MEDITERRANEAN ACTION PLAN (MAP)
REGIONAL MARINE POLLUTION EMERGENCY RESPONSE CENTRE FOR THE MEDITERRANEAN SEA (REMPEC)

Sixteenth Meeting of the Focal Points of the Regional Marine Pollution Emergency Response Centre for the Mediterranean Sea (REMPEC)

Sliema, Malta, 13-15 May 2025

REMPEC/WG.61/8/3
25 February 2025
Original: English

Agenda Item 8: Reduction of GHG emissions from ships

Implementation of Emission Control and Energy Efficiency Measures for Ships in Port Areas in the Mediterranean Region

REMPEC
Malta, 2025

Note by the Secretariat

The present document presents the Study on the Implementation of Emission Control and Energy Efficiency Measures for Ships in Port Areas in the Mediterranean Region.

The Meeting will be requested to consider the recommendations and propose the best way forward.

Background

1 The ship-port interface is defined as the area of coverage of a ship's operation from the time the pilot boards the vessel at the pilot station to help it berth. The coverage extends to the time the pilot leaves the vessel at the pilot station when the vessel departs from the port and includes the time the vessel is at the port.

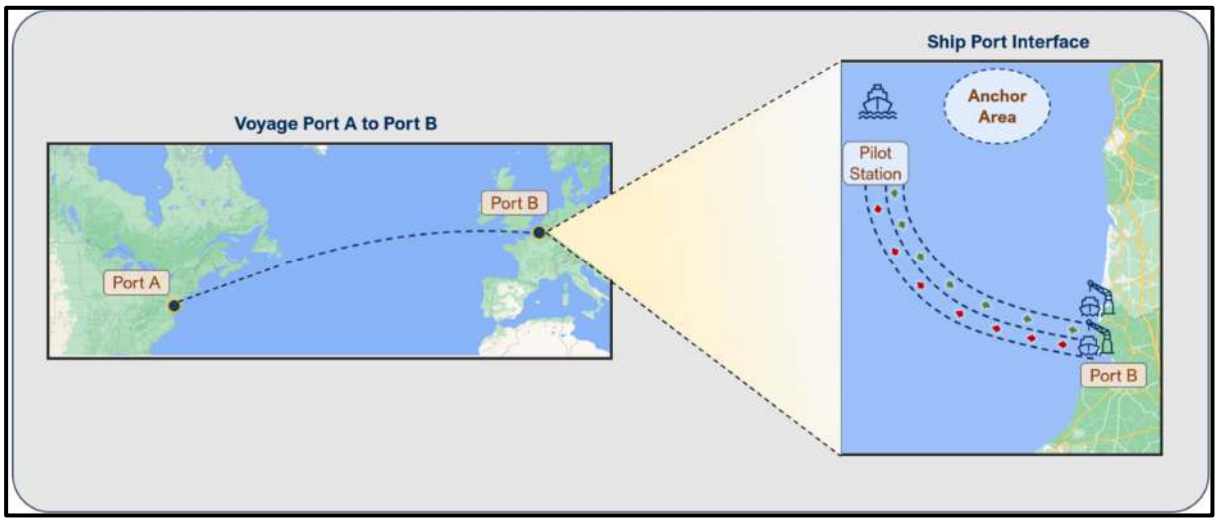


Figure 2.1 The ship-port interface Source: Drewry (2024)

2 Vessels are involved in various activities at port:

.1 **Cargo operation:** A vessel loads and discharges cargo at the port.

.2 **Crew change:** At times some crew members leave the ship upon completion of their contract and are replaced by new crew members who join the vessel at the port. The change of crew usually involves road transport between the port and the airport.

.3 **Provisions:** Ship chandlers deliver provisions or other items ordered by the vessels. These are usually brought to the vessel at port via trucks or boats.

.4 **Bunker:** Vessels are refuelled at the port via shore pipeline, trucks at berth or small vessels known as bunker barges that carry bunker (marine fuel).

.5 **Others:** Other activities such as ship surveys and repair are also carried out at the port.

3 Various stakeholders involved in the port activities include:

.1 **Port authorities:** They are focused on port processes such as dredging and nautical services.

.2 **Terminal operators:** They are focused on berth and yard operations, efficiency of loading/unloading as well as storage of cargo.

.3 **Vessel service providers (tugs, pilots):** These include tugs and pilots that assist vessels to berth at the port. If these arrive late, it results in additional emissions from the vessels.

.4 **Shipping lines:** They are focused on vessel schedules, vessel fleet and vessel speeds, and can influence vessel emissions while navigating, waiting or at berth.

.5 **Supply chain stakeholders:** These include inland transport.

.6 **Ship agents:** They coordinate with various parties for berthing of the vessel while also taking the required clearances for it.

.7 **Customs:** They handle the duties, fees or taxes charged on items being shipped from one country to another.

.8 **Ship crew:** They oversee the operations during a port call.

4 All stakeholders can be subdivided into two broad categories:

.1 **Primary stakeholders** are directly involved in the ship-port interface and include vessels, port authorities/regulators, pilots, tugboats, terminals and stevedores (shore staff who carry out cargo loading and/or discharging).

.2 **Secondary stakeholders**, such as agents, cargo owners/charterers, perform a secondary role and are indirectly involved in the ship-port interface. These are shown in the graph below.

Figure 2.1 Primary stakeholders

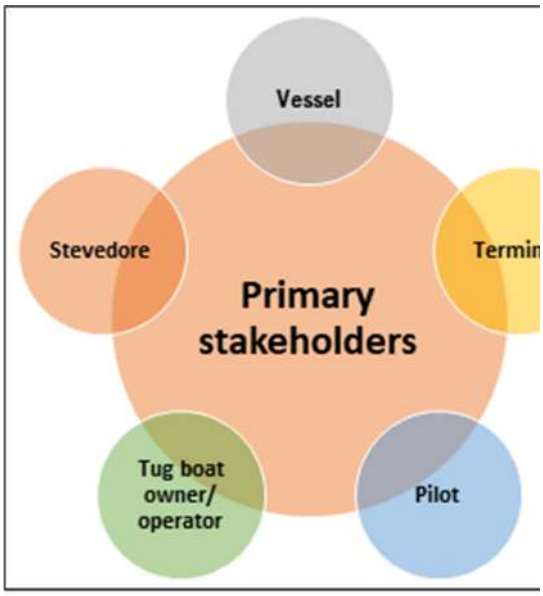


Figure 2.2 Secondary stakeholders

Source: Drewry (2024)

5 There are many sources of emissions during the ship-port interface.

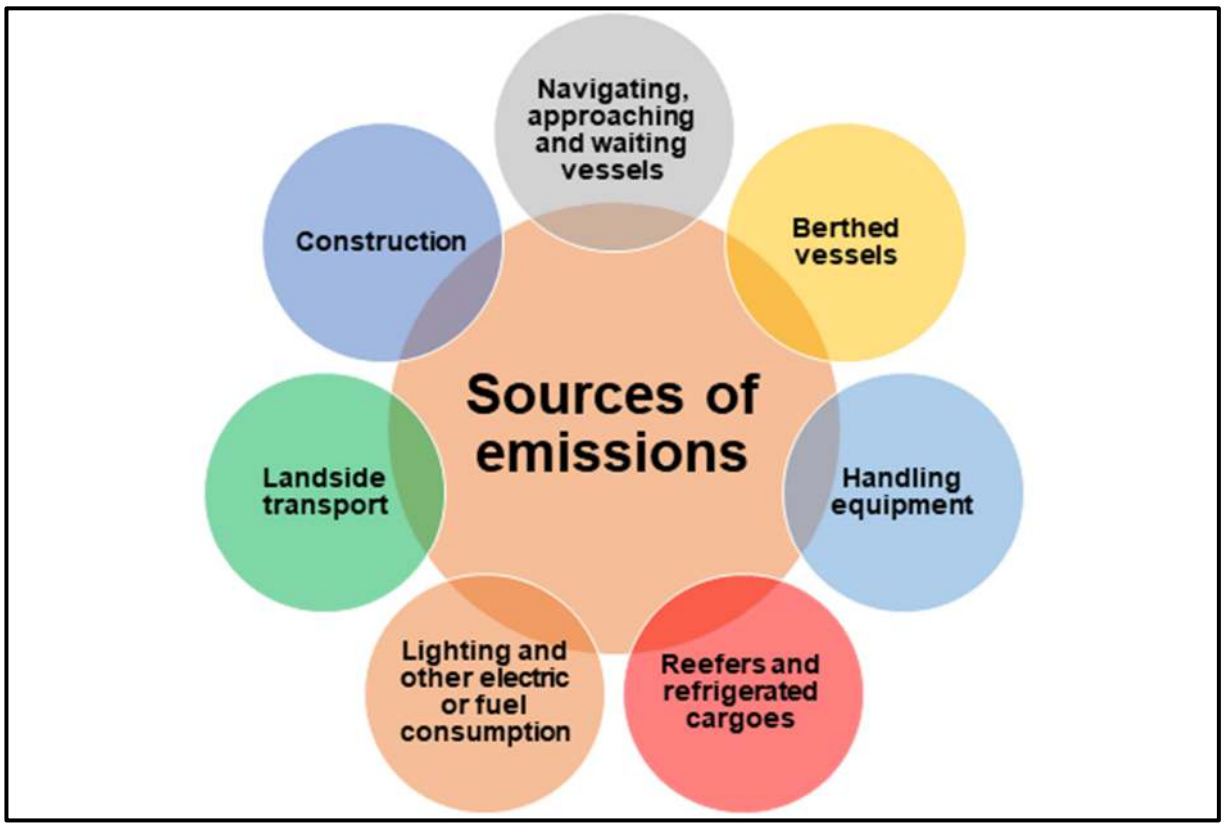
.1 **Emissions during the process of berthing:** These emissions are mainly from the vessels and tugboats.

.2 **Emissions during cargo operations:** These emissions are mainly from shore cranes, from berthed vessels for electricity generation, from port lighting, from heavy-duty vehicles and railroad locomotives, amongst others. Power consumption by reefers is another important source of emissions. Sustainable construction of berths helps reduce emissions.

.3 **Other emissions:** These emissions are due to various reasons including the time when the vessel is at berth during non-cargo operations, port lighting during non-cargo operations,

bunkering, movement of vehicles for crew change, delivery of provisions by ship chandler, movement of vehicles for agents and surveyors, amongst others.

Figure 2.3 Main sources of emission at ports



Source: Drewry (2024)

6 The Mediterranean region, with its unique challenges and opportunities, requires tailored approaches for the successful implementation of the 2023 IMO GHG Strategy by Contracting Parties to the Barcelona Convention (CPs), including relevant stakeholders. The Mediterranean basin faces significant environmental challenges due to emissions from ships, particularly in port areas and coastal regions, which often have harbours located near urban and industrial centres. To mitigate these challenges and related significant environmental impact, there is a need for a comprehensive study to identify and evaluate emission control and energy efficiency measures from ships and in ports.

7 To this effect, REMPEC commissioned Drewry Maritime Services to develop a Study to assist the Contracting Parties to the Barcelona Convention (CPs), with their efforts towards examining strategies and measures that could be deployed in the Mediterranean Sea basin, to increase efficiency, decrease impacts on human and environmental health and propose possible strategies for the long-term sustainability of coastal regions of the Mediterranean, through the implementation of Emission Control and Energy Efficiency Measures from Ships in Port Area in the Mediterranean Region. This activity was financed by the voluntary contribution from the French Ministry for Europe and Foreign Affairs.

8 The Study is provided in document REMPEC/WG.61/INF.15.

Emission reduction measures from vessels during the ship-port interface

9 International shipping contributes about 3% to the total Greenhouse Gas (GHG) emissions with a sizable portion emitted at ports where ships call for cargo operations and other purposes. Therefore, it is prudent to reduce emissions from vessels when they are at port. While there are several ways to reduce

these emissions, a few popular options that could be considered in the Mediterranean region are listed below:

.1 Emission reduction from the vessel's auxiliary engine

Emissions from auxiliary engines onboard can be curtailed using sustainable biofuels, hybrid engines, fuel cells and low-/zero-carbon fuels. Auxiliary engines can be shut down when using onshore power.

.2 Bow thrusters

An efficient bow thruster helps in the vessel's lateral (side-to-side) movement and manoeuvrability in tight spaces as well as during difficult weather conditions.

.3 Cargo operations-related smart systems on vessels for power reduction

Variable Frequency Drive (VFD) compatible crane motors or cargo pumps can help in energy saving. For refrigerated cargo operations on board, simple measures such as proper insulation and heat leakage control, proper ventilation, pre-trip inspections, automated temperature management and smart refrigerant systems help save energy.

.4 Light Emitting Diode (LED) lighting on vessels

LEDs help reduce power consumption and operational costs when compared with traditional fluorescent lamps as the former substantially reduces electrical load which in turn improves the ship's efficiency in terms of energy and fuel.

.5 Onboard Carbon Capture System (OCCS)

OCCS enables carbon emitted from the vessel to be captured and thereby help in reducing the emissions. Carbon capture technologies are useful for reducing emissions in hard-to-abate sectors. Once the supply chain develops, there could be great potential for liquid CO_2 transportation. These technologies will then result in ports developing infrastructure for loading and discharging the cargo of liquid CO_2 and will give further impetus to the development of OCCS.

.6 Others

Various port clearance portals and data platforms could streamline inspections from third parties such as customs, port authorities, flag states and classification societies. Many ports do not allow vessels to carry out hull cleaning and propellor polishing in port areas as well as at anchorage due to concerns of biological and chemical pollution. If these are permitted, emissions from vessels could reduce. Many ports do not allow main engine maintenance at port. Riding teams on vessels may carry out maintenance while the vessel is at port, reducing the time required by vessels at anchorage/repair berth and thereby lowering emissions.

10 Various measures undertaken to reduce emissions while sailing in deep seas are not so effective while the vessel is navigating within the port area. OBJ

Challenges and opportunities related to Emission reduction measures from vessels during the ship-port interface

11 The Study has identified a number of challenges and opportunities related to emission reduction measures from vessels during ship-port interface, namely:

Challenges	Opportunities
The use of sustainable biofuels along with conventional fuels on vessels can decrease emissions by reducing CO_2 emissions. However, the supply of sustainable biofuels for shipping is limited. The use of main and auxiliary engines driven by low-/zero-carbon fuels such as Liquified Natural Gas (LNG), methanol, hydrogen, sustainable biofuels and ammonia will reduce or eliminate carbon emissions. However, each of them has its respective challenges. For example, hydrogen requires a lot of volumetric storage onboard, LNG has the problem of methane slip and methanol as well as ammonia are highly toxic and flammable. Presently, only a limited number of oceangoing ships can receive Onshore Power Supply (OPS) because of the low availability of onshore power in ports. Additionally, in some ports, the electricity costs are also significantly higher than the cost of producing electricity on vessels; therefore, vessels avoid shore power in such ports. With the concern of Just-In-Time (JIT), smaller shipping companies fear that the system manager will favour the interests of large shipping companies, which may also be terminal operators. Hence, it is important to ensure that the manager of the system is independent and acts fairly. OCCS technologies are still in the development phase. These technologies are expensive and require major investments for infrastructure development. The production of green fuels is limited, while its cost is relatively high.	The growth of Carbon Capture and Storage (CCS) technologies offers opportunities to reduce emissions in hard-to-abate sectors. This will also encourage the development of liquid CO_2 terminals, which will also encourage OCCS. The associated energy and cost savings with LED-based systems, make LED lighting on vessels or in ports an easy and important measure to reduce emissions. Shipowners can reduce their carbon footprint by using low-/zero-carbon fuels to comply with the regulations.

12 The Study made the following recommendations regarding the above identified challenges and opportunities, namely:

.1 A vessel depends on tug and pilot assistance from the port for berthing/unberthing. Effective coordination among the ship crew, ship agent and port authorities can ensure that such assistance is made available to the vessel on time, ensuring quick turnaround. Since crew changes as well as delivery of essential supplies and spares are mainly done at port, efficient and advanced liaising with ship agents as well as other stakeholders can ensure that these

activities cause no delay to the departure schedule of the vessel. Systems like the digital port connection may be considered for better coordination and efficiency in the Mediterranean region;

.2 When a vessel berths at a port, it can be subjected to several inspections from third parties such as customs, port State controls, flag States, classification societies, and various other service providers. Various port clearance portals and data platforms could help vessels to streamline these inspections, therefore, saving time and reducing emissions in ports of the Mediterranean coastal States;

.3 Vessels should consider having a riding team to carry out maintenance, when possible, which would result in reducing the time required at anchorage/repair berths causing less emissions in the Mediterranean region; and

.4 Various emission reduction measures can be adopted by vessels and should be explored by shipowners operating in the Mediterranean region. These include:

- Efficient management of bow thrusters;
- For refrigerated cargo operations on board, measures such as automated temperature management and smart refrigerant systems help save energy;
- VFDs in ship crane motors for energy saving; and
- LED lighting on vessels.

Emission reduction measures in ports during the ship-port interface

13 Ports play an important role in reducing the overall GHG. Various ports are in a phase of developing sustainable strategies to reduce emissions in ports and ships.

.1 Emission reduction from tugboats

Tugboats involved in assisting vessels to berth usually have powerful engines; therefore, their contribution to GHG emissions should be considered. In many ports, tugboats are connected to onshore power while they are berthed and await the next job.

.2 Onshore power availability at berth

OPS significantly reduces GHG emissions from vessels, since auxiliary engines are no longer required to run on vessels while it is at berth.

.3 Cargo operations-related emission reduction by port

In recent years, considerable progress has been made in improving the performance of fossil fuel-driven equipment, as well as developing alternative power sources for cargo operation-related machinery in ports.

.4 LED lighting at port

Lighting is the third-largest energy consumer (12%) in a container terminal and also a major consumer in other types of terminals. The development of lighting technologies such as LED has made it possible to replace energy guzzlers like halogen lamps in ports, improving energy efficiency and reducing the carbon footprint.

.5 Just in Time (JIT)

JIT arrival system ensures seamless communication between the vessel, pilot, tugboats and the port so that the vessel only arrives when the berth is ready. This requires various stakeholders, such as terminal operators, pilots, tugboat operators and vessel captains, to work together.

.6 Carbon Capture, Utilisation and Storage (CCUS) value chain

CCUS is a process that captures CO2 released from thermal power plants, factories, etc. and either use it in production processes for crops, chemicals, construction materials, etc. or stores it in a stable underground geological formation. The inclination towards combatting climate change, switching to low-/zero-carbon fuel, reducing GHG emissions and a cleaner environment with zero-carbon footprint requires the CCUS value chain to be developed.

.7 Others

Several measures can be adopted by the port to increase efficiency and therefore reduce emissions. Some examples of such measures include dynamic under-keel clearance, auto mooring, green corridors, green fuel in trucks, allowing vessel's main engine immobilisation, etc.

Challenges and opportunities related to Emission reduction measures from ports

14 The Study has identified a number of challenges and opportunities related to emission reduction measures from ports, namely:

Challenges	Opportunities
There is a lack of infrastructure to receive liquid CO_2 or CO_2 storage containers required for the OCCS in ports. Uncertainty of green fuel availability for tugboats makes it difficult for ports to order green tugboats. In addition, electric tugboats involve high upfront costs and require infrastructure for power supply at berth. The infrastructure cost associated with the installation of OPS facilities can be high. One of the challenges for the OPS is that the source of energy needs to be green or else there would be no real reduction in GHG emissions. OPS can be installed at the terminals in collaboration with the port authority. However, this could pose problems for terminals as the concession agreements may have been signed many years before these systems came into existence and there may be a lack of clarity on the party responsible for the installation of OPS. This, in turn, requires amendments to the agreement between the port authorities and the terminal operators. While sustainable biofuels can use the existing bunkering infrastructure, new infrastructure would be required for low-/zero-carbon fuels such as methanol and ammonia. A feasible fuel pathway, consumer demand for sustainable shipping, supportive laws and regulations as well as cooperation across value chains are some of the challenges in forming a green corridor.	While OCCS and CCS are increasingly becoming popular, ports need to build the infrastructure to receive liquid CO_2 or CO_2 storage containers facility. Once the supply chain develops for carbon capture technologies, there could be great potential for liquid CO_2 transportation. These will result in ports developing infrastructure for loading and discharging the cargo of liquid CO_2, which will give further impetus to the development of OCCS. Many ports are developing sustainability strategies that consider the reduction of GHG emissions within their port boundaries. As a result, some ports are planning to become energy hubs, which includes managing their energy sources (e.g. offshore wind, solar or tidal) and becoming self-reliant. As per Clarksons, LNG-operated tugboats are the most popular dual-fuel tugboats in the orderbook. The opportunities to adopt new-generation tugboats are increasing in ports that are committed to an emission reduction strategy. Cruise and ferries have shown a keen/the highest interest in OPS worldwide, and there are opportunities for OPS, especially for cruise and ferry terminals across the globe. There are opportunities to reduce carbon footprint in the construction of ports using low-carbon cement in concrete design, the use of green materials in place of concrete or steel, where appropriate, as well as the use of recycled plastic and tyres where possible. These will, in

	turn, increase the demand for these technologies and reduce costs for them due to economies of scale. Life Cycle Analysis (LCA) of bunkers will lead to regionalisation of bunker procurement. In addition, higher space requirements for low-/zero-carbon fuels on vessels may lead to more frequent bunkering. Therefore, bunkering hubs are expected to shift to new locations. This also offers opportunities for various States to establish themselves as bunkering hubs. The availability of CCS technology, long-term storage of CO_2, low cost of renewable energy and availability of gas reserves will be the key to deciding the opportunities for bunkering hubs.

15 The Study made the following recommendations regarding the above identified challenges and opportunities, namely:

.1 While acquisition costs for electric and hybrid tugboats are high, there are savings in fuel and maintenance when considering it on a life cycle basis. Therefore, ports of the Mediterranean coastal States should consider investing in green tugboats;

.2 Ports of the Mediterranean coastal States should include advanced ship-to-shore cranes, new generation Rubber-Tyred Gantry (RTG), hybrid model Straddle Carriers (SC), fuel-cell powered forklifts, low-emission locomotives, etc;

.3 Ports of the Mediterranean coastal States should opt for LED technology to improve energy efficiency;

.4 As shipping companies are interested in developing JIT, port authorities of the Mediterranean coastal States should coordinate amongst all stakeholders of a ship's call, including the terminal, to implement a system based on available digital tools to achieve JIT berthing;

.5 Ports of the Mediterranean coastal States should explore making use of platforms like the "Digital Port Call" that is being implemented at the Port of Gothenburg (Sweden);

.6 In ports, where vessels tend to stay longer than a reasonable time after the completion of cargo operations, an overstay dockage policy should be considered in ports of the Mediterranean coastal States, which will also reduce the emissions from vessels at berth;

.7 Ports of the Mediterranean coastal States with large numbers of pilotage movements could consider leveraging smart technologies to reduce delays in the arrival of pilots and therefore reduce emissions;

.8 Dynamic Under Keel Clearance (DUKC) is useful in tidal ports and helps in reducing the emissions per ton of cargo. Therefore, such ports of the Mediterranean coastal States should explore these types of systems to reduce emissions;

.9 Auto mooring system should be considered in the Mediterranean region for terminals with vessels having short port stays and many vessels calling the terminal;

.10 Risk assessments should be undertaken by ports of the Mediterranean coastal States for the following:

- Allowing main engine immobilisation at berth considering the weather conditions;
- Permitting bunkering, provision supply and other such activities to lower emissions during port stay; and

- Analysing harmful impact on the marine life of the local area due to hull cleaning and propellor polishing, carried out preferably at berth or else at anchorage.

.11 Newly developed solar cells based on the highest efficiency thin-film technology are now available and could be installed where rigid glass modules cannot function efficiently. This makes it possible to add solar energy generation to low-load capacity roofs, structures such as carports and storage facilities, amongst others. Ports of the Mediterranean coastal States with a high projection of sunlight around the year should consider installing new-generation solar cells;

.12 Any port expansions in the Mediterranean region should be done, with sustainable construction methods to reduce carbon impact; and

.13 The inclination towards combatting climate change, switching to low-/zero-carbon fuel, reducing GHG emissions as well as achieving a cleaner environment with zero carbon footprint requires the CCUS value chain to be developed. Industrial usage of CO_2 and its importance as a key member in attaining zero emissions make CCS, OCCS and Liquid CO_2 infrastructure, including terminals, important requirements in the future. Such facilities should be given financial assistance. Therefore, CCS projects have been increasingly prevalent as many countries aim to reduce carbon emissions. Ports in Mediterranean coastal States should closely monitor the development of LCO_2 trade and can consider entering the carbon value chain business, such as operating CO_2 terminals or providing CO_2 storage facilities.

Policies and regulatory measures to reduce emissions during the ship-port interface

16 IMO has implemented regulations related to GHG emission reduction measures such as Energy Efficiency Design Index (EEDI)/Energy Efficiency Index for existing vessels (EEXI) and Carbon Intensity Indicator (CII). With every passing year, the CII regulation will get stricter, forcing vessels to improve their GHG emission reduction.

17 Several countries are implementing local regulations such as the European Union Emissions Trading System (EU ETS) Directive, the FuelEU Maritime Regulation and the UK ETS to become net-zero by 2050 or earlier. For example, Türkiye is taking the initiative to establish its own carbon pricing scheme comparable with the EU ETS.

18 Unlike shipping, there is no global organisation regulating the ports sector. However, the emissions from vessels near the port area are also accounted for; hence, vessels operating in the ship-port interface will be directly affected by these regulations. The FuelEU Maritime Regulation and the Alternative Fuel Infrastructure Regulation (AFIR) specifically mandate vessels to use OPS while at berth in several European ports, while the AFIR requires ports to have LNG bunkering facilities.

19 In addition to the regulations, initiatives are required, which promote early movers in achieving the net-zero target. 'Green corridors' encourage all stakeholders involved to opt for low-carbon emission alternatives and is expected to create demand for low-/zero-carbon fuels.

20 Many ports are taking charge to reduce GHG emissions. Port authorities of countries such as Singapore is actively involved and facilitating multi-stakeholder initiatives for the development of green shipping. Major ports in North America, Europe, Asia and the Mediterranean region can be seen taking major steps in the following categories: Reference may be made to several other industry-led frameworks and reports which can be adopted to initiate and develop green shipping corridors and green maritime hubs. For example:

.1 **Speed limits:** Ports are incentivising vessels operating in the ship-port interface with a speed limit to reduce emissions. Some port authorities such as the Port of Los Angeles (USA) and the Port of Long Beach (USA) are giving discounts of 15-30% reduction in dockage fees to vessels following such recommendations.

.2 **Discounts for low-emission vessels:** Many ports have come up with an Environmental Ship Index (ESI) and offer discounts to low-emission vessels while visiting their ports. These initiatives promote vessels to improve their energy efficiency and reduce carbon emissions.

.3 **OPS and Electrification:** Vessels can lower their emissions while at berth by using power supplied by ports called OPS. If the power is from renewable energy, carbon emissions can be reduced significantly. Similarly, promoting electrification of the port and providing charging stations for electric trucks help in curbing emissions.

.4 **Low-/zero-carbon fuel supply:** Many ports such as Rotterdam, Antwerp and Singapore have been supplying green and low-/zero-carbon fuels.

.5 **Renewable energy:** Many ports are investing in solar/wind energy to meet their power requirements. This will not only reduce overall carbon emissions but will also help ports to become self-sustainable for their power requirements. In a few cases, these solar panels are making excess power, which is sold to the city grid.

.6 **Overstay Dockage:** The overstay dockage policy contains clauses for imposing penalties on vessels that stay longer than the permissible time. This in turn reduces emissions from vessels at berth.

Challenges and opportunities to Policies and regulatory measures to reduce emissions during the ship-port interface

21 The Study has identified a number of challenges and opportunities related to policies and regulatory measures to reduce emissions during the ship-port interface, namely:

Challenges	Opportunities
Energy regulations in some countries prevent the commercialisation of electricity to ports or terminals, with energy being provided to them only by national energy distributors. Few ports are becoming energy hubs, which includes managing their own energy sources (e.g. offshore wind, solar or tidal). However, this strategy, in some cases, conflicts with the interests of the energy companies and with local legislation. It may require changes in local legislation with regard to the right to distribute power and pricing mechanisms. The constraints to the availability of sustainable investments need to be removed.	The potential for the development of multiple green corridors represents a significant opportunity. These green corridors would support the surrounding region develop better infrastructure and improve the availability of green fuels.

22 The Study made the following recommendations regarding the above identified challenges and opportunities, namely:

.1 Local emission regulations should be reviewed by Mediterranean coastal States that are not EU Member States and should be aligned with the EU ETS as far as possible;

.2 The use of low-emission fuels is the principal strategy, which is implemented in maritime transport to reduce emissions. However, for this to be possible, there should be enough bunkering facilities in the ports of the Mediterranean coastal States and they should be adequately spread throughout the routes. Often, a detailed risk analysis is necessary for ports involved in the creation of green shipping corridors due to the risks

commonly associated with the adoption of low-emission fuels (e.g. methanol, ammonia, etc.);

.3 Establishing green corridors in the Mediterranean region will require not only individual efforts from numerous stakeholders involved but also collaborative action from the entire maritime shipping ecosystem. Stakeholders such as port authorities and fuel producers can integrate low-/zero-carbon fuel production plants within green corridor port infrastructures to improve efficiency in the green corridors;

.4 A feasibility study should be conducted for specific green corridors to dive deeper into understanding the needs and requirements of infrastructure, policy and finance to build a more solid political case for the green corridors in the Mediterranean region;

.5 The infrastructure cost associated with the installation of OPS facilities can be high. Therefore, grants from various organisations and national governments of Mediterranean coastal States should be given to the ports for their installation;

.6 The concession agreements between the port authorities and the terminals of the Mediterranean coastal States should be amended to include OPS;

.7 Existing energy legislations of some Mediterranean coastal States may need to be changed to allow the ports to manage their energy sources (e.g. offshore wind, solar or tidal) and its distribution;

.8 Port authorities of the Mediterranean coastal States should consider providing electricity to vessels at rates that are cheaper than the cost incurred by the vessels, till the time this becomes mandatory. This will not only encourage the usage of OPS facilities of the ports and reduce emissions but will also motivate the ship owners to fit OPS reception capabilities earlier than the time required by the regulations;

.9 In case multiple vessels use OPS, there is a potential for energy demand imbalance; therefore, the electric grid requirement of the terminals in ports of the Mediterranean coastal States should be increased by about five to six times to handle such loads;

.10 Port authorities of the Mediterranean region should give discounts to vessels having onshore power, even if the port does not have onshore power infrastructure. This may motivate ship owners to fit OPS reception capabilities earlier than the time required by the regulations;

.11 As data sharing is a big concern worldwide, countries are reluctant to share information. A neutral third party could work on bringing relevant stakeholders of the Mediterranean region on a common ground as a facilitator for a fast step towards decarbonisation;

.12 Mediterranean coastal States should review their laws related to data sharing and modify them as required so that information-sharing platforms can be developed and used;

.13 Port authorities of the Mediterranean region should give discounts in port dues to vessels running on low-/zero-carbon fuels. This will incentivise the efforts of first movers and motivate more ship owners to make the switch to low-/zero-carbon fuels; and

.14 Ports of the Mediterranean coastal States should adopt speed reduction policies as done by some benchmarking ports.

Other emission reduction measures

23 There are several other measures which can be taken in general by all the stakeholders involved.

Challenges and opportunities related to other measures

24 The Study has identified a number of challenges and opportunities related to other emission reduction measures, namely:

Challenges	Opportunities
Collaboration through data sharing among competing parties is essential for JIT, but there are several limitations in data sharing, such as competition law and antitrust concerns, data storage and control concerns, culture and behaviour resistance and contractual relationship concerns between the shipowner and the charterer. Major challenges with low-/zero-carbon fuel include establishing and scaling supply chains, revising fuel standards, accelerating the pace of infrastructure deployment as well as adopting modern and fuel-efficient ships.	There are considerable opportunities for manufacturers of port equipment for modification of existing equipment to include energy-saving measures or to retrofit them to use green fuels. Moreover, a new market is also developing for equipment getting operated on green fuels. JIT offers the potential to reduce emissions, especially in ports that face congestion for vessels. There are opportunities for various equipment and component manufacturers. For example: Fuel cell manufacturers; Battery manufacturers; Other emission reduction equipment including Propulsion Improving Device (PID) and Energy Saving Device (ESD) manufacturers; LED lighting manufacturers Provision of swappable batteries services; Shipyards for installation of various PIDs and ESDs; and Upgrading/modifications to run an engine on 100% sustainable biofuels.

25 The Study made the following recommendations regarding the above identified challenges and opportunities, namely:

.1 Mediterranean coastal States should educate the various stakeholders and train the required staff to make them fully aware of green transition underway and take action accordingly; and

.2 Access to grants and finance should be increased for green initiatives in the Mediterranean region.

Conclusion

26 The Study concluded that the measures taken to reduce emissions from vessels sailing on the deep seas are not sufficient in the ship-port interface. Mediterranean coastal States should work together to implement emission reduction measures to assist in achieving net zero emission targets, especially considering that many ports are close to densely populated areas.

Actions requested by the Meeting

27 **The Meeting is invited to**:

.1 **take note** of the information provided in the present document; and

.2 **comment** as deemed appropriate, on the recommendations provided in paragraphs 12, 15, 22 and 25 and discuss a possible way forward.

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