

Public policy recommendations for a new European waterborne transport system

Deliverable D6.1 - Version Final - 2023-06-01



Advanced, Efficient and Green Intermodal Systems

<http://aegis.autonomous-ship.org/>



This project has received funding from the European Union's Horizon 2020 research and innovation program under Grant Agreement N° 859992.



Document information

Title	Public policy recommendations for a new European waterborne transport system
Classification	Public

Editors and main contributors	Company
Nelson F. Coelho	Aalborg University
Jan van Tatenhove	Aalborg University
Jesper Raakjær	Aalborg University

Rev.	Who	Date	Comment
0.1	AAU	2023.05.08	Draft for review
0.2	VH	2023.05.11	Comments from consortium reviewer VH
0.3	DTU	2023.05.21	Comments from WP partner DTU
0.4	SO	2023.05.29	Comments from WP partner SINTEF Ocean
Final	AAU	2023.06.01	Final version to be submitted to EC

© 2020 AEGIS CONSORTIUM

This publication has been provided by members of the AEGIS consortium and is intended as input to the discussions on and development of new automated and autonomous waterborne transport systems. The content of the publication has been reviewed by the AEGIS participants but does not necessarily represent the views held or expressed by any individual member of the AEGIS consortium.

While the information contained in the document is believed to be accurate, AEGIS participants make no warranty of any kind with regard to this material including, but not limited to the implied warranties of merchantability and fitness for a particular purpose. None of AEGIS participants, their officers, employees, or agents shall be responsible, liable in negligence, or otherwise howsoever in respect of any inaccuracy or omission herein. Without derogating from the generality of the foregoing neither of AEGIS participants, their officers, employees or agents shall be liable for any direct, indirect, or consequential loss or damage caused by or arising from any information advice or inaccuracy or omission herein.

The material in this publication can be reproduced provided that a proper reference is made to the title of this publication and to the AEGIS project (<http://aegis.autonomous-ship.org/>).



Table of contents

Table of contents.....	2
Executive summary	3
Definitions and abbreviations	4
1 Introduction.....	6
2 Methodology	7
3 Governance arrangement	9
4 Policy status quo.....	11
4.1 Short Sea Shipping.....	11
4.2 Inland Waterway Transport	14
4.3 Maritime Autonomous Surface Ships.....	16
5 Setting the target: the 2011 White Paper	19
6 EU waterborne transport policy.....	21
6.1 Motorways of the Seas.....	21
6.2 NAIADES III	22
6.3 Trans-European Transport Network	23
6.3.1 Barge perspective.....	24
6.3.2 Maritime port perspective	25
6.3.3 Inland port perspective	26
6.4 Connecting Europe Facility.....	27
6.5 Combined Transports Directive.....	28
6.6 European Maritime Single Window environment	31
6.7 'Fit for 55': the waterborne dimension	33
6.7.1 Alternative Fuels Infrastructure Regulation	34
6.7.2 Energy Taxation Directive.....	34
6.7.3 Renewable Energy Directive.....	36
6.7.4 Effort-sharing Regulation	36
6.7.5 Emissions Trading System Directive	37
6.7.6 FuelEU Maritime Initiative.....	37
7 Addressing legal and regulatory challenges.....	39
8 Conclusion	40
References.....	42



Executive summary

The AEGIS project introduces a new European waterborne transport system aimed at revitalizing the role of waterborne transport in cargo transportation. The project consortium has developed concept designs that leverage innovations in connected and automated transport, including smaller and more flexible vessels, automated cargo handling, autonomous ships, standardized cargo units, and digital technologies. This proposed system necessitates policies at different levels to support its implementation and success.

Policies for advanced intermodal systems focus on technological advancements introduced by AEGIS, such as automation and autonomy in port handling and navigation. These policies require improvements in reporting and certification processes and should address administrative requirements, cybersecurity challenges, and workforce impacts. Additionally, policy support should facilitate the transition to a digitalized environment.

Efficient intermodal systems require policies that optimize resource management. AEGIS aims to compete economically with road transport, but achieving this goal necessitates investments in waterways and port infrastructure. Policy support should provide public economic incentives and ensure equal treatment between different transport modes. Furthermore, it should facilitate private investments and enable business model adaptations to enhance efficiency.

Green intermodal systems prioritize environmental sustainability, and AEGIS aligns with EU policies on carbon reduction. The project aims to reduce the environmental footprint by introducing ships with lower pollution levels and exploring alternative propulsion systems. Addressing environmental challenges, such as emissions, waste, and noise near urban areas, requires policies that analyze environmental requirements and offer fiscal advantages for sustainable energy sources.

This report begins by identifying the stakeholders involved in policymaking and implementation. It then highlights the implementation challenges that have followed the setting of the EU policy target to move cargo from road to water, namely with respect to short sea shipping, inland waterway transport and maritime autonomous surface ships. The core of the report focuses on EU public policies enacted or altered after setting the targets. Climate change and its potential impact on infrastructure are discussed, and the report concludes by addressing the political aspects of resolving legal and regulatory challenges identified. The report centres some attention on the recent EU policy making developments ('Fit for 55' packages) as well as previous instruments with great impact on the viability of a system such the one designed by AEGIS (e.g. NAIADES III, TEN-T, CEF, Combined Transports, EMSW).

While this report provides recommendations for the overarching public policy framework, they must be complemented by legal work to reform rules and standards that perpetuate outdated policy paradigms. Separate reports will continue the analysis initiated here, focusing on the practical implementation of these policies. By providing an overview of the AEGIS project and analysing the relevant policy landscape, this report serves as a valuable resource for policymakers, researchers, and stakeholders interested in promoting sustainable, efficient, and innovative waterborne transport systems in Europe.



Definitions and abbreviations

AAWA	Advanced Autonomous Waterborne Applications Initiative
AEGIS	Advanced Efficient and Green Intermodal Systems project
AIS	Automatic Identification System
AIS	Automatic Identification Systems
BIMCO	Baltic and International Maritime Council.
CCNR	Central Commission for Navigation on the Rhine
CEF	Connecting Europe Facility
CEF-T	Connecting Europe Facility for Transport
CEMT	European Conference of Ministers of Transport
CESNI	European Committee for drawing up Standards in the field of Inland Navigation
CLECAT	European Association for Forwarding, Transport, Logistics and Customs Services
CLIA	Cruise Lines International Association.
CMR	Convention on the Contract for the International Carriage of Goods by Road
COLREG	Convention on the International Regulations for Preventing Collisions at Sea
DMA	Danish Maritime Authority
EC	European Commission
ECSA	European Community Shipowners' Associations
EEA	European Express Association
EFIP	European Federation of Inland Ports
EMSWe	European Maritime Single Window environment
ESN	European Short Sea Network
ESPO	European Sea Ports Organisation
ESR	Effort Sharing Regulation
ETC	European Transport Corridors
ETD	Energy Transition Directive
ETS	Emissions Trading Scheme
EU	European Union
EUDA	European Dredging Association
FAL	Facilitation of International Maritime Traffic Convention
FEPORT	Federation of European Private Port Companies and Terminals
GHG	Greenhouse Gas
GNS	Good Navigation Status
GSIS	Global Integrated Shipping Information System
HFO	Heavy Fuel Oil
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
ICS	International Chamber of Shipping
ICT	Information And Communications Technology
IMO	International Maritime Organization
IPSCA	International Port Security Contractors Association
ISO	International Organization for Standardization
ISPS	International Ship and Port Facility Security



ITF	International Transport Forum
IWT	Inland Waterway Transport
LNG	Liquefied Natural Gas
LPG	Liquified Petroleum Gas
M2M	Machine-to-Machine
MARPOL	International Convention for the Prevention of Pollution from Ships
MASS	Maritime Autonomous Surface Ships
MOS	Motorways of the Seas
MRV	Monitoring, Reporting, and Verification:
MSW	Maritime Single Window
MUNIN	Maritime Unmanned Navigation through Intelligence in Networks project
NAIADES	Navigation and Inland Waterway Action and Development in Europe.
NEXUS	Next Generation Support Vessels Providing Safe And More Efficient Offshore Wind Farm Services project
NGO	Non-Governmental Organization
NOx	Nitric Oxides
OPS	Onshore Power Supply
PIANC	World Association for Waterborne Transport Infrastructure
RFNBO	Renewable fuels of non-biological origin
ROPAX	“Roll-On/Roll-Off” passenger
RORO	“Roll-On/Roll-Off” vessels
SOLAS	International Convention for the Safety of Life at Sea
SOx	Sulphur Oxides
SPC	Short-Sea Promotion Centres
SSS	Short Sea Shipping
STCW	International Convention on Standards of Training, Certification and Watchkeeping for Seafarers
TEN-T	Trans-European Transport Network
UNCLOS	United Nations Convention on the Law of the Sea
UPEI	Union of the European Independent Fuel Suppliers



1 Introduction

The AEGIS project proposes a new European waterborne transport system. The concept designs for the system that were prepared by the consortium leading the project use new innovations from the area of connected and automated transport, including smaller and more flexible vessel types, automated cargo handling, autonomous ships, new cargo units and new digital technologies to regain the position that waterborne traditionally had in cargo transport.

The proposed system requires policy at different levels. Policies for advanced intermodal systems focus on technological advancements. AEGIS introduces automation and autonomy in port handling and navigation, requiring improvements in reporting and certification. Policy support should analyse administrative requirements, cybersecurity challenges, and workforce impacts. It should also address the transition to a digitalized setting. Policies for efficient intermodal systems optimize resource management. AEGIS aims to compete economically with road transport but requires investments in waterways and port infrastructure. Policy support should offer public economic incentives and avoid discrimination between modalities. It should facilitate private investments and business model adaptations. Policies for green intermodal systems prioritize environmental sustainability. AEGIS reduces the environmental footprint by introducing ships with lower pollution and exploring alternative propulsion systems. It aligns with EU policies on carbon reduction. Environmental challenges include emissions, waste, and noise near urban areas. Policy support should analyse environmental requirements and offer fiscal advantages for sustainable energy sources.

This report begins with a reference to stakeholders, providing an overview on who is involved in policymaking and implementation; then, a separate section focuses on the state of the art, namely what policy reports indicate as challenges; then reference is made to the actual targets that govern the design of the AEGIS concept. The core of the report consists of EU public policy that was enacted or altered subsequently to the setting of the targets. The report also includes a note on the challenge of climate change, as it may impact on infrastructure, and ends with a link to the political aspect of resolving legal and regulatory challenges identified [1].

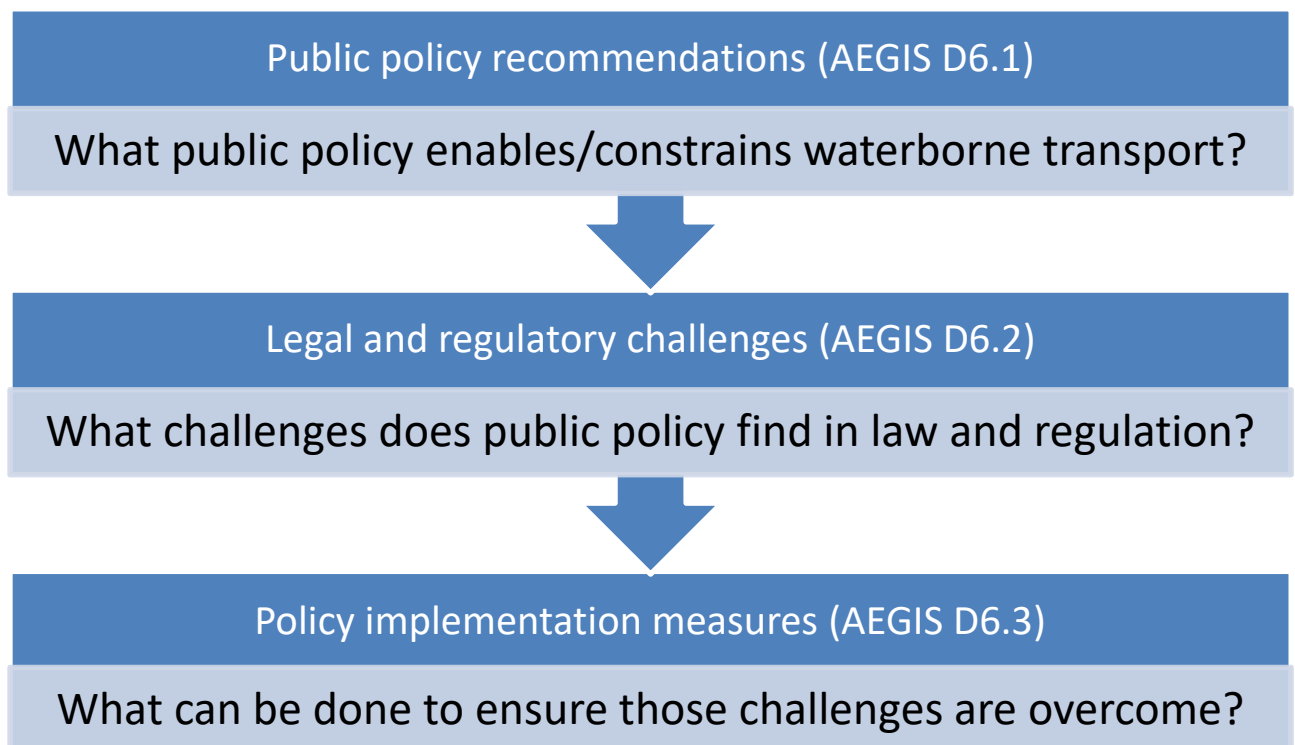


2 Methodology

This report is based on a mix of desk-based research (document analysis, literature review) and semi-structured key informant interviews. Data collection was driven by the design of solutions prepared by technical work packages and 3 use-cases: one on short sea shipping, the other on inland waterway transport and the third one on small and medium enterprise ports.

This report analyses EU public policy affecting the three segments of the proposed concept: short sea shipping, inland waterway transport, and port planning and development. The potential for SSS was studied in the context of Norway, namely focusing on the redistribution of cargo along a very intended coastline such as Trøndelag. The AEGIS concept includes the introduction of a mother-daughter concept, with a crane able to perform autonomous transshipment at berth. Norway is not a member State to the European Union, but its government is closely aligned with EU environmental policy. The potential for IWT was studied in the context of the Scheldt River area, and connections between Rotterdam, Ghent and Paris. The AEGIS concept includes the introduction of autonomous RORO barges (CEMT class II, IV, VI) connecting larger ports to smaller waterway terminals. While many research projects resembling AEGIS stop at the waterfront, AEGIS included the port planning angle with the participation of two SME ports. This use-case focuses on port development and challenges proper of connecting sea and waterway to road and rail, and also issues related to energy production, storage and supply. This case is interfaced with SSS routes from Aalborg to Sweden and an IWT route from Vordingborg to Poland (bulk). There may exist challenges more broadly related to any of the three segments to which this report does not address any solutions, for the analysis is curtailed by the context from which the participants of the project derive.

This report is the first leg of a wider analysis focused on identifying legal and political factors that enable or constrain the implementation of a new waterborne transport system in Europe.





The purpose of this report is to identify the relevant public policy and to issue some recommendations on how to enable the implementation of the AEGIS concept designs. These recommendations are based on the AEGIS project use-cases, but they are presented in general terms, and untied from their local context. Therefore, focus is given on public policy enacted by institutions of the European Union and by regional organizations with a focus on Europe.

Recommendations stem from actors involved in waterborne transport governance, namely in the cargo segment (i.e., excluding passenger support and focusing on short sea or inland waterway transport). Yet throughout the duration of the research (June 2020 - May 2023), policy makers were quite active in revising public policy that relates to European transport systems. This means that some of the recommendations were already tackled by new policy, and other potential issues emerged. To ensure this report could have a longer lifespan than the circumstance of the cases and the contexts, it was important to generalize some of the lessons learned and not to specifically mention local or national specificities.



3 Governance arrangement

Public authorities play a major role in the development and regulation of waterborne transport systems. The state may own and operate ports and waterways, or it may regulate the use of these facilities by private companies. National and regional governments often have responsibility for waterway infrastructure and safety regulations, while local governments typically manage ports and terminals. EU institutions and agencies also play an important role in the governance of waterborne transport systems in Europe.

Shipping companies operate vessels that transport goods and passengers by sea and may own their own ships or lease them from other companies. Shipping companies range from large multinational corporations to small local operators, and operate in a variety of sectors, including container shipping, bulk shipping, and passenger transportation. Many shipping companies are members of industry associations and organizations which work to promote the interests of the industry and represent the views of their members in policy discussions.

Shipbuilders and ship repair companies build and repair ships and other vessels. They may be involved in the design, construction, and commissioning of new vessels, or in the maintenance and repair of existing vessels. Shipbuilders and ship repair companies work closely with shipping companies and other stakeholders to ensure that vessels are designed and built to meet the needs of their customers, and that they are maintained in a safe and efficient manner.

Ports can be owned by state, municipality or private or in a combination. In northern Europe most ports are owned by municipalities and operated by companies (self-governed bodies) owned by the respective municipality. Port authorities are responsible for managing vessel traffic, overseeing the loading and unloading of cargo, and maintaining port infrastructure. Port authorities also work closely with other stakeholders, such as terminal operators and shipping companies, to ensure that ports are meeting the needs of their customers and operating in a sustainable manner.

Terminal operators are responsible for managing the loading and unloading of vessels at ports and terminals. They may be responsible for the handling of containers, bulk cargo, or other types of goods. Terminal operators work closely with shipping companies and other stakeholders to ensure that cargo is handled safely and efficiently, and that vessels are turned around quickly to minimize downtime. They may also be responsible for providing warehousing and other value-added services to their customers.

Waterway operators manage the operation of waterways, which can include maintaining the navigation channel and managing traffic. Inland waterway operators manage the operation of rivers, canals, and other inland waterways, including the maintenance of locks and other infrastructure. Waterway operators work closely with other stakeholders, such as shipping companies and port authorities, to ensure that waterways are navigable and that vessels can transit safely and efficiently.

Marine insurance companies provide insurance coverage for ships and cargo. They help to mitigate the risks associated with waterborne transport, such as damage to vessels or loss of cargo. Marine insurance companies work closely with shipping companies and other stakeholders to ensure that they are providing the right coverage at the right price.



Freight forwarders are companies that arrange the transport of goods on behalf of their clients. They may work with multiple carriers, including waterborne carriers, to find the best route and price for the transport of goods. Freight forwarders can also provide other services, such as warehousing, customs clearance, and documentation preparation.

Classification societies also play a role in the governance of waterborne transport systems. They are responsible for ensuring that ships and other vessels meet safety, environmental, and other regulatory requirements. Classification societies inspect and certify ships and provide technical support and advice to ship owners and operators.

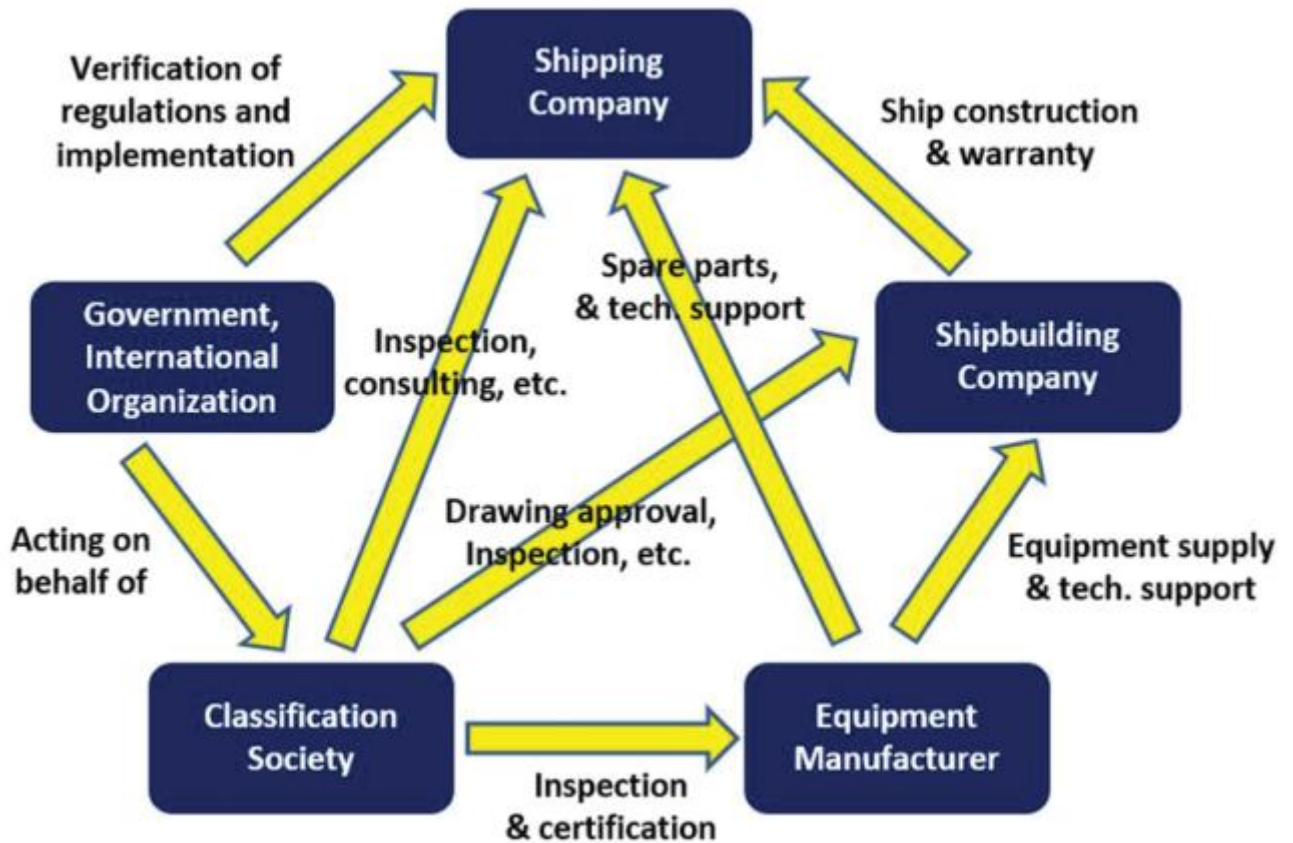


Figure 1: Shipping stakeholders

The diagram above illustrates the relationships between stakeholders who are indirectly affected by the EU policies discussed in this report [2][3].



4 Policy status quo

This section highlights some of the key challenges identified by the literature and by policymakers themselves when preparing new policy. This is a necessary first step to understand the new public policy enacted by the EU while the AEGIS project was unfolding. This section is divided into three main domains: short-sea shipping policy [4], inland waterway transport policy, and policy applicable to maritime autonomous surface vessels.

4.1 Short Sea Shipping

The virtues and problems of SSS in the EU context have in the past been widely studied from a management and policy perspective[5]. To assist in the integration of SSS in the logistics chain, the EC has established Short-Sea Promotion Centres in EU coastal states. These centres are encouraged to coordinate within a European Shortsea Network [6]. Based on information received from the maritime industries and through the ESN, efforts to improve the overall image of SSS have been successful. Accordingly, the general image of the mode seems to have reached that of a modern and efficient means of transport in co-modal chains. However, full integration of SSS in logistics chains remains to be improved. Consequently, efforts on promoting the image of the mode should now focus on this targeted segment. Shippers, cargo owners, forwarders and hauliers should continue to be important targets for promotion and so should attracting young people to the profession [7].

SSS connections within the EU remain limited. However, the infusion of maritime subsidies has potentially bolstered the financial stability of shipping companies, enabling some of them to renew or expand their fleets. Consequently, this has led to fluctuations in cargo volumes, an increase in vessel sizes, and subsequent consolidation among container shipping lines, thereby yielding varied effects on ports and onshore employment. A study conducted by ITF revealed that "reorienting maritime subsidy policies could enhance outcomes and prevent a race to the bottom among different subsidy regimes" [8]. Meanwhile, others have encountered challenges in evaluating the effectiveness of SSS policies due to the market distortions arising from the allocation of public funds to the rail and road sectors¹.

A study commissioned by the EU has revealed that direct subsidies for the initiation of SSS lines may not be the optimal long-term solution for sustaining SSS services [9]. The study emphasizes that policy efforts related to SSS should prioritize enhancing port infrastructures and providing economic support to stakeholders on the supply side, such as ports and shipping companies, rather than solely concentrating on the demand side. Moreover, the study identifies several bottlenecks that have impeded the progress of logistical restructuring towards SSS, including:

- a. rigid bureaucracy and heavy administrative procedures are affecting SSS, especially in those sea-basins that involve third countries
- b. accessibility costs to/from ports due to inefficient access and port infrastructures, capacity problems or poor intermodal facilities

¹ Example: "whereas SSS policy is driven by the private sector and, as a consequence, every SSS service should be financially sustainable in the long term, the rail and road sectors are directly or indirectly supported by public funds. This has created market distortions and makes it difficult to estimate the potential modal shift from road to sea under a free- market scenario." Ng, A. K., Saurí, S., & Turró, M. (2013). Short sea shipping in Europe: issues, policies and challenges. In *Regulating Transport in Europe* (pp. 196-217). Edward Elgar Publishing.



- c. the extension of the road network and the flexibility of road transport services are given a competitive edge that is difficult to beat (and back-haul costs are low)
- d. the increase of SSS capacity requires high demand rates
- e. scale economies in the RORO and ROPAX segment are not decisive because vessels are multi-purpose and designed for quick operation
- f. imbalance of traffic flows (export and import) at origin/destination points
- g. inter-modality in ports is poorly developed (i.e. the links between the land modes and SSS are not fully integrated within the supply-chain).

The identification of these issues led to some policy actions being proposed to the European Commission in that same study:

- a. promotion of SSS advantages among international forwarders
- b. adaptation of road transport directives to facilitate intermodal transport
- c. implementation of a demand incentive around EU
- d. standardization of Intermodal Transport Unit 45-foot pallet wide
- e. design and implementation of maritime electronic manifest (e-Manifest)
- f. directive "Port services competitiveness"
- g. improvement of road accesses to RORO and ROPAX terminals
- h. create a standard reservation system for all RORO and ROPAX services
- i. financial mechanism to extend over time the cost of adaptation of SSS vessels to the sulphur directive
- j. support research into the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS
- k. Promotion of the maritime profession (at all levels) in the EU
- l. implementation of specific regulation to collect SSS statistical data
- m. to extend Connecting Europe Facility coverage as Motorways of the Sea² development support.

To tackle these bottlenecks and problems, this EU study proposed policy actions and initiatives for the demand side (see 1-4) and for the supply side (see 5-13).

Table 1: Proposed policy actions and initiatives for the demand side and supply side

	Bottleneck, threat or obstacle affected	Stakeholder directly Affected	Main SSS factor improved
1. Promotion of SSS advantages among international forwarders	Lack of awareness of the competitiveness of SSS services among non-specialised major forwarders	Major international shippers, cargo-owners, freight forwarders and logistic operators	Market knowledge
2. Adaptation of road transport directives to	Reduced hinterland for RORO and ROPAX due to	Shippers, cargo-owners, freight forwarders, logistic operators	-Transport time -Road transport cost -Reliability

² EU programme 'Motorways of the Sea' aims at "concentrating flows of freight on sea-based logistical routes in such a way as to improve existing maritime links or to establish new viable regular and frequent maritime links for the transport of goods between Member States so as to reduce road congestion and/or to improve access to peripheral and islands regions and State." European Commission (2008), Commission communication on providing guidance on State aid complementary to Community funding for the launching of the motorways of the Sea. Official Journal, C 317, 10-12.



facilitate intermodal transport	the limitations-imposed directive		-Safety and security effects to be evaluated -Service flexibility
3. Implementation of a demand incentive: ECOBONUS	User's reluctance to change their usual way of operation (road)	Road hauliers, freight forwarders, shippers and cargo-owners	-Transportation cost -SSS attractiveness
4. Standardization of Intermodal Transport Unit 45 foot pallet wide (45' PW)	Lack of harmonization of intermodal loading units.	Road hauliers, freight forwarders, shippers and cargo-owners	-Transportation cost -Efficiency
5. Design and implementation of maritime electronic manifest (eManifest)	Tough administrative burdens by the shipping industry by facilitating administrative formalities for seaborne EU goods	Shipowners	-Transportation time -Reliability
6. Directive "Port services competitiveness"	Port services cost and time	Shipowners, ports	-Transportation cost -Reliability -Efficiency
7. Improvement of road accesses to RORO and ROPAX terminals	Congestion in roads in predeparture periods to ensure schedule and reliability	Port Authorities, terminal operators	-Transport time (and cost) -Reliability
8. Create a standard reservation system for all RORO and ROPAX services	A shipper must have confidence on having a place in the scheduled vessel and the possibility of adapting to unforeseen circumstances without excessive penalties	Shipowners	-Transport time -Transport cost -Reliability -Service flexibility
9. Financial mechanism to extend over time the cost of adaptation of SSS vessels to the sulphur directive ³	Lack of funding to invest in the required adaptation measures	Shipowners	-Transport cost
10. Support research in to the design of more performing (and standardized) vessels for the various types of cargoes and services of SSS	Problems related to vessels costs due to excessive customisation	Shipowners and SSS specialists	-Transport time -Transport cost (including vessel's operating cost, port cost, etc.) -Safety and security
11. Promotion of the maritime profession (at all levels) in the EU	Lack of staff at all levels from EU countries, which creates dependency on foreign manpower in a strategic sector	Seafarers and shipowners	-Security -EU economy
12. Implementation of specific regulation to collect SSS statistical data	Lack of detailed statistical data about SSS market	Promotion Centres Policy makers	-Reliability
13. To extend Connecting Europe Facility coverage as MoS development support	Weak development of the MoS despite the fact that they are included in the TEN-T network	Shipowners	-Transport time and cost -Reliability

Potential areas of improvement using information and communications technology, leading to increased utilization of SSS, have also been listed in this 2015 study [10]. They are summarized as follows:

³ Generally, three different compliance methods can be considered and their feasibility will depend on the type of vessel, newly build or retrofit and economical trade-off. Using alternative low sulphur content fuels, LNG fuel, methanol, LPG or biofuels; Introducing exhaust gas cleaning technologies to remove SOx from emissions. Two effective and mature technologies could be widely used (wet and dry scrubbing). Converting to Dual Fuel engines and install LNG Tanks.



1. Integration of the logistics chain stakeholders (shipowners, carriers, forwarders) in a one-stop shop (IT systems), allowing the monitoring of cargo flow and transparency.
2. Avoidance of discrimination of SSS in relation to deep sea shipping.
3. Year-round navigability (no restrictions due to ice, bad weather, drought).
4. Availability of water depth with no tidal restrictions.
5. Simplification of rules governing the operation of ports.
6. Reduced bureaucracy and complex documentation, namely in customs.
7. Improvement of the overall reliability of the terminal.
8. Establishment and monitoring of a set of service performance indicators.

It is evident that the majority of issues and suggestions concerning the implementation of SSS pertain to the supply side. This can be attributed to the limited authority granted to the EU by its Member States. Nonetheless, there is potential for national implementation measures that place greater emphasis on the demand side. Moreover, the advent of automation and digitalization holds significant promise in shaping the competitiveness of SSS within the broader framework of EU transport policy.

4.2 Inland Waterway Transport

While not all SSS operations utilize inland waterways (only a small fraction of the SSS fleet does), this represents a segment of the possibilities afforded by SSS. IWT operates under distinct regulations, forming a separate policy domain for analysis. Inland vessels and terminals are subject to specific crew requirements and safety standards [11]. A separate study identifies obstacles specific to the IWT sector [12], which can be summarized as follows: a) inefficiencies in navigation and traffic management; b) inadequate integration of IWT within logistics processes; and c) substantial administrative burdens associated with compliance with legislation. Furthermore, another study presents a comprehensive list of obstacles that hinder the development of inland waterborne transport [13]:

- a. Lack of infrastructure developments and maintenance (inland waterway and sea transport)

Infrastructure of waterborne transport still needs to be developed and upgraded in many regions of the EU. The needed investments include the IWT and ports infrastructure itself (fairways, locks, quays...) and the hinterland connections of seaports and inland ports. On this aspect, the rules and calls of the CEF-T represent a barrier for ports which is limiting their development.

- b. Lack of qualified IWT staff (inland waterway transport)

A lack of qualified IWT staff for both operational and management has been identified. Another obstacle to find qualified employees is the absence of a regulatory framework for workers' professional qualifications across-borders.

- c. Lack of collaboration / coordination among stakeholders (inland waterway transport)

Shippers prefer transporting goods using trusty and well-known and tested routes and modes. They might consider transshipments to different modes as a risk. Moreover, the poor integration between IWT and the other actors within the logistics chain hinder the development of alternative solutions.



- d. Progressive loss of its environment-friendly image & compliance with more stringent standards on environment (inland waterway and sea transport)

Due to high emissions of NO_x and particulates compared to road transport, the latter is becoming more environment-friendly at a much faster pace than inland shipping. The standards for IWT are covering both: increasing demands by environmental regulations at EU, national and regional level for all modes of transport; and increasing demands by shippers for more sustainable logistic chains.

- e. Market accessibility for waterborne transport (inland waterway and sea transport)

The limited market accessibility of waterborne transport can primarily be attributed to two factors:

Geographic constraints. The development of inland waterways is primarily contingent on the relative positioning of production and consumption sites in relation to the inland waterway network. The overall cost of waterborne transport, including factors such as location, handling, and last-mile logistics, can become prohibitively high. The viability of utilizing waterways is heavily influenced by the unique circumstances of each territory and the geographic distribution of individual sites.

Logistical limitations. Waterborne transport is not always a feasible option due to certain logistical considerations. Inland waterway vessels may encounter challenges in accommodating certain types of goods, such as those with specific packaging requirements like pallets, or shipments that exceed their size capacity. These limitations can restrict the versatility and practicality of waterborne transport for certain cargo types.

- f. Competitiveness and environmental performance of waterborne transport against other modes (inland waterway and sea transport)

Waterborne transport tends to lag behind other modes in terms of investment in innovation. The challenging aspect of developing a business case for such investments lies in the substantial upfront capital required, with benefits anticipated to materialize in the long term. Therefore, it becomes crucial to accelerate the adoption of existing innovative solutions in order to modernize the fleet, thereby enhancing the competitiveness of waterborne transport and, consequently, improving its environmental performance.

- g. Administrative burden for waterborne transport

One crucial criterion for evaluating the effectiveness of IWT is the concept of GNS, which forms an integral part of the TEN-T guidelines. GNS signifies the condition of the inland navigation transport network that enables efficient, reliable, and safe navigation, achieved by ensuring minimum waterway parameter values and levels of service [14]. Given that each EU Member State has its own distinct policy on internal waterway transport, there is a case-specific nature to some considerations in this domain [15].

Additionally, considering the evolution of navigation conditions throughout the duration of the project, it is essential to address the challenge of climate change concerning inland waterway ports [16]. Ports and waterways globally are confronting adverse effects such as elevated air and water temperatures,



rising sea levels, altered precipitation patterns, changes in wind and wave conditions, and an increase in frequency and severity of extreme events like heatwaves, storms, and droughts. These climate-related changes pose substantial risks to businesses, operations, safety, and infrastructure, with far-reaching consequences for local, national, and global economies. To bolster resilience and facilitate adaptation, it is crucial for port and waterway operators to take prompt action. To support these efforts, PIANC's technical Working Group 178 has developed comprehensive guidance that introduces a four-stage methodological framework, empowering operators to plan effective adaptation strategies [17]. This framework enables operators to understand the potential impacts of climate change on their assets, operations, and systems, assess vulnerabilities and risks, and identify and evaluate appropriate adaptation measures.

The first stage emphasizes the importance of efficient data collection and management, active engagement with stakeholders, and setting clear climate change adaptation objectives. The second stage highlights the significance of identifying the required information to establish baseline conditions and explore future climate-related changes using scenario-based analysis. It also underscores the need for continuous monitoring and collection of local data. The third stage outlines the process of assessing the vulnerability of waterborne transport infrastructure assets, operations, and systems, including conducting a comprehensive risk analysis to evaluate the likelihood and potential consequences of projected changes. Finally, the fourth stage introduces a range of potential measures, encompassing structural, operational, and institutional options. The guidance provided assists operators in screening and evaluating these options for inclusion in an adaptation pathway. By adhering to this framework, port and waterway operators can proactively prepare for the challenges posed by climate change, ensuring that their infrastructure remains resilient and adaptable in the face of evolving conditions.

4.3 Maritime Autonomous Surface Ships

The operation of MASS is a relatively new issue. There has been some research on policy support for autonomous ships prior to AEGIS, also in the course of other EU sponsored research projects (e.g. NEXUS [18], MUNIN [19]) and private sector initiatives (e.g. AAWA [20]). Furthermore, the Danish Maritime Authority published a report in 2017 entitled “Analysis of Regulatory Barriers to the use of autonomous ships” [21]. According to the study, the overall themes of international regulation in this regard are the following: 1) safety, 2) homogeneous technical standards and product requirements for ships, 3) regulation of employees’ rights at sea as well as occupational health conditions, 4) protection of the marine environment, and 5) shipowners’ civil liability in connection with pollution, collision, wreck removal and damage to goods or persons. Associated to these themes are different types of hurdles:

1. jurisdictional issues
2. navigation and regulations for preventing collisions at sea
3. manning and “seafarers” of the future
4. protection of the marine environment
5. construction requirements and technical conditions for ships
6. liability, compensation and insurance issues
7. cybersecurity and anti-terror safeguards.



In general, the Study recommends that the DMA continues its work promoting international regulatory work on autonomous ships within the IMO together with a number of other member States. In addition, it recommends the following specific measures:

- a. adaptation of national regulation to allow for fully autonomous ferries on short domestic crossings
- b. adaptation of national regulation to allow for periodically unmanned (physical) bridges and electronic lookout in order to attract suppliers of technology and systems and to acquire valuable insight for use in the international regulatory work within the IMO
- c. preparing national regulation by generally eliminating the barriers to autonomous ships, thereby paving the way for fast implementation of international regulation once adopted
- d. the first intermediate goal in terms of preparing national regulation could be to adapt the definition of the concept of the “master” and to lay down new definitions of the concepts “autonomous ships” and “remote operator” and to clarify which rights/obligations should rest with a “remote operator”.

In addition, the report states that it would be important to amend national regulation requiring ships always to be manned or documents to always be physically available on board.

In 2020, the European Commission's Directorate-General for Mobility and Transport published a study titled "Social Aspects within the Maritime Transport Sector" [22]. This study examined the impact of digitalization and automation within the sector. One notable finding was that the STCW does not effectively address the latest technologies and high levels of automation already present in some vessels today. Experts in maritime education argue that training seafarers to meet the minimum requirements of the STCW is insufficient. Instead, there is a need for training that encompasses novel technologies and facilitates a smoother transition from sea to shore. The study also highlighted the increasing prevalence of digitalization and automation within the maritime shipping sector, although it acknowledged that these technological changes will not revolutionize maritime transport overnight. Key trends identified include the growing autonomy of ships, the development of smart ships, the utilization of the Internet of Things (particularly for safety, efficiency, and compliance purposes), and the integration and optimization of supply chains. Interestingly, the study found that ship owners generally exhibit reluctance to fully embrace the concept of autonomous shipping, as they do not anticipate its emergence in the near future. Instead, new technologies are being progressively retrofitted onto existing ships and incorporated into evolving business models.

The lack of a well-defined regulatory framework poses a significant obstacle for stakeholders who wish to invest in and transition from road to sea operations. While global changes are beyond the control of EU and Member State policymakers, there are other crucial policy support measures that can be implemented starting now. An analysis focusing on the perceived impact of autonomous shipping has underscored the increasing significance of several factors in ensuring the successful and sustainable operation of highly automated and autonomous maritime systems. These factors include system trust, understanding, predictability of decision-making, and the necessary skills for developing, operating, and maintaining such technologies.

Through participant interviews, five key dimensions emerged: "control," "trust," "practical implementation considerations," "awareness and understanding," and "training and organization of work." It is at this level that policy support measures must be effectively implemented to address the



challenges and promote the adoption of autonomous shipping. By addressing these dimensions, policymakers can foster an environment that promotes system control, instils trust in autonomous systems, addresses practical implementation considerations, enhances awareness and understanding among stakeholders, and establishes appropriate training and organizational structures for the workforce. These policy support measures will play a critical role in facilitating the successful integration of autonomous shipping and ensuring its long-term viability and effectiveness [23].

In general, previous research has shown that the complexity of MASS in SSS and IWT is lower compared to deep-sea shipping. This is primarily due to the fact that unmanned ships make more frequent port calls and salvaging is much easier. Consequently, several maintenance issues can be mitigated or resolved at a lower cost. Additionally, operations conducted near the shore take place in emission control areas, where manned ships are also required to use cleaner fuels or exhaust cleaning systems. As a result, fuel costs pose less of a problem in this context. Furthermore, coastal shipping typically benefits from superior and more affordable communication infrastructure, which further reduces operational costs. However, it is worth noting that these ships operate in more congested waters, necessitating alternative approaches to anti-collision measures and automated manoeuvres.



5 Setting the target: the 2011 White Paper

The European Commission outlined a vision for a sustainable, efficient, and safe transport system in Europe [24]. Its primary objective was to establish a unified European transport area that would facilitate the movement of people and goods across national borders. The EC put forth various policy initiatives to realize this vision, including the promotion of alternative transportation modes, the advancement of clean and energy-efficient vehicles, and the implementation of measures to reduce congestion and enhance safety on European roads. Overall, it provided a comprehensive strategy for the future of transportation in Europe, serving as a guiding document for European transport policy development.

A key element of the White Paper was the recognition of the significance of waterborne transport, particularly SSS and IWT, in fostering a sustainable and efficient transport system in Europe. The document proposed several policy initiatives concerning waterborne transport, including:

- Facilitating the movement of goods and passengers by sea through the development of motorways of the sea.
- Encouraging the use of inland waterways for freight transport, especially for the carriage of bulk goods over long distances.
- Enhancing waterborne transport infrastructure and equipment, such as modernizing ports, establishing intermodal transport networks, and promoting clean and energy-efficient vessels.
- Strengthening the regulatory framework for waterborne transport by establishing common technical standards and safety regulations throughout Europe.

The White Paper acknowledged the potential of waterborne transport to contribute to a more sustainable and efficient transport system in Europe. To support its development and growth, the document outlined specific goals and targets for waterborne transport, including SSS and IWT. These objectives encompassed:

- Establishing a comprehensive MOS network and shifting 30% of road freight over 300 km to sea or inland waterway transport by 2030.
- Increasing the share of inland waterway transport in the modal split by 20% before 2020.
- Promoting the development of clean and energy-efficient vessels, aiming to reduce emissions from shipping by at least 40% by 2050.
- Enhancing port and logistics efficiency by reducing ship waiting times in ports by 30% and administrative costs by 25%.
- Creating a unified European maritime space by simplifying and harmonizing regulatory frameworks and improving cooperation between member states.
- Improving the safety and security of waterborne transport, targeting a 50% reduction in accidents and incidents by 2020.

While progress has been made towards achieving some of these goals, certain challenges and slower-than-expected progress have been encountered. Factors contributing to these challenges include:

- Slow implementation of policy initiatives due to a lack of political will and inadequate execution.



- Competition from other modes of transport, such as road and rail, which offer greater flexibility and more frequent services.
- Economic downturn and budget constraints leading to delays or cancellations of waterborne transport projects and initiatives due to funding limitations.
- Technical complexities associated with developing and implementing new technologies for waterborne transport, requiring substantial investment and research.
- Regulatory barriers at both the national and EU levels, with differing regulations and standards across member states impeding the establishment of an integrated European transport system.

Addressing these challenges require further policy initiatives to promote the growth and development of waterborne transport in Europe. The following heading discusses some of those policies.



6 EU waterborne transport policy

This section introduces EU public policy applicable directly to waterborne transport systems. This is policy that was enacted or revised by European institutions during the AEGIS project, and it is thus quite impactful on the potential for the AEGIS concept design to be successfully implemented.

6.1 Motorways of the Seas

The MOS initiative was launched by the European Union in 2001 to promote maritime transport as an alternative to congested land transport and reduce greenhouse gas emissions. However, the initiative has not fully achieved its goal of shifting cargo from roads to waterways for several reasons [25].

One major reason is the lack of infrastructure and investment in the waterborne transport sector. While the EU has invested heavily in road and rail infrastructure, the same level of investment has not been made for ports and terminals needed for water transport. This lack of infrastructure has hindered the development of waterborne transport in Europe and made it less competitive compared to other modes of transportation.

Additionally, the lack of investment in the sector has prevented it from keeping up with technological advancements in other modes of transport. This has put water transport at a disadvantage, as it has not been able to offer the same level of efficiency and convenience as road and rail transportation.

Another reason for the initiative's limited success is the lack of cooperation between stakeholders involved. The MOS initiative requires collaboration between shipping companies, port authorities, and national governments. However, there has been a lack of coordination and cooperation among these stakeholders, resulting in a fragmented and inefficient transport system. This lack of cooperation has prevented the smooth functioning of the initiative and hindered its ability to shift cargo from roads to waterways effectively.

The European Coordinator for MOS proposed investment priorities and recommendations for the future of sustainable maritime transport [26]. These priorities are based on stakeholder dialogue, transport data analysis, legislative drivers, and emerging trends. The recommendations are aligned with four pillars: Sustainable, Smart, Seamless, and Resilient:

- **Sustainable**

The focus is on fighting climate change and improving air and water quality in maritime transport. The short-term priority is to develop market-ready low or zero-emission ship propulsion. Retrofitting existing ships and fleet renewal are also important. Port infrastructure for alternative fuels and renewable energy for port activities are recommended.

- **Seamless**

The aim is to improve the connection between ports and the land-based transport network. This includes enhancing the connection between core and comprehensive ports with the hinterland network. Ice-breaking capabilities, which are crucial for Baltic Sea transport, are also emphasized. Efforts should be made to ensure smooth intermodal connections.



- **Smart**

Digital communication and solutions are seen as essential for improving efficiency and safety in maritime transport. Data exchange standards and harmonized tools along transport chains, including multimodal land transport, should be developed. Digital solutions for sea and vessel traffic management are also recommended.

- **Resilient**

The focus is on preparing the maritime transport system to face exogenous shocks. Recent events like the COVID-19 pandemic and the Suez Canal blockage have highlighted the need for resilience. Risks related to climate change, such as extreme weather events, should also be considered. Building resilience involves developing contingency plans and investing in infrastructure and technologies that can withstand disruptions.

The recommendations propose specific actions and financing mechanisms to support these investment priorities.

6.2 NAIADES III

The European Commission has adopted the NAIADES action plan for the period 2021-2027, which serves as a continuation of an earlier action programme that concluded in 2020 [27]. This action plan establishes the EU framework to promote and support the development of inland waterway transport. It takes into account the objectives of the EU Green Deal and the Smart and Sustainable Mobility Strategy, aiming to bolster future-proof inland waterway transport and contribute to the fundamental transformation of the EU's transport systems toward zero-emission and multimodal mobility. To ensure the success of the NAIADES action plan and further enhance inland waterway transport, several recommendations have been put forth [28]:

- **Increased investment in infrastructure**

Member states are urged to allocate more resources toward developing and maintaining infrastructure for inland waterways. Additionally, there should be an increase in funding from the CEF specifically designated for waterway projects. By investing in infrastructure, the capacity and efficiency of inland waterway transport can be improved, facilitating its integration into the multimodal transportation chain.

- **Enhanced integration of Inland Waterway Transport**

The IWT sector should be fully integrated into the multimodal transport system, ensuring a seamless flow of goods and services. This requires the establishment of a regulatory framework that supports IWT and addresses any imbalances, such as long-lasting port congestion. By promoting efficient connections and cooperation between different transport modes, the share of IWT can be increased, contributing to sustainable and efficient logistics.

- **Support for the energy transition**



The NAIADES action plan should provide tailored funding mechanisms to support the large-scale deployment of green technologies in the inland waterway transport fleet. This includes promoting the use of reliable alternative fuels and advancing digitalization efforts within the sector. By facilitating the adoption of cleaner and more efficient technologies, the sector can contribute to reducing emissions and achieving environmental objectives.

- **Striking the right balance**

The European Commission must strike a balance between ambitious goals and the implementation of measures for the energy transition. A comprehensive set of measures should be presented, including the introduction of emissions trading, infrastructure charges, and energy taxes across all transport modes. These measures would ensure the implementation of the "polluter pays" principle and create a level playing field among different transportation sectors.

- **Improving technical screening criteria**

The current technical screening criteria for inland waterway transport need improvement to align with the criteria used for other transport modes. The aim is to establish a level playing field that allows fair competition and encourages the adoption of sustainable practices. The current criteria are perceived as inadequate and unrealistic and should be revised accordingly.

- **Support for the sector as a frontrunner**

The NAIADES action plan should provide support to the inland waterway transport industry, acknowledging its role as a frontrunner in sustainable and efficient transportation. By fostering innovation, research, and development within the sector, it can continue to lead the way in adopting environmentally friendly practices and technologies.

- **Strong governance and cooperation**

The action plan should emphasize the mutual benefits of collaboration between the European Union and other organizations involved in inland waterway transport. Strong governance structures and effective cooperation mechanisms are essential to effectively support and advance the sector in Europe.

6.3 Trans-European Transport Network

The European Union's trans-European transport network policy, known as TEN-T, is a crucial tool for developing a connected, efficient, multimodal, and high-quality transport infrastructure throughout the EU. It encompasses railways, inland waterways, short sea shipping routes, and roads that link urban nodes, ports (both maritime and inland), airports, and terminals. The policy is governed by Regulation (EU) No 1315/2013, which is currently being revised to align the network with the European Green Deal and the Sustainable and Smart Mobility Strategy [29].

Introduced in 1996, the TEN-T policy aims to establish a well-integrated and top-notch transport network across EU member states. Its objectives include enhancing connectivity and efficiency, reducing congestion and pollution, and fostering economic growth. The policy strives to create a



seamless and multimodal transport system that facilitates the smooth movement of goods, people, and services. It also aims to improve access to markets for peripheral regions, enhance safety, and promote sustainability in the transport sector.

While the TEN-T policy has made progress in improving Europe's transport network, it faces certain challenges and limitations. One criticism is its emphasis on constructing new infrastructure instead of effectively utilizing existing infrastructure. This has led to overspending and underutilization of certain transport assets, such as high-speed rail links. Additionally, the policy has been accused of focusing too heavily on road and rail transport while neglecting waterborne transport. This lack of attention has hindered the growth potential of waterborne transport and its contribution to the EU's sustainability objectives.

To overcome these limitations and enhance the effectiveness of the TEN-T policy in promoting sustainable and efficient transport, several recommendations can be made. Firstly, there should be a shift towards optimizing existing infrastructure rather than solely building new facilities. This entails improving connectivity between different transport modes and maximizing the capacity of current infrastructure. Secondly, the policy should consider waterborne transport by improving port and waterway connectivity, supporting the development of innovative waterborne transport technologies, and incentivizing the use of waterborne transport by shippers. Lastly, the policy must align with the EU's broader sustainability goals, such as reducing carbon emissions, by supporting the development of low-emission transport modes, encouraging the adoption of alternative fuels, and implementing policies that promote sustainable freight transport.

From the perspective of the AEGIS project, it is important to note that while comprehensive ports like Aalborg in Denmark are part of the TEN-T network, others like Vordingborg are not included. This exemplifies the limited inclusion of commercial ports in the network. Excluding many commercial ports from the TEN-T has implications for port infrastructure development and access to funding. Ports outside the network face challenges in securing funding to improve their infrastructure, fairways, channels, and related aspects. In contrast, established ports within the network have easier access to EU funding, such as the Connecting Europe Facility (CEF). This situation results in a less interconnected transport network with fewer logistical hubs and limited flexibility. It may also lead to longer "last miles," impacting the efficiency and effectiveness of transportation and logistics operations. To address this, the TEN-T policy could consider revising the criteria for recognizing commercial ports as part of the network, allowing for more ports to join and enabling greater flexibility in seaborne transport. This would strengthen or establish new sea routes to enhance connectivity.

6.3.1 Barge perspective

The IWT sector acknowledges and supports the EC proposal for the TEN-T guidelines. However, it highlights some shortcomings that need to be addressed in order to achieve the Union's modal shift ambitions. To facilitate this transition, the IWT sector puts forth several actionable recommendations for policy support. These are some points raised by the barge owners [30].

Firstly, the IWT sector emphasizes the importance of ensuring a "Good Navigation Status" with clear and ambitious parameters. Recognizing that Europe's inland waterways have diverse hydro-morphology, the sector suggests that the TEN-T guidelines should consider the specific needs of each waterway. The focus should be on achieving a "Good Navigation Status" to address current implementation shortcomings and increase climate resilience using a river basin approach. The sector



recommends prioritizing the protection and non-deterioration of the existing waterway network. The proposed minimum parameters for the core network, such as bridge height of 5.25 meters and a navigable channel depth of 2.50 meters for rivers and canals, are considered unambitious and should be raised to more ambitious levels to facilitate the modal shift goal. Additionally, a strong governance structure is needed to ensure that implementing acts adopted per river basin consider the experience gathered by the River Commissions.

Secondly, the IWT sector highlights the issue of underinvestment and lack of political attention as major obstacles to realizing EU strategies aimed at eliminating infrastructure bottlenecks. To achieve the goal of increasing the modal share of IWT by 25% by 2030 and 50% by 2050, the sector urges the European Commission to increase investment in the sector. This will ensure the efficient, reliable, and safe navigation of inland waterways.

Another key recommendation from the IWT sector is the need to increase infrastructure capacity and standards. The current minimum standards proposed by the legislation for bridges and navigable channel depth are insufficient to meet the increasing modal shift goal. To unlock the full potential of modal shift, the IWT sector suggests raising these standards within a corridor approach to more ambitious parameters. For instance, to accommodate the growing share of hinterland container transports, a fit-for-future infrastructure standard of at least 3 or preferably 4 layers infrastructure should be set for new infrastructure.

Furthermore, the IWT sector emphasizes the importance of promoting alternative fuels and energy supply. Recognizing the energy transition in IWT, the sector highlights the dependence on sufficient availability of alternative fuels and energy supply in both sea and inland ports, as well as along the entire network of navigable waterways. The revision of the guidelines should focus on introducing an alternative fuel network along European waterways, reducing emissions, and supporting the EU Green Deal objectives.

Lastly, the IWT sector emphasizes the need for cross-border cooperation and river basin management to ensure a seamless and efficient supply of goods through waterways. The TEN-T guidelines should take into account the specific hydro-morphology of each waterway and support a river basin approach to increase climate resilience. This approach should be reinforced by robust governance structures based on clearly defined key performance indicators and the active participation of the River Commissions.

6.3.2 Maritime port perspective

The European Sea Ports Organisation issued its position on the Commission proposal for the revision of the Union guidelines for the development of the TEN-T [31].

- Establish an integrated governance structure for European Transport Corridors (ETC) that enhances coordination and distribution of competences, ensuring adequate representation of ports.
- Improve rail connectivity by addressing last-mile connections and operational and technical barriers, facilitating efficient cross-border rail freight transport on ETC.
- Adopt a differentiated approach for port rail networks, considering the complexity and diversity of rail systems within ports, to avoid excessive requirements that hinder efficiency.



- Promote the development of multimodal freight terminals in core and comprehensive ports, open to all operators and users, including terminals located outside the port area but connected to seaports.
- Embrace the river basin approach for inland waterway transport, involving seaports connected to TEN-T inland waterways, and provide clarity on the concept of "dedicated handling capacity" for inland waterway vessels.
- Prioritize the resilience and security of European seaports, recognizing their critical infrastructure status and their role in maintaining a resilient European transport system.
- Ensure coherence between European transport infrastructure policy and other relevant EU legislation, ensuring consistency and transparency in screening processes for foreign direct investments in essential port infrastructure.
- Enhance cybersecurity measures and address civil protection needs for European seaports to safeguard against potential threats and ensure uninterrupted operations.

6.3.3 Inland port perspective

EFIP has recently issued a statement regarding the proposed revisions to the TEN-T guidelines. In their statement, EFIP raises several concerns and provides recommendations aimed at improving the guidelines and ensuring their effectiveness [32].

One of the main concerns highlighted by EFIP is the need for clear and unambiguous environmental performance requirements. They point out that the proposed wording in Article 21, 1 (c) of the TEN-T proposal is unclear, which could result in overlapping and conflicting legislation. EFIP recommends adapting the wording to maintain the existing environmental progress achieved.

EFIP emphasizes the importance of strong legal protections for existing rail connections to these ports. They propose that rail connections to core inland ports should be designated as part of the core rail network, ensuring their continued development and accessibility.

EFIP also draws attention to the need for recognition of passenger transport inland ports. They argue that the current recognition criteria for comprehensive inland ports fail to acknowledge the changing role of some ports as dedicated passenger hubs. EFIP calls for passenger transport inland ports to be properly recognized in the guidelines.

Furthermore, EFIP emphasizes the importance of prioritizing the development of inland waterway infrastructure. Inland shipping is recognized as a CO₂-friendly mode of transport that contributes to sustainable transportation. EFIP recommends continued investment in cross-border waterways and infrastructure projects to maintain competitiveness and ensure the uninterrupted flow of international goods.

In terms of waterways, EFIP suggests that class III inland waterways be included in the TEN-T network. While updating these waterways to level IV may not be achievable in all cases, EFIP suggests that navigable waterways connected to at least level IV or those with the potential to reduce negative environmental impacts should be considered as a minimum option for the comprehensive network.

Lastly, EFIP emphasizes the importance of cross-border multimodal planning. They recommend that member states consult with inland ports during their analysis of current and future capacity for multimodal terminals to avoid disjointed deployment of new terminals. EFIP also suggests that each



terminal should have the capability to service 740m-long trains to support rail and multimodal transport.

Overall, EFIP's statement provides valuable insights and recommendations to improve the proposed revisions to the TEN-T guidelines. By addressing these concerns and implementing the suggested recommendations, the EU can enhance the efficiency, sustainability, and inclusivity of its inland transport network.

6.4 Connecting Europe Facility

CEF is a program that funds targeted transport, energy, and telecommunications infrastructures in order to improve cohesion in the internal market and the EU's competitiveness in the global market [33]. It was established in 2013 with a budget of €33 billion for the 2014-2020 period but was reduced to €30 billion in 2015 to establish the European Fund for Strategic Investments (EFSI). CEF financing takes the form of grants, procurement, financial instruments, and support actions. Most of the CEF budget is implemented by the Innovation and Networks Executive Agency (INEA). The CEF mainly focuses on cross-border projects where financial markets have little or no interest in investing, but which are important in terms of EU economic, social, and territorial cohesion. In transport, the focus shifted to decarbonization, and making transport connected, sustainable, inclusive, safe, and secure. 60% of transport resources would go to the development of basic infrastructure and 40% to modernizing the existing network. Co-financing rates would be simplified, and priority given to cross-border sections. The core network corridors would be adapted to reflect growing transport flows and improve connectivity. Several core maritime ports, cross-border and inland waterway sections would be integrated into the core network corridors, which were further aligned with rail freight corridors.

The disadvantage of CEF is that the program only funds ports and infrastructure which are part of the network. EU should consider a funding program for other commercial ports and/or infrastructure which are also can, and will play, an important role in the green transition in general and promoting SSS in specific.

One position paper by BusinessEurope highlights key messages regarding the importance of a well-functioning and EU-wide transport infrastructure network and the renewal of the Connecting Europe Facility (CEF) beyond 2020 [34]. Firstly, a comprehensive and efficient transport infrastructure network is vital for connecting European regions and ensuring the EU's internal market operates smoothly. The completion of the TEN-T is crucial to meet the increasing demand for transport services in the coming decades. Secondly, while the renewal of CEF is welcomed, the budget allocated to transport infrastructure should be more ambitious to achieve its objectives. Thirdly, public-private partnerships should play a significant role in delivering transport projects quickly and flexibly, with a focus on projects with high EU added value such as cross-border connections. Streamlining national procedures for implementing projects of common interest on the core network of TEN-T is a positive initiative to reduce delays and facilitate private investment. The paper emphasizes that financial flows need to reach the market swiftly through a clear and transparent regulatory framework. It also underlines the need for substantial resources to develop new and smart infrastructure and renew deteriorating existing infrastructure across all modes of transport. BusinessEurope supports simplified procedures, improved financing access, and increased private participation to align with the CEF transport pillar. The completion of the TEN-T network by 2030 and its connection to European regions, removal of bottlenecks, and contribution to climate objectives are considered priorities. However, concerns are



raised about the reduction in the budget for transport infrastructure. The paper encourages the use of public-private partnerships, emphasizes the importance of sustainable mobility and infrastructure, and calls for better indicators to measure the effectiveness of the CEF objectives. It also stresses the need for efficient and transparent national procedures to facilitate TEN-T project implementation and supports the establishment of a single competent authority. Additionally, the paper suggests including environmental impact assessments and land expropriation procedures within the scope of the regulation. Ultimately, BusinessEurope urges a seamless transition from the current CEF program to CEF II and a rapid decision-making process to ensure continuity in funding programs.

6.5 Combined Transports Directive

Combined transport of goods is a transportation method that predominantly relies on trains, ships, or barges for the majority of the journey, with a short road leg at the beginning and/or end. It involves loading the goods into intermodal units, such as containers, at the start of the journey, which are then seamlessly transferred between different modes of transportation without the need to unload the goods themselves—a process known as transshipment. This approach combines the principles of intermodal and multimodal transport, where multimodal transport entails using multiple modes of transportation, such as road and rail, to transport goods or passengers. Intermodal transport, on the other hand, involves the movement of goods in single loading units that are transhipped from one mode of transport to another, such as transferring a container from a road vehicle to a barge on an inland waterway. In the case of combined transport, the road leg is limited to a short distance, and the primary part of the route is carried out using rail, inland waterways, or maritime transport.

Combined transport of goods, as described above, aligns with the guidelines set forth in EU law [35]. Commonly known as the "Combined Transport Directive," it establishes the legal framework and provisions for promoting and regulating combined transport operations within the EU member states. The directive emphasizes the importance of intermodal and multimodal transport systems, highlighting the seamless transfer of goods between different modes of transportation without unloading. It sets out rules regarding the use of intermodal loading units, transshipment procedures, and the limited role of road transportation in combined transport. The EU Directive on Combined Transports serves as a vital reference for ensuring standardized and efficient operations in the field of combined transport across the European Union.

The EC, in its Amendment of the Combined Transport Directive, provides a distinct definition of 'combined transport' that deviates from the commonly accepted understanding of multimodal contracts of carriage. According to the Commission, combined transport refers to a specific type of contract where the carrier and the shipper agree to transport particular goods from the place of receipt to the consignee's destination using multiple modes of transportation. This definition emphasizes the use of different means of transportation while highlighting the seamless transfer of goods throughout the journey. By adopting this definition, the European Commission aims to establish a clear framework for regulating and promoting efficient combined transport operations within the European Union.

CLECAT, the European association representing the interest of freight forwarders and logistics service providers, has issued a position paper calling for the revision of Directive 92/106/EEC on combined transport of goods between Member States [36]. The paper highlights several current issues faced by freight forwarders in combined transport and proposes solutions for an ambitious revision of the directive. The position paper emphasizes the need for clear definitions to ensure a common



understanding and application of the directive throughout the European Union. CLECAT suggests introducing definitions for multimodal transport, intermodal transport, and combined transport to address the current ambiguity and inconsistency in interpretation. Additionally, CLECAT supports changing the legislative instrument from a Directive to a Regulation. This would give the regulation a more binding legal force across the Union and avoid problems caused by different interpretations. The association proposes extending the scope of the instrument to cover all multimodal transport operations in the EU, provided that the longest leg of the journey is carried out by a sustainable mode of transport. This expansion aims to support a market-driven modal shift towards more sustainable transportation options. To incentivize the industry to adopt multimodal transport, CLECAT suggests the introduction of appropriate financial and non-financial incentives. This would help offset the higher costs associated with combined transport compared to road-only transport. The position paper also highlights the importance of infrastructure, cost factors, and administrative burdens in combined transport. It calls for the provision of high-quality infrastructure, heavier load authorizations for multimodal transport, the introduction of eco-premiums, and a reduction of administrative burdens and costs. Overall, CLECAT's vision for the revision of the Combined Transport Directive focuses on addressing existing shortcomings, promoting sustainability goals, and facilitating a market-driven modal shift towards more sustainable transport options in the European Union.

BusinessEurope, a representative of 40 national industry federations, has outlined its priorities and key issues for the revision of the Combined Transport Directive [37]. The organization emphasizes the need to focus on multimodal optimization in European transport, extend the directive's scope to include a wider range of operations, establish a common and harmonized framework for CT operations at the EU level, provide clear and harmonized definitions, foster investment in high-quality infrastructure, reduce administrative burdens, and promote digitization in multimodal transport. BusinessEurope supports the overall objectives of facilitating sustainable freight transport options, increasing the use and competitiveness of intermodal or multimodal transport, reducing negative externalities, and achieving the EU's climate and sustainability goals. They highlight the importance of reducing regulatory barriers, increasing interconnectivity and capacities across all modes of transport, bridging missing links, strengthening multimodal freight terminals, and promoting smart digital solutions. The organization calls for an extension of the directive's scope to enable more multimodal transport operations and suggests modifying the eligibility criteria to ensure fairness and effectiveness. They emphasize the need for a common and harmonized framework for CT operations, consistent with other EU legal acts, and clear definitions to avoid diverging interpretations. BusinessEurope also emphasizes the importance of support measures and incentives that remove inefficiencies, promote modal optimization, and target the efficiency and integration of different transport modes while ensuring a level playing field. They highlight the significance of high-quality infrastructure compatible with multimodal operations and advocate for investments in upgrading road, seaport, and airport infrastructures. The organization stresses the need for uniform application, calculation methods, and reporting obligations, along with the promotion of digitalization and seamless data exchange. Overall, BusinessEurope's position paper seeks to promote sustainable and efficient CT operations while contributing to the EU's green transport goals.

The European Express Association fully supports the revision of Directive 92/106/EEC, which establishes common rules for Combined Transport of goods within the European Union (EU) [38]. The EEA emphasizes the need for an integrated approach that aligns with other transport policy initiatives under the forthcoming "Greening Transport Package" planned for mid-2023. Express transport



operations rely on multiple modes of transport for speedy and reliable delivery of goods. The EEA argues for complementary transport modes and improving all modes to enhance the commercial environment and accelerate decarbonization. Although rail and inland waterway transport are significant, they cannot fully replace road freight, which accounted for 77.4 percent of total inland freight transport in 2020. Existing railway solutions may not be suitable for overnight express deliveries in certain markets. The EEA suggests enhancing rail freight attractiveness by expanding rail infrastructure, prioritizing rail cargo, and proposing dedicated slots for rail freight. They advocate for incentives to promote the use of rail and waterborne transport, including financial support such as eco-premiums, reductions in track access charges, waivers of road toll charges, and reductions in administrative burdens. The EEA also highlights the potential of high-speed rail for express freight. They stress the importance of aligning the revision of the Combined Transport Directive with the EU Weights and Dimensions Directive, particularly for European Modular Systems (EMS) used in cross-border operations. The EEA opposes cross-subsidization and emphasizes that financial support for rail or waterborne transport should not be funded by charges paid by operators of other modes. Clearer definitions and scope for Combined Transport are necessary, including removing or increasing distance limitations for the road leg, simplifying terminology, and providing practical options for initial and final transport legs. The EEA suggests eliminating the requirement to refer to the "nearest suitable terminal" for road-rail transport and calls for harmonization and equal treatment of all modes used in Combined Transport to eliminate uncertainty caused by national variations.

The Federation of European Private Port Companies and Terminals has issued a position statement regarding the amendment of Directive 92/106/EEC concerning Combined Transport of goods between Member States [39]. FEPORT represents private port companies and terminals outside of the sea ports in the European Union. FEPORT supports the revision of the Combined Transport Directive and recognizes the importance of promoting multimodal transport in the direct port hinterland. The original aim of the directive was to enhance intermodality and reduce the reliance on road transport due to problems such as road congestion, environmental concerns, and road safety. According to the existing directive, combined transport is defined as the transportation of goods between Member States, where one leg of the journey involves freight road transport and the other leg involves rail, inland waterway, or maritime services, with the non-road transport section exceeding 100 km. The road transport leg must be between the point of loading/unloading and the nearest suitable rail loading station or within a radius not exceeding 150 km from the inland waterway or seaport. FEPORT sees the revision of the directive as an opportunity to unlock the potential of combined transport, where a significant part of the journey is conducted by rail, inland waterways, or sea, and the initial and final parts are carried out by road transport. The aim is to optimize the performance of multimodal logistic chains by promoting the use of the most efficient transport mode. This will require harmonization of technical requirements, utilization of digital innovation, and ensuring a level playing field between different modes of transport, including infrastructure charges. FEPORT emphasizes the need to support the development of terminals in areas where there is no existing market. In regions with an existing market, the focus should be on improving the operational efficiency of existing terminals rather than developing new ones. In cases of under capacity, the objective should be to expand the existing facilities. State support for the construction of new terminals should only be provided where there is no existing market for combined transport operations. The directive should prevent the development of new terminals with financial support that directly compete with neighbouring terminals without such support, as it could lead to competition distortion and possible



overcapacity. Infrastructure bottlenecks, including connections to terminals, are identified as one of the main barriers to combined transport. Member States are urged to address hinterland bottlenecks around terminals to make combined transport operations more attractive. Removing these bottlenecks will contribute to the efficient functioning of combined transport systems.

NGO Transport & Environment provides policy advice regarding waterborne transport and combined transport operations [40]. They suggest that the definition of combined transport should consider the availability of suitable terminals for waterborne transport, based on the specific intermodal load unit. T&E supports limiting the road transport share in combined transport to promote sustainable transportation, recommending that road legs be limited to the nearest suitable terminal with capacity. They propose considering factors such as fuel efficiency and CO₂ standards to potentially extend road legs for waterborne transport. T&E expresses agreement with current regulatory support measures, including the ban on numerical limitations and regulated tariffs/prices. They suggest linking the Combined Transport Directive with emission standards and CO₂ standards for cleaner trucks. T&E acknowledges that fiscal support measures for combined transport are ineffective for waterborne transport and calls for additional regulatory support at the EU level, such as incorporating European emission standards and promoting combined transport for megatrucks. They recommend investing in intermodal infrastructure, including facilities for waterborne transport, by allocating a portion of the post-2020 EU budget. T&E opposes toll/vignette exclusions for trucks in combined transport operations, as tolls are seen as crucial for increasing logistic efficiency and encouraging the use of cleaner vehicles.

6.6 European Maritime Single Window environment

In 2010, the EU mandated the implementation of the Maritime Single Window, which aimed to create an electronic system for exchanging reports on ships arriving at or departing from EU member state ports [41]. However, the directive has not reduced administrative burdens as intended, but rather increased them due to different interpretations by EU member states. To address this issue, the European Commission introduced European maritime one-stop-shop in 2019 [42]. The regulation aims to harmonize reporting rules for port calls, reduce administrative burdens on ships, and promote the "once-only principle" to eliminate redundant submissions. It also encourages the use of essential reporting data and adheres to the FAL Convention [43]. The EMSWe regulation began implementation in August 2019 and will span six years, replacing the current MSW directive in August 2025. The concept of digitalizing the logistics chain, known as AEGIS, relies on the MSW system for electronic ship clearance processes. The IMO is involved in the development of MSW and EMSWe, as they align with the principles of the FAL Convention, which aims to simplify and harmonize reporting formalities for international maritime trade. The EMSWe regulation ensures consistent reporting procedures across EU ports and reduces administrative burdens on ships in line with the FAL Convention principles. The IMO has been presented with some recommendations by ISO, BIMCO and IPSCA [44]:

- Encourage the Use of Internationally Standardized Digital Interfaces

The design of maritime single windows should incorporate internationally standardized digital interfaces and protocols. This will enable seamless operations even when the communication link between the ship and shore has limited quality. Standardization will promote interoperability and facilitate efficient information sharing.



- Support Automated Machine-to-Machine Communication

MSW should facilitate automated M2M communication to reduce the burden on ship crews and minimize unnecessary manual processing of outgoing or incoming messages. It is essential to establish provisions that ensure the authenticity, confidentiality, and integrity of message exchanges during automated M2M communication.

- Implement Robust International Standards for M2M Interfaces

Any M2M interface between the MSW and external users should be based on robust international standards. This is particularly crucial for ships engaged in international trade. By adopting international standards, information exchange can be streamlined, and compatibility across different systems can be ensured.

- Ensure Compliance with the IMO Compendium

Standards used in the implementation of MSW should be compliant with the IMO Compendium. The IMO Compendium is widely accepted internationally as the reference data model for maritime operations. Compliance will promote consistency, interoperability, and future-proofing of MSW systems.

- Consider Limiting Scope to Ensure Timely Implementation

Given the rapidly approaching deadline of January 1, 2024, it may be necessary to limit the functional scope of MSW implementations. Prioritize critical functions and focus on international scope to ensure a high-quality implementation. Special national reporting obligations may have lower priority in M2M implementations, as local agents or other parties can handle them.

- Engage Ship Software Providers

To expedite the implementation of shipboard reporting software, actively engage with software providers and inform them about the new possibilities for efficient ship-shore reporting. Collaborate with software manufacturers to ensure the necessary functionality is incorporated into their products.

- Establish Mechanism for Handling National Deviations

Address national deviations from FAL reporting requirements by establishing a mechanism for capturing and handling such deviations. These deviations should be reported to the IMO Secretary-General, allowing for their inclusion in the IMO Compendium to ensure consistency and harmonization of information elements.

- Provide Examples of Successful MSW Implementations

Encourage member states to share detailed information on their MSW implementations through platforms like the GISIS module: Maritime Single Window on the IMO website. Sharing best practices and successful case studies will assist other countries in implementing MSW effectively.



6.7 'Fit for 55': the waterborne dimension

The 'fit for 55' legislative package presented by the European Commission has a wide scope of application with respect to greenhouse gas emission reduction and is thus not exclusively applicable to the transport sector. Some of the measures enacted may eventually affect the implementation of a new waterborne transport system in Europe. The following subheadings introduces the proposed regulatory and legal developments that may enable or constrain the introduction of a new waterborne transport system for Europe.

Waterborne and intermodal transport organizations in Brussels have issued a joint statement endorsing the Fit for 55 proposals by the European Commission [45]. The associations highlight the significance of these proposals as crucial steps towards translating the climate targets outlined in the EU Green Deal into actionable policies. They emphasize the need for a comprehensive and balanced approach that aligns with other EU policies, particularly the Sustainable and Smart Mobility Strategy.

The statement emphasizes one key area of concern: Onshore Power Supply. While the associations welcome the requirements of the FuelEU Maritime Regulation for OPS connection by 2030 and infrastructure targets, they suggest that offering total or partial tax exemptions for electricity provided to vessels at berth could further incentivize the adoption of OPS before it becomes mandatory. They argue that a mandatory total exemption for electricity across all Member States would be even more effective. Harmonizing tax rates across the EU is also emphasized to ensure fair competition among EU ports. Furthermore, the associations stress the importance of public investments in OPS infrastructure to alleviate uncertainty for private companies. Given the uncertain nature of decarbonization pathways for the waterborne transport sector, private investments remain uncertain, making it necessary for a larger proportion of public investments to expedite the deployment of OPS infrastructure.

The joint statement also advocates for technology neutrality, stating that it is crucial for fostering innovation and should be upheld to enable the development and adoption of various zero-emission technologies alongside OPS. The list of zero-emission technologies permitted by the FuelEU Maritime Regulation should be regularly reviewed and updated to ensure its relevance in the future.

Addressing carbon leakage is another major concern raised by the associations. While they support the EU Commission's approach of phasing out allowances for sectors subject to international competition and implementing a carbon levy on imports, they call for similar measures to be applied in the maritime sector. They argue that as the EU ETS and FuelEU Maritime are implemented, measures should be in place to prevent carbon leakage and maintain the competitiveness of the maritime sector. This is particularly crucial to avoid potential shifts towards less sustainable transport options.

Regarding the allocation of revenues generated through the Fit for 55 proposals, the associations express their support for directing them towards emissions reductions in the industry. They appreciate the allocation of funds to the Innovation Fund for decarbonizing the maritime transport sector and emphasize the need for clear commitments to ensure that the funds are utilized to promote sustainability in the maritime sector, including investments in port infrastructure and potentially superstructure.

The statement acknowledges the transitional role of LNG as an alternative fuel for the shipping market in the short- to medium-term. While emphasizing the importance of preventing port stakeholders from



investing in LNG refuelling points without a viable return on investment, the associations propose retaining LNG as a transitional fuel under the Energy Taxation Directive. They highlight the significance of stimulating the adoption of LNG through tax measures.

Finally, the associations call for thorough impact assessments of the Fit for 55 proposals, particularly in terms of their effect on the European maritime logistics supply chain, greenhouse gas emissions, and the competitiveness of the waterborne, port, and logistics sector. They stress the need for a comprehensive evaluation to ensure that the proposed measures do not inadvertently lead to a shift towards less sustainable transport options.

The following sections look into the specific components of the package; it is not possible at this stage to submit thorough recommendations on such policies as they are very recent and have not been implemented.

6.7.1 Alternative Fuels Infrastructure Regulation

The existing Directive on Alternative Fuels Infrastructure was adopted on 29 September 2014. This directive requires Member States to develop national policy frameworks for the market development of alternative fuels and their infrastructure; foresees the use of common technical specifications for recharging and refuelling stations; and paves the way for setting up appropriate consumer information on alternative fuels, including a clear and sound price comparison methodology. The proposed regulation under 'fit for 55' is an update of that directive and will require EU Member States to ramp up the availability of LNG by 2025 and onshore electrical power supply by 2030 in core EU ports [46]. For waterborne transport, this initiative delivers on the clear requirement of the European Green Deal to oblige docked ships to use shore-side electricity. It is fully complementary to Fuel EU maritime initiative by ensuring that sufficient shore-side electricity supply is installed in ports to provide electricity while passenger ships (including RORO passenger ships, high speed passenger craft and cruise ships) and container vessels are at berth and accommodating the demand for decarbonised gases (i.e. bio-LNG and synthetic gaseous fuels (e-gas)). From National Policy Frameworks to Corridor Frameworks Battery, hydrogen and other sustainable fuels infrastructure must be deployed along a corridor approach. Installing all said infrastructure in all inland ports is unfeasible. Fixed alternative fuels infrastructure in all ports could lead to oversupply in some areas and undersupply in others, as inland ports are not evenly distributed. Fixed targets for all ports would not always make economic sense and could result in underutilised or stranded assets [47].

6.7.2 Energy Taxation Directive

The Energy Taxation Directive (ETD) entered into force in 2003 and lays down structural rules and minimum excise duty rates for the taxation of energy products used as motor fuel and heating fuel, and electricity. The proposed revision suggests that HFO used by ships will no longer be fully exempt from energy taxation for voyages in the EU, and it imposes a minimum tax on HFO. It will also remove exemptions and incentives for the use of fossil fuels. The revised Energy Taxation Directive proposes a minimum €0.90 per gigajoule tax on bunker fuels used for intra-European maritime voyages from January 1, 2023. The tax is just 12% of what other sectors that use fossil fuels such as gasoline and diesel will be charged because of the risk that shipowners and operators would otherwise source bunkers outside the EU. For the purposes of this Article, 'intra-EU waterborne navigation' shall mean navigation between two ports located in the Union, including domestic navigation.



Eurochambres, the Association of European Chambers of Commerce and Industry, acknowledged the need to revise certain aspects of the ETD to reflect technological developments [48]. However, they advocate for balanced and effective modifications that consider the current economic environment and crises in Europe. They oppose additional taxes on EU transport operators and believe that such measures will have no impact on reducing carbon emissions. The removal of the exemption of energy tax on fuels used in aviation and maritime industries, as proposed by the European Commission, would increase transportation costs, negatively affecting sectors like tourism and overall business competitiveness, especially in the context of high inflation. The impact of the proposed tax measure will disproportionately affect citizens and businesses in peripheral member states, island states, and island regions, undermining economic and social cohesion in the EU. Eurochambres highlights the already challenging economic context for the aviation and maritime industries due to the COVID-19 crisis and the war in Ukraine. They argue that taxation is not the solution for greening these industries, but rather investment in research, development, and innovation for sustainable technologies and fuels. The proposed tax measure will have significant implications for economic activity, particularly in the tourism sector, which contributes to a substantial portion of EU GDP and employment. The increase in ticket prices for air travel and the higher energy tax on longer trips will disproportionately impact peripheral EU member states and regions. Eurochambres emphasizes that the proposed tax measure will compound the financial burden already faced by the aviation and maritime industries, threatening their competitiveness and hindering investment and innovation for greener technologies. They argue that these industries are already heavily taxed through various national and international taxes and fees. In conclusion, Eurochambres calls for the retention of the current exemption of taxation on the use of kerosene fuel by the aviation and maritime sectors, urging the deletion of the proposed articles in the revision of the ETD.

The joint position paper submitted by ECSA, CLIA Europe, Interferry, and EUDA evaluates the Energy Taxation Directive from the shipping industry's perspective [49]. It emphasizes the need for evaluating the directive's effectiveness, cautioning against automatic alignments with other policy areas or changes to its scope. The paper highlights the importance of tax-free bunkers and luboils for the industry's competitiveness and affordability, arguing against imposing taxes on bunkers sold in EU ports. It addresses the taxation of fuel used in dredging operations, advocating for equal treatment and opposing distinctions between fuel for navigation and dredging machinery. The paper also proposes simplified and permanent tax treatment for shore-side electricity and calls for a technology-neutral approach with a taxation exemption for all energy supplies, including alternative fuels, to promote cleaner technologies and close the cost gap. Overall, the paper aims to support a revised directive that addresses industry needs, encourages greener options, and ensures a competitive business environment.

The joint letter from the EU industry emphasizes the need for the ETD to be revised to reflect the climate impact of energy carriers [50]. The signatories support the European Commission's initiative to update the directive, considering its significance in achieving the goals of the European Green Deal and promoting the development of new energy markets and technologies. They highlight the importance of accelerating the shift from fossil fuels to sustainable alternatives, such as Renewable and Low-Carbon Fuels, through favourable tax incentives. The letter calls for tax rates to be adjusted based on the fossil content of energy carriers as a step towards addressing their climate impact and supporting the production of Renewable and Low-Carbon Fuels. It also stresses the role of the ETD recast in the success of the European Green Deal and urges the European Parliament and Member



States to take decisive action in reaching an agreement on the revision. The letter further suggests maintaining provisions that incentivize higher blends of sustainable fuels, supporting the aviation and maritime sectors' sustainable transition, and utilizing ETS revenues for financial assistance.

6.7.3 Renewable Energy Directive

The original Renewable Energy Directive (RED I) came into effect in 2009, which was then updated with RED II in 2018. RED II is designed to increase the use of energy from renewables, foster better energy system integration and contribute to climate and environmental objectives associated with global warming and biodiversity loss. The Fit For 55 package includes a slight revision to this directive that aligns with the EU's significantly raised climate ambition. In order for the EU to meet the goals of the European Green Deal, it must implement significantly higher shares of renewable energy sources within an integrated energy system. RED II suggests an EU-wide target of 40% for the share of energy that must come from renewable sources by 2030, to replace the previous target of 32% (the old version of RED II also defined a target of 14% of energy from renewable sources in the transport sector). This new revision implements a GHG intensity reduction target of at least 13% by 2030 in the transport sector, as well as sub-targets for advanced biofuels, and renewable fuels of non-biological origin (RFNBO).

6.7.4 Effort-sharing Regulation

The Effort Sharing Regulation (ESR) was adopted in 2018 to establish national targets for reducing emissions in sectors such as road transport, building heating, agriculture, small industrial installations, and waste management. These sectors, which were previously not covered by the EU Emissions Trading System (EU ETS), account for about 60% of the EU's greenhouse gas emissions. To reach the EU's emission reduction goal by 2030, the Commission proposes a minimum 40% reduction under the ESR compared to 2005 levels, increasing the existing target of 29% by 11 percentage points. The ESR ensures fair and equitable contribution from all Member States by allocating emission reduction targets based on GDP per capita. Each Member State receives annual emissions allocations that progressively decrease until 2030. The ESR currently covers direct greenhouse gas emissions from transportation (excluding aviation and non-domestic shipping), buildings, agriculture, industrial installations, gases not included in the EU ETS, waste, and non-combustion related emissions from energy and product use. Inland navigation greenhouse gas emissions are also regulated by the ESR.

In March 2023, the Council adopted a revised version of the ESR after nearly two years of negotiations [51]. The revised ESR maintains the principle of "common but differentiated responsibilities," considering the capabilities and historical contributions of each Member State. Targets are increased to varying degrees for different states, with some experiencing significant increases while others have more modest adjustments. The ESR includes flexibility mechanisms that allow states to meet their targets through various means, such as banking excess emissions, transferring unused allocations, and utilizing carbon sinks. Member States failing to meet their targets must submit action plans to the Commission and make up for the gap in subsequent years. Although the ESR is seen as a top-down approach driven by Brussels, it is also influenced by bottom-up pressure from citizens and activists demanding stronger climate action. However, the revised ESR does not include an article on access to justice, which would have enabled citizens to sue Member States for not meeting their targets. The Commission remains responsible for enforcing the ESR [52].



The Union of the European Independent Fuel Suppliers (UPEI) recommends several key points regarding the revision of the ESR [53]. Firstly, they call for a coherent policy framework that addresses the existing regulatory inconsistencies in the fuel supply sector. They highlight the need to avoid creating new overlaps and burdens on consumers and companies, especially if a carbon component is introduced. Secondly, they emphasize the importance of a suitable identification of market players, taking into account the diverse nature of the independent fuel supply sector and ensuring that participants have various options for action with different abatement costs. They argue that extensive reporting requirements already exist, and no separate system of monitoring and verification is necessary. Thirdly, the UPEI advocates for a technology-neutral approach, covering all energies and fuels used in buildings and road transport, including renewable and carbon-neutral energies. They stress the need for a proper assessment of potential effects on prices, considering the low price elasticity of demand in the building heating and transport sectors and the potential impact on certain categories of the population. Lastly, the UPEI suggests avoiding parallel systems that would increase administrative burden and complexity, and instead supports either the EU ETS or the ESR as the appropriate system for regulating transport and building emissions, depending on the outcome of the Commission's impact assessment. Overall, the UPEI seeks to contribute to the achievement of Europe's climate targets by promoting a well-designed and effective ESR.

6.7.5 Emissions Trading System Directive

The EU ETS, the world's largest emissions trading system, will be extended to cover maritime transport [54]. The EU ETS, established in 2005, operates as a cap-and-trade system. Participants receive allowances through free allocation or auctions and can purchase additional allowances if needed. The draft legislation released by the EU proposes gradually including maritime emissions in the EU ETS, with shipping companies required to surrender allowances based on a percentage of their verified emissions from ships calling at EU ports. The EU ETS will apply to ships regardless of their flag or owner's jurisdiction, with member states administering the scheme for companies incorporated within their jurisdiction. Non-EU Shipping Companies will be administered by the member state they visit most frequently or the first port they visit if they have had no EU voyages in the previous two years. The Innovation Fund will be expanded to support decarbonization investments in the maritime sector, and penalties for non-compliance with the EU ETS may include expulsion orders.

The European Sea Ports Organisation (ESPO) supports the inclusion of maritime in the EU Emissions Trading System (ETS) for decarbonizing shipping. However, ESPO is concerned about the potential evasion of the EU ETS by shipping companies through calls to ports outside the EU or route reconfigurations. Evasion from the maritime EU ETS could undermine its credibility and effectiveness in reducing emissions and negatively impact employment and business activity in EU ports. ESPO calls for early monitoring and prevention of carbon and business leakage from the EU ETS Maritime. The organization also supports efforts to define "port of call" and calls for strategic use of ETS revenues to invest in green refuelling and recharging infrastructure in EU ports. ESPO emphasizes the need for the Commission to adapt the rules if evasion occurs [55][56].

6.7.6 FuelEU Maritime Initiative

The European Green Deal and the 2030 Climate Target Plan have set ambitious goals to reduce GHG emissions by at least 55% in 2030 compared to 1990 levels and achieve climate neutrality by 2050. Achieving these targets requires the contribution of all sectors, including the maritime transport industry. However, in 2018 and 2019, ships falling under the EU MRV emitted approximately 140



million metric tons of CO₂, primarily due to heavy reliance on fossil fuels. The global use of petroleum-based or natural gas-based marine fuels exceeded 99% in 2018, reflecting a similar situation in the EU. This lack of adoption of renewable and low-carbon fuels by ships calling at EU ports poses a significant challenge to the goals of the European Green Deal and the Paris Agreement. Moreover, docked ships in EU ports emit substantial air pollutants as a result of their use of fossil fuels. To address these issues, the European Commission introduced the FuelEU maritime proposal on July 14, 2021. This proposal includes progressively stricter limits on the carbon intensity of energy used by vessels from 2025, mandating the use of alternative fuels. The proposal applies to commercial vessels of 5,000 gross tonnes and above, covering energy used at EU ports and on voyages between EU ports, with 50% coverage for voyages departing from or arriving at an EU port. By January 2030, container ships and passenger ships at EU ports will be required to connect to onshore power supply (OPS) and use it for all energy needs while at berth, with some exceptions. The FuelEU Maritime initiative aims to establish a common EU regulatory framework to increase the share of renewable and low-carbon fuels in the fuel mix of international maritime transport without creating barriers to the single market. To support the uptake of sustainable maritime fuels, the Commission proposes limiting the carbon intensity of the energy used on board ships. The proposal also introduces a fuel standard for ships and mandates the most polluting ship types to use onshore electricity when at berth, placing the responsibility for compliance on the shipping company [57].

The European Community Shipowners' Associations (ECSA) supports the objective of the FuelEU Maritime proposal to promote the use of cleaner fuels in shipping. However, they express concerns about enforcement loopholes in the proposal and recommend making EU fuel suppliers responsible for meeting the fuel standards. They emphasize the need for consistency with other proposals in the 'Fit for 55' package and advocate for the use of incentives and tools to foster demand for cleaner fuels. They also argue against the introduction of a new Monitoring, Reporting, and Verification (MRV) system and propose integrating the reporting requirements into the existing EU MRV system. Additionally, ECSA opposes penalizing ships when onshore power supply is not available in ports and suggests using the Alternative Fuels Infrastructure Regulation (AFIR) proposal to incentivize the installation of onshore power supply infrastructure [58].



7 Addressing legal and regulatory challenges

There are several legal and regulatory challenges that must be addressed to successfully implement the proposed AEGIS concept design for a new waterborne transport system in Europe. This section examines these issues from a public policy perspective[1].

When it comes to international law-making, states must adopt strategies to further their national interests, whether through bilateral or multilateral agreements. The rules that apply to states are the result of compromise and negotiation. Therefore, decision-makers need to adopt appropriate strategies in international negotiations. In some cases, bilateral agreements may be explored to take advantage of the flexibility provided by certain instruments, such as SOLAS⁴. However, some states may prefer to wait for a consensus rather than exercising their rights under international law. The EU tends to act as a group in certain IMO procedures, harmonizing the benefits that its Member States may derive. Therefore, it may be important, as a matter of public policy, to harmonize the approaches of EU national delegations to the IMO to ensure that the international consensus reflects Europe's specific regional context.

At the global level, the main legal obstacle to the implementation of autonomous ships is the UNCLOS framework. However, challenges related to the interpretation of UNCLOS can be collectively addressed at the IMO. The AEGIS concept aims to ensure that the proposed vessel complies with the same safety and environmental standards as other vessels. It is important to note that UNCLOS is a living instrument that can be adapted to new technologies. Therefore, a contextual, pragmatic, and functional interpretation of the treaty is crucial. The IMO is the competent organization for the development of generally applicable rules and standards, including technical standards. Thus, the incorporation of MASS in UNCLOS can be achieved through the IMO.

While it is possible to interpret UNCLOS in light of IMO instruments that deal with MASS, the flag state has the primary responsibility to ensure that ships flying its flag comply with applicable rules and regulations on the safety of navigation, under both UNCLOS and IMO conventions. It is important to emphasize that states may impose stricter regulations compared to other member states and/or IMO members. This may create unfair competition and result in shipowners in certain member states having difficulties in owning and/or operating ships in the SSS segment.

Apart from public law developments, such as enacting new regulations or issuing interpretative guidelines, it is also important to consider the role of private law practices in addressing legal and regulatory challenges related to the implementation of the proposed AEGIS concept design for a new waterborne transport system in Europe.

⁴ SOLAS Regulation 11(1) of chapter XI contains an exemption provision according to which the flag State can conclude bilateral or multilateral agreements with other flag States about alternative security arrangements. The exemption possibility applies only to ship traffic with short crossings on regular routes within the territorial waters of contracting Parties.



8 Conclusion

EU public policy bears a significant impact on the implementation of a new waterborne transport system in Europe, even if the transition from road to water is in the hands of private parties. These policies primarily revolve around digitalization, economic incentives, and environmental protection, as they have the potential to affect different aspects of the logistics chain.

Digitalization is expected to play a crucial role in reducing the time spent on administrative tasks traditionally handled by ship crews. The IMO already initiated efforts to establish guidelines for transitioning from paper to electronic certificates, aiming to set standards for shifting away from traditional paperwork. As the implementation of MASS progresses, it is essential to determine whether specific certificates will be necessary and whether their implementation will pose unique challenges compared to manned vessels. National and international electronic systems may need to be adapted to accommodate MASS operations effectively.

Implementing MASS in waterborne transport goes beyond the assets themselves and impacts various actors involved in maritime operations. Seafarers will experience significant changes in their roles, initially transitioning to remote control and surveillance of vessel operations. The complete transition to fully autonomous ships is expected to occur gradually, requiring seafarers to acquire new skills and potentially leading to social issues such as unemployment and shifts in work culture. It is crucial to conduct further research on the impact of digitalization on shipboard safety and welfare to ensure the well-being of seafarers. Moreover, MASS implementation may affect other human interactions, including communication challenges for leisure boats in inland waterways and increased criminal activities such as stowaways or piracy due to reduced supervision and surveillance. The risk of cybersecurity threats and potential deviation from the ship's intended course also poses concerns for human safety. Therefore, liability questions must be carefully addressed and integrated into any policy support measures.

The efficiency of MASS implementation relies heavily on the support provided for infrastructure development. Various fiscal hurdles, such as navigational dues, vessel ownership taxes, and cargo dues, affect different types of vessels to varying degrees. The effectiveness of existing maritime subsidies in achieving their intended goals remains inconclusive based on impact studies. Consequently, there is a need to re-evaluate subsidy policies and explore alternative measures. Policy support for the AEGIS project, within the context of waterborne transport, could involve direct subsidies or tax exemptions for shipping companies, labour, capital investments, energy products, maritime infrastructure, maritime knowledge and innovation, and fuel. Another option is to transfer the financial risk to the government through favourable loans or credit guarantees for shipping companies, along with support for financing capital investments and infrastructure development.

Additionally, the construction or adaptation of port terminals plays a crucial role and requires consideration of both urban and marine planning policies. MASS operations in waterborne transport necessitate infrastructure adaptations at ports and waterways, including the implementation of suitable technology and potential marine works. The goal of bringing goods closer to their destinations through waterways also affects the development of hinterland infrastructure and intermodal connectivity, which may have implications for the local population. Security considerations, particularly in relation to the International Ship and Port Facility Security (ISPS) Code, are also essential. Governments, shipping companies, shipping personnel, and port/facility personnel all share



responsibilities in detecting security threats and implementing preventive measures to safeguard ships and ports involved in international trade.

The AEGIS project aligns with the European Union's focus on sustainable transport infrastructure, internalization of transport externalities, and reducing greenhouse gas emissions. The EU aims to shift towards more efficient maritime transport solutions, reducing the carbon footprint and waste of resources within logistics chains. It is crucial to thoroughly analyse and integrate incentives related to energy efficiency and ecological sustainability into policy support for MASS in waterborne transport. Given the unique nature of waterborne transport in internal waters and territorial seas, coastal and riverine states can implement measures that go beyond the minimum global standards set by the IMO. These measures may include restrictions on speed, emissions, vessel dimensions, noise levels, as well as the implementation of environmental taxes, fees, or charges that differentiate based on environmental impact. This approach ensures that the pursuit of "greener" and "efficient" transport aligns with established benchmarks and facilitates the transition of cargo from road to water transport.

Yet these recommendations on the overarching public policy framework are in itself not sufficient. They must be supplemented with legal work to reform rules and standards that still apply and perpetuate previously dominant policy paradigms and they must be implemented in practice. That is the remit of two separate reports that continue the analysis that begun here.



References

- [1] AEGIS D6.2 “D6.2 Regulatory challenges for a new European waterborne transport system”.
- [2] Kim, Mingyu, Tae-Hwan Joung, Byongug Jeong, and Han-Seon Park. "Autonomous shipping and its impact on regulations, technologies, and industries." *Journal of International Maritime Safety, Environmental Affairs, and Shipping* 4, no. 2 (2020): 17-25.;
- [3] Issa, M., Ilinca, A., Ibrahim, H., & Rizk, P. (2022). Maritime Autonomous Surface Ships: Problems and Challenges Facing the Regulatory Process. *Sustainability*, 14(23), 15630.
- [4] Psaraftis, H. N., & Zis, T. (2019). European Policies for Short Sea Shipping and Intermodality, 3-21. Santos, T. A., Fonseca, M. Â., Martins, P., & Soares, C. G. (2022). Integrating short sea shipping with trans-European transport networks. *Journal of Marine Science and Engineering*, 10(2), 218. Santos, T. A. (2022). Short Sea Shipping, Multimodality, and Sustainable Maritime Transportation. *Journal of Marine Science and Engineering*, 10(8), 1069.
- [5] Paixão, A. C., & Marlow, P. B. (2002). Strengths and weaknesses of short sea shipping. *Marine Policy*, 26(3), 167. Suárez-Alemán, A., Trujillo, L., & Medda, F. (2015). Short sea shipping as intermodal competitor: A theoretical analysis of European transport policies. *Maritime Policy & Management*, 42(4), 317. Trujillo, L., Medda, F., & González, M. M. (2011). 13 An analysis of short sea shipping as an alternative for freight transport. *International handbook of Maritime Economics*. Douet, M., & Cappuccilli, J. F. (2011). A review of Short Sea Shipping policy in the European Union. *Journal of Transport Geography*, 19(4), 968.
- [6] Council of the European Union. (2006). *PRESS RELEASE 2772nd Council Meeting Transport, Telecommunications and Energy [Press release]*. Microsoft Word - 92120 (europa.eu) https://www.consilium.europa.eu/ueDocs/cms_Data/docs/pressdata/en/trans/92120.pdf
- [7] European Commission (2006,) *Mid-term review of the Programme for the promotion of short sea shipping*, COM(2006) 0380 final, Brussels, 13.7.2006
- [8] International Transport Forum. (2019). Maritime Subsidies: Do They Provide Value for Money?. *International Transport Forum Policy Papers*, no. 70
- [9] European Commission DG Mobility and Transport. (2015). Analysis of recent trends in EU shipping and analysis and policy support to improve the competitiveness of short sea shipping in the EU Final report.
- [10] European Commission DG Mobility and Transport. (2015). Analysis of recent trends in EU shipping and analysis and policy support to improve the competitiveness of short sea shipping in the EU. COWI
- [11] V Verbergh, E., & Van Hassel, E. (2019, October). The automated and unmanned inland vessel. In *Journal of Physics: Conference Series* (Vol. 1357, No. 1, p. 012008). IOP Publishing.
- [12] Punter, L. M. Hofman, W. J. (2017). Digital Inland Waterway Area Towards a Digital Inland Waterway Area and Digital Multimodal Nodes. European Commission.



- [13] European Commission, Directorate-General for Mobility and Transport, (2020). *Assessment of potential of maritime and inland ports and inland waterways and of related policy measures, including industrial policy measures – Final report : executive summary*, Publications Office.
- [14] European Commission. (n.d). Study on support measures for the implementation of the TEN-T core network related to sea ports, inland ports and inland waterway transport.
- [15] Liger, Q., Gutheil, M., Eager, J. (2020). *Identification of potential synergies/re-use of legislative framework with digital aspect and concrete informatics solutions in other transport modes such as road, rail, maritime or air transport for potential re-use in the inland waterway transport – Final report*, Publications Office.
- [16] Némethy, Sándor A., Anna Ternell, Lennart Bornmalm, Bosse Lagerqvist, and László Szemethy. "Environmental Viability Analysis of Connected European Inland–Marine Waterways and Their Services in View of Climate Change." *Atmosphere* 13, no. 6 (2022): 951.
- [17] EnviCom WG 178. (2020). *Climate Change Adaptation Planning for Ports and Inland Waterways* [Press release]. <https://www.pianc.org/publications/envicom/wg178>
- [18] European Commission. (n.d). *Towards Game-changer Service Operation Vessels for Offshore Windfarms*. <https://cordis.europa.eu/project/id/774519/fr>. Visited 25.05.2023. Konstantinos, D. (2018). Identification of regulations, policies and classification of software and related practices D1.2. European Commission.
- [19] MUNIN | MUNIN – Maritime Unmanned Navigation through Intelligence in Networks. (n.d.).<http://www.unmannedship.org/munin/>
- [20] Rolls-Royce. (2016, April 12). *AAWA project introduces the project's first commercial ship operators*. [Press release]. <https://www.rolls-royce.com/media/press-releases/2016/pr-12-04-2016-aawa-project-introduces-projects-first-commercial-operators.aspx>
- [21] Danish Maritime Authority. (2017). *Analysis of regulatory barriers to the use of autonomous ships Final report*. [Report \(dma.dk\)](https://www.dma.dk)
- [22] European Commission, Directorate-General for Mobility and Transport, (2020). *Study on social aspects within the maritime transport sector – Final report*, Publications Office. <https://data.europa.eu/doi/10.2832/49520>
- [23] Mallam, S. C., Nazir, S., & Sharma, A. (2020). The human element in future Maritime Operations—perceived impact of autonomous shipping. *Ergonomics*, 63(3), 334-345.
- [24] European Commission (2011) WHITE PAPER Roadmap to a Single European Transport Area – Towards a competitive and resource efficient transport system, COM(2011) 144 final, Brussels, 28.3.2011.
- [25] Cullinane, K., & Haralambides, H. (2021). Global trends in maritime and port economics: The COVID-19 pandemic and beyond. *Maritime Economics & Logistics*, 23, 369-380. Baindur, D., & Viegas, J. (2011). Challenges to implementing motorways of the sea concept—lessons from the past. *Maritime Policy & Management*, 38(7), 673-690.



- [26] Bodewig, K. (2022). Shaping the future policy of European Maritime Space. Motorways of the sea. Detailed implementation plan of the European Coordinator. European Commission. <https://transport.ec.europa.eu/system/files/2022-09/2022-mos-dip.pdf>
- [27] European Commission. (2021). *Boosting future-proof European inland waterway transport*, COM(2021) 324 final. Brussels, 24.6.2021
- [28] European IWT Platform. (2021, July 5). EU IWT platform welcomes the Commission's NAIADES III publication to boost future-proof European Inland Waterway Transport (IWT) [Press release]. <NAIADES-III-Press-Release.pdf> (inlandwaterwaytransport.eu)
- [29] 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. *Official Journal of the European Union*, L 348, 20 December 2013.
- [30] European Barge Union. (2022). *Inland waterway transport (IWT) sector position on the ten-t guidelines*. EBU-UENF. <IWT-position-on-the-Commission-TEN-T-regulation-proposal-20220608-final-rev-1-1.pdf> (ebu-uenf.org)
- [31] The European Sea Ports Organisation (ESPO). (2022). on the Commission proposal for the revision of the Union guidelines for the development of the Trans-European Transport Network (TEN-T). ESPO. <https://www.espo.be/media/ESPO%20TEN-T%20position%20FINAL%20April%202022.pdf>
- [32] European Federation of Inland Ports. (2019). Position of the European Federation of Inland Ports (EFIP) on the consultation of the TEN-T Guidelines. [https://www.inlandports.eu/media/Position%20of%20the%20European%20Federation%20of%20Inland%20Ports%20on%20TEN-T%20Consultation 5.pdf](https://www.inlandports.eu/media/Position%20of%20the%20European%20Federation%20of%20Inland%20Ports%20on%20TEN-T%20Consultation%205.pdf)
- [33] Pape, M., (2021). Connecting Europe Facility 2021-2027 Financing key EU infrastructure networks. EPRS, European Parliament. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/628247/EPRS_BRI\(2018\)628247_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/628247/EPRS_BRI(2018)628247_EN.pdf)
- [34] BUSINESSEUROPE. (2018). Transport infrastructure: The Connecting Europe Facility and the Trans-European Transport Network. BUSINESSEUROPE. https://www.business-europe.eu/sites/buseur/files/media/position_papers/internal_market/2018-10-17_connecting_europe_facility_and_trans-european_transport_network.pdf
- [35] European Commission. (2017). Proposal for a Directive Of The European Parliament and of The Council amending Directive 92/106/EEC on the establishment of common rules for certain types of combined transport of goods between Member States, (COM2017) 0648 final. Brussels, 08.11.2017.
- [36] CLECAT. (2021). *Revision of the Combined Transport Directive 92/106/EEC*. European Association for Forwarding, Transport, Logistics and Customs Services. https://www.clecat.org/media/clecat-pp_revision-of-combined-transport-directive.pdf



- [37] BUSINESSEUROPE. (2023). *Revision of the Combined Transport Directive - BusinessEurope comments*. BUSINESSEUROPE. <https://www.businesseurope.eu/publications/revision-combined-transport-directive-businesseurope-comments>
- [38] EEA. (2023). *Express industry priorities for the revision of the EU Combined Transport Directive (92/106/EEC)*. *Europexpress.org*. <https://www.euroexpress.org/uploads/ELibrary/EEA%20Combined%20Transport%20Position%20Paper%20-%20February%202023.pdf>
- [39] ESPO. (2022). *Joint Position on the Revision of the Combined Transport Directive*. *Espo.be*. <https://www.espo.be/media/EFIP%20ESPO%20Position%20Combined%20Transport%20FINAL.pdf>
- [40] European Federation for Transport and Environment AISBL. (2017). *Consultation questionnaire on Amendment of the Combined Transport Directive*. *Transportenvironment.org*. https://www.transportenvironment.org/wp-content/uploads/2021/07/2017_04_TE_response_Combined_Transport_Directive.pdf
- [41] Remáč, M., (2021). *European Maritime Single Window*. EPRS, European Parliament. [https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/615681/EPRS_BRI\(2018\)615681_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/BRIE/2018/615681/EPRS_BRI(2018)615681_EN.pdf)
- [42] 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. *Official Journal of the European Union*. L 198/64, 25.07.2019.
- [43] International Maritime Organization. (2016). *Guidelines for the use of electronic certificates*. *Imo.org*. <https://wwwcdn.imo.org/localresources/en/OurWork/IIS/Documents/FAL.5-Circ.39-Rev.2%20-%20Guidelines%20For%20The%20Use%20Of%20Electronic%20Certificates.pdf>
- [44] Facilitation Committee (FAL), 47th session, 13-17 March 2023. International maritime Organization: Supporting implementation of the Maritime Single Window (MSW). (2023, Marts 13-17). International Maritime Organization. <https://www.imo.org/en/MediaCentre/MeetingSummaries/Pages/FAL-47th-session.aspx>
Visited 25.05.2023.
- [45] The Federation of European Private Port Companies and Terminals. (2021, December 08). *Waterborne and intermodal transport organizations call for more consistency between "Fit for 55" proposals*. [Press release]. <https://www.apa.org/news/press/releases/2020/11/anxiety-depression-treatment> https://www.feport.eu/images/downloads/press_releases/2021/joint-position-of-waterborne-logistics-organizations.pdf
- [46] *Fit for 55 – New EU GHG regulations for ships coming soon*. (2021, October 13). DNV. Retrieved from <https://www.dnv.com/news/fit-for-55-new-eu-ghg-regulations-for-ships-coming-soon-208746> on 25.05.2023
- [47] EFIP., EBU., INE., ESO-EBO., European IWT Platform. (2022). *Position of the European Federation of Inland Ports (EFIP), Inland Navigation Europe (INE) and the Inland Waterway Transport sector*



- on the Alternative Fuels Infrastructure Regulation. [unece.org.
https://unece.org/sites/default/files/2022-02/ECE-TRANS-SC3-WP3-2022-inf_03e.pdf](https://unece.org/sites/default/files/2022-02/ECE-TRANS-SC3-WP3-2022-inf_03e.pdf)
- [48] Eurochambres. (2023). *European Commission proposal to revise the Energy Taxation Directive (ETD)*. Eurochambres. <https://www.eurochambres.eu/wp-content/uploads/2023/01/230109-Eurochambres-position-on-the-European-Commission-proposal-to-revise-the-Energy-Tax-Directive-ETD.pdf>
- [49] ECSA., CLIA Europe., Interferry., EUDA. (2018). *Energy Taxation Directive*. [ecsa.eu.
https://www.ecsa.eu/sites/default/files/publications/Position Paper of ECSA CLIA EUROPE INTEFERRY EUDA annexed to the public .. .pdf](https://www.ecsa.eu/sites/default/files/publications/Position%20Paper%20of%20ECSA%20CLIA%20EUROPE%20INTEFERRY%20EUDA%20annexed%20to%20the%20public%20..pdf)
- [50] CLEPA. (2022). *Joint letter of the EU industry: European Energy Taxation should reflect the climate impact of energy carriers*. European Association of Automotive Suppliers. <https://clepa.eu/wp-content/uploads/2022/11/2022-11-Joint-letter-on-European-Energy-Taxation.pdf>
- [51] Regulation (EU) 2023/857 of the European Parliament and of the Council of 19 April 2023 amending Regulation (EU) 2018/842 on binding annual greenhouse gas emission reductions by Member States from 2021 to 2030 contributing to climate action to meet commitments under the Paris Agreement, and Regulation (EU) 2018/1999. *Official Journal of the European Union*. L 111/1. Brussels, 19.04.2023
- [52] Harris, M. E. (2023, April 20). *The Revision Of The Effort Sharing Regulation: A Key Piece Of The "Fit For 55" Puzzle*. *Diritti Comparati*. Tutti i diritti riservati. <https://www.diritticomparati.it/the-revision-of-the-effort-sharing-regulation-a-key-piece-of-the-fit-for-55-puzzle/?print-posts=pdf>
- [53] UPEI. (2020). *UPEI Position Revision of the EU Emissions Trading System and the EU Effort Sharing Regulation*. UPEI.
- [54] European Commission. (2015). *EU ETS Handbook*. European Union.
- [55] ESPO. (2023, April 19). *Ets Shipping: Europe's Ports Call For Early And Robust Action To Prevent Evasion* [Press release]. <https://www.espo.be/news/ets-shipping-europes-ports-call-for-early-and-robust>
- [56] Lagouvardou, S., & Psaraftis, H. N. (2022). Implications of the EU Emissions Trading System (ETS) on European container routes: A carbon leakage case study. *Maritime Transport Research*, 3, 100059.
- [57] European Commission (2021), Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on the use of renewable and low-carbon fuels in maritime transport and amending Directive 2009/16/EC, COM(2021) 562 final, Brussels, 14 June 2021.
- [58] ECSA. (2021). *ECSA Position Paper On The Fuel EU Maritime Proposal*. European Community Shipowner's Association.