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Agenda Item 7: Air pollution from ships

Environmental and Legal Impacts of the Use of Exhaust Gas Cleaning Systems (EGCS) in the Mediterranean Sea

REMPEC
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Note by the Secretariat

The present document presents the Study on the Environmental and Legal Impacts of the Use of Exhaust Gas Cleaning Systems (EGCS) in the Mediterranean Sea.

Background

1. The Mediterranean Sea is an important waterway for trade and tourism, accounting for 20% of the global seaborne trade. The region is exposed to air and water pollution through various sources such as sulphur oxides (SO_x) and particulate matter[1] (PM) from the shipping industry.

2. The International Maritime Organization (IMO), as well as the European Union (EU), have been continuously working on legal frameworks to mitigate the global and regional environmental impact of the shipping industry. The designation of Emission Control Areas (ECAs)[2] was introduced as an amendment to the International Convention for the Prevention of Pollution from Ships (MARPOL) through the Marine Environment Protection Committee (MEPC) Circular MEPC.1/Circ.778/Rev.4 to curtail emissions and protect marine diversity and ecosystems.

3. Under MARPOL, general requirements to reduce air pollution due to sulphur emissions are provided in Regulation 14 of Annex VI and are mentioned below:

.1 The sulphur content of any fuel oil used on board ships shall not exceed the following limits:

- 4.50% m/m[(3)] prior to 1 January 2012;
- 3.50% m/m on and after 1 January 2012; and
- 0.50% m/m on and after 1 January 2020.

.2 While ships are operating within an ECA, the sulphur content of fuel oil used on board ships shall not exceed the following limits:

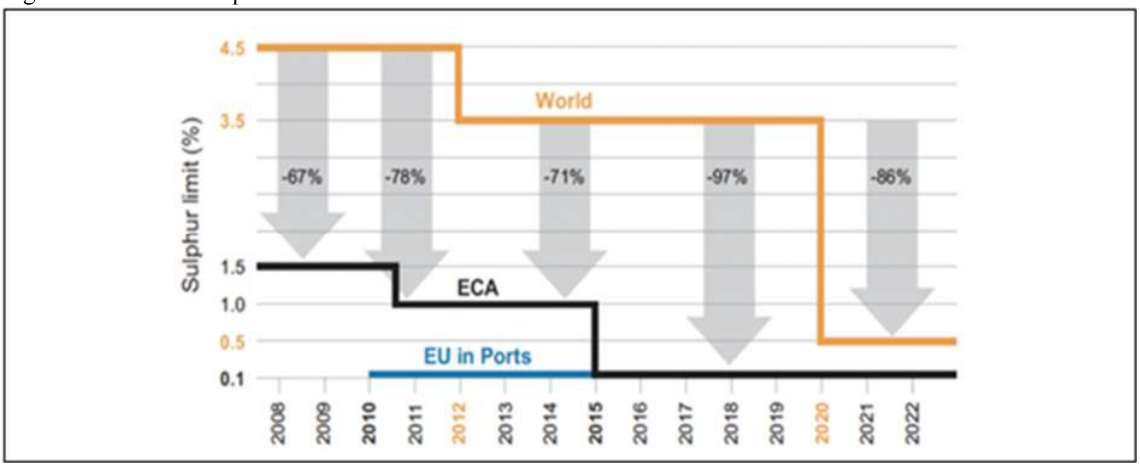
- 1.50% m/m prior to 1 July 2010;
- 1.00% m/m on and after 1 July 2010; and
- 0.10% m/m on and after 1 January 2015.

[1] PM is a complex mixture of particles and liquid droplets, generally from unburned fuel, oil and incombustible, and which consists of a number of components, including acids (such as nitrates and sulphates), organic chemicals, metals, and soil or dust particles. PM2.5 and PM10 are the two types of air pollution, the “10” and the “2.5” refer to microns.

[2] Emission Control Areas (ECAs) are defined under MARPOL Annex VI as areas where the adoption of special mandatory measures to regulate emissions from ships is required to prevent, reduce and control air pollution from NO_x and/or SO_x and/or PM.

[3] % m/m (percentage, mass in mass) expresses the number of grams of substance in 100 g of final product in percentage terms

Figure 1 MARPOL sulphur limits timeline



Source: Sustainable ships, IMO

4. The mitigation of SO_x and PM can be achieved by carrying two or more separate fuels (one with sulphur not exceeding 0.1% m/m and another with sulphur not exceeding 0.5%m/m) and using them accordingly, adapting to alternate fuel and by other equivalent means. MARPOL 73/78 Annex VI Regulation 4 allows equivalent means to comply with other regulations of Annex VI. One such equivalent is the EGCS, colloquially termed "scrubbers" which allows ships to continue using fuel oils with a sulphur content exceeding regulated values by reducing their SO_x emissions through the treatment of exhaust gas. EGCS has gained momentum across the globe to comply with current regulations. However, many coastal States are restricting their use because of the resulting water pollution. It should also be noted that MARPOL Annex VI does not specifically limit PM but this is reduced by reducing the sulphur content of the fuel oil.

5. The 79th Session of the IMO's Marine Environment Protection Committee (MEPC 79) (London, UK, 12-16 December 2022) adopted the amendments to MARPOL Annex VI concerning the designation of the Mediterranean Sea as an Emission Control Area for Sulphur Oxides and Particulate Matter (Med SO_x ECA), with a date of entry into effective application on 1 May 2025.

6. It is noted that the entry into effective implementation of the Med SO_x ECA, will bring along new challenges to Mediterranean coastal States in relation to preventive measures, including but not limited to the use of EGCS. To ensure the consistent implementation of the 0.10% Sulphur limit under MARPOL Annex VI in the Med SO_x ECA, it is essential to address such challenges.

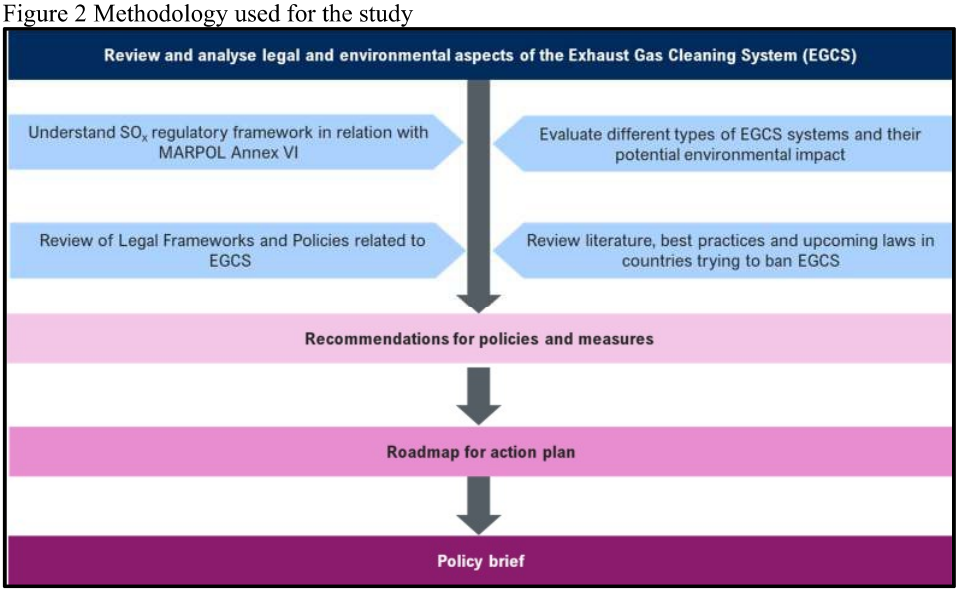
7. To this effect, the Secretariat commissioned a Study on the Environmental and Legal Impacts of the Use of Exhaust Gas Cleaning Systems (EGCS) in the Mediterranean Sea, herein after referred to as the Study. Funding was secured from the voluntary contribution by the Italian Ministry of Environment and Energy Security (MASE) and IMO's Integrated Technical Cooperation Programme (ITCP). The Study was carried out by Drewry Maritime Services and is provided in document REMPEC/WG.61/INF 11.

8. The Study aims to provide a strategic and evidence-based approach to enhancing the Mediterranean region's present environmental policies that primarily focus on air pollution assessment and its impact on climate change and human health and could be biased against the impact on the marine environment.

9. In undertaking the Study, all Contracting Parties were consulted on any national policies concerning the discharge of water from EGCS and on ports that have port reception facilities to handle the EGCS residues or are in the process of developing infrastructure to incorporate such measures to

handle EGCS residues in the future. More than 50% of the Mediterranean coastal States[4] have developed local regulations or policies to restrict the discharge of washwater in areas within the control of the States or port authority. Of these, authorities in 24% of CPs to the Barcelona Convention have imposed restrictions beyond their port areas. While a lot is happening locally, there is no comprehensive policy regarding the ban/restriction for the discharge of EGCS washwater in the Mediterranean region as a whole.

Figure 2 Methodology used for the study



Source: Drewry (2024)

Introduction to EGCS

10. The increase in global emissions has forced regulators to introduce stricter environmental regulations to achieve climate goals. The use of EGCS is one such alternative that allows vessels to run on HFO. The new designs of EGCS are effective in the ECAs, where emissions must be reduced to 0.1% SO_x. An EGCS is designed to reduce sulphur emissions. When flue gases react with water, sulphur is converted into its various compounds which get dissolved in the water and do not escape along with the flue gases into the atmosphere. EGCS has gained popularity over the past decade with several factors propelling its growth:

.1 The first and primary driver for the EGCS system is the regulation to reduce SO_x emissions.

.2 The secondary driver is the cost difference among Heavy fuel oil (HFO), Very low sulphur fuel oil (VLSFO) and low sulphur marine gas oil (LSMGO).

11. Ships mostly use wet types of EGCS which are of three types: open-loop, close-loop and hybrid. All three of them have separate pros and cons related to them. With ongoing strict measures for sulphur emissions and upcoming regional and local regulations along with global measures; open-loop EGCS is banned in many places. Therefore, a hybrid system will be the most preferred option as it can be operated in close-loop mode in areas of restrictions.

12. It is worth mentioning that the effectiveness of EGCS depends upon seawater alkalinity in open-loop EGCS while in close-loop EGCS it can be controlled through a dosing process of alkaline material. Hence the effectiveness of open loop is very low in freshwater areas where more water is required for dilution, which in turn requires more fuel and results in higher emissions.

[4] Since the State of Bosnia and Herzegovina does not have major ports, it does not need such policies.

13. With many countries raising concerns over washwater discharge from the EGCS, upcoming advancements such as dry EGCS and Onboard Carbon Capture and Storage (OCCS) could play a major role in marine decarbonisation. Several companies are coming up with different technological measures to eliminate hurdles, such as issues related to washwater discharge and tackling SO_x and CO^2 emissions together. With these technologies, they could meet the requirements related to SO_x and PM, and at the same time tackle CO^2 emissions, aiming to meet carbon neutrality targets.

Challenges and opportunities related to EGCS

14. The Study has identified a number of challenges and opportunities concerning the use of EGCS, namely:

Challenges	Opportunities
.1 The efficiency of open-loop EGCS reduces as alkalinity in seawater and freshwater decreases, resulting in the need for a higher flow rate of seawater, which requires more energy. This results in more fuel consumption and therefore higher emissions. .2 Higher capex and opex for the hybrid-loop EGCS can lead to a slower transition towards the acceptance of this system.	.3 Increased interest in hybrid EGCS will favour suppliers and manufacturers of the desired commodities such as Sodium Hydroxide (NaOH).

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

.1 Restriction on washwater discharge at national, sub-national and port levels from the open-loop and close-loop EGCS in various countries, dependency on alkalinity of seawater, high flow rate requirement for washwater and less efficient operation in freshwater suggests that open-loop EGCS should not be used;

.2 CPs should consider emphasising the use of Hybrid EGCS as the system does not depend on seawater alkalinity and can efficiently work in freshwater basins as well as sources of water with less alkalinity. This eliminates the use of seawater, and reduces fuel and overall emissions, as well as the discharge of marine pollutants into the sea;

.3 Shipowners are recommended to fit appropriate-sized tanks on ships for storing the bleedoff water in areas where close-loop scrubber discharge is banned, taking any future bans into consideration;

.4 Many Polycyclic Aromatic Hydrocarbons (PAHs) can be carcinogenic, mutagenic and toxic. The list of 16 priority PAHs from the U.S. Environmental Protection Agency (EPA) does not include alkyl-PAHs, which leads to an inappropriate impact assessment of EGCS washwater discharge in the marine environment. From the experimental characterisation of EGCS washwater discharge under the Evaluation, control and Mitigation of the EnviRonmental impacts of ShippinG Emissions (EMERGE) project, it was found that ecotoxicological effects were mostly related to alkylated PAHs. So, it is possible that shipping can comply with current EGCS guidelines despite harming the marine environment. A detailed analysis of alkyl PAHs should be carried out and the conclusion should be incorporated in Water Framework Directives (WFDs) of CPs for appropriate action, which should be taken.

Challenges and opportunities related to legal frameworks and policies related to EGCS

16. The Study has identified a number of challenges and opportunities related to the legal frameworks and polices related to EGCS, namely:

Challenges	Opportunities
.4 The present environmental policies related to SO_x in shipping focus primarily on pollution in the air, with little consideration given to the marine environment and human health. The fuel used should not only prevent air pollution but should also not harm the marine environment. This results in higher uptake of EGCS as it meets the regulations for air pollution but damages the marine environment. .5 Emissions of SO_x and PM are not the only pollutants, and regulations should aim at targeting all pollutants in the entire environment. While many PAHs are carcinogenic, mutagenic and toxic, the harmful impact of alkylated PAHs discharged with EGCS washwater as well as the compounds formed in the discharge water is not known. This prevents the appropriate impact assessment of the marine environment, which enables the shipping to comply with the current EGCS guidelines despite harming the marine environment. .6 MARPOL Annex VI does not specifically limit the PM, although it reduces when the sulphur content of the fuel oil is decreased. The lack of quantitative measures will create challenges when assessing the effectiveness of the measures to reduce PM. .7 Revised guidelines for EGCS (MEPC 2015, 2018 and 2021) have still not targeted metal concentrations and have only indirectly assessed it by using turbidity as a proxy. .8 Vanadium and Anthracene have been identified as major discharge compounds from open-loop EGCS in the Baltic Sea, yet no clear water quality guidelines exist for measures against their toxicity. .9 National legislations of various Mediterranean coastal States are not fully aligned with MARPOL Annex VI. .10 Since PRFs have yet to be established for handling EGCS residue, effectively implementing the regulations for its disposal will be challenging.	.11 Achieving good GEnS status for the Mediterranean Sea will help improve the state of marine biodiversity in all the regions, not limited to those concentrated around protected sites. This will create an opportunity for formulating WFD for the Mediterranean region as well as for research and development in the Mediterranean Sea. .12 Awareness about the harmful effects of EGCS washwater discharge creates the opportunity for a global regulation to ban EGCS washwater discharge to sea. With increasing awareness, new ECAs, such as the Norwegian Sea and the Canadian Arctic, are being announced.

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

.1 MARPOL Annex VI does not specify any limits on PM emissions. It is recommended that such measures need to be quantified so that the decline in PM emissions in the SECA region can be measured which in turn will help to analyse and reduce the effect of air pollution and air hazards on the coastal population;

.2 A third-party facilitator can work with all CPs to the Barcelona Convention to formulate long-term plans considering UNCLOS and developing certain measures till EEZ within the framework of articles 212(3) and 222 of UNCLOS. It entitles all CPs to propose global and regional rules, after taking approval from the IMO, to safeguard their marine environment and reduce air pollution in their coastal state jurisdiction;
The BBNJ Agreement should be considered by CPs to the Barcelona Convention with emphasise on the need for conserving sensitive areas beyond national jurisdiction. This will help decide whether or not to extend the ban on EGCS washwater discharge beyond territorial waters.
.3 CPs to the Barcelona Convention to make use of the Circular MEPC.1/Circ.899 circular for understanding risk and impact assessments of EGCS washwater. CPs to the Barcelona Convention should review various ongoing discussions in IMO for coming up with a framework and strategy to take steps towards consideration of banning open-loop EGCS and relevant restriction in their coastal States;

.4 The CPs to the Barcelona Convention should follow "Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas" Resolution A.982(24) of the IMO, and try to get appropriate areas approved as PSSA;

.5 CPs to the Barcelona Convention should align with the MEPC adopted guidelines "Annex 7 resolution MEPC.199(62); Guidelines for reception facilities under MARPOL Annex VI" for PRF. CPs to the Barcelona Convention to verify that PRF facilities in their national jurisdiction are adequate and are capable of receiving the increased residual waste from vessels calling their ports after the implementation of Med SO_x ECA; and

.6 Certain metals, such as vanadium, naphthalene, nickel, copper, zinc and anthracene, which pose a risk to the environment, should be included in the EGCS guidelines and with appropriate limits assigned. The list is to be prepared after the conclusion of a global study to evaluate the hazardous effects related to open-loop EGCS washwater discharge and bleed-off water from close-loop EGCS on marine life and coastal ecosystem Restriction o XXX.

Potential environmental impact of EGCS on the marine environment in the Mediterranean Sea

18. The popularity of EGCS has grown globally and various authorities have expressed their concern regarding the use of open-loop EGCS in port and coastal waters. Various studies carried out show the impact of the EGCS on marine biodiversity but have been limited in scope. Some important findings are mentioned below:

- Estuaries and coastal waters contain pollutants such as naphthalene that are part of the 'priority hazardous substance's list.
- The dilution series of the EMERGE project observed the effects at low concentrations of EGCS washwater discharge and found reduced egg production, higher deformations and abnormal development of the larvae of the species.
- The research into the Baltic Sea ports found that EGCS accounts for 9% of certain cancer-causing PAHs found in marine environments (>98% comes from open-loop EGCS).
- The British Port Association (BPA) pointed out that areas with limited water exchange can lead to higher sediment concentrations creating potential contamination hotspots.
- Open-loop EGCS has resulted in excessive levels of heavy metals and tar substances in the marine environment and could increase shipping lane acidification to the 1970s-90s level.

- Close-loop EGCS samples were found “extremely toxic” in some cases with other samples ranging from “practically non-toxic” to “highly toxic. During a project it was found that copepods died within one day of being exposed to a 5% concentration of the sample from the EGCS and within 8 days when exposed to a 40% concentration of the EGCS effluents.
- It was found that SO_x pollution in the English Channel may cause a yearly pH drop equivalent to 2 to 4 times the annual rate of climate change caused by the acidification process in water bodies. However, acidification is reduced because the flushing effect in the channel is high.
- While conducting the study, the IMO Task Team on EGCS identified gaps in scientific data of many contaminants and suggested the collection of additional data.
- Another study found that risks to marine life are in acceptable range and were only slightly above detection limits.

19. During the EMERGE project, it was found that in the Mediterranean region, many important shipping lanes run close to shore and archipelago[5] areas, putting the coastal ecosystem at risk. Considering the existence of dense shipping traffic in regional seas, most of the European coastline, and marine life in those areas, will be impacted by EGCS effluents. It affects marine food web due to the restriction of planktivorous invertebrates, fishes and their larval stages. It concludes that it is merely moving the problem from the atmosphere to the hydrosphere, which in turn increases the exposure of toxicants such as vanadium, PAHs and alkylated PAHs to marine biota11.

20. The spatial distribution of open-loop EGCS has increased in the Mediterranean Sea from various kinds of vessels, especially from container ships. During various studies, it was concluded that less polluting alternatives should replace HFO. Ships using high-sulphur fuels in combination with EGCS have higher PM emissions than ships using low-sulphur fuel, which suggests that the use of high-sulphur fuel should be prohibited to reduce PM emissions.

21. The EMERGE project found that the ecotoxicological effects were mostly related to alkylated PAHs. The exclusion of alkylated PAHs from EGCS washwater discharge criteria is unfortunate as it causes major toxicological effects. So, it is possible that EGCS criteria can comply with the current guidelines while at the same time, we may be harming the marine environment.

22. It is paramount that the fuel used should not only prevent air pollution but should also not harm the marine environment. However, it can be concluded that the present environmental policies in shipping focus on air pollution assessment and its impact on climate change and human health. This may be biased against the impact on the marine environment.

Challenges and opportunities related to the potential environmental impact of EGCS on the marine environment in the Mediterranean Sea

23. The Study has identified a number of challenges and opportunities related to the potential environmental impact of EGCS on the marine environment in the Mediterranean Sea, namely:

Challenges	Opportunities
.13 Lack of proper data in many parts of the Mediterranean Sea makes it difficult to effectively conclude the harmful effects of EGCS. In addition, there are no studies or data available on the sub-lethal effects of early life stages in fish as mentioned in the EMERGE project; therefore, direct toxic effects on fish are largely unknown. This creates ambiguity around the interpretation of the harmful effect of EGCS,	.14 There is an opportunity to create a unified and common environmental policy for all CPs to the Barcelona Convention, taking into consideration Natura 2000 sites, PSSA and all other regional protected sites.

[5] a group of small islands or an area of sea in which there are many small islands.

leading to resistance from stakeholders to ban EGCS and protests from proponents of EGCS against any ban. In the Mediterranean region, many important shipping lanes run close to the shore and archipelago, which puts the sensitive shallow-water coastal ecosystems at risk.	

Recommendations related to coastal marine life and environmental perspective

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

.1 Since heavy release of discharge washwater can raise the acidification level, as was seen in the Baltic Sea (Claremar, Haglund and Rutgerson, 2017), the CPs to the Barcelona Convention should take preventive measures to reduce the harmful effects of open-loop EGCS in the Mediterranean Sea and carry out a study on the amount of washwater discharge per year in the Mediterranean Sea and acidic levels at major hotspots in the region. The study should also include close loop bleed-off water evaluation;

.2 CPs to the Barcelona Convention should formulate a long-term goal to acquire the good status of coastal environments of the Mediterranean Sea. In addition, all ecological indicators in the Mediterranean marine ecosystem should be periodically checked. Shallow Subtidal Reefs (SSRs) are areas of most concern and immediate action for their preservation should be proposed. The data collected after the periodical checks, literature review and ecological evidence should be maintained to identify the impact of the applied regulatory framework and further directives should be proposed as per the result of the analysis. It is crucial to maintain a consistent record of the ecological conditions of marine ecosystems, allowing stringent comparisons of their status over time to achieve environmental targets;

.3 CPs to the Barcelona Convention should model their own report for the whole of the Mediterranean region, similar to the OSPAR commission report on the ban of open-loop EGCS;

.4 A holistic joint study of environmental impact analysis of EGCS discharge from open-loop and close-loop EGCS should be carried out after considering the super emission control area comprising Med SO_x ECA, Baltic SECA and the newly approved Norwegian ECA;

.5 CPs to the Barcelona Convention should align with the Biodiversity Strategy for 2030 and Natura 2000 which ensure long-term protection, conservation and survival of Europe's most valuable and threatened species and habitats as well as their ecosystems. Similarly, the survival of the coastal and inland saline wetland ecosystems/marine ecosystems is a challenge because these are being subjected to EGCS washwater discharge and are expected to come under protection within the regulatory framework by mid-2026. Similar strategies should also be developed for CPs to the Barcelona Convention that are not part of the EU to implement the measures unanimously in the whole of the Mediterranean Sea; and

.6 REMPEC should consider organising a meeting of all CPs highlighting/pinpointing the need to restore the lost biodiversity and suggesting steps to implement measures for improving marine biodiversity such as the EU Nature Restoration Law.

Best practices in other regions and various other measures

25. Air pollution has become a major health threat globally with the shipping industry contributing majorly to port areas and coastal regions. After the implementation of Med SO_x ECA, the air quality in the Mediterranean region will improve at the cost of hazardous effects on marine species and human health which are part of the coastal ecosystem.

26. The survival of the coastal and inland saline wetlands and coastal benthic ecosystems in the Mediterranean Sea will be a challenge as they are subjected to EGCS washwater discharges. A major concern was evident for Shallow Subtidal Reefs (SSR) for which two-thirds of sites showed moderate-to-bad ecological status. The insufficient knowledge and data on the status of marine ecosystems in the Mediterranean Sea are major drawbacks to proper impact analysis.

27. Natura 2000 is the largest network of protected areas in the world which protects more than 27,000 nature sites under the EU legislation established in 1992. Directive 92/43/EEC and Directive 2009/147/EC of the European Parliament and the Council aim to ensure the long-term protection, conservation and survival of Europe's most valuable and threatened species and habitats as well as their ecosystems. Member States must prioritise Natura 2000 sites until 2030 when implementing the restoration measures under the Nature Restoration law of the EU. For habitats listed as deemed in poor condition in the law, Member States will take progressive measures to restore at least 90% ecosystem by 2050.

28. Some States/commissions such as Sweden and OSPAR are setting examples by coming up with stricter proposals for banning EGCS.

.1 The Swedish Government has decided that any washwater discharge from EGCS in the State's maritime territory is prohibited and has thus proposed the ban in two steps. Firstly, from 1 July 2025, emissions from EGCS operating in open-loop mode will be prohibited and thereafter from 1 January 2029, all types of EGCS, including those used in close-loop mode, will be prohibited. Key points from their proposal are:

- There is no WFD designated for the Mediterranean Sea.
- Vessels to consider the PSSAs to prevent any damage to marine biodiversity by restricting EGCS washwater discharge.
- According to the study, the assessment for the entire Mediterranean Sea returned a 'moderate' environmental status.
- A phase-in period should be provided to ban the EGCS so that shipowners can recover their costs of installing EGCS.

.2 CPs of the OSPAR Convention carried out a study modelling the discharges from open-loop EGCS on ships in the OSPAR region. The key results from the study concerning EGCS are mentioned below:

- The total effluent release volume from EGCS in all OSPAR regions was about 622 million tonnes in 2020. Of this, 99.9% can be attributed to open-loop EGCS with about 84% released inside the 200 nautical mile zones and about 21% in the 12 nautical mile zone.
- The estimated total load of PAHs is close to 2.5 times higher than the mass of 16 PAH, suggesting that alkylated PAHs should also be included.
- In the revised IMO guidelines for EGCS (MEPC 2015, 2018 and 2021), metal concentrations are still not directly targeted but only indirectly assessed using turbidity as a proxy.

Challenges and opportunities related to best practices in other regions and various other measures

29. The Study has identified a number of challenges and opportunities related to best practices in other regions and various other measures, namely:

Challenges	Opportunities
.15 Use of EGCS with HFO also creates a challenge as the hazardous effects of an HFO oil spill are usually long-lasting when compared with the effects of an MGO oil spill. .16 Higher spread between HFO and LSMGO will continue to encourage shipowners to install EGCS, which in turn contributes to overall higher emissions which can hinder the decarbonisation efforts. .17 There are a few CPs to the Barcelona Convention that have not ratified MARPOL Annex VI, which may prevent the smooth implementation of Med SO_x ECA. .18 A number of CPs to the Barcelona Convention have not ratified the UNCLOS which can create problems in the implementation of regional measures for EGCS washwater discharge in the entire Mediterranean region. .19 Funding and research are required for different methods to improve water quality. .20 Dry EGCS technology needs to be promoted as it can eliminate the washwater discharge and simultaneously address air pollution. It also lays the foundation for new technological developments in the field of OCCS. .21 Reduction in the exchange rate of seawater in the Mediterranean Sea during winter can result in a heavy concentration of PAHs coming from EGCS washwater discharge posing hazards to marine species and human health alike. .22 The workforce involved in the process of implementing Med SO_x ECA needs to be trained by the CPs to the Barcelona Convention.	.23 Tourism will get a boost in the long run because of better air and water quality, along with improving marine life. .24 The creation of the European super emission control area should encourage various stakeholders to take advanced initiatives such as forming green fuel bunkering hubs, green corridors, advanced EGCS technologies, and OCCS and CCS supply chain systems. .25 Requirement for research and development in dry EGCS and OCCS technologies, which do not have washwater discharge, creates opportunities for institutions involved in such research. .26 Developing PRFs will create opportunities and thereby jobs for waste disposal companies. .27 Design advancements in EGCS and OCCS could facilitate the continuing use of HFO without impacting marine life and coastal ecosystems. .28 Higher demand for LSMGO offers growth opportunities for bunker trades and bunkering companies in the Mediterranean region.

Recommendations related to best practices in other regions and various other issues

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

.1 CPs to the Barcelona Convention should work together to develop a Project Proposal which is to be considered under the InvestEU programme such as “Investments in zero and low carbon vessels and related land-based infrastructure in Norway during 2024-2030” of EUR 50 million;

.2 The low flushing effect and exchange rate in the Mediterranean Sea during winter can lead to potential contamination hotspots because of higher sediment concentration. Local water authorities should increase their checks for water quality during winter specifically in regions with dense shipping traffic;

.3 CPs to the Barcelona Convention may submit the proposal to IMO for considering phasing out EGCS for preserving coastal marine life from the long-term effects of EGCS washwater;

.4 A proper familiarisation for the MARPOL Annex VI should be carried out for various stakeholders of the CPs to the Barcelona Convention with REMPEC providing infrastructure support and adequate training for staff, including the PSC inspectors who board the vessels to check for compliance. REMPEC can also organise training workshops to explain the implications and suggestions concerning the implementation of Med SO_x ECA;

.5 CPs to the Barcelona Convention need to encourage and promote advanced technologies such as OCCS and Dry EGCS. Research and development for better technologies should collaborate with academic institutions and research organisations;

.6 With the development of the European super emission control area, CPs to the Barcelona Convention may explore ways to collaborate with other countries of different regions to establish green hubs/corridors;

.7 A facilitator needs to encourage the CPs to the Barcelona Convention that have not ratified UNCLOS and MARPOL Annex VI to come to a mutual understanding so that regional measures can be taken for EGCS discharge in the entire Mediterranean region;

.8 CPs to the Barcelona Convention to encourage shipowners to promote considering the harmful effects of EGCS discharge before deciding to build ships running on HFO;

.9 LSMGO trade and bunkering prospects should be promoted in the Mediterranean region;

.10 Chemical suppliers' preparedness near ports will be required over time with an increased preference towards Hybrid EGCS; and

.11 Waste disposal companies in the region can improve preparedness to receive EGCS residue from vessels.

Conclusion

31. The increase in the popularity of EGCS and growing concerns with EGCS discharge water have led countries to come up with their local and regional policies to safeguard their jurisdictional water. The Mediterranean Sea is a major shipping traffic lane and therefore a joint study of the environmental impact of EGCS is paramount for all the CPs to the Barcelona Convention in order to overcome the depletion and restoration of marine biota and overcome the harmful effects on the coastal population. The study should also be carried out for hazardous effects and limits for alkyl PAHs, metal concentration and other complex compounds which damage the marine environment with open-loop washwater and close-loop bleed-off water.

Actions requested by the Meeting

32. **The Meeting is invited to**:

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

.2 **comment** as deemed appropriate, more specifically on the recommendations provided in paragraphs 15, 17, 24, 30 and 31 and discuss a possible way forward.

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