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The IMO's approach to climate change mitigation: Regulatory and policy framework for reducing GHG emissions

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Abbreviations

2013 Strategy	2013 Strategy on integrating maritime transport emissions in the EU's greenhouse gas reduction policies
2018 IMO GHG Strategy	Initial 2018 IMO Strategy on Reduction of GHG Emissions from Ships
2023 IMO GHG Strategy	2023 IMO Strategy on Reduction of GHG emissions from Ships IMO, MEPC.377(80)
BC	Black carbon
CBD	Convention on Biological Diversity
CH4	Methane
CII	Carbon Intensity Indicator
CO2	Carbon dioxide
EEDI	Energy Efficiency Design Index
EEOI	Energy Efficiency Operational Indicator
EEXI	Energy Efficiency Existing Ship Index
ETA	Emission Trading System
EU	European Union
GAIRS	Generally accepted international rule and standard
GHG	Greenhouse gas
GISIS	Global Integrated Shipping Information System
HELCOM	Baltic Marine Environment Protection Commission
HFC	Hydrofluorocarbons
ICCT	International Council for Clean Transportation
ICJ	International Court of Justice
IMO	International Maritime Organisation
IPCC	Intergovernmental Panel for Climate Change
IUCN	International Union for the Conservation of Nature

LCA	Life cycle assessment
LNG	Liquified Natural Gas
MBM	Market-based measures
MEPC	Marine Environmental Protection Committee
MEPC 58	58th session of the MEPC
N2O	Nitrous oxide
NF3	Nitrogen trifluoride
NOx	Nitrogen oxides
PFC	Perfluorocarbons
SEEMP	Ship Energy Efficiency Management Plan
SF6	Hexafluoride
SMS	Safety Management System
SOx	Sulphur dioxide
UN	United Nation
UN SDG 13	United Nations development goal number 13
UNCTAD	United Nations Conference on Trade and Development
UNDP	United Nations Development Program
UNEP	United Nations Environmental Program
US EPA	United States Environmental Protection Agency
VOC	Volatile Organic Compounds
WMO	World Meteorological Organization

CHAPTER 1: INTRODUCTION

1.1 Topicality

As the Intergovernmental Panel for Climate Change warns us: "The evidence is clear: the time for action is now. We can halve emissions by 2030*."*[1] Average annual global greenhouse gas emissions in the period 2010 – 2019 were recorded to reach unprecedented heights in the history of mankind.[2] Certainly, climate change is occurring rapidly, and along with it comes a growing necessity for the development of new measures and regulations. Despite temporally decreasing during the Covid 19 lockdown in 2020, global fossil carbon dioxide (CO2) emissions climbed by 5.3% in 2021.[3] Beside these levels, the increase of global temperature from the period 1850-1900 to the period 2010-2019, indicates a rise of 0.8°C to 1.3°C, with the best estimated total of 1.07°C.[4] The climbing greenhouse gas emissions (GHG) and temperatures shown by these figures over the last decade underline the IPPC's appeal for taking decisive actions against this crisis. Pertaining to shipping, the fourth International Maritime Organisations (IMO) GHG Study 2020 recorded an upward trend of all GHG levels within the last ten years, estimating a 9.6% increase from 977 million tonnes in 2012 to a peak of 1,076 million tonnes in 2018.[5] Some reports, estimate that global annual emissions reached a total of 833 million tonnes in the year 2021, rising 4.9% from 2020.[6] Comparable,

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[1] Intergovernmental Panel on Climate Change (IPCC) Press Release, 'The evidence is clear: the time for action is now. We can halve emissions by 2030' (4 April 2022) 2022/15/PR, 1.

[2] Ibid.

[3] Joint Research Centre, 'Global CO2 emissions rebound in 2021 after temporary reduction during COVID lockdown' (EC Science Hub, 14 October 2022) <https://joint-research-centre.ec.europa.eu /jrc-news-and-updates/global-co2-emissions-rebound-2021-after-temporary-reduction-during-covid19-lockdown-2022-10-14_en> accessed 20.07.2023.

[4] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report', Contribution of WG I, II and III to the Sixth Assessment Report of the IPCC (13-19 March 2023)IPCC AR6 SYR para 2.1.1.

[5] IMO, 'Reduction of GHG emissions from ships - Fourth IMO GHG Study 2020', (29 July 2020) IMO doc MEPC.75/7/15, annex 1, 1.

[6] Lingpeng Meng and others, 'Carbon emission reduction behaviour strategies in the shipping industry under government regulation: A tripartite evolutionary game analysis' (2022) 378 JCP 1, 2 <https://doi.org/10.1016/j.jclepro.2022.134556> accessed 15.08.2023 citing Simpson Spence Young, 'Simpson Spence Young Outlook 2022' (2022) <https://www.ssyonline.com/media/2016/ssy-2022-outlook-final.pdf> accessed 15.08.2023.

the final quartal of 2022 documented the European Union's (EU) total GHG emissions at 938 million tonnes.[7] The shipping sector seems to generates a similar amount of GHG emissions as the entire EU generates across all sectors within a quartal. Observing the field of global anthropogenic GHG emissions, their quantity rose thereby to 2,89% in 2018.[8] Percentage wise, the contribution of shipping seems small, especially perceived with other global GHG emissions, as the emittance of bigger sectors like the energy and heat sector lie on average around 24% and the total transport sector around 14%.[9] Estimating the current contribution of ships to the global total at 3%, appears misleading with its low number when in reflection of the accelerating demand of shipping, these numbers could increase up to 10 – 13 % within the forthcoming decades.[10] The IMO GHG study 2020 predicts hereby greenhouse gas levels from shipping to grow between 90% and 130% by 2050 from those estimated in 2008.[11] The numbers above suggest a constant rise of GHG emissions from ships, omitting the temporal decrease during Covid 19, whereby the substantial impact of shipping in greenhouse gas levels becomes apparent, demanding modification towards a more sustainable approach.

Various repercussions for the environment and humankind occur from rising GHG levels.[12] The assorted dangers entail in particular the endangerment of biodiversity and the cessation of marine ecosystem functions.[13] Illustrated by the acidification of the ocean, its deoxygenation, the rising temperatures and sea level with further related alterations prompted by the elevating GHG emissions, the ocean is evidently transformed by consequences of climate change.[14]

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[7] Eurostat, 'Quarterly greenhouse gas emissions in the EU' (EC, May 2023) < https://ec.europa.eu /eurostat/statistics-explained/index.php?title=Quarterly_greenhouse_gas_emissions_in_the_EU> accessed 15.08.2023.

[8] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, 1.

[9] Takeski Kuramochi and others, 'G20 Status and Outlook' in UN Environmental Programme (UNEP), *Emission Gap Report 2020* (UDP, Nairobi 2020) EGR 2020, 7.

[10] Anthony King, 'Emissions-free sailing is full steam ahead for ocean-going shipping*'* (European Commission, 06.09.2022) <https://ec.europa.eu/research-and-innovation/en/horizon-magazine/emissions-free-sailing-full-steam-ahead-ocean-going-shipping> accessed 20.07.2023.

[11] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, 4.

[12] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n 4) para 2.1.

[13] Nathaniel Bindoff and others, 'Changing Ocean, Marine Ecosystems, and Dependent Communities' in Hans Pörtner and others (eds.) *IPCC Special Report on the Ocean and Cryosphere in a Changing Climate* (CUP, 2019) 543.

[14] Ibid.

These negative connotations have prompted governments to commit to certain climate change mitigation measures. Whereas some states show great commitment, others express a more limited capability and desire to act. Exemplary, the EU's initiative against climate change, which may be inapplicable for the entire global community, particularly less developed states, as they choose between "catching up" and "developing differently".[15]

As far as the international legal framework is concerned multiple regimes aim to reduce GHG levels directly and indirectly, for instance the International Convention for the Prevention of Pollution from Ships modified by the Protocol 1978 (MARPOL 73/78), the 1992 United Nations Framework Convention for Climate Change (UNFCCC) and the 1982 United Nations Convention on the Law of the Sea (UNCLOS). Introducing the 1997 Protocol the IMO added the Annex VI to MARPOL regulating the prevention of air pollution from ships.[16] Annex VI of MARPOL has been reviewed and adapted multiple times with the development of scientific and technical progress.[17] On the 7th July 2023 the IMO adopted the 2023 IMO Strategy on Reduction of GHG emissions from Ships (2023 IMO GHG Strategy) following the initial IMO Strategy on Reduction of GHG Emissions from Ships of 2018.[18] Beside strategical intentions, the IMO presented a number of short- mid- and long-term measures amending Annex VI, as shown by the Energy Efficiency Design Index (EEDI) and the Ship Energy Efficiency Management Plan (SEEMP).[19] The acquired and developed data can also be found within the different IMO GHG studies, exemplary the fourth IMO GHG Study of 2020.[20] Within their regime for global shipping the IMO facilitated cooperation between the different governments, striving to attain standards of maritime security, safety and navigation at the highest possible level.[21]

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[15] UN Conference on Trade and Development (UNCTAD), 'Climate Change, Green Recovery and Trade' (Geneva, 2021) UNCTAD/DITC/TED/2021/2, 3.

[16] Protocol to Amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (28 October 1997) IMO doc MP/CONF 3/34.

[17] E.g. IMO Res MEPC.176(58) (10 October 2008) IMO doc MEPC 58/23/Add.1 annex 13, reg 12-15.

[18] IMO Res MEPC.377(80) (7 July 2023) IMO doc MEPC.80/WP.12, para 1.2-1.4.

[19] IMO Res MEPC.203(62) (15 July 2011) IMO doc MEPC.62/24/Add.1, reg 20.1 and reg 22.

[20] IMO, 'Fourth IMO GHG Study 2020' (n 5).

[21] Ellen J. Eftestøl and Emelie Yliheljo, 'International Shipping: Who levels the playing field' in Gabriela Argüello and other (eds), *Regulation of Risk* (Brill and Nijhoff, 2023) 288.

1.2 Research question and objective

Based upon the topicality of GHG emissions and the IMO's involvement, my thesis will investigate and examine the regulatory and policy framework of the IMO for reducing GHG emissions and its alignment with the international legal framework to provide a better understanding of where we currently stand in the mitigation of the climate crisis. This research question will be divided into three sub-questions, each forming a separate chapter throughout the thesis. The first sub-question will consider the context and consequences of climate change and GHG-emissions in a universal background as well as specifically in respect to contributions of the shipping sector. The international regulatory and policy framework developed outside the mandate of the IMO will be deliberated in the second sub-question, with a short examination of relevant EU activities. Lastly, the third sub-question will address the IMO's regulatory and policy framework, to investigate and clarify their contribution to the global efforts in reducing GHG emissions to mitigate climate change.

Based upon the information extracted from the research question, this thesis aims to achieve a better understanding of the IMO and their contribution to climate change mitigation. The objective of this thesis is thus to improve comprehension of the IMO's shipping regulations for reducing GHG emissions by inspecting their regulatory and policy framework for mitigating climate change. Moreover, the structure behind alleviating the environmental crisis and the IMO's approach to support it, shall be investigated.

1.3 Methodology and sources

Given the research question and objective, the legal doctrinal method will be utilized for most of this thesis. If necessary, the chapters will examine some state practice to support its arguments, mostly as a reality check. The doctrinal method incorporates the usage of library-based research to provide an understanding of the framework's context as well as supporting its interpretation.[22] The sources cover scholarship, the regulatory and policy framework and where applicable jurisprudence.

[22] Salim Ibrahim Ali, Zuryati Mohamed Yusoff and Zainal Amin Ayub, 'Legal Research of Doctrinal and Non-Doctrinal' (2017) 4 (1) IJTRD 493 <http://www.ijtrd.com/papers/IJTRD6653.pdf> accessed 08.08.2023.

The primary focus of this thesis is the regulatory and policy framework for the reduction of GHG emissions in the mitigation of climate change. In this sense, it is notable that the regulatory framework and the policy framework hold a different weight in international law. Art. 38 (1) of the 1945 ICJ Statute lists international conventions, international customs, and general principles of law as primary sources, with judicial decisions and the teachings of the most highly qualified publicists, as subsidiary means for determining rules of law. The policy framework is part of a broader concept of governance and deemed 'soft law' due to its non-binding nature.[23] However, as policy expresses the acceptable and feasible standards of the international community, it is foundational to the advancement and harmonization of national and international law.[24] In understanding that the legal analysis of this thesis depends on the interpretation of international treaties, it is sensible to use the 1969 Vienna Convention on the Law of Treaties (VCLT), as it addresses treaty interpretation in art. 31 VCLT. Primary and secondary legal sources, in particular 1973/78 MARPOL and 1982 UNCLOS as well as other relevant international rules and standards, will be examined in light of the objective. Amidst these sources' information of literature, reports, statements, and statistical data evaluating GHG emissions and climate change, form the basis for investigating the IMO's approach.

1.4 Scope

As this thesis aims to provide a better understanding of the IMO and its contribution, the examination of the context will remain focused on the IMO's approach. While the primary emphasis rests on the IMO's legal framework, supplemented by the rest of the global legal framework, the investigation will persist on the relevance for reducing greenhouse gases. The thesis limits itself to instruments relevant to regulating ship emissions, excluding topics outside the IMO's competence on greenhouse gases, such as coastal and offshore operations. While there may be relevant impacts and legal regimes for distinct topics, e.g., arctic waters and indigenous people, their specific regulations exceed this thesis scope. Due to the international context of the IMO the thesis will also not investigate regional agreements, such as OSPAR and HELCOM as well as specific treaties like the CBD, since their individuality will not support the objective. Pertaining MARPOL 73/78 Annex VI, the emission control

[23] Patricia Birnie, Alan Boyle, Catherine Redgwell, *International Law & the Environment* (OUP, 3rd edn, 2009) 35.

[24] Ibid 37.

areas for NOx and SOx will not be considered beyond a general acknowledgement, as they only affect these two specific gases. In terms of state practice, the EU will be partially examined at times to view weaknesses or potential improvement in the IMO's approach. Similarly, innovations and mechanisms to reduce GHG levels will only be considered as far as relevant to the matter.

1.5 Terminology

Climate change is principally defined as altering the composition of the global atmosphere and changing the natural climate over comparable time periods.[25] Largely considered as the reason for climate change, greenhouse gases are gaseous constituents of the atmosphere, both natural and anthropogenic, that absorb and re-emit infrared radiation.[26] Greenhouse gases stem from natural sources and sinks as well as human activities, whereby the rising levels majorly originate and are blamed upon the latter.[27] The climate is regulated through physical and chemical elements as well as the heating by the solar energy, reflecting partially away from earth permeated in part into gases.[28] This cycle repeats itself as the energy from the gases is partly absorbed and partially reflected into space, creating a repeating cycle and balance of retaining and releasing warmth.[29] These gases, regulating the absorbance of the solar energy within the atmosphere, are called 'greenhouse gases' and disturbing their balance affects the climate by warming Earth's surface.[30] Hereby the primarily blamed gases instigating alarm are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), as well as fluorinated gases utilized for cooling and refrigeration.[31]

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[25] UNFCCC 1992, art. 1 (2).

[26] UNFCCC 1992, art. 1 (5); UN Development Programme (UNDP), 'The Climate Dictionary: An everyday guide to climate change' (UNDP, 2 February 2023) <https://climatepromise.undp.org/news-and-stories/climate-dictionary-everyday-guide-climate-change> accessed 15.06.2023.

[27] World Meteorological Organization (WMO), 'State of the Global Climate 2022' (2023) WMO-No.1316, 1,

[28] Helen S. Findlay, 'Introduction to Climate Change' in Farah Obaidullah, *The Ocean and Us* (Springer 2023) 4.

[29] Ibid.

[30] Ibid.

[31] UNDP, 'The Climate Dictionary' (n. 26) accessed 15.06.2023.

CHAPTER 2: CONTEXT

2.1 Introduction

In contemporary context, the matter of climate change and greenhouse gases became an important point of interest within the global community. This may be attributed to the fact that climate change is a fundamental threat supplementing the degradation of the global atmosphere.[32] The facts and consequences of climate change are heavily debated and researched within various reports, strategies and laws calling for actions against the global change, though it is challenging to reach unanimous conclusions from them.

In the United Nation (UN) Climate Action Summit 2019 Thunberg declared: "This year alone we have seen temperature records shatter from New Delhi to Anchorage – from Paris to Santiago – from Adelaide to the Arctic Circle. If we do not take action on climate change now, these extreme weather events are just the tip of the iceberg. And that iceberg is also rapidly melting."[33] In line with her statement, the global community acknowledges the importance to adopt an inclusive global regulatory regime, as may be seen in the 1992 UNFCCC, though solutions to the global crisis have remained somewhat stagnant.[34] In the succeeding sections the general context of climate change and GHG emissions will be investigated, followed by an examination of the contribution from the shipping sector.

2.2 Climate change and GHG emissions

2.2.1 Causes of climate change and GHG emissions

Amidst multiple elements relevant to climate change and greenhouse gas emissions, the first matter of investigation falls upon the background of greenhouse gases and their effect on the environment. Humans are largely attributes as the principal trigger for climate change and its

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[32] Alan Boyle and Catherine Redgwell, *Birnie, Boyle & Redgwell's International Law and the Environment* (OUP, 4th edn, 2021) 357.

[33] Greta Thunberg 'Full transcript of Secretary-General's press encounter' (UN Secretary General, 1st August 2019) < https://www.un.org/sg/en/content/sg/press-encounter/2019-08-01/full-transcript-of-secretary-generals-press-encounter> accessed 15.06.2023.

[34] Boyle and Redgwell (2021) (n. 32) 356.

consequent environmental harm, specifically by emitting key GHG and disturbing the natural balance.[35] Beyond the activities of humans, there are natural sources for greenhouse gases, exemplary volcanic eruptions, and fluctuations in solar energy.[36] Beside these natural phenomenon's, natural greenhouse gases are fundamental to earth's biodiversity, as in their absence the surface might be around 33 °C colder than current temperatures.[37] In accordance with the IPCC, it is "unequivocal that human influence has warmed the atmosphere, ocean, and land*"*, causing extensive and brisk alterations to the environment.[38] While the statement of the IPCC is more definite in assigning blame, the global community largely acknowledges human activities as the principal source and influence.[39] The IPPC[40], the EU[41] and the US EPA[42] list CO2, CH4, N2O, as well as fluorinated gases as the primarily proliferated gases from human interference. The gases are steadily released whilst utilizing and exploiting the environment, observable while producing power sources for transport, heat, and electricity.[43]

Although 2020 documented a temporary reduction during the lockdown for the Covid 19 virus, the global emissions in 2021 retained their levels with a 5.3% increase.[44] CO2 levels in 2021 were documented at 415 parts per million, finding unprecedent levels in at least two

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[35] United States Environmental Protection Agency (US EPA), 'Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021' (2023) EPA 430-R-23-002 1-3 < https://www.epa.gov/ghg emissions/inventory-us-greenhouse-gas-emissions-and- sinks-1990-2021> accessed 19.07.2023; Jeff Turentine, 'What are the Causes of Climate Change' (NRDC,13.09.2022) <https://www.nrdc.org/ stories/what-are-causes-climate-change#natural> accessed 19.07.2023.

[36] Turentine (n 35) accessed 19.07.2023.

[37] WMO, 'Greenhouse gases' (WMO, 2022) <https://public.wmo.int/en/our-mandate/focus-areas/environment/greenhouse-gases#:~:text=The%20main%20greenhouse%20gases%20whose, ozone%20in%20the%20lower%20atmosphere.> accessed 23.07.2022.

[38] IPCC, 'Climate Change 2021 – The Physical Science Basis' (2021) WG I Contribution to the Sixth Assessment Report of the IPCC, IPCC WGI SPM A.1.

[39] See US EPA, 'Inventory of U.S. Greenhouse Gas Emissions and Sinks' (n. 35) 1-3 accessed 19.07.2023; IPCC, 'Climate Change 2021 – The Physical Science Basis' (n 38) A.1; European Energy Agency, 'Trends and predictions in Europe 2022' (2022) EEA Report No 10/2022 12.

[40] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n. 4) para 2.1.1.

[41] European Energy Agency, 'Annual EU GHG inventory 1990–2021 and inventory report 2023'(2023) EEA/PUBL/2023/044 87.

[42] See US EPA, 'Inventory of U.S. Greenhouse Gas Emissions and Sinks' (n 35) 1-3

[43] Turentine (n 35) accessed 19.07.2023.

[44] Joint Research Centre (n. 3) accessed 20.07.2023.

million years and increasing around 47% since 1750.[45] In accordance to the UN Environmental Programme (UNEP), CO2 emissions represent 65% of global GHG emissions, causing many studies to predominantly focus on them.[46] The ocean and living biomass captivate and naturally release CO2 into the atmosphere within a "global carbon cycle".[47] Various sources cause CO2 emissions, whereby the biggest contributors remain within the fossil fuel combustion by generating energy as well as stemming from the industry, the transport and the residential sectors.[48] Beside CO2, CH4 has risen to 1896 parts per billion in 2021, increasing by 156% since 1750 at a level not documented in at least 800.000 years.[49] While methane has a comparatively short atmospheric lifespan, it is largely regarded as a much more potent greenhouse gas than CO2.[50] CH4 occurs mainly within natural gas, hydrocarbon fuels, agriculture and paddy rice production, though it derives naturally from the decay of organic matter.[51] N2O has increased by 23% since 1750 reaching 335 parts per billion in 2021.[52] It is primarily produced by managing soil and animal manure of agriculture, though additional sources can be found in fossil fuel combustion, chemical industrial processes and sewage treatment.[53] Fluorinated gases contain several fluorine-containing halogenated substances, including Hydrofluorocarbons (HFCs), Perfluorocarbons (PFCs), hexafluoride (SF6) and Nitrogen trifluoride (NF3).[54] These gases are utilized in different equipment's and products, discharging them afterwards and their effect on global warming is suggested to be around 23 000 times greater than CO2.[55]

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[45] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n. 4) para 2.1.1.

[46] Kuramochi and others (n 9) 7.

[47] US EPA 'Inventory of U.S. Greenhouse Gas Emissions and Sinks' (n. 35) ES-8.

[48] IPCC, 'IPCC Special Report on Carbon dioxide Capture and Storage' prepared by Working Group III of the Intergovernmental Panel on Climate Change (CUP, 2005) 77.

[49] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n. 4) para 2.1.1.

[50] J. Michael Kuperberg and others, 'Conclusion and Recommendation' in Arctic Monitoring and Assessment Programme *AMAP Assessment 2015: Methane as an Arctic climate forcer* (2015) 107.

[51] IPCC, 'Climate Change 2022 – Mitigation of Climate Change' (2022) WG III Contribution to the Sixth Assessment Report of the IPCC, AI 1808.

[52] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n. 4) para 2.1.1.

[53] IPCC, 'Climate Change 2022 – Mitigation of Climate Change' (n 51) AI 1809.

[54] US EPA, Inventory of US Greenhouse Gas Emissions and Sinks 1990 – 2021 (n 35) ES-2.

[55] European Commission, 'Causes of climate change (EC Climate Action)' <https://climate.ec.europa.eu/climate-change/causes-climate-change_en> accessed 23.07.2023.

2.2.2 Consequences of climate change

The aforementioned gases produced by human activity alter the composition of the atmosphere and contribute to the long-term change of the climate.[56] The global community seems to gain a heightened interest for greenhouse gas levels, with the emergence of its extensive impacts. As the earth is warming, the global field observes and addresses various repercussions of climate change. Art. 1 (1) UNFCCC describes the *adverse effects of climate change* as "changes in the physical environment (…) which have significant deleterious effects on the composition, resilience or productivity of natural and managed ecosystems or on the operation of socio-economic systems or on human health and welfare."

The rising temperatures have remained a global and topical issue over several years. In accordance with art. 2 (a) of the 2015 Paris Agreement, temperatures should be kept well below the critical temperature of 2°C with a set limit at 1.5°C to reduce impacts and risks. The temperatures in 2021 already rose 1.1°C from pre-industrial levels, the UN sustainable development goal nr. 13 (UN SDG 13) declared.[57] In addition, the IPPC specified that global temperatures, from the period 1850-1900 to the period 2010-2019, indicated a rise of 0.8°C to 1.3°C, with a best estimated total of 1.07°C.[58] With the continuous disturbance of GHG levels by human activity and the elevated temperatures, further extreme weather changes are predicted by global organizations. The UN's SDG 13 showcases that the temperatures are expected to cross 1.5°C within the next 5 years alone.[59] The IPCC reports that an increase temperature of 1.5°C from pre-industrial levels already impacts the weather heavily with amassing heat waves and extended warm seasons with brief cold seasons.[60] Moreover foreseeable, are extreme heats within warm seasons, reaching a critical tolerance level to endanger health and agriculture should temperatures rise beyond 1.5°C to 2°C.[61] In addition, the UN predicts a sea-level rise of 30-60 cm and the disappearance of 70-90% warm water coral reefs by 2100, even if the temperatures remain under 2°C.[62]

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[56] UNFCCC 1992, art 1 (2); art 1 (5)

[57] UNGA Res 70/1 (25 September 2015) UN doc A/RES/70/1, Goal 13

[58] IPCC, 'Synthesis Report of the IPCC Sixth Assessment Report – Longer Report' (n 4) para 2.1.1.

[59] UNGA Res 70/1 (25 September 2015) UN doc A/RES/70/1, Goal 13

[60] IPCC PR, 'Climate change widespread, rapid, and intensifying' (9th August 2021) 2021/17/PR, 2

[61] Ibid.

[62] UNGA Res 70/1 (25 September 2015) UN doc A/RES/70/1, Goal 13

In wake of rising temperatures, subsequent and concurrent repercussions occur within the marine environment. The oceanic ecosystem absorbs the majority of heat trapped by the greenhouse gases, making it the primary affected party of the climate change crisis.[63] One such repercussion, as reported by the IPCC is an intensification of the water cycle with extreme rain and an increase of rainfall patterns with rising precipitation.[64] The alteration of natural cycles and weather patterns are trailed by extreme heats, droughts, floodings and storms.[65] Beside disturbances of weather and water cycle, the sea level is constantly rising and flooding low-lying coastal areas, as the permafrost and arctic ice continue to melt.[66] Within the process of ocean acidification, the ocean absorbs CO2 from the atmosphere into the coastal waters, increasing its corrosiveness for certain species and compromising their ability of marine organisms to create and retain shells and skeletons, consequently affecting the ecological network, biodiversity and aquaculture.[67] Accompanying these detrimental events is the reduction of oxygen within the ocean's ecosystem, damaging the biodiversity and ecosystem.[68] In marine environment, harm from these changes extends to the damage of coral reefs, the distribution of marine species and the melting of ice within the polar sea.[69] The International Union for the Conservation of Nature (IUCN) declares these effects not only harmful for nature, but also for society.[70] The lasting and negative impacts on the ocean from human activity, illustrated by the ocean warming, its acidification and the sea level rise, are extensive and upset local and global human and marine life.[71] Within five potential future climate scenarios the IMO illustrates different aftermaths for high and very high GHG emissions, low and very low emissions and for remaining at the current emission levels until

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[63] Courtney Lindwall, 'What Are the Effects of Climate Change?' (NRDC, 24th October 2022) < https://www.nrdc.org/stories/what-are-effects-climate-change#weather> accessed 20.07.2023

[64] IPCC PR, 'Climate change widespread, rapid, and intensifying' (9th August 2021) 2021/17/PR 2

[65] Turentine, (n 35) accessed 29.07.2023.

[66] IPCC, 'Climate change widespread, rapid, and intensifying' (n 60) 2.

[67] Climate and Cryosphere, AMAP, International Arctic Science Committee, 'The Arctic Freshwater System in a Changing Climate' (2016) 15 <https://www.amap.no/documents/download/2628/inline> accessed 15.08.2023

[68] IPCC, 'Climate change widespread, rapid, and intensifying' (n 60) 2.

[69] Birnie, Boyle, Redgwell, *International Law & the Environment* (2009) (n 23) 380

[70] IUCN, 'NATUR 2030 one nature, one future 2021-2024' (IUCN Programme, 2021) 4.5 < https:// portals.iucn.org/library/sites/library/files/documents/WCC-7th-001-En.pdf> accessed 25.08.2023

[71] Ibid 4.4.

2050, whereby different assumptions underly the scenarios.[72] The European Parliament declared in their Regulation (EU) 2015/757 in accordance with the IMO's data, the possibility to reduce specific energy consumption and CO2 emissions of ships by up to 75% through the appliance of operational and measures, implementing existing technologies, whereby a significant part of those measures can be cost-efficient.[73]

In reflection of the data provided by these global organizations, the common consensus appears to warn humankind against the consequences of climate change. Rising temperatures might cross the 1.5°C mark within the next 5 years alone.[74] Extreme weather changes, the warming, rising and acidification oceans, melting sea-ice and other impacts, can be observed in contemplation of the GHG levels.[75] Within the marine environment the damage extends further to coral reefs and the distribution of marine species.[76] These developments can be perceived as clear warning signs for long-term damage of the marine environment.

2.3 Contribution of the shipping sector

In taking causes and consequences into account, the scope of contribution from the shipping industry seems interesting to observe. Shipping represents a crucial connection in global network supply chains and is essential for accessing the global market, by contributing over 80% of world trade on the sea.[77] By viewing their role in global trade, the interaction between the shipping industry and greenhouse gas levels appear vital for impact determination. In 2012, levels of greenhouse gases reached 977 million tonnes, with a surge of circa 9.6% to 1,076 million tonnes in 2018.[78] Whilst 2020 documented a decline of 3.8% in maritime trade,

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[72] IPCC, 'Climate Change 2021 – The Physical Science Basis' (n 38) SPM B Box SPM.1.1.

[73] Council Regulation (EC) 2015/757 of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC (EC Regulation) (2015) OJ L 123/55, para 9.

[74] UNGA Res 70/1 (25 September 2015) UN doc A/RES/70/1, Goal 13.

[75] See IPCC, 'Climate Change 2021 – The Physical Science Basis' (n 38) SPM A.2 and A.3.

[76] Birnie, Boyle, Redgwell, *International Law & the Environment* (2009) (n 23) 380.

[77] 'Climate change adaptation for seaports in support of 2030 Agenda for Sustainable Development - Note by the UNCTAD secretariat' UNCTAD (Geneva 20–22 April 2020) UN doc TD/B/C.I/MEM.7/23, 2020, 2; UNCTAD, 'Review of Maritime Transport 2022' (2022) UNCTAD/RMT/2022, XV.

[78] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, 1.

the growth to 2021 has been estimated at 3.2 %, with total shipments of 11 billion tonnes.[79] Following 2021, UNCTAD projected a 1.4% rise in 2022, with an annual middling of 2.1% for the period 2023 – 2027.[80] Comparable to the extent of maritime trade, the global GHG emissions of shipping were documented to potentially rise. Global quantitative contributions from ships to global anthropogenic GHG emissions are estimated at circa 3%.[81] UNEP suggests that the shipping sector is a comparative small part of global GHG emissions, as the emittance of bigger sectors like energy and heat generation lie on average around 24% and the total transport sector around 14%.[82] Whilst 3% appears like a low percentage in comparison to other sectors, these numbers are estimated to increase up to 10 – 13 % within the forthcoming decades with an accelerating demand of shipping.[83] In addition, the IMO GHG study 2020, predicts levels of GHG emissions from the shipping sector to grow between 90% and 130% by 2050 from the emission levels estimated in 2008.[84] Based upon this growth it is prominent that there are various elements steering the prediction of the 2020 IMO GHG Study. Beside the rising demand of shipping estimated in the next decade and its position in world-trade, the sectors reliance on carbon-intensive bunker further founds the shipping industry as a deciding contributor of greenhouse gases.[85] The key greenhouse gases found within the shipping industry are CO2, black carbon (BC), nitrogen oxides (NOx), CH4, sulphur dioxide (SO2) and CO.[86] Hereby CO2 is primarily a consequence from burning fossil fuels within the ships combustion machinery.[87] Beside CO2 further prominent greenhouse gases in the maritime sector include CH4, stemming from the usage of gas or dual fuel engines and cargo tanks in Liquified Natural Gas (LNG) carriers, refrigerants such as HFCs,

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[79] UNCTAD, 'Review of Maritime Transport 2022 - Overview' (2022) UNCTAD/RMT/2022 (Overview)3.

[80] ibid 4.

[81] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, 1.

[82] Kuramochi and others (n 9) 7.

[83] King (n 10) accessed 20.07.2023.

[84] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, 4.

[85] Estela Morante, 'Roadmap to decarbonize the shipping sector: Technology development, consistent policies and investment in research, development and innovation ' in UNCTAD *Transport and Trade Facilitation Newsletter N°96 - Fourth Quarter 2022* (Article No. 99, 19 December 2022) < https://unctad.org/news/transport-newsletter-article-no-99-fourth-quarter-2022> accessed 20.08.2023

[86] Phillippe Christ 'GHG Emissions Reduction Potential from International Shipping' in OECD/ITF *Joint Transport Research Centre Discussion Papers* (Discussion Paper No. 2009-11, 2009) 6.

[87] European Commission '2020 Annual Report from the European Commission on CO2 Emissions from Maritime Transport' (Commission Staff Working Document, 17.8.2021) SWD(2021) 228 final, 11.

PFCs and SF6 from cargo refrigeration and lastly SOx, NOx and BC emitted from other sources on the ships.[88] These numbers reflect the shipping industries importance and growth in their emittance of greenhouse gases, with fossil fuels as their main contributor.

In accordance with the EU, lacking opportunities and alternative sources to adapt combustion machinery and ships to more sustainable options as well as deficient affordable and globally utilizable technology led and leads to a continuous reliance on fossil fuels as the main fuel of the shipping industry.[89] The development of new technologies is considered a "focus area" of UNCTAD whilst deliberating the decarbonation of shipping, with a concentration on finding renewable and sustainable alternatives for fossil fuels and adapting ships and their propulsion systems in accordance.[90] Auxiliary technological progress suggests retrofitting the existent maritime fleet with dual-fuel engines capable of using sustainable fuels instead of fossil fuels.[91] The Det Norske Veritas and Germanischer Lloyd suggested some alternative fuels, listing "Blue fuels from reformed natural gas with CCS", "Biofuels from sustainable bioenergy sources*"* and "Electro fuels from renewable electricity, with non-fossil carbon, or nitrogen".[92] In particular biofuels rose in demand with their price peaking in 2022.[93] Beyond the utilization of alternative low- and non- carbon fuels the shipping industry has touched upon complementing processes. Carbon capture for sequestration is regulated within the provisions of the London Convention 1972 or the 1996 Protocol thereto.[94] Carbon

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[88] European Commission, '2020 Annual Report from the European Commission on CO2 Emissions from Maritime Transport' (n 87) 11.

[89] European Commission, 'Proposal for a regulation of the European Parliament and of the Council on the use of renewable and low-carbon fuels in maritime transport and amending Directive 2009/16/EC' COM(2021) 562 final, 2.

[90] Morante (n.85).

[91] Christos Chryssakis, 'Challenging Road ahead for retrofitting to dual-fuel engines' (DNV, 16 May 2023) <https://www.dnv.com/expert-story/maritime-impact/challenging-road-ahead-for-retrofitting-to-dual-fuel-engine.html#:~:text=Retrofitting%20a%20single%2Dfuel%20engine,fuels%20can%20also%20be%20used.> accessed 30.08.2023.

[92] DNV, 'Future Fuels' (DNV) <https://www.dnv.com/maritime/hub/decarbonize-shipping/fuels/future-fuels.html> accessed 17.08.2023.

[93] Renewable Energy Division (RED) in the Directorate of Energy Markets and Security, 'Renewable Energy Market Update - Outlook for 2023 and 2024' (International Energy Agency, June 2023) 12.

[94] 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972, annex I para. 4.2.

sequestration is defined as "separation of carbon dioxide from industrial and energy-related sources, transport to an offshore geological formation, and long-term isolation from the atmosphere".[95] Beside carbon sequestration and to with the 0.50% m/m SOx limit of reg. 14 in IMO Resolution MEPC.305(73), many ships were outfitted with "scrubbers" as exhaust cleaning systems removing SOx with a buffer solution from ship exhaust.[96] Hereby, the ship releases the discharge of the often acidic and toxic wash-water typically into the ocean, as the International Council for Clean Transportation (ICCT) criticises in their report.[97] These incentives and ideas show alternative solutions towards a more sustainable approach within shipping and though usage of fossil fuels remains criticised, some choices seem to feature them persistently.

Technological development requires supplementation by adjusting and adapting new policies as well as investing in innovative and scientifical research.[98] Beside deficient technologies the lifespan of a vessel, around 30 to 40 years, ascertains the necessity to act quickly due to the danger of "locked-in emissions" for the following decades.[99] Affirmatively the IMO acknowledged the need for technological innovation, zero and near-zero fuels and energy sources within shipping.[100] In the new 2023 IMO GHG Strategy, these advances contain exemplary measures for *well-to-wake* GHG emissions of fuels.[101]In using a *well-to-wake* or *life cycle assessment* (LCA) the IMO amounts the products impression on the environment over the full life-cycle of the vessel.[102] Equally, the EU introduced an assessment on a *well-to-wake* basis in their FuelEU Maritime Directive 2009/16/EC.[103] Within the LCA its possible

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[95] IMO, 'Report of the thirty fourth consultative meeting and the seventh meeting of contracting parties' (29 October – 2 November 2012) IMO doc LC 34/15, annex 8 para 1.1.

[96] Liudmila Osipova, Elise Georgeff, and Bryan Comer, 'Global scrubber washwater discharges under IMO's 2020 fuel sulfur limit' (ICCT Report, 2021) <https://theicct.org/publication/global-scrubber-washwater-discharges-under-imos-2020-fuel-sulfur-limit/> accessed 14.08.2023.

[97] Ibid, accessed 14.08.2023.

[98] Morante (n 85).

[99] I. R. Istrate and others, 'Quantifying Emissions in the European Maritime Sector' (JRC Technical Report, 2022) EUR 31050 EN, 2.

[100] IMO Res MEPC.377(80) (n 18) para 3.1 and 3.3.

[101] ibid 3.2.

[102] IMO, 'The application of LCA guidelines' Intersessional Meeting of the WG on reduction of GHG emissions from Ships (ISWG-GHG) (12 May 2023) IMO doc ISWG-GHG 15/3/3, para 4.

[103] European Commission, COM(2021) 562 final (n 89) para 16.

to divide the live cycle into phases, separating *well-to-tank* emissions as fuels inside the ship tank from emissions deriving from the fuel usage and their after treatment of their exhaust as so called *tank-to-wake* emissions.[104] Beside developing and researching fuels and technology, the global community appraises market-based measures for challenging GHG levels. Market-based measures, interlope with the market of the shipping industry, by adjustment of price mechanisms without consideration of commercial parties.[105] Through interference, the product price rises, limiting the selling quota and giving the incentive to constrain production of the product to essential and wanted goods and services.[106] Further promising interference within the market, as suggested by *Eftestøl,* may be found in the provisional agreement for an EU Emission Trading System to shipping, in part due to its compliance with the so called *polluter pays principle.*[107] Caution should be exercised, when viewing these measures and ideas for mitigating climate change, as some showcase issues when touches upon. Inspecting fabrication and availability of alternative fuels, e.g. biofuels, which often derive from food-based crops and limited due to sustainability concerns and lacking technology.[108] With the limited quantity of the basis for alternative fuels and therefore its availability, the pricing of biofuel is affected in hindsight to the shortage and demand.[109] Such effect, based on demand and rising prices, can be observed within the price peak of 2022.[110] Beside problems of availability, not all states can keep pace with these changes and technological advances, as less developed states are particularly burdened by these alterations due to fiscal disadvantage.[111] Their lack of development in this area and the necessity of "e*nhanced support*" was regarded within the 27th UN Conference of the Parties in 2022.[112] Reflecting

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[104] IMO, ISWG-GHG 15/3/3 (n 314) para 4.

[105] Erik Røsæg 'GHG emissions from international shipping', (2022) PPP god. 61, 176, str. 61-83, 71

[106] Ibid.

[107] Ellen J. Eftestøl, 'The proposed extension of the EU-ETS to shipping - BIMCO´s ETS - allowances (ETSA) clause for time charter parties 2022 filling a legal gap' in Lia Athanassiou (eds) *Protecting maritime operators in a changing regulatory and technological environment* (Nomiki Bibliothiki S.A., 2023) 323.

[108] R. Laursen and others, 'Update on Potential of Biofuels for Shipping' (European Maritime Safety Agency, 2022) EMSA/OP/43/2020, 3.

[109] Ibid 5.

[110] RED, 'Renewable Energy Market Update - Outlook for 2023 and 2024' (n 93) 12.

[111] UNCTAD, Climate Change, Green Recovery (n 15) 3.

[112] UN Conference of the Parties, *Agenda item 11 - Matters relating to the least developed countries* (27th session, Sharm el-Sheikh, 2022) para. 7.

upon the aforementioned innovations, measures and alternatives, multiple options for reducing GHG emissions are visible, ranging from technical improvement to new fuels and the regulation of the market. The application and implementation of these options, require reflection on their limits, as the issue of availability and demand as well as the different capabilities and desires of states, discussed in the above show.

2.4 Conclusion

Climate change is reportingly brought up as an issue in our society. It is the alteration of the global atmosphere and a long-term change of natural climate.[113] Primarily blamed gases are CO2, CH4, N2O and fluorinated gases, whereby 65% of global GHG emissions consist of CO2, from usage of fossil fuels.[114] Human activities subsist as a primary source, by emittance of these gases and by disturbing the natural balance.[115] Ensuing from steady rising emissions, global organizations warn that rising temperatures might cross the 1.5°C mark within the next 5 years.[116] Extreme weather changes, the warming, acidification and rising of oceans, melting sea-ice and other impacts can be observed in the environment.[117] These changes can be recapped, as detrimental for the environment and humankind in total. Shipping's current contribution comprises around 3% of global GHG emissions, though future estimations show the possibility of an increase up to 13%.[118] Proposed sustainable solutions in the shipping sector, can be found in aforementioned options containing fuel alternatives such as biofuels, innovations like scrubbers and carbon sequestration as well as different measures ranging from fuel assessment to influencing the market with market-based measures. Usage of these options entails' reflection upon their limits as well as the limits of implementing states. Climate change exists as an urgent and global problem with extensive consequences and although it appears that options for more sustainable approaches exist, their application and implementation perhaps require a global approach and development in shipping.

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[113] UNFCCC 1992, art. 1 (2)

[114] Kuramochi and others (n 9) 7.

[115] US EPA, 'Inventory of U.S. Greenhouse Gas Emissions and Sinks 1990 – 2021' (n 35) 1-3 accessed 19.07.2023; Turentine, (n 35) accessed 19.07.2023

[116] UNGA Res 70/1 (25th September 2015) UN doc A/RES/70/1, Goal 13

[117] See IPCC, 'Climate Change 2021 – The Physical Science Basis' (n 38) SPM A.2 and A.3.

[118] King (n 10) accessed 30.08.2023.

CHAPTER 3: INTERNATIONAL LEGAL FRAMEWORK OUTSIDE THE IMO

3.1 Introduction

Climate change and GHG emissions occur globally alongside wide-ranging impacts to the environment with shipping, amongst other sectors, contributing towards the rising GHG levels. With the existence of different options for reducing these levels, limited by availability, varied circumstances and interests, the strain to find a global solution is perceptible. Acknowledging these difficulties, but reflecting on the extensive impacts of the crisis, the requirement of global action in form of an international regime to collectively act against the rising GHG levels is visible.[119] The international legal framework for mitigating climate change within shipping outside the IMO is widespread and thereby complex as it encompasses multiple international instruments and institutions, such as the 1992 UNFCCC and the 2015 Paris Agreement, examined within this chapter.

Parts of the regulatory and policy framework for shipping, to mitigate climate change and reduce GHG emissions outside the IMO's regime, can be found in international, national, and regional law.[120] Within the international law protecting the environment, the UN has been credited as the main environmental competence for protecting, preserving and conservating the natural environment and promoting sustainable development.[121] As individual states have only limited power in alleviating global issues, the main contributors to the framework for shipping outside the IMO remain to be global institutions, counting the UN and its sub-agencies, as exemplified by the IPCC, the UNEP and the World Meteorological Organization (WMO).[122] These agencies act jointly against climate change, as shown by the creation of the IPCC, resulting from the collaboration of the WMO and the UNEP in the 1980s.[123]

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[119] Boyle and Redgwell *(*2021) (n. 32) 403.

[120] Eftestøl and Yliheljo, 'International Shipping: Who levels the playing field' (n. 21) 286.

[121] Birnie, Boyle, Redgwell 2009 (n. 23) 58; Yubing Shi, *Climate Change and International Shipping: The Regulatory Framework for the Reduction of Greenhouse Gas Emissions* (Brill 2016) 118; Eftestøl and Yliheljo, 'International Shipping: Who levels the playing field' (n. 21) 282.

[122] Yubing Shi, *Climate Change and International Shipping: The Regulatory Framework for the Reduction of Greenhouse Gas Emissions* (Brill 2016) 119.

[123] Ibid 126.

3.2 The international climate change regime

In recognition of climate change as a global threat, possible solutions to address the issue require a "detailed and comprehensive" international regime.[124] Thereby the existent customary international law fails to provide this detailed regime for reducing GHG emissions.[125] Whilst the international legal framework is built upon various international instruments and institutions, some central treaties are noticeable. These include for instance the 1992 UNFCCC and the 2015 Paris Agreement.

3.2.1 1992 UNFCCC

The United Nations Framework Convention on Climate Change, adopted in Rio de Janeiro in 1992, is a structural foundation and frame for other subsequent agreements dealing with the climate crisis by providing central principles, goals and institutions.[126] Historically, the 1992 UNFCCC is not the first convention dealing with climate change.[127] Before its establishment a variety of treaties covered this topic, including the 1979 Convention on Long-Range Transboundary Air Pollution and the 1985 Convention for the Protection of the Ozone Layer.[128] Within its Preamble the UNFCCC acknowledges that:

> *"*the global nature of climate change calls for the widest possible cooperation by all countries and their participation in an effective and appropriate international response, in accordance with their common but differentiated responsibilities and respective capabilities and their social and economic conditions."

In addition, art. 2 UNFCC defines the objective as the stabilization of GHG concentrations within the atmosphere at a level that prevents dangerous anthropogenic interference with the climate system. The principle listed in art. 3 UNFCCC include the protection of the climate system for the benefit of present and future generations of humankind in consideration of the specific needs and special circumstances of developing country Parties as well as the

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[124] Boyle and Redgwell *(*2021) (n. 32) 403.

[125] ibid.

[126] Aldo Chircop, Meinhard Doelle and Ryan Gauvin, *Shipping and Climate Change, International Law and Policy Considerations - Special Report* (Centre for International Governance Innovation, 2018) 9

[127] Shi (n 122) 130

[128] Shi (n 122) 130

obligation to take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects. Reflecting upon the structural importance of UNFCCC for following agreements and the wording of art. 1 to 3 UNFCCC, the treaty appears to have a central role in the climate change regime. By looking at the preamble the language refers to "common but differentiated responsibilities" and "respective capabilities", making the treaty appealing for the different states, especially less developed ones. However, the lack of detailed regulations to achieve these aims, lead to the assumption that the UNFCCC embodies more of a base for climate change mitigation, containing the fundamental objective and principles.

3.2.2 1997 Kyoto Protocol

In pursuit of the UNFCCC objective the 1997 Kyoto Protocol was adopted and introduced certain commitments to limit and reduce GHG emissions, exemplary by introducing elaborated measures and policies and cooperation.[129] The protocol represents the *principle of common but differentiated responsibilities,* takes national circumstances into account and introduced limits for GHG emissions.[130] Taking the Kyoto Protocol into account for shipping, art. 2 (2) Kyoto Protocol is noticeable, as it refers the parties of Annex I to pursue limitations and reduction of GHG emissions from marine bunker fuels from the International Maritime Organization. In accordance to art. 2 (2), international shipping is excluded from the 1997 Kyoto Protocol, though *Ringbom* notes hereby that the reference to the IMO does not preclude potential actions of other institutions.[131] The opposite to this view may be argued, as the explicit reference in art. 2 (2) Kyoto Protocol appears to emphasise the IMO's mandate in matters of climate change for shipping.[132] In consideration of further international incinerations towards an existent mandate, the second view, acknowledging the IMO's mandate, will be assumed in this thesis hereinafter.[133] The 1997 Kyoto Protocol aims towards the UNFCCC objective and admits to the principles held within. Though international

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[129] Kyoto Protocol to the United Nations Framework Convention on Climate Change, adopted 11 December 1997, entered into force 16 February 2005, (1998) 37 ILM 22, preamble; art. 2 (a) and (b)

[130] Birnie, Boyle, Redgwell (2021) (n 32) 401

[131] Henrik Ringbom, 'Regulating Greenhouse Gases from Ships' in Elise Johansen, Signe Veierud Busch, Ingvild Ulrikke Jakobsen (eds) *The Law of the Sea and Climate Change* (CUP, 2021) 133-134

[132] Ibid 135

[133] See pt 4.2 of this thesis on 'the IMO and its mandate for GHG emissions'.

shipping does not fall under the Protocol, the reference within art. 2 (2) Kyoto Protocol may be taken as acknowledgement of the IMO's mandate for regulating GHG emissions for ships.

3.2.3 2015 Paris Agreement

The Paris Agreement was adopted in 2015 to augment implementation of the UNFCCC objective and to enhance global efforts for climate change mitigation in consideration of sustainable development and eradication of poverty.[134] The Paris Agreement features "self-selected national contributions" of the states and "procedural obligations to report on efforts" for reducing GHG emissions.[135] Art. 2 (1) a Paris Agreement contains their ambition in:

> "Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."

Although it had been contemplated, the Agreement holds no responsibilities or obligations for the shipping sector and the IMO to reach its objective.[136] There is no inclusion or exclusion of international shipping within the Paris Agreement.[137] In reflection of the IMO's actions against climate change, it is notable that their regulations often contain references to the Paris Agreements goal of art. 2 (1) a, exemplary within the 2023 IMO GHG Strategy.[138] Thereby the IMO recognizes that the objective of the Paris Agreement would "significantly reduce the risks and impacts of climate change".[139] Bearing in mind that the Paris Agreement contains no reference to the IMO or to shipping, its objective of limiting temperatures is reflected within the IMO's actions against reducing GHG emissions. Following the acknowledgment of the IMO, the Paris Agreement goal plays a role for GHG levels within the shipping sector. Though the UNFCCC introduces principles and a general objective, the Paris Agreement contains an actual temperature limitation, which the IMO reflects upon within its framework.

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[134] 2015 Paris Agreement, art 2 (1).

[135] Patricia Birnie, Alan Boyle, Catherine Redgwell (2021) (n 32) 402.

[136] Henrik Ringbom, (n 131) 136.

[137] ibid 137.

[138] IMO Res MEPC.377(80) (n 18) preamble and para 1.6.1.

[139] Ibid preamble.

3.2.4 UN SDG 13

Within the UN Sustainable Development Goal 13 of the UN 2030 Agenda for Sustainable Development, the UN declared a limitation for the temperature to 1.5° Celsius above pre-industrial levels, requires GHG emissions to peak before the year 2025 as well as a decline of the emissions by 43 percent by 2030 with a total stop for GHG emissions by the year 2050.[140] This goal is at current time, due to lacking national commitments, not reachable as the actions are not sufficient in staying within the limitations of 1.5° Celsius.[141] Shipping, exemplified, would be required to reduce their GHG emissions by half to obtain this goal, and eliminate their emissions of CO2, black carbon and methane by 2050.[142] As it reflects a global aim, it is an interesting goal to deliberate when considering the IMO and their approach.

3.2.5 Further regulations and policies

The international legal framework for climate change outside the IMO, extends to even more regulations and policies. Exemplary the carbon capture for sequestration is regulated within the provisions of the London Convention 1972 or the 1996 Protocol thereto.[143] Though further agreements exist, the objective of this thesis does not cover them.

3.3 The international Law of the Sea

The third Conference of the UN on the Law of the Sea yielded the 1982 United Nations Convention on the Law of the Sea, often referred to as the "constitution of the oceans".[144] 1982 UNCLOS is one of the major treaties in the law of the sea to consider for climate change mitigation and reducing GHG emissions in the marine environment. Before addressing the provisions for preventing pollution within UNCLOS, one must consider whether GHG

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[140] UNGA Res 70/1 (25th September 2015) UN doc A/RES/70/1, Goal 13

[141] UNGA Res 70/1 (25th September 2015) UN doc A/RES/70/1, Goal 13

[142] Lucy Gilliam, 'Shipping and the Ocean' in Farah Obaidullah, *Ocean and Us* (Springer 2023) 127.

[143] 1996 Protocol to the Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter 1972, annex I para. 4.2

[144] Remarks by Tommy T. B. Koh, President of the Third United Nations Conference on the Law of the Sea, available at <https://cil.nus.edu.sg/wp-content/uploads/2015/12/Ses1-6.-Tommy-T.B.-Koh-of-Singapore-President-of-the-Third-United-Nations-Conference-on-the-Law-of-the-Sea-_A-Constitution-for-the-Oceans_.pdf> accessed 20.08.2023

emissions fall under the term of *pollution* of UNCLOS. The definition for pollution of the marine environment in art.1 (4) LOSC reads that it:

> "means the introduction by man, directly or indirectly, of substances or energy into the marine environment, including estuaries, which results or is likely to result in such deleterious effects as harm to living resources and marine life, hazards to human health, hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for use of sea water and reduction of amenities;"

Scientifically, the amassment of greenhouse gases causes the increase of energy within the atmosphere and subsequently in the ocean.[145] *Doelle* concludes here, that the maritime pollution stemming from the rise of energy falls under the definition of *pollution* under UNCLOS.[146] However, the period of UNCLOS creation is noticeable before the topic of climate change has been a known international issue for the oceans.[147] The negotiations of the treaty took place in a time, where climate change as well as GHG emissions were an unknown factor and in consequence neither are originally considered within UNCLOS.[148] In light of this, the enclosure of climate change and GHG emissions under the convention and its regulatory and policy framework may be arguable. Reflecting upon the interpretation of UNCLOS as a "living instrument" allows the usage of it as a period adaptive tool.[149] This interpretation is visible within the *Request for an Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC)* elaborating that "it must "grow" in accordance with the times*"*.[150] International treaties would lose their relevance quite effectively over time, where there is no development in interpreting their terms.[151] Following the argumentation of *Doelle* and by interpreting UNCLOS as a *living instrument*, it may be concluded that the pollution of GHG emissions falls under UNCLOS.

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[145] Doelle, 'Climate Change and the Use of the Dis (n 162) 322

[146] Ibid 322

[147] Monica Feria-Tinta 'On the request for an advisory opinion on climate change under UNCLOS before the International Tribunal for the Law of the Sea' (2023) 00 JIDS 1–16, 3.

[148] ibid 3.

[149] ibid 3.

[150] Judge Lucky in Request for an Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC) (Advisory Opinion of 2nd April 2015) 9

[151] Doelle, (n 162) 321

The importance of maritime protection and preservation factors within multiple parts of UNCLOS, though the overall provisions containing the general duties and obligations for the protection and preservation of the marine environment are held in part XII UNCLOS. Art. 192 introduces part XII UNCLOS with the obligation to protect and preserve the marine environment. The provision encloses all maritime areas, including the exclusive economic zone, and obligates the flag state to enforce compliance of vessels under their jurisdiction and to enact the coastal states conservation measures as an integral part of their duty to protect and preserve.[152] The equal application of art. 192 UNCLOS conveys that the flag states are bound to the duty to protect and preserve beyond the coastal maritime zones.[153] Build upon the general obligation within art. 192 UNLCOS, art. 194 (1) UNCLOS obligates to take all measures necessary to prevent, reduce and control pollution from any sources, by using the best means within their abilities while harmonizing with the other states. In addition, art. 194 (2) UNLCOS obliges states to ensure that the activities under their jurisdiction or control are conducted in a way not causing damage to other states and their environment, and that the pollution arising from incidents or activities under their jurisdiction or control does not spread beyond the areas where they exercise sovereign rights. In accordance with the dispute chamber in the Advisory Opinion submitted by SRFC, quoting the Pulp Mills case, this also contains the duty to act in due diligence.[154] Lastly art. 194 (5) UNCLOS emphasizes the need to protect and preserve the rare or fragile ecosystems. In application of these rules art. 195 UNCLOS adds the duty not to transfer damage or hazards or transform one type of pollution into another. Art. 197 UNCLOS finalizes the general rules by asserting a duty of cooperation on a global or regional basis through the competent international organization.

Following the general provisions of part XII UNCLOS, art. 211 UNLCOS addresses pollution specifically from vessels. Art. 211 (1) UNLCOS obliges states to act through "the competent international organization or general diplomatic conference" which "shall establish international rules and standards to prevent, reduce and control pollution of the marine environment from vessels". The term "competent international organization (s)" occurs within

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[152] Request for an Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC) (Advisory Opinion of 2nd April 2015) 120.

[153] Chircop, Doelle and Gauvin, 'Shipping and Climate Change, International Law and Policy Considerations' (n 126) 17.

[154] Request for an Advisory Opinion submitted by the Sub-Regional Fisheries Commission (SRFC) (Advisory Opinion of 2nd April 2015) 128 (referring to Pulp Mills on the River Uruguay).

several regulations of UNCLOS.[155] For the adoption of "international shipping rules and standards in matters concerning maritime safety, efficiency of navigation and the prevention and control of marine pollution from vessels and by dumping" the IMO secretariat provided that the term *competent international organization*, if used singular, refers exclusively to the IMO.[156] At the same time, the singular term of *the competent international organization* is also generally accepted as a reference to the IMO.[157] Art. 211 (1) UNCLOS is an example of this reference, regulating jurisdiction over vessel-sourced pollution.[158] Reflecting upon these provisions shows, that the IMO enjoys a special mandate under UNCLOS and therefore under the law of the sea to regulate vessel sourced pollution in protecting the marine environment. Art. 211 UNCLOS establishes moreover a "sophisticated jurisdictional framework" whereby the enforcement of the IMO's standards may be done by flag-states and in addition by coastal states.[159] As the reliability of flag states sometimes depends on their capabilities, the extension to coastal states extends the application of pollution standards.[160] In addition, art. 91 (1) UNCLOS requires the existence of a "*genuine link*" between the state and the ship, as to exclude the phenomena of "*flags of convenience*" coming from the mere registration.[161]

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[155] Erik Røsæg, 'The Role of the International Maritime Organization in Defining and Altering the Jurisdiction of Flag, Coastal, ad Port States' in Henrik Ringbom, *Jurisdiction over Ships* (2015) Band 80, Publications on Ocean Development, 365

[156] IMO, 'Implication of the United Nations Convention on the Law of the Sea on the International Maritime Organization' Study by the Secretariat of the IMO (30th January 2014) LEG/MISC.8, 7; Røsæg, 'The Role of the International Maritime Organization in Defining and Altering the Jurisdiction of Flag, Coastal, and Port States' (n 155) 365.

[157] Røsæg, 'The Role of the International Maritime Organization in Defining and Altering the Jurisdiction of Flag, Coastal, ad Port States' (n 155) 365; Aldo Chircop, 'The IMO, its Role under UNCLOS and its Polar Shipping Regulation' in Robert C. Beckman and others (eds) *Governance of Arctic Shipping* (Publications on Ocean Development, Band 84, 2017) 118; Iva Parlov, 'Coastal State Jurisdiction over Ships in Need of Assistance, Maritime Casualties and Shipwrecks' (2022) Band 97, Publications on Ocean Development, 71 referring to Division of Ocean Affairs and the Law of the Sea, Bulletin No. 31 (UN,1996), 80-95.

[158] Iva Parlov, 'Coastal State Jurisdiction over Ships in Need of Assistance, Maritime Casualties and Shipwrecks' (2022) Band 97, Publications on Ocean Development, 71

[159] Donald R Rothwell and Tim Stephens, *The International Law of the Sea* (Bloomsbury, 2nd edn. 2016) 376.

[160] Ibid 376.

[161] Boyle and Redgwell, *2021 ibid* 524

Art. 212 UNLCOS is considered closely in the light of GHG emissions, as it can be interpreted to apply in this issue.[162] It regulates pollution through and from the atmosphere, including the adoption of laws and regulations and the responsibility to establish global and regional rules, standards, and international practice.[163] Beyond UNCLOS the climate regime under the law of the sea requires consideration of certain soft law. In 1992 the UNEP produced the Agenda 21 to offer guidelines for global actions for sustainable development, followed by the 1992 Rio Declaration on Environment and Development with its 27 principles.[164] In adopting the 1992 "*Rio instruments*" the international community established sustainable development as a principal notion of international environmental policy, thereby also affecting the international law of the sea.[165]

Even though it may be debated, the scientific as well as the historic approach in reflection of UNCLOS as a *living instrument,* seem to conclude GHG emissions as *pollution* under art. 1 (4) UNLCOS.[166] Whilst the general provisions of part XII UNCLOS, supplemented by soft law, provide certain obligations towards the protection of the marine environment, the import of UNCLOS for reducing GHG emissions in the shipping sector, may be visible in the distribution of authority between flag and coastal states as well as for international organizations and states.[167] This means that the law of the sea refers to the IMO as the authority as the *competent international organization* to deal with GHG emissions of shipping. In addition, the jurisdiction is widened whereby coastal states may support flag states in the enforcement of the IMO's measures.

3.4 The European Union

The European Union is an interesting example to be beheld in consideration of climate change mitigation. Despite the EU's "*strong preference*" to follow the approach of the IMO to regulate the emission of greenhouse gases, the "*slow pace*", as the 2013 strategy on

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[162] Meinhard Doelle, 'Climate Change and the Use of the Dispute Settlement Regime of the Law of the Sea Convention' (2006) 37 Ocean Development and International Law 3-4, 323.

[163] 1982 UNCLOS, art 212 (1) and (3)

[164] Stakeholder Forum for a Sustainable Future*, '*Review of Implementation of Agenda 21 and The Rio Principles – Synthesis' (Un SD21, January 2012) 1 <https://sustainabledevelopment.un.org /content/documents/641Synthesis_report_Web.pdf> accessed 20.08.2023

[165] Alan Boyle and Catherine Redgwell, *(* 2021) (n 32) 57.

[166] Doelle, 'Climate Change and the Use of the Dis (n 162) 322

[167] Ringbom (n 131) 131

integrating maritime transport emissions in the EU's greenhouse gas reduction policies states, resulted in their engagement with international developments and the introduction of various strategies as well as regulations.[168] Maritime Transport plays an integral role within the transports system and the economy of the EU, facilitating around 75% of EU external trade volumes and 31% of EU internal trade volumes.[169] Within the international community, the EU is the source of around 8% of the global CO2 emissions[170], whilst the approximate contribution of the shipping sector within the EU's total CO2 emissions hovers around 3 - 4%.[171] The continuous effectiveness of the maritime sector is foundational for keeping EU citizen mobile, developing EU regions and the upkeep of the EU economy.[172] Their multiple regulations and policies, for instance the 2019 Green deal[173], their monitoring, reporting and verification system[174] , their "Fit for 55" target[175]and their EU Emission Trading System (ETS)[176] make them a curious sample when observed within the international context, particularly in light of existent IMO regulations and policies.

Before the introduction of the Green Deal, the 2013 strategy on integrating maritime transport emissions in the EU's greenhouse gas reduction policies (2013 Strategy), outlined the EU's approach.[177] Originally the EU strategy contained three steps, starting with the implementation of a monitoring, reporting and verification system, continuing with the defining of a reduction target in the maritime sector and finishing with the application of

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[168] European Commission, 'Integrating maritime transport emissions in the EU's greenhouse gas reduction policies' COM(2013) 479 final, 4.

[169] European Commission, COM(2021) 562 final (n 89) 1.

[170] European Commission, COM(2021) 550 final (n 172) 12.

[171] European Commission, SWD(2021) 228 final (n 87) 5.

[172] European Commission, COM(2021) 562 final (n 89) 1.

[173] European Commission, 'The European Green Deal' COM(2019) 640 final.

[174] Council Regulation (EC) 2015/757 of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC (EC Regulation) (2015) OJ L 123/55.

[175] European Commission, ''Fit for 55': Delivering the EU's 2030 climate target on the way to climate neutrality' COM (2021) 550 final.

[176] Council Regulation (EC) 2003/78/EC of 13 October 2003 on establishing a M9 system for greenhouse gas emission allowance trading within the M9 Union and amending Council Directive 96/61/EC (EC Regulation) (2003) OJ L 275 .

[177] European Commission, 'Integrating maritime transport emissions in the EU's greenhouse gas reduction policies' COM(2013) 479 final.

market-based-measures.[178] Thereby the EU presented a "*regional lead*" within the global efforts to reduce GHG emissions.[179] The EU's initiative in the 2013 Strategy displays a regional advance against the climate crisis beside a global approach. In accordance with their intentions, the EU supported the global effort, but desired swift actions as they did not exist in the IMO's regulations and policies.[180] In the 2019 "Green Deal", the EU offered their ambition to increase the reduction target of 2030 by at least 50% and towards 55% with a proposal for the enshrinement of the climate change neutrality goal by 2050 in legislation by March 2020 and aligning all EU policies in accordance.[181] Aiming for the protection, enhancement, and conservation of the EU's natural capital as well as the protection and health of its citizen from environmental threats and consequences, the Union strives for a "*just and conclusive*" transition to their net zero goal of emitting greenhouse gases.[182] Within the 2021 zero pollution action plan, the European Commission signified the polluter pays principle to exclude the "*pollution for free*".[183] The key elements of the Green Deal contained the announcement of the European Climate Act by 2020, the collaboration and involvement of citizen, employees, NGO's and others, as well as the assurance of enforcing and delivering policies and legislation of environmental protection, effectively.[184] Beyond announcing their climate goals, the deal has foundational value for subsequent strategies protecting the environment and the economy.[185] Within the fit for 55 package, the EU set the ambition to reduce GHG emissions "by at least 55% by 2030 compared to 1990 and for being the first climate neutral continent by 2050".[186] If one looks closely ate the language used, the wording of "by at least" appears very decisive and leaves little space to deviate from the 55%. The different strategies and goals of the EU are, when observed in reflection of the 1992 UNFCC

[178] Ibid 5.

[179] Eftestøl and Yliheljo, 'International Shipping: Who levels the playing field' (n 21) 300.

[180] European Commission, COM(2013) 479 final 4.

[181] European Commission, 'The European Green Deal' COM(2019) 640 final, 4

[182] Ibid 2.

[183] European Commission, 'Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' COM(2021) 400 final, 12.

[184] European Commission, 'The European Green Deal' COM(2019) 640 final, 23.

[185] European Commission, COM(2021) 550 final (n 174) 1 .

[186] European Commission, ''Fit for 55': Delivering the EU's 2030 climate target on the way to climate neutrality' COM (2021) 550 final 1

and the 2015 Paris Agreement, certainly more precise in regard to different measures and seems like a robust regional approach to reduce GHG emissions in shipping.

Chapter 1 art. 1 of the 2015/757 regulation defines its subject matter as the establishment of rules for the accurate monitoring, reporting and verification of CO2 emissions and of other relevant information from ships arriving at, within or departing from ports under the jurisdiction member states, to endorse reducing CO2 emissions from the ships in a cost-effective manner.[187] Beyond the monitoring, reporting and verification system, the EU directs towards the introduction of renewable fuels and energy sources, entailing at the same time the necessary technological advancement.[188] Their ambition to raise the demand for renewable fuels introduced the FuelEU initiative.[189] It supports the EU's objective by limiting usage of fossil fuels to increase the demand of renewable and low-carbon fuels.[190] Beside the FuelEU initiative, other measures encompassed the adjustment of existent energy taxation and adapting the infrastructure of alternative energy sources.[191] These measures, similar to the strategies and aim of the EU in general, show clear direction towards the climate change mitigation goal, containing clear ideas how reducing GHG emissions shall be achieved. Another strategy presented for reducing GHG emissions was the EU's ETS.[192] It creates a system for GHG emission allowance trading within the EU "in order to promote reductions of greenhouse gas emissions in a cost-effective and economically efficient manner". Thereby the participances can "buy or receive emission allowances which they can trade with one another" inside of a "set maximum".[193] The ETS complies with the *polluter pays principle*

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[187] Council Regulation (EC) 2015/757 of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC (EC Regulation) (2015) OJ L 123/55, ch 1, art 1

[188] Røsæg 'GHG emissions from international shipping' (n 105) 70.

[189] European Commission, SWD(2021) 228 final (n 87) 9

[190] Council of the EU, 'FuelEU Maritime initiative: Provisional agreement to decarbonise the maritime sector' (Press Release, 23th March 2023) < https://www.consilium.europa.eu/en/press/press-releases/2023/03/23/fueleu-maritime-initiative-provisional-agreement-to-decarbonise-the-maritime-sector/> accessed 07.07.23

[191] European Commission, SWD(2021) 228 final (n 87) 9

[192] Council Regulation (EC) 2003/78/EC of 13 October 2003 on establishing a M9 system for greenhouse gas emission allowance trading within the M9 Union and amending Council Directive 96/61/EC (EC Regulation) (2003) OJ L 275

[193] Eftestøl, 'The proposed extension of the EU-ETS to shipping' (n 107) 323.

and promises an interference within the market in the shipping sector.[194] With the insertion of market-based measures by adjustment of price mechanisms without consideration of commercial parties interferes with the product price rises, the selling quota is limited, and it gives the incentive to constrain the production of the product to essential and wanted goods and services.[195] In reflection of this measure, the EU seems to act within a very sensitive area, namely by putting a price onto GHG emissions. In addition, the members of the EU are acting as port states, meaning that ships entering the EU fall beneath their system.

In the economy and transport systems of the EU, shipping plays a central role with their internal and external trade relies on it.[196] The EU's initiative illustrates a regional approach in reducing GHG emissions within the global goal of climate change mitigation.[197] Reflecting upon the EU's strategies language and measures demonstrates that the EU is decisive and exact when introducing new measures, such as market-based measures into their system, featuring very delicate topics like GHG pricing and support raising usage of alternative fuels for ships. The presented measures express a very decisive approach against GHG emissions from ships. The EU's system seems very robust, particularly due to their status as port states.

3.5 Conclusion

In reflection of the extensive consequences of climate change in the marine environment and the contribution of shipping, an international approach of mitigating this global problem appears necessary. The international legal framework for climate change mitigation outside the IMO's competence is derived from various regulations and policies. Within this framework, the 1992 UNFCCC provides the fundamental global objective of stabilising GHG emissions by acting collectively, reflecting principles of *common but differentiated responsibilities* and the respective capabilities of states.[198] The 1997 Kyoto Protocol presents more detailed aims, though it is not applicable within the shipping sector beyond a reference within art. 2 (2) Kyoto Protocol.[199] Shipping remains unmentioned within the 2015 Paris

[194] Eftestøl, 'The proposed extension of the EU-ETS to shipping' (n 107) 323.

[195] Røsæg 'GHG emissions from international shipping' (n 105) 71.

[196] European Commission, COM(2021) 562 final (n 89) 1.

[197] Eftestøl and Yliheljo, 'International Shipping: Who levels the playing field' (n 21) 300.

[198] 1992 UNFCCC preamble and art 2.

[199] See Ringbom (n 131) 135.

Agreement, though the IMO refers to its temperature limits inside their own approach.[200] Though the UNFCCC introduces principles and a general objective, the Paris Agreement contains an actual temperature limitation, which the IMO reflects upon and implements into framework. The general climate regime is moreover accompanied by further regulations and policies, such as the SDG 13 of the UN displaying global views. Within the law of the sea, though debated, it may be concluded that GHG emissions fall under the term of *pollution* held in art. 1 (4) UNCLOS.[201] Whilst general provisions of part XII UNCLOS, supplemented by soft law, offer some obligations towards the protection of the marine environment, the import of UNCLOS for reducing GHG emissions in the shipping sector, is mainly in the distribution of authority between flag and coastal states as well as for the competence of the IMO as the *competent international organization*.[202] Whereas general jurisdiction and enforcement of greenhouse gas pollution may fall under UNCLOS, the more specific regulations featuring emission levels, measures and technical standards refer to the competent international organization, namely the IMO. In addition, the jurisdiction is widened whereby coastal states may support flag states in the enforcement of the IMO's measures.[203] Shipping plays an important role within the EU as their trade system is reliant upon it.[204] Reflecting on the EU's strategies and measures demonstrates that the EU's way to implement the strategies is very decisive with clear measures, goals and a guiding hand, exemplary with market-based measures by consider very delicate topics like GHG pricing and supporting the usage of alternative fuelling for ships. Using certain language such as "by at least"[205] and showing their aim to reach net zero, exemplary by excluding "pollution for free"[206], their strategy seems to be more rapid than the global framework. The EU's system seems very robust, particularly due to their status as port states. By reflecting upon the regulations of the 1992 UNFCCC, the 2015 Paris Agreement and in terms of general regulations the 1982 UNCLOS, the strategies and measures of the EU appear ambitious and strict. Their measures include

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[200] IMO Res MEPC.377(80) (n 18) preamble.

[201] Doelle, (n 162) 322.

[202] Ringbom (n 131) 131.

[203] Rothwell and Stephens (n 159) 376.

[204] European Commission, COM(2021) 562 final (n 89) 1.

[205] European Commission, "Fit for 55': Delivering the EU's 2030 climate target on the way to climate neutrality' COM (2021) 550 final, 1.

[206] European Commission, 'Pathway to a Healthy Planet for All EU Action Plan: 'Towards Zero Pollution for Air, Water and Soil' COM(2021) 400 final, 12

distinct approaches towards reducing GHG levels, exemplary by observation and collection of data, alternative fuels and market-based measures. Viewing the limitations on biofuels the actions of the EU appear to acknowledge demand and availability, building a system around it.[207] Though recognizing availability, the global consideration of the capabilities of states, is not particularly reflected within the EU approach as they may be unrealistic for developing countries due to the required monetary wealth to fulfil it. While there are certain points of criticism, the over-all desire of the EU to improve their emissions still seems impressive as their strategies show a clear goal with binding limits.

The international legal framework, outside of the IMO, combines multiple sources of international law such as the 1992 UNFCC, the 2015 Paris Agreement and within the law of the sea the 1982 UNCLOS. Within these treaties, there is the general recognition that actions against climate change and the rising GHG emissions, are necessary. Their regulations illustrate the global objective to collectively act against this crisis, even setting certain limits like the limitation of the Paris Agreement. Their value to the framework of reducing GHG emissions within shipping is more basic, as some of the do not apply, whilst other contain no specific regulations for the matter or a reference towards the *competent international organization* for shipping. Beside the international legal framework, the EU showcases an interesting example of a regional framework for mitigating climate change within the shipping sector. The EU method is indeed noteworthy, viewing it next to the IMO's own approach.

[207] See pt 2.3 (p 16 ff) of this thesis.

CHAPTER 4: The IMO's regulatory and policy framework

4.1 Introduction

Established by the 1948 Convention on the IMO, the International Maritime Organization is a specialized agency of the UN, with the mission to promote "safe, secure, environmentally sound, efficient and sustainable shipping through cooperation" by the adoption of standards for maritime safety and security, navigational efficiency as well as preventing and controlling vessel-sourced pollution, and furthermore through contemplation of the correlating legal matters and the implementation of universal and uniform IMO instruments.[208]

Within the international law of the sea the IMO enjoys a special mandate under UNCLOS as "competent international organization" in the context of shipping.[209] This chapter will investigate the IMO's approach and framework for climate change mitigation and their contribution towards the international efforts in reducing greenhouse gas emissions.

4.2 The IMO and its mandate for GHG emissions

The IMO's mandate for regulating GHG emissions can be derived from multiple sources. Within the 1948 Convention on the IMO (1948 IMO Convention) art. 1 (a) defines the IMO's purpose as a "machinery for cooperation" for the "prevention and control of marine pollution from ships*".* Their main purpose thereby is the adoption of technical means as the "highest practicable standards" as specified in art. 1 (a).[210] Additional reference to the IMO derives from the 1982 UNCLOS. The International Maritime Organization, in accordance with their mission, may develop relevant standards to prevent vessel-sourced pollution by implementing respective IMO instruments and regulations.[211] These regulations include MARPOL 73/78, containing, amid others, regulations on air pollution from ships.[212] In this sense UNCLOS already refers to the IMO as well as MARPOL 73/78 through the system of the *rule of*

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[208] IMO Res A.1149(32) (15th December 2021) IMO doc A 32/Res.1149, annex para 1

[209] E.g. IMO, 'Implication of the United Nations Convention on the Law of the Sea on the International Maritime Organization' Study by the Secretariat of the IMO (30th January 2014) LEG/MISC.8, 7

[210] 1948 Convention on the IMO, art 1 (a); Shi, *(n 121*) 179

[211] IMO Res A.1149(32) (15th December 2021) IMO doc A 32/Res.1149, annex para 1

[212] MARPOL 73/78, annex VI

reference whereby state powers regulate international standards outside of UNCLOS itself.[213] MARPOL 73/78 is one of the key IMO treaties dealing with vessel sourced pollution, whereby it is generally recognized that a reference in UNCLOS to the singular term *competent international organization* essentially refers to the IMO.[214] The MARPOL 73/78, as one of the key IMO instruments, contains regulations on vessel-sourced air pollution and as an instrument adopted by the *competent international organization* it is already referred to by UNCLOS as a reflection of *generally accepted international rules and standards (GAIRS)*.[215] The main advantage of MARPOL's status as the reflection of GAIRS and the IMO's status as the *competent international organization* for vessel-sourced pollution is the increasing potential of a binding nature for third states.[216] MARPOL, by reflecting GAIRS, creates expectations and responsibilities on the side of flag states, as they are obliged to follow and implement them with their status as a *mandatory minimum*.[217] Beside the UNCLOS reference, art. 2 (2) of the 1997 Kyoto Protocol refers to the IMO's competence by pursuing limitations and reduction of GHG levels not controlled by the Montreal Protocol from marine bunker fuels. Beyond international conventions, state practice also adheres to the IMO's competence on the matters of maritime pollution from ships, exemplified by the EU's as "an international sector by nature, shipping is regulated by the IMO".[218] In summary, the ´IMO' mandate mainly derives from the 1948 IMO Convention and the 1982 UNCLOS by *rule of reference*, though it is augmented by further agreements and state practice.

4.3 1973/78 MARPOL and Annex VI

MARPOL 1973 modified by the Protocol 1978, contains the objective of preventing the pollution of vessels by discharge of substances or effluents containing substances, harmful for

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[213] James Harrison, *Making the Law of the Sea : A Study in the Development of International Law* (Cambridge University Press 2011) 166

[214] Chircop, 'The IMO, its Role under UNCLOS and its Polar Shipping Regulation' (n X) 118; See also pt 3.3 of this thesis.

[215] Harrison, (n 213) 171 and 179

[216] Erik J Molenaar, *Coastal State Jurisdiction over Vessel-Source Pollution* (Kluwer Law International 1998) 168-169.

[217] Boyle and Redgwell, (2021) (n 32) 525; Parlov, (n 158), 73.

[218] European Parliamentary Research Service, 'Sustainable maritime fuels 'Fit for 55' package: The FuelEU Maritime proposal' (European Parliament Briefing, May 2023) PE 698.808, 2

the marine environment.[219] MARPOL is a framework convention, with six annexes whereby only annexes I and II are mandatory to sign by the parties.[220] Annex I to V MARPOL 73/78 consider multiple sources of vessel-sourced pollution, exemplary pollution by oil.[221] In accordance with the 1997 Protocol to amend the International Convention for the Prevention of Pollution from Ships the Annex VI MARPOL 73/78 (hereinafter only Annex VI) entered into force on 19th May 2005 and covers the regulations for the prevention of air pollution from ships.[222] There are 161 contracting states to the general text of MARPOL 73/78 and its mandatory annexes I and II, covering 98.89% of global shipping tonnage.[223] For Annex VI the signing contracting parties are slightly lower at 147 states, covering 96.66% of global shipping tonnage.[224] As far as this thesis is concerned, Annex VI is of most relevance so further discussions will focus upon it.

Annex VI is dedicated to the prevention of air pollution from ships covering the requirements for the control of ship emissions within chapter 3.[225] Among other matters Annex VI contains specific mandatory measures for so-called *emission control areas* (ECA) for NOx and SOx in very vulnerable maritime areas, where more stringent measures apply due to a higher level of protection.[226] Historically, the reduction of air pollution from ships was contemplated within multiple resolutions of the IMO, particularly in resolution A.719(17) of 1991 and the Protocol

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[219] MARPOL 73/78, art 1 (1)

[220] Chircop, Doelle and Gauvin, 'Shipping and Climate Change, International Law, and Policy Considerations' (n 126) 19.

[221] MARPOL 73/78, annex I

[222] Protocol to Amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (28 October 1997) MP/CONF 3/34 (COP Protocol) art 2; MARPOL 73/78, annex VI

[223] Global Integrated Shipping Information System (GISIS) 'Status of Treaties' (IMO) <https://gisis.imo.org/Public/ST/Treaties.aspx> accessed 08.08.2023

[224] Ibid accessed 10.08.2023.

[225] MARPOL 73/78, annex VI

[226] IMO, 'List of special areas, emission control areas and particularly sensitive sea areas' (2 July 2018) IMO doc MEPC.1/Circ.778/Rev.3 para 2 and 3;
In reference to ECA, the negotiations of the BBNJ agreement for special areas could potentially be of interest. However, as ECA concern very particular greenhouse gas emissions and very specific areas, they are beyond the general global regime for greenhouse gases investigated within this thesis. This part exists to demonstrate that more strict measures of the IMO exist and are recognized, though they are outside the scope of this thesis focus on general greenhouse gas emissions.

of 1997.[227] Since its ratification, annex VI has been discussed and revised several times in concurrence with scientific revelations and technical developments for climate change mitigation. In 2003 the resolution A.963(23) (2003 Resolution) advocated for the creation of new mechanisms concerning limits and decreasing greenhouse gas emissions.[228] In 2005 the Protocol, "Regulations for the prevention of air pollution from ships", entered into force with the proposal to initiate a revision process for Annex VI. [229] The objective of the protocol was to lower the adverse impact of emissions from a diesel engine and offered information about these consequences for the environment, human health and estimated the emission levels of ships.[230] Following the 58th session of the MEPC in 2008 (MEPC 58) Annex VI underwent a revision, entering into force in 2010, featuring GHG emissions from ships by limiting and prohibiting ozone depleting substances and regulating fuels, such as NOx, SOx and Volatile Organic Compounds (VOCs).[231] In addition, standards for engines and machinery were set and fuel oil availability and quality were considered.[232] Parallel to the revision of Annex VI, the resolution MEPC.177(58) amended the technical code on control of emission of nitrogen oxides from marine diesel engines (NOX Technical Code 2008).[233] Observing the development since 1997, there is something of a lapse between the introduction of Annex VI and the discussions within the 58th session of MPEC. Although some reflection of the topic occurred, no binding obligations with repercussions were agreed upon within this period.[234] While the 2003 Resolution already suggested an amendment, the Protocol of the 58th session of MPEC elaborated that the proposal was contested by serval member states as it suggested mechanisms "*binding and equally applicable to all flag States in order to avoid evasion*".[235]

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[227] IMO A 17/Res.719 (1991) and Protocol of 1997 to Amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (MP/CONF. 3/34), preamble

[228] IMO Res A.963(23) (5 December 2003) IMO doc A 23/Res.963, para 1

[229] IMO 'Prevention of air pollution from ships – MARPOL Annex VI - Proposal to initiate a revision process' (15 April 2005) IMO doc MEPC 53/4/4.

[230] ibid 1.

[231] IMO Res MEPC.176(58) (10 October 2008) IMO doc MEPC 58/23/Add.1 annex 13, reg 12-15.

[232] MEPC 58/23/Add.1 annex 13, reg 13.7.1; reg 15.2 and reg 18.

[233] IMO Res MEPC.177(58) (10 October 2008)

[234] Shi, (n 121) 183.

[235] IMO, 'Report of the MEPC on its fifty-eighth session' (16 October 2008) IMO doc MEPC 58/23 para 4.3; IMO, 'Report of the MEPC on its fifty-seventh session' (7 April 2008) IMO doc MEPC 57/21 para 4.73

This highlights the problem previously discussed of the ability and interests of different states, especially developing states, requiring a balance in the IMO's approach.[236] Viewing the tactic of the IMO Røsæg remarks: "*The initiatives of the IMO are based on careful consideration of the practical consequences and a desire not to bring the market or equilibrium among states out of balance"*.[237] In addition to balancing issues, there is also the weight of the amendment procedure of MARPOL 73/78 as well as Annex VI, as new additions to an annex fall under the tacit amendment procedure, whereby two thirds of the parties need to accept it before it enters into force.[238] Viewing this amendment procedure, it shows that the IMO requires the consensus of its member states to develop its framework.

MARPOL 73/78 and Annex VI are essential instruments of the IMO for the regulation of greenhouse gases. In application of the IMO's mandate and their status as GAIRS their influence is not limited to the member states and applies to third parties. Though there have been multiple revisions of Annex VI, the amendment procedure itself does not support quick decisions, as there are diverse member states with different desires. The global aspect, includes developing countries not accepting of measures "*binding and equally applicable to all flag States"* as their capability or desire does not align with the IMO's design.[239] Balancing different desires with the international community and also within their own competence, covering vessel pollution to navigation, requires a very careful approach.

4.3.1 Energy Efficiency Design Index

In 2011, the resolution MEPC.203(62) amended the MARPOL Annex VI, introducing several new measures to decrease the levels of greenhouse gases.[240] Firstly, the resolution introduced changes to surveying, certificating, and controlling ships.[241] Secondly, the Energy Efficiency Design Index for new ships as well as existent ships undergoing major conversion and the

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[236] See pt 1.1 (p 3) and pt 2.3 (p 17-18) of this thesis.

[237] Røsæg 'GHG emissions from international shipping' (n 105) 74.

[238] Harrison, (n 213) 161 and 164

[239] IMO, 'Report of the MEPC on its fifty-eighth session' (16 October 2008) IMO doc MEPC 58/23 para 4.3; IMO, 'Report of the MEPC on its fifty-seventh session' (7 April 2008) IMO doc MEPC 57/21 para 4.73

[240] IMO Res MEPC.203(62) (n 19)

[241] IMO Res MEPC.203(62) (n 19) ibid ch 2

Ship Energy Efficiency Management Plan for all ships were introduced.[242] The EEDI and SEEMP were introduced following the voluntary Energy Efficiency Operational Indicator of 2009 presenting an evaluation on the performance of a fleet with regard to CO2 emissions as well as information on a ships performance with regards to fuel efficiency.[243] The EEDI and the SEEMP, in force since January 2013, embody one of the first global mandatory measure within the global shipping sector.[244]

The EEDI is a technical measure applicable to all new ships and ships undergoing major conversion of 400 gross tonnage and above, not merely engaged in a voyage within their flag states jurisdiction or sovereignty.[245] Furthermore excluded from the regulations on the attained and required EEDI are ships powered by diesel-electric propulsion, turbine propulsion or hybrid propulsion systems.[246] This exclusion is mainly based upon the straightforwardness of the EEDI formular, which is not able to take into account alternative propulsion systems.[247] The calculated EEDI is individual for each ship and indicates "*the estimated performance of the ship in terms of energy efficiency*", whilst being held against the guiding EEDI relative to the EEDI guiding Reference line held within the regulation.[248] It differs for ship types and sizes and sets out phase 0 to phase 3 with starting dates on the 1st January 2013, 2015, 2020 and 2025, establishing a time frame for reducing the factors for the EEDI relative to the EEDI reference line.[249] The reduction factor for the EEDI relative in phase 3 starting on the 1st January 2025 and onwards is up to 30%, therefore obliging a 30% increase of efficiency by 2025.[250] Should the ship fall under more than one of the different

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[242] IMO Res MEPC.203(62) (n 19) ibid reg 20.1 and reg 22

[243] IMO, 'Guidelines for voluntary use of the EEOI' (17 August 2009)IMO doc MEPC.1/Circ.684, para 4

[244] IMO, 'Improving the energy efficiency of ships' (IMO) <https://www.imo.org/en/OurWork/Environment/Pages/Improving%20the%20energy%20efficiency%20of%20ships.aspx> accessed 24.07.2023

[245] IMO Res MEPC.203(62) (n 19) ibid reg 19.1 and 2

[246] IMO Res MEPC.203(62) (n 19) ibid reg 19.3

[247] The international Council of Clean Transportation (ICCT), 'The Energy Efficiency Design Index (EEDI) for New Ships', (ICCT, Policy Update 15, 3.10.2011) 2 < https://theicct.org/sites/default/files/publications /ICCTpolicyupdate15_EEDI_final.pdf> accessed 13.08.2023

[248] IMO Res MEPC.203(62) (n 19) reg 20.1 and 2

[249] IMO Res MEPC.203(62) (n 19) reg 21 table 1 and 2

[250] IMO Res MEPC.203(62) (n 19) reg 21 Table 1

ship types, the most stringent required EEDI is applicable.[251] Supplementary regulations can exemplary be found within the 2013 *Guidelines for calculation of reference lines for use with the EEDI*[252], the 2014 *Guidelines on the Method of Calculation of the Attained EEDI for new ships*[253], and the 2014 *Guidelines on survey and certification of the Energy Efficiency Design Index*[254]. In 2014 the regulations containing the EEDI within Annex VI were amended with the Resolution MEPC.251(66) introducing new ship types such as vehicle carriers (ro-ro cargo ships), LNG carriers and cruise passenger ships.[255] Further amendment of Annex VI MARPOL occurred in 2020 in MEPC 75 relocating the starting date of phase 3 from January 2025 to the 1st April 2022 for certain ship types, including LNG carriers, container and cargo ships with non-convectional propulsion and set a 30% to 50% reduction rate for container vessels depending on their size.[256]

From the initial creation of the EEDI, the IMO developed this tool within various supplementary and additional regulations. The EEDI approaches climate change mitigation with different phases and reduction rates for greenhouse gases. Tactically the IMO takes various aspects of the shipping industry into consideration by sorting the reduction rates into different ship types as well as sizes and ascertaining different goals for each vessel, exemplary in the regulation 21 of Resolution MEPC.203(62).[257] Notable is moreover the allowance to decide within this approach, as the conduction of reaching the rates is left open. The 2020 IMO GHG Study notes the variation within the data derived from the EEDI as it can be influenced by the design efficiency of individual ships devised to fall under the requirements of the mandatory EEDI regulations, but not actually bringing a real progress to the energy efficiency.[258] This alludes to an acknowledgement pertaining the possibility to circumvent the IMO regulations. Multiple options to comply with the regulations are possible,

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[251] IMO Res MEPC.203(62) (n 19) reg 21 (4)

[252] IMO Res MEPC.231(65) (17 May 2013) IMO doc MEPC 65/22

[253] IMO Res MEPC.245(66) (4 April 2014) IMO doc MEPC 66/21

[254] IMO Res MEPC.254(67) (17 October 2014) IMO doc MEPC 67/20

[255] IMO Res MEPC.251(66) (4 April 2014) reg 21.11

[256] DNV, 'New GHG regulations for ships approved during IMO MEPC 75 meeting' (20.11.2020) < https://www.dnv.com/news/new-ghg-regulations-for-ships-approved-during-imo-mepc-75-meeting-191311< accessed 12.8.2023

[257] IMO Res MEPC.203(62) (n 19) reg 21

[258] IMO, 'Fourth IMO GHG Study 2020' (n 5) annex 1, p 243.

encompassing the use of propulsion and engine optimisation, as well as technologies for energy efficiency and the limitation of engine power.[259] Exemplary scrubbers are an allowed possibility to comply with the EEDI.[260] While the general idea behind the EEDI strives towards protecting the environmental harm, the possibility to slide by in using criticised technologies, such as the scrubbers, may reduce the success of the objective somewhat. Another point of weakness may be seen within the requirement of a "*new ship*" or a ship undergoing "*major conversion*".[261] Their exclusion of most ships might be problematic as it initiates a slow and gradual change until the old ships are taken out of account and the planned profits of the EEDI can be reaped.[262] This is reflected within the long service life of vessels, potentially reaching 30-40 years, allowing the deduction that current regulations and limits for ships build now, will define the emission levels for the next decades.[263] Remarkable is also the IMO's lack of consideration in the topicality of Biofuel. With a "*tank-to-wake*" approach, enclosing the IMO's consideration of efficiency to the carbon consent of standard reference fuel, the EEDI is not influenced by the utilization of biofuels.[264] Though the change to alternative non- or low-carbon fuels may lower the EEDI value of a ship, the energy efficiency of a ship remains unimproved and possibly even deteriorates with the weight of additional equipment and usage of low energy density fuels.[265]

There are multiple technical elements and standards to the EEDI regulations of the IMO. The reduction rate, dependant on ship size and type, is reduced within 3 phases, whereby the third phase, except for certain ship types, starts on 1st January 2025. With the open fulfilment of the requirements the shipping industry may apply different technologies and innovations in fulfilling the EEDI obligation. Comparable to the general wide approach of Annex VI

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[259] DNV, 'Energy Efficient Design Index regulations' (DNV) < https://www.dnv.com/maritime/hub/decarbonize-shipping/key-drivers/regulations/imoregulations/eexi.html#:~:text=The%20EEDI%2C%20which%20applies%20to,are%20to%20meet%20EEDI%20targets.> accessed 25.08.2023

[260] EMSA, Alternative technologies (EMSA) < https://www.emsa.europa.eu/sustainable-shipping/new-technologies.html> accessed 26.08.2023

[261] IMO Res MEPC.203(62) (n 19) reg 20.1

[262] ICCT, 'The Energy Efficiency Design Index (EEDI) for New Ships' (n 237) accessed 13.08.2023

[263] I. R. Istrate and others, 'Quantifying Emissions in the European Maritime Sector' (JRC Technical Report, 2022) EUR 31050 EN, 2

[264] DNV, 'Use of biofuels in shipping' (21.02.2023) < https://www.dnv.com/news/use-of-biofuels-in-shipping-240298> accessed 14.08.2023

[265] IMO, 'Air pollution and Energy Efficiency' (8 February 2019) IMO doc MEPC 74/5/6 para 21

MARPOL, the EEDI continues to view different capabilities and desires of the international community, with the allowance to choose how to reach the reduction rates.

4.3.2 Ship Energy Efficiency Management Plan

Beside the EEDI the IMO introduced the Ship Energy Management Plan, whereby it is mandatory for all ships to keep a SEEMP on board, which may also be a part of the ships Safety Management System (SMS).[266] The SEEMP is a ship-specific plan, with the goal of improving the energy efficiency required for all ships of 400 gross tonnage and above engaging in international voyages.[267] It aims to promote the technical cooperation, the transfer of technology and the information exchange between the states, particular for developing states.[268] It was supported by the 2016 Guidelines for the development of a SEEMP providing a potential tactic to improve the ship efficiency while optimizing the performance and the methodology for ships of 5,000 gross tonnage to collect the data required under regulation 22A MARPOL Annex VI .[269] Further guidelines were adopted in 2022 with the resolution MEPC.346(78) introducing the 2022 Guidelines for the development of a ship energy efficiency management plan.[270] Within these guidelines the structure of a SEEMP was elaborated, with three parts containing the provision of an approach to monitor and increase the efficiency of ships over time for ships of 400 GT and above in part I, the description of methodologies uses while collecting data for ships of 5,000 GT and above in part II and the calculation of a carbon intensity indicator for ships of 5,000 GT with some exceptions in part III.[271] It is notable that the SEEMP, similar to the EEDI is reliant on the collection of new technologies and data, though the SEEMP aims directly for it, while the technological development for the EEDI is more implied. With the application to all ships, the range differs

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[266] IMO Res MEPC.203(62) (n 19) reg 22.2

[267] AMSA, 'Ship Energy Efficiency Management Plan (SEEMP)' < https://www.amsa.gov.au/marine-environment/air-pollution/ship-energy-efficiency-management-plan-seemp#:~:text=A%20Ship%20Energy%20Efficiency%20Management,energy%20efficiency%20of%20a%20ship.> accessed 23.07.2023

[268] IMO Res MEPC.203(62) (n 19) reg 23

[269] IMO Res MEPC.282(70) (28 October 2016) IMO doc MEPC 70/18/Add.1, 1

[270] IMO Res MEPC.346(78) (10 June 2022) IMO doc MEPC 78/17/Add.1

[271] IMO Res MEPC.346(78) ibid para 1.3.1, 1.3.2, 1.3.3 and 1.3.4

from the EEDI pertaining to new and majorly converted ships.

4.3.3 Data Collection System

With the Resolution MEPC.278(70) in 2016 as an amendment to MARPOL Annex VI, the IMO Ship Fuel Oil Consumption Database was introduced with the Data Collection System (DCS).[272] The Regulation 22A MARPOL Annex VI was added, requiring all ships of 5.000 gross tonnage and above, from the year 2019, to collect data, specified in appendix IX to Annex VI in accordance with the appropriate methodology mandatory by the SEEMP and to submit this information to the IMO Ship Fuel Oil Consumption Database.[273] The IMO Ship Fuel Oil Consumption Database has taken a module within GISIS.[274] The required information contains the ships identity, the time period of the data, the technical characteristics of the ship, the fuel oil consumption by fuel oil type, the distance travelled and the time underway.[275] The first report on fuel oil consumption data submitted to the IMO Ship Fuel Oil Consumption Database in GISIS was released in March 2021 on the reporting year 2019, reporting on 27,221 ships in total out of a potential 32,511 (83.7%).[276] Within the reporting year 2021 this number rose to 85.4% with 28,171 ships out of a potential 32,998 ships, featuring 94.4% of the ships that fell under the scope of reg. 27 of Annex VI MARPOL.[277] The DCS is another step by the IMO to collect data and observe the shipping sector in matters of greenhouse gas emissions. Notable is that the DCS emerged shortly after the EU's regulation 2015/757 introducing the accurate monitoring, reporting and verification of carbon dioxide emissions and of other relevant information from ships.[278]

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[272] IMO Res MEPC.278(70) (28 October 2016)

[273] IMO Res MEPC.278(70) ibid reg 22A.1 and 9

[274] IMO, 'Global Integrated Shipping Information System (GISIS) – IMO Ship Fuel Oil Consumption Database Module' (8 March 2018) Circular Letter No.3827

[275] IMO Res MEPC.278(70) appendix XI

[276] IMO, 'Report of fuel oil consumption data submitted to the IMO Ship Fuel Oil Consumption Database in GISIS (Reporting year: 2019)' (10 March 2021) IMO doc MEPC 76/6/1 para 9

[277] IMO, MEPC 79/6/1 ibid para 8.2

[278] Council Regulation (EC) 2015/757 of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport, and amending Directive 2009/16/EC (EC Regulation) (2015) OJ L 123/55,

4.3.4 Energy Efficiency Existing Ship Index and Carbon Intensity Indicator

In 2021 Annex VI MARPOL was revised by the Resolution MEPC.328(76), entering into force in November 2022.[279] Measures adopted hereby, encompassed the Energy Efficiency Existing Ship Index (EEXI) and the Carbon Intensity Indicator (CII).[280] The EEXI was introduced by the initial 2018 IMO GHG Strategy as a candidate short-term measure.[281] It is applicable for all ships and sets a reduction factor based upon the ships type and size.[282] The EEDI and the EEXI look somewhat similar, with the main difference being that the EEDI is applicable for new ships, while the EEXI also covers existent ships. The EEXI, identically to the EEDI, does not take biofuels into account.[283] The attained EEXI is individually calculated for each ship, specifying its energy efficiency verified by the competent authority.[284] There will be a review of this regulation by January 2026.[285]

Alongside the EEXI, Resolution MEPC.328(76) presented the Operational Carbon Intensity with the Attained annual operational carbon intensity indicator (attained annual operational CII).[286] With the conclusion of the year 2023 and at the end of the succeeding year, all existent ships of 5,000 gross tonnage and above are obliged to determine the attained annual operational CII over a 12-month period spanning from January to December, with a three month deadline to report it to the competent administration.[287] The attained CII determines the rating of A, B, C, D or E indicating their performance level with A meaning major superior, E being an inferior performance level and C being the value equal to the required annual operational CII set by the IMO.[288] In case a ship is appraised as D for three successive years or as E, it is mandated to create a plan of corrective action with the aim of reaching the required level of C in accordance with a revised SEEMP .[289] The CII will also be reviewed by

[279] IMO Res MEPC.328(76) (17 June 2021) IMO doc 76/15/Add.1

[280] IMO Res MEPC.328(76) ibid, reg 23 and 28

[281] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 4.7

[282] IMO Res MEPC.328(76) (17 June 2021) IMO doc 76/15/Add.1, reg 25 table 3

[283] DNV, 'Use of biofuels in shipping' (n X) accessed 14.08.2023

[284] IMO Res MEPC.328(76) (17 June 2021) IMO doc 76/15/Add.1, reg 23.1

[285] IMO Res MEPC.328(76) ibid.1, reg 25.3

[286] IMO Res MEPC.328(76) ibid, reg 28

[287] IMO Res MEPC.328(76) ibid, reg 28.1 and 2

[288] IMO, Res MEPC.328(76) (17 June 2021) IMO doc 76/15/Add.1, reg 28.6

[289] IMO, Resolution MEPC.328(76) ibid, reg 28.7 and 28.9

1st January 2026.[290] The EEXI and the CII both introduce measures applicable for existent ships, allowing a more short-term measure in comparison to the slowly extending EEDI. 2023 is the first year of data collection for the EEXI and the CII, whose numbers will in addition with the information of the EEDI and SEEMP help to continue the technological and operational advance for the IMO's objective. The EEXI and the CII have been introduced beside the existent EEDI and SEEMP. They notably cover areas, uncovered by previous established regulations, including existent ships by the EEXI and a new categorization system of the CII. Both measures contain technical standards the realization of the aims remains within the discretion of the states.

4.4 IMO GHG Studies

Following the adoption of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships amending Annex VI of MARPOL 73/78, the Resolution 8 of the conference of the parties of MARPOL 73/78 on CO2 emissions from ships requested the completion of a GHG study to estimate the relative levels of CO2 emissions of ships.[291] Since the first IMO GHG study in 2000, three further IMO GHG studies have been published. The first IMO GHG study from 2000, concluded on various points presenting the world's total consumption of marine CO2 emissions at 1.8 and suggesting operational and technical measures to reduce further GHG emissions through international standards for new and perchance also for existent vessels.[292] These amendments to existent processes should be taken under consideration of the "*objectives of the safety*" and the "*environmental regime*" as the IMO strives for a balance between.[293] In 2009, the second IMO GHG study estimated shipping at 2.7% of global emissions, further referring to operational and technical measures as well as a number of plausible policies such as a limit on the EEDI.[294] The third GHG study

[290] IMO, Resolution MEPC.328(76) ibid reg 28.11

[291] 'Consideration and adoption of resolutions and recommendations and related matters' MARPOL 73/78 Conference of the parties (22 October 1997) IMO doc MP/Conf. 3/35, resolution 8.

[292] IMO, 'Study of Greenhouse Gas Emissions from Ships' (March 2000) Final Report to the International Maritime Organization, Issue no. 2 – 31 March 2000, 8 and 9

[293] IMO, 'Study of Greenhouse Gas Emissions from Ships' (March 2000) Final Report to the International Maritime Organization, Issue no. 2 – 31 March 2000, 9

[294] IMO, 'Prevention of Air Pollution from Ships - Second IMO GHG Study' (9 April 2009) IMO doc MEPC 59/INF.10, annex, 7

in 2014 held the annual global total at 3.1%, offering an inventory of GHG emissions and non-GHG emissions from 2007 to 2012 and providing predictions up to 2050.[295] The most recent fourth IMO GHG Study of 2020 held the annual total shipping emissions at 2.89% in 2018 predicting a rise of 90-130% of the 2008 annual emissions in the timespan to 2050.[296]

These IMO studies show a consistent rise of global annual CO2 emissions with warning predictions that the emissions will continue to grow. As some estimate the numbers to grow up to 10 – 13 % within the forthcoming decades the urgency of the topic in question is noted.[297] The IMO GHG studies are within their objective to find a balanced solution between the state parties' interests and the environmental protection aspect. In front of these deliberations, it might be possible to estimate the study as neutral, opposed to more sectoral studies, exemplary the more political and economic interest based European Union.[298] In general the estimation and analysation of GHG emission data within study's offers an informational base for subsequent regulatory and policy work of the IMO and helps to view emissions from shipping within a broad context and next to future scenarios and predictions.[299] While the IMO GHG studies mainly provide background information, their data supports the establishment of subsequent measures and is therefore of foundational value and an important scientific source for the establishment of an reliable global legal framework.

4.5 IMO GHG Strategies

4.5.1 Initial 2018 IMO GHG Strategy

Beside the informational background of the IMO GHG studies and the mandatory and voluntary requirements from different IMO measures, the IMO released the strategic intentions within their initial IMO Strategy on Reduction of GHG Emissions from Ships of

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[295] IMO, 'Reduction of GHG emissions from ships – third IMO GHG Study' (25 July 2014) IMO doc MEPC 67/INF.3, para 1.1 and 5.1.

[296] IMO, 'Fourth IMO GHG Study 2020' (n 5) 1 and 4.

[297] King (n 10) accessed 20.07.2023

[298] see pt 2.2 and pt 4.1 of this thesis.

[299] IMO, 'Existing IMO Activity related to reducing GHG emissions in the shipping sector' ISWG-GHG (21 February 2017) IMO doc ISWG-GHG 1/2, para 18

2018 (initial 2018 IMO GHG Strategy) in their Resolution MEPC.304(72).[300] The 2018 IMO GHG Strategy, revised in 2023, is considered the first "*milestone*" within the "Roadmap for developing a comprehensive IMO Strategy on reduction of GHG emissions from ships" as it was agreed upon within the MEPC 70.[301] There are three objectives of the initial 2018 IMO GHG Strategy. The first objective contains the IMO's impact to the effort of the global community, namely the goals within the 2015 Paris Agreement and the SDG 13 of the UN 2030 Agenda for Sustainable Development, in reducing Greenhouse gases from the international shipping sector.[302] Beside their contribution to the global efforts, the aim is to pinpoint suitable and balanced measures, particularly by facilitating advances in the context of global trade and maritime transport services.[303] The third objective ascertains the IMO's desire to proceed within the field of research, development and monitoring of greenhouse gases within the shipping sector.[304] These objectives are accompanied by the IMO's vision of "*reducing GHG emissions from international shipping and, as a matter of urgency, aims to phase them out as soon as possible in this century*".[305] The levels of ambitions contained within the 2018 IMO GHG Strategy consist of three main parts. The first addresses the regression of the carbon intensity of the ship, whilst using three phases establishes with the EEDI.[306] Secondly, the general decline of CO2 emissions from ships, with the aim of 40% reduction by 2030 and 70% reduction by 2050 in comparison to the numbers documented in 2008.[307] The last level tackles the peak and following reduction of the total annual greenhouse gases, with a decrease of 50% by 2050 and the determination to pursue stopping emissions in alignment with the goals held within the 2015 Paris Agreement.[308]

Several short-term measures between 2018 and 2023, mid-term measures between 2023 and 2030 and long-term measures beyond 2030 are listed within the strategy.[309] Short term

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[300] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1,

[301] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 1.4

[302] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 1.7.1

[303] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 1.7.2

[304] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 1.7.3

[305] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 2

[306] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 3.1.1

[307] IMO MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 3.1.2

[308] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 3.1.3

[309] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 4.1

measures proposed contain the development of the EEDI and the SEEMP, energy efficiency measures for new and existing ships, and further measures promoting data collection, research, guidelines, and international collaboration.[310] Certain measures, notably the EEXI, have been adopted following the strategies proposal. As mid-term measures the MEPC projected alternative low-carbon and zero-carbon fuels, energy efficiency measures to increase the efficiency performance, market-based measures and the development of technical cooperation and capacity-building activities.[311] With the MEPC 76 the Work Plan to Progress development of mid- and long-term GHG reduction measures in line with the Initial IMO Strategy on Reduction of GHG Emissions from Ships was adopted in 2021 introducing the three phases of collation and initial consideration, assessment and development of measures.[312] Lastly long-term measures were listed, proposing long-term development and provision of zero-carbon or fossil-free fuels to and the creation and adoption of new measures to reduce GHG emissions.[313] The indication towards alternative low-carbon and zero-carbon fuels did not stand alone. With the introduction of a *well-to-wake* assessment, the IMO considers the products impression on the environment over the full life-cycle of the vessel.[314]

The initial 2018 IMO GHG Strategy is the first milestone of the IMO to reduce GHG emissions and mitigate climate change. It contains their ambition to set certain limits of CO2 emissions and considers potential short- mid- and long-term measures to do so. The initial IMO strategy notably initiated the EEDI and the SEEMP, though as expounded previously both of these measures are very widely applicable and allow a lot of discretion for the parties they apply to. The failure to introduce market-based measures is also interesting when viewing the EU's success to implement such measures.[315]

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[310] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 4.7

[311] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 4.8

[312] IMO, 'Workplan for the development of mid- and long-term measures as a follow-uo of the initial IMO Strategy on Reducing GHG emissions from ships' IMO doc MEPC 76/15/Add.2, annex 14

[313] IMO Res MEPC 304 (72) (13 April 2018) IMO doc MEPC 72/17/Add.1, para 4.9

[314] IMO, 'The application of LCA guidelines' Intersessional Meeting of the WG on reduction of GHG emissions from Ships (ISWG-GHG) (12 May 2023) IMO doc ISWG-GHG 15/3/3 para 4

[315] See pt 3.4 (p 30) of thesis.

4.5.2 2023 IMO GHG Strategy

The initial 2018 IMO GHG Strategy was revised with the resolution MEPC.377(80) on the 7th July 2023.[316] The 2023 IMO GHG Strategy's objective mirrors the aims of the initial 2018 IMO GHG Strategy as does its vision.[317] Its levels of ambition includes four parts. The first ambition is the enhancement of the EEDI to reduce the carbon intensity of ships.[318] The second level addresses the decrease of the carbon intensity in the shipping sector by at least 40% by the year 2030, in comparison to the levels documented in 2008.[319] This is followed by the endorsement and increase of at least 5% to 10% of zero or near-zero GHG emission technologies, fuels and/or energy sources within the global shipping sector.[320] Their ambitions are concluded by the goal of reaching net zero GHG emissions "*by or around*" 2050, under consideration of the circumstances of the state parties, to continuously pursue the aims of art. 2 of the 2015 Paris Agreement.[321] Two indicative checkpoints have been introduced for their ambition to reach net zero within the global shipping sector. The first checkpoint is the reduction of the total annual greenhouse gas emissions from the global shipping sector by at least 20%, endeavouring for 30%, by 2030, in comparison to 2008.[322] The second checkpoint is the decrease of the total annual greenhouse gas emissions from the global shipping sector by at least 70%, endeavouring for 80%, by 2040, in comparison to 2008.[323] Observing these ambitions and checkpoints, there are various differences, or perhaps enhancements, found within the 2023 IMO GHG Strategy. A very stark difference to the initial strategy can be found within the checkpoints, setting a percentage for 2030 and 2040 with the final goal "*by or around*" 2050 to reach net zero emissions. Noticeable is furthermore the setting of an actual percentage for increasing of zero or near-zero GHG emission technologies, fuels and/or energy source. Whilst the review of short-term measures will be concluded by the 1st January 2026, there were a variety of mid-term measures proposed.[324] There is the reference to the development of the basket of mid-term measures comprised of a technical and an economical

[316] IMO Res MEPC.377(80) (n 18).

[317] Ibid para 1.10 and 2.

[318] Ibid para 3.3.1.

[319] Ibid para 3.3.2.

[320] Ibid para 3.3.3.

[321] Ibid para 3.3.4.

[322] Ibid para 3.4.1.

[323] Ibid para 3.4.2.

[324] Ibid para 4.3.

element with the purpose of endorsing the energy transition and offering the world fleet a "*needed incentive while contributing to a level playing field and a just and equitable transition*".[325] Further candidates for mid-term measures contain informed policymaking as well as supporting globally available technologies, fuels and energy sources to reach zero or near-zero GHG emissions.[326] Thereby included is the development of well-to-wake GHG emissions of fuels attended to within the IMO's Guidelines on Life cycle GHG intensity of marine fuels of Resolution MEPC.376(80) (LCA guidelines).[327] The proposed market-based measures have been discussed several times, with MEPC 57 even reflecting on the form and nature of these measures though no final regulation has been adopted.[328] Reflecting upon the failure of the IMO to implement market-based measures, it is interesting to note that the 2023 IMO GHG Strategy returns to it once again, considering GHG emission pricing mechanism.[329] Reason for the lacking system within the IMO can potentially be blamed upon the global position of the IMO. As it is an international organization with states of different capabilities, e.g. developing states, the introduction of a pricing system is certainly tricky. Moreover, the IMO requires the consent of the different states, making the process more complicated due to the involvement of these states with different capabilities.

Differing from the initial 2018 GHG Strategy, the 2023 Strategy considers the impacts on states, in particular the different needs of developing countries.[330] Discussed in the above, there are various hurdles for developing countries in their capability or even desire to keep up the emerging measures to reduce greenhouse gases. As certain measures have been rejected before, exemplary the 2003 Resolution, the IMO continues to balance different interest of the global community.[331] The 2023 IMO GHG Strategy proposes several adaptions to the initial 2018 IMO GHG Strategy and with differing percentages for 2030 and 2040 as well as the net zero aim in 2050, the IMO sets the bar much higher than before. However, in the 2050 goal, the language stating "by or around" leaves not a strict limit to pursue. In addition, there are

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[325] IMO Res MEPC.377(80) (n 18) para 4.5.

[326] Ibid para 4.9.

[327] Ibid para 3.2

[328] IMO, 'Report of the MEPC on its fifty-seventh session' (7 April 2008) IMO doc MEPC 57/21 4.77

[329] IMO Res MEPC.377(80) (n 18) para 4.5.

[330] IMO Res MEPC.377(80) (n 18) para 4.10.

[331] IMO, 'Report of the MEPC on its fifty-eighth session' (n X) para 4.3; IMO, 'Report of the MEPC on its fifty-seventh session' (n X) para 4.73

also allowances for states, particularly devoting states, within this strategy. The 2023 Strategy reflects the general IMO approach of introducing measures, very open to the discretion of the global community. It is arguable, that the ambition of the IMO is lacking, as they are careful in their approach to not cause disbalance within the global community. Beside these points, there is also the raised ambition by introducing checkpoints within the 2023 Strategy. Though the 2023 IMO GHG Strategy may be considered open for the states discretion whilst viewed next to the EU's approach, the strategy also shows a clear development from the initial 2018 IMO GHG Strategy.

4.6 The European Union

The main difference between the EU and the IMO approach towards reducing GHG emissions, can be seen in the dissimilarity of their measures. Much more detail and a direct implementation are featured within the EU that seemingly lack within the measures of the IMO. Reflecting on the measures of the IMO shows technical inclined measures like the EEDI and the SEEPM, though certain operational measures like the DCS also exist. These measures do not give any detail on the implementation, leaving it open to different solutions in achieving their requirements.[332] One may additionally compare the IMO and the EU to the point that we consider the type of language they use, as the EU sets very clear limitations while the IMO takes a much more open approach in the achievement of their aims. The EU exemplary uses "by at least"[333] within their Strategy, whilst the IMO's 2023 IMO GHG Strategy allows "by or around".[334] Here it is observable that the EU sets their targets much more precisely that the IMO, meaning that the IMO leaves more discretion to actually favour the shipping sector not delivering their goals in time. Both stimulate the development of new and sustainable fuels, technologies, and energy sources, although the EU system displays much clearer and stricter aims, exemplary by rising the demand of renewable and low-carbon fuels with the FuelEU initiative.[335] Viewing the tactic of the IMO Røsæg remarks: "The measures have a remarkable technical profile, as with most IMO instruments. Perhaps it is fair

[332] See DNV, 'Energy Efficient Design Index regulations' (DNV) (n X) accessed 30.08.2023

[333] European Commission, ''Fit for 55': Delivering the EU's 2030 climate target on the way to climate neutrality' COM (2021) 550 final, 1.

[334] IMO Res MEPC.377(80) (n 18) para 3.3.4

[335] European Commission, SWD(2021) 228 final (n 87) 9

to say that the IMO has an engineering approach, while the approach of the EU is more political and economic".[336] Technical measures can be seen within the different formulars, and methods found within the EEDI and the EEXI. Meanwhile, the EU introduced the EU ETS where they take up a very sensitive issue, namely the pricing of GHG emissions and interfering with the market of shipping.[337] Comparing the plans for market-based measures by the IMO no success has been documented, as the 2023 IMO GHG Strategy reflects upon it once again.[338] Potentially these differences in the measures may be drawn from the different members they are applicable to. The EU acts as a regional actor and assumedly has more freedom to decide on sensitive matters, such as pricing GHG emissions. Moreover, the EU acts as a port state through their members, applying their measures in a wider scale. This would mean that the EU can provide a system for reducing GHG emissions, the IMO cannot reach as they are a global organization. Their global status and the required consensus needed to amend their regulations and policies, implies lesser ability to change their approach without the support of their members.[339] As the IMO is very conscious on the principle of common but differentiated responsibilities and the different capabilities, the IMO has to balance the necessity to reduce GHG emissions with the ability and desires of states. This may be seen within the 2023 IMO GHG Study featuring barriers and supporting actions for developing countries.[340] Though some similarities of the approaches may be observed in the parallel running data collection systems and the introduction of well-to-wake assessments, the background of the EU and the IMO are different. The EU has the monetary ability and support of member states to develop alternative fuels, energy sources and technologies, whilst also introducing sensitive measures such as GHG emission pricing. Their measures can, in reflection of their ability, be more stringent and decisive to regulate GHG levels in shipping, even bring rising costs in achieving these aims. Observing the IMO's approach next to the more regional based approach of the EU, shows certain similarities. While the measure themselves are very relatable and could be considered the same, the actual application and implementation of them differs.

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[336] Røsæg 'GHG emissions from international shipping' (n 105) 74.

[337] Eftestøl, 'The proposed extension of the EU-ETS to shipping' (n 107) 323.

[338] IMO Res MEPC.377(80) (n 18) para 4.5.

[339] See Harrison, (n 213) 161 and 164.

[340] IMO Res MEPC.377(80) (n 18) para 5.

4.7 Conclusion

GHG emission are a global issue and acknowledged as a threat within the international community. The reduction of these emissions and thereby the mitigation of climate change is thus a global concern. Based upon the competence of the IMO under MARPOL 73/78 we have an international instrument for reducing GHG levels of the shipping industry. At the same time, this framework includes developing states which sometimes disagree with the proposed actions speaking against measures "*binding and equally applicable to all flag States"*.[341] Their disagreement is of significance, because the IMO requires consensus to implement further amendments and changes to the existent framework of regulating GHG emission. The IMO uses different measures within their approach of reducing GHG emissions from ships. Measures in relation to energy efficiency of ships include the EEDI, the SEEMP, the EEXI and the CII with multiple technical elements and standards. Looking at the IMO's measures it is noticeable that it's possible to fulfill the requirements of measure obligations even with criticized technology, exemplary scrubbers, as there is no clear direction on how to implement them.[342] After the initial 2018 GHG Strategy as a "milestone" containing certain limits and measures, the revised 2023 IMO GHG Strategy brought forward the current ambitions of the IMO.[343] There are multiple differences visible when comparing the two strategies, though the main difference may be the 2023 Strategy introduces higher ambitions, including checkpoints which will come up soon. Viewing the IMO next to the EU gives an interesting comparison towards their different abilities and goals. However, the EU gives sample to different measures which may be of interest for future IMO measures.

The IMO's approach and framework for climate change contains multiple measures, strategies and studies. Within it they are very mindful to not cause disbalance within the global community by consideration of states different capabilities, while also striving towards reducing GHG levels in the shipping sector and climate change mitigation. With the new 2023 IMO GHG Strategy new ambitions were raised, containing checkpoints towards their goals.

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[341] E.g. IMO, 'Report of the MEPC on its fifty-eighth session' (n X) para 4.3; IMO, 'Report of the MEPC on its fifty-seventh session' (n X) para 4.73

[342] EMSA, Alternative technologies (EMSA) < https://www.emsa.europa.eu/sustainable-shipping/new-technologies.html> accessed 26.08.2023

[343] IMO Res MEPC.377(80) (n 18).

CHAPTER 5: CONCLUSION

Climate change is undoubtedly causing global consequences to the environment, given the rising temperatures and ocean, and the deterioration of marine life. The shipping industry contributes to this deterioration, as more than half of the total global GHG emissions consists of CO2 derived from human activity, in particular the persistent usage of fossil fuels.[344] Should GHG levels continue to rise, they are expected to grow beyond the limits of the 1.5°C mark within the 2015 Paris Agreement alongside further damage to the ocean's ecosystem and biodiversity.[345] The rapid deterioration of the environment is reportedly predicted to have heavy and long-term effects. Shipping's current contribution comprises around 3% of global GHG emissions, though future estimations show the possibility of an increase up to 13%.[346] Suggested sustainable options for the shipping sector may be found in fuel alternatives such as biofuels, innovations like scrubbers and carbon sequestration as well as different measures ranging from fuel assessment to influencing the market with market-based measures.[347] However, utilizing these options requires reflection upon their limits as well as the limits of implementing states, such as availability and capability.

The international legal framework for climate change mitigation in the shipping sector outside the IMO's competence is combined of various regulations and policies. The 1992 UNFCCC provides a basic but important foundation by providing the global ambition to act collectively towards stabilizing the GHG emissions, while reflecting on the principle of *common but differentiated responsibilities* and the respective capabilities of states. [348] While there is no mention of shipping within the 2015 Paris Agreement, the IMO refers to its temperature limits inside their own approach, thereby implementing it into their own framework.[349] The framework is moreover accompanied by further regulations and policies, such as the SDG 13 of the UN. Within the law of the sea, though debated, this author concluded that GHG emissions fall under the term of *pollution* held in art. 1 (4) UNCLOS.[350] Whilst general

[344] Kuramochi and others (n 9) 7.

[345] UNGA Res 70/1 (25th September 2015) UN doc A/RES/70/1, Goal 13

[346] King (n 10) accessed 30.08.2023

[347] See pt 2.3 (p 14 ff) of this thesis.

[348] 1992 UNFCCC preamble and art 2

[349] IMO Res MEPC.377(80) (n 18) preamble.

[350] Doelle, (n 162) 322

provisions of part XII UNCLOS, supplemented by soft law, offer some obligations towards the protection of the marine environment, the import of UNCLOS for reducing GHG emissions in the shipping sector, is mainly within the distribution of authority between flag and coastal states as well as in the reference to the IMO as the *competent international organization*.[351] Within these treaties, there is the general recognition that actions against climate change and the rising GHG emissions, are necessary. Within them the global objective to collectively act against this crisis is illustrated, even setting certain limits like the limitation of the Paris Agreement. Their value to the framework of reducing GHG emissions within shipping is more foundational, as some of them do not apply, whilst others contain no specific regulations for the matter.

Based upon the competence of the IMO under MARPOL 73/78 we have an international instrument for reducing GHG levels of the shipping industry. At the same time, this framework includes developing states which sometimes disapprove of the proposed actions speaking against measures "binding and equally applicable to all flag States".[352] Balancing these states with the ambition to reduce GHG emissions of shipping, the IMO often seems to take a wider approach within their measures. The IMO introduced multiple technical elements and standards to shipping, encompassing the EEDI, the SEEMP, the EEXI and the CII. These measures do not give any detail on their implementation, leaving it open to different solutions in achieving the requirements.[353] Observing the DCS and the IMO GHG Studies, they exist as an important scientific source for the establishment of an international legal framework by mainly providing background information and supporting the forming of subsequent measures. After introducing the initial 2018 GHG Strategy as a "milestone" containing certain limits and measures, the revised 2023 IMO GHG Strategy brought forward the current ambitions of the IMO.[354] Within the 2023 IMO GHG Strategy the implementation of measures remains mostly undefined and open to the discretion of the states. Hereby one might argue that this implies a lack of progress from the initial 2018 IMO GHG Strategy. There still is a reliance upon the balancing required for the IMO to implement new measures. Though

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[351] Ringbom, (n 131) 131

[352] IMO, 'Report of the MEPC on its fifty-eighth session' (16 October 2008) IMO doc MEPC 58/23 para 4.3; IMO, 'Report of the MEPC on its fifty-seventh session' (7 April 2008) IMO doc MEPC 57/21 para 4.73

[353] See DNV, 'Energy Efficient Design Index regulations' (DNV) (n X) accessed 30.08.2023

[354] IMO Res MEPC.377(80) (n 18).

with the introduction of checkpoints, the IMO stepped into the other direction. The checkpoints show the rise in ambition within the IMO, as the mere stating of the goal is no longer enough and certain points within the reduction of GHG emissions should be reached, making their new approach more decisive. The main difference when comparing the EU and the IMO approach is within the implementation of measures and the respective backgrounds. As the IMO has to balance certain expectations and ambitions, their framework is much more considerate and reliant upon the states, including developing states. The IMO and the EU are both using technical and operational measures, differences arise not from the nature of the measure, but from the way the rules are implemented and whom they concern. The EU can tackle sensitive issues, like putting a price on GHG emissions, by implementing market-based measures and acts as a port state, widening the influence of their system. The IMO is meanwhile struggling with balancing and consensus. There is also the monetary backing to contemplate, as the EU pricing measures may be too expensive for less developed states.

Though the IMO keeps referring to the goal of the 2015 Paris Agreement, the possibility to reach it with the existent regulatory and policy framework may be debatable. In viewing the EU next to the IMO the differences are prominent, though using the EU, especially in respect to their introduction of market-bases measures, as a leading example might help the IMO to improve their own approach. Reflecting on the IMO within the international legal framework for climate change mitigation, allows certain appreciation. The general climate change regime, outside the IMO, leaves the marine environment open and rather vulnerable, as little detailed standards and rules exist within shipping to safeguard them beside the foundational objectives and limits of the 1992 UNFCCC and the 2015 Paris Agreement. The IMO may be criticised for their approach in some respects, but they do use their mandate to tackle the reduction of GHG emissions. In doing so the IMO strives to remain considerate of all states. Viewing the IMO as a global organization their current regulatory and policy frame is not quite where one would expect it in face of all the climate change consequences. While consideration is visible, the crisis part of climate change seems forgotten. The new 2023 Res provides some hope with checkpoints and a seemingly raised ambition towards their aim. As their measures are criticised as slow one must consider the time required. And as the IPPC alerts us: "*the time for action is now."*[355]

[355] IPCC (n 1).

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