Shaping the future policy of the

European Maritime Space

Motorways of the Sea Detailed Implementation Plan of the European Coordinator

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Acronyms and abbreviations

CEF	Connecting Europe Facility
COP21/COP25	21st /25th Conference of the Parties to the UN Framework Convention on Climate Change
CNC	Core Network Corridors
CSDP	Common Security and Defence Policy
CTF	Cleaner Transport Facility
DCS	Data Collection System
DIP	Detailed Implementation Plan
EFTI	Electronic Freight Transport Information
EGD	European Green Deal
EIB	European Investment Bank
EMSA	European Maritime Safety Agency
ERTMS	European Railway Traffic Management System
ETS	Emissions Trading System
EU	European Union
GHG	Greenhouse Gas
HFO	Heavy Fuel Oil
ICT	Information and Communications Technology
IoT	Internet of Things
IMO	International Maritime Organisation
JASPERS	Joint Assistance to Support Projects in European Regions
LNG	Liquefied Natural Gas
MAE	Mediterranean Atlantic Ecobonus
MED	Marine Equipment Directive
MGO	Marine Gas Oil
MoS	Motorways of the Sea
MRV	Monitoring, Reporting and Verification
NECA	NOx Emission Control Area
NH3	Ammonia
NMVOCs	Non-methane Volatile Organic Compounds
NOx	Nitrogen Oxides
OPS	On-shore Power Supply
PRF	Port Reception Facilities
Ro-Ro	Roll-on/Roll-off
SECA	Sulphur Emission Control Area
SO2	Sulphur Dioxide
SSS	Short Sea Shipping
STM	Sea Traffic Management
TAF	Telematics Applications for Freight
TEN-T	Trans-European Transport Network
UfM	Union for the Mediterranean

Foreword by the European Coordinator

Maritime transport plays a key role for the European economy, transporting 75% of its external trade and ensuring smooth and efficient trade flows in and out of the European Union. With its large network of 335 maritime ports on the trans-European transport network (TEN-T), the European maritime sector also forms an important part of the intra-European transport system, facilitating and redistributing trade flows to and from land-based route networks and connecting the mainland to Europe's peripheral regions and islands. Specifically, short sea shipping represents around 65%[1] of the TEN-T ports' total cargo traffic.

The Motorways of the Sea (MoS) programme is a key instrument in this setting. MoS is strongly focused on short sea shipping routes, i.a. contributing to the nearly four billion tonnes[2] of cargo by gross weight handled by European ports each year. It thereby also serves as a functional maritime junction between the major nodes of the core and comprehensive network and should therefore be seen as an integral part of TEN-T and its corridors. Besides, it has a key role to play in the decarbonisation of the European economy, by supporting environmental efforts through innovation and road decongestion. Furthermore, road decongestion greatly contributes not only to the sustainability goals, but also stimulates the reduction of external costs, e.g. by effectively reducing the number of accidents and decreasing waiting time. Finally, by fostering the integration of digital technologies, it helps to ensure a smarter, more efficient and more competitive maritime sector.

Approximately a year and a half ago, I was given the mandate as European Coordinator for Motorways of the Sea. Looking back at these very exciting past months, I can conclude that I am very grateful that I was given this important task to assist the European Institutions, Member States and the European maritime community in shaping the maritime dimension of the TEN-T and integrating it better with the landside network. In addition, I wish to highlight the importance of European short sea shipping in reaching our sustainable goals by decarbonising the shipping and ports' sector. My vision for Motorways of the Sea is that it becomes the cornerstone for the creation of a truly sustainable, smart and seamless European Maritime Space. It should encompass all maritime infrastructure and some components of the freight transport services elements of the TEN-T.

All together, we have made considerable progress during these past months in reaching these goals by launching an honest debate about the strengths and weaknesses of the Motorways of the Sea programme. I sincerely thank Member States, EU maritime associations, port authorities, shipping lines and all other stakeholders for their strong engagement and commitment, and for being a strong ally in this endeavour.

Motorways of the Sea is certainly the programme under the Connecting Europe Facility with the highest EU cooperation spirit, as it by default links ports from different countries. On the other hand, we also have to acknowledge that MoS has never been an easy programme – it is rather complex compared to other funding priorities under CEF, in part due to the eligibility criteria. Furthermore, there is a clear margin for improvement with regard to its integration with the priorities of the core network corridors.

This is why I set myself a clear strategic objective for my mandate to better link Motorways of the Sea with the corridors and to create a truly maritime dimension of the TEN-T. The upcoming revision of the TEN-T Regulation will be a great opportunity to rethink and reshape the maritime dimension of the TEN-T. For me, MoS needs to be part of an overarching concept of the TEN-T, covering ports and shipping for the benefit of the entire

[1] Based on Eurostat maritime transport data.
[2] https://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_ports_freight_and_passenger_statistics

European Maritime Space. It also needs to place more emphasis on its role in being an integral part of the entire transport chain (e.g. sea-bound and hinterland connection of ports).

In view of a better integration of Motorways of the Sea with the core network corridors (CNC), I will continue to strive for a more region-by-region approach with a specific view per sea-basin. This is why I organised (and will continue to organise) a series of joint working groups per sea-basin with my colleagues, the European Coordinators of the corridors. Bringing together the corridors with MoS contributes to a better understanding for all stakeholders of the interlinkages between the sea and the hinterland access of our European maritime ports. It also helps to identify the specific challenges and opportunities of each sea-basin and thus set more tailored priorities.

In terms of thematic priorities, my present work plan for Motorways of the Sea clearly addresses the challenges of the maritime sector today. These are, most importantly, the greening of the maritime sector as well as the digitalisation of ports and shipping. MoS largely supported those goals in the past. Indeed, the CEF I funded 50 MoS projects with EUR 430.5 million. More than half of it addressed the greening of the maritime sector.

As a result of a close cooperation and dialogue with Member States and the wider maritime community, as well as a sound analysis of transport data, legislative drivers and emerging trends, I am hereby proposing the following three thematic pillars which focus around the development of a **sustainable, seamless and smart European Maritime Space**:

- The first pillar for a ***sustainable*** European Maritime Space addresses the objectives of fighting climate change and improving air and water quality. Under this pillar, I strongly advocate for investments in decarbonisation, e.g. looking into all types of promising alternative and in particular non-fossil fuels, onshore power supply, innovation in propulsion systems as well as the use of eco-incentives.
- The second pillar underlines the need to ensure ***seamless*** maritime transport by improving multimodal connectivity, in terms of better connections with the corridors and better links with outermost regions, islands and neighbouring countries.
- Under the third pillar, I recommend pushing for a ***smart*** European Maritime Space, through the improved adoption of digital tools throughout the industry, such as the digitalisation of trade lanes, interoperable data sharing or Sea Traffic Management (STM).

All three pillars are of course closely interrelated and have strong synergies between them.

To meet the challenges of the sector and to properly address the objectives of these three pillars, significant investments are needed which cannot possibly be met by grant financing alone. This is why I also call upon all stakeholders to embrace the opportunities of sustainable finance. This Detailed Implementation Plan (DIP) presents a first set of innovative financial instruments, based on the results of a first thematic seminar that I organised on "Financing MoS". In the upcoming months I will further deepen this issue and also enter into a more structured dialogue with finance institutions and (private) investors in order to grasp all opportunities for our maritime sector. It goes without saying that I will also continue to strongly advocate for a CEF II budget which attributes a fair share for maritime and MoS investments.

Europe has the opportunity to become a leading example with regard to a more sustainable shipping and ports sector. The TEN-T, and in particular Motorways of the Sea, can certainly help in this respect. The present DIP comes at a time of great opportunity since the TEN-T revision is about to be launched and the multi-annual work programme for CEF II is to be designed. I therefore hope that this document becomes a reference point for future political priorities under TEN-T as well as for funding priorities of the next CEF 2021-2027.

On a final but important note, I wish to underline that the present plan was prepared as of November 2019 and was presented for consultation in mid-February 2020. Since then, the world has been profoundly affected by the **Covid-19 crisis** which has had a significant impact on our lives, our health systems and our economies. The transport industry has been heavily impacted by measures to contain the pandemic. Continuity of service has been ensured by transport workers under difficult conditions, showing their critical function in serving the population's basic needs. The transport sector will also be crucial in supporting the economic recovery. This counts in particular for the shipping and ports' sector, with cruise, ferry, ro-pax and pax operators being hardest hit.

However, we know so far only part of the catastrophic effects on people and economies. It is indeed too early at this stage to undertake a thorough analysis in the present work plan on how the maritime sector is and still will be affected by the crisis, and to draw conclusions on what kind of measures need to be taken to adequately recover.

Therefore, I propose that I will start over the next weeks an initial analysis with all the Member States and relevant stakeholders of the maritime sector. The aim would be to gather your views and opinion on the future possible reorientation of the priorities of my work plan in view of the Covid-19 crisis. Indeed, the Motorways of the Sea DIP will anyhow see a further revision by the end of 2021, which comes also very timely in view of the expected TEN-T revision proposal from the European Commission planned for Summer 2021.

In light of all these developments it will be necessary to have a fresh look at the Motorways of the Sea's future. The process does therefore certainly not conclude with the submission of this present DIP. Instead, I see it as the launch of an interesting debate and journey that I would like to invite you all to join me on. Only together can we create the conditions for a sustainable, smart and seamless European Maritime Space, able to face the challenges of today's economy and environment to the benefit of European citizens and businesses. Without a well-functioning Motorways of the Sea network, we cannot achieve an integrated, fully-fledged and effective TEN-T system. Our challenge will be to turn this ambition into reality. The joint interest of all Member States and relevant stakeholders is the crucial driving force behind this plan.

I count on your engagement and thank you for your continuous efforts!

Prof. Kurt Bodewig

European Coordinator
for Motorways of the Sea

Executive Summary

The Motorways of the Sea programme (MoS), with its focus on short sea shipping routes, maritime links and associated maritime infrastructures such as hinterland connections, equipment, facilities and relevant administrative formalities, is the maritime pillar of the trans-European transport network (TEN-T) and its related funding instrument, the Connecting Europe Facility (CEF). It builds on the core and comprehensive network of European ports and logistics centres as well as on the TEN-T core network corridors. As such, MoS is very well placed to support the European shipping industry and ports. The programme prioritises the full integration of maritime transport operations in the logistic chain. In doing so, it also helps concentrate freight flows on sea-based routes, thus reducing road congestion, as well as increasing connectivity among Member States.

The maritime transport sector is of great importance in Europe. In 2018, the 335 ports of the TEN-T core and comprehensive networks handled 3.8 billion tonnes of cargo in total[3] (including deep sea traffic). Almost three quarters of this volume were handled in one of the 84 core network corridor (CNC) ports, demonstrating the strong interconnection of the maritime ports on the TEN-T. More importantly, out of the global cargo handled by EU TEN-T ports, two thirds (or 2.5 billion tonnes[4]) were related to short sea shipping, clearly demonstrating its importance in Europe.

This Detailed Implementation Plan (DIP) therefore seeks to continue the further development of a well-functioning and sustainable short sea shipping sector in Europe, with two main strategic objectives in mind: ensuring a **better integration of MoS within the wider TEN-T policy** and **widening the financing possibilities for MoS projects**.

The previous MoS European Coordinator defined three main development pillars which relate to a) Environment, b) Integration within the logistics chain and c) Safety/Traffic Management/Human Element. The present European Coordinator for MoS took these three pillars as the starting point of his analysis.

Taking into consideration current trends and (new) legislative drivers of the maritime sector as well as the strategic objectives of the European Coordinator, the three pillars have been reshaped into the overall objective of **creating a European Maritime Space** that is: **Sustainable, Seamless, Smart**.

In other words, MoS shall be integrated in the overall TEN-T policy and better linked with the priorities of the maritime ports' sector. The "European Maritime Space" would thus become the maritime pillar of the TEN-T network which connects and integrates the corridors, and more widely the TEN-T ports' network, through the upgrade of short sea shipping routes and the development of maritime ports and their hinterland connections. The European Maritime Space would provide for an efficient, viable and sustainable integration with the other modes of transport.

Next to it, regional particularities, challenges and opportunities need to be taken into consideration when developing the European Maritime Space. This is why a region-by-region approach for the new maritime pillar of the TEN-T has been proposed. Six major sea basins can be distinguished in Europe: the Baltic Sea, the North Sea, the Atlantic Sea, the Western and the Eastern Mediterranean Sea and the Black Sea. These sea basins are all characterised by a more intensive exchange within them than between basins, though they are, of course, interconnected among each other. In addition, there are TEN-T maritime ports in the EU's outermost regions (e.g. Azores, Madeira, the Canary Islands, Guadeloupe, Martinique, Reunion Island and French Guiana).

[3] https://ec.europa.eu/eurostat/statistics-explained/index.php?title=Maritime_transport_of_goods_-_quarterly_data&oldid=465991
[4] Based on Eurostat maritime transport database.

Various emerging trends driven by i.a. political objectives of the new European Commission, legislative initiatives and other legal acts at EU and international level, as well as practices stemming from the maritime industry, affect the development of the European Maritime Space and Motorways of the Sea projects. First, population growth and demographic changes are shifting the economic situation globally. Secondly, there is a strong impetus for the development of sustainable policies to counter climate change and its effects. Thirdly, major technological developments such as the ever-increasing penetration of digitalisation in all aspects of our lives and the development of automation are both an opportunity and a challenge for the future of the shipping sector. Finally, increased expectations for safety, in terms of new shipping lanes or mitigating cybersecurity risks, also play a role in shaping the future of the maritime sector.

Based on these trends and the long-term vision of European short sea shipping as a sustainable, carbon-free transport mode fully integrated in the TEN-T network, the current and future steps have been spelled out in this Detailed Implementation Plan (DIP). In addition, the state of adequacy is what is used in this DIP to measure what a sustainable, seamless and smart European Maritime Space would look like and the investment needed to reach those objectives. By comparing the status quo with targets, one can see where we stand today: the current '*degree of adequacy*' of European short sea shipping and the gap towards a vision of the adequate state, developed in cooperation with stakeholders and experts. This DIP looks at these gaps and identifies the total investment costs needed to move from the status quo to the adequate state.

Firstly, efforts are required to reduce carbon emissions, in particular through improving ship propulsion systems. It is estimated that the development of new engine types and pilot vessels as well as retrofitting of old vessels will require over EUR 1.5 billion in investment. In addition to that, European researchers must contribute to the research for carbon-free fuel types compatible with the needs of long-distance shipping. Indeed, various alternative fuels are currently being researched and tested in order to provide a sustainable long-term alternative to the transitionary solution of LNG, such as hydrogen, ammonia, ethanol and methanol.

Secondly, a better integration within the logistics chain will require improvements both in terms of ports' physical infrastructure (cargo handling, terminals…) and their hinterland connections, to ensure a smooth transit between them and the core network corridors. While most of these investment needs are related to deep sea shipping and not counted here, it is estimated that between EUR 400 million and 1 billion in investment will be required for infrastructure related to short sea shipping alone.

Finally, developing physical infrastructure for digital services in order to enable the streamlining and digitalisation of procedures will require more than EUR 335 million in investment, both to upgrade existing infrastructure and fully develop interoperable new ones.

Previously, over the 2008-2013 period, under the TEN-T programme, 44 MoS projects were financed, generating over EUR 1.2 billion in investment, of which the EU contributed EUR 281.9 million. Under the current CEF programme (2014-2020), 50 MoS Actions were financed for a total of EUR 430.5 million of grant financing, making the Motorways of the Sea funding priority the most important instrument in financing maritime interventions in maritime ports, European vessels, hinterland services and other economic actors.

Given the significant investments required to develop a more sustainable maritime sector, supplementary sources to public financing are necessary. For this reason, one of the main objectives of this DIP is to identify a wide range of innovative financial schemes to pursue the development of the European Maritime Space. Collecting information from a wide range of sources, from thematic seminars and conferences to interaction with stakeholders, public and financial institutions, a wide range of financial instruments were identified. Firstly, the Connecting Europe Facility remains one of the key tools for the development of

Motorways of the Sea projects. Other instruments and mechanisms, such as green shipping initiatives, Horizon Europe and InvestEU were also established to have a strong impact on the development of projects.

Following the findings of the study on which this DIP is based, and the numerous stakeholder consultations undertaken by the European Coordinator, the following general conclusions can be drawn:

- It is fundamental that the importance of Motorways of the Sea as the "maritime dimension" of the TEN-T is well reflected in the upcoming revision of the TEN-T Regulation. In that optic, reinforcing the connectivity with core network corridors and adopting a more regional sea-basin approach is key to clarifying the role of MoS alongside the specificities of other European corridors.
- To ensure a sustainable European Maritime Space, the development of *sustainable freight transport services*[5] and the transition to non-fossil fuels should be accelerated. In addition, MoS and short sea shipping more generally should ensure the accessibility and the connectivity of and within the EU and should foster modal shift from road to sea.
- To ensure a seamless European Maritime Space, there needs to be an emphasis on ensuring smooth multimodal transport by fostering modal shift and promoting investments in connections to the hinterland, especially last-mile connections by rail and inland waterways, and road when necessary. In the spirit of a better alignment with the core network corridors, integrating maritime transport into the core network corridors at the nodes should continue to be a priority. In addition, comprehensive ports can play an essential function by offering alternatives in a door-to-door flow logic, in particular in terms of reducing the negative externalities of the creation of congested areas.
- To ensure a smart European Maritime Space, the adoption of digital tools throughout the industry, such as the digitalisation of trade lanes, interoperable data sharing or Sea Traffic Management, needs to be fostered.
- A coherent mix of public funding and private financing remains the way forward for a successful completion of the TEN-T network. Equally, grant support needs to be focused on the projects of highest European added value. While leveraging private funding is crucial to maintaining and improving transport infrastructure in Europe, it is important to note that MoS needs financial incentives via grants to attract private financing. Indeed, financing gaps that cannot easily be filled by other means require MoS grants. As a result, a robust financial framework has to be secured in the next multi-annual financial framework 2021-2027.

The upcoming revision of the TEN-T Regulation is a valuable opportunity that can help better integrate the Motorways of the Sea programme in the wider TEN-T and thus to promote it as the horizontal priority of the TEN-T network. Reshaping MoS into a "European Maritime Space" covering both ports and shipping can provide a good solution to ensuring relevant developments in the EU transport policies concerning environment, climate protection, energy, digitalisation, health and social issues, are fully taken into account. As environmental challenges hold high importance on the international and the EU's agenda, MoS has a real opportunity to strengthen the TEN-T's objective to enable a sustainable, safe, smart and efficient transport network. It will also provide appropriate solutions to shift the focus to supporting efficient and sustainable mobility, including smart and carbon free transportation.

[5] Article 32 of the TEN-T Regulation

1 Towards an updated Motorways of the Sea Detailed Implementation Plan

In international trade, no transport sector is as critical as the maritime sector. Roughly 80% of all goods are transported by sea[6], and in terms of tonnes per kilometre travelled, shipping is the most efficient and cost-effective transport mode. EU-owned ships represent 41% of the global merchant fleet[7] and trade on all oceans, serving markets all over the world. Furthermore, with its large network of 335 ports, the European maritime sector is also considered central to ensuring smooth and efficient flow of external trade in and out of the European Union, as well as connecting the mainland to Europe's peripheral regions and islands.

The maritime transport sector also forms a big part of the intra-European transport system, facilitating and redistributing trade flows from land-based route networks, while contributing to the efforts to reduce the overall external environmental and social costs from transport. Short sea shipping, in the EU's definition, is the maritime transport of goods over short distances. In the EU, it accounts for around 65% of all cargo transiting through EU ports, or 2.5 billion tonnes of cargo[8], and more than 400 million passengers embarking or disembarking from European ports each year[9]. Although there is already a notable and steady growth in the use of short sea shipping routes, quicker expansion and reinforcement of short sea shipping would strongly contribute to the competitiveness and sustainability of the EU transport and logistics chain.

The Motorways of the Sea programme (MoS), with its focus on short sea routes, maritime links, port infrastructure and associated infrastructures such as hinterland connections, equipment, facilities and relevant administrative formalities, is very well placed to support the European short sea shipping industry and ports. The programme prioritises the full integration of maritime transport operations in the logistic chain. In doing so, it helps concentrating freight flow on sea-based routes, often diverting flows from their land-based counterparts and reducing road congestion, as well as increasing connectivity among Member States through the establishment or the upgrading of intermodal sea-land combined services.

Motorways of the Sea is the maritime pillar of the Connecting Europe Facility (CEF). It builds on the core and comprehensive networks of European ports and logistics centres, as well as on the trans-European transport network (TEN-T) core network corridors. Aiming at boosting trade growth, MoS also ensures the maritime sector is on par with the latest technological and environmental developments. Over the 2008-2018 period, 94 MoS projects were financed, with a total EU participation of EUR 717.2 million[10]. Building on these accomplishments, the European Coordinator for MoS, Prof. Kurt Bodewig, through this Detailed Implementation Plan (DIP), seeks to continue the implementation of a well-functioning short sea shipping sector and an overall "European Maritime Space"[11], with two major objectives in mind.

The first objective is to ensure a better integration of MoS as a horizontal priority in the wider TEN-T policy, and in particular, a better alignment with the core network corridors (CNC). This is to be done through a more regional approach and a better cooperation with the CNCs, both in terms of activities and studies.

[6] https://unctad.org/en/Pages/Publications/Review-of-Maritime-Transport-(Series).aspx
[7] https://stats.unctad.org/handbook/MaritimeTransport/MerchantFleet.html
[8] Based on Eurostat maritime transport data.
[9] https://ec.europa.eu/eurostat/statistics-explained/index.php/Maritime_transport_statistics_-_short_sea_shipping_of_goods
[10] INEA presentation MoS Forum March 2019
[11] As per Article 21 of Regulation (EU) 1315/2013

The second goal is to widen the financing possibilities for MoS and to embrace the opportunities presented by innovative financial schemes, by providing a detailed analysis of financing and funding opportunities.

The Motorways of the Sea Detailed Implementation Plan (DIP) of April 2018 by the previous European MoS Coordinator, Brian Simpson, defined three pillars: a) Environment, b) Integration of maritime transport in the logistic chain and c) Safety / traffic management / human element. Although these three pillars remain valid, the revision of the MoS DIP 2020 goes into further detail and reshapes these pillars, taking into account the evolution of the political, technological and economic considerations.

In terms methodology, the reshaping of the three pillars was based on the revised MoS study according to the latest data and developments available, each section of the study feeding into the different chapters of this DIP. The analysis was conducted keeping in mind the objective of better alignment with the wider TEN-T policy. Firstly, the study analysed emerging topics and trends that include a policy or financial intervention (such as the EU's ambition to become carbon neutral by 2050, the increasing size of ships, the development of digitalisation) (Chapter 3). Secondly, an analysis of the overall situation of short sea shipping in Europe was conducted (Chapter 2 and 4), in order to identify the investment needs in the current conjuncture (Chapter 5). These needs were analysed with regards to port infrastructure, port and shipping operations and further integration / alignment with core network corridors, assessing in particular the current corridor work plans. Based on this analysis, the study classified future investment needs by level of priority, and identified innovative financial tools to sustain these needs (Chapter 6). A clear focus has been put on CNC ports and their respective connections; the role of comprehensive ports will be further addressed in light of the revision of this DIP in 2021 in coherence with the revision of the TEN-T Regulation.

Further information to complement the DIP was gathered through extensive data analysis, discussions with EU institutions, the Member States, stakeholders, and other TEN-T corridor coordinators. In addition, much input was gathered from several conferences and seminars on the issue.

Last but not least, the findings of the European Court of Auditors' report on maritime transport in the EU[12] were also taken into consideration when drawing up the policy recommendations and conclusions in this MoS DIP.

This Detailed Implementation Plan comes at a time of great opportunity for the Motorways of the Sea programme. The TEN-T policy is currently under review, and its upcoming revision is thus a chance for MoS to become part of an overarching concept of the TEN-T covering ports and shipping for the benefit of an integrated "European Maritime Space".

Indeed, rather than being solely a functional maritime junction between the ports of the core network corridor, Motorways of the Sea can take on a larger role in the TEN-T policy. It can become a tool to truly establish a "European maritime transport space without barriers"[13], through the integration of entire transport flows (for example by enabling hinterland connection of ports as well as sea-bound transport).

The three pillars of the DIP have therefore been reshaped and sharpened to reflect the objectives of the TEN-T review: ensure a sustainable, safe, smart and efficient transport system. Furthermore, in the spirit of better integration with the wider TEN-T policy, the priorities of MoS have also been more closely aligned with those of the core network corridors, notably through a sea basin approach. Finally, the evolving legislative drivers and emerging trends in the maritime sector also impacted the definition of the pillars.

[12] European Court of Auditors, Special Report No 23/2016
[13] Article 21 of Regulation (EU) No 1315/2013

Based on all these findings, the three pillars have been re-oriented towards the sustainability and efficacy of the **European Maritime Space**.

As a result, the new pillars are:

1. **Sustainable**: putting emphasis on reduction of GHG emissions and pollution of both air and water;
2. **Seamless**: enhancing the connectivity with the whole TEN-T network and the CNCs in particular, other transport modes, peripheral and outermost regions, islands and European neighbourhood countries;
3. **Smart**: aligning maritime with the European digital agenda, with attention being paid to navigational safety and automation, while maintaining the need to protect and promote the potential of human capital.

The Motorways of the Sea Programme is key to maintaining an integrated, competitive and sustainable short sea shipping network within the EU. This Detailed Implementation Plan presents a number of recommendations under the three pillars to shape the MoS programme of tomorrow.

2 Characteristics of Motorways of the Sea

2.1 Motorways of the Sea – the maritime dimension of the Trans-European Transport Network

The Motorways of the Sea represent the waterborne dimension of the TEN-T network. Its programme is funded by the Connecting Europe Facility (CEF). In other words, funding allocated to projects under the Motorways of the Sea funding programme support maritime industry stakeholders (ports, ship and logistics operators, maritime suppliers and service providers, and public administrations) in implementing projects that seek to develop maritime transport and maintain a viable EU maritime sector. This includes projects looking at improving connectivity between core and comprehensive ports of the TEN-T network and land-based core network corridors, optimising cargo flows, and improving the environmental performance of the sector. Through these projects, MoS also seeks to support projects bridging access to the various European sea basins.

The legal basis for the MoS funding programme is contained in Article 21 of the TEN-T Regulation (EU) 1315/2013, where it is established that MoS, inter alia:

(1)… shall contribute towards the achievement of a European maritime transport space without barriers. They shall consist of short-sea shipping routes, ports, associated maritime infrastructure and equipment, and facilities as well as simplified administrative formalities enabling short-sea shipping or sea-river services to operate between at least two ports, including hinterland connections (...),

(3) Projects of common interest (...) may also include activities that have wider benefits and are not linked to specific ports, such as services and actions to support the mobility of persons and goods, activities for improving environmental performance (...). Under the current TEN-T Regulation, two main types of projects can receive funding under Motorways of the Sea:

- projects to support new or upgraded maritime links, i.e. a serviced route between two core ports or between one core and one comprehensive ports;
- projects with wider benefits, i.e. projects and studies not linked to a specific maritime link that benefit the wider maritime community.

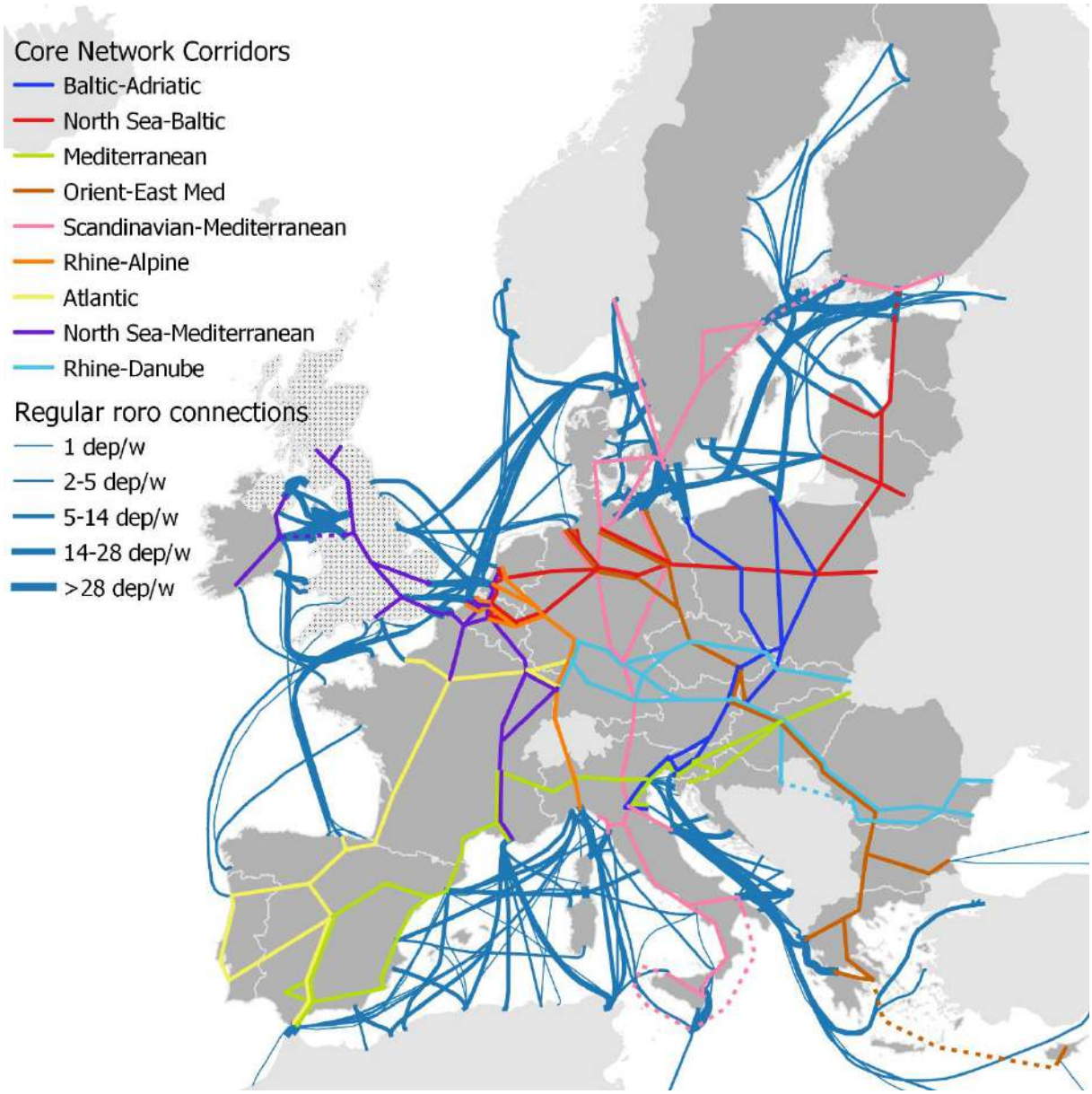
The TEN-T Regulation is coming up for revision in 2020/2021 which may lead to a change in certain definitions and concepts, however, for now, the above articles are still valid.

In order to assess the characteristics of MoS activities, this DIP looks at the structure of each region according to a sea basin approach, allowing for a more detailed prioritisation of issues according to common challenges and opportunities. Furthermore, it should be noted that this DIP has a clear focus on the movement of freight given the importance of freight for the TEN-T network in terms of traffic flows, and the associated investments needed to improve such flows (intermodal terminals, rail/IWW infrastructure, etc.). Nevertheless, ro-ro connections with a focus on private passenger cars as well as ro-pax connections have been included in the analysis of maritime connections in chapter 2.2. The role of passenger transport should be further explored in the updated Detailed Implementation Plan in 2021.

2.2 Structure of maritime traffic in European sea basins

In 2018, the 335 ports of the TEN-T core and comprehensive networks[14] handled 3.8 billion tonnes of cargo (see Table 1). Almost three quarters of this volume were handled in the 84 core network corridor (CNC) ports.

Figure 1 European Core Network Corridors and ro-ro shipping routes



Note: ro-ro shipping routes exclude regular car carriers (client contracts rather than free ro-ro capacity)
Source: MoS study consortium

[14] see Regulation (EU) No 1315/2013

Six major sea basins can be distinguished in Europe: the Baltic Sea, the North Sea, the Atlantic, the Western and the Eastern Mediterranean, and the Black Sea. These sea basins are all characterised by a more intensive exchange within than between basins, though they are, of course, interconnected among each other. In addition, there are maritime ports in the EU's outermost regions (e.g. Azores, Madeira, the Canary Islands, Guadeloupe, Martinique, Reunion Island and French Guiana). Out of the total 3.8 billion tonnes handled in 2018, almost two thirds were related to short sea traffic. Short sea shipping (including feeder traffic) had a particularly high share in the Baltic Sea, the Eastern Mediterranean and the Black Sea.

The largest volume of cargo is handled in the North Sea basin. Its 20 CNC ports handle 1.4 billion tonnes per year, equal to more than one third of the total EU maritime traffic. It is followed by the Western Mediterranean (around 500 million tonnes) and the Baltic Sea (around 350 million tonnes). The Atlantic basin has the largest volume handled in core ports which are not part of the core network corridors. Taken together, all Atlantic core ports actually handled around 360 million tonnes.

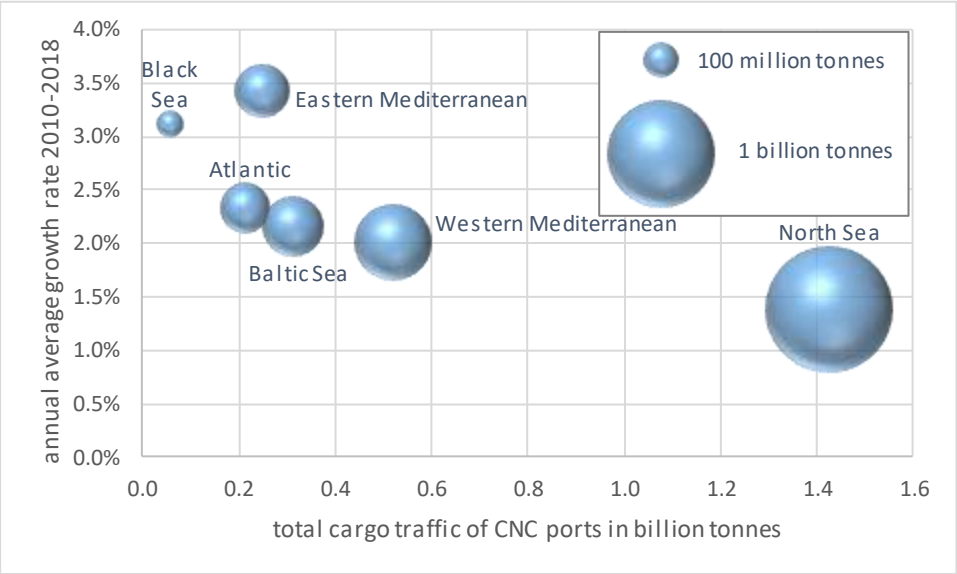
Table 1 Maritime cargo traffic by major sea basins, 2018

	Total cargo volume handled (mln tonnes)				*of which short sea*	
sea basin	CNC ports	other core ports	comprehensive ports	Total	*million tonnes*	*share of total*
Baltic Sea	355	16	183	554	*470*	*(85%)*
North Sea	1.386	89	118	1.593	*912*	*(57%)*
of which UK	*167*	*89*	*58*	*314*	*232*	*(74%)*
Atlantic	213	154	109	477	*287*	*(60%)*
of which UK	*61*	*44*	*41*	*146*	*106*	*(72%)*
Western Mediterranean	522	45	144	712	*477*	*(67%)*
Eastern Mediterranean	249	0	55	305	*225*	*(74%)*
Black Sea	58	0	12	69	*51*	*(74%)*
Outermost regions	0	29	14	43	*26*	*(61%)*
Total EU maritime ports	3.011	466	735	4.213	*2.786*	*(58%)*
of which short sea	*1.734*	*216*	*500*	*2.449*		
	(58%)	*(46%)*	*(68%)*	*(58%)*		

Note: UK ports are no longer part of the TEN-T network after the UK left the EU. The presented figures are for 2018, hence still including the UK.
Source: ISL based on Eurostat, 2019

The Eastern Mediterranean (around 250 million tonnes) and the Black Sea (around 60 million tonnes) are the regions with the smallest absolute volumes, but they have also been the fastest-growing basins with 3.4% and 3.1% average annual growth between 2010 and 2018, respectively. During the same period, the EU average was 1.9%.

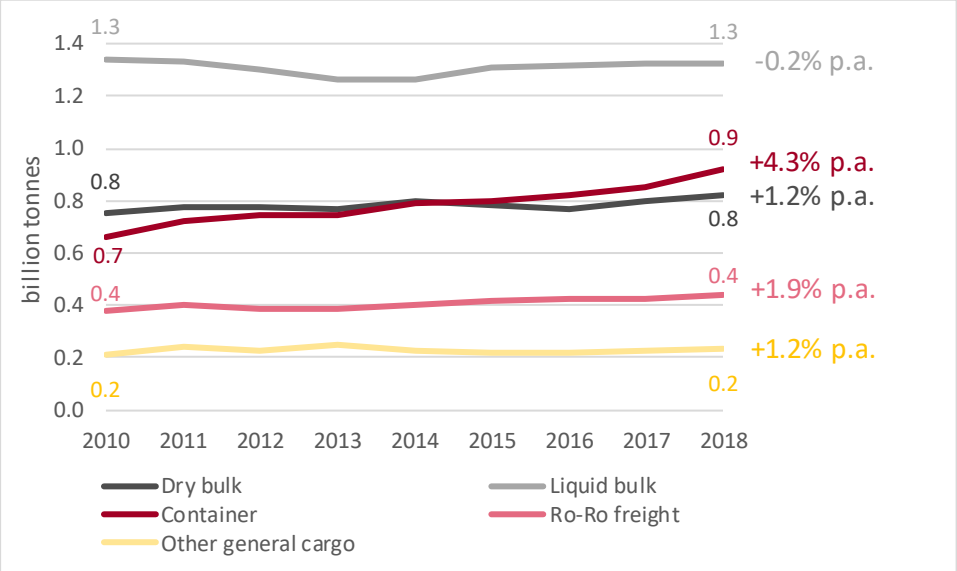
Figure 2 Average annual growth of CNC ports by sea basins, 2010-2018



Note: Based on CNC ports
Source: ISL based on Eurostat, 2019

The most important cargo types – in terms of tonnes handled – are liquid bulk (1.3 billion tonnes handled in EU ports in 2018), container (0.9 billion tonnes) and dry bulk (0.8 billion tonnes). During the post-crisis years 2010-2018, unitised traffic showed the strongest growth. Container traffic grew by 4.3% per year on average and Ro-Ro freight traffic by 1.9% per year. Liquid bulk traffic actually decreased slightly.

Figure 3 Cargo traffic of major European seaports by cargo type, 2010-2018



Note: growth rates indicated average annual growth between 2010 and 2018; based on 258 major ports handling 99.6% of total maritime traffic.
Source: ISL based on Eurostat, 2019

There are several dozen regular short sea links between the different sea basins and hence between different parts of the European TEN-T Network. Broadly speaking, two types of short sea shipping services can be distinguished: those bridging straits or connecting islands (e.g. across the Fehmarn Belt, the Strait of Gibraltar or the English Channel) and long-distance services along coastal lines that form an alternative to parallel land-based routes. The former are sometimes part of a core network corridor (e.g. the connection between South Italy and Malta), while the latter connect different corridors (e.g. services in the Western Mediterranean between Italy and Spain) or run in parallel to such corridors (e.g. North Sea-Baltic or Atlantic coastal services).

Despite a relatively small number of direct deep-sea services, the Baltic Sea and the Black Sea strongly rely on short sea connections with the North Sea and the Mediterranean Sea, respectively. In the North, there is an extensive exchange between the North Sea and the Baltic Sea – more than between any other pair of basins in Europe. In early 2019, there were around 60 regular short sea container services and almost 40 regular ro-ro services between these two seas.[15] In the South, the Black Sea is connected to the Mediterranean with around 20 short sea container services and five ro-ro services (excluding car carriers). The Atlantic Coast provides around 50 regular container and ro-ro connections with the outermost regions, particularly with the Azores, Madeira, the Canary Islands and the French Caribbean.

In order to fully develop the potential of Motorways of the Seas, the role of each basin and its maritime ports has to be acknowledged. The relevant traffic structures in each sea basin are highlighted below.

2.2.1 Baltic Sea

Four core network corridors connect the Baltic Sea[16] with the European hinterland. Two corridors start in ports of the southern coast (Northeast Germany and North Poland) and move southwards (Orient-East Med and Baltic-Adriatic). The Baltic Sea ports connect them with Sweden and Denmark through a dense network of ro-ro services and with other Baltic Sea countries through ro-ro and container services, including the non-EU countries Norway and Russia.

Further to the West, the Scandinavian-Mediterranean Corridor connects to the ports of Lübeck and Rostock with the continental European hinterland. Unlike Orient-East Med and Baltic-Adriatic, the corridor continues to Denmark, Sweden and Finland.[17] This part of the corridor is hence in parallel to several ferry routes between the German Baltic Sea ports on the one hand and Denmark, Sweden and Norway on the other hand. The current land route via Jutland and the Öresund between Copenhagen and Malmö is actually mostly used for direct block trains, while most of the cargo travels in trucks, trailers and rail waggons on one of the ferry routes. There is hence competition between the land and maritime routes, but also the possibility for forwarders to prepare synchromodal offers – especially after the opening of the Fehmarn Belt fixed link that will make land-based transport more attractive. For transport between Sweden and Finland, the Scandinavian-Mediterranean Corridor actually includes a short sea link (Stockholm-Turku).

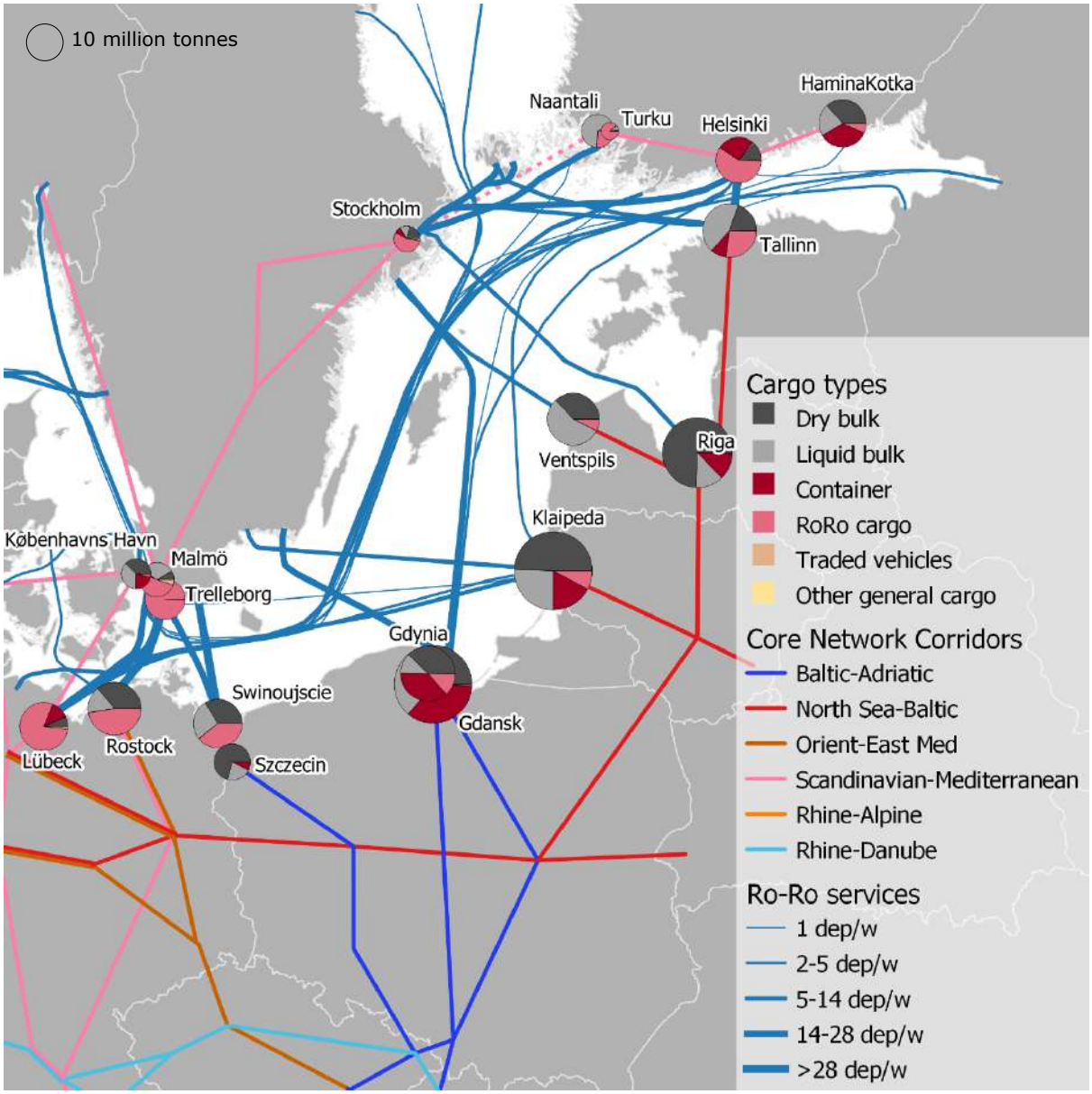
The North Sea-Baltic Corridor stretches along the southern and eastern coast of the Baltic Sea, crossing Germany, Poland, Lithuania, Latvia, Estonia and Finland. Here again, there is a parallel maritime route from Belgian, Dutch and German CNC ports to the Baltic States and Finland. The maritime route takes more time but is considerably cheaper than the

[15] Regular services are services that sail with a regular schedule. Container services normally have one departure per week or more, ro-ro services often have much higher frequencies.
[16] including Great Belt, Little Belt and Öresund
[17] It includes the Fehmarn Belt connection between Puttgarden and Rödby, which is currently operated by one ferry operator offering more than 40 departures per day. It will be complemented by the Fehmarn Belt tunnel in the mid-2020s.

land-based route (mostly truck traffic due to the lack of regular rail services). The northernmost section of the corridor is the ro-ro link between Tallinn and Helsinki.

Besides the links on or in parallel to CNCs, there are various maritime links between CNCs, e.g. Swinoujscie (Baltic-Adriatic) and Trelleborg (Scandinavian-Mediterranean) or between Riga (North Sea-Baltic) and Stockholm (Scandinavian-Mediterranean). Due to their geographical location, maritime transport is particularly important for Lithuania, Latvia, Estonia and Finland for connecting with other EU markets.

Figure 4 Core network Corridor ports and regular ro-ro services in the Baltic Sea basin, 2018



Note: ro-ro shipping routes exclude regular car carriers for traded vehicles (client contracts without free ro-ro capacity for external cargo);
only ro-ro services calling in one of the CNC ports of the Baltic Sea basin are included
Source: ISL, 2019

In addition, there is a strong interchange between the North Sea and the Baltic Sea. All Baltic Sea CNC ports have regular container and/or ro-ro connections with ports in the North Sea. Container traffic has a much higher share as hub ports in the North Range have a dense feeder network related to transhipment of deep-sea traffic. However, these services also transport intra-European short sea traffic, particularly on the longer distances (e.g. Finland). Some core ports (e.g. Gothenburg, Aarhus or Gdansk) also have direct deep-sea container services.

There are nineteen CNC ports in the Baltic Sea area, handling a wide variety of cargo types (see Table 2). Five ports handle more than 20 million tonnes, all with a strong focus on bulk traffic. The port of Trelleborg stands out with its strong specialisation on ro-ro traffic. It connects the Scandinavian-Mediterranean Corridor with the Orient-East Med Corridor (Rostock) and the Baltic-Adriatic Corridor (Swinoujscie).

Table 2 Maritime cargo traffic of CNC ports in the Baltic Sea by cargo type, 2018

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	**million tonnes**	av. annual growth 2008-2018
Denmark							
København	36%	35%	20%	4%	5%	6,4	-1,2%
Sweden							
Göteborg	0%	58%	17%	22%	3%	40,6	-0,4%
Malmö	8%	31%	2%	50%	9%	8,3	-2,8%
Trelleborg	0%	0%	0%	99%	0%	11,2	-1,0%
Stockholm	19%	11%	8%	50%	13%	4,9	0,8%
Finland							
Naantali	9%	65%	0%	26%	1%	7,8	-1,1%
Turku	2%	7%	1%	71%	20%	2,2	-4,0%
Helsinki	12%	1%	25%	55%	8%	14,7	2,2%
Hamina/Kotka	29%	18%	28%	5%	20%	15,9	-0,2%
Estionia							
Tallinn	19%	42%	9%	26%	3%	20,4	-3,5%
Latvia							
Rīga	68%	12%	11%	0%	9%	34,4	1,9%
Ventspils	36%	54%	0%	7%	3%	19,2	-3,5%
Lithuania							
Klaipėda	46%	24%	16%	7%	6%	42,8	4,6%
Poland							
Gdańsk	26%	37%	34%	1%	2%	42,4	9,5%
Gdynia	34%	11%	33%	12%	11%	21,0	5,0%
Świnoujście	33%	26%	0%	38%	2%	16,8	6,6%
Szczecin	50%	15%	5%	0%	30%	9,4	1,9%
Germany							
Rostock	33%	15%	0%	43%	10%	19,6	-0,8%
Lübeck	6%	0%	12%	76%	6%	16,5	-2,5%
Total Baltic Sea CNC ports	28%	27%	15%	22%	7%	354,7	1,1%

Source: ISL based on Eurostat, 2019

2.2.2 North Sea

With 1.4 billion tonnes handled in 2018, the North Sea[18] core network corridor ports are by far the busiest group among the six sea basins. They represent more than half of the total CNC port traffic of the EU.

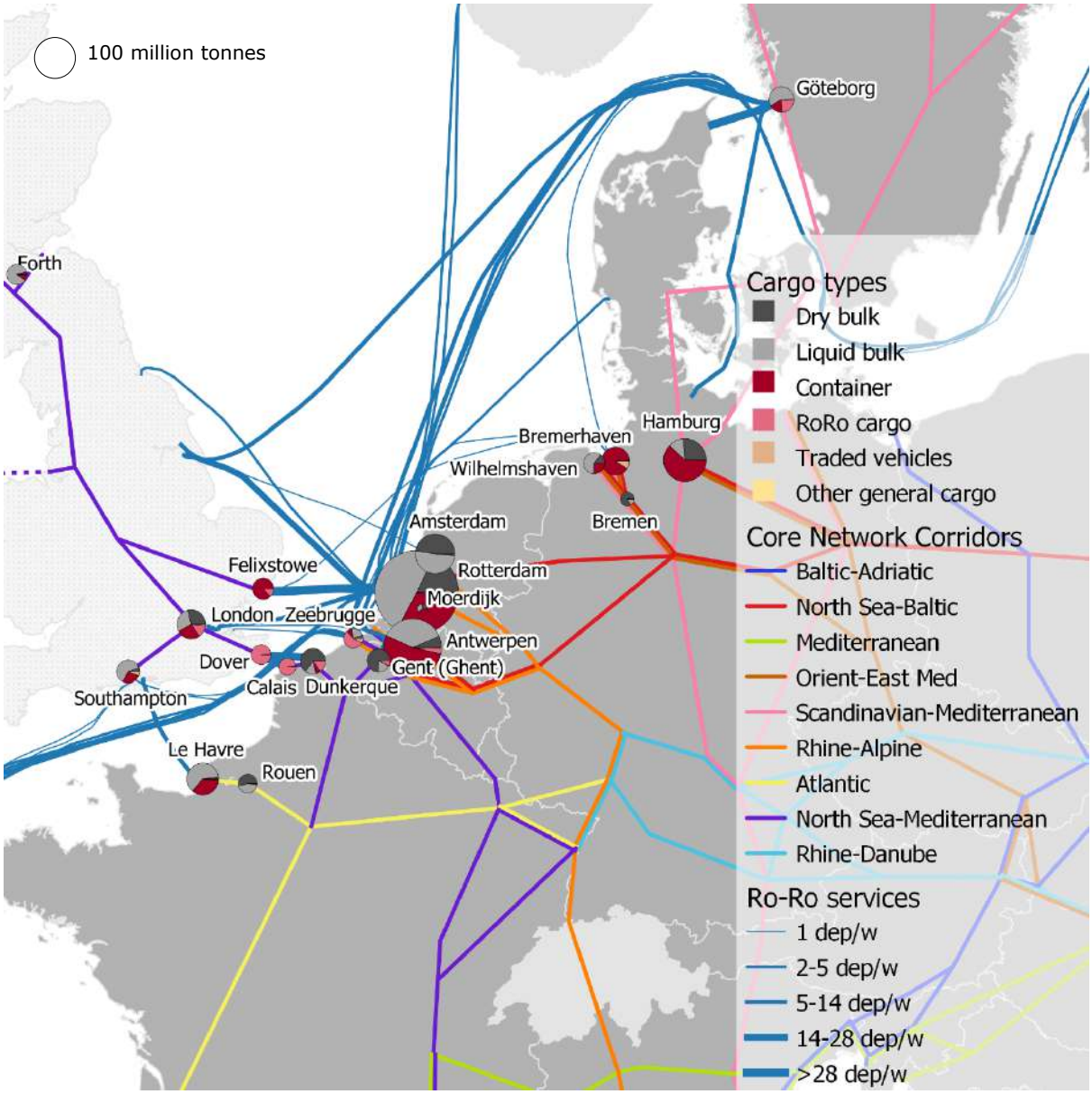
Six core network corridors connect the North Sea ports with their hinterland. Most of them – the North Sea-Mediterranean, the Rhine-Alpine, the Scandinavian-Mediterranean and the Orient-East Med Corridors – are North-South corridors and hence important hinterland connections of the North Sea ports. The Scandinavian-Mediterranean Corridor marks the eastern end of the North Sea and is the only one connecting Sweden (and also Norway) with the main continent. There are parallel maritime connections, but mostly from Baltic Sea ports (see 2.2.1). The North Sea-Mediterranean Corridor marks the western end and connects Great Britain and Ireland with the continent. It includes Europe's busiest ro-ro route, namely Dover-Calais, and also Dover-Dunkerque.

While it is not clear yet how Brexit will change traffic flows on these links after the transitional period, it is already clear that the busiest ro-ro routes in the area will become connections with a neighbouring country rather than links on an intra-EU Core Network Corridor. An intensification of direct links between the continent and Ireland (see 2.2.3) could shift away volumes from the cross-channel links.

The two other corridors – namely the Atlantic Corridor and the North Sea-Baltic Corridor – include important hinterland axes for Le Havre, Rouen, the Benelux ports and the German north range ports.

[18] including English Channel and Kattegat

Figure 5 Core Network Corridor ports and regular ro-ro services in the North Sea basin, 2018



Note: ro-ro shipping routes exclude regular car carriers for traded vehicles (client contracts without free ro-ro capacity for external cargo);
only ro-ro services calling in one of the core ports of the North Sea basin are included
Source: ISL, 2019

There are twenty CNC ports in the North Sea, including Europe's top four ports in terms of cargo handling: Rotterdam, Antwerp, Hamburg and Amsterdam. Oil imports have a higher share than in other basins, while ro-ro traffic is less important as it concentrates on the English Channel. In the top four ports, its share is between 0% and 3% only (see Table 3).

Table 3 Maritime cargo traffic of CNC ports in the North Sea by cargo type, 2018[19]

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	million tonnes	av. annual growth 2008-2018
Sweden							
Göteborg	0%	58%	17%	22%	3%	40,6	-0,4%
Germany							
Hamburg	25%	11%	64%	0%	1%	125,1	0,5%
Bremen	55%	10%	0%	0%	34%	12,2	-1,7%
Bremerhaven	0%	1%	89%	0%	10%	51,2	0,4%
Wilhelmshaven	15%	60%	25%	0%	0%	28,3	-3,5%
Netherlands							
Amsterdam	44%	47%	1%	1%	8%	99,5	0,2%
Rotterdam	17%	47%	28%	3%	5%	441,5	1,4%
Moerdijk	24%	29%	37%	0%	10%	6,5	1,2%
Belgium							
Antwerpen	6%	35%	51%	3%	5%	212,0	2,2%
Gent	66%	16%	0%	7%	11%	33,7	2,3%
Zeebrugge	5%	22%	9%	53%	12%	23,9	-3,7%
France							
Dunkerque	63%	13%	6%	15%	3%	41,1	-2,0%
Calais	2%	1%	0%	97%	0%	18,9	0,1%
Le Havre	2%	61%	35%	1%	1%	64,9	-1,5%
Rouen	52%	43%	1%	0%	4%	22,9	0,2%
United Kingdom							
Felixstowe	0%	0%	87%	13%	0%	28,3	1,2%
London	28%	29%	26%	14%	4%	53,2	0,0%
Dover/Folkestone	0%	0%	1%	98%	1%	24,9	0,2%
Southampton	6%	61%	27%	0%	6%	34,5	-1,7%
Forth	4%	85%	9%	1%	1%	26,6	-3,8%
Total North Sea CNC ports	19%	37%	32%	7%	5%	1389,7	0,4%

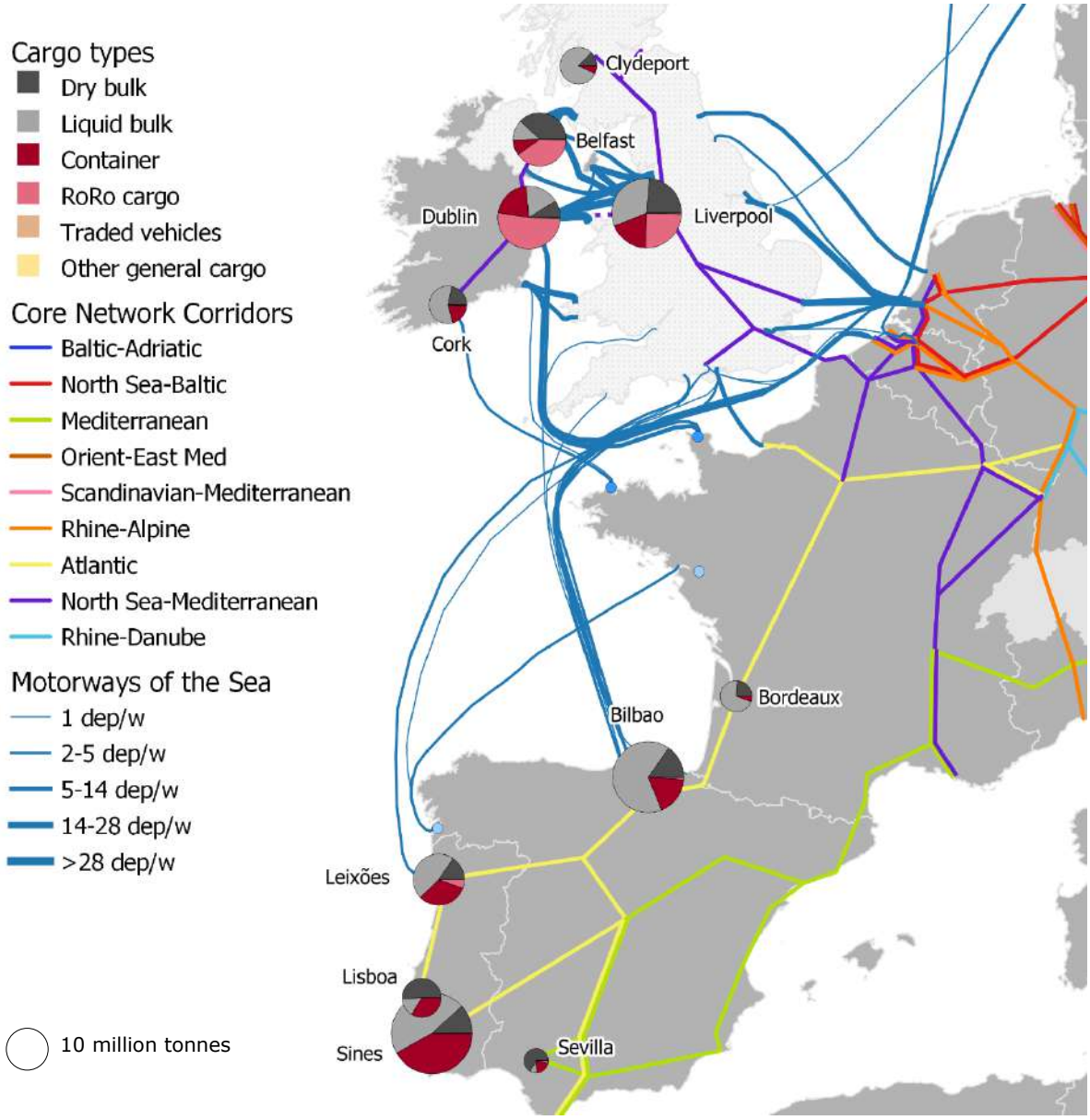
Source: ISL based on Eurostat, 2019

2.2.3 Atlantic Sea

The European Atlantic Basin includes Ireland, Portugal and the western coasts of Great Britain[20], France and Spain. The most important core network corridors connecting the basin's ports with the hinterland are the Atlantic and the North Sea-Mediterranean Corridors. The former connects the Portuguese ports Lisbon, Leixoes and Sines via Bilbao and Bordeaux with the Paris area and Southwest Germany. The corridor also includes Le Havre and Rouen as the two North Sea ports and Algeciras in the strait of Gibraltar. It will include from 2021 on the port of Nantes Saint-Nazaire, too. While there are no direct ro-ro services between these ports, there are several services in parallel to the corridor, for example connecting Leixoes with Rotterdam, Nantes Saint-Nazaire with Vigo or Bilbao with a ro-ro service to Belgium.

[19] Note that Ghent has merged with Zeeland Seaports (Vlissingen and Terneuzen) to form "North Sea Port".
[20] The study acknowledges the possible effects of the Brexit that will be further analysed in the next DIP.

Figure 6 Core Network Corridor ports and regular ro-ro services of EU ports in the Atlantic basin, 2018



Note: ro-ro shipping routes exclude regular car carriers for traded vehicles (client contracts without free ro-ro capacity for external cargo)
Source: ISL, 2019

The second important corridor for the Atlantic Basin is the North Sea-Mediterranean Corridor, more precisely its northern part connecting Ireland and Great Britain with the European continent. Five Atlantic CNC ports are situated on the corridor: Liverpool, Dublin, Belfast, Clydeport and Cork. The maritime connection between Liverpool and Dublin is part of the corridor, but there are also many ro-ro connections in parallel, both between CNC ports (Liverpool and Belfast) and with non-CNC ports. After the United Kingdom has left the EU, these connections are now connections with a neighbouring country. There is also a maritime connection between the two corridors: a weekly link between Bilbao, Liverpool and Dublin.

Besides the connections within the Atlantic Basin, the Irish Sea ports are also connected with numerous container and roro services to ports on the continent in the North Sea basin. These direct connections may gain importance for connecting Ireland with the European mainland once the transition period for the UK following Brexit is over.

The European Atlantic Coast ports play a vital role in connecting outermost regions in the Atlantic (Canaries, Acores, Madeira, Guadeloupe and Martinique) with the continent. Due to the long distance, container traffic plays an important role for this connection. There are around 50 departures per week altogether to and from these regions (container and ro-ro combined).

Altogether, there are eleven CNC ports in the Atlantic basin, the largest ones in terms of tonnes handled being Sines, Bilbao, Liverpool and Dublin.[21] All ports can be classified as medium-sized compared with the major North Range ports or the larger hubs in the Mediterranean.[22]

The cargo profile of the ports is quite diverse (see Table 4), with a focus on liquid bulk in Clydeport, Bordeaux, Bilbao and Cork, high shares of dry bulk in Seville and Lisbon, a strong focus on container traffic in the Portuguese ports and on ro-ro traffic in the Irish Sea (Dublin, Belfast and Liverpool).

Table 4 Maritime cargo traffic of CNC ports on the Atlantic Coast by cargo type, 2018

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	million tonnes	av. annual growth 2008-2018
Portugal							
Lisboa	50%	15%	33%	0%	1%	10,4	-1,3%
Sines	12%	46%	42%	0%	0%	44,3	6,0%
Leixoes	15%	44%	30%	5%	6%	17,6	1,8%
Spain							
Sevilla	54%	7%	17%	3%	20%	4,0	-0,5%
Bilbao	14%	60%	16%	1%	8%	33,9	-0,8%
France							
Bordeaux	23%	70%	5%	0%	2%	6,7	-2,8%
United Kingdom							
Liverpool	23%	31%	18%	24%	4%	32,6	0,1%
Clydeport	12%	78%	7%	0%	2%	9,1	-4,5%
Belfast	37%	12%	9%	39%	3%	18,9	3,8%
Ireland							
Dublin	9%	18%	21%	52%	0%	26,3	2,2%
Cork	21%	56%	19%	1%	3%	9,5	-0,2%
Total Atlantic CNC ports	19%	40%	23%	14%	3%	213,4	1,1%

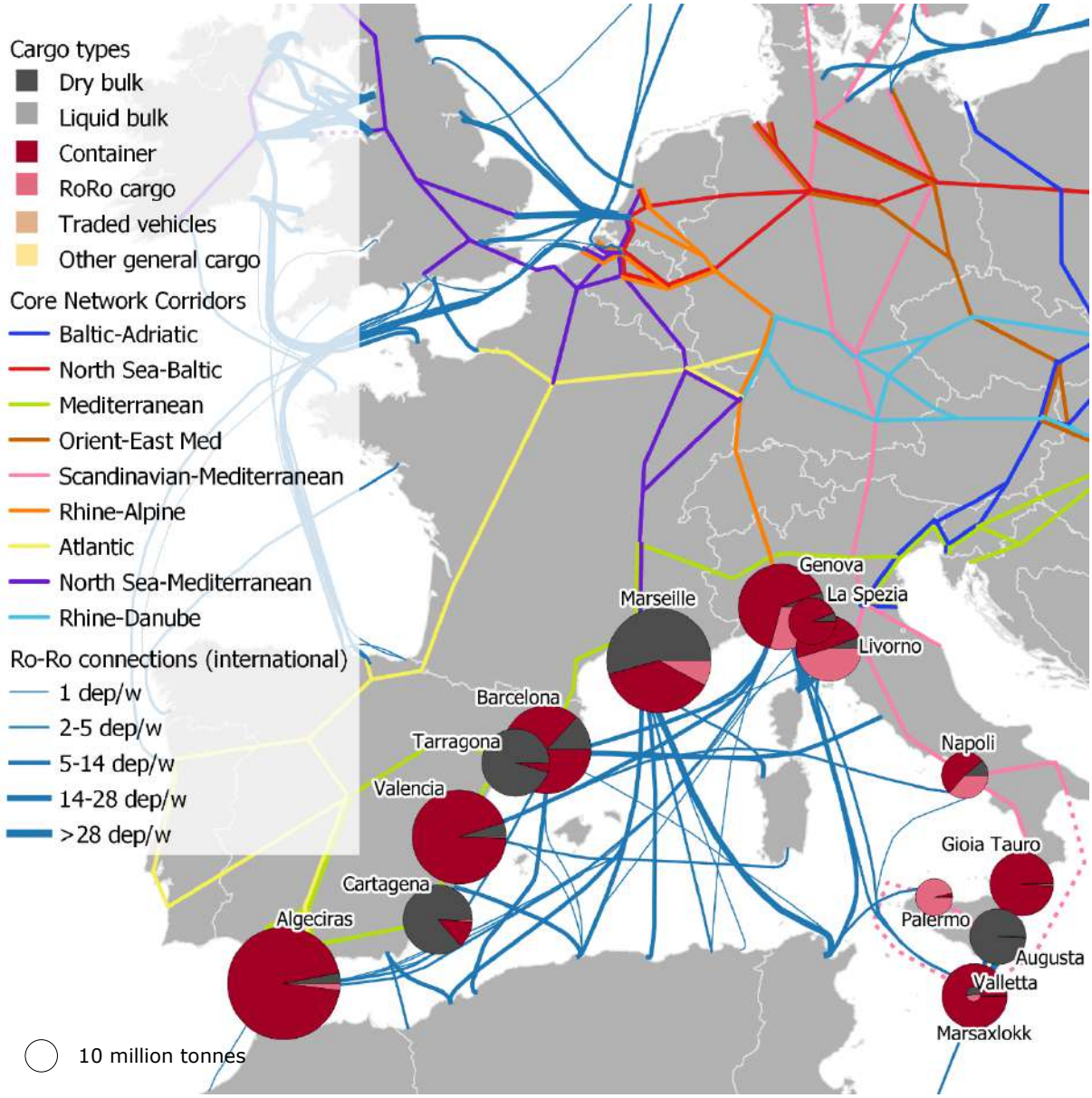
Source: ISL based on Eurostat, 2019

[21] Nantes St. Nazaire is planned to become a CNC port in 2021.
[22] The largest ports on the Atlantic Core Network Corridor are Le Havre (included in this DIP in the map and chapter of the North Sea basin) and Algeciras (included in the Western Mediterranean sea basin).

2.2.4 Western Mediterranean Sea

Five core network corridors start/end in the Western Mediterranean basin. Four corridors (from East to West: Atlantic, North Sea-Mediterranean, Rhine-Alpine, and Scandinavian-Mediterranean) are North-South corridors linking the different ports of the Western Mediterranean with the European hinterland. The Mediterranean CNC is an exemption: it stretches from the Strait of Gibraltar along the Mediterranean coast to North Italy and on through Slovenia, Croatia and Hungary to the Ukraine.

Figure 7 Core Network Corridor ports and regular ro-ro services in the Western Mediterranean, 2018



Note: ro-ro shipping routes exclude regular car carriers for traded vehicles (client contracts without free ro-ro capacity for external cargo); only ro-ro services calling in one of the core ports of the Western Mediterranean are included;
Source: ISL, 2019

The various Ro-Ro connections in the Western Mediterranean CNC ports prolong the North-South corridors to North Africa. There is hence an extensive exchange between the corridors and Motorways of the Sea. The port of Algeciras provides the shortest sea distance and high-frequency services to/from Morocco. Valencia, Barcelona, Marseille and Genoa provide numerous long-distance services to Morocco, Algeria and Tunisia. Malta – the southernmost tip of the Scandinavian-Mediterranean Corridor – is connected to the continent via Italian ports. In addition, there are East-West connections between Italy and Spain, a direct alternative to land-based transport.

There are fifteen CNC ports in the Western Mediterranean handling more than 500 million tonnes per year – the second-largest volume after the North Sea. There are five ports handling more than 50 million tonnes: Algeciras, Marseille, Valencia, Barcelona, and Genoa.

Table 5 Maritime cargo traffic of CNC ports in the Western Mediterranean by cargo type, 2018

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	million tonnes	av. annual growth 2008-2018
Spain							
Algeciras	2%	36%	57%	1%	4%	88,6	4,0%
Cartagena	20%	77%	3%	0%	1%	33,5	2,8%
Valencia	4%	3%	76%	0%	16%	62,0	2,1%
Tarragona	31%	59%	1%	0%	8%	31,8	-0,3%
Barcelona	8%	28%	51%	0%	13%	54,5	2,8%
France							
Marseille	20%	60%	14%	3%	4%	75,7	-2,0%
Italy							
Genoa	4%	34%	42%	20%	0%	51,6	1,0%
La Spezia	5%	7%	88%	0%	0%	16,0	-0,6%
Livorno	4%	24%	35%	32%	4%	30,4	0,6%
Napoli	7%	35%	33%	24%	0%	15,5	5,5%
Gioia Tauro	0%	3%	93%	1%	2%	28,5	-1,0%
Palermo/Termini Imerese	1%	18%	2%	77%	3%	9,7	5,0%
Augusta	4%	93%	0%	0%	2%	21,4	-2,2%
Malta							
Valletta	39%	9%	2%	36%	14%	1,4	-4,2%
Marsaxlokk	0%	3%	97%	0%	0%	29,7	3,6%
Total West Med. CNC ports	9%	37%	42%	7%	6%	550,4	1,1%

Source: ISL based on Eurostat, 2019

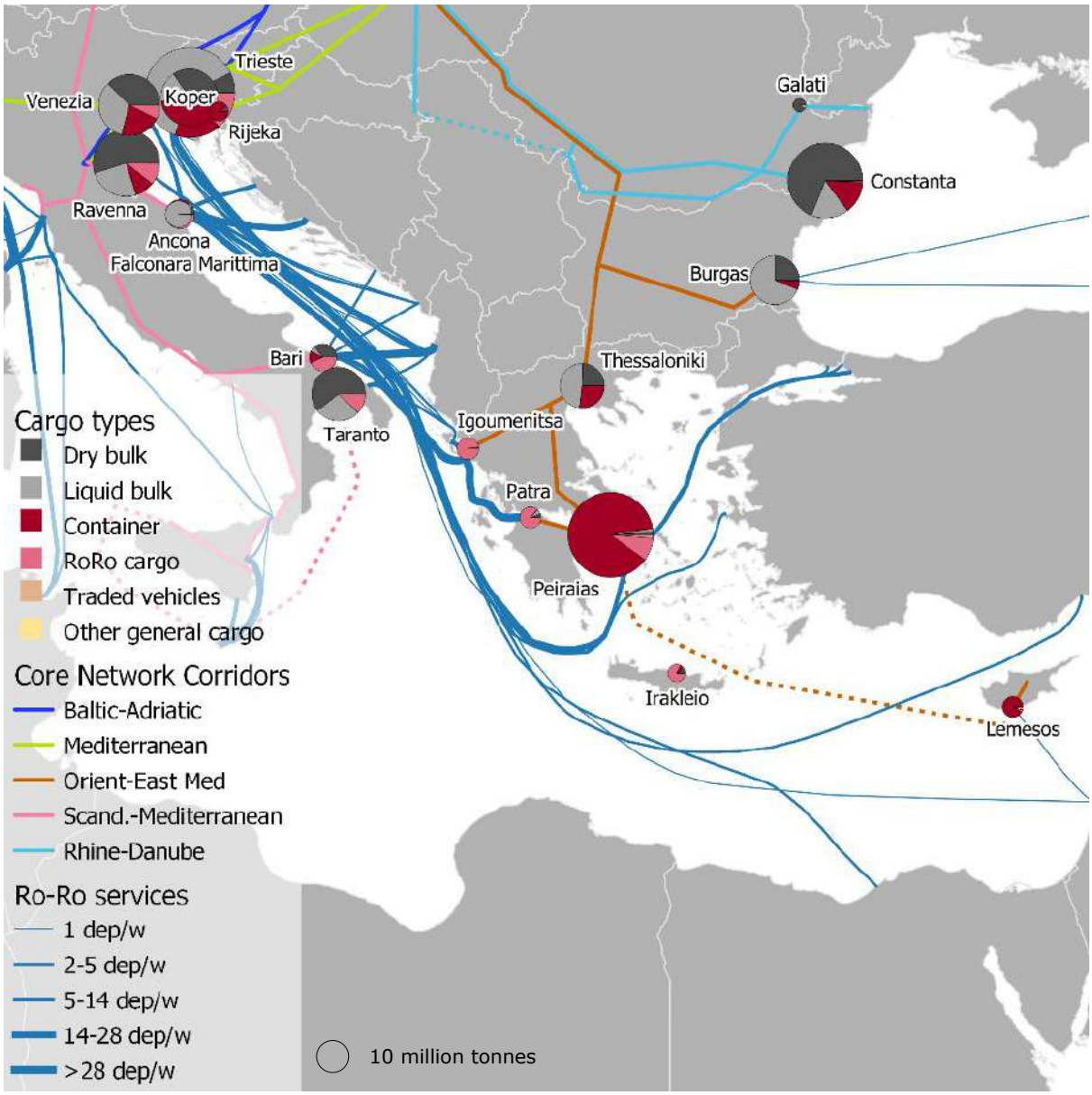
The share of container traffic is higher than in any other port range, reaching 42% on average in the basin. This is partly due to the large transhipment hubs (Algeciras, Gioia Tauro and Valencia),[23] but also due to a high share of containers in regional hinterland traffic. The share of dry bulk, by contrast, is the lowest of all European basins.

[23] Note that Marsaxlokk Freeport Terminals are not included – they would add roughly 30 million tonnes of container traffic, almost exclusively transhipment.

2.2.5 Eastern Mediterranean and Black Sea

The Eastern Mediterranean ports hosts five different core network corridors, three of which concern ports in the Adriatic Sea: Scandinavian-Mediterranean, Baltic-Adriatic and Mediterranean. The Adriatic has a dense network of ro-ro services, connecting the East coast of Italy with Croatia and with neighbouring Montenegro and Albania. In addition, there are various services connecting the Adriatic CNC ports with Greece and onwards to Turkey. For cargo coming from Western Europe, they provide an alternative to the land-based Orient-East Med Corridor for cargo to Greece.

Figure 8 Core Network Corridor ports and regular ro-ro services in the Eastern Mediterranean and Black Sea, 2018



Note: ro-ro shipping routes exclude regular car carriers for traded vehicles (client contracts without free ro-ro capacity for external cargo); only ro-ro services (excluding car carriers) calling in one of the core ports of the Eastern Mediterranean or Black Sea are included
Source: ISL, 2019

The Orient-East Med Corridor itself connects Central Europe with Greece and on to Cyprus (connected to the EU with container services, among others to/from Piraeus and Thessaloniki). Finally, the Rhine-Danube Corridor links the Romanian ports of Constanta and Galati with Central and Western Europe. The Danube is already intensively used for bulk transport while container transport only plays a minor role.

The seventeen ports of the basin handled roughly 300 million tonnes in 2018 – less than the port of Rotterdam alone. There are nine ports with an annual maritime traffic of more than ten million tonnes, the largest ones being Trieste, Piraeus and Constanta (see Table 6). Almost half of the basin's traffic is handled in the Northern Adriatic ports.

With regard to cargo types, the region stands out with a comparatively high share of dry bulk. The port of Constanta is the largest player in this segment with around 25 million tonnes handled in 2018. Ro-Ro traffic is also slightly above average, Trieste and Piraeus being the major players and another eleven ports handling ro-ro traffic in the basin.

Table 6 Maritime cargo traffic of CNC ports in the Eastern Mediterranean and Black Sea by cargo type, 2018

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	**million tonnes**	av. annual growth 2008-2018
Croatia							
Rijeka	9%	0%	76%	0%	15%	2,7	-0,3%
Slovenia							
Koper	32%	16%	40%	0%	11%	23,1	3,4%
Italy							
Trieste	6%	56%	15%	12%	9%	57,5	4,5%
Venezia	35%	31%	20%	7%	7%	26,3	-1,3%
Ravenna	51%	23%	9%	10%	8%	31,1	0,3%
Ancona/Falconara Marittima	8%	5%	28%	52%	7%	5,9	1,1%
Bari	31%	6%	12%	37%	15%	5,3	7,8%
Taranto	58%	26%	0%	12%	4%	20,3	-8,5%
Greece							
Igoumenitsa	2%	0%	0%	98%	0%	3,6	0,0%
Patras	6%	7%	1%	85%	1%	3,3	-2,0%
Piraeus	1%	2%	88%	9%	1%	50,9	19,2%
Heraklion	8%	2%	7%	81%	1%	2,2	-5,1%
Thessaloniki	24%	47%	26%	0%	4%	14,0	-1,0%
Cyprus							
Limassol	0%	0%	79%	4%	17%	3,0	-1,8%
Bulgaria							
Burgas	22%	61%	5%	0%	12%	16,7	0,4%
Romania							
Constanța	64%	15%	13%	0%	7%	39,5	-1,5%
Galați	66%	7%	0%	0%	28%	1,3	-2,5%
Total East Med/Black Sea CNC ports	28%	26%	28%	11%	7%	306,8	1,0%

Source: ISL based on Eurostat, 2019

2.2.6 Outermost Regions

The outermost regions are particularly dependent on their maritime ports and the maritime connections. Due to the long distances, containerised trade is the most effective way of serving these regions. Except for the Canaries, ro-ro traffic plays no significant role for cargo traffic or only for inter-island traffic (see Table 7). The share of container traffic, by contrast, is higher than in any other European port range, reaching 44% on average.

Liquid bulk is also more important than on average, particularly for the islands' power supply. Dry bulk, by contrast, is at 9% only as there is little heavy industry in the outermost regions.

Table 7 Maritime cargo traffic of core and comprehensive network ports in outermost regions by cargo type, 2018

	Share of cargo segment in %						
country/port	dry bulk	liquid bulk	container	ro-ro	other general cargo	million tonnes	av. annual growth 2008-2018
Carribean/South America							
Guadeloupe	24%	18%	53%	1%	3%	3,0	-2,5%
Fort de France (Martinique)	10%	42%	44%	5%	0%	2,6	-1,6%
Cayenne (French Guaiana)	10%	27%	60%	2%	1%	0,8	1,6%
Acores							
Ponta Delgada	25%	23%	50%	0%	2%	1,4	-0,5%
Madeira							
Caniçal	8%	29%	61%	0%	3%	1,1	-0,3%
Canary Islands							
Las Palmas	2%	36%	48%	9%	4%	19,5	-0,2%
Santa Cruz de Tenerife	5%	48%	25%	20%	2%	9,2	-4,6%
Reunion							
Port Réunion	25%	19%	54%	0%	2%	4,8	1,1%
Total outermost core/compr. ports	9%	35%	44%	9%	3%	42,4	-0,7%

Source: ISL based on Eurostat and Guyane Port, 2019

3 Legislative drivers and emerging trends affecting Motorways of the Sea

Complementary to the analysis of the maritime traffic data above, the present chapter outlines the current legislative instruments that set the framework for maritime operations – hereafter called "legislative drivers". In addition, the future needs of the maritime industry will be anticipated based on emerging trends that can result i.a. from policy and legislation at international and at EU level, and from other socio-economic drivers.

A list of relevant legislation for the maritime sector can be found in Annex 1, including key dates and developments.

3.1 Legislative drivers

As mentioned in section 2.1, the regulation that establishes Motorways of the Sea is **Regulation (EU) No 1315/2013 (TEN-T Regulation)** which lays down the overall framework for the development of the trans-European transport network and its infrastructure components. Article 21 specifically introduces the core notion of MoS within the TEN-T Regulation. Some elements of Motorways of the Sea are also addressed in Article 32(b) which specifies that Member States shall pay particular attention to projects which provide efficient freight transport services and contribute to reducing negative environmental impacts through the promotion of the deployment of innovative and safe transport services.

The revision of the TEN-T Regulation in 2020-2021 will be of key importance to the entire framework of actions under the CEF, for which a new funding period will also start for the period of 2021-2027. The process of developing this DIP, and the ensuing dialogue, will also provide an opportunity to shape the future provisions concerning the European maritime dimension in the new TEN-T Regulation.

The legal framework for maritime transport when it comes to operations, safety and environment, is for the larger part set at international level by the International Maritime Organisation (IMO). These rules are then directly applicable to EU-related international shipping, including intra-EU voyages, and many are implemented at EU level through EU Directives or Regulations. Through its body of related legislation, the EU is committed to addressing pressing climate concerns and other environmental issues such as air emissions, waste and the protection of marine life. These issues fall under pillar 1 (sustainable). In addition to safety rules, many of which are set at international level, rules regarding logistics and administrative procedures are established at EU level, and these fall under pillar 2 (seamless). Finally, digitalisation is a field that is growing in terms of regulatory supervision at the EU level and falls under pillar 3 (smart).

Further details on the various legislative drivers are provided by topic, below, and the schematic diagram in Figure 5 shows the non-exhaustive regulatory framework and the key dates for the entry into force of provisions of relevance to the European maritime sector.

A. Decarbonisation, Greenhouse Gas (GHG) Emissions, Alternative Fuels

In December 2019, the European Commission presented its **European Green Deal** (EGD)[24], an ambitious package of measures that should enable European citizens and businesses to benefit from the sustainable green transition. These policy measures ranged

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

from ambitious emissions reduction targets, to investing in cutting-edge research and innovation, to preserving Europe's natural environment. Of particular interest are the package's dispositions on sustainable mobility and GHG emissions. Under the proposed European Climate Law, the EU will strive to become a carbon neutral continent, which entails a 90% reduction of emissions from transport. Further, the 40% emission reduction goal for 2030 will be raised to 55%, and the European Emissions Trading System (EU ETS) is expected to be extended to the maritime sector.

Furthermore, in January 2020, the European Commission published its 2020 Work Programme, announcing its intention to launch a legislative proposal on maritime fuels - **FuelEU Maritime**. This initiative aims at accelerating the uptake of sustainable alternative fuels in maritime transport and in European ports, by providing a framework for increased demand of low or zero-carbon fuels.

In addition to these new ambitious initiatives, the EU had previously developed a consequent body of law to put Europe on a path of decarbonisation, meet the climate commitments agreed in Paris at COP21 and achieve a 40% GHG emissions reduction by 2030 compared with 1990 levels. Progress reports[25] to this end show steady progress. The 25th UN Conference of the Parties to the UN Framework Convention on Climate Change (COP25) in Madrid in December 2019 provided another milestone in the long history of efforts to address the climate challenge by the EU and the other Parties.

The revised **Renewable Energy Directive 2018/2001/EC** sets a binding renewable energy target of at least 32% by 2030, while providing the transport sector with an aim to achieve a minimum target of 14% for renewable transport fuel in the same time period. Further, the **Energy Efficiency Directive 2018/2002/EC** has set a binding 32.5% energy efficiency target by 2030.

The **Directive on the Deployment of Alternative Fuels Infrastructure** (2014/94/EU), (to be revised in 2021) is also relevant as it requires Member States to draft and notify national policy frameworks on alternative fuel infrastructure. As regards maritime, there is a requirement that by the end of 2025 core network ports shall provide Onshore Power Supply (unless there is no demand and the costs are disproportionate to the benefits, including environmental benefits) and LNG bunkering facilities (to enable LNG inland waterway vessels or seagoing ships to circulate throughout the TEN-T Core Network). The revision of this Directive will possibly bring clarity on the role of transition fuels and existing technology in order to ensure smooth conversion to other clean alternative fuels.

Back in 2013, the European Commission released a **Communication on integrating maritime transport emissions in the EU's GHG reduction policies**. This document proposed a gradual approach to address GHG emissions from ships, and led to the adoption of **Regulation (EU) 2015/757 on monitoring, reporting and verification (MRV) of carbon dioxide emissions from maritime transport**. In parallel, the IMO adopted its own Data Collection System (DCS)[26]. Whilst the EU scheme focusses on CO_2 emissions from shipping activities to, from and within the EU area, the IMO scheme covers global fuel oil consumption from shipping. The EU MRV is currently being revised to partially align it with the IMO DCS[27].

Internationally, the IMO has set out ambitious reduction targets for the shipping sector through its initial **GHG emissions reduction strategy**[28]. This new strategy adopted in 2018 aims to reduce GHG emissions from shipping by at least 50% by 2050 compared to 2008 levels, coupled with a vision for the decarbonisation of the sector, and a list of

[25] Report from the Commission to the European Parliament and the Council of the EU: Taking stock of progress at Katowice COP
[26] Resolution MEPC.278(70)
[27] COM(2019) 38 final
[28] Resolution MEPC.304(72)

potential short, mid- and long-term further emission reduction measures to achieve such objectives. The European Commission is closely monitoring the ongoing negotiations of concrete measures at IMO. In addition, the existing IMO's **Energy Efficiency Design Index**[29] and the **Ship Energy Efficiency Management Plan** are aimed at promoting the use of energy efficient equipment and engines, as well as fuel-efficient ship operation. New ship designs are required to meet an efficiency level, a level that gradually increases since the inception of the measure in 2013.

B. Air pollution

Sulphur is a key air emission challenge that the maritime sector has had to face. It was addressed by the IMO MARPOL Convention Annex VI at the global level, and transposed at EU level by the **Marine Sulphur Directive 2016/802/EU**. The legislation sets a global sulphur cap of 0.50% by 2020 and 0.10% restrictions for the SECA areas (Baltic, North Sea and English Channel) as of 2015. To address air pollution challenges, the EU also adopted the National Emission Ceilings Directive[30], which transposes across the EU emission reduction commitments for 2020 in regards to five air pollutants: nitrogen oxides (NOx), non-methane volatile organic compounds (NMVOCs), sulphur dioxide (SO2), ammonia (NH3) and fine particulate matter. Under this Directive all the Member States are obliged to report on their progress with emission reduction, keeping in mind that international maritime transport is not covered by the NEC.

MARPOL Annex VI also sets international rules regarding NOx. The IMO designated the Baltic Sea and the North Sea as NOx Emission Control Areas (**NECAs**)[31] back in 2016, requiring all vessels built after 2021 to demonstrate their compliance with NOx emissions reductions of 80% compared to the emission level of 2016.[32] A less stringent version of these limitations is also applied outside of NECAs.

C. Infrastructure and Marine Environment

The **Environmental Impact Assessment Directive 2014/52/EU** provides the rules for assessing the potential effects of projects on the environment, including projects involving coastal zones and the marine environment. Furthermore, **the EU Seaports Regulation (EU) 2017/352** established a framework for the provision of port services and common rules on the financial transparency of ports. Amongst many measures introduced, it also defines the conditions under which the freedom to provide port services applies, such as the type of minimum requirements that can be imposed for safety or environmental purposes.

The European Union aims to enhance the sustainable development of its maritime economy while protecting its marine environment. Thus, water management is also high on the agenda of the European Union. The **Marine Strategy Framework Directive 2008/56/EC** strives to achieve Good Environmental Status of the EU marine waters by 2020, by addressing i.a. marine litter and underwater noise. In addition, **Directive 2019/883/EU on Port Waste Reception Facilities** establishes requirements for ports to have facilities for collection of separate waste streams and scrubber waste.

Protection of marine biodiversity, including limiting the spread of marine invasive species, is also addressed by the **IMO Ballast Water Management Convention**[33]. The EU also

[29] http://www.imo.org/en/ourwork/environment/pollutionprevention/airpollution/pages/technical-and-operational-measures.aspx
[30] Directive (EU) 2016/2284
[31]The Baltic Sea area (Regulation 14.3.1 of MARPOL Annex VI and Regulation 1.11.2 of MARPOL Annex I), The North Sea area (Regulation 14.3.1 of MARPOL Annex VI and Regulation 1.14.6 of MARPOL Annex V)
[32] https://www.europarl.europa.eu/doceo/document/E-8-2018-003591-ASW_EN.html
[33] http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/International-Convention-for-the-Control-and-Management-of-Ships%27-Ballast-Water-and-Sediments-(BWM).aspx

addressed this issue through the adoption of **Regulation (EC) 1143/2014 on Invasive Alien Species**, which required Member States to adopt Action Plans by 2015 to prevent the introduction and spread of invasive alien species (including some marine species). The Regulation does however not transpose the detailed provisions of the Ballast Water Management Convention, and such requirements remain applicable through the International Convention.

In sensitive sea areas, such as the Baltic and North Sea, the IMO Conventions have included specific measures to preserve the maritime environment. For example, the **Baltic Sea Special Area for Sewage** prohibits cruise ships to dispose of their waste at sea: they are required either to drop it off in ports or to have onboard sewage treatment system.

Finally, in the spirit of lowering the total footprint along the entire lifecycle of vessels, the EU **Regulation (EC) 1257/2013 on Ship Recycling** requires EU flagged ships to be recycled at an EU-approved recycling facility. This Regulation is the European implementing law of the **Hong Kong Convention**[34] adopted by the IMO, which aims to ensure that the process of recycling end-of-life ships does not pose undue risks to human health, safety and the environment.

D. Digital Single Market

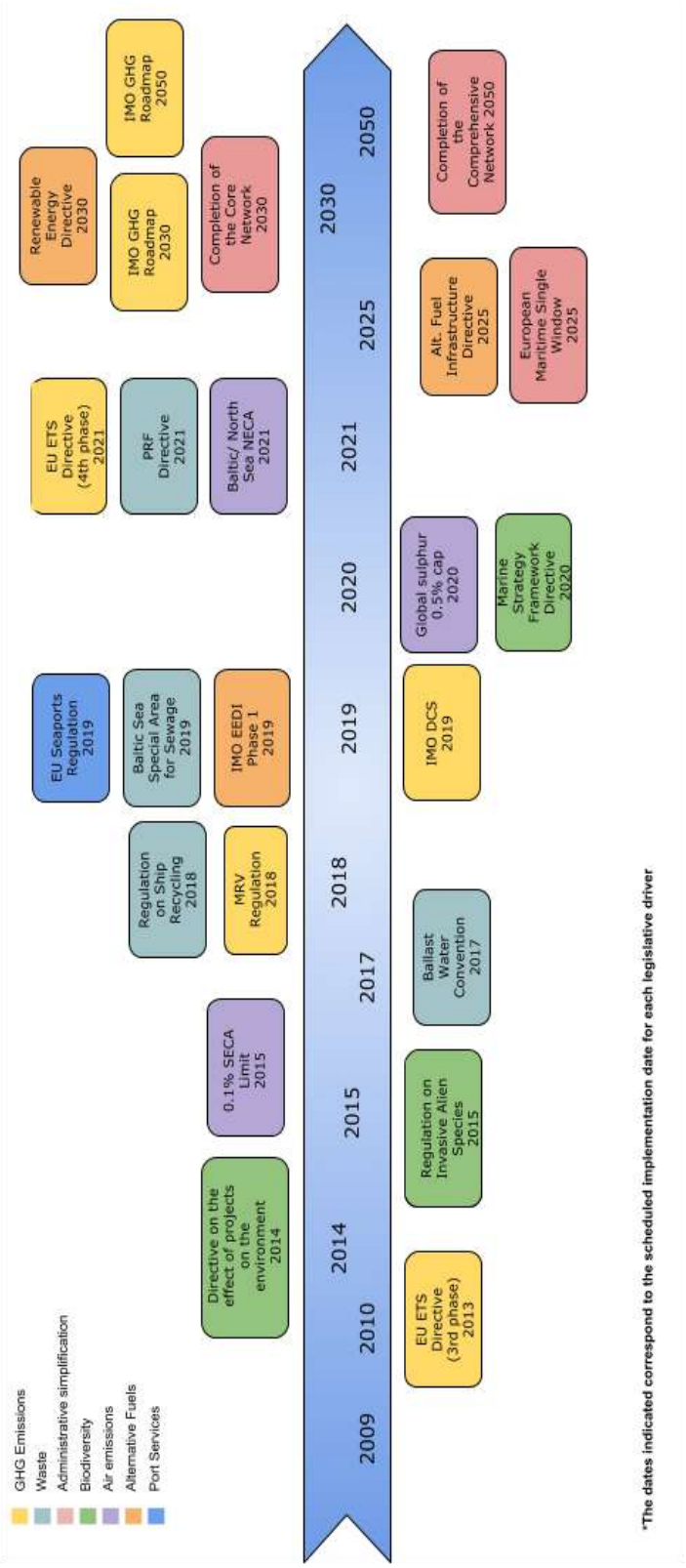
As digitalisation becomes more widespread across all transport modes, including shipping, the EU has focused on administrative simplification. This was first addressed in 2010 by the Directive on Ship Reporting Formalities that digitalised the reporting obligations and banned the use of paper forms. In 2019, a new Regulation 2019/1239 for the **European Maritime Single Window environment** ('EMSWe') was adopted. This Regulation creates a framework for a technologically neutral and interoperable digital environment. It establishes harmonised interfaces for exchanging information related to ship reporting obligations between public authorities and the maritime industry in order to facilitate maritime transport and trade. The Regulation also allows relevant part of the collected data to be exchanged with other transport modes in order to facilitate multimodal transport.

In 2010, the European Commission launched the flagship initiative **Digital agenda for Europe** under the Europe 2020 strategy, aiming at boosting Europe's economy by delivering sustainable socio-economic benefits from the digital single market. In line with its agenda, the **Common Information Sharing Environment** was introduced in 2016, which can be considered as a key innovation with regard to European maritime governance and security. It also supports the development of the Blue Economy by providing useful ocean monitoring and surveillance, related to human and environmental safety, disaster response and early detection of harmful maritime threats, among many other activities.

As a part of the EU's alignment with recent digital developments, a proposal for a Regulation on **Electronic Freight Transport Information** (eFTI) was introduced by the European Commission in 2018. The aim of the proposal was to simplify and optimise communication between transport operators and authorities by putting in place a uniform legal framework requiring authorities to accept freight transport information in electronic form on goods travelling within the EU hinterland. The Regulation is currently in the final stages of the adoption procedure, expected to be concluded in July 2020. Maritime transport is excluded insofar as relevant maritime transport information is already covered by the EMSWe Regulation provisions. However, the eFTI Regulation is of high relevance as it will boost harmonisation and interoperability across the multimodal logistic chain of which MoS is part.

[34] http://www.imo.org/en/About/Conventions/ListOfConventions/Pages/The-Hong-Kong-International-Convention-for-the-Safe-and-Environmentally-Sound-Recycling-of-Ships.aspx

Figure 9 Timeline of Legislative Drivers



3.2 Emerging trends

The Motorways of the Sea funding programme is striving to ensure that there is a sustainable, seamless, smart and safe transport system for goods and people in the European Union. In this section, various emerging trends driven by i.a. political objectives of the new European Commission, legislative initiatives and other legal acts on the European Union level as well as on the international level, and practices stemming from the maritime industry will be explored. These emerging trends build also on trends identified by the maritime sector[35] and are explored in order to offer a forecast of what the environmental, economic and social needs will be, and where future MoS investment could go.

3.2.1 Population growth and demographics

One of the trends that can be seen globally is the rapidly **growing and ageing population**. The world's population is expected to increase by 2 billion people by 2050.[36] However, the growth rate is expected to slow down, thus affecting supply-and-demand. This is a global trend which is defined by the numbers showing a global population getting older fast. This ultimately means that the population that can work effectively is slowly becoming outnumbered by the population that is less capable of being involved in production.

There is a gradual shift in the world's **economic centre of gravity**, which slowly is pulling towards Asia. It is predicted that by 2030 Asia will represent 66% of the global middle-class population[37], which in turn will provide basis for economic progress by driving consumption and domestic demand on a more regional level.

Traditional trade intensity from East to West is slowing down quite significantly, due to prolonged trade tensions between the US and China, which negatively affect the global economic activity[38]. This shift is shaping logistics and trade in a completely different way. As a result, trade is becoming more knowledge-intensive, technology-driven and more intra-regional. Due to introduction of new business models and services, such as one-click online booking platforms or real-time cargo tracking, the supply chain is becoming more complex in order to accommodate new changes. Furthermore, target marketing and production of custom-tailored goods to meet the needs of a customer greatly influences their behaviour, this way significantly increasing trade flow. This development gives rise to more frequent sailings of smaller vessels with lower cargo volumes on shorter distances. Such a shift might positively influence smaller ports in close proximity to resource-rich territories.

One example of targeted growth relates to technological developments in additive manufacturing, such as 3D printing, which enables smooth sailing operations, by providing an opportunity to perform quick repair works onboard damaged ships. This development holds a potential to save time and costs for continuous business operations. However, in order to realise its full potential, more research and innovation is needed in order to scale up Europe's manufacturing capabilities.

Another trend in demographics is that **urbanisation** globally is set to reach approximately 60% by 2030[39], which implies that ports near the cities with high concentration of population must be efficiently connected to them, in order to keep up with the economic

[35] http://waterborne.eu/vision/global-trends-and-drivers/
[36] https://www.un.org/development/desa/en/news/population/world-population-prospects-2019.html
[37] https://ec.europa.eu/knowledge4policy/foresight/topic/growing-consumerism/more-developments-relevant-growing-consumerism_en
[38] https://www.un.org/development/desa/dpad/publication/world-economic-situation-and-prospects-september-2019-briefing-no-130/
[39] https://ec.europa.eu/knowledge4policy/foresight/topic/continuing-urbanisation_en

growth, as well as the need to ensure and maintain territorial cohesion with island and peripheral regions that would otherwise not be economically viable for private operators.

Due to an expected slowdown in population productivity, the maritime sector has a potential to shape itself according to the newest developments in digitalisation and innovation, supporting the flow of goods across the whole supply chain. For example, autonomous vessels will facilitate transportation of cargo, while predictive maintenance systems will ensure an uninterrupted course of motion.

3.2.2 Sustainability and climate change

A. Decarbonisation

Environmental issues have been and will continue to be a top priority for the EU, fully committed to the objective of a more sustainable economy and society as adopted in the UN 2030 Agenda for Sustainable Development and the Paris Agreement on climate change.

The EU is already making a difference with the EU 2030 Energy and Climate framework, the Energy Union, the Circular Economy Action Plan, and the EU implementation of the abovementioned 2030 Agenda for Sustainable Development. In November 2018, the European Commission presented its strategic vision for a prosperous, modern, competitive and climate-neutral economy by 2050[40]. Based on this, European Commission President Ursula von der Leyen proposed in December 2019 an ambitious programme for the five years ahead. She presented the new **European Green Deal (EGD)**[41], a package of legislative proposals designed to reach the vision of a climate neutral Europe by 2050.

One big potential change on the EU policy scene relates to green taxation. The possibility of a "**carbon border adjustment mechanism**" has been formally included in the proposed policy measures of the Green Deal, and the maritime sector is likely to be impacted, in particular through its effects on trade.

The EU **Energy Taxation Directive 2003/96/EC**[42] is also on the agenda for revision and could both result in a different energy tax structure, i.a. affecting shore side electricity, and put an end to the current tax exemption for shipping fuels. This would have an important impact on the maritime sector's choice of fuels.

Despite progress at IMO level, where a CO_2 reduction target of at least 50% by 2050 has been set, Members of the European Parliament have repeatedly called for a more comprehensive engagement from the shipping industry in the efforts of meeting climate targets. The European Green Deal includes a number of proposed measures in this respect to ensure sustainable and smart mobility, such as the production and deployment of sustainable alternative transport fuels. It also proposes restricting access of the most polluting ships to the EU ports. In the European Commission's communication on the EGD, it is formally proposed to extend the **Emissions Trading System** to the maritime sector.

The EU greenhouse gas targets for 2030 and 2050 are debated extensively by Member States within the Council, and in September 2019, an extensive policy debate on the issue of transport and climate change was held[43]. The development, production and use of alternative fuels, including the on-shore power infrastructure, received wide support from Member States, but several Member States considered that sufficient funds should continue to be made available, and common standards are needed. EU climate-related investments are expected to grow significantly.

[40] COM(2018) 773
[41] COM(2019) 640 Final
[42] Directive 2003/96/EC
[43] https://www.consilium.europa.eu/en/meetings/tte/2019/09/20/

The **Sustainable Europe Investment Plan**, presented on 14 January 2020[44] is expected to unlock EUR 1 trillion of climate-related investment over the next decade. Furthermore, the European Investment Bank is to be turned into **Europe's climate bank** by 2025 and half of its total financing should be dedicated to climate investment. The Commission is also increasingly working on sustainable finance.

In addition, work is currently underway in the European Commission to come up with a **Green Taxonomy**, in order to harmonise European standards and avoid greenwashing and to classify environmentally sustainable activities. A technical expert group (TEG) was charged with the task and produced a definition that incorporates six sustainability parameters: climate mitigation, adaptation, protection of water, waste reduction, pollution prevention and control and the protection of healthy ecosystems. The TEG report[45] was published in June 2019, and on 18 December 2019 the European Commission welcomed a political agreement reached between the European Parliament and the Council on creation of an EU classification for all sustainable activities. The first parts of the legislation could come into force by the end of 2020, with the aim to set a global standard, starting with likeminded jurisdictions.

In addition, local and regional **eco-incentive schemes** such as Marebonus and Med Atlantic Ecobonus, although not legislative, are also gaining recognition for their impact on the shipping sector's climate footprint. The Med Atlantic Ecobonus (MAE) Action[46] for example is a policy study carried out by four Member States (Italy, France, Spain, Portugal) aiming to be of use for the European Commission and the Member States to drive a formal debate towards the possible implementation of eco-incentive measures in the future. The incentive would reward and support projects' demonstrated capacity to reduce social and environmental externalities and has conducted an ex-ante analysis to support its proposal.

Currently the European waterborne sector is well developed, consisting of three sectors - transport, infrastructure and logistics, as well as blue growth. In order to successfully implement new technologies and concepts in economically, environmentally and socially sustainable manner, appropriate education and training related to skills and competences is required, according to the Waterborne Technology Platform[47]. Furthermore, the Platform has set a goal to build zero-emission short sea vessels by 2030 and turn the sector into the most integrated form of transport available in Europe.

B. Air emissions

The year 2020 can be considered as a turning point for the maritime industry in terms of its efforts to reduce air emissions from ships. As from the 1st of January 2020, a **global sulphur cap** for the amount of sulphur allowable in shipping fuels is set at 0.50% (compared to 3.5% before 2020 outside of SECAs). The burden is mainly on the shipowners to ensure compliance, and options for compliance include the use of Marine Gas Oil (MGO)/distillates, ultra-low sulphur fuels and blends, alternative fuels and, of course, exhaust-gas cleaning technology/scrubbers. On the other hand, ports are required to ensure the availability of adequate infrastructure.

On the same issue, Mediterranean countries agreed at the end of 2019 on the possible designation of the region as a Sulphur Emission Control Area (ECA) at the IMO, following the outcomes of further studies. The decision was taken at the Conference of the Parties (COP21) to the Barcelona Convention for the protection of the Mediterranean which took

[44] https://ec.europa.eu/regional_policy/en/newsroom/news/2020/01/14-01-2020-financing-the-green-transition-the-european-green-deal-investment-plan-and-just-transition-mechanism
[45] https://ec.europa.eu/info/files/190618-sustainable-finance-teg-report-taxonomy_en
[46] http://mae-project.eu/
[47] https://www.waterborne.eu/

place in Naples from 2-6 December 2019. The following text is an excerpt from the Naples Declaration[48] (p4):

"Acknowledging the importance of protecting the environment as well as the health of people living in the Mediterranean coastal region, and considering that the designation of the whole Mediterranean Sea as Med SOx ECA (Emission Control Area) will lead to substantial benefits for human health, environment and especially air quality;

12. We agree to finalize, based on the outcome of the further studies and the preparatory work, and in line with the agreed Roadmap, the development of a mutually agreed joint and coordinated proposal for the possible designation by the IMO of the Mediterranean Sea, as a whole, as an emission control area for Sulphur oxides pursuant to MARPOL Annex VI;"

In parallel, at EU level, there are other suggestions put forward in the European Green Deal that include a new approach for a **sustainable Blue Economy**, increased focus on international ocean governance, and "**zero-pollution ambition**" covering air, water and noise pollution from transport. In this regard, it is likely that all the EU's acquis relating to pollution will be scrutinised and proposals will emerge to revise them as necessary to meet this ambition.

C. Water quality & waste management

Increased focus on waste from ships as well as alarming data on marine litter have influenced the work at EU level in the past five years, notably through the adoption of the Circular Economy Package. The emphasis is not expected to diminish. The Commission President has asked the Environment and Oceans Commissioner to continue this process through a **Circular Economy Action Plan**.

Another growing concern with regards to water and waste management relates to the wash-water from Exhaust Gas Cleaning Systems (scrubbers). For this reason, some Member States have started to ban the use of open loop scrubbers, due to the risks associated with contaminants such as acidification, eutrophication and the accumulation of hazardous hydrocarbons and heavy metals. There is also a concern that scrubber washwater will compromise the compliance with the Marine Strategy Framework Directive and the Water Quality Framework Directive and their criteria for water quality. Following a request from the EU and its Member States, this issue has also been put on the agenda of the IMO, which is currently undertaking a review of the environmental impacts of the wash-water discharges.

In addition, the following topic areas all include some aspects of water and waste management, and thus they also contribute as trends impacting the maritime coastal environments:

- integrated governance and protection of the oceans
- ballast management system & ballast water discharge
- prohibition of discharging untreated sewage in the sea
- invasive alien species (IAS).

[48] UNEP/MED IG.24/L.3

3.2.3 Technology, Information and Communication revolution

A. Connectivity of peripheral & outermost regions

The European Union (EU) has nine outermost regions, these are: French Guiana, Guadeloupe, Martinique, Mayotte, Reunion Island and Saint-Martin (France), Açores and Madeira (Portugal), and the Canary Islands (Spain). All are located geographically very distant from the European continent, and in total, they are home to 4.8 million citizens.[49] The outermost regions are part of the EU and should be seen as equally important components of the TEN-T corridors. A thorough consideration of the insular and peripheral regions within the EU wide network will greatly contribute to the greater connectivity of the European territory.

Indeed, these regions play a significant role in providing a European presence in strategic areas of the world and by having unique characteristics, they provide interesting opportunities to engage in research and innovation in biodiversity, terrestrial and marine ecosystems, renewable energies. They can develop regional cooperation and are also often attractive tourist destinations requiring passenger transport logistics. They also possess coastal assets that require particular attention in the context of climate resilience.

Climatic conditions and in particular hurricane and storm exposure in the peripheral and outermost regions are of increasing global concern. Although climate resilience is a concern for all ports, those located in these regions are particularly affected. Small island states recurrently call for support on climate resilience in international fora such as the International Maritime Organisation (IMO). In light of the rising risk to livelihoods but also to their critical port infrastructure, we may see more attention being paid to investments in breakwaters, dykes and other protection measures implemented to keep the ports from flooding.

B. Digital technologies

As an enabler of trade, and in a rapidly changing world, the maritime sector has to ensure that it assimilates the newest technology developments in a timely manner in order to stay competitive and attractive to businesses and passengers.

One of the ways to ensure this is to focus on trade facilitation through **digitalisation**. This trend was recognised by the European Commission President in her mission letter to the Executive Vice-President for a Europe fit for the Digital Age, Margarethe Vestager[50].This trend is also reflected in the EU's long term "**Blue Growth**" Strategy, which aims to achieve smart, sustainable and inclusive growth. It supports the marine and maritime sectors by developing sectors that have a high potential for sustainable jobs, innovation and growth. This strategy provides a thematic link with Motorways of the Sea, and a platform for cooperation and connectivity.

Currently goods shipped by sea are mostly accompanied by digital based customs documentation and submitted through digital customs systems or maritime national single windows (RFD, in future EMSWe). By transforming this documentation flow into electronic format, the whole trade process experienced rapid changes minimizing the cost of business transactions, speeding up trade and lowering the cost of doing business. Nonetheless, in order to fully exploit the potential of a full digital transformation the message to be exchanged should be more interoperable than they currently are in order improve the customs controls' efficiency and trade administration processes.

[49] https://ec.europa.eu/regional_policy/en/policy/themes/outermost-regions/
[50] https://ec.europa.eu/commission/sites/beta-political/files/mission-letter-margrethe-vestager_2019_en.pdf

In order to pursue the interoperability of data sharing and improve interconnection between maritime operators, customs, ports and other supply chain stakeholders in regards to vessel calls and cargo management, due account should be taken of the concept of the "federated network of platforms", developed by the Digital Transport and Logistic Forum (DTLF)[51]. The federated network of platforms represents a decentralised data exchange environment in transport and logistics, based on common rules and principles, and connecting existing and emerging data sources and platforms.

The high level of interoperability between various data sharing systems regarding customs data, cargo data, port data and data from other logistic chain operators, can help stakeholders to optimise cargo flows, plan terminal works and facilitate administrative procedures in advance for the vessel's arrival at a port's premises.

Interoperability can also be boosted by new technologies used to streamline different types of operations and to exchange data in real time. Distributed architecture such as Blockchain may be able to speed up cargo checks, supporting clearing procedures, thus favouring transparency and fraud detection. Other technologies are emerging in terms of favouring the multimodal logistic chain such as Artificial Intelligence, Machine Learning, IoT and Robotic Process Automation.

Optimisation of port operations, and the whole supply chain, through ICT solutions continues to be another trend to look out for in the maritime sector. This includes port call optimisation, port throughput optimisation and multimodal logistic optimisation. In this respect port call systems (e.g. the PORTCDM approach developed in previous MoS actions) should be coherent with EMSWe and federated with other platforms as they could share partially the same information environment.

Concerning ship operations, ICT systems such as on board IoT devices and sensors can help prevent equipment and machinery breakdowns and unscheduled vessel repairs which often result in costly downtime. This is usually done by continuously monitoring the actual condition of the machinery and equipment through sensor measurements. Collected data can be used for predictive maintenance, which enables vessels to operate optimally with a minimal risk of operational disruptions.

In relation to multimodal logistics chain, in order to maximise the port throughput, it is important to work in boosting the interoperability of data and messages coming from different actors (e.g. the work already on going from DG MOVE to assess how the TAF/TSI messages could be extended to other actors and how this standard can evolve taking into account the logistic chain needs). Moreover, utilising ICT land systems in the port's direct hinterland, such as fast trade lanes federating networks of logistic chain stakeholders, is highly needed.

The importance of digitalisation gained recognition on the EU level as well, with the already mentioned EU Regulation on **electronic freight transport information** (eFTI). Its main purpose is to harmonise and establish an EU framework for existing information while encouraging to use electronic documents and it is relevant for the multimodal logistic chain. As maritime transport information is covered by the EMSWe it is important to seek interoperability between these initiatives.

[51] www.dtlf.eu/sites/default/files/public/uploads/fields/page/field_file/executive_summary2_reading__0.pdf

3.2.4 Economic growth in developing countries

A. Cooperation with neighbouring countries & access to overseas markets

Promotion of short sea shipping also with neighbouring countries is important for an efficient operation of MoS. One of the main goals of it is to reduce road congestion and improve the environmental performance of the whole transport system by shifting freight from road transport to short sea. This should be highlighted to businesses and passengers in order to influence their decision in choosing maritime transport.

The intergovernmental institution, Union for the Mediterranean (UfM), consisting of 43 state parties, is actively engaged towards addressing the complex challenges facing the transport sector. It also seeks to develop an efficient, integrated, interoperable and sustainable transport infrastructure network through a holistic and integrated approach, with a view to improving transport **connectivity in the Euro-Mediterranean region**. By virtue of the UfM political dimension, the Ministers of Foreign Affairs of the countries involved are able to devise and adopt ministerial declarations, which set the scene for the future priorities and steer the society to develop concrete actions in the areas that require improvement.

In terms of overseas markets, the North African Mediterranean neighbourhood sees itself as the **Gateway to Africa** for European trade. According to the African Development Bank, Africa is today the second-fastest growing region. African economic growth was projected to accelerate to 4 percent in 2019 and 4.1 percent in 2020[52]. As of 2019, there are approximately 1.3 billion people living in Africa's 54 countries. Current growth statistics relate to sales of commodities, services and manufacturing and these figures are set to grow steadily. The World Bank estimates that most countries in Africa will reach middle income status by 2025[53]. Several international business observers have identified Africa as the future economic growth engine of the world. However, those statistics have been made prior to the Covid-19 crisis and might see important changes in a few months from now.

The European Commission announced on 9 March 2020 a new EU Africa Strategy, aimed at intensifying cooperation between the European Union and its closest neighbour. Based on five key partnerships, on the green transition, digital transformation, sustainable growth and hobs, peace and governance and migration and mobility, this new strategy will be officially launched in October 2020 and will usher in an era of ever-closer cooperation with Africa.

Despite Africa's importance as one of the fastest-growing economies in the world, focus should nevertheless also be maintained on other countries and regions. Strong benefits can certainly be reaped from closer ties with Asian countries, in particular through the Black Sea basin. Equally, establishing regular short sea shipping links with non-African Mediterranean neighbours, such as Turkey, Israel, Lebanon, Egypt, i.a. can present significant advantages for the European maritime industry.

When it comes to the importance of Europe's peripheral and outermost regions, these have been addressed in section 3.2.3.A above.

[52] https://www.afdb.org/en/documents/african-economic-outlook-aeo-2019-english-version
[53] https://www.worldbank.org/en/news/press-release/2012/10/04/despite-global-slowdown-african-economies-growing-strongly-world-bank-urges-countries-spend-new-oil-gas-mineral-wealth-wisely

3.2.5 Increased expectations for safety

Safety is a precondition for maritime operations in Europe and the maritime safety policy framework of the EU ensures the highest safety standards through enforcement of IMO rules in addition to specific EU measures. This is further illustrated by the implementation and operational tasks assigned to the European Maritime Safety Agency (EMSA)[54].

Safety has always been of utmost importance, and although accidents - by definition - are accidents, there is a growing trend towards a zero tolerance for maritime accidents and incidents.

A. Navigational safety

New shipbuilding technologies continue to allow naval architects and shipbuilders to increase the **size of vessels** and the industry has experienced container ship capacities increasing from 2,400 TEU (240m long) to the latest generation of ships crossing the mark of 20,000 TEU (400m long). In 2020, the world's largest ship is MSC Gülsün with 23,756 TEU (400m long).

This trend affects port facilities as container terminals have historically built berths between 300 and 360m, implying that the new generation of ships may have become too large for contemporary berths. Thus, the ports that serve international trade require continuous investment in order to keep up with the ever-larger vessels and increased volumes of goods. In addition, the size and engine power of these vessels exacerbates the difficulties of slow-speed handling; an issue that should be reflected in pilotage practices through the safe and efficient navigation of ships. It also emphasises the importance of using sufficiently powerful and manoeuvrable tugboats during docking operations.

European flagged vessels (to which international conventions apply) have to abide with the quality requirements set by the Marine Equipment Directive (MED), which aims at ensuring that only approved marine equipment, such as live-saving appliances, navigation equipment, evacuation systems, are installed on board ships flying the flag of an EU country and for which the approval of the flag State administration is required by international instruments. These requirements contribute to the high standards of EU maritime safety.

The maritime industry is also obliged to keep up with the newest developments in container shipping. Some types of cargo, such as fuel or radioactive materials being transported on increasingly larger ships, do present certain concerns for regulators. In order to efficiently safeguard shipping activities, the EU devised multiple initiatives, such as Hazmat reporting, which aims at improving the quality and accuracy of reporting on dangerous and polluting goods.[55] Major fires on container vessels are one of the most significant safety issues. These incidents expose a gap in the firefighting capabilities of ships and crew, and other causes, such as misdeclaration of dangerous cargo significantly increases safety risks. Thus, it is quite possible that more updated risk management procedures will be promoted vis-à-vis seafarers. Emergency trainings and drills are one way to help with preparing crew members to face real life emergency situations.

Another navigational safety issue relates to the **Arctic Route**. Due to global warming, the Central Arctic Ocean's ice is melting at an unprecedented rate, opening new possibilities for resource extraction and transport, resulting in increased economic and military activity in the region. The Arctic region rapidly becomes a focal point of economic and geopolitical competition among the states concerned. With three EU Member States – Denmark, Finland and Sweden, and also half a million of EU citizens calling the Arctic their home,[56]

[54] http://www.emsa.europa.eu/emsa-documents/latest/download/5762/3657/23.html
[55] http://www.emsa.europa.eu/ssn-main/documents/download/5230/2298/23.html
[56] https://op.europa.eu/en/publication-detail/-/publication/6feff832-0cdb-11ea-8c1f-01aa75ed71a1

the European Union has an important role in ensuring a peaceful and sustainable Arctic. Given the increasing interest in and a possibility to explore and navigate Arctic waters, navigational safety is a key area to be taken into account. As a particularly sensitive sea area, technical and operational preparedness in case of thick ice or oil spill, and crew training to withstand harsh conditions is considered to be of paramount importance.

This also shows that in relation to passenger vessels, especially the ones travelling to islands or across channels, in order to minimise accidents at sea, the safety and security standards must be of the highest level, to ensure that the dedicated infrastructures, facilities and vessels used are reliable and equipped with life-saving equipment. Furthermore, cooperation on passenger data exchange can support search and rescue operations effective, as well as providing medical help, in the case of an incident.

Finally, as a third trend to keep in mind, **cybersecurity risk mitigation** should also be included in safety training. Cybersecurity policies should be introduced providing employees with the necessary skills to safeguard sensitive information and defend operational systems. Failure to react accordingly to cyber security threats may result in serious incidents, such as traffic disruption and loss of life at sea. Safety concerns should also be addressed on the land-side since cybersecurity is also a major issue for port infrastructure and operations.

B. Connection to hinterland & interoperability with other modes

European ports are vital gateways as they are linking Europe with the rest of the world, and play an important role in connecting the European Union within its borders and with its peripheral and outermost areas. The maritime routes carry billions of tonnes each year, providing links ranging from short-distance ro-ro ferries crossing straits to round-the world container liner services.

However, in order to ensure a seamless European maritime space, it is of crucial importance to ensure that ports have efficient hinterland and last mile connections. They must be well integrated in the overall transport network, as ports are most often neither the source nor the ultimate destination of freight flows. A well-developed logistics chain provides an efficient and uninterrupted trade, and as such, flexible solutions, such as rail shuttles from ports to larger hubs located further inland, or the development of inland waterways, should be considered with more attention than they have been to date.[57] These solutions would greatly contribute to the greening of ports and a larger movement away from road transport.

According to the statistics, around three out of the four billion tonnes of cargo received by ports per year actually form a part of hinterland traffic, i.e. traffic that needs pre-/post-carriage by truck, rail or barge. Additional to the ro-ro and container services, there are a significant amount of European trade on tramp service or time chartered and this should be considered when looking at maritime dimensions of the TEN-T. Consequently, it is essential to make sure that ports are well connected with hinterland infrastructure in order to boost the success of maritime transport. Notwithstanding the overall priority on railway and inland waterway hinterland connections, it is also true that it is still possible to identify seaports on the TEN-T corridors without a proper and efficient hinterland connection by road so that, where justified, bottlenecks in road access infrastructure to the seaports should also be removed.

To ensure smooth integration of maritime transport with the overall logistics chain, the maritime National Single Windows, set up in accordance with the EMSWe Regulation, should allow to exchange relevant information with similar frameworks among different transport modes, that way contributing to better interoperability and multimodality.

[57] see Regulation (EU) No 1315/2013, art. 23(b)

C. Automation

Even though the maritime sector is embracing **automation** slower than other transport sectors, the deployment of autonomous technology is now starting to accelerate, particularly in ports. The main reason why ports have accepted automation is that, if automated, certain port services are safer. The number of injuries and cases involving human-related disruptions drops significantly and performance becomes more predictable. Automation in cargo handling services also opens up the possibility to attract more **women** to the sector. Automation is not intended to substitute jobs. With a new management approach and comprehensive **training** modules, it should make jobs safer and more efficient.

The impact of automation is not limited to cargo handling, and is relevant for all maritime activities, with the potential to increase productivity, safety and environmental performance. Indeed, according to a report by the World Maritime University entitled "Transport 2040: Automation, Technology, Employment, the Future of Work" [58], automation will be integrated in vessels and infrastructure, but also has the potential to disrupt practices in maintenance, user interface for passenger services and lead to the development of new services brought about by **evolving technology**. However, the report also notes that although transport has a high potential for automation, its adoption rates will be slower, due to the wide range of low, medium and high skilled jobs across the sector, and this is especially true for maritime transport which is the most diverse in terms of human capital and skills.

As for **autonomous ships**, they are starting to be developed as remotely operated ships as the first step, and later on completely autonomous ships will be introduced with an ability to assess their surrounding environment and the ship's condition to act accordingly. However, in order to reach an objective of having fully autonomous ships by 2030, more research, investment, stakeholder consultation and regulatory progress is needed. At the moment all existing legal instruments are considering manned vessels, thus a common understanding and interpretation of the regulatory requirements in case of autonomous vessels must be devised within the IMO. The maritime industry is keeping up with the newest developments, and the IMO has started reviewing the current rules in order to evaluate their compatibility with autonomy through its Regulatory Scoping Exercise. From one point of view, autonomous shipping certainly would help reduce human errors and thus reducing the number of accidents at sea, such as collisions or acts of piracy. In addition, it would also reduce ship owners operating expenditures. However, in order to reap the benefits of using autonomous ships, high cyber security standards have to be implemented onboard ships as well as developing shore-side infrastructure systems around the globe for monitoring and control purposes, as well as maintenance and repair operations as the result of crew elimination. Equally, port state authorities will have to overcome the additional challenges linked to understanding which priorities are programmed in the algorithms that will control autonomous operation in their ports and waterways by ships from different companies and flag states.

[58] https://commons.wmu.se/lib_reports/58/

D. Human capital and jobs in the maritime sector

The EU maritime transport sector accounts for the employment of around 203,000 people[59] and ownership of over 40% of the world's fleet[60], while ports employ over 1.5 million workers [61]. Due to its global nature, seafaring faces various challenges, such as severe competition, dependence on business cycles, social dumping, lack of attractiveness of the profession e.g. due to long working hours with harsh living conditions and social isolation, and lack of social protection.

In order to support the seamless and sustainable transport of goods and passengers by sea, it is essential to promote a **smart and safe work environment**. The quality and safety of such operations will be guaranteed by ensuring employees of the sector possess the right skills and competences. The European Commission has identified key objectives to be reached in the upcoming years, such as create and safeguard adequate labour force in the maritime sector, make this sector more attractive to young people and promote maritime safety and security.[62]

It is also largely agreed that the upskilling of maritime professionals should emphasise the new challenges coming from new technologies, such as handling alternative fuels or dangerous cargo. Furthermore, in order to increase preparedness for various kinds of risks such as cyber-security, or accidents, natural disasters, emergency procedures and contingency planning should be taken into account.

It is an ongoing effort to address social aspects of maritime life, it is important to bring awareness to harassment and bullying at work and devise measures to eliminate them, as well as to ensure seafarers benefit from proper social protection. Finally, it is still an important challenge and objective to attract women and youth to the industry (see the reference above on how automation could be an enabler).

[59] www.emsa.europa.eu/damage-stability-study/items.html?cid=77&id=3662
[60] https://stats.unctad.org/handbook/MaritimeTransport/MerchantFleet.html
[61] https://ec.europa.eu/transport/modes/maritime/ports/ports_en
[62] https://ec.europa.eu/transport/modes/maritime/seafarers_en

4 Towards sustainable, seamless and smart Short Sea Shipping

The vision for short sea shipping as climate-neutral and clean maritime transport, fully integrated into the European multimodal transport network and seamlessly connected both physically and digitally cannot be reached by any segment of the industry alone. Shipbuilders, ship owners, ports and logistics operators, class societies and others must play their part in the chain of responsibility.

Ports today, however, seem to play a major role in ensuring the adequate provision of high-quality port and hinterland infrastructure needed for today's shipping. This includes the provision of alternative fuels and refuelling possibilities, shore-side electricity, digital infrastructure, waste management infrastructure as well as the shore-side workforce. The integration of short sea shipping in logistics chains requires cooperation with the ports and beyond, e.g. with forwarders and cargo owners.

In some fields of action, targets to reach the above vision are clearly set by the legislative drivers (see 3.1) and emerging trends (see 3.2), while in other areas the necessary or desirable change must be identified based on an analysis of market demand (see 4.1). By comparing the status quo with these targets, one can see where we stand today: the current '**degree of adequacy**' of European short sea shipping and the gap towards a vision of the adequate state developed in cooperation with stakeholders and experts (see 4.2). Chapter 5 focuses on these gaps, identifying the total investment costs needed to move from the status quo to the adequate state.

4.1 Short Sea Shipping until 2030: defining the adequate state

Based on the long-term vision of European short sea shipping as a carbon-free transport mode fully integrated into the trans-European transport network, the necessary current and future steps can be spelled out and the 'adequate' intermediate states with regard to environment, integration in logistics chains and digital solutions be defined. Some of these intermediate steps are already clearly defined by the legislative drivers, while others need to be defined based on the existing legislation against the background of recent developments both within and outside the sector.

4.1.1 Environmental stakes

There is a political consensus that the transport sector has to increase its efforts to decrease **greenhouse gas emissions**. In 2018 the IMO adopted the Initial IMO Strategy on Reduction of GHG emissions from ships. The Initial Strategy requires shipping to peak GHG emissions from international shipping as soon as possible and to reduce the total annual GHG emissions by at least 50% by 2050 compared to 2008. The Initial Strategy is to be revised in 2023. First concrete measures for the delivery of the strategy are currently being considered at the IMO. At EU level, the European Green Deal puts forward several measures for maritime transport (including the extension of EU ETS to maritime transport and shore-side electricity). At national level, some Member States address shipping in their national plans. Shifting transport from road to sea has long been considered as a mean to decarbonise transport.[63] In the light of the reduction goals set in the IMO initial strategy and the European Green Deal the maritime transport sector must increase its efforts to decarbonise.

[63] COM(2011)144 final

Besides operational measures such as slow steaming or route optimisation, the focus will naturally be on **ship propulsion and ship efficiency** (in terms of CO_2 equivalents per tonne-kilometre) as these are the main factors impacting on GHG emissions in maritime transport. As a first step, Regulation 2015/757 requires ship owners to monitor and report CO_2 emissions from larger vessels (see 3.1). In order to significantly reduce CO_2 emissions and the emissions of other greenhouse gases, the development of new propulsion techniques must be accelerated. Currently, it is not clear which type of fuels will be the best solution for large-scale long-distance shipping (hydrogen, ammonia, synthetic fuels, biofuels, electric or other). However, it is clear that by 2030 the latest, the first zero-emission vessels must be commercially viable. This adequacy target is a direct consequence of the IMO target set for 2050. In order to halve the emissions from shipping, a large share of the fleet must be close to carbon neutrality by then.

Two lines of action have to be pursued in this context until 2030. First, in order to achieve reductions quickly, existing technical and operational energy efficiency solutions like hull design optimisation, weather routing, etc. have to be adopted on as many vessels as possible. Shipyards and owners must make sure that new vessels' propulsion is compatible with the latest state-of-the-art in terms GHG reductions and air pollutants. The issue of methane slip from LNG engines is already being addressed in research,[64] but it should also be addressed by new regulations as methane contributes 20-30 times more to climate change per tonne than CO_2.[65]

Second, research and innovation on more environmentally friendly shipping has to be intensified. As ships have an average lifetime of more than 20 years (some ship types even much longer), vessels built in 2025 will still be sailing in 2050. In order to reach more ambitious objectives beyond 2030, new concepts and innovations are hence needed quickly. There may be a dual strategy, with some alternative fuels being favoured for existing vessels (either with existing engines or cost-effective retrofitting solutions) and others being favoured for newbuildings.

An intermediate target ('adequate state') for 2030 would be to have at least 10% of intra-European shipping services actually using more environmentally friendly fuel types than Heavy Fuel Oil (HFO) or Diesel.[66] The share should be 100% of newbuildings until 2050. As regards research and innovation, a carbon-free pilot vessel of medium or large size adapted to intra-European shipping (several hundred nautical miles) should be ready by 2030 the latest, addressing also the issue of bunker availability at the large scale needed for shipping.

The ports must enable these changes, e.g. by providing **bunkering facilities for alternative fuels or charging facilities with low-carbon electricity** (to the degree possible, compare Regulation 1315/2013, Art. 33 b) in order to facilitate the move towards alternative propulsion techniques as described above. Ports and terminal operators shall of course also contribute directly by continuing to focus on energy efficiency and low-carbon terminal equipment despite their rather limited share in the total transport chain's emissions.

Specific targets have already been set for **LNG bunkering** in maritime ports: all core network ports shall be covered until 2025 and all comprehensive network ports until 2030 (Directive 2014/94 – see **Error! Reference source not found.** for more detail). This does n ot mean that the 'adequate state' requires all these ports to have an LNG terminal. Such terminals should rather be available in all port ranges, complemented by a fleet of LNG bunkering vessels that can serve nearby ports.

[64] e.g. MariGreen project "Methane catalyst for LNG engines"
[65] Methane and other greenhouse gases are not even covered by the monitoring regulation
[66] Many dual-fuel engines actually still use MDO

The directive also addresses **shore-side power supply** which shall be available in all core network ports and other ports by 2025 if costs can be justified by potential demand. A port-by-port analysis is hence necessary to identify the actual needs and define the adequate state (Directive 2014/94, Art. 4 (5), currently under revision). New installations shall comply with IEC/ISO/IEEE 80005-1. In the long term, other means can be used to reach the same goal – namely a reduction of noise and air emissions – e.g. fuel cells on the ships.

Waste reception is another essential environmental issue that needs to be addressed by ports. Directive 2019/883/EU ensures implementation requirements set out in the MARPOL Convention, and is linked with the Circular Economy Package and EU Plastic Strategy EU Environmental Legislation as well as the issue of marine litter from maritime transport. Directive 2019/883/EU defines criteria for an adequate state for port reception facilities in Europe based on 'the types and quantities of waste from ships normally using the port' aiming at a reduction of waste from vessels into the marine environment and at facilitating maritime transport services through reduced administrative requirements. Hence, the Directive tackles the adequacy of port reception facilities based on demand, the delivery of waste from ship to shore through economic incentives, enforcement where necessary and exemptions where possible and the provision of coherent and equal administrational procedures. Of particular importance are the principles for the cost recovery systems through a transparent system of fees and costs and the calculation of significant contributions from the port users – while allowing a differentiation of fees based on categories, types, sizes and traffic types and also according to classification of ships that produce reduced quantities of waste and manage waste in a sustainable and environmentally sound manner as well as short sea services.

An information, monitoring and enforcement system is to be developed and applied by ports – supported by an inspection regime. Exemptions are e.g. to be based on ships with regular and frequent port of calls, evidences for arrangements for waste delivery, electronic reporting procedures or paid fees in ports within the vessel's service route. Four Implementing Acts are foreseen in relation to the calculation of sufficient on board storage capacities, criteria for on board waste management, a risk-based targeting mechanism and a methodology for reporting passively fished waste.

The previous Directive on Port Reception Facilities acknowledged the fact that not all waste categories are relevant for all ports. Port reception facilities shall be "adequate to meet the needs of the ships normally using the port" (Article 4) so a port-by-port analysis of traffic structures is necessary to clearly identify the needs in each port based on the analysis of the concerned ship traffic and other relevant influencing factors.[67]

The environmental pillar also includes a number of **local emissions** which are generally of less relevance for global climate change, but very important for the health of the population in the port vicinity. This is, of course, particularly important for the so-called 'city ports' which are situated in densely populated areas. So far, no EU-wide legislation exists for a common approach to port air emissions, but the sector should be aware of the high importance of local pollutants with regard to the acceptance and hence the sustainability of port activities. There are no clear targets yet set for OPS installations in EU ports. As a basis for the estimation of investment needs, it is assumed 'adequate' that by 2025, all cruise terminals[68] located in densely populated areas should use OPS or other

[67] COM(2018) 33 Final

[68] according to Eurostat definition: https://ec.europa.eu/eurostat/cache/metadata/en/mar_esms.htm; cruise vessels are characterised by rather long port stays and a high power demand during the stay (e.g. for air conditioning, amenities, etc.)

means to reduce local air and noise emissions. Among others, the cruise industry is studying technological options.[69]

By 2030, the 'adequate state' supposes that all cargo terminals in densely populated areas with a significant amount of ship calls of at least four hours located in such areas have similar means installed wherever feasible.[70]

A second local issue is **land use**. Cities are growing and land is becoming scarce and expensive in the cities. The reconversion of previous port areas into residential or commercial areas can be observed in many cities. The increased competition for land makes efficient land use paramount in urban areas. In future, possibilities to increase the land efficiency of ports and terminals (e.g. cargo handled per hectare, differentiated by cargo type) should be given a priority. By 2030, ports planning a capacity expansion should strive to reach at least the current industry standard (e.g. 8th decile) on the existing terminals for the same kind of cargo (unless particular circumstances limit land efficiency).

4.1.2 Integration of maritime transport in the logistics chain

Maritime transport is virtually always part of a multimodal transport chain. Maritime transport is the most cost-effective for large volumes of cargo, but these can be transported only between ports or other places with sea-side cargo handling facilities (e.g. industry with own quay wall and cargo-handling equipment). Hence, the attractiveness of maritime transport chains depends on the efficient integration of maritime and hinterland transport.

European ports are at the crossroad of the logistics supply chain bringing together all modes of transport. They do not only include maritime infrastructure components, but also transport infrastructure such as roads, bridges, tunnels, junctions, parking areas, freight terminals and logistic platforms, railway tracks, sidings and marshalling yards. In addition, European ports are often hubs of energy and are increasingly digital hubs at the service of the entire transport and logistic chain.

A prerequisite for this integration is the **physical infrastructure in the ports**, including terminals and their connections with the hinterland network. The terminals must provide enough capacity to assure the loading operations between seagoing vessels and the different hinterland modes in line with demand. Both intra-European short sea container traffic and ro-ro traffic did not grow at the same pace as container deep sea traffic during recent years, so the need for capacity demand is rather limited for short sea shipping. However, there has been considerable demand in some sea basins, indicating a possible need for additional handling capacities (see 4.2).

The rail, road, inland waterway and pipeline connections must assure the smooth transfer of volumes between the ports and the hinterland transport network. As this is a demand-side indicator, the adequate state can only be defined port by port. Each seaport knows the gaps and bottlenecks in its respective hinterland quite well. The challenge for future investments is a neutral, demand-based identification of the most urgent bottlenecks concerning port-hinterland infrastructure. As a first step, indicators like traffic density per rail track, road lane, quay metre or per ha of terminal could be collected and compared.

The **hinterland network** must provide the necessary capacity for transport between the ports and importers or exporters. The necessary capacity depends, of course, on the size of the port that needs to be connected. Here again, the planning must be port by port and region by region. The CNC ports' adequate hinterland connection is essential for the functioning of TEN-T network as a whole. This includes links to the extended gateways and

[69] www.greencruiseport.eu/files/public/download/GCP%20Action%20Plan%202030_Final%20Report%2004Feb2019.pdf

[70] Most cargo terminals have a mix of ships from different parts of the world, so standardisation issues prevail.

on intermodal terminals in the hinterland. In the long run, the link with the comprehensive network and its ports should be improved, too. This will also improve the resilience of the TEN-T network (see 5.4).

4.1.3 Streamlining and digitalising procedures

Besides the physical infrastructure, **smart administrative procedures** are important for the competitiveness of maritime logistics chains. A disadvantage of short sea shipping vis-à-vis land transport is the requirement to do customs declarations. The number of players involved in the transport – each with specific data needs – is also much higher. For road transport, the cargo is in the same hands from door to door. Maritime transport involves at least one shipping company, two terminals and two hinterland transports.

Maritime Single Windows are a first step to simplify the procedures for maritime transport, but other players should be connected to these systems (e.g. via port community systems, if existing) in order to avoid unnecessary duplication of data. The European Maritime Single Window environment (EMSWe) as one stop for all transport-related data (uploaded from existing information from electronic transport documents and related data) should be ready and implemented by 2025 the latest. An adequate state at port level could be seen in providing a tool compatible with the EMSWe technical standards, in all the core and comprehensive ports in 2030. In addition, the new Regulation on electronic freight transport information (eFTI) aims to ensure data interoperability with the EMSWe environment, in order to facilitate re-use and cargo information exchange along the entire logistics chain within the hinterland[71].

4.2 Current gaps in the European Sea Basins

As the above analysis has shown, the needs of ports depend very much on the cargo and ship traffic volume and its structure. Shore-side electricity, for example, brings the highest effects on cruise vessels and on container ships, particularly if there is a high number of active reefer containers aboard. In ferry ports with very high frequencies and short berthing times, they may actually not be feasible.

LNG is currently being developed for intra-European shipping, but its lower levels of development in other parts of the world could hinder its use for deep-sea shipping. On-shore power supply and other means to reduce local air and noise emissions have the highest impact in densely populated areas and should be a priority there.

Additionally, as the global pressure to address climate change is increasing, the momentum around the need to decarbonise transport sector can be expected to grow. The use of synthetic or bio-LNG can contribute to achieving GHG emission reductions targets and reaching net-zero emissions. Other alternative fuels also present the potential advantage of being able to transit on already existing gas networks, facilitating their deployment. Insofar, LNG can also be a facilitator for future low/zero-emission fuels. Given the strong benefits for reducing GHG emissions that alternative fuels can bring to the SSS sector in Europe, production capacities must be increased, and propulsion systems should be developed further.

The need for additional terminal capacity dedicated to short sea traffic is rather limited as growth of maritime traffic was driven by deep sea traffic during the past decades. However, some regions have seen a considerable expansion of short sea traffic volumes so that there may be a need for capacity expansion.

[71] Following agreement on amendments by the EU co-legislators on the Commission proposal for the eFTI Regulation, the Regulation is expected to enter into force by mid-2020, and start fully applying as of mid-2025.

Table 8 Total short sea cargo traffic increase/decrease in Core Network Corridor ports, 2008/2010-2018

	Cargo traffic growth/decrease	
Basin	2008-2018	2010-2018
Baltic Sea	+17%	+15%
North Sea	+6%	+12%
Atlantic	+11%	+20%
Western Mediterranean	+10%	+17%
Eastern Mediterranean	+17%	+31%
Black Sea	-9%	+28%

Note: TEN-T ports including UK
Source: ISL based on Eurostat

Therefore, the 'adequate state' and the way forward will hence not be universal for all ports for some areas of action such as LNG provision, onshore power supply or hinterland connections. One needs rather to differentiate between groups of ports according to the demand structure (cargo types, ship sizes, etc.) and current status quo. Therefore, the gaps in the above areas will be analysed separately for the different sea basins below. Comparable criteria will have to be developed for assessing investment needs, supporting the decision-making process in coordination with Member States and stakeholders.

In some cases – such as the development towards a European Maritime Single Window or the development of new ship propulsion technologies – adequacy can only be defined for the European port landscape as a whole. These pan-European gaps are addressed at the end of this chapter.

4.2.1 Baltic Sea

The Baltic Sea has been at the forefront of technological innovation for environmentally friendly shipping. One driver was probably that it was the first SECA area worldwide. LNG propulsion was identified as one possibility to reduce the sulphur content, other options like electric ferries are explored. For instance, electric ferries are already in use on the Helsingor-Helsingborg connection. In addition to this, hybrid-ferries have also been developed, for instance in the Fehmarn Belt between Denmark and Germany.

There are **LNG terminals** in all major coastal areas and further terminals are planned. The onward distribution from the existing terminals is done by seagoing LNG bunker vessels that can serve ports in the respective neighbouring areas.

Despite the high land-side investments, the number of cargo vessels with LNG propulsion is still very limited: by late-2019, only a few of the roughly 100 ro-ro/ro-pax vessels regularly calling in the Baltic Sea is LNG ready and only two out of 200 container vessels had LNG propulsion (both dual fuel, i.e. Diesel or LNG). However, several such vessels have been ordered by the operators.

On-shore power supply (OPS), by contrast, relies mostly on fixed installations that can only be used in the respective port. Only few ports in Europe have already introduced OPS solutions which are particularly advantageous for cruise ships (long berthing times, very high energy consumption), large container ships (very long berthing time, high energy consumption) and ro-pax vessels (medium berthing time, medium energy consumption). Dry bulk carriers, by contrast, benefit much less. As a first step, all cruise ports situated close to city centres should be equipped with OPS systems.

There are six major cruise ports in the Baltic Sea, all except Kiel being core network ports: Rostock-Warnemünde, Kiel, Copenhagen, Stockholm, Lübeck-Travemünde and Tallinn.

Two ports have already installed OPS systems for cruise ships (Stockholm and Kiel) and by 2021 all cruise terminals that are located close to city centres will be equipped according to plans of the respective port authorities. For ro-ro ships, the case is less clear. They do not stay very long in one port, so they benefit less from OPS. However, the same ships call regularly in the same ports, so the issue of standardisation is rather easy to handle.

The population in the Nordic states is particularly sensitive to environmental concerns. The issue of **local pollution** has been tackled in various ways, e.g. by using OPS systems (see above) or environmentally friendly terminal equipment such autonomous electric terminal tractors currently tested in the port of Gothenburg. Another way of reducing the impact of port operations is to move operations away from the city centres to other port areas, giving space to new housing and moving polluting activities (also caused by hinterland transport) out of the city centre. The ports of Malmö and Riga, for example, have moved cargo operations away from the city centres to new locations outside the cities.

Though there was a strong growth of container traffic during the past decade in the Baltic Sea, this growth did not come unexpectedly and there is still spare terminal capacity. Capacity expansion plans are under way in many ports – both increasing the efficiency of existing terminals and constructing new terminals. However, it has to be noted that the volume and growth is mostly related to feeder traffic to/from North Range ports and deep sea direct calls in the Baltic Sea and hence not related to intra-European short sea trade. Ro-ro traffic reached a new record high two years in a row in the Baltic Sea's core and comprehensive ports, but volumes were only 3% higher overall in 2018 than they were in 2007.[72] A lifting of trade sanctions on Russia could, however, boost transit traffic in some Latvian, Estonian and Finnish ports. Therefore, there is no general need for additional terminal capacity, even though there may be single terminals which are reaching its limits.

As regards the **rail connection** and onward transport, it has to be noted that a large part of rail traffic in the Eastern Baltic is transit traffic. While in all other EU coastal areas, the bulk of hinterland traffic is staying in the country or going to other EU countries, a large share of hinterland traffic of the Baltic States' ports as well as some Finnish and Polish ports has origin or destination in Russia, Belarus and the Ukraine. In order to optimise these transport chains, EU standards promoted on the core network corridors cannot be imposed easily. Instead, the cooperation with the neighbouring states is necessary to define standards and make these transports as efficient as possible.

A particular challenge concerning only the Baltic Sea is **ice-breaking**. In order to keep ports in the Northern Baltic Sea (particularly the Gulf of Finland and the Bothnian Bay) accessible, ice-breaking is necessary during winter months. Shipping is particular important to connect the peripheral regions of Northern Sweden and Northern Finland to the European mainland, so the ice-breaking fleet must be modernised.

4.2.2 North Sea

The North Sea is among the busiest shipping regions in the world, particularly the English Channel and off the coasts of France, Belgium, the Netherlands and Germany. Environmental issues are hence of particular importance. There are various functioning **LNG terminals** in the area covering all major shipping areas except the German Bight. This gap will be closed with the planned terminal in Brunsbüttel.

The development of **OPS installations** in the North Sea is quite advanced compared to other sea basins. The Port Authority of Antwerp, for example, acknowledges OPS as a strategic objective and has therefore set the ground for further OPS installations by signing two agreements in 2018 which facilitate the further installation of OPS infrastructures in Antwerp. This will extend the already existing provisions of barges and service vessels with

[72] For comparison: container traffic exceeded 2007 volumes by 74% in 2018.

on-shore power to sea-going vessel. Dunkerque installed OPS facilities for container vessels in early 2020.

A similar recent development can be seen in the Port of Hamburg. The port decided in October 2019 to provide OPS infrastructures at existing berths for cruise and freight vessels from 2022. Currently, the issue on acceptance by the vessel operators is under discussion and how to settle the price differences between diesel and shore-side electricity, the latter being more expensive.

Similar problems have been addressed in the Port of Zeebrugge where already existing wind turbines could provide the electricity for OPS systems. However, the price gap needs to be solved here as well. Currently, only the Swedish-Finnish company Stora Enso and the Belgian naval base use shore-side electricity for their vessels.

The issues in terms of investment costs for OPS systems, the currently relatively low number of vessels with OPS plug-in and the existing price gap in favour of using diesel for auxiliaries instead of shore-side electricity are also essential obstacles for the Port of Bremerhaven in its considerations of OPS systems.

However, port investment costs and demand for shore-side electricity in terms of vessels with plug-in and price drawbacks for shore-side electricity are obstacles that need to be addressed also in other sea basins.

The ports in the North Sea have quite diverging structures. Some are close to city centres (e.g. the aforementioned ports of Hamburg and Antwerp) and hence particularly keen on reducing **local emissions**. In order to increase acceptance, various measures have been introduced to reduce such emissions. This includes the use of more silent terminal equipment or electric yard equipment to reduce local air emissions. Next to the impact of port operations, local administrations also target hinterland transport. The city of Bremerhaven, for example, is currently building a tunnel where port hinterland traffic moves through residential areas in order to reduce disturbances from port activities.

Similar to the Baltic Sea, container traffic in the North Sea is mainly related to deep sea traffic and the related feeder traffic. Before the crisis years 2007/2008, many ports initiated **terminal capacity** expansion plans and a new container port was built in Wilhelmshaven to cope with expected capacity issues. Therefore, there is currently still considerable unused container terminal handling capacity and no need for further capacity expansion. Ro-ro traffic concentrates on traffic between the United Kingdom and ports on the European mainland. After a new record high in 2017, volumes dropped in 2018 and were actually 1% lower than in 2007. Trade is likely to be negatively affected by Brexit so a need for further terminal capacity is unlikely. The EU-UK traffic and the level playing field between EU and UK ports will be an issue during the next years.

As regards the **rail connection** of ports and terminals, the standards are very good in the North range ports and also in the container ports around the North Sea where integrated rail terminals are standard. Intermodal traffic has a considerable share (between 25 and 60%) in the major container ports with larger hinterland outreach. In ro-ro terminals, the situation is different, particularly in Great Britain. Many terminals – including market leader Dover – do not have a rail connection. Most ports in the Hamburg-Le Havre range also have a well-developed **barge connection**. The most urgent issues are in the hinterland, i.e. guaranteeing the necessary water depth for inland navigation. For container traffic, bridge heights in the hinterland are an issue as many of the canals have originally been built for dry bulk and liquid bulk transport.

4.2.3 Atlantic Sea

Except for the Irish Sea, the Atlantic Sea basin is characterised by long sailing distances – even for short sea shipping. Also, the ports generally have a high share of deep-sea shipping. No Emissions Control Area (ECA) was established or even discussed so far. These factors explain why the use of alternative fuels in the area has not yet seen progress.

The landside infrastructure for LNG provision is rather well developed. There are various **LNG terminals** along the French, Spanish and Portuguese Atlantic Coast so this part of the Atlantic basin is well covered. LNG bunkering is limited to the ports with LNG terminals. This seems appropriate for the aforementioned coastal areas because vessels can include additional bunkering stops on long distances. The Irish Sea, by contrast, is not yet covered, even though there are many regular short sea ro-ro services within the area – a good basis for potential future demand. Due to the high number of relevant ports on both sides of the Irish Sea and the short distances, mobile LNG bunkering facilities (e.g. a seagoing bunkering vessel) combined with a larger-scale LNG terminal seem to be the best option.

There has been also an increasing pressure in the Atlantic area to reduce **emissions in ports** – particularly with regard to cruise vessels. For example, the Port of Dublin has announced that new berths to be built will also have to provide OPS. The use of OPS will be especially an obligation for cruise vessels taking into account the impact of local air emissions on the air quality of port cities. Here, the Dublin Port Company (DPC) intends to contribute clearly to such a corresponding development by being a forerunner with regard to obligatory use of OPS (currently required very few ports in the world only, e.g. Los Angeles).

A similar future-related development can be observed in the Spanish ports where an OPS Master Plan is under preparation for the supply of on-shore power to even all ships at berth in Spanish Ports. The OPS Master Plan is partly funded by the Connecting Europe Facility – CEF program for the construction of the trans-European transport networks (TEN-T). Within the project, pilot cases will provide berths with OPS infrastructure in different Spanish ports. In Lisbon – the basin's largest cruise port and situated close to the city centre – no OPS system has been installed yet.

Container traffic grew strongly in the area during recent years, but this was mostly due to deep sea traffic. Ro-ro traffic concentrates in large part on the Irish Sea as Ireland is connected to the European continent in large part via the United Kingdom. Depending on the future institutional arrangements, this transit traffic may become more complicated due to customs procedures so there may be a shift to direct routes. Due to the longer sea distances, part of the current truck and trailer ferry traffic could be shifted to container traffic and new container **terminal capacities** may be needed. For ro-ro traffic, short sea distances are normally preferred by the market so the southern Irish ports could need development. This could relieve capacity issues in and around the port of Dublin. Direct links between Irish ports and ports of the Atlantic basin could be developed after Brexit.

As shown in 2.2.3, the ports in the Atlantic are rather of medium size, making it relatively difficult to reach the critical volume for **rail services**. Also, their hinterland less populated and has less industry that the North Sea basin. Despite these demand-side limitations and some infrastructure limitations, rail services are well developed, and some ports are integrated on rail freight corridors. Even the port of Dublin – the most unlikely CNC port of the area for rail services because situated on an island with all potential destinations within a radius of 300 km – has developed some regular rail connections. **Barge traffic** plays a role in short distances in some Atlantic ports, e.g. in Nantes Saint-Nazaire or in Liverpool.

4.2.4 Western Mediterranean Sea

The Western Mediterranean has many ro-ro services with medium to long distances and few international short-distance services. The shortest routes are between southern Spain and Morocco. Though there are no Emission Control Areas yet, discussions are ongoing and market players have start to be prepared for such plans.

The major ports in Western Mediterranean between Algeciras and Livorno have either own **LNG terminals** or are within the reach of a neighbouring port's terminal. For the remaining regions (the southern half of Italy and Malta), there are already plans to close the gap.

Likely due to the crucial role of cruise shipping for ports in the Western Med, **OPS** has become already an essential technology for reducing local air emissions from the shipping sector. Just like the North Sea and Baltic Sea, there already several implemented OPS installations in the Western Mediterranean.

As described for the Spanish Atlantic ports, the OPS Master Plan is under preparation and refers also to the Spanish ports in the Western Mediterranean. Against this background, the Port Authority of Barcelona announced the strategic objective to equip all berth linked to the city with shore-side electricity from in 2023. The Port Authority of the Baleares also defined port areas where OPS systems shall be installed.

In Italy, the port of Civitavecchia installed OPS systems as a measure to lower impacts on local air quality from cruise and freight vessels as early as 2008. Further Italian examples are the Port of Genova, where the port authority implemented an OPS facility providing shore-side electricity to cruise, cargo and ferry vessels in 2018, and the Port of Livorno where in 2017 an OPS system was installed serving cruise ships with shore-side electricity.

In France, the port of Marseille Fos has equipped three docks in 2017 in order to reduce air emissions from its ship operations in the port. By 2023, all international ferries shall be equipped and all cruise and repair docks until 2025.

The Western Mediterranean is an attractive market for transhipment traffic and for deep sea traffic in general. Short sea trade in the area is mostly ro-ro traffic between the EU and North Africa. This traffic grew strongly before and after the financial crisis, but it is stagnating since around 2011 due to political instability in North African countries. In the long term, economists see a growth potential in the region then the political situation stabilises, so additional **terminal capacities** for ro-ro traffic may be needed in the more distant future.

Rail connections are particularly important for ports serving a wider hinterland, i.e. the Spanish, French and northern Italian CNC ports. All these ports are connected to the network and most have regular rail services. Due to their geography, some ports (e.g. on islands like Malta or Sicily) do not have a need for rail connection because their hinterland traffic concentrates on a rather small area. Other ports would benefit from an upgrade of the rail infrastructure for extra-regional traffic.

For inland waterway transport, the most important **barge connections** are Rhone and Saône between Marseille and Lyon and onwards which already have regular container lines and are well connected to the main container terminals in Fos-sur-Mer.

The G20 Compact with Africa and the related policy intends to build stronger economic ties between Europe and Africa. If economic growth on the African continent continues and stabilises, demand will grow at a much a higher pace than intra-European shipping. The ports in the Western Mediterranean connecting Europe with Africa may hence need **additional terminal capacity** – both for roro and container traffic.

4.2.5 Eastern Mediterranean and Black Sea

While there are discussions about an Emission Control Area (ECA) in the Mediterranean (see above), the Black Sea is not included in these discussions. Therefore, while ports and ship operators are preparing for a possible Mediterranean ECA, there is no activity yet in the Black Sea.

This is also reflected in the **LNG terminal** coverage. There are installations in the Northern Adriatic and plans for installations in Southern Adriatic and in Greece, but no advanced plans yet in the Black Sea. Due to the lower traffic density and a high share of bulk traffic (i.e. irregular calls of different ships that make investments in LNG propulsion less likely), it is a challenge to develop demand in the region.

The provision of **OPS systems** in the Eastern Mediterranean is still underdeveloped although the impacts from vessels berthing in ports on local air quality – and here particularly from cruise ships – are widely acknowledged. Notably, the first on-shore power supply infrastructure here has been established in the Port of Kyllini serving a ro-pax ferry regularly calling the port. The installation of the OPS system in December 2018 in the framework of the ELEMED[73] project contributes to reduced local air pollution and is considered a milestone for the provision of OPS systems in ports around the Eastern Med.

In the Black Sea, only the Bulgarian ports of Varna and Burgas have OPS systems, but they have insufficient capacity. There are plans to further develop the shore-side electricity infrastructure.

The problems to be tackled in the other EU sea basins, i.e. high investment costs for ports in OPS infrastructures, the low number of vessels geared with technical equipment for using OPS and the price drawbacks for shore-side electricity are assumed to be essential obstacles.

In the Eastern Mediterranean and Black Sea ports, the infrastructure for **rail traffic** exists in most ports. The most intensive use of rail traffic is made in the Northern Adriatic ports as they serve a wider hinterland including Austria, Slovakia and Hungary. The port of Constanta has both rail and **inland waterway** traffic as it is connected to the Danube river by a Canal. The Greek ports – even those situated on the mainland – currently do not have sufficient demand for rail hinterland services, though they could potentially serve the Western Balkan countries.

The need of **additional terminal capacity** for short sea shipping is particularly important for the Eastern Mediterranean and Black Sea as the area faces the strongest growth of cargo traffic among all European regions. The port of Venice, for example, has recently built a new roro terminal, co-financed by the European Commission in the "ADRIAMOS" project.

[73] The ELEMED project is funded by the EU and involves the three EU Member States Cyprus, Greece and Slovenia and studies all technical, regulatory, safety and financial issues related to OPS systems in the Eastern Med.

4.2.6 Pan-European gaps

The most obvious pan-European gap is the way towards the **European Maritime Single Window** and the EU-wide acceptance of **Electronic Transport Documents**. By 2018, only two Member States had put in place regulations and pilot projects to accept Electronic Transport Documents and the EU-wide use was close to zero, while more than half of the 21 member states for which data was available had similar regulations in place for air transport where the use was already widespread (around 40%). Maritime Transport ought to catch up here because the direct competitor of short sea shipping – road transport – has a much lower administrative burden.

While the issue of **port reception facilities** is covered by a new Directive, the adequacy of these facilities is mostly a question of demand. As the Directive itself notes, the demand for reception facilities depends very much on the ship types calling in a port. For example, cruise ships have a strong demand due to the high number of persons staying on the ships and tankers having particular demands for tank cleaning.

The development of alternative **ship fuels and propulsion technology** towards less polluting ones is a European-wide and even a global issue. The search for the least-polluting alternatives is open. This search must also take into consideration a 'well-to-wheel' approach, i.e. take into account the polluting effects from the energy source to the ship's propeller. While electric vessels are emission-free in a 'tank-to-wheel' approach and certainly good for the local environment, the actual impact on global climate change depends on the way the energy is produced. Also, due to the low energy density of today's battery packs, they are not an option for long-distance transport yet. The quest is hence open and, besides drop-in fuels that can be used in existing vessels and infrastructure (such as bio- or e-fuels and gases), currently includes exploring new alternatives such as ammonia or hydrogen.

Outermost regions' ports are the main entrance for freight on these territories. Regional cooperation is a way of development in the strategy of the European Commission for the outermost regions. Maritime links with close third countries (in America or West Africa for outermost regions of Atlantic Ocean or in East Africa, Asia or Australia for outermost regions of Indian Ocean) should be encouraged.

5 Investment needs

In order to reach an 'adequate', sustainable flow of goods (and data) along maritime transport chains, certain investments will be needed in the physical and digital infrastructure in the ports, in the hinterland and on the sea. The terminal equipment only plays a minor role with regard to CO_2 emissions, but it is an important source of local air and noise emissions. In order to combat global climate change, the focus must rather be on the transport means, i.e. vessels, barges, trains, and trucks.

The investment needs that the sector faces during its transition towards the adequate state can be estimated by looking at the existing gaps (see 4.2), the number of projects needed to fill these gaps and the average cost (in 2019 EUR) for each project. The number of necessary projects is estimated based on the definition of the adequate state (4.1) and a detailed assessment of the status quo in the respective areas. The cost per project has been estimated based on analysis of past projects (both from core network corridors, past MoS programmes and private investments).

The port infrastructure analysis focuses on short sea shipping, which is why issues like dredging or construction of new large-scale container terminals play a minor role, while they are, of course, important for many of the core network corridor ports, particularly those engaged in Far East container traffic.[74] A review of past port investment projects revealed that few investments in the construction of new terminals were related to demand in the short sea sector.[75]

The hinterland infrastructure (intermodal terminals and hinterland connections) is shared by short sea and deep-sea traffic. Short sea and deep-sea containers often share the same train or barge. Due to this high integration, it is not possible to distinguish between "short sea" and "deep sea" investments here, which is why they are fully included in the assessment.

A similar approach is taken towards investment needs in the European short sea fleet. While research on new fuel types and ship propulsion is fully taken into account because it benefits both deep sea and short sea shipping, investments in vessels (e.g. reconversion of existing vessels) are only taken into account where they are necessary for European short sea shipping. Finally, the digital infrastructure and dual use facilities are shared domains and fully taken into account.

The needs are estimated independently of the potential financing tools. In other words, the investment needs below are not matched with a potential eligibility or non-eligibility under the Connecting Europe Facility (CEF). The needs thus address all funding and financing instruments, including investments by the private sector.

5.1 Port investment needs including sea-side and land-side infrastructure and superstructure

As it has been noted in a ship operator survey conducted in 2017,[76] the sea approach (draught and maximum ship size) is not a major issue for short sea shipping.[77] There are, however, capacity issues for developing rail and barge services. The necessary infrastructure needs upgrading with growing demand. Though barges can be handled at the same quays as seagoing vessels, the latter always have priority. When capacity is

[74] https://www.espo.be/media/Port%20Investment%20Study%202018_FINAL_1.pdf
[75] The analysis was based on port development plans and port websites and hence includes projects independently of their co-funding by the EU.
[76] See European Commission: Detailed analysis of ports and shipping operations. Annex to Motorways of the Sea Detailed Implementation Plan, April 2018, pp. 16-18
[77] See Detailed analysis of ports and shipping operations, Annex to Motorways of the Sea Detailed Implementation Plan, April 2018

scarce, barges can face severe issues and delays, which is why for instance the port of Antwerp has recently urged the major container terminals in the port to provide separate barge facilities at each terminal. The port thus wants to avoid a shift from barge to road. In general, it is estimated that there is currently a limited need to build **new sea terminals** for intra-European shipping beyond the ones that are already planned or under construction (e.g. in Venice). During the next 30 years, new terminal capacities may be needed in regions with significant growth of intra-European shipping, but the increase of efficiency and reconversion of existing terminals should be prioritised over new terminal constructions. It is estimated that no more than five new short sea terminal constructions or large-scale terminal extensions will be needed, resulting in an investment need of up to EUR 400 million.[78]

Similarly, **facilities for combined transport** need to expand based on demand. Depending on the development of demand in the ro-ro and container sector, the total necessary investment cost for such terminals until 2050 is estimated to reach between EUR 200 and 500 million (between five and fifteen new terminals or major upgrades). This will concern mostly core network corridor ports, though there may be single instances also in larger comprehensive ports. The **hinterland infrastructure** – including road, rail and inland waterway connections of the port with the main networks, but also parkings, railway sidings and marshalling yards – must be developed in line with demand of both deep sea and short sea traffic.

The investment needs in the ports that will be necessary to address the environmental needs are noticeably higher. As shown in the gap analysis by basin (see 4.2), there is a need for around half a dozen new **LNG terminals** to fully cover all major port ranges (not counting the Hamina LNG project already under construction). In total, around EUR 400 million are estimated to be still invested by 2030 in order to have the necessary large-scale plants. The distribution of LNG for bunkering needs either **LNG bunker vessels** (necessitating also the respective regulation in ports that allows ship-to-ship bunkering) or small-scale mobile LNG tank storage. These are particularly necessary for short sea services as these cannot move their vessels to ports that are a few hundred nautical miles away only for bunkering. Deep-sea vessels, by contrast, can include calls in one of the major LNG terminals as they already do bunker calls today for HFO or Diesel. The costs for LNG bunker vessels and small-scale LNG tank storage are estimated to be much higher, i.e. around one billion EUR.[79] The investment costs for providing the necessary infrastructure for **future alternative fuels** like ammonia and hydrogen have not been sufficiently developed and cannot yet be assessed. LNG is currently considered as an intermediate option for addressing the requirements at present. Whether the existing and planned storage and bunkering infrastructure can be used for future fuels beyond LNG cannot yet be answered.

The development of **port reception facilities** (PRF) in EU ports is an issue for both short sea and deep-sea shipping. With regard to investment costs, it is essential to consider that the adequacy relates on one hand to operational conditions which means to match the requirements of vessels without hampering the operational process of any vessel while using waste reception facilities – while on the other hand also the environmental management of the facilities through ports are to be taken into account.

Looking at the pure operational conditions for waste reception facilities by ships it is essential to acknowledge that the simple provision does not necessarily fulfil the adequacy of vessels' requirements. For instance, inadequate locations which are not easily and at-all-times accessible and complicated administrative procedures and non-transparent

[78] Many multipurpose terminals in European ports are already underused and the expected decline of coal and oil imports will free further infrastructure with good nautical conditions. In the container sector, former deep-sea terminals can be converted into short sea terminals, as was the case for Rotterdam Short Sea Terminals.
[79] The cost for a single seagoing bunker vessel is in the range of 50-100 million Euro.

and/or high fees for waste handling services might be factors for creating obstacles in using waste reception facilities and supports illegal / inadequate waste disposal.

With regard to the revised Directive on Port Reception Facilities for the delivery of waste from ships and the provision of adequate facilities it is a requirement that these services are conveniently located and easy to use with a view to receive any kind of waste defined in the Directive. So in order to assess port investment needs it is essential to analyse properly the adequacy of existing PRF and the requirements for an enforcement system to be applied. Transparent calculations of cost recovery systems (implementing the "polluter pays" principle) and the required waste reception capacities are to be provided. Additionally, exemptions to be applied for the individual ports are to be considered for the investment cost. The costs for port reception facilities and services are difficult to estimate and concern not only the ports, but also the local administrations which need to provide the necessary infrastructure. Compared with the aforementioned investment needs and the uncertainty around them, the total budget for port reception facilities will be almost negligible and will have to be covered by fees.

The use of **on-shore power supply** systems to reduce local air and noise emissions – particularly in densely populated areas – must be also made available in many ports and their major terminals. In order to cover all terminals with longer ship stays in these areas, around 200 installations may be needed. This concerns both core and comprehensive ports as well as shipowners (polluter pays principle) and results in an investment need of about EUR 400 million (average of two million EUR per unit – higher for cruise vessels and large container vessels, lower for roro and smaller container vessels). In order to include as many vessels as possible, the issue of standardisation and integration of older vessels must be studied in each port beforehand.

The need to invest in more silent and less polluting **terminal equipment** is difficult to capture as it depends on the impact of terminal activities on the local population. Investments in 'green' terminal equipment can contribute both to lower local air emissions and less CO_2 equivalents. Local authorities can require terminal operators to respect certain limits regarding air and noise emissions. The awareness of ports and terminal operators has increased and the costs for less polluting terminal equipment will be considerable in some ports.

5.2 Investment needs concerning the European short sea fleet

Probably the most crucial investment of the coming decade will be to develop renewable fuel types and propulsion technologies that are compatible with the needs of maritime transport. At this point in time, it is difficult to appraise the total investment needed as **research and development** is an open process and may go in different directions. Assuming the three to five new engine types or vessel pilots, the total cost could reach EUR 500 million for the development of pilot vessels alone. The research on new fuels and propulsion technologies is a world-wide quest to which Europe must contribute. As no clear solution is on the horizon yet, the cost for this contribution are difficult to estimate.

The costs for the uptake of new technologies will mostly be borne by the ship operators and are difficult to estimate beforehand. It is not unlikely that the investment costs in new vessels will not be significantly higher than today if new synthetic fuels are being developed. It will be rather a question of operating costs due to higher costs for these fuels. However, if new fuel types which are not compatible with existing engines are to be introduced quickly, the costs for **reconversion of existing vessels** – if possible at all – could reach up to one billion EUR (around 50 conversions of younger vessels in the current short sea fleet). This also entails investments needed for compatibility with onshore power supply systems.

5.3 Investment needs concerning digital infrastructure and services

The physical infrastructure for **digital services** is already in place and part of the general infrastructure. For logistical services such as electronic transport documents and maritime National Single Windows, the focus should be on complete mobile internet coverage of the port area, the hinterland and also the port approach.

The investment lies first and foremost in the development of standards and programming, more precisely in the development of interoperable interfaces between the different systems (e.g. XML, AS4, APIs, JSON…) that make information sharing an automated process without the need to enter information manually more than once. The number of these projects, fully compatible with the technical standards of the EMSWe Regulation and building on existing systems (PCS, NSW, TOS,..) will be quite high (at least 200), but the cost per project at the local level will be rather low compared with the other investment categories. The real cost of interoperability varies depending the configuration of existing systems and can be considered in a range between EUR 500.000 to 2 million. These investments should also take account of and be coordinated with the technical requirements resulting from the implementation of the eFTI Regulation and possible future environment of the federated network of platforms as developed by the DTLF.

Besides the aforementioned digital services some particular cases can be mentioned such as:

- more reliable information on under-keel clearance is needed both for security and efficiency reasons. Improved hydrographic surveys and providing the relevant GIS data may require additional investments in some ports;
- although it is a requirement coming from the rail regulation, the implementation of the TAF-TSI standard (Technical Specification for rail Interoperability relating to Telematics Applications for Freight services) may impact ports and will require investments concerning digital infrastructure and services to drive communications between railway undertakings, infrastructure managers and rail service providers.

5.4 Upgrade of ports for resilience and dual use

There are hundreds of cargo terminals in the core and comprehensive network ports that are operating on a day-to-day basis. This large terminal capacity offers the potential to reroute traffic in exceptional situations, e.g. natural disasters, accidents or other events that block neighbouring ports, or to accommodate the transport of exceptionally high or heavy cargo, projects or military equipment.

In order to estimate the investment needs, the potential demand and the necessary infrastructure for such exceptional traffic must be analysed in order to draw a map of ports and terminals that could be part of a 'resilience network'. This work can build on the work recently done by the European Commission in the context of the Military Mobility Action Plan, but should take a broader focus in order to include other exceptional traffics. A gap analysis will then be able to show investment needs in certain sea basins and coastal areas. The analysis must cover terminals and the relevant hinterland connection.[80]

[80] Projects with civilian-military synergies may be eligible for co-financing under the Military Mobility Action Plan (see 6.2).

5.5 Summary on investment needs

The total investment needs (excluding resilience and dual use, to be analysed succinctly) range between four and five billion EUR.

The largest degree of uncertainty relates to the necessary capacity increases which are needed in ports, terminals and hinterland connections. On the one hand, future market growth is always subject to uncertainty. On the other hand, whether the construction of new terminals beyond the one currently planned and under construction is needed or whether efficiency gains would be sufficient to provide the capacity increase must be analysed case by case in order to assess the exact investment needs. Consequently, the overall investment needs estimate shows a wide span from around EUR 200 million to almost one billion.

Around one third of the investments is related to the completion of LNG bunkering infrastructure. While the terminal network is taking shape, LNG bunkering vessels are still rare. For short sea operators, it is paramount to have bunkering possibilities in one of the ports of call or on the route. Therefore, the investment needs for bunkering vessels are twice as high (around one billion EUR) than for missing terminals (around EUR 500 million).

Research, development and reconversion of the short sea fleet will also need high investment amounts of around EUR 1.5 billion. The reconversion costs are quite uncertain as it depends on future fuel types how much is needed to upgrade a vessel. The research costs are also high and unsecure, but they are shared with deep sea shipping and actually at the world scale.

Finally, taking into account the already mentioned costs of interoperability and focusing on core ports, the digital infrastructure in Europe needs around EUR 335 million (average of 1 million for 335 ports) to create or upgrade interoperable federated systems between the different actors.

When considering LNG infrastructure, the decarbonisation of ship propulsion and on-shore power supply together, around EUR 3.3 billion (equal to around two thirds of the total investment) are related to improving the environmental performance of short sea shipping. The remaining investments will also have a positive impact on the environmental performance of the transport sector as a whole as long as shipping continues to be the most efficient mode of transport.

6 Funding and financing instruments

6.1 TEN-T and CEF I funding allocated to MoS so far

During the 2008-2013 period, under the TEN-T programme, 44 MoS projects were co-funded, generating over EUR 1.2 billion in investment, of which the EU contributed EUR 281.9 million[81].

Under the current CEF programme (2014-2020), the full maritime portfolio as of January 2020 comprises 151 Actions of a total of more than EUR 1.5 billion. These Actions have been selected under seven priorities (see Table 10). Out of these, 50 MoS Actions were co-funded for a total of EUR 430.5 million of CEF grants, making the Motorways of the Sea funding priority one of the most important instruments in financing maritime interventions in maritime ports, European vessels, hinterland services and other economic actors.

Table 9 CEF maritime project portfolio

CEF Call Priority	Priority	Actions	EU Contribution
Motorways of the Sea (MoS)	Motorways of the Sea (MoS)	50	430.452.239,62
Multimodal logistics platforms	Multimodal logistics platforms	16	59.281.585,31
New technologies and innovation	New technologies and innovation	21	93.684.412,10
Nodes of the Core Network	Nodes of the Core Network	2	1.018.675,16
Pre-identified projects on the core network corridors	Maritime Ports	27	776.695.508,12
Pre-identified projects on the other sections of the Core Network	Maritime Ports	9	157.662.622,54
Projects on the Core and Comprehensive Networks	Maritime Ports	21	46.795.544,89
Transport-Energy Synergy Call	Synergy	4	8.510.072,35
Safe and secure infrastructure	Safe and secure infrastructure	1	4.188.172,00
Total		**151**	**1.578.288.832,09**

Source: INEA, Status May 2020

The average participation of MoS per Member State is of EUR 15.9 million with varying levels. It should however be noted that some countries have not received any funding, such as Luxembourg or Bulgaria, whereas Finland and Sweden are the leading beneficiaries with EUR 93.5 and 59.0 million, respectively, and France and Poland following with EUR 41 and 33 million, respectively. There is a higher number of projects coming from the North of Europe, compared to the South, largely explained by the earlier introduction of stricter air pollution measures in the North Sea and Baltic Sea.

This next section will elaborate in more detail EU funding for each of the three pillars[82] of the Motorways of the Sea Programme, as identified by the previous European Coordinator, Brian Simpson.

[81] https://ec.europa.eu/inea/connecting-europe-facility/motorways-sea-one-stop-help-desk/quick-guide-building-mos-projects/mos

[82] The three pillars define the MoS Coordinator's priorities under the Multi-Annual Financial Framework 2014-2020

Pillar 1: Environment

Nineteen projects were co-funded under the TEN-T programme that mainly addressed improving the environmental performance of maritime transportation. These have generated EUR 463.7m of investments, of which the EU has contributed with EUR 109.8m[83].

Since 2014, 28 additional environment/sustainable shipping projects were co-funded under the current CEF, for which the EU total contribution has been EUR 225.9 million. These projects were mainly LNG or exhaust-gas-cleaning-related, reflecting the sulphur ECA-compliance preparations in the Baltic and North Sea/English Channel areas. Similar projects were also implemented in other regions of Europe; including in the Mediterranean, i.a. to comply with the requirements under the Directive on Alternative Fuel Infrastructure. Other projects covered areas such as alternative fuels, electric vessels, on-shore power supply, port reception facilities, and SECA compliance monitoring.

Pillar 2: Integration of Maritime Transport in the logistics chain

Twenty-one projects were co-funded under the TEN-T programme related to the integration of maritime transport in the logistics chains. These have generated just over EUR 737.3 million of investments of which the EU has contributed EUR 146.5 million in the TEN-T[84].

Under the CEF (i.e. since 2014), 17 additional projects have been funded in the field of the integration of maritime transport in the logistics chains, for which the EU total contribution has been EUR 154.1 million.

Pillar 3: Safety, Traffic Management and the Human Element

Under TEN-T, four projects have been co-funded related to safety, traffic management and the human element, generating a total investment of over EUR 52.1 million (of which the EU has contributed over EUR 25.6 million)[85].

In addition, five projects were co-funded under CEF so far, for a total investment of EUR 122.6 million (EUR 50.5 million of EU contributions). It is important to note that many other environmental and logistics projects that belong to Pillar 1 and 2 also included activities contributing to the enhancement of maritime safety and the further development of traffic management and the human element.

6.2 Use of an intelligent mix of funding and financing instruments to support MoS

At a time where pressure for a more sustainable maritime sector is growing, public funding alone is no longer sufficient given the high investment needs. Moreover, the increased salience of foreign financing in transport and infrastructure projects and fierce competition from non-EU entities are a growing concern for many European stakeholders. For this reason, one of the main objectives of this DIP is to present a wider range of European funding and financing possibilities, including new innovative financial schemes, to pursue the development of the European Maritime Space. Efforts were therefore made to gather as much information as possible from a wide range of sources, from thematic seminars and conferences to interaction with stakeholders, public and financial institutions.

[83] https://ec.europa.eu/inea/connecting-europe-facility/motorways-sea-one-stop-help-desk/quick-guide-building-mos-projects/mos
[84] https://ec.europa.eu/inea/connecting-europe-facility/motorways-sea-one-stop-help-desk/quick-guide-building-mos-projects/mos
[85] https://ec.europa.eu/inea/connecting-europe-facility/motorways-sea-one-stop-help-desk/quick-guide-building-mos-projects/mos

A coherent mix of public funding and private financing remains the way forward for a successful completion of the whole TEN-T Network, as the current CEF co-funds up to 30% of implementation projects and up to 50% of studies (whether they take the form of pilot action or not) for Motorways of the Sea. Equally, grant support needs to be focused on the projects of highest European added value and projects fostering a modal shift.

In addition, it is crucial to understand that MoS/CEF cannot and should not substitute for private investment instruments. MoS grants should address funding and financing gaps that cannot be easily financed by other means, such as those arising in innovative projects, connectivity projects involving island and outermost regions, etc…

As a result, a stable allocation of grant calls, in the context of the multiannual financial perspective, should not be neglected. For this purpose, calls should be launched regularly according to a pre-existing timetable, to increase predictability, facilitate long-term planning of investments and to better promote synergies between different funding instruments. Actions should be complemented by EIB and other international financial institutions and National Promotional Banks' initiatives and financing opportunities from the private sector. In this context, it is worth mentioning that with regard to maritime transport:

The **2019 CEF Transport MAP call**[86] was launched on the 16 October 2019, with a deadline set for the 26 February 2020. This call aims to allocate the EUR 1.4 billion remaining under CEF Transport 2014-2020. Of these, EUR 1.1 billion have been earmarked for pre-identified projects on the core network, which includes i.a. maritime ports and inland waterways. The co-funding rate is of 20% for work projects, 50% for studies and 85% for cohesion projects. Importantly, funding can only be granted for ports, not for vessels (with the exception of port servicing vessels, such as bunkering ships). In addition, EUR 30 million were allocated to the Motorways of the Sea priority. Seven project applications were submitted under the MoS priority.

The **CEF Blending facility**[87] is a mix of CEF grants / debt instruments paired with financing from the EIB or national promotional banks (so called implementing partners). Under this blending facility, almost EUR 100 million is available for the development and deployment of alternative fuels. Funding can be granted for the upgrade of ports for the deployment of shore-side alternative fuel infrastructure, including on-shore power systems (OPS), or the construction or retrofitting of vessels with new propulsion systems that run on alternative fuels, with co-funding rates of 15% for LNG and 20% for hydrogen or electricity. Given that under the current CEF, funding is at this moment not available for vessels under regular calls, this instrument is a useful tool to green European fleets under the "sustainable" pillar of MoS. Importantly, despite a relatively small budget, the Blending Facility may receive additional funds if agreed by Member States at any time, and applications can be made on a rolling three-month basis, i.e. there are multiple opportunities to submit an application until 31 March 2021. Already, at the first cut-off date on 14 February 2020, the CEF Blending facility had received some waterborne applications.

In the next multi-annual programme, MoS continues to be a funding priority in the **Connecting Europe Facility 2021-2027** Regulation. Although precise numbers have yet to be published due to the ongoing negotiations for the next MFF, especially in the context of the Corona crisis and negotiations for its recovery measures at EU level, dedicated funding for MoS will fall under the "modernisation of the existing TEN-T network" pillar of CEF II, to which 40% of the general envelope will be allocated.

[86] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/apply-funding/2019-cef-transport-map-call
[87] https://ec.europa.eu/inea/en/connecting-europe-facility/cef-transport/apply-funding/blending-facility

In addition, since the adoption of the **Action Plan on Military Mobility**[88], the Commission is working to improve movements of military forces by addressing shortcomings in the transport infrastructure. Under the military mobility envelope of the CEF 2021-2027, the Commission will fund transport infrastructure built or upgraded for military purposes provided it is also useful for civilian transport (so-called dual-use infrastructure). It is a win-win initiative for both defence and transport in the sense that it will allow a smooth mobility of armed forces within and beyond the EU while contributing to the completion of the TEN-T network. This envelope could be of interest for infrastructure investments in ports and thus serve the interests of Motorways of the Sea in terms of an improved hinterland connection too. However, its budget still depends on the outcome of the negotiations on the next multi-annual budget.

As regards EU-level financing tools, it is important to note that the Board of Directors of the **European Investment Bank (EIB)** recently adopted a new Energy Lending Policy under which it will phase out lending to fossil fuel-based energy projects by end 2021[89]. The new policy implies that the EIB will cease lending to energy infrastructure[90] directly associated with unabated fossil fuels, in order to align the Bank with efforts to tackle climate change. As a result, lending will now be directed towards projects that promote clean energy innovation, energy efficiency and renewables. In view of the "Green Deal" and the EIB becoming Europe's climate bank, the EIB aims to unlock EUR 1 trillion of climate action and environmentally sustainable investment in the decade leading to 2030. As a result, MoS projects that fit under the sustainable pillar might now be able to access increased financial support from the EIB. This will be further reinforced by the emergence of **European green taxonomy** (cf. emerging trends).

Shipping projects supported by the EIB aim at supporting modal shift towards short sea shipping and improving the environmental performance and reducing emissions from the European shipping sector. These include projects that expand capacity and improve efficiency of the short sea routes, as well as replacing older vessels with newer more energy efficient and less polluting ones. It also includes those looking to improve the environmental performance of existing vessels through conversion and retrofitting.

One potential source of financial support from the EIB is the **Cleaner Transport Facility** (CTF)[91], launched in 2016. The CTF is an initiative targeting the deployment of alternative fuels in the transport sector. One of the instruments of the CTF is the Green Shipping Guarantee Programme. Through this programme, the EIB supports investments in green vessels and technologies which improve environmental performance and reduce harmful emissions in the European shipping sector. The programme works through guaranteed intermediated loans, disbursed via partner financial institutions (ABN AMRO, BNP Paribas, Crédit Agricole CIB, Société Générale, ING). Individual transactions are originated and screened by the partner financial institutions and presented to the EIB for internal review. EUR 750 million have been allocated for the programme, with a streamlined/accelerated approval process for projects up to EUR 50 million. Co-financing rates are up to 50% debt financing for new vessels and up to 100% for green components of retrofitting operations.

The EIB has also implemented the CEF Debt Instrument (CEF DI), a risk-sharing facility supporting projects in the transport, energy and digital sectors. Under the CEF DI, **Future Mobility** (FM) supports clean, digital and automated transport investments. It backs projects that reduce carbon emissions, increase energy efficiency and boost technological innovation. Future Mobility is another possible financing source for eligible shipping

[88] JOIN(2018) 5 Final
[89]https://www.eib.org/en/press/all/2019-313-eu-bank-launches-ambitious-new-climate-strategy-and-energy-lending-policy
[90] This does not cover transport infrastructure dedicated to alternative fuels, which falls under the EIB's transport lending policy. Under the current policy, alternative transport fuels are supported by the bank.
[91] https://www.eib.org/attachments/press/20161201-vp-pvb-handout-ctf-council.pdf

investments, with co-financing rates up to 50% debt financing for both new vessels and the retrofitting of existing ones.

Further, the **InvestEU Programme**[92], which will run between 2021 and 2027 aims to build on the success of the Juncker Plan's EFSI. InvestEU will provide an EU budget guarantee to support investment and access to finance in the EU with the objective of triggering EUR 650 billion in additional investment. To do so, InvestEU will mobilise private and public investment through an EU guarantee of EUR 38 billion to back the investment projects of European partners (EIB, EBRD, World Bank, Council of Europe Bank, and pillar-assessed NPBs). The programme will support four policy areas of which two are of interest: sustainable infrastructure (EUR 11.5 billion) and research, innovation and digitalisation (EUR 11.25 billion). These two policy areas present synergies with all three pillars of MoS. InvestEU projects will need to address market failures or investment gaps and be economically viable, help meet EU policy objectives and achieve a multiplier effect in order to be eligible.

Moreover, the **Horizon Europe**[93] Programme is estimated to provide over EUR 100 billion in funding[94] based on the current Commission proposal, in part for resource-efficient transport projects that respect the environment. With particular focus on both decreasing the ecological impact of vessels, such as developing retrofit solutions and Next Generation Propulsion for Waterborne Transport (through the increased use of alternative fuels for example) and developing a more effective intermodal logistics chain, it provides an additional opportunity for co-funding MoS projects.

Some of the investment instruments discussed above, such as Horizon Europe programme or the InvestEU Fund, support investments in the waterborne, transport, energy and digital sectors. Thus, these instruments also enable the maritime technology sector to receive necessary financing support.

To leverage private funds, the option of issuing green **bonds** is also viable. The current taxonomy for "green" bonds, as defined by the **Climate Bonds Initiative**[95], requires at least 95% of the proceeds to be dedicated to assets that are defined as "green". This green label can provide issuers with much needed finance and signal sustainability aspirations, enabling access to a wider investor base. On the other hand, the label also reassures investors and allows them to easily identify green fixed income products. In 2018, the labelled green bond market represented over USD 389 billion (~ EUR 353 billion). However, bonds issued under this label were in the great majority short term, with tenors no more than 10 years. Recognising the importance of these mechanisms, the European Commission is developing its own green taxonomy (cf. emerging trends), partly to deliver its own standards for Green Bonds and partly to foster longer term investments to fit the needs of i.a. the transport sector.

Finally, further development of eco-incentive measures can also provide an additional form of financing. Eco-incentives follow a goal-based approach[96] in order to measure and monetise the socio-environmental benefits resulting from projects encouraging environmentally sustainable activities. For example, the aforementioned Med Atlantic Ecobonus would reward projects for the actual and demonstrated socio-environmental benefits they achieve, independent of cost. Such eco-incentives could therefore help to bridge funding gaps, thus allowing for the development of innovative, sustainable MoS projects (such as projects that reduce road congestion, deploy alternative propulsion systems or facilitate intermodality). It is important to note that the Med Atlantic Ecobonus Action remains at the proposal stage, and consensus at the Member States level and within

[92] https://ec.europa.eu/commission/sites/beta-political/files/what_is_investeu_mff_032019.pdf
[93] https://ec.europa.eu/programmes/horizon2020/en/h2020-section/smart-green-and-integrated-transport
[94] Depending on the results of negotiations of the next MFF 2021-2027.
[95] https://www.climatebonds.net/files/reports/cbi_sotm_2018_final_01k-web.pdf
[96] https://ec.europa.eu/transport/sites/transport/files/studies/internalisation-handbook-isbn-978-92-79-96917-1.pdf

the European Commission is still required for its implementation. Implementation of the EU green taxonomy and the Commission's Hanbook of External Costs of Transport to the eligibility criteria for the eco-incentives would greatly contribute to a harmonised implementation approach accross all sea basins. Eco-incentives could be potentially used for complementing the enforcement of environmental targets.

All these funding and financing instruments are great enablers to complete infrastructure projects, whilst Member States have of course a choice of financing methods, that is either to opt for appropriations on state budget or to choose an alternative financing provided by these instruments.

Next to funding and financing instruments, there is also a variety of advisory services that may be mobilised to support MoS projects. Indeed, to facilitate the access to EU funding opportunities and blended financing opportunities, the European Commission has set up several agencies and initiatives that can improve the quality of applications. These agencies can prove more than useful to support MoS projects when seeking funds. The **European Investment Advisory Hub**[97] is a joint initiative of the European Commission and the EIB, established as part of the Investment Plan for Europe. The Advisory Hub provides technical and financial advice and capacity-building services for project promoters to development investment projects at all stages of the project life cycle, which may include projects seeking blended finance. A key feature of the Advisory Hub is the mobilisation of cross sectoral teams of EIB experts combined with external consultants to deliver tailor-made project advice, primarily to public sector promoters. The Joint **Assistance to Support Projects in European Regions (JASPERS)**[98] is another a joint initiative of the European Commission and the EIB with more expertise on technical issues. JASPERS can provide assistance to project promoters seeking EU funding through CEF, the European Structural and Investment Funds (ESIF) and the Instrument for Pre-Accession Assistance (IPA). JASPERS expertise lies in strategic planning, improving the quality of projects and capacity building. Both JASPERS and the Advisory Hub will continue as part of the Invest EU programme. Finally, with regard to the Connecting Europe Facility, the **Innovation and Networks Executive Agency**, responsible for managing and allocating the funds also provides assistance to project promoters seeking to apply for CEF funding. Their expertise is specific to CEF and applications for its programmes.

[97] https://eiah.eib.org/
[98] https://jaspers.eib.org/

7 Recommendations and outlook by the European Coordinator

Sustainable. Seamless. Smart. These are the three new pillars that I bring forward in my first DIP as European Coordinator for Motorways of the Sea. They reflect my vision for Motorways of the Sea to become the cornerstone of a barrier-free **European Maritime Space** within the context of the review of the TEN-T policy and the next Multi-Annual Financial Framework 2021-2027. They are the way forward to support the competitiveness of the EU in maritime transport and trade in a global context. Given the level of ambition and potential that the European maritime sector can achieve, it goes without saying that there is a clear case and a future role for MoS in terms of fostering innovation in short sea shipping.

Based on a wide stakeholder dialogue throughout the past months and a sound analysis of transport data, legislative drivers and emerging trade, I like to draw the following conclusions for Motorways of the Sea:

- It is fundamental that the importance of Motorways of the Sea as the "maritime dimension" of the TEN-T framework is reflected in its upcoming revision of the TEN-T Regulation. In that optic, reinforcing the connectivity with core network corridors and adopting a more regional sea-basin approach is key to clarifying the role of MoS alongside the specificities of other European Corridors.
- To ensure a sustainable European Maritime Space, the development of sustainable freight transport services and the transition to non-fossil fuels both for the shipping and the ports' sector needs to be accelerated. Additionally, connectivity issues with islands, peripheral and outermost regions should be addressed.
- To ensure a seamless European Maritime Space, there needs to be an emphasis on ensuring smooth multimodal transport by fostering modal shift and promoting investments in connections to the hinterland, especially last-mile connections by rail and inland waterways and road when necessary. In the spirit of better alignment with the core network corridors (CNCs), integrating maritime transport into the CNCs at the nodes should continue to be a priority
- To ensure a smart European Maritime Space, the adoption of digital tools throughout the industry, such as the digitalisation of trade lanes, interoperable data sharing or Sea Traffic Management needs to be fostered.
- While leveraging private funding is crucial to maintaining and improving transport infrastructure in Europe, it is important to note that MoS needs financial incentives via grants to attract private financing. Financing gaps that cannot easily be filled by other means require MoS grants (e.g. innovative alternative fuels, connections to islands and outermost regions, hinterland connections, wider benefit actions…). As a result, a robust financial framework has to be secured in the next Multi-Annual Financial Framework 2021-2027.
- In this context of ambitious challenges and review of the development frameworks, the development of sustainable freight transport services needs to be accelerated. As such, eco-incentives measures such as those discussed in the Med Atlantic Ecobonus that are proven to trigger market decisions prioritising actions with strong socio-environmental benefits need to be further developed.
- In order to ensure a continuous support of the Motorways of the Sea funding programme in the future, a clear, understandable, and stable framework is needed - both in regulatory and investment terms. Any future calls should be launched according

to a pre-defined schedule, thus facilitating planning of investments and increasing synergies with other funding instruments.

7.1 Investment priorities and needs for the future

To this end, I propose the following investment priorities and needs for the future under the three new pillars which are of course closely interlinked and present important synergies amongst them:

Sustainable

- The focus on decarbonisation of the maritime sector points to an important need for projects innovating in ship propulsion and efficiency. The mid-term priority should be on non-fossil fuel power and long-distance capability. New engine types should also be considered.
- Deployment of alternative fuel shore-side infrastructure and bunkering vessels. Although priority is given to the deployment of zero or low carbon fuels, LNG is regarded an interim, transitionary solution for the maritime sector and still necessary for the maritime sector on its way to zero/low emission fuels (e.g. renewable or synthetic gas). Consideration for its low-carbon alternatives, such as synthetic, methane or bio-LNG, should be given where possible.
- Shore-side power supply should be further explored and developed, and capacity increased, particularly in ports situated close to densely populated areas. Persistent local air and noise emissions in particular in city ports continue to be problematic, making the case for on-shore power supply an urgent need.
- Port energy efficiency initiatives and shifting from fossil fuel based power sources to renewable energy sources should be further promoted.
- In light of the fast-changing climate conditions, emphasis must be placed on climate adaptation, to ensure the safety and good function of ports and maritime links. Of particular importance are protection measures for port resilience and climate adaptation measures, especially in exposed regions, to ensure a resilient transport network.
- Waste reception facilities should be given priority particularly because innovative solutions are needed to deal with the new types of waste and marine litter. The Circular Economy Package and EU Plastics Strategy is a key legislative driver in this regard.
- Projects developing eco-incentives and innovative financial tools contributing to the sustainability of short sea shipping and further bridging funding gaps for innovative solutions such as alternative fuels need to be given further attention.

Seamless

- As regards the physical infrastructure in ports, projects that remove persistent bottlenecks in the loading operations between seagoing vessels and hinterland modes (including barge) should be highly considered. Projects that aim to develop direct hinterland connections, preferably by rail and inland waterways, and multimodal terminals are of key importance as well.
- Traffic Management and optimisation of the port call process should be further supported to gain the potential of energy efficiency in maritime transport.
- Projects to support connectivity and territorial cohesion by taking into account the needs and characteristics of peripheral regions, outermost regions and islands are

needed. In parallel, revisiting the criteria for MoS projects (removal of current limitations with regard to involvement of at least one core port and one comprehensive port; allowing for intra-national connections) could prove useful and should be further explored during the revision of the TEN-T Regulation.

- Given the central role of shipping for Europe's trade connections and the growing importance of neighbouring countries in the world's economy, support for the development of maritime links with third countries are key to maintaining the prosperity of the maritime sector. Participation of the countries within the European neighbourhood should thus continue to be encouraged and regional cooperation of outermost regions with third countries be improved.
- In terms of navigability, ice-breaking continues to be an important element in the Northern Baltic and projects to secure maritime links to peripheral regions in the North and in Arctic conditions should continue to be supported.

Smart

- Pursuing the interoperability between various stakeholders and data sharing systems (such as port community systems, EMSWe, eFTI, TAF/TSI etc.) is of utmost importance as to increase process efficiency. Funding digitalisation projects should therefore be aimed to avoid further fragmentation of the data sharing environment and to ensure compliance with the eMSWE, EFTI and future federated network of platforms ecosystem.
- Projects to promote efficient customs operations and cargo clearance tools continue to be of great need. National Single Windows and their integration at the EU level, taking into account the development the European Maritime Single Window environment and the progressive implementation of the new European Customs Code, continue to deserve attention.
- In the same vein, support for the integration of new technologies and digitised processes is crucial to ensure the competitiveness of short sea shipping and support the transition towards a more sustainable maritime sector. Priority should be given to the digitalisation of administrative processes and to trade facilitation on corridors (i.e. the concept of international fast trade lanes, a set of harmonised and interoperable tools such as business process modelling, software solutions, operational guidelines and governance models aimed to trade facilitation on corridors).
- Digital technologies, such as block chain platforms can be used to streamline maritime logistics operations but also speed up cargo checks, decreases the risk of delays and penalties levied on for customs compliance. Smart systems using such tools for transparency and fraud detection should also be further explored. In the same vein, developing more reliable information on under-keel clearance and improved hydrographic surveys can increase the efficiency and security of the maritime industry.
- The further development of Sea Traffic Management by developing European wide maritime ICT services for sea traffic management, "intended route" monitoring and situational awareness should be supported in order to foster safety, effectiveness and competitiveness. Equally, real-time vessel traffic monitoring and surveillance should also be developed.

7.2 Outlook on the future of MoS in view of the TEN-T revision

The Motorways of the Sea programme, being funded under CEF, has shown many strengths and opportunities throughout the past years. It has drawn in the highest EU cooperation spirit with the involvement of multiple partners from different countries, even to a certain extent with third countries. Its importance lies in being a fundamental element of the TEN-T network, as MoS is largely contributing to road decongestion. Besides, it supports internal and external trade flows through its logistics chains. Furthermore, depending on the geographical situation of some Member States or regions, MoS represents the only possible mode of transportation for internal trade exchange. MoS also recognises the importance of environmental protection and integration of maritime transport in the logistic chain, which is clearly evidenced by supporting wider benefit initiatives under the current CEF programme. MoS is also capable of reacting to current developments present in the maritime world arena, thus it has a viable potential to address the challenges concerning the greening and digitalisation of maritime transport.

However, in order to strengthen the MoS programme even more, significant changes have to take place and existing weaknesses and limitations need to be adequately addressed. At the moment, the definition used for MoS is rather unclear and complex, which makes it harder to understand and explain the concept per se. MoS supports a wide variety of projects which involve infrastructure and port facilities, short connecting road and sea links, electronic logistics management systems and information systems among many others. All of this adds to the high complexity of the programme. Furthermore, there are certain limitations in terms of eligibility criteria under the MoS programme, for example in terms of the obligation to involve at least one core port and two EU Member States. In terms of clarity provided by the TEN-T Regulation, in comparison to core network corridors defined in the Regulation, MoS also struggles to present clear targets and might require more specific objectives to be set out in the legal document. Finally, overlaps between the MoS funding priorities, innovation and new technology priority, and the maritime ports' priorities can create hesitation on which instrument is most adequate. The broader, horizontal aspect of MoS, combined with the market-driven demand, makes it more challenging as a financing tool, compared with the other CEF or Research and Innovation instruments.

I therefore consider the upcoming revision of the TEN-T Regulation as a highly valuable opportunity that can help to better define and integrate the Motorways of the Sea programme in the wider TEN-T. More importantly, a further reshaping of MoS – in the context of an overarching concept for the entire maritime dimension of the TEN-T – can provide viable answers for integrating relevant developments in the EU transport policies concerning environment, climate protection, energy, digitalisation, health and social issues. As environmental challenges hold high importance on the international and the European Union's agenda, MoS has a real opportunity to strengthen the TEN-T's objective to enable a sustainable, safe, smart and efficient transport network as well as to provide appropriate solutions for shifting the focus of financed projects on supporting efficient and sustainable mobility, including smart and carbon free transportation.

Based on a first brainstorming and debate with Member States and key maritime stakeholders, I wish to devise some preliminary suggestions that could help to shape a better future for MoS and the maritime priority of the TEN-T overall, such as:

- Reshaping the concept of MoS to cover ports and shipping for the benefit of the entire 'European Maritime Space' which incorporates all elements of maritime infrastructure and which is directed towards a sustainable, smart and seamless transport network;
- Better integration of the entire transport flows, including sea bound and hinterland connection to ports;
- Introduction of a sea-basin approach which can help identify concrete objectives and qualitative targets to be reached based on the MoS adequacy concept.

I also acknowledge the need to address and alleviate current complexities present in MoS in order to further strengthen it as a horizontal priority within TEN-T, by providing a simplified MoS concept with clear project types as well as clarifying the funding rules. Furthermore, I see a need to cater for more flexibility of eligibility criteria in the future, which might include an idea to widen eligibility criteria with regard to the cooperation with third countries and outermost regions.

Overall, a reinforced cooperation with other funding instruments and innovative financing solutions can help MoS to achieve its objectives. Further synergies need to be sought.

The European Commission has started the review process of the TEN-T Regulation. The evaluation of the current TEN-T Regulation is planned to be finalised by mid-2020. Depending on the outcome of this review process, a preparation of the European Commission's legislative proposal for a revision of the TEN-T Regulation is envisaged for 2021.

Throughout this process, I plan to organise a series of debates with all relevant stakeholders of the sector in order to contribute with a sound proposal for reshaping the maritime dimension of the TEN-T. I very much count on your further commitment and engagement in this endeavour and look forward to interesting debates.

7.3 Outlook on COVID-19 crisis

As highlighted in my introductory remarks, this document was prepared before the world was heavily affected by the Covid-19 crisis. The impacts of this pandemic on the transport sector are severe, but the full consequences are yet to be assessed. It is therefore difficult at this point in time to accurately and fully consider how the crisis will affect the future policy of MoS. In this context, I will be consulting with stakeholders and Member States over the next few weeks and months to try to understand the effects of the crisis on the entire sector, and on short sea shipping in particular. Such dialogue will be key in ensuring the MoS policy takes full account of the challenges being faced by the various actors of the European Maritime Space. The MoS DIP will see a further revision by the end of 2021, and our aim will be to include the results of these consultations in this revised document. A clear focus of our renewed MoS policy will be put on what COVID-19 recovery measures will be needed by the sector and how a more resilient European Maritime Space can be promoted.

8 Contact

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Annex I - Legislative Drivers

EU Regulations and Directives

Regulation/ Directive	Description	Deadline(s) for implementation	MoS/EU policy relevance
Regulation (EU) No 1315/2013 TEN-T Regulation	Infrastructure	Core Network completion: 31 December 2030 Comprehensive Network Completion: 31 December 2050	Establishes the overall framework for the development of key transport infrastructure (incl. ports) at EU level
Directive 2014/52/EU amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment	Environmental Impact Assessment	Entered into force on 15 May 2014	Provides the rules for assessing the potential effects of projects on the environment, including projects involving coastal zones and the marine environment
Directive 2014/94/EU on deployment of alternative fuel infrastructure	Infrastructure/Alternative fuels	LNG bunkering facilities to be in place (in core ports): 31 December 2025 On-shore power supply to be in place (in core ports): 31 December 2025	Establishes specific requirements for the availability of alternative fuel facilities for shipping in EU core ports, depending on demand and the proportionality of costs to benefits, including environmental benefits.
Regulation (EU) 2015/757 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport (MRV Regulation)	Environment Climate	First reporting period: as of 1 January 2018	Requires ship owners to monitor, report and verify annual CO_2 emissions from vessels (larger than 5000GT) calling at EU ports. This is seen as the first step towards achieving CO_2 reduction from ships
Directive (EU) 2018/410 on enhance cost-effective emission reductions and low-carbon investments (EU ETS Directive)	Environment Climate	National transposition deadline: 9 October 2019	The EU ETS Directive, which established a carbon market for a number of sectors, so far does not include shipping. However, a recital states that "action [on reducing GHG

			emissions from ships] from the IMO or the EU should start from 2023, including preparatory work on adoption and implementation and due consideration by all stakeholders". The Transport Commissioner has been asked to lead work on extending ETS to the maritime sector.
Regulation (EU) No 1257/2013 on ship recycling	Environment Ship Dismantling	Application date: 31 December 2018	Requires EU flagged ships to be recycled at EU-approved facilities
Directive 2019/883 on port reception facilities for the delivery of waste from ships (PRF Directive)	Environment Waste	National transposition deadline: 28 June 2021	Requirement for ports to provide adequate facilities i.a. for collection of separate waste streams, and for scrubber waste
Regulation 2019/1239 establishing a European Maritime Single Window environment	Simplification of Administrative Procedures	Application date: 15 August 2025	Requires the Commission to design and implement a common interface (EMSWe) for the harmonised and digitalised reporting of ship formalities
Regulation 1143/2014 on invasive alien species (IAS)	Environment Water Management and Biodiversity	Entered into force on 1 January 2015	Member States were required to adopt Action Plans on pathways for the introduction of key IAS ("IAS of Union concern") by mid-2019. The Action Plans target shipping-related pathways, and the Regulation underscores the importance of MS implementing the IMO Ballast Water Management Convention.
Regulation 528/2012 and Regulation 334/2014 concerning the making available on the market and use of biocidal products (Biocidal Product Regulation)	Environment Biodiversity	The Regulations entered into force more of less directly. The list of active substances under the Biocidal Product	The Regulation lays down rules for the establishment of a list of active substances that may be used in biocidal products and for the authorisation of biocidal products. This Regulation is relevant for

		Regulation is updated regularly.	maritime transport, as it concerns the approval or ban of certain substances that might be found in antifouling paints.
Marine Strategy Framework Directive 2008/56/EC	Environment Water Quality	Entered into force in 2008.	The main goal of the Marine Directive is to achieve Good Environmental Status of EU marine waters by 2020. This includes action on i.a. marine litter and underwater noise.
Renewable Energy Directive 2018/2001/EU	Climate/ Alternative Fuels	Member States have until 30 June 2021 to transpose it into national law	The Directive refers to a renewable energy target for the transport sector as a whole, with the European Parliament increasing this overall target to a 14% share by 2030, with a clause for a possible upwards revision by 2023.
Directive on Energy Efficiency (EU) 2018/2002	Climate/Alternative Fuels	Entered into force on 14 December 2018	The Directive set a binding target on energy efficiency of at least 32.5% by 2030.
Directive 2012/33/EU of the European Parliament and of the Council amending Council Directive 1999/32/EC as regards the sulphur content of marine fuels	Environment/ Air Emissions Sulphur	National transposition deadline: 18 June 2014	This Directive transposed the international rules adopted by the IMO on the sulphur content of marine fuel (MARPOL Annex VI) into EU law. These rules include the stricter limit in SECAs of 0.10% as of 2015 as well as the global limit of 0.50% outside SECAs as of 2020.
Council Directive 92/106/EEC of 7 December 1992 on the establishment of common rules for certain types of combined transport of	Combined Transport	Entered into force in 1992	The goal is to promote Combined Transport operations. These measures must cover combined forms of transport bringing together road and other

goods between Member States			modes of transport, such as rail, inland waterway and sea transport.
Directive 2009/16/EC of the European Parliament and of the Council of 23 April 2009 on port State control	Port State control	Date of transposition: 31 December 2010	The purpose of this Directive is to reduce substandard shipping in the European waters. The rules set out concern harbour installations, maritime safety, prevention of pollution from ships.
Regulation (EU) 2017/352 of the European Parliament and of the Council of 15 February 2017 establishing a framework for the provision of port services and common rules on the financial transparency of ports	Ports	Date of entry into force: 24 March 2019	The purpose of this regulation is to facilitate access to the port services market and introduce financial transparency and autonomy of maritime ports

IMO Conventions and instruments

Regulation	**Description**	**Deadline(s) for implementation**	**MoS/EU policy relevance**
MARPOL Annex VI, Regulation 14 Global sulphur cap for marine fuels (0.50%)	Environment Air emissions Sulphur	1 January 2020	Sets a global limit for the amount of sulphur contained in shipping fuels to 0.50% (compared to 3.5% today outside of SECAs). Options for compliance include MGO/distillates, ultra-low sulphur fuels and blends, alternative fuels and scrubbers.
IMO Data Collection System for fuel consumption (IMO DCS)	Environment Climate/GHG	First reporting period: as of 1 January 2019	Requires vessels (+5000 GT) trading globally to monitor and report fuel consumption

IMO GHG roadmap	Environment Climate/GHG	GHG reduction targets for shipping: ● reduce total annual GHG emissions from ships by at least 50% by 2050 (2008 baseline) ● phase out GHG emissions from ships as soon as possible in this century ● reduce GHG emissions per transport work by at least 40% by 2030, with efforts towards 70% by 2050 (2008 baseline)	Establishes ambitious GHG reduction targets for the shipping sectors. Ongoing discussions on possible measures to achieve the target.
IMO Energy Efficiency Design Index (EEDI)	Environment Climate/GHG	Phase 1: 2015 - 2019 Phase 2: 2020 - 2024 Phase 3: 2025 onwards *(IMO MEPC74 in May 2019 to discuss possible application from 2022)*	Technical requirements for new vessels aimed at improving energy efficiency. The EEDI is one of the tools currently under discussion at IMO in the context of the 2050 GHG reduction targets.
Baltic Sea special area for sewage (IMO MARPOL Annex IV)	Environment Water and Waste Management	Application dates: ● 1 June 2019 for new passenger ships ● 1 June 2021 for existing passenger ships ● 1 June 2023 for existing passenger ships on route between a port outside the special area and a port located east of 028°10’E4	Passenger ships are prohibited from discharging untreated sewage in the Baltic Sea. Vessels are required to install approved treatment systems on board, or alternatively to discharge at a port reception facility.
Baltic/North Sea NECA	Environment Air Emissions NOx	Application date: 1 January 2021	Requires vessels operating in the Baltic/North Sea built after 2021 to comply with Tier III NOx (nitrogen oxide) emission standards,

			i.e. to achieve 80% NOx reduction
Ballast Water Management Convention	Environment Water Management and Biodiversity	Application date: 8 September 2017 Full implementation by 2024	Requires vessels to install an approved ballast management system of board to comply with the agreed standard for ballast water discharge
Hong Kong Convention for the Safe and Environmentally Sound Recycling of Ships	Environment Ship Dismantling	The treaty will enter into force 24 months after ratification by 15 states, representing 40% of world merchant shipping by gross tonnage, and a combined max. annual ship recycling volume not less than 3% of their combined tonnage.	The Convention has been designed to try to improve the health and safety of current ship breaking practices.

Proposals and ongoing discussions

Proposal	**Description**	**Comments**	**Competence**	**MoS/EU policy relevance**
Proposal to revise the MRV Regulation COM(2019) 38 final	Environment Climate	Published on 4 February 2019 (discussions ongoing in EU institutions)	EU	Seeks to harmonise certain elements of the EU MRV Regulation with the IMO DCS. However, the proposal does not pursue full alignment, meaning that both systems are expected to continue to coexist.
Regulation on electronic freight transport information (eFTI) COM(2018) 279	Simplification of Administrative Procedures	The Regulation is expected to be adopted in July 2020, and enter into force in August/September 2020, and become fully applicable as	EU	This Regulation will require Member States to accept electronic freight information, and specifies the format and data

		of August/September 2025		set for the delivery of such information
Proposal for Evaluating and Developing Harmonised Rules and Guidance on the Discharge of Liquid Effluent from Exhaust Gas Cleaning Systems (scrubbers)	Environment Water / Scrubbers	EU submission to MEPC 74 calling on the Committee to consider "the inclusion of a new output in its programme of work in order to evaluate and harmonize the development of rules and guidance on the discharge of liquid effluents from EGCS, including conditions and areas".	EU submission to MEPC 74 in May 2019 (initiated by FR)	The submission calls for further analysis to be conducted on the topic of washwater discharge from open loop scrubbers. IMO member states (non-EU) have already voiced concerns about a possible attempt to ban open loop scrubbers.
Proposal for a Mediterranean Sulphur ECA	Environment Air emissions Sulphur	The Naples Declaration adopted at Barcelona Convention COP21 in December 2019 begins a formal process to designate the MED a sulphur ECA. A submission to IMO in 2022 will be made. Possible entry into force of the ECA in 2024.	Barcelona Convention	Should this initiative be successful at IMO, the SOx limit in the Mediterranean will be established at 0.10% (compared to 0.5% as of 2020).
Directive 2003/96/EC on Taxation of Energy Products and Electricity	Environment Climate	Entered into force in 2003. On the agenda for revision.	EU/MS	Taxation as a possible tool to further climate policy objectives has received considerable attention in recent months. This could have an impact on the current tax exemption for shipping fuels. There may also be

				changes related to shore-side electricity.
International Ocean Governance	Environment Oceans	Both the EC and the EP have called for a more effective and integrated governance and protection of the oceans.	EU	The Environment and Oceans Commissioner is asked to work on "A new approach for a sustainable blue economy" and take an active part in the UN Ocean Conference in Lisbon 2020.
Biodiversity Strategy for 2030	Environment Biodiversity	A Biodiversity Strategy for 2030 is part of the Commission's "A European Green Deal".	EU	Calls for more marine protected areas.
Zero-pollution ambition	Environment	A Zero-pollution ambition is part of the Commission's "A European Green Deal".	EU	The zero-pollution ambition will cover air, water and noise pollution from transport and other sectors.

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