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Executive Summary

The legislative process of the amendment of the Regulation on Monitoring, Reporting, and Verification of CO2 emissions from ships (EU-MRV, Regulation 2015/757) was initially motivated by the administrative burden for the shipping companies obligated to report under both the EU

-MRV and the International Maritime Organization Data Collection System (IMO DCS). However, following the momentum set by the European Green Deal, the amendment of the EU-MRV will also include decarbonization goals and moves towards the inclusion of the shipping sector into the Union's Emission Trading System. The shipowners will need to adjust their way of business by investing in low carbon fuels to avoid high costs per carbon unit. This report aims to review the EU MRV amendment process, some parts of the European Green Deal, and its effect on EU flagged ships. Also, it provides an opinion on future decarbonization trends according to IMO and EU goals for 2030.

1. Introduction

A low carbon future is required by the Paris Agreement that focuses on reducing global greenhouse gas (GHG) emissions for mitigating global warming and other detrimental consequences of anthropogenic climate change. The agreement aims to limit the global temperature increase to 2 degrees Celsius above preindustrial levels and pursue efforts to limit it to 1.5 degrees Celsius. Up to now, 197 countries including the European Union (EU) have adopted the Paris Agreement. All major emitting Countries have committed to cut their climate-altering pollution. Developed nations will assist developing nations in their climate mitigation and adaptation efforts. International maritime transport emits around 2-3% of total global GHG emissions. That is more than the emissions of any EU state. Equally considerable is the fact that in 2015, the shipping sector at the EU level represented 13% of the overall EU GHG emissions from the transport sector. However, so far, EU emission reduction objectives or specific mitigation measures have not expressly included maritime transport.

According to a study from the International Maritime Organization (IMO), without any measures, global shipping emissions could grow between 50% and 250% by 2050. Also, CO2 emissions from maritime transport at the EU level have -increased by 48% between 1990 and 2008, and are expected to increase by 86% above 1990 levels by 2050 despite the adoption of minimum ship efficiency standards for new ships by the IMO in 2011. If nothing is done to tackle these emissions, this risks undermining the goals of the Paris Agreement and the efforts deployed by other sectors. In 2013 the EU adopted a strategy for progressively integrating maritime emissions into the EU's policy for reducing greenhouse gas emissions. In April 2015, the Regulation (EU) 2015/757 on the monitoring, reporting, and verification of carbon dioxide emissions from maritime transport (the "EU MRV Regulation"), was adopted by the European Parliament and the Council. EU MRV Regulation obliges shipping companies to report their annual CO2 emissions and other relevant information arising from their ships' voyages to and from EEA ports and within EEA ports. The obligations for shipping companies started in 2017 with the preparation and

submission to accredited verifiers of monitoring plans. The monitoring of fuel consumption, CO2 emissions, and energy efficiency started in 2018 and the first emissions reports were published on THETIS-MRV System in July 2019. Following the adoption of the EU MRV Regulation and entry into force of the Paris Agreement, the IMO Marine Environment Protection Committee (MEPC) adopted amendments to the MARPOL Convention establishing the legal framework for a global data collection system for fuel oil consumption of ships ("global IMO DCS").

Under the global IMO DCS, monitoring obligations start in 2019, with reporting in 2020. Therefore, from January 2019 all ships performing EEA-related maritime transport activities are obligated to monitor and report under both the EU MRV Regulation and the global IMO DCS. According to the EU MRV Regulation, Article 22, Commission will review the Regulation and if appropriate, propose amendments to ensure alignment with the international agreement. In February 2019, the Commission proposed amending Regulation (EU) 2015/757 to take appropriate account of the global data collection system for ship fuel oil consumption data to allow for streamlining and reducing administrative effort for companies and administrations as possible, while preserving the objectives of the EU MRV Regulation.

Then, on January 24, 2020, European Parliament published a Draft Report regarding the proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 to take appropriate account of the global data collection system for ship fuel oil consumption data. Also, on March 20, 2020, further amendments to the Draft Report were published. On May 29, 2020, the Committee's opinion was published. In September 2020, the European Parliament adopted an amendment proposal, and the inter-institutional negotiations between EU Parliament, Member States (through the Council), and the EU Commission (so called "trilogue") should start in the first or second quarter of 2021. The implementation of the European Green Deal which was first introduced in December 2019 is now in the process. It could be said that the EU MRV amendment process and the European Green Deal go hand in hand in a way of promoting environmental sustainability and the overall health of the society. Therefore, this report will also point out the main objectives of the EU Green Deal and how it can affect the shipowners. Furthermore, it will include the shipowners' opinion on future decarbonization, their way of facing challenges to meet new decarbonization goals such as the inclusion of all GHG emissions into the EU MRV Regulation, and setting of an Energy Efficiency goal by 2030.

2. The legislative process for the amendment of Regulation (EU) 2015/757

In a Resolution of February 2014 on a 2030 framework for climate and energy policies, the European Parliament noted that all sectors of the economy including maritime would need to reduce greenhouse gas (GHG) emissions. Before, International maritime shipping was the only means of transportation not included in the Union's commitment to reduce GHG emissions. The purpose of the EU MRV Regulation is to collect emission data from shipping and use it for further policymaking and to incentivize emission reductions by providing information on ships' efficiency to relevant markets. Shipping companies are obligated to monitor, report, and verify the fuel consumption, CO2 emissions, and energy efficiency of their ships on voyages to and from European Economic Area (EEA) ports on an annual basis, starting from 2018. Since International Maritime Organization (IMO) in October 2016 adopted the legal framework for a global data collection system for fuel oil consumption of ships (global IMO DCS), the Commission has examined how the two systems could be aligned to reduce the administrative burden on vessels, while preserving the objectives of the EU MRV Regulation. Therefore, the official legislative proposal was published on February 4, 2019, by the European Commission with the document: "Proposal for a Regulation of the European Parliament and the Council amending Regulation (EU) 2015/757 to take appropriate account of the global data collection system for ship fuel oil consumption data"[1].

On July 29, 2020, the Committee on the Environment, Public Health and Food Safety published a Report on the proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 to take appropriate account of the global data collection system for ship fuel oil consumption data (COM(2019)0038 – C8-0043/2019 – 2019/0017(COD)).[2] Also, on September 16, 2020, text on the proposal for a regulation of the European Parliament and of the Council amending Regulation (EU) 2015/757 to take appropriate account of the global data collection system for ship fuel oil consumption data (COM(2019)0038 – C8-0043/2019 – 2019/0017(COD)) was adopted.[3] Key events in amending EU – MRV Regulation (EU) will be updated accordingly. [4]

[1] https://www.europarl.europa.eu/RegData/docs_autres_institutions/commission_europeenne/com/2019/0038/COM_COM(2019)0038_EN.pdf

[2] https://www.europarl.europa.eu/doceo/document/A-9-2020-0144_EN.html

[3] https://www.europarl.europa.eu/doceo/document/TA-9-2020-0219_EN.html

[4] https://oeil.secure.europarl.europa.eu/oeil/popups/printficheglobal.pdf?id=700056&l=en

3. A path towards decarbonization

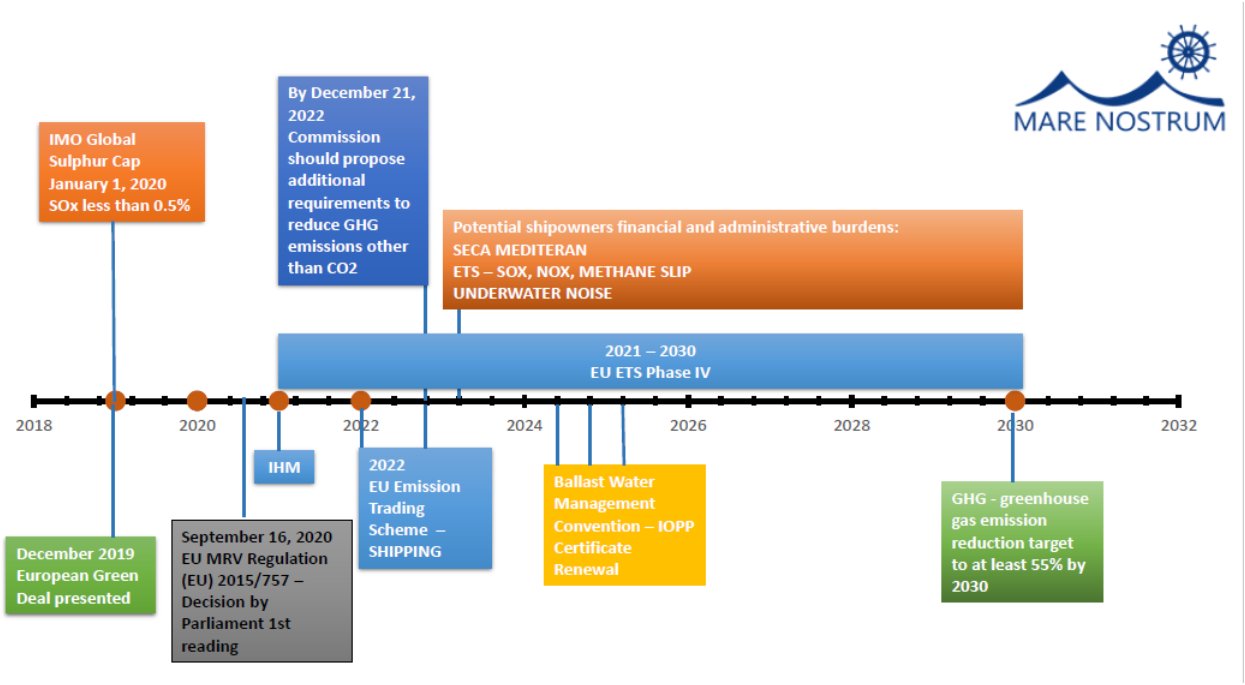
Climate neutrality is crucial to reach the objectives of the Paris Agreement. Key targets for 2030 regarding Climate and Energy Framework were to cut at least 40% in greenhouse gas emissions (GHG), to share at least 32% for renewable energy and at least 32.5% improvement in energy efficiency. On December 11, 2019, European Commission introduced the European Green Deal that should be a tool for turning the EU into a climate-neutral, just, and prosperous society with a modern, resource-efficient, and competitive economy. According to the goal of becoming climate neutral by 2050, the EU strives to become a leader in the global fight against climate change. By the EU Deal, the EU strives to become climate-neutral by 2050 and by cutting pollution it will protect human life, animals, and plans. Also, the EU Deal will help companies to become world leaders in clean products and technologies and help to ensure a just and inclusive transition.

According to the EU Deal, transport represents 25% of EU emissions. Therefore, cutting transport emissions will be obligatory for all transport industries, including maritime. It is proposed that European Climate Law turns the political commitment regarding becoming climate–neutral by 2050, into a legal obligation. Therefore, all sectors of the economy should invest in environmentally-friendly technologies, support industry innovation, and create cleaner, cheaper and healthier forms of private and public transport. Moreover, industries should work on decarbonizing the energy sector, ensure more energy-efficient buildings and cooperate with international partners to improve global environmental standards. For industries to be able to do that, the EU provides financial support and technical assistance through the Just Transition Fund. Regions that are most affected by the move towards a green economy will have access to use at least 100 billion euros over the period 2021 – 2027.

A way of becoming climate–neutral is to move towards full decarbonization which means the development of alternative and innovative green technologies and fuels. Extending this approach to the sector of shipping, shipowners would be faced with additional costs due to investing in new ships or upgraded propulsion systems. Even with the Just Transition Fund, shipowners must be able to pay part of investment costs. This happens at a time when the COVID-19 pandemic makes running businesses even more difficult and adds additional economic burdens on a sector already negatively affected by expensive repatriation and crew changes in international trade or inability to apply for a loan for newbuilds. The banking system is not supporting large-scale investments for non-commercialized new technologies which would help meeting European Green Deal for ships included in MRV Regulation reporting procedures. Nevertheless, shipowners expect new regulations and restrictions such as the inclusion of all GHG emissions into the EU Emissions Trading System (EU-ETS) before the commercial availability of ships with greener

engines that could power green ammonia, green hydrogen, or green methanol. Trading on the spot market for shipowners depends also on fuel availability in the worlds' ports, of which Japan is leading with ammonia fuel for the maritime industry, whilst the EU promotes hydrogen as the solution for Short Sea Shipping (SSS), of which fleet is mainly not included in EU MRV reporting obligation due to its low tonnage. Croatian Shipowners' Association Mare Nostrum expects that the EU will also include into EU MRV mandatory reporting for vessels down to 400 GT operating in the short sea shipping sector, as well as a mandatory reduction of ships' underwater noise to minimize the impact on NATURA 2000 areas. Also to be noted, starting from 2021 into EU MRV Thetis System shipowners will have to upload an IHM (Inventory of Hazardous Materials) which does not correlate with GHG emissions. Figure 1 represents the timeline of expected restrictions for shipowners until 2030. All these restrictions represent additional financial and administrative burdens for shipowners.

Figure 1: Timeline of expected restrictions for shipowners until 2030



Source: Croatian Shipowners' Association Mare Nostrum

From Figure 1 it can be seen that until 2030 the European Commission strives to reduce EU greenhouse gas emissions by 55% compared to 1990 levels.

On July 29, 2020, the International Maritime Organization (IMO) published its Fourth GHG Study regarding the reduction of GHG emissions from ships (MEPC 75/7/15).

Table 1: Total shipping and voyage-based and vessel-based international shipping CO2 emissions 2012-2018 (million tonnes)

Year	Global anthropogenic CO_2 emissions	Total shipping CO_2	Total shipping as a percentage of global	Voyage-based International shipping CO_2	Voyage-based International shipping as a percentage of global	Vessel-based International shipping CO_2	Vessel-based International shipping as a percentage of global
2012	34,793	962	2.76%	701	2.01%	848	2.44%
2013	34,959	957	2.74%	684	1.96%	837	2.39%
2014	35,225	964	2.74%	681	1.93%	846	2.37%
2015	35,239	991	2.81%	700	1.99%	859	2.44%
2016	35,380	1,026	2.90%	727	2.05%	894	2.53%
2017	35,810	1,064	2.97%	746	2.08%	929	2.59%
2018	36,573	1,056	2.89%	740	2.02%	919	2.51%

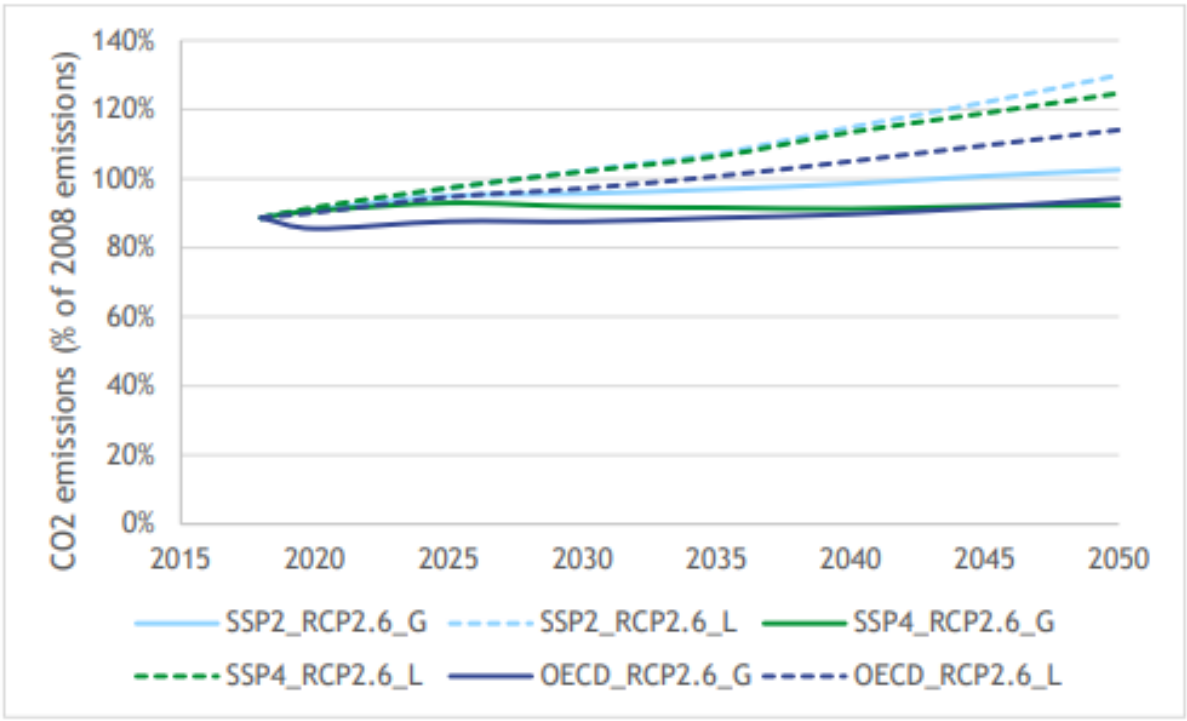
Source: Fourth IMO GHG Study 2020, MEPC 75/7/15

From Table 1 it can be seen that the share of total shipping emissions on a global level has increased from 2.76% in 2012 to 2.89% in 2018. Under a voyage-based allocation of International shipping, CO2 emissions have also increased over this same period from 701 million tonnes in 2012 to 740 million tonnes in 2018 (5.6% increase), but to a slower growth rate than total

shipping emissions, and represent an approximately constant share of global CO2 emissions over this period (approximately 2%).[5]

Figure 2: Projections of maritime ship emissions as a percentage of 2008 emissions

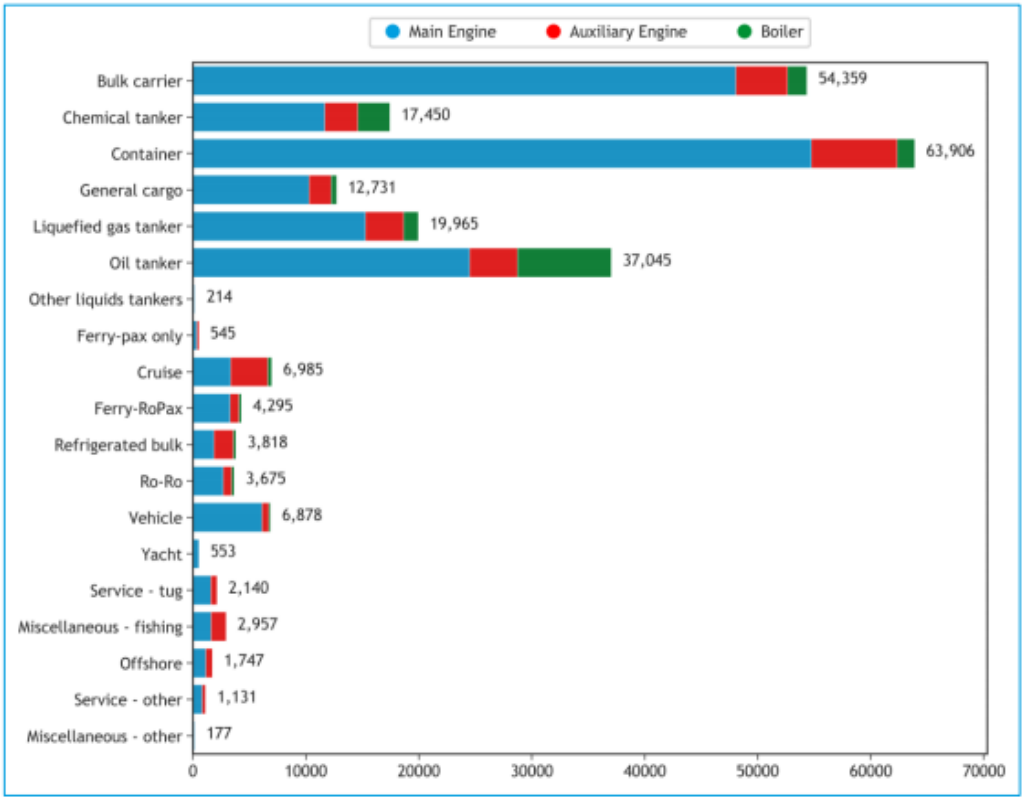
[5] https://safety4sea.com/wp-content/uploads/2020/08/MEPC-75-7-15-Fourth-IMO-GHG-Study-2020-Final-report-Secretariat.pdf



Source: Fourth IMO GHG Study 2020, MEPC 75/7/15

Figure 2 represents projections of maritime ship emissions and their increase from about 90% of 2008 emissions in 2018 to 90-130% of 2008 emissions by 2050 for a range of plausible long-term economic and energy scenarios. Due to the COVID-19, emissions in 2020 and 2021 should be significantly lower. Also, depending on recovery situation it can be expected that emissions will be few percent lower than projected.

Figure 3: International, voyage-based allocation, Heavy Fuel Oli (HFO) equivalent fuel consumption (thousand tonnes), 2018, split by main engine, auxiliary engine and boiler



Source: Fourth IMO GHG Study 2020, MEPC 75/7/15

Figure 3 shows that depending on the ship type there are differences in the share of emissions that occur at sea on the passage, as opposed to during maneuvering, anchorage or berthed phase of operation. From the figure, it can be seen that the largest portion of the HFO consumption stems from container ships and bulk carriers, while ferries account for a relatively small portion.

On 16 September 2020, the European Parliament adopted EU MRV amendments to the proposal based on the ENVI Committee's report. In the amendment it is stated that emissions of all GHGs and not just CO_2 should be reported and reduced by 55% compared to 1990 levels[6] which is an increased binding 2030 target. Now, it is expected that the trilogue (three-party negotiations among the EU Parliament, the EU Commission, and the Council) will proceed. Vessels under the MRV are called to cut their carbon emissions per voyage by 40% by 2030 compared with 2018. Furthermore, the EU Commission plans to set the total quantity of CO2 allowances for the maritime industry per Member State (MS). According to this system, each MS will be able to buy

[6] https://www.europarl.europa.eu/doceo/document/TA-9-2020-0219_EN.pdf

them with special provisions through an auction. To meet the goal of the EU Green Deal and by introducing phase IV of the EU ETS, it is expected that the cost of emitting one tonne of carbon dioxide in Europe will rise. On December 12, 2020 after the meeting in Brussels where EU leaders targeted reducing CO2 emissions, the price rose to 31.30 EUR/tonne which is the highest since the EU ETS was launched in 2005.[7] EU leaders agreed on cutting at least 55% of emissions by 2030 instead of the previous goal to cut 40% from 1990 levels.

Figure 4: EU Carbon Pricing

Source: https://www.reuters.com/article/us-eu-carbon/eu-carbon-price-rises-to-all-time-high-after-eu-climate-deal-idUSKBN28L0SO

[7]https://www.reuters.com/article/us-eu-carbon/eu-carbon-price-rises-to-all-time-high-after-eu-climate-deal-idUSKBN28L0SO

From Figure 4 it can be seen how the price of EU carbon allowances in December 2020 rose to an all-time high above 31 euros a tonne. According to the Reuters survey of eight analysts, the price of the EU allowances is expected to rise in 2021 to average 37.86 euros a tonne and to 41.61 euros a tonne in 2022. On average, the price in 2023 is forecasted to 46.15 euros a tonne.[8] However, according to the Environmental Defense Fund, the current social cost of carbon is over 50 dollars per tonne.[9] Moreover, there are estimations that in the long run, the cost of CO2 per tonne will raise up to 100 to 300 euro per tonne.[10] Shipowners strongly oppose "polluter pays" principle because it additionally burdens their business since every year they must face more restrictions and obligations. However, they believe that this cost shouldn't be paid by a shipowner who is a transport service provider but instead by a client who orders transportation.

Croatian shipowners are working on achieving the goals of the Initial IMO GHG Strategy and they take action in power and propulsion systems, voyage optimization, fleet management, logistics, and incentives. To decrease overall costs and reach environmental goals, shipowners are forced to look for alternative solutions regarding the type of fuel, such as electricity, hydrogen, ammonia, or biofuels. Searching for renewable energy and investing in technology developments that will reduce their CO2 emissions could be a key solution. Since green hydrogen does not emit CO2 or pollutes air, it could be stated that using hydrogen fuel cell ship with battery storage can be seen as an option that would benefit both shipowners and EU Green Deal. However, this investment has large CAPEX and if the shipowner has to renew a large fleet, he could not do it because there are no commercially available ships on market. Shipowners need more support from the European Union and their EU Flag States due to new legal constraints regarding decarbonization goals.

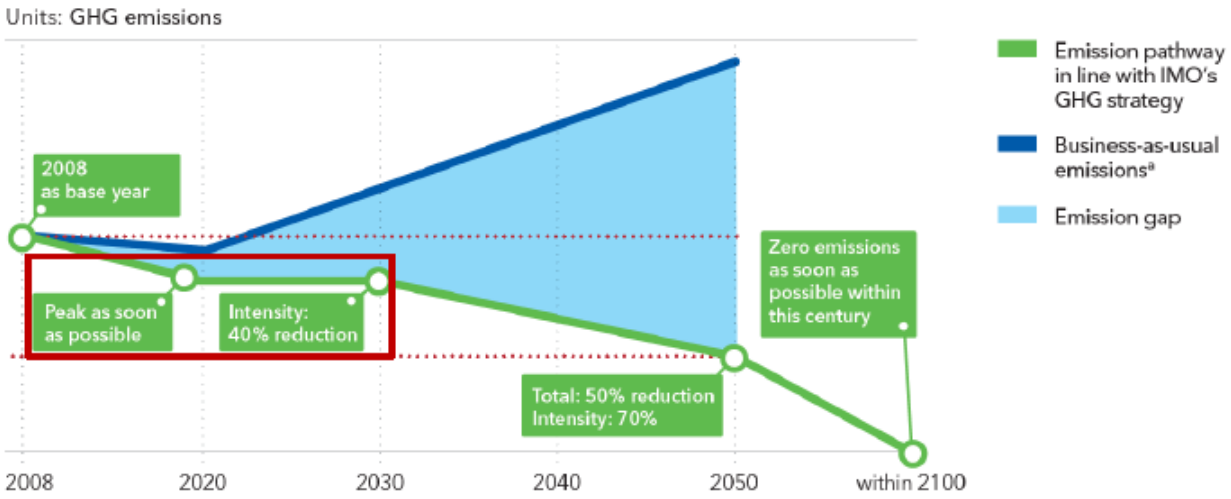
One thing is certain and that is new technologies, new fuels and innovations will be vital to meet the ambitious goals of the EU Green Deal. However, more action is needed to speed up the process of supporting shipowners to move towards decarbonization. European Commission should set up a fund for shipyards that would develop new green solutions in the maritime industry which shipowners buy on the market. This fund should offer support in research and development (R&D), infrastructure, test building, and adoption of green fuels and technology for shipyards as movers of new buildings where market goals are clear.

[8] https://www.reuters.com/article/us-eu-carbon-poll-idUSKBN2711HK
[9] https://www.edf.org/true-cost-carbon-pollution
[10] https://www.linkedin.com/pulse/why-we-need-carbon-price-herbert-diess/

3.1 DNV GL Webinar

On November 24, 2020, DNV GL (now: DNV) hosted a meeting that presented the main outcomes from the virtual MEPC 75 meeting which was held on November 16-20, 2020, and on which were discussed mandatory CO2 reduction measures to affect all maritime stakeholders.

Figure 5: Globa maritime GHG emission trends



Total: Refers to the absolute amount of GHG emissions from international shipping.
Intensity: Carbon dioxide (CO_2) emitted per tonne-mile.
[a]Note that the the business-as-usual emissions are illustrative, and not consistent with the emissions baseline used in our modelling (Chapter 6).

Source: https://www.dnv.com/maritime/insights/topics/decarbonization-in-shipping/index.html

The red rectangle from Figure 5 shows the main focus of the meeting which is to reach the peak as soon as possible and reduce carbon intensity by 40% until 2030. These goals should be determined by short-term measures which should enter into force by January 1, 2023. Regarding operational measures, by January 1, 2023, all ships above 400 GT should develop an approved energy efficiency improvement and decarbonization plan. After 2023 cargo and cruise ships above 5000 GT should calculate an annual Carbon Intensity Indicator and rating A to E. Each ship needs to achieve a rating of C or better to reach a 40% reduction of carbon intensity. Moreover, IMO decided to develop a Carbon Intensity Code which should enter into force around 2025. Furthermore, major industry associations such as the International Chamber of Shipping (ICS)

and World Shipping Council (WSC) proposed to set up a Research Board and Research Fund to provide funding for low-carbon and zero-carbon emission technologies. This would be funded by a mandatory payment per tonne of fuel oil purchased. It is proposed that this would be 2 dollars per tonne for all ships above 5000 GT which is approximately five billion dollars after ten years of the program. This 2 dollars per tonne is less than 7% of the cost of emissions allowances in the EU-ETS. During the DNV GL meeting, it was stated how EU MRV and IMO DCS would remain as distinct systems with separate reporting obligations.[11]

4. Conclusions

Croatian shipowners are compliant with the EU-MRV and are supporting regulation changes including amendments from September 2020 to minimize air pollution. Moreover, Croatian shipowners are supporting the role of voyage optimization in reducing GHG emissions. However, they hope to get help from EU funds to meet all legal obligations. This is also true for all expected restrictions in the future (Figure 1). It is clear that, in the long-term, low carbon fuels will be the only way to reach the higher level objective of the EU Green Deal and to avoid potentially increasing costs regarding EU ETS. Currently, worldwide available fuels such as liquefied natural gas and optionally methanol is an option for retrofit of the current fleet but for new builds, shipowners must wait for the infrastructure in main world ports which is suitable for their core or new developed business strategies.

Shipowner who operates in International trade would not buy a ship if the ship can be bunkered at few locations and just in EU countries or be expected to start doing research and innovation. Shipowners provide transportation solutions and not R&I solutions, where for that purpose EU has great naval laboratories and respected shipyards. Green hydrogen, ammonia, or methanol are options for bunkering in the world's ports which development is followed by shipowners and is not be expected to have global harmonization in fuel options before 2025. Short sea shipping in Croatia promotes the idea to include Liquid Organic Hydrogen Carrier as new fuel for Ro-Pax and Ro-Ro vessels to be served within EU waters for vessels that do not fall under MRV regulation

[11] https://www.dnvgl.com/maritime/webinars-and-videos/on-demand-webinars/access/MEPC-75-mandatory-CO2-reduction.html?utm_campaign=MA_20Q4_WBNR_FOLLUP_%20MEPC%2075%3A%20mandatory%20CO2%20reduction&utm_medium=email&utm_source=Eloqua

obligations and have minimal impact on CO2 emissions. Commercially available ships with green technology or bunkering in Asia and Europe do not exist for green fuels. Reduction of CO2 emissions for EU flagged vessels operating in international trade and who are obliged to report to THETIS MRV require substantial investments, global regulations and to provide suitable infrastructure for large-sized vessels in major world ports. In 2021. , Croatia is starting to work on Hydrogen Strategy for Croatia 2021 – 2050 where shipowners will participate. Hydrogen is a promising option amongst other shipowners, but its application is limited to short sea shipping due to lack of energy density when compared to long-distance voyages vessels. Bunkering of hydrogen is anticipated in bigger ports along the TEN-T corridors, but countries as Greece and Croatia need also smart island ports to be equipped with proper electrification or hydrogen infrastructure to decarbonize the Short Sea Shipping sector.