



# THESSISMUN

THESSALONIKI INTERNATIONAL STUDENT  
MODEL UNITED NATIONS

## INTERNATIONAL MARITIME ORGANIZATION (IMO)

*Topic area A: “Broadening the scope of the Ship Energy Efficiency Regulations and Related Guidelines, considering progress made in light of the GloMEEP project”*



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## Welcoming Letter by the Chairs of the IMO

Dear aspiring delegates,

We would like to express our most sincere honor and excitement to serve as Chairs of the International Maritime Organization and in this capacity we shall cordially welcome you to ThessISMUN 2019.

We are convinced that your passion and enthusiasm towards International Relations is indisputably proven by your participation in this simulation. More specifically, your fervor to get involved in the proceedings of the International Maritime Organisation and use your ThessISMUN 2019 experience as a springboard for your further involvement in the field of international shipping, maritime safety and environmental sustainability of marine ecosystems constitutes our duty to deliver. Therefore, we pledge our full devotion on succeeding our goal, which is to facilitate your ThessISMUN and specifically, your IMO experience.

Our agenda this year contains 2 pertinent and intriguing topics of debate that range from maritime safety to energy efficiency aiming to provide the committee with an holistic view of the topics being discussed by the IMO. Regarding Topic Area A, “Broadening the scope of the Ship Energy Efficiency Regulations and Related Guidelines, considering progress made in light of the GloMEEP project”, energy efficiency has always been a crucial subject for the IMO, due to the many environmental problems that arise. Thus, our goal here is to find a way to use less energy to provide more products and performance. Topic Area B, “IMO Strategy for implementing sustainable maritime security measures in West and Central Africa.”, on the other hand is about security in the West and Central Africa; a matter that agonizes the IMO. The Organization is on high alert, in order to prevent the so-called “Somalization” of the area.

In the following Study Guide we have strived to provide you with the fundamental background information as well as summarized details and further bibliography, for those wishing to further expand their knowledge in preparation for the conference.



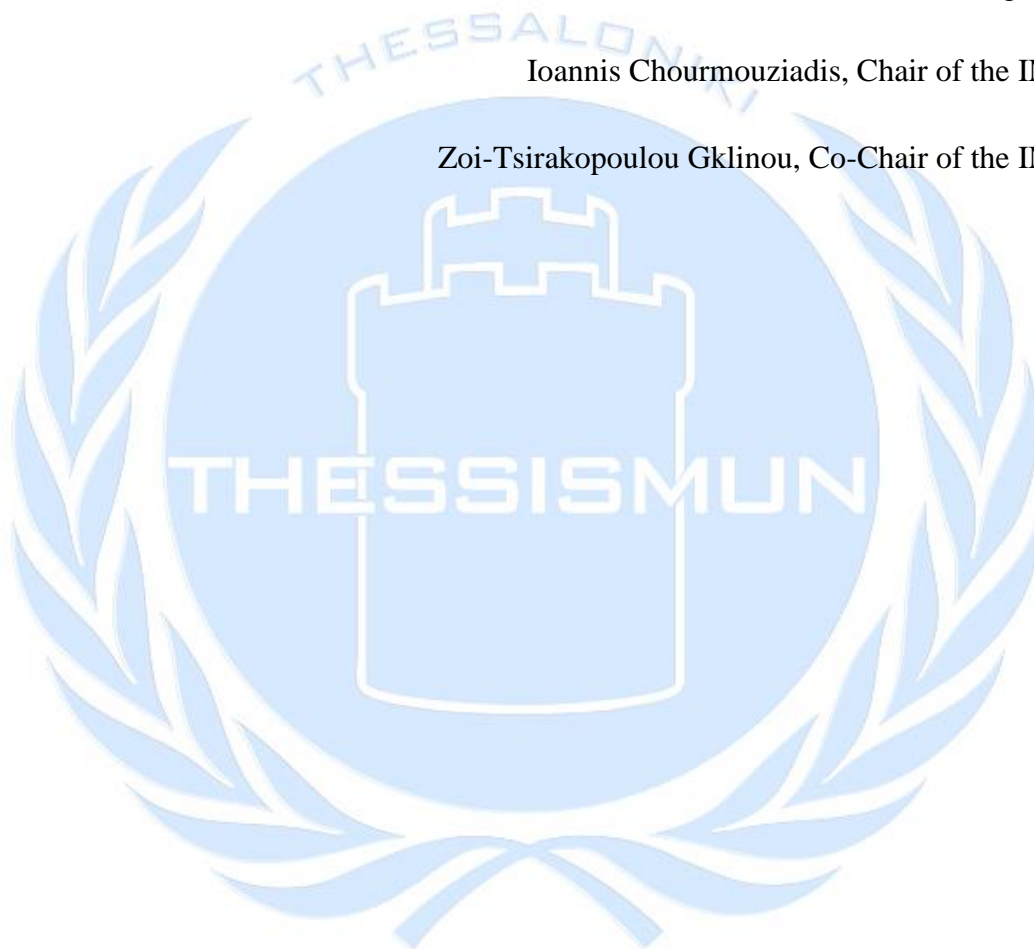
Finally, we want to ask all of you to not only carefully read this guide, but also the Rules of Procedure (RoP), as you cannot play the game if don't know the rules.

It goes without saying that we are very much looking forward to meeting each and every one of you in person; it is in these conferences where amazing memories are forged and strong friendships are built.

Kind Regards,

Ioannis Chourmouziadis, Chair of the IMO

Zoi-Tsirakopoulou Gklinou, Co-Chair of the IMO





## Mandate of the Committee

The International Maritime Organization, as a specialized agency of the United Nations, serves as the standard-setting authority on issues related to international shipping such as, but not limited to, safety, security, and environmental performance. Founded in 1948 (originally named Inter-Governmental Maritime Consultative Organization), IMO's mandate is to create a fair and effective regulatory framework designed to be universally adopted and universally implemented by the shipping industry. More precisely, the IMO's measures regulate multiple aspects of international shipping, such as ship design, manning, construction operation, equipment, and disposal in order to galvanize a safe, environmentally sound, energy efficient and secure sector.<sup>1</sup>

With a view to managing the aforementioned measures, the Organization's Member States, as well as the civil society, along with the shipping industry are working together towards a blue economy and sustainable growth. It has to be noted that the IMO's field of operations is limited in the maritime sector, meaning in the sea and the ports of every state, and thus, the Organization is not authorized to provide humanitarian assistance outside its jurisdiction. Moreover, the collaboration of the IMO with Non-Governmental Organizations (NGOs), as well as governmental ones and other specialized agencies falls under the mandate of this committee, if deemed necessary.<sup>2</sup>

Regarding the 2030 Agenda for Sustainable Development, the IMO, as a specialized agency of the United Nations has invested in the realization of the Sustainable Development Goals (SDGs). Indeed, there is an obvious interdependence between the aspirations of the 2030 Agenda and the operation of the IMO, as multiple of the SDG's cannot be achieved without a sustainable transport sector that supports world trade. While specific SDG 14, is key to the IMO, the Organization's Technical Cooperation

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<sup>1</sup> International Maritime Organization (IMO). *Introduction to IMO*. [Online].2018.[Accessed 05 December 2018]. Available from: <http://www.imo.org/en/About/Pages/Default.aspx>

<sup>2</sup> UN Office of the High Representative for the Least Developed Countries, Landlocked Developing Countries and Small Island Developing States. *The International Maritime Organization*. [Online]. 2018. [Accessed on 05 December 2018]. Available from: <http://unohrrls.org/meetings-conferences-and-special-events/international-maritime-organization>

Committee has formally approved various linkages between IMO's technical assistance work and the all the SDG's.<sup>3</sup>

As of today, the Organization numbers 171 Member States, as well as three associate members.<sup>4</sup> Its main bodies are the Assembly, where all Member States are represented, and the Council, which is the IMO's governing body and it is consisted of 40 Member States, as elected by the Assembly.<sup>5</sup>



<sup>3</sup> International Maritime Organization (IMO). *IMO and Sustainable Development Goals*. [Online]. [Accessed on 05 December 2018]. Available from:

<http://www.imo.org/en/MediaCentre/HotTopics/Documents/IMO%20SDG%20Brochure.pdf>

<sup>4</sup> International Maritime Organization (IMO). *The International Maritime Organization. What it is, What it does, How it works*. [Online]. 2018. [Accessed 12 December 2018]. Available from:

<http://www.imo.org/en/About/Documents/IMO%20general%20presentation%202016.pdf>

<sup>5</sup> International Maritime Organization (IMO). *IMO-What it is*. [Online]. 2018. [Accessed 12 December 2018]. Available from:

[http://www.imo.org/en/About/Documents/What%20it%20is%20Oct%202013\\_Web.pdf](http://www.imo.org/en/About/Documents/What%20it%20is%20Oct%202013_Web.pdf)

## Introduction

Nowadays, one of the most severe environmental challenges is climate change. It is alarming that in the past two centuries, emissions of Greenhouse Gases (GHG) deriving from human activities have resulted in a rise of 1.1°C of the planet's temperature.<sup>6</sup> As it is well known, global warming vastly affects global ecosystems, since it constitutes the main factor of ocean warming and ice melting, as well as it affects human health.

Despite the fact that the maritime sector is considered as the least polluting one in terms of size and impact since over 80% of international trade in goods is carried by sea, its importance for the global economy makes it necessary to improve the energy efficiency requirements for ships.<sup>7</sup> In this direction and, since reducing emissions from ships is a complex and multifaceted issue, the International Maritime Organization (IMO) has drafted related mandatory guidelines for its Member States. More precisely, these measures require vessels to consume a certain amount of energy, based on their type, and as a result, to reduce the percentage of their detrimental emissions. In short, IMO's guidelines include technical (Energy Efficiency Design Index (EEDI)), as well as operational provisions (Ship Energy Efficiency Management Plan (SEEMP)) that will be further analyzed.<sup>8</sup>

It has to be noted that reducing emissions from ships and therefore achieving energy efficiency entails various legal, policy and institutional changes by the States.<sup>9</sup> Consequently, the IMO, in order to support states in their effort, has launched GloMEEP, a project aiming at supporting the implementation of energy efficiency measures for

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<sup>6</sup> NASA. *Global Climate Change*. [Online]. 2017. [Accessed 12 December 2018]. Available from: <https://climate.nasa.gov/evidence/>

<sup>7</sup> International Maritime Organization (IMO). *Marine Environment*. [Online]. 2017. [Accessed 12 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/Pages/Default.aspx>

<sup>8</sup> Global Maritime Energy Efficiency Partnership (GloMEEP). *Ship Emissions Toolkit. Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

<sup>9</sup> Ibid



shipping that will eventually reduce the Greenhouse Gases/the greenhouse gas concentration (GHG) of the industry.<sup>10</sup>

## Definitions

**Efficiency:** *doing more and better with less by obtaining more value with the available resources, by reducing the resource consumption and by reducing the pollution and environmental impact of the used resource for the production of goods and services.*<sup>11</sup>

**Energy efficiency:** *the one energy resource that every country possesses in abundance and is the quickest and least costly way of addressing energy security, environmental and economic challenges (operational definition).*<sup>12</sup>

**Greenhouse Gases (GHG):** *Greenhouse gases refer to carbon dioxide, nitrous oxide, methane, ozone and chloro—fluorocarbons occurring naturally and resulting from human (production and consumption) activities, and contributing to the greenhouse effect (global warming).*<sup>13</sup>

**Pollution of the marine environment:** *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.*<sup>14</sup> (UNCLOS Art. 1 par. 1 (4)).

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<sup>10</sup> Global Maritime Energy Efficiency Partnership (GloMEEP). *About GloMEEP*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://glomeep.imo.org/>

<sup>11</sup> United Nations. *Water and Energy Efficiency*. [Online]. 2014. [Accessed 12 December 2018]. Available from: [http://www.un.org/waterforlifedecade/pdf/01\\_2014\\_water\\_energy\\_efficiency.pdf](http://www.un.org/waterforlifedecade/pdf/01_2014_water_energy_efficiency.pdf)

<sup>12</sup> International Energy Agency. *Energy Efficiency*. [Online]. 2018. [Accessed 12 December 2018]. Available from: <https://www.iea.org/topics/energyefficiency/>

<sup>13</sup> The United Nations. Glossary of Environment Statistics. *Studies in Methods*. 1997, volume F, p.67

<sup>14</sup> United Nations Convention on the Law of the Sea. [Online]. 1982. 1833 UNTS, opened for signature 10 December 1982, entered into force 16 November 1994 [Accessed 12 December 2018]. Available from: [http://www.un.org/depts/los/convention\\_agreements/texts/unclos/part1.htm](http://www.un.org/depts/los/convention_agreements/texts/unclos/part1.htm)



## Historical and Factual Background

The first person to claim that the CO<sub>2</sub> concentration in the atmosphere will lead to a temperature rise was Svante Arrhenius (1859-1927)<sup>15</sup>. More specifically, after long research on the link between carbon dioxide and the great Ice Age, he, along with his colleague Thomas Chamberlin, proposed that the carbon dioxide caused by human activities could warm the Earth's surface. They also discovered that the Earth's temperature was about 15°C due to the infrared absorption capacity of water vapor and carbon dioxide. Thus, they named the phenomenon «Natural Greenhouse Effect». However, the most important thing that they suggested was that the increase in the concentration of CO<sub>2</sub> emissions in the atmosphere could lead to a 5°C rise.<sup>16</sup>

The theory of Arrhenius was not verified up until 1987. During those years it was believed that the human influence on the atmosphere was insignificant and precisely the influence of solar energy and ocean circulation. Moreover, there was a perception that the oceans would automatically cancel out every form of pollution.<sup>17</sup>

In 1980 the global annual mean temperature, viz the average temperature of the air as indicated by a thermometer, started to rise. The world panicked, people were questioning the possibility of a new Ice Age and throughout the decade the temperature curve was increasing so fast that the global warming theory actually started to make sense and won terrain fast. A plethora of environmental Non-Government Organizations (NGOs) was advocating the international community to start taking measures to prevent global warming. The press made the global warming a “hot” news topic and it went viral rapidly through pictures of smoke stags, melting ice caps and various flood events. Many people thought that the human race was at the edge of a critical climate

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<sup>15</sup> S.M. Enzler MSc. *History of the greenhouse effect and global warming*. [Online]. 2019. [Accessed on 10 January 2019]. Available from: <https://www.lenntech.com/greenhouse-effect/global-warming-history.htm#ixzz5d2mJqtTl>

<sup>16</sup> Maslin, M., *Global Warming, a very short introduction*. Oxford: Oxford University Press, 2004

<sup>17</sup> Lewis D., Scientists Have Been Talking About Greenhouse Gases for 191 Years. *Smithsonian*. [Online]. 2015. [Accessed on 10 January 2019]. Available from: <https://www.smithsonianmag.com/smart-news/scientists-talking-about-greenhouse-gases-191-years-180956146/#QZbGxiYby65Y9Px.99>

change with consequences that reach out until today.<sup>18</sup> Finally, in 1988 the world understood that the atmosphere was warmer than any other period since 1880, which led to the acceptance of the “Greenhouse Effect Theory” and the founding of the Intergovernmental Panel on Climate Change (IPCC).<sup>19 20</sup>

Due to the fact that the basis of the “Greenhouse Effect Theory” was very controversial, in 1990 scientists thought that the measurements were not carried out properly and that a number of sea data were missing.<sup>21</sup> More precisely, a vast majority of satellite records was different than the initial ones and the idea that the models of global warming have been overestimated began to grow. As a result, the IPCC reviewed its initial data and found out that 1998 was globally the warmest year on record, followed by 2002, 2003, 2001 and 1997, in that respective order. What is more, the IPCC underlined that the 10 warmest years were around 1990.<sup>22</sup>

Up until now the climate records of the IPCC are still controversial and many scientists are becoming skeptical of its conclusions. The discussions on the issue of global warming and its effects are still ongoing and data is being continuously renewed. Therefore, the IPCC is perpetually revising and adapting its models to the new findings and theories that arise.

But, how are the oceans affected by the greenhouse effect? It is true that around 90% of the planet’s heat is absorbed by the oceans and because of that, while the oceans are warming the sea levels are rising and while the water is warming it is also expanding. So the major cause of sea-level rise is exactly this expansion followed by land-based icebergs and ice sheets. During the 21st century, sea levels have increased by

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<sup>18</sup> M.D.H. Jones and A. Henderson-Sellers. History of the greenhouse effect. *Sage Journal*. 1990, volume 14, p.1-18.

<sup>19</sup> It was founded by the United Nations and the World Meteorological Organization

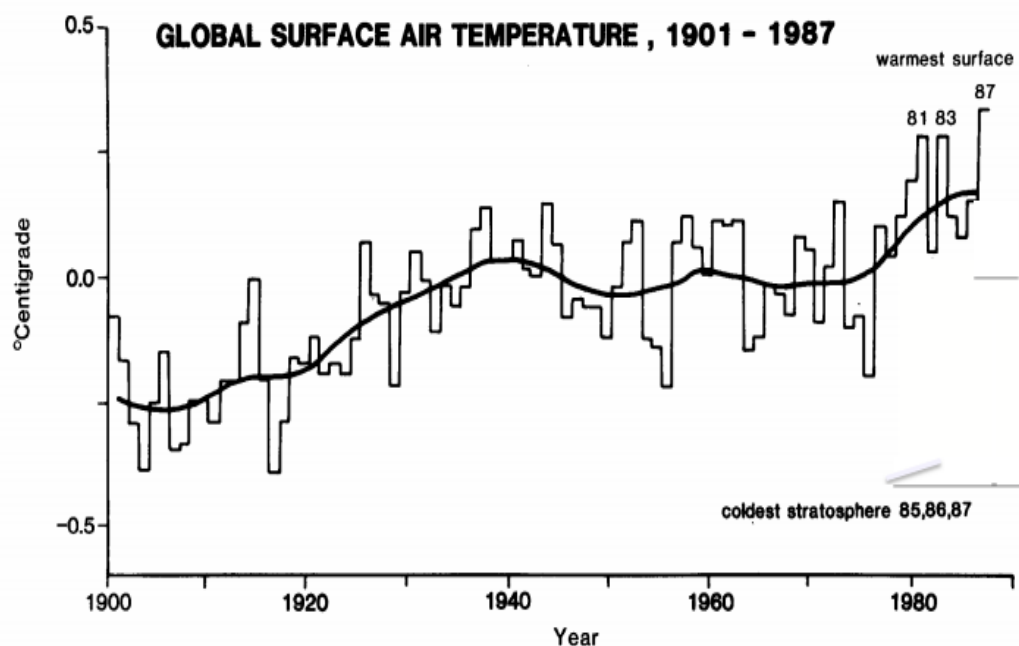
<sup>20</sup> S.M. Enzler MSc. *History of the greenhouse effect and global warming*. [Online]. 2019. [Accessed on 10 January 2019]. Available from: <https://www.lenntech.com/greenhouse-effect/global-warming-history.htm#ixzz5d2mJqtTl>

<sup>21</sup> S.M. Enzler MSc. *History of the greenhouse effect and global warming*. [Online]. 2019. [Accessed on 10 January 2019]. Available from: <https://www.lenntech.com/greenhouse-effect/global-warming-history.htm#ixzz5d2mJqtTl>

<sup>22</sup> Maslin, M., *Global Warming, a very short introduction*. Oxford: Oxford University Press, 2004

19 cm. As time passes, the whole ice melting is expected to increase heavily and as a result, many cities that are close to the ocean or the sea will drown.

Last but not least the alkalinity of the water, due to the mass absorption of the atmosphere's carbon dioxide, dissolves. Right now this effect is not so crucial but it will surely become a big problem if we continue conducting business as usual and not take action in reducing the GHG emissions. This phenomenon has the power to affect the creation of shells for a plethora of sea organisms, such as coral and some plankton and it is empowering coral bleaching which is also affected by increased ocean temperatures. Thus, there will be damaging consequences in the marine food chain for tourism and the fishing industries.



**Figure 1** Measured globally-averaged (i.e., land and ocean) surface air temperatures for this century (derived from a variety of sources see e.g., Jones *et al.*, 1988). Note that the number and distribution of observations vary very widely through the century. Note also that there are two periods of 'warming': 1915-35 and 1975 to date.

## Topic Analysis

### Emissions from Ships

Undoubtedly, ships account for a wide range of emissions that lead to different health and environmental issues. The major compounds that they release are carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), sulfur oxides (SO<sub>x</sub>), particulate matter (PM), ozone-depleting substances (ODSs) and volatile organic compounds (VOCs). In this section, with a view to achieving a better understanding of the topic area, each of the aforementioned air emissions is shortly explained.<sup>23</sup>

### Carbon Dioxide (CO<sub>x</sub>)

Carbon Dioxide is defined as a “heavy, colorless and odorless gas, naturally present in the Earth’s Atmosphere”.<sup>24</sup> It can be formed through natural processes, such as the respiration and the decomposition of organic substances, as well as by human activities and mainly through the ignition of fossil fuels. CO<sub>2</sub>, as the primer GHG traps heat in the atmosphere and thus inducing the widely known effect “global warming”.<sup>25</sup> According to the Third IMO GHG Study of 2014, international shipping accounts for 2.2% of the total emissions volume of 2014 and is expected to grow between 50% and 250% in the following thirty years.<sup>26</sup>

<sup>23</sup> Global Maritime Energy Efficiency Partnership (GloMEEP). Ship Emissions Toolkit. *Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

<sup>24</sup> Cambridge Dictionary. *Carbon Dioxide*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://dictionary.cambridge.org/dictionary/english/carbon-dioxide>

<sup>25</sup> NASA Global Climate Change. *Carbon Dioxide*. [Accessed 21 December 2018]. Available from: <https://climate.nasa.gov/vital-signs/carbon-dioxide/>

<sup>26</sup> Global Maritime Energy Efficiency Partnership (GloMEEP). Ship Emissions Toolkit. *Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)



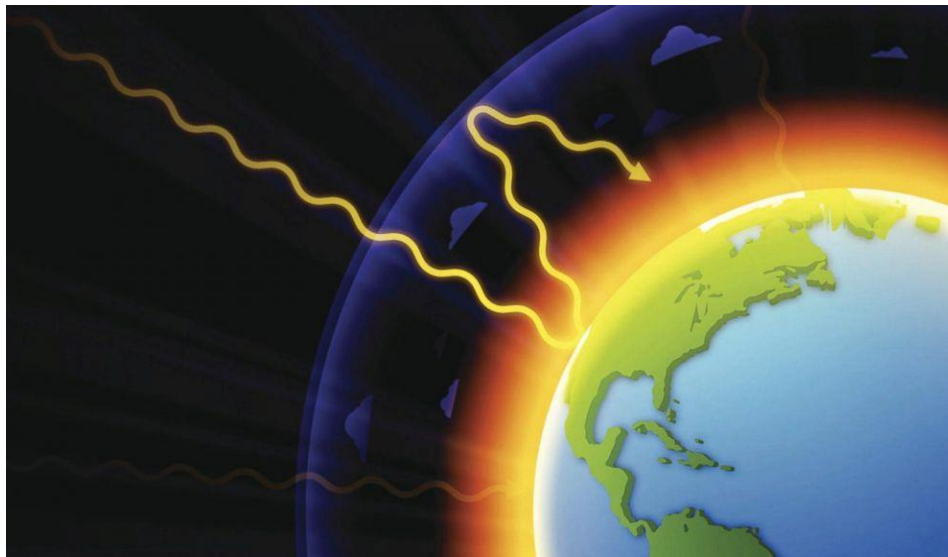


Figure 2: Sunlight reaching the atmosphere

### Nitrogen Oxide (NO<sub>x</sub>)

NO<sub>x</sub> is comprised of a mixture of gases originally composed of nitrogen and oxygen, formed as a result of a reaction amongst them under high pressure or at high temperatures, such as in engines.<sup>27</sup> These oxides are responsible for damages on marine ecosystems that can also lead to eutrophication and thus diminish the quality of water and generally have a negative impact on biodiversity. Moreover, NO<sub>x</sub> is said to be the accountant for the smog in the atmosphere.<sup>28</sup> Concerning the maritime industry, it is estimated that international shipping represents approximately 13% of global nitrogen oxides emissions produced by the human factor.<sup>29</sup>

<sup>27</sup> U.S. National Library of Medicine. *Nitrogen Oxides*. 2018. [Accessed 21 December 2018]. Available from: <https://toxtown.nlm.nih.gov/chemicals-and-contaminants/nitrogen-oxides>

<sup>28</sup> Global Maritime Energy Efficiency Partnership (GloMEEP). *Ship Emissions Toolkit. Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

<sup>29</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

## Sulfur Oxides (SO<sub>x</sub>)

SO<sub>x</sub> constitute a mixture of sulfur and oxygen molecules, which is most predominant in the lower part of the atmosphere.<sup>30</sup> As sulfur oxides are contained in the petroleum-derived fuels, they are closely connected with the petroleum operating vehicles and vessels.<sup>31</sup> According to the World Bank Group, these oxides are linked to health issues such as reduced lung function, diseases of the respiratory system, as well as premature mortality.<sup>32</sup> Moreover, the emission of such oxides is the main cause of acid rain. With regards to international shipping, the industry is estimated to produce 13% of global emissions from human sources.<sup>33</sup>

## Particulate Matter (PM)

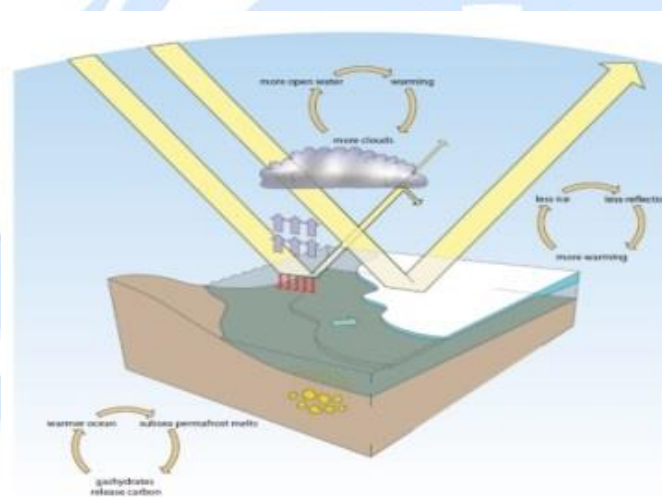


Figure 3: The Albedo Effect

Particulate Matter is a concoction of solid particles and liquid droplets found in the air. According to the United Nations Environment Program (UNEP) PM can cause breathing problems and result in lung malfunction.

<sup>30</sup> Encyclopedia Britannica. *Sulphur Oxide*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://www.britannica.com/science/sulfur-oxide>

<sup>31</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>32</sup> The World Bank Group. *Pollution Prevention and Abatement Handbook 1998: Toward Cleaner Production*. [Online]. 1998. [Accessed 21 December 2018]. Available from: <http://documents.worldbank.org/curated/en/758631468314701365/pdf/multi0page.pdf>

<sup>33</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

tioning, as well as heart diseases.<sup>34</sup> Moreover, since PMs are also comprised of black carbon, they can also be linked to global warming, as black carbon is known for its ability to directly absorb the light from the surfaces that it is found and thus to cause the snow and ice to melt.<sup>35</sup> PM, since it is often grouped together with sulfur oxides, is produced by the maritime industry as well.<sup>36</sup>

### Ozone Depleting Substances (ODSs)

Ozone Depleting Substances (ODS) refer to substances created by mankind that harm the stratospheric ozone layer, which is responsible from absorbing the radiation from the sun, and thus preventing it from getting to the planet's surface.<sup>37</sup> These substances usually lead to skin cancer, as well as they affect marine life.<sup>38</sup> The annual emissions of ODSs connected to the marine sector are estimated to be approximately 8 tons.<sup>39</sup>

### Volatile Organic Compounds (VOCs)

Volatile Organic Compounds (VOCs) constitute a group of chemicals based on carbon that evaporates easily.<sup>40</sup> They are created in events of crude oil evaporation, which occurs during loading, storage, and transportation of crude oil on ships. Methane, as a major component of the VOCs, is a strong GHG that can lead to global

<sup>34</sup> United Nations Environment Programme (UNEP). *Pollutants: Particulate Matter*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <https://www.unenvironment.org/tntunep/toolkit/pollutants/facts.html>

<sup>35</sup> Norwegian Polar Institute. *Albedo Effect*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <http://www.npolar.no/en/facts/albedo-effect.html>

<sup>36</sup> GlobalMEEP. Ship Emissions Toolkit. *Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

<sup>37</sup> Ibid

<sup>38</sup> United States Environmental Protection Agency. *Ozone Layer Protection*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <https://www.epa.gov/ozone-layer-protection>

<sup>39</sup> International Maritime Organization (IMO). *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>40</sup> United States Environmental Protection Agency. *Volatile Organic Compounds' Impact on Indoor Air Quality*. [Online]. 2017. [Accessed 21 December 2018]. Available from: <https://www.epa.gov/indoor-air-quality-iaq/volatile-organic-compounds-impact-indoor-air-quality>



warming.<sup>41</sup> According to the third IMO GHG Study of 2014, VOC emissions in 2014 reached 2.4 million tons.<sup>42</sup>

### Calculating a Vessel's Energy Efficiency

Generally speaking, achieving energy efficiency can be summarized into the idea of “providing more with less”. As a result, the IMO aims at reducing the percentage of harmful for the environment emissions of ships through a mandatory energy efficiency framework. This framework encompasses both technical (Energy Efficiency Design Index) and operational measures (Ship Energy Efficiency Management Plan) that require vessels, depending on their type, to use a specific amount of energy.

### Energy Efficiency Design Index (EEDI)

The Energy Efficiency Design Index (EEDI) is a performance-based technical measure that shall be applied, according to the IMO RESOLUTION MEPC.203(62), to all new and existing, but majorly converted, ships.<sup>43</sup> Essentially, the EEDI is aiming at the promotion of using more energy efficient, or in other words, less polluting equipment and engines for ships.<sup>44</sup> Thus, a different minimum energy efficiency level is required per capacity mile (i.e. ton-mile).<sup>45</sup> More precisely, each type of vessel has to follow a very specific level of compliance with energy efficiency that will be reducing every year, in order for less

<sup>41</sup> GlobalMEEP. Ship Emissions Toolkit. *Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

<sup>42</sup> International Maritime Organization (IMO). *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>43</sup> Maritime Environment Protection Committee. *Resolution MEPC.203(62): Amendments to the Annex of the 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 (15 July 2011)*. [Online]. 2011. MEPC 62/24/Add.1. [Accessed 12 December 2018]. Available from:

[http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203\(62\).pdf](http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203(62).pdf)

<sup>44</sup> International Maritime Organization. *Energy Efficiency Measures*. [Online]. 2017. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-and-Operational-Measures.aspx>

<sup>45</sup> Sigma Hellas Ltd. *EEDI & SEEMP*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://www.marpol-annex-vi.com/eedi-seemp>



energy to be utilized. In other words, the ships are required to use a certain amount of energy and not a specific type of machinery or technology. As a result, ship owners are incentivized to invest in researching cost-efficient solutions for building and majorly refurbishing ships.<sup>46</sup>

The impact for the marine industry is that, as all ships are obliged to use a precise amount of energy, the larger ones, which consequently are the ones producing the greatest percentage of Greenhouse Gas (GHG) emissions, are required to use less energy and thus, reduce their pollutant gases.<sup>47</sup>

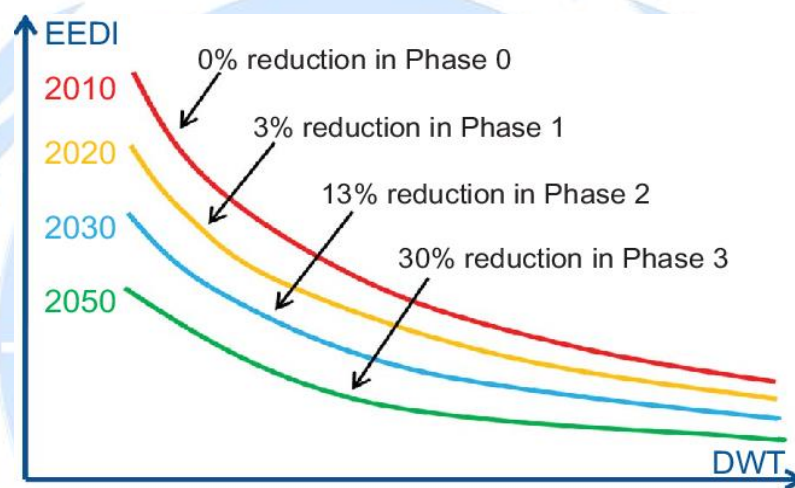


Figure 4: EEDI Reduction Phases

## Ship Energy Efficiency Management Plan (SEEMP)

The Ship Energy Efficiency Management Plan (SEEMP) refers to an operational tool, firstly introduced in IMO's RESOLUTION MEPC.203(62).<sup>48</sup> The SEEMP needs to be developed for all ships and then kept on board in all of its

<sup>46</sup> Sigma Hellas Ltd. *EEDI & SEEMP*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://www.marpol-annex-vi.com/eedi-seemp>

<sup>47</sup> International Maritime Organization. *Energy Efficiency Measures*. [Online]. 2017. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-and-Operational-Measures.aspx>

<sup>48</sup> Maritime Environment Protection Committee. *Resolution MEPC.203(62): Amendments to the Annex of the 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 (15 July 2011)*. [Online]. 2011. MEPC 62/24/Add.1. [Accessed 21 December 2018]. Available from: [http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203\(62\).pdf](http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203(62).pdf)

trips.<sup>49</sup> More precisely, this document includes all energy efficiency measures of each vessel and can, therefore, assist ship owners in abiding by the energy efficiency requirements of their ship.<sup>50</sup>

This plan is further elaborated in IMO's Resolution MEPC.213(63) "*Guidelines for the Development of a Ship Energy Efficiency Management Plan*" of 2012.<sup>51</sup> In short, the SEEMP needs to contain planning, implementation, monitoring, self-evaluation, and development. It has to be added that the first stage, planning, describes the goal setting, as well as the implementation of a specific target of Energy Efficiency Operational Indicator (EEOI), which constitutes the most common quantitative measure of energy efficiency.<sup>52</sup>

### **Data collection system for fuel oil consumption of ships**

With a view to effectively calculating a vessel's energy efficiency and thus, be able to reduce its GHG emissions, it is deemed necessary to estimate the amount of fuel oil they consume while operating.<sup>53</sup> In their efforts to do so, the Members of the IMO's MEPC decided to establish a data collection system for fuel oil consumption for ships that would operate in three stages: data collection, data analysis and decision making on further steps.<sup>54</sup> Therefore, in October 2016 the resolution MEPC. 278 (70) amended the Annex VI of the MARPOL Convention into making data collection mandatory for all ships of 5,000 gross ton-

<sup>49</sup> Sigma Hellas Ltd. *EEDI & SEEMP*. [Online]. 2018. [Accessed 21 December 2018]. Available from: <https://www.marpol-annex-vi.com/eedi-seemp>

<sup>50</sup> Ibid

<sup>51</sup> Maritime Environment Protection Committee. *Resolution MEPC.213(63): "Guidelines for the Development of a Ship Energy Efficiency Management Plan"* (15 July 2012). [Online]. 2012. MEPC 63/23. [Accessed 21 December 2018]. Available from: [http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-\(MEPC\)/Documents/MEPC.213\(63\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-(MEPC)/Documents/MEPC.213(63).pdf)

<sup>52</sup> International Maritime Organization. *Energy Efficiency Measures*. [Online]. 2017. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-and-Operational-Measures.aspx>

<sup>53</sup> Ibid

<sup>54</sup> International Maritime Organization. *Data collection system for fuel oil consumption of ships*. [Online]. 2017. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Data-Collection-System.aspx>

nage and above.<sup>55</sup> This data is concentrated by the Secretary-General of the IMO, who bears the responsibility to draft an annual report regarding the status of the fuel oil consumption.<sup>56</sup>

## Achieving Energy Efficiency

### Use of Modern Technology

A stakeholder's ship must have engines that comply with the mandatory energy efficiency standards, as underlined in the Energy Efficiency Design Index (EEDI).<sup>57</sup> Specifically, the usage of Modern Technology is profitable for three main reasons:

- It is more energy efficient and low-cost, while at the same time, it produces less CO<sub>2</sub> emissions.
- It contributes to the monitoring and to the calculation of the performance of the energy efficiency regulations.
- It can familiarize the professionals that work on the shipping industry with the energy efficiency mechanisms.<sup>58</sup>

A plethora of Modern Technology has been introduced to the shipping department, in order to ensure low-cost methods in areas, such as the day-to-day duties of maintaining a ship. For example, a propeller polishing, a water flow optimization, and hull cleaning can save enough energy to outweigh their costs. In addition to

<sup>55</sup> Maritime Environment Protection Committee. *Resolution MEPC.278(70): "Amendments to the Annex of the 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"* (28 October 2016). [Online]. 2016. MEPC 70/18. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/278%2870%29.pdf>

<sup>56</sup> Ibid

<sup>57</sup> Starcrest Consulting Group LLC, CE Delft and Civic Exchange. Study of emissions control and energy efficiency measures for ships in the port area. *Air Pollution and Energy Efficiency Studies*. 2015, p.27. [Accessed on January 13 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Air%20Pollution/Port%20Area.pdf>

<sup>58</sup> Starcrest Consulting Group LLC, CE Delft and Civic Exchange. Study of emissions control and energy efficiency measures for ships in the port area. *Air Pollution and Energy Efficiency Studies*. 2015, p.27. [Accessed on January 13 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Air%20Pollution/Port%20Area.pdf>



that, the DNV GL<sup>59</sup> has designed a program that is useful at the drafting of a Ship Energy Efficiency Management Plan (SEEMP). This program is a computer-based device that calculates the technological measures of a ship, its operational costs, and its capability for energy efficiency.<sup>60</sup> Certainly, modern technology helps a lot, when it comes to energy efficiency in ships.

### Energy Efficiency Measures in the Port Area

Ports are also very essential for reducing emissions and because of that, they are and shall continue to be, monitored. In order to efficiently monitor a port, ships must abide by the energy efficiency regulations.<sup>61</sup> Currently, the Emission Control and Energy Efficiency Measures (ECEEM) mechanism is used for the purpose of monitoring ports and divides the control measures into three main categories:

- **Equipment measures**, which target at the increase of savings and the decrease of wastes at near ports by installing new technology or by improving the current ones, for example by upgrading the boiler machine of a ship.
- **Energy measures**, which focus on using alternative types of energy, such as solar power and on the energy resources of a ship.
- **Operational measures**, that aim at increasing energy efficiency through using innovative automatic technology on ports, such as cranes or mooring systems, while at the same time, they aim at minimizing a stakeholder's cost and at protecting the environment.<sup>62</sup>

<sup>59</sup> The DNV GL is an international accredited registrar and classification society headquartered in Norway.

<sup>60</sup>International Maritime Organization. *Computer-based model to appraise the technical and operational energy efficiency measures for ships*. [Online]. 2019. [Accessed on January 13 2019]. Available from:

<http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Computer-based-model-to-appraise-the-technical-and-operational-energy-efficiency-measures-for-ships.aspx>

<sup>61</sup>Starcrest Consulting Group LLC, CE Delft and Civic Exchange. Study of emissions control and energy efficiency measures for ships in the port area. *Air Pollution and Energy Efficiency Studies*. 2015, p.27. [Accessed on January 13 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Air%20Pollution/Port%20Area.pdf>

<sup>62</sup> Starcrest Consulting Group LLC, CE Delft and Civic Exchange. Study of emissions control and energy efficiency measures for ships in the port area. *Air Pollution and Energy Efficiency Studies*.



## Maneuvering

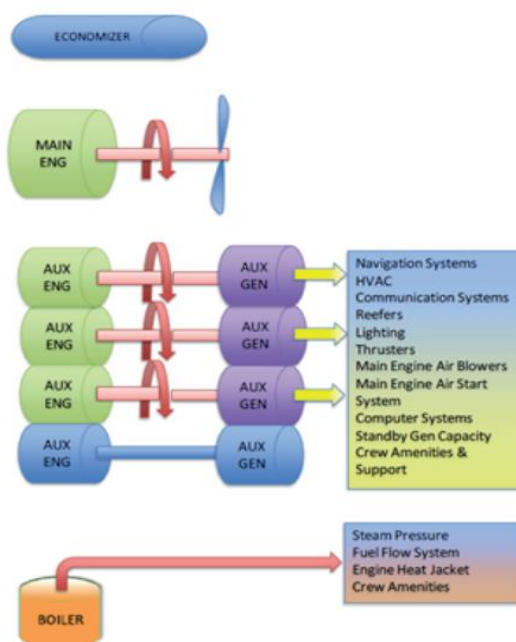


Figure 5: Vessel systems in operation

## Training for Energy Efficiency Ship Operation

It is true that in order for any plan to work, there needs to be an efficient management. In this case, there needs to be well-trained personnel, able to handle all new mechanisms introduced to the maritime sector. For this reason, in 2011, the IMO based on the resolution MEPC.203(62), adopted a number of technical and operational measures which provide an energy efficiency framework for ships.<sup>63</sup> In 2013 the World Maritime University and the IMO introduced the Train the Trainer (TTT), which focuses on training the professionals at managing and operating ships and vessels in such a way that the Greenhouse Gas (GHG) emissions are reduced. Also, the TTT aims at supporting IMO's capacity building operations,

2015, p.27. [Accessed on January 13 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Air%20Pollution/Port%20Area.pdf>

<sup>63</sup> International Maritime Organization. MEPC.203(62): Amendments to the Annex of the 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. (15 July 2011). [Online]. 2011, MEPC.203(62).[Accessed on January 13 2019]. Available from: [http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-\(MEPC\)/Documents/MEPC.203\(62\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-(MEPC)/Documents/MEPC.203(62).pdf)

that are implemented in developed countries. Moreover, due to the pedagogic nature of the program, it provides the capability for potential trainers to train their own personnel, hence, the name of the program. Last but not least, there are still modern technologies that are brought in the program, up until today.<sup>64</sup>

## About GloMEEP

### What is GloMEEP?

GloMEEP is a project by the Global Environment Finance-United Nations' Development Program (GEF-UNDP) and the IMO, that aims at assisting its members in meeting all the energy efficiency regulations for shipping, in order to minimize Greenhouse Gas (GHG) emissions deriving from this industry.<sup>65</sup>

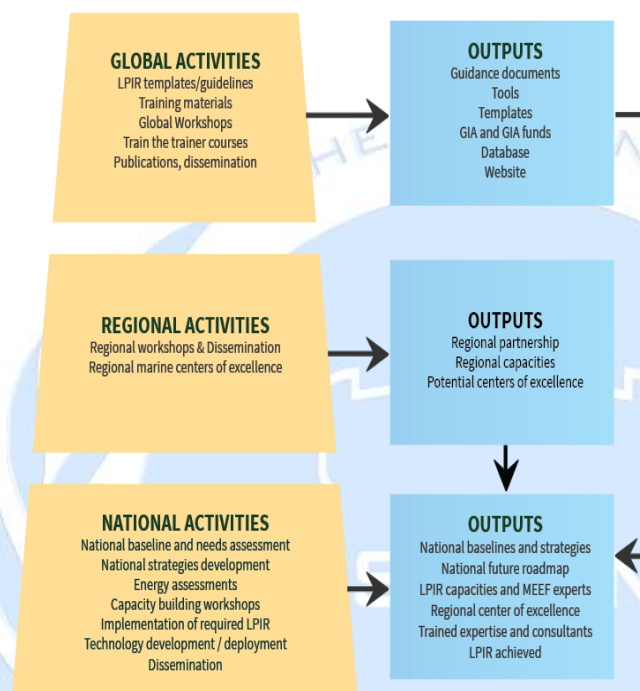


Figure 6 : GloMEEP outputs and activities

### What is the main goal of GloMEEP?

The main goal of GloMEEP is to support its *Ten Lead Pilot Countries*,<sup>66</sup> so as to reduce the Greenhouse Gas (GHG) emissions from international shipping, as well as to fully comply with the IMO's energy efficiency requirements. This can be achieved

<sup>64</sup> International Maritime Organization. *IMO Train the Trainer (TTT) Course on Energy Efficient Ship Operation*. [Online]. 2019. [Accessed on January 13 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/IMO-Train-the-Trainer-Course.aspx>

<sup>65</sup> Global Maritime Energy Efficiency Partnership. *About the Project*. [Online]. 2019.[Accessed 13 January 2019]. Available from: <https://glomeep.imo.org/about/about-the-project/>

<sup>66</sup>The *Ten Lead Pilot Countries* namely are Argentina, China, Georgia, India, Jamaica, Malaysia, Morocco, Panama, Philippines, and South Africa.

through means, such as making the necessary reforms on policies and institutions, through raising awareness and through establishing public-private partnerships.<sup>67</sup>

### **Why GloMEEP is important for the IMO?**

In order for the maritime sector to limit GHG emissions, the IMO member States in July 2011 adopted a number of technical and operational mandatory measures, namely the aforementioned EEDI for all the new ships and SEEMP. It is estimated that a fruitful implementation of the IMO's measures will drastically reduce emissions by 2050.

The importance of GloMEEP hides in the fact that it is a crucial contributor to IMO's efforts to reduce GHG emissions by:

- Enhance the policy and regulatory environments
- Know-how and human capacity developments
- Institutional capacity building
- Promoting the deployment of new technologies and processes for energy efficient ship operation.

Last but not least, the GloMEEP project plays an important and illustrative guiding role as only in 2018, GloMEEP did tremendous work on combating GHG emissions. More specifically among many other things, the program launched a number of workshops all around the world namely, Philippines, Jamaica, China, India, Panama, Malaysia Morocco, and South Africa to reduce port emissions.

## **Legal Background**

Ensuring energy efficiency and reducing emissions from ships depends on different policy areas, from maritime transport and trade to climate change and air pollution. Thus, it is covered by various policies established by different institutions. Since there

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<sup>67</sup> Global Maritime Energy Efficiency Partnership. *About the Project*. [Online]. 2019.[Accessed 13 January 2019]. Available from: <https://glomEEP.imo.org/about/about-the-project/>



are numerous international agreements and conventions addressing air pollution and Greenhouse Gas (GHG) emissions, in this section we are going to briefly summarize the most important ones for addressing the topic at hand.

### The United Nations Convention on the Law of the Sea (UNCLOS)

The United Nations Convention on the Law of the Sea (UNCLOS), as adopted in 1982 in Montego Bay, established a legal framework for the preservation and sustainable use of the world's oceans, as well as their resources.<sup>68</sup> Particularly, Articles 212 and 222 are related to the emissions from ships:

**Article 212:** *“Pollution from or through the atmosphere:*

- 1. States shall adopt laws and regulations to prevent, reduce and control pollution of the marine environment from or through the atmosphere, applicable to the air space under their sovereignty and to vessels flying their flag or vessels or aircraft of their registry, taking into account internationally agreed rules, standards and recommended practices and procedures and the safety of air navigation.*
- 2. States shall take other measures as may be necessary to prevent, reduce and control such pollution.*
- 3. States, acting especially through competent international organizations or diplomatic conference, shall endeavor to establish global and regional rules, standards and recommended practices and procedures to prevent, reduce and control such pollution.”<sup>69</sup>*

**Article 222:** *“Enforcement with respect to pollution from or through the atmosphere States shall enforce, within the air space under their sovereignty or with regard to vessels flying their flag or vessels or aircraft of their registry,*

<sup>68</sup> Marine Insight. *Nautical Law: What is UNCLOS?* [Online]. 2016. [Accessed 21 December 2018]. Available from: <https://www.marineinsight.com/maritime-law/nautical-law-what-is-unclos/>

<sup>69</sup> *United Nations Convention on the Law of the Sea*. [Online]. 1982, 1833 UNCLOS 25, opened for signature 10 December 1982, entered into force 16 November 1994. [Accessed 21 December 2018]. Available from: [http://www.un.org/Depts/los/convention\\_agreements/texts/unclos/unclos\\_e.pdf](http://www.un.org/Depts/los/convention_agreements/texts/unclos/unclos_e.pdf)

*their laws and regulations adopted in accordance with article 212, paragraph 1, and with other provisions of this Convention and shall adopt laws and regulations and take other measures necessary to implement applicable international rules and standards established through competent international organizations or diplomatic conference to prevent, reduce and control pollution of the marine environment from or through the atmosphere, in conformity with all relevant international rules and standards concerning the safety of air navigation.*<sup>70</sup>

### **MARPOL Annex VI Regulations on Ship Air Pollution and Energy Efficiency**

MARPOL Annex VI constitutes the main international policy concerning maritime emissions and improvement of ship energy efficiency. However, when the treaty was first signed in 1973, no regulations relating to air pollution were included.<sup>71</sup> Following the IMO Resolution A.719 (17) *on Prevention of Air Pollution from Ships*, a new Annex was formed in 1997, including regulations for the Prevention of Air Pollution from Ships; these comprised a limitation of gases such as  $\text{SO}_x$  and  $\text{NO}_x$ .<sup>72</sup> On the contrary, no provisions regarding  $\text{CO}_2$  emissions from ships were agreed upon then. After the IMO's resolution A.963(23) of 2003 *on policies and practices related to the reduction of GHG emissions from ships*, began a wide consideration of controlling the  $\text{CO}_2$  emissions that led to a package of technical and operational energy efficiency measures.<sup>73</sup> As a result, a fourth Chapter entitled "*Regulations on energy effi-*

<sup>70</sup> Ibid

<sup>71</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>72</sup> International Maritime Organization. *Prevention of Air Pollution from Ships*. [Online]. 2017. [Accessed 18 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Air-Pollution.aspx>

<sup>73</sup> International Maritime Organization. *Resolution A.963 (23): IMO Policies and Practices Related to the Reduction of Greenhouse Gas Emissions From Ships (05 December 2003)*. [Online]. 2003, A 23/Res.963. [Accessed 21 December 2018]. Available from: [http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Assembly/Documents/A.963\(23\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Assembly/Documents/A.963(23).pdf)

ciency for ships” was added to MARPOL Annex VI, introducing the first ever mandatory global Greenhouse Gas (GHG) regime for the maritime industry.<sup>74</sup> Last but not least, as of August 2018, MARPOL Annex VI has been ratified by 91 countries that represent more than 96% of the global tonnage.<sup>75</sup>

### United Nations Framework Convention on Climate Change (UNFCCC)

The United Nations Framework Convention on Climate Change (UNFCCC) was first adopted in 1992, as a means to tackle climate change. Five years later and in light of this framework, the Kyoto Protocol, which legally binds its parties to reduce emissions, was signed. According to it, the IMO is formally responsible for regulating the GHG emissions from international shipping.<sup>76</sup> More precisely, Article 2.2. defines that “*The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively.*”<sup>77</sup> Quite recently, in 2015, the Paris Agreement was adopted, including commitments and provisions regarding emissions, from 2020 onwards. Essentially, its main aim is to reduce the global temperature at least by 1.5°C.<sup>78</sup> However, it has to be noted that the Paris Agreement does not refer to international shipping at all.<sup>79</sup>

<sup>74</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>75</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>76</sup> Ibid

<sup>77</sup> *Kyoto Protocol to the United Nations Framework Convention on Climate Change*. [Online]. 1998,2303 UNFCCC 2, opened for signature 11 December 1997, entered into force 16 February 2005. [Accessed 21 December 2018]. Available from: <https://unfccc.int/resource/docs/convkp/kpeng.pdf>

<sup>78</sup> [https://unfccc.int/files/meetings/paris\\_nov\\_2015/application/pdf/paris\\_agreement\\_english\\_.pdf](https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/paris_agreement_english_.pdf)

<sup>79</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>



## 1979 Geneva Convention on Long-range Transboundary Air Pollution (LRTAP Convention)

The Geneva Convention on Long-range Transboundary Air Pollution (LRTAP Convention), as the first international legally binding document addressing the issues of air pollution, was adopted in 1979.<sup>80</sup> Its initial target was to reduce acid rain effects by regulating the emissions of Sulphur. Later on, the Parties widened its scope through the inclusion of eight protocols, so as to encompass the limitation of nitrogen pollutants, Volatile Organic Compounds (VOCs), photochemical oxidants, as well as heavy metals.<sup>81</sup> One of the most important requirements of the LRTAP Convention is that Parties shall exchange information on data of agreed air pollutants.<sup>82</sup> Regarding the maritime sector, according to the reporting guidelines of the Convention: *“Emissions from fuels used for international maritime shipping shall not be included in the national totals. Those emissions should be reported separately as memorandum items in the annex I reporting template. Emissions from international inland shipping shall be included in the national totals for the part that is emitted on national territory.”*<sup>83</sup>

## 1985 Vienna Convention for the Protection of the Ozone Layer & 1987 Montreal Protocol

The Vienna Convention for the Protection of the Ozone Layer of 1985 and the Montreal Protocol of 1987 is the first ever treaties in the history of the United Nations to be universally ratified in 2009.<sup>84</sup> The Vienna Convention for the

<sup>80</sup> United Nations Economic Commission for Europe. *Convention on Long-Range Transboundary Air Pollution: 13 November 1979*. [Online]. 1979, CLRTAP. [Accessed 13 January 2019]. Available from: <https://www.unece.org/fileadmin/DAM/env/lrtap/full%20text/1979.CLRTAP.e.pdf>

<sup>81</sup> Stockholm Convention. The Convention on Long-range Transboundary Air Pollution and its Protocol on Persistent Organic Pollutants. [Online]. 2019. [Accessed 13 January 2019]. Available from: <http://chm.pops.int/Partners/MEAs/LRTAP/tabid/4148/Default.aspx>

<sup>82</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>83</sup> Stockholm Convention. The Convention on Long-range Transboundary Air Pollution and its Protocol on Persistent Organic Pollutants. [Online]. 2019. [Accessed 13 January 2019]. Available from: <http://chm.pops.int/Partners/MEAs/LRTAP/tabid/4148/Default.aspx>

<sup>84</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from:



Protection of the Ozone Layer, as defined in its title, aims at protecting the globe's ozone layer through regular observations, research, and exchange of information on the effects of human activities on the ozone layer.<sup>85</sup> Building upon these goals, the Montreal Protocol on Substances that Deplete the Ozone Layer introduces specific legal obligations that include limitations and reductions of the consumption and the production of ozone-depleting substances.<sup>86</sup>

### IMO RESOLUTION MEPC. 203 (62) - Inclusion of regulations on energy efficiency for ships in MARPOL Annex VI

During the 62nd session of the IMO's Marine Environment Protection Committee (MEPC) in July 2011, the Resolution MEPC.203(62) on the inclusion of regulations on energy efficiency for ships in MARPOL Annex VI was adopted. The new Chapter 4 of Annex VI of the MARPOL Convention requires that each new or existing ship that has undergone a major conversion shall adopt an Energy Efficiency Design Index (EEDI), whereas every ship needs to keep on board a Ship Energy Efficiency Management Plan (SEEMP). The Parties are also obliged to collaborate with the IMO, as well as inter alia, in order to exchange information and technical assistance.<sup>87</sup>

### Recent Developments

The issue of energy efficiency, in light of the climate change, can always be considered as relevant. However, nowadays, it is important for two main reasons; firstly, it

<http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>85</sup> *The Vienna Convention for the Protection of the Ozone Layer*. [Online]. 1985, 1513 VCPOL 1, opened for signature 22 March 1985, entered into force 22 September 1988. [Accessed 21 December 2018]. Available from:

[http://mountainlex.alpconv.org/images/documents/international/convention\\_ozone\\_layer.pdf](http://mountainlex.alpconv.org/images/documents/international/convention_ozone_layer.pdf)

<sup>86</sup> *Montreal Protocol on Substances that Deplete the Ozone Layer*. [Online]. 1987, 1522 MPDOL 29, opened for signature 16 September 1987, entered into force 1 January 1989. [Accessed 21 December 2018]. Available from:

[https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg\\_no=XXVII-2-a&chapter=27&clang=\\_en](https://treaties.un.org/pages/ViewDetails.aspx?src=TREATY&mtdsg_no=XXVII-2-a&chapter=27&clang=_en)

<sup>87</sup> Maritime Environment Protection Committee. *Resolution MEPC.203(62): Amendments to the Annex of the 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 (15 July 2011)*. [Online]. 2011. MEPC 62/24/Add.1. [Accessed 21 December 2018]. Available from: [http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203\(62\).pdf](http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Technical%20and%20Operational%20Measures/Resolution%20MEPC.203(62).pdf)

clearly constitutes a heated debate topic on weather countries and companies are able to increase their assets in order to achieve energy efficiency. This fall, the issue escalated even more, following the bitter reactions of many states and multinational shipping companies to the so called “IMO 2020”. Moreover, energy efficiency is *the* topic to be discussed during 2019, posterior to the most recent United Nations Climate Change Meeting. The aforementioned events will be further analyzed.



Figure 7: Prices of low/high sulphur fuels

a response to the environmental concerns about the harmful emissions from ships and aims to lower the sulfur cap limit from 3.5%.<sup>88</sup> Since the required limitation is rather big, member-states have raised their apprehensions regarding the implementation of this regulation.

Shipping companies and analysts warn that reducing the sulfur oxides will cause various issues in the maritime industry, especially in cases of non-compatible fuels and

Despite the fact that almost all countries and parties agree with taking measures for protecting the environment, the debate on how this will happen is ongoing and heated. The most recent development is the “IMO 2020 Sulphur Regulation”, which aims at imposing a 0.5% sulfur cap on fuel content from January 1<sup>st</sup>, 2020. This goal serves as

<sup>88</sup> Liang L.H. What you need to know: The 2020 IMO fuel sulphur regulation. *Sea Trade Maritime News*. [Online]. 17 May 2017. [Accessed 21 December 2018]. Available from: [http://www.seatrade-maritime.com/images/PDFs/SOMWME-whitepaper\\_Sulphur-p2.pdf](http://www.seatrade-maritime.com/images/PDFs/SOMWME-whitepaper_Sulphur-p2.pdf)

that it will also affect prices and even global trade.<sup>89</sup> For this reason, in October 2018, the United States of America backed a plan for a phased start of the enforcement of the IMO 2020, which was however rejected. It needs to be clarified that according to the International Bunker Industry Association the cases of polluting fuels that have been observed to various vessels do not relate with the reduction of sulfur oxides in the fuel oil blending.<sup>90</sup> More precisely, lately there have been reported problems in more than a hundred ships due to their fuels, despite the fact that they did abide by the international quality standards of the International Standards Organization. Further research concluded that the pollution was caused by chemical elements unrelated to petroleum derivatives, such as sulfur oxides.<sup>91</sup> However, states, as well as ship owners and fossil fuel producers should bear in mind the potential challenges that they will have to face, in order to abide by the IMO 2020 Regulation.

Most recently and following the conclusion of the 2018 United Nations Climate Change Conference in December 2018, there are various developments regarding the reduction of carbon oxide emissions from the shipping industry. Specifically, the representatives of the member-states in Katowice, Poland, while finalizing the practical implementation of the 2015 Paris Agreement, found themselves wondering about decarbonizing the maritime transport industry, something that was not mentioned in the Agreement before.<sup>92</sup> Moreover, a dire need for carbon neutrality, in order to clean up the industry was identified.<sup>93</sup> However, many people from the maritime industry ex-

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<sup>89</sup>Liang L.H. What you need to know: The 2020 IMO fuel sulphur regulation. *Sea Trade Maritime News*. [Online]. 17 May 2017. [Accessed 21 December 2018]. Available from: [http://www.seatrade-maritime.com/images/PDFs/SOMWME-whitepaper\\_Sulphur-p2.pdf](http://www.seatrade-maritime.com/images/PDFs/SOMWME-whitepaper_Sulphur-p2.pdf)

<sup>90</sup> Wittels J. U.S.-Backed Plan for Phased Start of Ship-Fuel Rules Fails. *Bloomberg*. [Online]. 24 October 2018. [Accessed 21 December 2018]. Available from: <https://www.bloomberg.com/news/articles/2018-10-24/imo-rejects-u-s-backed-plan-for-phased-start-of-ship-fuel-rules>

<sup>91</sup> World Maritime News Staff. IBIA: Fuel Contamination Unrelated to Low Sulphur Fuel Oil Blending. *World Maritime News*. 17 October 2018. [Accessed 21 December 2018]. Available from: <https://worldmaritimenews.com/archives/262759/ibia-fuel-contamination-unrelated-to-low-sulphur-fuel-oil-blending/>

<sup>92</sup> Hellenic Shipping News Staff. Cutting Shipping's Carbon. *Hellenic Shipping News*. 20 December 2018. [Accessed 21 December 2018]. Available from: <https://www.hellenicshippingnews.com/cutting-shippings-carbon/>

<sup>93</sup> Selin H. Cargo Ships Are the World's Biggest Polluters — but No One Wants to Fix It. *Inverse*. 19 December 2018. [Accessed 21 December 2018]. Available from:



pressed their concerns about this initiative, as there were “no concrete details about this plan”.<sup>94</sup> So, since it is a current issue, it only takes time to see how the situation will evolve.

## Measures Already Taken

Prior to the initiation of the theory of the “Green House Effect”, the international community, through the OILPOL and the MARPOL Conventions of 1954 and 1973 respectively, made its first steps towards achieving maritime energy efficiency.<sup>95</sup> Some years later, the United Nations committed itself to, among others, protecting the environment, through the establishment of the Millennium Development Goals (MDGs).<sup>96</sup>

As the international community realized that the “Green House Effect” is not something to tread lightly with, it was apparent that action needed to be taken. Thus, in 2011, the IMO adopted the first, after the Kyoto Protocol, legally binding climate change treaty, the resolution MEPC.203 (62).<sup>97</sup> Through this resolution, the Energy Efficiency Design Index (EEDI) was made mandatory for new ships, whereas the Ship Energy Efficiency Management Plan (SEEMP) needed to be developed by all ships.<sup>98</sup>

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<https://www.inverse.com/article/51897-cargo-ships-are-emitting-boatloads-of-carbon-and-nobody-wants-to-take-the-blame>

<sup>94</sup>Hellenic Shipping News Staff. Cutting Shipping’s Carbon. *Hellenic Shipping News*. 20 December 2018. [Accessed 21 December 2018]. Available from: <https://www.hellenicshippingnews.com/cutting-shippings-carbon/>

<sup>95</sup> International Maritime Organization. *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>96</sup> United Nations. *United Nations Millenium Development Goals*. [Online]. 2019. [Accessed 13 January 2019]. Available from: <http://www.un.org/millenniumgoals/global.shtml>

<sup>97</sup> International Maritime Organization. MEPC.203(62): Amendments to the Annex of the 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. (15 July 2011). [Online]. 2011, MEPC.203(62).[Accessed on January 13 2019]. Available from: [http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-\(MEPC\)/Documents/MEPC.203\(62\).pdf](http://www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/Marine-Environment-Protection-Committee-(MEPC)/Documents/MEPC.203(62).pdf)

<sup>98</sup> International Maritime Organization. *Energy Efficiency Measures*. [Online]. 2019. [Accessed 13 January 2019]. Available from:



According to the IMO experts, the adoption of the aforementioned mandatory measures for all ships and vessels from 2013 on will have as a result the significant emission reduction and a big cost saving for the shipping industry. More specifically, thanks to the introduction of the EEDI and SEEMP, the annual CO<sub>2</sub> emissions will be reduced to 420 million tons, and mathematically speaking to 20-26% by 2030. Moreover, these measures will lead to lower fuel cost, and up until 2030, it is esteemed that 90-310 billion dollars will be saved up.<sup>99</sup> However, we always have to keep in mind that, in order for lower fuel costs to actually exist, new technologies and more efficient ships need to be introduced to the maritime industry, and their introduction is predicted to cost.

In addition, a series of national and regional Technical Co-operation (TC) workshop activities have taken place, so as to empower the implementation of the measures to fight emissions from international shipping.<sup>100</sup> Furthermore, the GloMEEP project, as a project that aims to transport the maritime industry into a low carbon-energy efficient future, has been actively seized upon combating emissions.<sup>101</sup> Last but not least, the IMO, along with the European Union, are currently attempting to establish a global network of Maritime Technology Cooperation Centers (MTCCs). This project also aims at introducing innovative technologies on energy efficiency and provides assis-

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<http://www.imo.org/en/ourwork/environment/pollutionprevention/airpollution/pages/technical-and-operational-measures.aspx>

<sup>99</sup>International Maritime Organization. *Energy Efficiency Measures*. [Online]. 2019. [Accessed 13 January 2019]. Available from: <http://www.imo.org/en/ourwork/environment/pollutionprevention/airpollution/pages/technical-and-operational-measures.aspx>

<sup>100</sup>International Maritime Organization. *Technical Co-operation (TC)*. [Online]. 2019. [Accessed 13 January 2019]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Pages/Technical-Co-operation.aspx>

<sup>101</sup>Global Maritime Energy Efficiency Partnership (GloMEEP). Ship Emissions Toolkit. *Rapid assessment of ship emissions in the national context*. [Online]. 2018, volume 1, p. 9-39. [Accessed 21 December 2018]. Available from: [https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1\\_31082018-Interim-Upload2-rev.pdf](https://glomeep.imo.org/wp-content/uploads/2018/09/Guide-1_31082018-Interim-Upload2-rev.pdf)

tance to countries, so as to reduce their Greenhouse Gas (GHG) emissions of their shipping sectors.<sup>102</sup>

## Future Challenges

Global warming has always been a problem. In the past, there may have been a number of measures that took place, however, the issue is still ongoing. One of the main challenges that the IMO has to face upon the matter of increasing energy efficiency is that it must become more adaptable to potential crises and situational changes.<sup>103</sup> Are the current guidelines enough? Do they suffice to face new challenges? Can new start-up companies operating in the maritime sector afford new technology innovations?

To respond, we must first think of the various existing stakeholders. Firstly, there are countries cooperating amongst them, with a view to reducing Greenhouse Gas (GHG) emissions and dealing with the problem by sharing knowledge or by working under an organization. For these countries, it is very important to carefully design their policy-making, in order to be able to participate in a bigger network of operations and programs, such as the GloMEEP, and eventually become more energy efficient.<sup>104</sup> Then, there are other countries, who tend to play an important role for the maritime sector, and who, in most cases, lack of know-how, especially concerning new technologies. As a result, these countries need to be provided with the skills needed to operate within the digital environment, but also to be supported financially, in order to successfully implement all mandatory regulations.<sup>105</sup>

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<sup>102</sup>European Union. *The Global MTTC Network (GMN) - Capacity Building for Climate Mitigation in the Maritime Shipping Industry*. [Online]. 2019. [Accessed 13 January 2019]. Available from: <https://europa.eu/capacity4dev/climate-mitigation-in-the-maritime-shipping-industry>

<sup>103</sup>International Maritime Organization (IMO). *Third IMO GHG Study*. [Online]. 2015. [Accessed 21 December 2018]. Available from: <http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Third%20Greenhouse%20Gas%20Study/GHG3%20Executive%20Summary%20and%20Report.pdf>

<sup>104</sup> Ibid

<sup>105</sup> Farrell D., Promoting energy efficiency in the developing world. *McKinsey Quarterly*. [Online]. 2018, volume 4. [Accessed 13 January 2019]. Available from: <https://www.mckinsey.com/business->

Therefore, the IMO needs to be constantly alert, in order to identify potential crises and to efficiently tackle with them at an early stage. The members of the organization from their part need to establish a common ground, through dialogue, on cooperating in such a manner that energy efficiency will be increased and will generate profit.

## Conclusion

All in all, the international community has built a drastic network of operations however, there are still many challenges up ahead. Precisely, there is mandatory equipment that ships must install, abiding by the IMO guidelines and standards, in order to be more energy efficient. Despite its rather elevated cost, the aim of this high technology equipment is to maximize the performance and, at the same time, to minimize the wastes, through reducing the Greenhouse Gas (GHG) emissions and through using less energy.

As a result, the member states of the IMO committee must engage in dialogue amongst them and must build a better environment for communication. It is very crucial not only for the present but also for the future, that countries continue to exchange information, to work under programs, such as GloMEEP and to support one another by sharing proficiencies on various areas. States that are already working together in fighting global warming must set an example for other countries to find common ground and to design their policymaking. Moreover, since the IMO guidelines outline a legal basis for the shipping industry, member states need to make the reforms needed in order to adapt to it. Last but not least, following the energy efficiency regulations, all relevant stakeholders need to take into account the United Nations' Sustainable Development Goals (SDGs), and, on a broader scope, to start looking for answers on how to best address the climate change and eventually protect the environment

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functions/sustainability-and-resource-productivity/our-insights/promoting-energy-efficiency-in-the-developing-world



## Points to be addressed

This section serves as a means to help you deeply understand the issue at hand and to guide you during the course of the debate. During the committee sessions, you must address specific matters that are of great importance for the whole process and of course for the drafting of your final document. The key points that should be discussed and decided upon are the following:

- How do emissions from ships affect the environment? Do they need to be reduced, and if yes, how could that happen?
- Are all types of vessels required to have an **EEDI** and/or an **SEEMP**?
- What is the **role of technology** for achieving energy efficiency? What about the cost required for implementing new technologies in the maritime sector? Will small companies and start-ups operating in the marine sector be able to afford such costs?
- What is the significance of energy efficiency measures applied in the ports of each member state?
- Is there a need of special training of the shipping professionals on the new <sup>[L]</sup><sub>[SEP]</sub> energy efficiency regulations? If yes, how could it be accomplished?
- How can the implementation energy efficiency requirements for ships be monitored and enforced?
- What is the competence of the current IMO guidelines on energy efficiency? How could they be enhanced? Are the member states policies compatible with the IMO guidelines?
- What do you think about the **GloMEEP** project? Has it been efficient so far? How could it be further developed?
- How could the Member States overcome the **technical and financial** <sup>[L]</sup><sub>[SEP]</sub> **challenges** arising by the implementation of energy efficiency measures?
- What do you think about the recent developments and especially the IMO 2020 Agenda and the 2018 United Nations Conference on Climate Change?



Will states be able to abide by these new regulations? How?

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