new definition of freight terminals) allowing more terminals to get access to financial resources (asset upgrades, facilitation to road access and connections to logistic centres, digitalisation).



Truck operations in the Rail scenario 2030 are limited to some extent and subject to stricter social rules and much higher road charges for long-distance trucking. The first and last mile road operations of an intermodal chain will be submitted to special policy arrangements ('cabotage' exemptions). In total, truck operating costs are expected to increase by 15 per cent by 2030 relative to 2015. The generalised cost development for the five following cost categories is expected for 2030:

- **Infrastructure:** it is assumed that the plans like in Germany to halve track access charges for (intermodal) freight trains are rolled out to all corridor countries by 2030 and are then extended to a marginal cost-based pricing system following the Scandinavian model by 2050. This strategy implies that funding needs to come from other sources, since we assume massive growth in rail demand. To close the funding gap, the Swiss and Austrian models of cross-funding rail by imposing high surcharges on motorway user tariffs for HGVs should be used.
- **Rolling stock:** it is assumed a full establishment of a European Railway Area with widely de-regulated and / or unified technical and operational standards. The long and expensive licencing process of rolling stock is significantly reduced. Expensive special purpose wagons are replaced by modular systems and a Europe-wide wagon management system increases their utilisation and availability.
- **Energy:** Three elements contribute to the development of energy costs over time: energy efficiency, the energy mix and energy prices by source. While electricity prices have risen steadily, diesel prices rose and fell sharply in the past decade. Innovations to improve energy efficiency in rail transport are successful in the 2030 scenario case: These increase the energy efficiency of engines by 5 per cent by 2030 through consistent energy recuperation and engine control, and achieve additional savings of 20 per cent through predictive and automated driving and aerodynamics. However, the recent significant increases in oil-dependent energies and also in the production of electricity will unfortunately compensate drastically the benefits of the innovative measures to reduce the energy costs.
- **Labour:** Due to massive investments in automation technologies and international industry standards, a drastic increase in labour productivity in the rail sector will be noticed. This trend results in labour costs that are 15 per cent lower in 2030.
- **Management:** the administrative costs could be cut by 25 per cent by 2030. This can be realised by replacing the still common paper-based communication and planning by highly connected IT solutions, by efficient cooperation among European railways and industry bodies, and finally by Big Data applications, deep learning and predictive maintenance to make better use of the available resources.

Table 18 summarises the key quantitative indicators to be reached for the scenarios 2030 and 2050.

Cost category	Rail scenario 2030	Rail scenario 2050
LOAD FACTOR	Partial corridor extension to 740m trains (TEN-T, RFC); optimisation train loading algorithms in place, European wagon management and cargo trading platforms	Up to 1500m trains; equal speeds; ETCS level 3; European wagon and cargo management;
	+++	+++
INFRASTRUCTURE	Policy plans for track access charges: partially halving rail track access charges - on some networks a zero charge will be applied for encouraging the use of rail as more sustainable – partial P400 profile	Track access charges: marginal cost pricing by 2050 – all networks will propose a zero fee for intermodal transport trains – full P400 European network

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ROLLING STOCK	Soft removal of regulatory barriers but additional administrative hurdles; better management of wagon fleet – partial wagon pooling -asset market partially in place	Strong decline in licencing and operating costs for locomotives, modular wagon systems, longer trains and European wagon management tools available– wagon pooling
	--	---
ENERGY COSTS	Full electrification (–10 per cent primary energy demand) and improved energy efficiency through driver assistance (–5 per cent) – costs for energy production are higher than current references (+25%) – full implementation of all EU Rail JU research initiatives	Engine control. Driver assistance systems and aerodynamics – full electrification of lines and wagons – recharging during journey in place, stabilisation of the energy prices (largely based on renewable energies)
	++	++
LABOUR COSTS	More or less stable for drivers; decrease for local workers due to automation of terminals and track works	Automation and standardisation, but also more labour-intensive customer demand; strong unions
	-	--
ADMINISTRATIVE COSTS	Productivity increases mainly in administrative structures (+25 %); some extra management costs	Common use of highly efficient IT solutions for management, horizontal cooperation, Big Data and deep learning
	-	-
TOTAL GENERALISED COSTS	Dominant drivers: infrastructure improvements, rolling stock and energy costs	Extremely deep cuts across all cost categories; main driver is train utilisation and wagonloads
	-	--

Table 18 – 2030 & 2050 Scenarios for rail

Symbol	Estimated impacts
0	No impact
+	+1 to +5%
++	+6 to +10%
+++	Over +10%
-	-1 to -5%
--	-6 to -10%
---	Over -10%

6.4.2 Road

A significant increase in CO₂ productivity is needed in order to achieve the EU emission reduction targets set in the Green Deal and Fit for 55 initiatives. To set the scene, the following section briefly describes the major trends of demand development, the lack of lorry drivers, the capacity limits of digital and transport infrastructure, regulations and policies, and issues of public acceptance.

Economic development has a strong impact on freight growth and logistics efficiency for long-distance freight transport. When considering freight growth, the trend towards the decentralisation of energy production, the volume of intercontinental land transport and the level of infrastructural capacity are all important factors. It is expected that EU transport activity will continue to grow in the coming decades, with road

transport maintaining its dominant role. Road freight transport is projected to increase by 33% by 2030 and 55% by 2050. However, some studies predict rather lower moderate growth in the next decade. Three major trends have influenced the demand for transport: logistics, the structure and the volume of goods.

Unattractive social and economic working conditions, a negative image and the current shortage of heavy good vehicle drivers in Europa (400,000 according to industry associations). For the road transport scenario developed in this paper, the lack of truck drivers has important implications: the wages of skilled drivers will most likely rise as their bargaining position improves. This will generate pressure to introduce automated driving. Autonomous trucks and platooning may help to maintain road haulage productivity. The increasing lack of truck drivers might therefore increase the technology and productivity gap between road haulage and rail freight in favour of the former.

Both road and rail freight have to deal with major maintenance works and increasing passenger transport on their infrastructure networks. Capacity investments are restricted by financial, physical and political (acceptance) limits. further weight restrictions or complete bridge closings, for instance, may become necessary in the near future.

The image of road transportation has suffered from the fact that it is the only large key source category in which greenhouse gas emissions increased between 1990 and 2016 in the EU-28. Furthermore, truck drivers attempting to overtake others travelling at roughly the same speed, accidents, noise and pollution have contributed to the negative image of road haulage for years. Nevertheless, continuing noise reduction, increasing vehicle efficiency and truck safety due to driver-assistance systems and automation as well as low-emission trucks have the potential to improve the image of road haulage.

National and supranational regulations and policies such as pricing policies, road pricing, energy tax rates and bans of at least certain diesel cars have addressed market failures and will continue to do so. These measures are already moving the tipping point forward at which alternative engines become economic for light-duty vehicles.

Road freight transport has inherent conveniences such as door-to-door delivery and the absence of technological and organisational barriers. Furthermore, technological developments are successively reducing its inherent inconveniences such as safety issues, lower energy efficiency and the possibility of efficiently bundling large volumes of freight. It is often easier for road haulage to adopt information and telecommunication innovations because its innovation cycles are much shorter than rail's due to much larger batch sizes.

Vehicle efficiency is considered the biggest lever to reduce road freight's energy. This is defined as the economically realisable potential of engine optimisation, idling reduction and lightweight materials as well as improvements in engines, drivetrains and transmissions. Further potential exists in aerodynamics, low rolling resistance tyres and tyre pressure systems and hybridisation.

Besides vehicle efficiency, logistics and extra-long trucks offer a wide array of potential efficiency improvement measures. The most significant ones are: extra-long trucks with a length of 17.80 to 25.25 m, improved vehicle utilisation, the Internet of things and blockchain technology, and integrated platforms.

Digitalisation, driver-assistance systems and automation also offer further potentials for efficiency improvement: Improved traffic information as well as connected and autonomous driving will contribute to the safety and efficiency of road transport.

The basic narrative of an enthusiastic Road vision builds on the arguments that road haulage can become at least as clean as rail (zero exhaust emissions), fully decarbonised (zero CO₂), reliable (little congestion) and safe (zero accidents). Furthermore, adverse impacts like the lack of drivers can be remedied and road haulage can further reduce its costs (larger vehicles and digitalisation) and increase its efficiency (also by digitalisation and cooperation).

Two major drivers of such an extreme vision can be identified: (1) digitalisation in a broad sense enabling autonomous driving, accident avoidance, route and traffic management as well as cooperative logistics

improving the efficiency and costs of road haulage, and (2) alternative propulsion(s) enabling zero emissions and full decarbonisation of road haulage.

Concerning infrastructure capacity limits, the development of rail freight is heavily dependent on the development of some overstressed sections of the rail network and on upgrading and constructing new combined traffic terminals. However, local resistance is hindering development of overstressed sections, some terminals cannot be enlarged, and the new combined traffic terminals must be built at strategic locations that can be difficult to acquire. These facts are very likely to contribute to a lower growth of combined transport than predicted in the official traffic forecast for 2030. The volumes not absorbed by combined transport will contribute to the growth and payload efficiency of road haulage. Furthermore, improved construction site management and the development of a traffic analysis system contribute to relieving road congestion in the future. Additional comfortable parking lots along motorways improve the quality and safety for truck drivers. Autonomous and remotely controlled trucks can use the free capacity on motorways at night, helping to mitigate road capacity limits as well. However, the road system's charging and distribution network are considered the major barrier to the introduction of alternative propulsions.

The advancement of digital technologies and their application across supply chains and fleet management, collaboration among shippers and the optimisation of vehicle operations are expected to lead to systemic improvements in road freight and logistics. SAE Level 2 features such as emergency braking systems, adaptive cruise control, lane keeping assist systems as well as driver-assisted truck platooning are already being adopted in the truck fleets at costs of about 1,800 USD per truck. More advanced driver-assistance systems will be pushed by ever increasing regulatory safety requirements.

The lack of skilled truck drivers may well push the introduction of highly automated trucks (SAE level 4) that can be remote controlled, making truck driving a much more attractive profession. In turn, this could influence the development of truckers' wages, hindering the amortisation and therefore the introduction of fully autonomous trucks.

Road haulage **load factors** are expected to increase slightly in both scenarios (normal and extreme). In the very positive scenario however, mostly road-bound hub-and-spoke networks, backhauling, integrated supply chains, automated freight matching and larger trucks are expected to improve vehicle utilisation more than in the other scenario.

Infrastructure costs in road haulage are expected to be stable in the 2030 scenario whereas in the 2050 scenario they will significantly decrease. The decrease is because road tolls will be lower for cleaner trucks, which are therefore expected to diffuse quickly into the fleets. Furthermore, dynamic road tolling and automatic driving could contribute to more vehicles driving at lower fares during the night. Extending the motorway network will distribute the cost burden of the necessary investments across more "shoulders". Charging may be adapted so that larger and potentially also heavier trucks may be more economical per load-unit. Larger and increased numbers of vehicles on more tolled roads mean lower tolling rates per ton-kilometre.

The **rolling stock costs** for road haulage are expected to increase in both scenarios. This is due to the (partially forced) proliferation of new and expensive digital equipment, aerodynamic improvements and electric drivetrains. However, remote diagnostics soon start to slow down this cost increase.

Energy costs for road haulage are expected to decrease quite significantly in both scenarios. This is due to the multiple effects of efficiency gains pushed by regulations as well as the use of alternative energy sources, v2x communication, driver-assistance systems and automated driving.

Labour costs for road haulage are expected to be stable in the normal scenario whereas these costs will significantly decrease in the 2050 scenario. This drop is the result of longer vehicles, automation and remote control decreasing the need for staff and making the jobs that do remain more attractive.

Administration costs for road haulage are expected to drop in all scenarios, but the decrease is stronger in the 2050 scenario. This is due to the expected rapid development of digital administration tools and lower insurance rates due to safer vehicles.

Table 19 summarises the key quantitative indicators to be reached for the scenarios 2030 and 2050.

Cost category	Road scenario 2030	Road scenario 2050
LOAD FACTORS	Without longer trucks, only slight improvement possible in loaded hauls and use of truckload space +	Longer and heavier trucks, European cargo trading platforms, horizontal cooperation and mergers ++
INFRASTRUCTURE	No major change to current pricing practices on European motorways 0	No more environmental charges; more traffic sharing fixed infrastructure costs; heavier trucks decreasing costs per ton --
ROLLING STOCK	Stop trials with longer and heavier vehicles; some field tests with electrified motorways; more expensive trucks (+20 per cent), constant maintenance costs 0	New digital equipment, aerodynamic elements and electric drive trains by 2030; payoff of these costs towards 2050 +
ENERGY COSTS	Modest improvement in logistics planning, better aerodynamics (–21 per cent), driver-assistance systems, increase of energy supply +	Growing prices plus multiple effect of efficiency gains, regulations, alternative energy sources, driver assistance systems and automation, stabilisation of energy prices +
LABOUR COSTS	Competition for truck drivers by higher wages and stronger enforcement of social legislation (driving and rest times, etc.) drives personnel costs up +	Longer vehicles, automation and remote control of trucks +
ADMINISTRATIVE COSTS	Advanced use of IT technologies and networking (–20 %); formation of larger haulage companies --	Rapid development of digital administration tools and lower insurance rates due to safer vehicles ---
TOTAL GENERALISED COSTS	Dominant drivers: driver and fuel costs -	Main drivers: more efficient infrastructure use, energy efficiency and the replacement of human labour --

Symbol	Estimated impacts
0	No impact
+	+1 to +5%
++	+6 to +10%
+++	Over +10%
-	-1 to -5%
--	-6 to -10%
---	Over -10%

Table 19 – 2030 & 2025 Scenarios for road

6.4.3 Inland Navigation

The scenarios for 2030 and 2050 are based on a full-scale implementation of the NAIADES III action plan and the corresponding supportive legislative initiatives which are described in a previous chapter of this document. They also foresee also possible future updates of this action plan, moving however in the same direction towards achieving the same goals.

Having said the above, the gradual implementation of the 2021-2027 action plan is expected to have by 2030 a positive impact on the reliability & security of inland navigation mainly through investments in hard infrastructure & fleet renewal. Moreover, from operational aspect, the speed and load factor of vessels are expected to increase while the transshipment speed is also expected to improve. The attractiveness of inland ports will also increase as a result of better integration to multimodal logistics systems (enhanced connectivity) and the upgraded transshipment infrastructure.

During the period until 2030, extensive investments to hard infrastructure, alternative fuels, digitalisation and human capital will begin to gradually increase the efficiency and integration of the sector but will also increase costs of labour, infrastructure and vessels. In the following period between 2030-2050 these investments will begin to pay off through increased automation and better environmental behaviour of the sector, reaching the Green deal goals & lowering costs. In terms of transportation costs it is expected that the fuel, depreciation, insurance, repair & maintenance and administrative costs will decrease as a result of the fleet modernisation, the digitalisation and the increased reliability of the mode.

Cost category	IWW scenario 2030	IWW scenario 2050
LOAD FACTORS	Infrastructure projects towards the goal of “Good navigation status” will gradually allow for achieving higher load factors and longer navigable periods. Development and gradual roll-out of innovative, climate-adaptable vessels able to sail with low water levels. ++	The completion and upgrade of the inland waterway TEN-T network will address bottlenecks and extend further the navigable periods. Full renewal of fleet with climate-adaptable vessels. +++
INFRASTRUCTURE	No major change to current pricing practices. 0	Less cost for infrastructure maintenance because of previous investments reduces charges for infrastructure use --
VESSELS	Innovative, climate-adaptable vessels able to sail with low water levels while minimising impacts on aquatic ecosystems are introduced. Vessels are more expensive but with less maintenance costs. ++	The investments during the previous decades for fleet renewal have been paid off and the sector now has an eco-friendly, fully automated and easier (& less costly) to maintain fleet of vessels. 0
ENERGY COSTS	Partial fleet renewal with barges having reduced environmental footprint. Gradual introduction of alternative energy sources. +	Full fleet renewal and extensive use of alternative energy sources leads to drop on the alternative energy prices. 0
LABOUR COSTS	Increase of labour costs by the effort to create the conditions to attract and maintain qualified personnel in the sector. ++	Increased automation and digitalisation reduce the number of employees in the sector and balances the cost of the better skilled personnel for new technologies and working practices. 0
ADMINISTRATIVE COSTS	Extensive digitalisation of the sector allows for the reduction of administrative costs. -	Full digitalisation & automation of processes leading to further reduction of administrative costs

		--
TOTAL GENERALISED COSTS	Dominant driver: investments to hard and soft infrastructure +	Dominant driver: Increased efficiency --

Table 20 – 2030 & 2050 Scenarios for IWW

Symbol	Estimated impacts
0	No impact
+	+1 to +5%
++	+6 to +10%
+++	Over +10%
-	-1 to -5%
--	-6 to -10%
---	Over -10%

6.4.4 Maritime

Almost 90 % of the EU's external freight trade is seaborne and around 40% of the EU's internal trade between Member States is transported by water. Short-sea shipping, which represents 40% of intraEU exchanges in terms of tonne-kilometres, and inland waterway trade are encouraged to grow as a way of reducing congestion and pollution from land-based transport, stimulating a modal shift.

The continued growth of global trade makes an absolute reduction in current emission levels very challenging and this will not be achieved by simple incremental development. If growth rates average just 2% over the next 30 years, shipping volumes will increase by 80%. Today's challenges for the sustainable development of maritime transport include optimal use of energy sources and minimising its environmental influences, in particular with regard to pollutants and greenhouse gas emissions. There is therefore an essential need for research, development, and innovative solutions, in order to address these important issues.

The key drivers for the maritime transport can be categorised in the following main drivers:

- Demographic: population growth, urbanization, politics
- Technological: increase of innovations, decrease cost of technology
- Environmental: global temperature, Regulation,

The need for waterborne transport will continue to grow towards 2030 and beyond, primarily driven by population growth and rising prosperity. **Population growth** is increasing the demand for food, energy and water supply, which will result in an increased need for water transport, renewable energy, and aquatic food production. Waterborne transport will remain the most cost efficient means for the global transportation of raw materials, finished goods, fuel, food and water. Infrastructure and links to all other transport modes will grow and adapt in response. Maritime transport, including inland waterways transport, will also become an integral part of an efficient intermodal logistic chain.

Growth in global waterborne trade and activity will create significant new opportunities for the EU maritime industry, with its expertise in delivering high value-added, sophisticated and innovative products and services. **Connection with other transport modalities**, including inland-waterway transport, will become seamless. Smart vessels will communicate with smart ports to limit congestion, waiting time and thus costs and they will adapt their sailing speed to match harbour slots automatically.

Concerns about **climate change** has led to legislation imposing limits on greenhouse gas emissions (GHG). This will require a reduction of energy consumption by waterborne transport, the use of cleaner fuels, such as LNG, the electrification of ships, the use of fuel cells, and renewable energy resources. Monitoring of ship's emissions is also required with regulatory enforcement by coastal states. Climate change will lead to more extreme weather events and polar ice melting will affect all waterborne sectors. This will require ships and offshore structures that are more robust, to operate in these more severe weather conditions.

Financial, regulatory, and societal pressures will continue to encourage shipping to lower its environmental impact and improve its safety record. In the future more vessels will offer superior energy efficiency through measures such as improved hydrodynamics, use of lightweight materials, and advanced hybrid-power generation systems, with energy storage to optimise performance. Vessels will also have a reduced environmental impact due to the use of alternative fuels and renewable energy.

Digitalisation will spur automation and positively impact safety and environmental performance. New cloud technologies will dramatically affect the design, manufacture and operation of vessels and their components. The Internet of Things will help to deliver smart vessels with shore-based control. Cybersecurity and Human Factors will become important issues with digitalisation and automation. The next generation of connectivity between ship and shore with Blockchain will help shipowners to reduce costs, avoid expensive repairs and improve operational efficiency. Automated processes and the introduction of "big data" in maritime operations will lead to advances in engine monitoring, remote maintenance, and real-time weather data and routing.

The future of the global ports and shipping industry is still uncertain, but four important aspects are expected to change: trade routes, the competitive position of ports, ecosystems, and cargo distribution. Each affected by underlying trends.

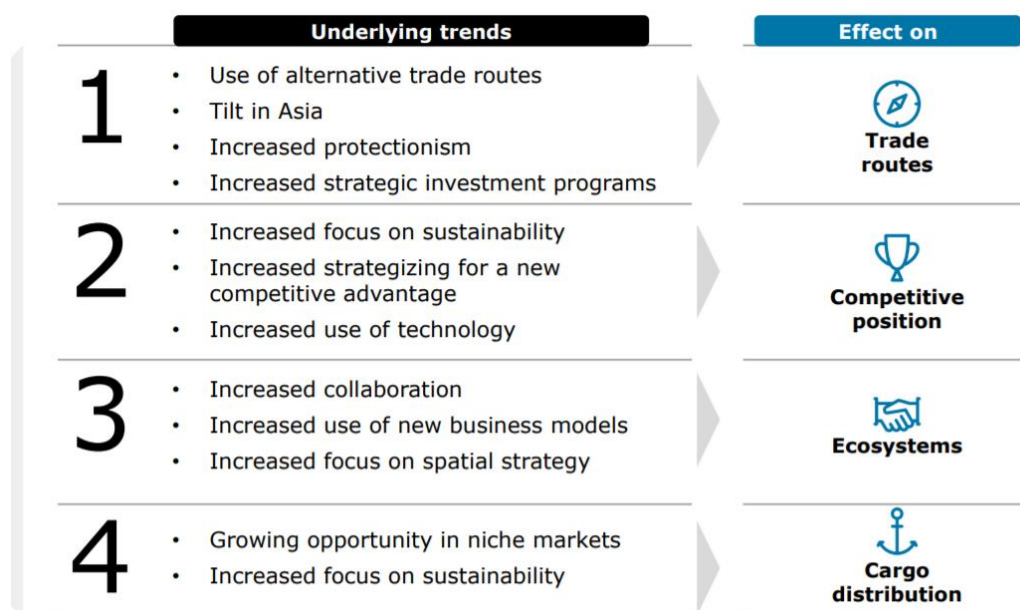


Figure 21 - Trends in maritime transport

The vision of the future maritime sector can be summarised as follows: the objective is to achieve a globally connected and competitive European Waterborne Sector, with zero-emission ships and zero-accidents, digitalised shipping and autonomy, to ensure a sustainable marine and maritime economy.

According to this scenario, stakeholders in the maritime industry continue to undertake new measures imposed by the IMO strategy for reducing CO₂ emissions from international shipping by 40% by 2030 and by 70% by 2050. The IMO strategy aims to lead to a shift to a zero-carbon system within the next three decades and reduce the sector's total emissions by at least 50% compared to 2008 levels by 2050.

Moreover, the European maritime industry will be affected by the results of the “Fit for 55 package” which is a set of proposals to revise and update EU legislation and to put in place new initiatives with the aim of ensuring that EU policies are in line with the climate goals agreed by the Council and the European Parliament. Fit for 55 refers to the EU’s target of reducing net greenhouse gas emissions by at least 55% by 2030.

The Fit for 55 package includes more than ten legislative proposals and policy initiatives, one of which is the revision of the EU emissions trading system (EU ETS) to include shipping: Until now, maritime transport remains the only sector with no specific EU commitments to reduce greenhouse gas emissions. The EU Emissions Trading System is an existing part of the EU’s policy to combat climate change and constitutes the world’s biggest emissions trading system, but plans for inclusion of shipping emerged in 2019 as part of the “European Green Deal”. Under the EU ETS, a limit is set on the total amount of certain GHG emissions that can be emitted, and companies receive or buy emission allowances which they can trade with one another as needed. If the shipping company fails to surrender the right number of allowances by April 30 of the following year, it will be fined 100 euro per tonne of CO₂ not accounted for. The measure will be introduced gradually from 2023 until 2026.

The inclusion of shipping to the EU ETS is expected to put a cost on maritime carbon emissions and to increase the price of marine bunker fuels by taxing non-sustainable fuels and setting limits to the GHG intensity on ship energy use.

A report published by University Maritime Advisory Services (UMAS) and the Energy Transitions Commission (ETC), defines the total investments needed between 2030 and 2050 for cutting in half the emissions of the maritime amount to approximately \$1.4tn. In addition, \$400bn will also be required in order to fully decarbonize the sector, summing the investments to a total of \$1.9tn.

Breaking down the share of these investments, the reported study specified that 87% of the total funds will have to be invested in land-based storage, which include investments in hydrogen production, ammonia synthesis and the land-based storage and bunkering infrastructure. The remaining 13% of investments would have to be used for the ships themselves, which will require new machinery and onboard storage in order to run on low carbon. Ship-related spending would also include investments related to improving energy efficiency, which are estimated to grow due to the higher cost of low carbon fuels compared to traditional marine fuels⁸.

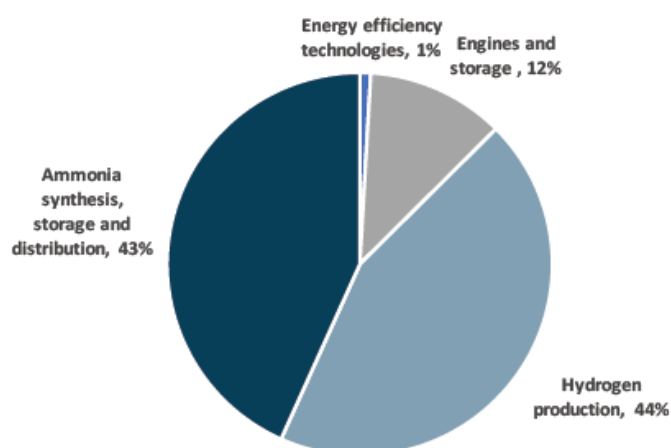


Figure 22 - Estimated distribution of investments towards the greening of maritime sector

Cost category	Maritime scenario 2030	Maritime scenario 2050
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⁸ <https://www.globalmaritimeforum.org/news/the-scale-of-investment-needed-to-decarbonize-international-shipping>

INFRASTRUCTURE	Significantly high initial investments on land-based facilities in ports to support the transition of the sector towards the greening of the sector. +++	Infrastructure investments for the shift to sustainable maritime are completed and repaid. 0
VESSELS	Increased cost of new ships to comply with new environmental requirements. +	Lower maintenance cost of ships due to automation. -
ENERGY COSTS	Transition to low sulphur initially and then to alternative fuels (hydrogen, Ammonia) results to an increase of energy costs. Carbon cost enters charterparty negotiations leading to increased freight rates. +++	Prevalence and mass production of sustainable alternative fuels (Hydrogen & Ammonia) balances their price +
LABOUR COSTS	Increase of labour costs by the effort to create the conditions to attract and maintain qualified personnel in the sector. +	Increased automation and digitalisation reduce the number of employees in the sector and balances the cost of the better skilled personnel for new technologies and working practices. --
ADMINISTRATIVE COSTS	Extensive digitalisation of the sector allows for the reduction of administrative costs. -	Full digitalisation & automation of processes leading to further reduction of administrative costs --
TOTAL GENERALISED COSTS	Main drivers: transition towards cleaner & greener maritime sector and digitalisation of the sector +++	Main drivers: transition towards cleaner & greener maritime sector and digitalisation of the sector +

Table 21 – 2030 & 2050 Scenarios for Maritime transport

Symbol	Estimated impacts
0	No impact
+	+1 to +5%
++	+6 to +10%
+++	Over +10%
-	-1 to -5%
--	-6 to -10%
---	Over -10%

6.5 Modelling input parameters

Based on the information provided by the operator of the strategic model, the input parameters which are used for calibrating the model are summarised in the following table. These parameters are mainly provided per mode of transport and this is the reason why the above analysis followed the same “per mode” logic, in order to be aligned with the model’s requirements.

For each mode of transport, the main parameters used are the costs, the speed, the load factor, the security and the reliability. In the case of maritime transport, an additional parameter is included, that of the ship rotations. With respect to the cost parameter, it consists of several sub-components, some of which are common among the different modes of transports while other differ based on the nature of the mode. In general, all cost sub-components are translated in €/TEU by the model in order to have a unified method of measurement. In addition to the per mode parameters, the model also considers some other parameters which are related to the transshipment cost and speed, the value of time per nstr1 commodity type and finally an “attractiveness per terminal” parameter which is produced by a model and is used for the calibration of transport values.

Road	<ul style="list-style-type: none"> Costs: <ul style="list-style-type: none"> - Labour costs (driver wages incl. social costs and reimbursed expenses); - Capital costs (costs of depreciation and interest cost of vehicle); - Fuel costs (including excise duties);
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	<ul style="list-style-type: none"> - Other costs (insurance, road tax, repairs and maintenance, tire costs, overhead); - Toll costs. • Speed • Load factor • Reliability • Security
Rail	<ul style="list-style-type: none"> • Costs: <ul style="list-style-type: none"> - Labour costs (driver wages incl. social costs and reimbursed expenses); - Capital costs (lease of locomotive and wagons, reserve material); - Traction costs; - Access charges; - Other costs (insurance, repairs and maintenance, shunting, overhead, waiting); • Speed • Load factor • Reliability • Security
IWW	<ul style="list-style-type: none"> • Costs: <ul style="list-style-type: none"> - Labour costs (driver wages incl. social costs and reimbursed expenses); - Capital costs (costs of depreciation, interest cost of vessel); - Fuel costs; - Other costs (insurance, repairs and maintenance, overhead); • Speed • Load factor • Reliability • Security
Maritime	<ul style="list-style-type: none"> • Costs: <ul style="list-style-type: none"> - Labour costs; - Capital costs; - Fuel costs; - Other costs (insurance, repairs and maintenance, overhead); • Speed • Load factor • Reliability • Security
Transshipment	<ul style="list-style-type: none"> • Costs • Speed
Other parameters	<ul style="list-style-type: none"> • Value of time per commodity type • Attractiveness per terminal

Table 22 – Input parameters of the strategic model

6.6 Key Outputs of stakeholders' workshop

UIRR and CERTH have organized on the 25th of November 2022 a virtual session on the activities performed so far in this task. A panel of selected experts per transport mode have been invited to gather their feedback on the development of the final input parameters for the PLANET's simulation model related to legal/policy initiatives and strategies. More than 15 experts, representing all transport modes, have participated in this validation workshop.

The workshop has been divided into two blocks:

- Block 1: Presentation of the Policy, legislation initiatives and strategies of the sector that have been examined => experts were invited to provide a feedback regarding missing or additional initiatives

- Block 2: Presentation of the selected legal and policy initiatives (inventory) with some estimations of their impacts based on the strategic model input parameters and example values. => experts were invited to provide their assessment.

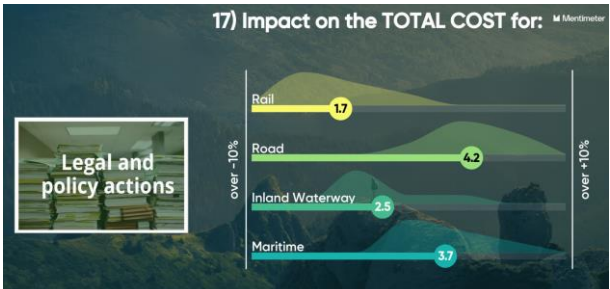
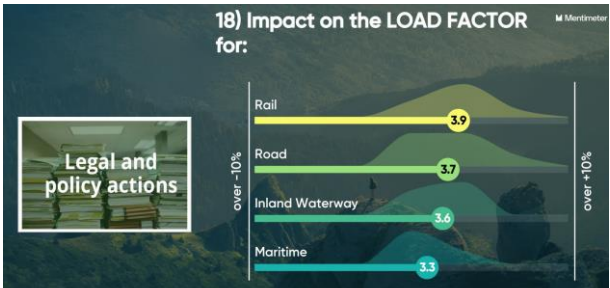
During the session, interactive tools such as Miro Boards and Mentimeter were used to collect feedback and comments from the participants. It was also decided to add to this assessment some new legal and policy actions such as CT Directive, Emission Trading System (ETS) and the Green Deal.

As presented in 6.5, every parameter that is used by the model corresponds to a large set of values which reflect the differences among areas or the local conditions that may affect it. For example, the rail cost parameter sub-component “traction cost” is a set of values that is mainly dependent on the price of energy to different areas of the EU.

For this reason, the present analysis cannot not provide detailed values of all sub-components and parameters with an acceptable level of reliability. Instead, based on a critical review of the impact assessment reports that were collected for the selected policy and legislation initiatives, it will provide an estimation of the % range of change of value for the main parameters that are expected to change in each case. Having said the above, the input parameters to be evaluated per legal & policy initiative were focused on four elements which were considered more relevant from the complete list of input parameters presented in 6.5: (1) Total transportation costs, (2) Load factor, (3) Reliability and (4) Transport speed. In each of the questions presented to the workshop participants, they were asked to provide their quantitative estimation of impacts selecting from a range of percentages (over -10%, -6 to -10%, -1 to -5%, 0, 1 to 5%, 6 to 10%, over 10%). The final results were then calculated using the number of votes and the intermediate value of these ranges.

Some values of the input parameters were given as potential references to the participants (for example the average total cost per TEU/km). The validation was considering only the scenario 2030 and its relevant impacts.

The detailed impacts per legal or policy initiative have been integrated in the annex. On the question ‘how will all legal and policy actions impact the main parameters in 2030’, the following results have been obtained:

	<p>TOTAL COSTS</p> <p>All the identified initiatives will have significant impacts on the total costs for road and maritime whereas as inland and rail should be somehow benefit from the actions taken at European or/and international levels.</p>
	<p>LOAD FACTOR</p> <p>All the identified initiatives will have quite similar impacts for all transport modes with rail and road scoring slightly better than inland waterway and maritime.</p>


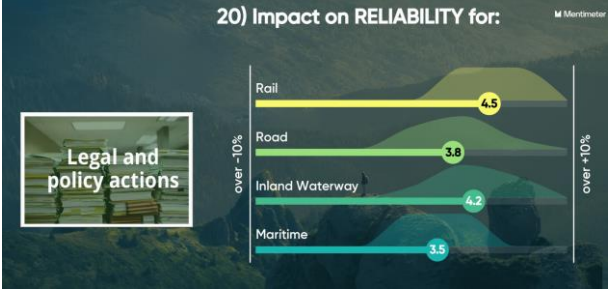
 <p>19) Impact on the AVERAGE SPEED for:</p> <p>Legal and policy actions</p> <p>Rail: 3.7 Road: 3.2 Inland Waterway: 3.2 Maritime: 3</p>	<p>AVERAGE SPEED</p> <p>All the identified initiatives will have quite similar impacts for all transport modes with rail on first place and maritime on last position.</p>
 <p>20) Impact on RELIABILITY for:</p> <p>Legal and policy actions</p> <p>Rail: 4.5 Road: 3.8 Inland Waterway: 4.2 Maritime: 3.5</p>	<p>RELIABILITY</p> <p>All the identified initiatives will have a quite significant impact for rail and inland waterway and an important influence for road and maritime.</p>

Table 23 - Key outputs of the validation workshop

Based on the analysis described above, the output of the workshop in the form of input parameters for the strategic model can be summarized in the following table.

Input parameter for the strategic model	% value change
	2030
Total transportation cost per mode	
• Rail	-5,00%
• Road	4,17%
• IWW	-1,50%
• Maritime	+2,33%
Load factor per mode	
• Rail	+2,86%
• Road	+2,43%
• IWW	+1,71%
• Maritime	+0,86%
Reliability per mode	
• Rail	+5,50%
• Road	+2,83%
• IWW	+4,17%
• Maritime	+1,50%
Transport speed per mode	
• Rail	+2,33%
• Road	+0,50%
• IWW	+0,50%
• Maritime	0,00

Table 24 – Policy & legislation impact estimated input values for the strategic model

7 Conclusions

Under the coordination of UIRR, the Industry Association for Road-Rail Combined Transport and with the support of CETH, Task 1.3 was aiming at (1) defining and evaluating the impacts of forthcoming international, EU and national legislative initiatives and EU policy developments of the EGTN, (2) providing input for the scenario 2030 simulation model to be developed in Task 1.5 and (3) liaising with WP4 on the key implementation barriers of the identified legislative and policy documents.

7.1 Methodological Approach

The project partners involved in this task have agreed on the following methodological approach: (1) the creation of an inventory of all potential legislative and policy actions that might influence the realisation of the EGTN, (2) the execution of qualitative impact assessment of both types of initiatives (with a focus on the EGTN layers and attributes), (3) the catalogue of key implementation barriers per EGTN layer (legal) and per document (policy), (4) the development of 2030 and 2050 scenario including vision and strategies per transport mode, own projections, prioritisation of key legal and policy documents and their potential impacts on the modelling input parameters. The execution of all these tasks have been based on desktop research, direct contacts with experts, online survey and workshops in order to validate the works carried out in this task.

7.2 Inventory of legal and policy initiatives

The **catalogue related to the legislative initiatives** has been focused on all acts taken by any governance bodies at international, EU and national level. For the European Union, it means the analysis of EU treaties, Regulations, Directives, Delegated and Implementing Acts. The international catalogue has concentrated on set of rules, norms and standards generally recognised as binding nations such. It covers treaties and standardization committees. For national level, cases have been considered where differences on the ones of the non-EU countries along the three emerging routes/corridors to/from Europe identified in Task 1.2., which a clear focus on China. At European level, 9 legislative actions have been described and listed. Most of them have been recently developed and updated (apart the Combined Transport Directive from 1992) and are covering a large variety of topics such as infrastructure (6x), greening (2x), digitalisation (5x), operations (4x) and intermodal transport (x7). For the catalogue of legislation at international level the analysis has been mainly concentrating on four organisations covering rail essentially: (1) The United Nations Economic Commission for Europe (UNECE), (2) OTIF, (3) OSJD and the International Rail Transport Committee (CIT). Also, for the international level, 9 different pieces of rules have been collected and analysed with nearly all covering the aspects of 'intermodality' and 'operations'.

The **portfolio related to the policy initiatives** has addressed specific policy initiatives of the EU which have not yet been translated to legislative actions or have become legislations only recently and are expected to have an impact on the green and digitalisation aspects of the EGTN development. Starting from the presentation of the initiatives emerging from the recently published document of "Sustainable and Smart Mobility Strategy" and their relation to EGTN development, the analysis has continued on-going policies deriving from the Digital Transport and Logistics Forum (DTLF) and also the EU taxonomy initiative for sustainable financing that may have an impact on the EGTN attributes.

7.3 Qualitative Impact Assessment

The next step of the analysis was to evaluate if the identified legal & policy initiatives will impact the EGTN layers and attributes and how they could influence the overall EGTN development. For both types of actions, the impact assessment was based on a qualitative approach gathering opinions and drivers from interviews, surveys, workshop and, whenever available, past or present impacts assessments carried out on behalf of Authorities such as the European Commission. For the legal context, a scoring grid (from – to ++) was developed whereas, for the policy aspects, the results of the assessment have been summarised and described.

From the list of identified **legal initiatives at EU level**, seven documents have been retained as relevant for the EGTN development: nearly all have an influence on the layer ‘infrastructure’ whereas only two are covering the layer ‘governance’. Concerning the EGTN attributes, the evaluation demonstrates that most of the acts positively impact the EGTN attributes ‘geo-economic’, ‘innovation’ and ‘impact’. The other two attributes ‘Integrated’ and ‘Inclusive’ are less influenced. Without surprise, the most influential Regulation on EGTN is the TEN-T which covers all three EGTN layers and all EGTN attributes. For the railway sector, the second most impacting Regulation is the Rail Freight Corridors. In addition, the CT Directive should significantly improve the development of intermodal transport within the EGTN. The less affecting the EGTN is the Directive on Weights & Dimensions. Concerning the **international evaluation**, only two documents are directly relevant for EGTN: the AGC and AGTC agreements impacting largely the railway infrastructure parameters of the future EGTN.

The evaluation of the **policy actions has been focused on three areas**. First, the ‘Smart and Sustainable Mobility’ package will have a positive impact on the on EGTN development by facilitating the achievement of the environmental sustainability component of the EGTN attributes, by facilitating the introduction and exploitation of innovative technologies (Blockchain, IoT, AI, 3D printing etc.) in logistics operations on the EGTN and also the implementation of the PI concept (PI containers, PI nodes, PI moves etc.) on EGTN corridors. Secondly, the policy initiatives taken out from the DTLF activities (eFTI, corridor information systems) are expected to significantly improve the efficiency of the TEN-T network and facilitate the movement of goods within the EU, thus enhancing the economic and environmental sustainability attributes of the future development of the EGTN. Finally, the ‘EU Taxonomy’ will facilitate the realization of the environmental sustainability and resilience attributes of the EGTN.

7.4 Key implementation barriers

A barrier is an obstacle which prevents a given legal or policy instrument being implemented or limits the way in which it can be implemented. In the extreme, such barriers may lead to certain policy instruments being overlooked, and the resulting strategies being much less effective. Based on the potential impacts of the identified initiatives relevant for EGTN, the analysis has emphasized on the key implementation barriers that should be overcome in order to benefit from the intended full potential of the legal and policy initiatives.

National, EU and international legislations are designed to set fair and transparent framework conditions for all transport modes (road, rail, inland waterway, maritime) aiming at putting all modes under the same playing field and more recently at greening drastically the land transport modes with the publication of the Green Deal by the European Commission and endorsed by the European Parliament. However, it is to be noted that improvements in the implementation of legal initiatives should be undertaken. On the EGTN layer ‘infrastructure’, it should be for example highlighted that some legal texts have not even been transposed into national laws, that some key requirements are only optional and that the single-mode approach is still preferred to a more integrated intermodal concept. For the EGTN layer ‘Technological’, the current legislations do need a more coordinated approach between Member States to ensure a full data interoperability on the Eurasian corridors for example. On the EGTN layer ‘governance’, the different legislative actions still allow too much flexibility for adopting national-specific requirements. For example, the TEN-T, CT Directive or RFC Regulation should limit the possibility of the Member States to ask for derogations.

EU policies may be established with the intention of them becoming future Regulations and legislations, but in practice there are some key implementation barriers that may affect the adoption of these policies in the near future. The evaluation of the policy initiatives has been focused on the DTLF activities. For the eFTI implementation, the following main barriers have been identified: (1) initial high compliance costs for the transition period towards paperless transport, (2) uncertainties as to whether or not an electronic transport document will be accepted by authorities, banks, insurance companies and courts and (3) the lack of development of interoperable standards (and IT solutions) for the exchange of transport documents and ITS data between businesses and authorities across different modes of transport and different Member States. For Corridor Information Systems, the low acceptance by the core players with high volume and/or first mover capabilities has been considered as key barrier as it will slow down the process of wide implementation. As second main barrier, the financial or technical inability of organizations to amend their systems in order to implement their local interface for connecting to the federative platforms has been also identified as obstacle for setting up federative platforms at EU level.

7.5 Development of 2030 and 2050 scenario and input parameters

Initially not planned within Task 1.3, scenarios for 2030 and 2050 have been developed in order to evaluate the impacts of prioritized legal and policy initiatives on the simulation input parameters (overall transport costs, speed, load factor, transshipment costs & speed, reliability, security and ship rotation). This analysis has been performed per transport mode (road, rail, inland waterway and maritime).

In order to develop coherent and plausible scenarios for 2030-2050, a compilation of all known existing vision and strategies per transport mode, published by official recognized institutions, has been undertaken. For the rail and road transport modes, the exercise was simplified by the publications of relevant institutions as the Europe's Rail Joint Undertaking, ERRAC or ERTRAC whereas for inland navigation and maritime such organisations do not exist at all. For inland waterway, the NAIADES III Action Plan has been used as a basis whereas, for maritime, the visions of the most important EU ports have analysed in details.

For each selected legal and policy action, the following aspects have been analysed: (1) the potential impacts have been categorised per transport mode (road, rail, IWW and maritime), (2) the relevance for the simulation modelling and the prioritisation of the documents to be further investigated. Five documents (4 legal and 1 policy) have been selected and further investigated. The CT Directive, even if it has been published in 1992, continues to be relevant as it fosters the intermodal approach and is still an effective tool to support modal shift. A new proposal is in preparation by the Commission. The main expected economic, social and environmental impacts of the TEN-T and RFC Regulation have been summarized and detailed. Both legal initiatives are in the process to be revised. A similar impact analysis has been performed for the eFTI and Federative Platforms. For eFTI, for example, the industry is expected to make savings worth EUR 20-27 billion over 2018-2040, thanks to the reduction in administrative costs. This is equivalent to 75-102 million work hours saved yearly. The standardisation of platform services will result in important benefits for all the actors operating in the supply chain.

The design of a credible vision for 2030-2050 has been based on literature review and experts' know-how. A scenario per transport mode has been realized assessing per cost category the potential key quantitative indicators (with ranges from over -10% to over +10%). Key developments and drivers per transport mode have been compiled, analysed and assessed. The obtained results have been validated through a focused workshop. The outcome of this exercise is the provision of value changes per input parameter (total costs, load factor, reliability and speed) and per transport mode. The outputs have been transferred to the PLANET's partners responsible for the simulation model.

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9 ANNEX: PLANET Validation Workshop slides


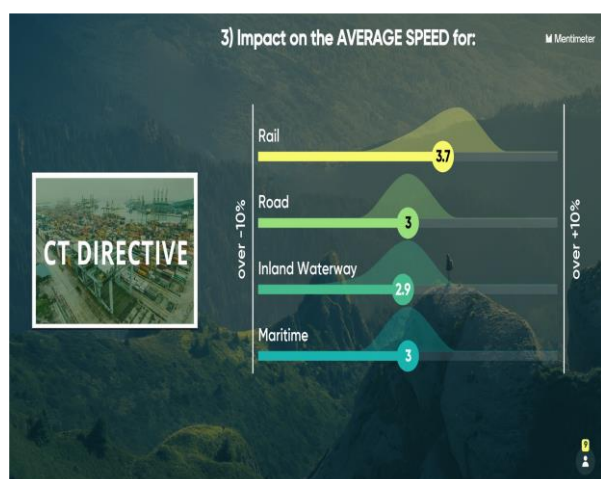
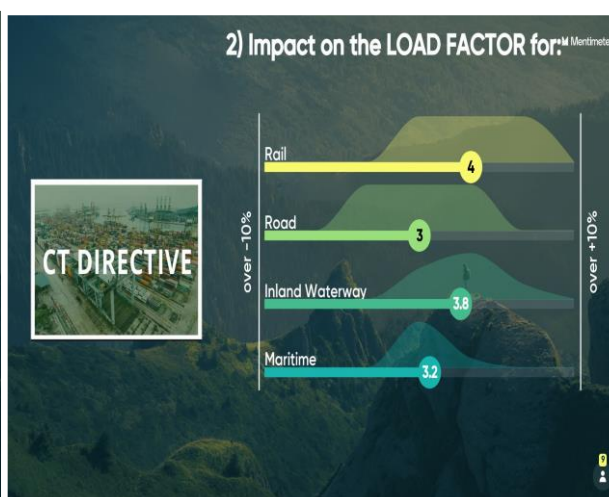
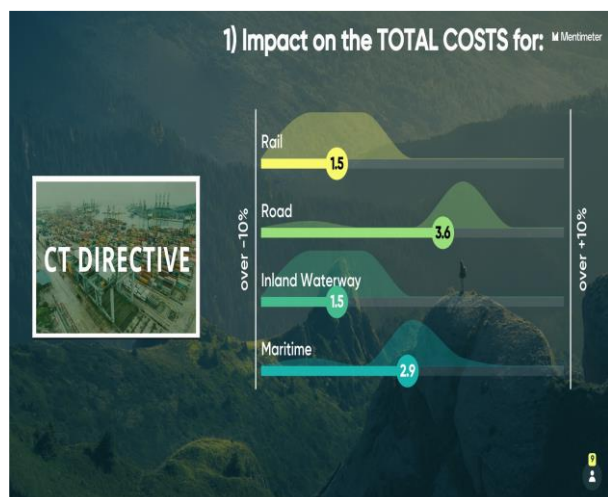


Workshop on impacts of legal & policy initiatives on the transport modes

Combine Transport Directive

How will the CT Directive impact in 2030:

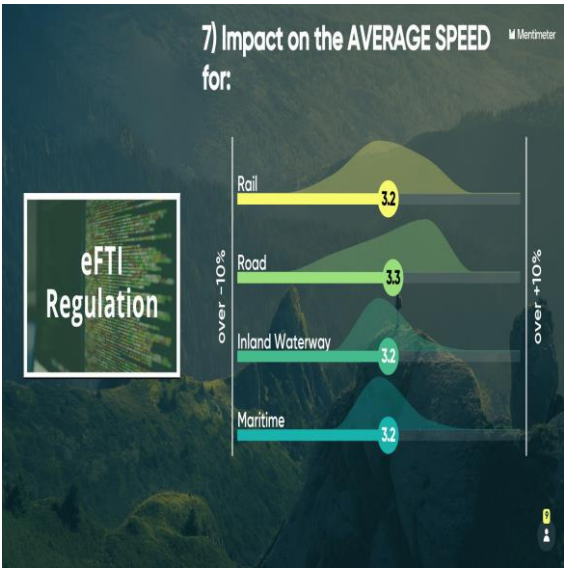
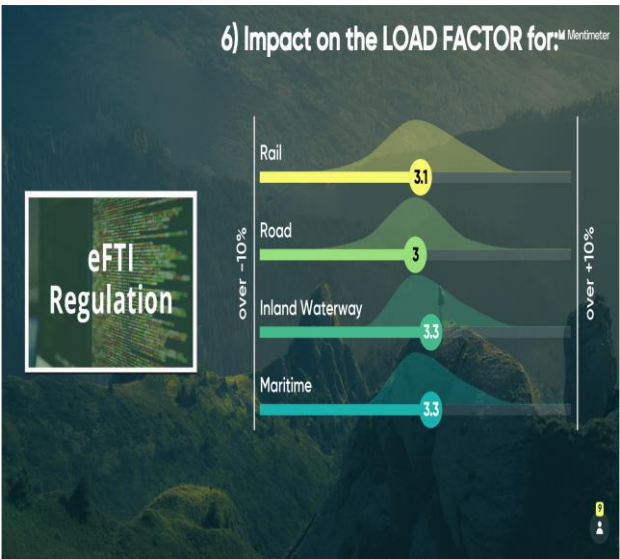
- 1) the total costs
- 2) the load factor
- 3) the average speed
- 4) the overall reliability

eFTI Regulation

How will the eFTI Regulation impact in 2030:


- 5) the total costs
- 6) the load factor
- 7) the average speed
- 8) the reliability



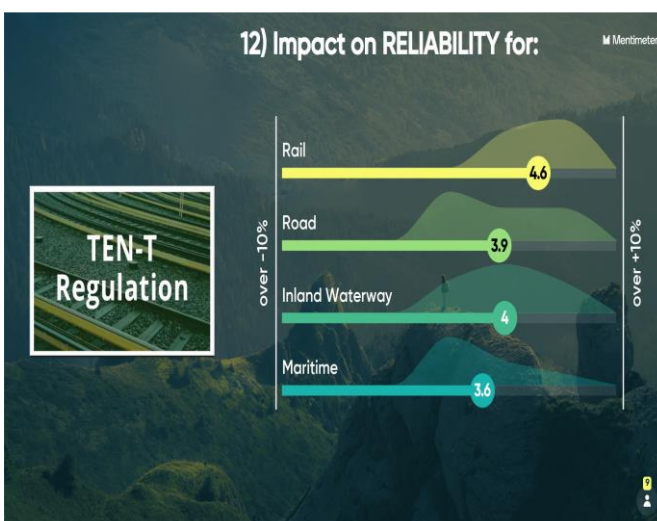
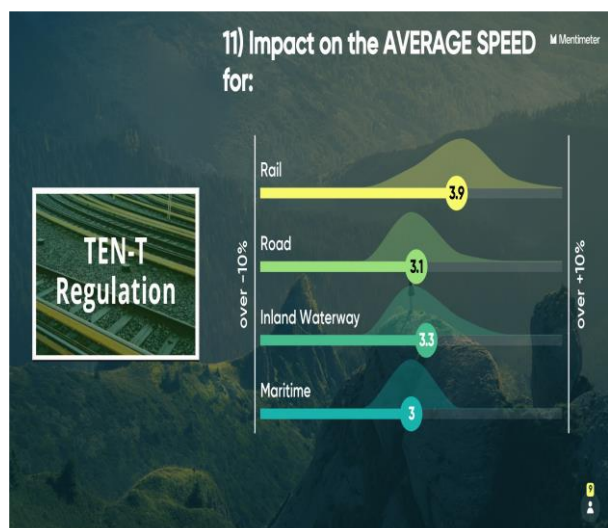
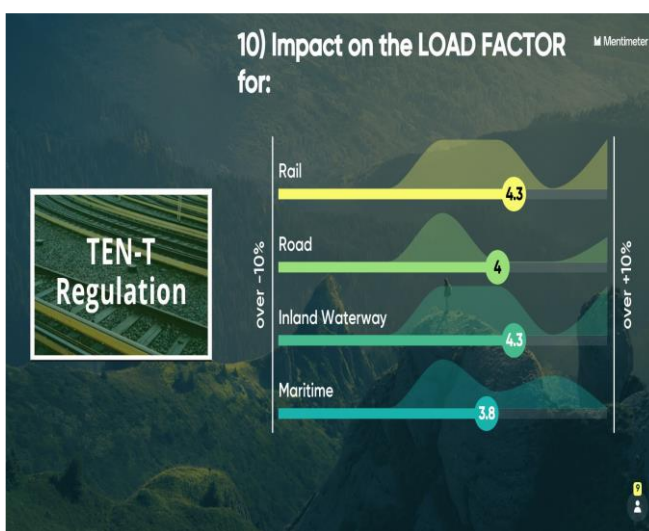
TEN-T Regulation

How will the eFTI Regulation impact in 2030:

- 9) the total costs
- 10) the load factor
- 11) the average speed
- 12) the reliability



Mentimeter



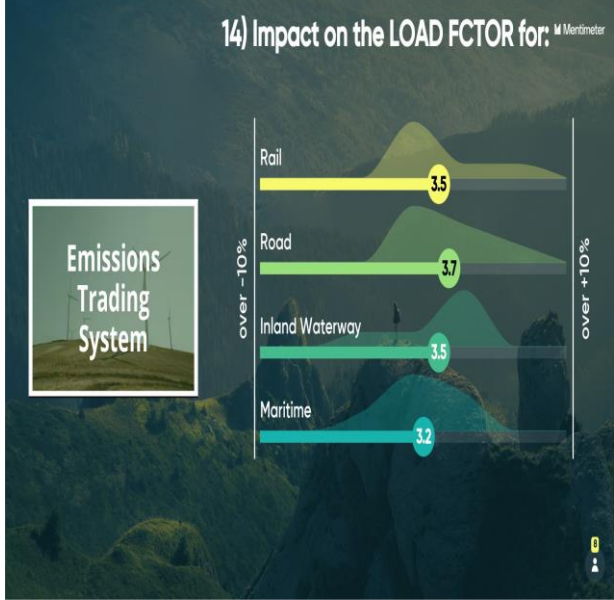
Emissions Trading System (ETS)

How will the ETS impact in 2030:

- 13) the total costs
- 14) the load factor
- 15) the average speed
- 16) the reliability



Mentimeter

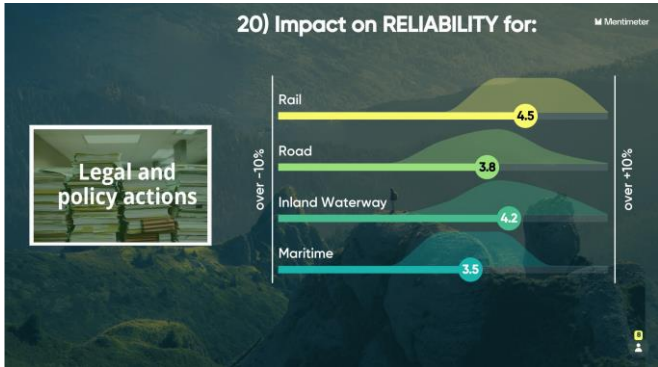
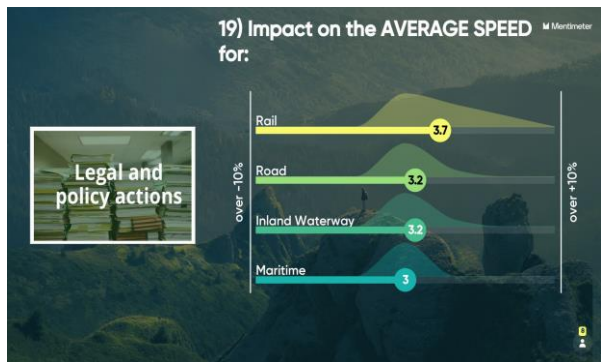
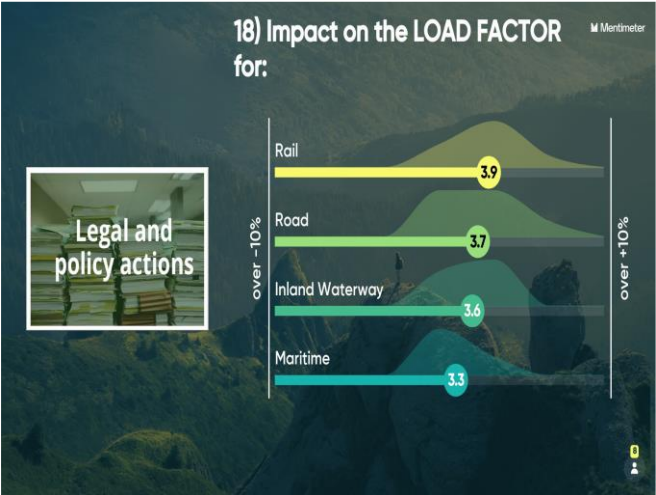


Mentimeter

Legal and policy actions

How will all legal and policy actions impact in 2030:

- 17) the total costs
- 18) the load factor
- 19) the average speed
- 20) the reliability



PANET - validation
workshop.pdf