

TOWARDS A CLEANER SHIPPING INDUSTRY

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Abstract

This paper analyzes the urgent problem of climate change, attributing its causes to anthropogenic activities such as the combustion of fossil fuels and extensive deforestation, which significantly contribute to rise in the concentration of gases in the atmosphere. Within it, the international consensus is emphasized on the need to implement measures to combat these changes, including the gradual elimination of the use of fossil fuels and the intensification of the capacity of ecosystems to absorb greenhouse gases. This document highlights the essential role of various international agreements and regulations in addressing environmental issues. These initiatives reflect the global commitment to adopt a comprehensive and coordinated approach to climate challenges, underscoring the importance of international collaboration in achieving a sustainable future.

Key words: *climate change; environment; gas emissions; ship emissions; shipping industry.*

JEL Classification: Q54

I. INTRODUCTION

Today, tackling climate change is a pressing priority, it's necessary to gradually reduce the use of fossil fuels. Also, we need to increase the Earth's natural capacity to absorb these gases. At the 2021 Basiq Conference, it was highlighted that more than 300 legally binding international laws and treaties have been implemented to manage environmental issues.

International initiatives reflect global efforts to tackle various environmental issues, including maritime environmental problems, air pollution and also the efficient waste management. The common goal of all parties involved in combating climate change. This joint commitment highlights the importance of a concerted and integrated approach to ensure a sustainable and healthy environment for future generations. (Istrate-Scradeanu et al, 2021)

All these initiatives are included in the Paris Agreement. A key aspect of the Paris Agreement is the commitment to decrease greenhouse gas emissions by 45% until 2030 and to achieve emissions neutrality by 2050. It is important to emphasize that there is no one-size-fits-all solution or universal antidote to combat climate change. Diversity of measures and approaches is necessary to effectively address the complexity of this global problem.

Greenhouse gases have the ability to absorb and retain solar radiation, thereby preventing the sun's heat from leaving the atmosphere. This phenomenon, known as the greenhouse effect, is essential for maintaining the temperatures that make life on Earth possible. However, the increase in the concentration of these gases due to human activities amplifies the greenhouse effect, leading to increased average temperatures and global climate change.

Addressing climate change requires a coordinated global effort, involving both measures to reduce emissions and strategies to adapt and mitigate the effects already present, reflecting a collective commitment to a sustainable future.

II. IMPACT OF SHIPPING INDUSTRY AND ITS REGULATORS

In the transport sector, greenhouse gas emissions come mainly from the burning of fossil fuels. Reducing these emissions can be achieved by replacing conventional fuels with alternatives with a low carbon content, or by decrease the transport. However, the decrease in transport volumes seems difficult to accept in a world undergoing continuous economic development and globalization.

The maritime sector is responsible for approximately 2-3% of greenhouse gas emissions. Although this percentage may seem small, the remaining of global emissions are attributed to other industries, many of which are customers of the maritime sector. For example, the steel industry is highly dependent on shipping for the supply of raw materials. Iron ore, which accounts for 28% of bulk goods transported by sea, and coke, which accounts for 5%, are essential for steel production. (Ship Finance Danish, 2023)

Thus, to reduce emissions in the transport sector, it is essential to adopt innovative and sustainable measures, not only in terms of the type of fuel used, but also in terms of making supply chains and global transport more efficient. The transformation of this industry into a greener one will not only contribute significantly to the reduction of global emissions, but will also stimulate the development of new technologies and practices that can be applied in various economic sectors.

The steel industry is responsible for 7-9% of global greenhouse gas emissions, a significant contribution to the problem of climate change. It is crucial to underline the essential role that the maritime sector plays in global trade and the transportation of goods.

The major dependence on shipping highlights the importance of the industry in the global economy and the need to adopt sustainable measures in this sector. Reducing emissions in shipping can have a significant impact not only on direct emissions, but also on industries dependent on it, such as steel. The adoption of green technologies and alternative fuels can transform this sector, contributing to a more sustainable and cleaner future.

In the context of globalization and the continuous increase in demand for goods and raw materials, efforts to reduce emissions must be coordinated and integrated, involving all stakeholders, from governments and international organizations to the private sector. Only through a concerted approach can we hope to achieve internationally set climate goals and ensure a balance between economic development and environmental protection.

The predominant liquid fuel used by maritime sector is heavy fuel oil (HFO). This fuel is rich in sulphur, and its combustion in marine engines generates not only power for propulsion but also harmful emissions. Among them, SO_x are particularly harmful to human health, causing respiratory problems and severe lung diseases.

The release of sulfur oxides into the atmosphere contributes to the formation of acid rain, which has destructive effects on the environment. It can affect agricultural crops and forests, adversely affect marine environmental and lead to acidification of seas and oceans. This disrupts aquatic ecosystems, affecting the life cycles and reproduction of many species, which can have devastating consequences for marine biodiversity.

To mitigate these negative effects, it is crucial to adopt measures to reduce sulfur oxide emissions from the maritime sector. Viable solutions include using low-sulphur fuels, implementing exhaust gas purification technologies such as scrubbers, and exploring greener alternatives such as liquefied natural gas (LNG) or synthetic fuels. These measures will help protect public health and the environment, while promoting a more sustainable and responsible maritime industry.

III. WHAT HAVE WE DONE IN THE SHIPPING INDUSTRY?

Since 2008, the maritime sector has managed to reduce CO₂ emissions by around 17%, which corresponds to an average annual decrease of 1.3%. This reduction led to a 42% improvement in carbon intensity, expressed in tonnes per nautical mile, indicating an annual increase of approximately 4% in energy efficiency. (IRENA, 2021). In 2022, shipping emitted an average of 7 grams of CO₂ per tonne per nautical mile. This data is carefully monitored by the International Maritime Organization (IMO).

These advances reflect the commitment of the maritime industry to improve the efficiency of its operations and reduce environmental impact, even in the context of continued expansion of global trade. Continually improving energy efficiency and reducing emissions are essential to achieving global climate goals and ensuring greener shipping. Continuous monitoring and the adoption of innovative technologies will play a crucial role in supporting these long-term goals.

The International Maritime Organization (IMO) has implemented a number of regulations essential to reduce sulfur dioxide emissions in the maritime industry as part of its commitment to environmental protection. These regulations are designed to significantly reduce the environmental impact of shipping, but they also generate significant economic challenges for the sector.

From beginning of 2020, a limit on the sulfur content of fuels to 0.50% m/m was introduced, a significant reduction from the previous level of 3.50% m/m. This measure is followed by a further reduction planned for 1 January 2025, when the sulfur content will be limited to 0.10% m/m. These changes are intended to help reduce the carbon footprint of the maritime industry by 8%, which will have a positive impact on reducing air pollution and global climate change. (Olorunubi et al, 2023)

However, the implementation of these regulations involves considerable economic costs. In December 2019, the price of marine fuels was doubled, reflecting the additional costs required to comply with the new sulfur

standards. In addition, these changes are expected to increase the cost of transporting goods, with an estimated impact between 1% and 10%, particularly favoring the use of less expensive raw materials.

These regulations, while essential for environmental protection, require careful management to balance ecological objectives with economic implications. The adoption of more efficient technologies and the development of alternative fuel solutions will be crucial to mitigate the economic impact and ensure the long-term sustainability of the maritime sector.

IV. HOW DID WE DO IT?

Decoupling the volume of global trade from greenhouse gas emissions in the maritime industry is achieved through a combination of strategic and technological measures. A significant factor in this process is reducing the speed of ships, a practice that began as a result of the financial crisis of 2008. This measure was initially implemented to address overcapacity in the maritime fleet, but has also had a notable effect on reducing CO₂ emissions. Studies have shown that reducing travel speed by 20% can reduce CO₂ emissions by approximately 24%, indicating a clear benefit of this strategy in reducing environmental impact. (Tsvetkova et al, 2024)

However, to meet the ambitious target of reducing CO₂ emissions by 45% by 2030, the maritime industry needs to take further action. Speed reduction, while effective, is not sufficient to achieve these long-term targets. Thus, the maritime sector invests in the modernization of ships, integrating advanced technologies aimed at saving energy. These technologies include more efficient powertrains, engine improvements and innovative solutions to reduce fuel consumption.

In addition to technological improvements, the maritime industry has begun to implement additional operational measures. These measures aim to optimize travel itineraries, adapt routes according to weather conditions and adhere to strict arrival and operating schedules. These adjustments not only contribute to energy savings, but are often combined with additional speed reductions, thereby increase operational efficiency and reduce environmental impact.

By integrating these technological and operational strategies, the maritime industry is able to advance towards sustainability goals and significantly reduce greenhouse gas emissions. This combined approach reflects the sector's commitment to environmental protection and highlights the importance of continued investment in green solutions and efficient operating practices.

Furthermore, how did we do it?

Here are some of the key initiatives and direction lines implemented:

- ✓ **Energy Efficiency:** This includes optimizing ship design, hull coatings, and propeller technologies to reduce drag and improve fuel efficiency. Advanced weather routing systems and slow steaming techniques have also been adopted to optimize fuel consumption.
- ✓ **Improved Engine Technology:** This includes the use of low-friction engine components, waste heat recovery systems, and more efficient combustion processes.
- ✓ **Alternative Fuels:** LNG (liquefied natural gas) has gained popularity as a cleaner-burning fuel option for certain vessels. Biofuels as methanol and hydrogen were also being researched and tested as potential alternatives.
- ✓ **Emission Control Areas (ECAs):** Ships operating in these areas are required to use cleaner fuels or install emission abatement technologies like scrubbers**.
- ✓ **Ballast Water Management:** The shipping industry has implemented measures to prevent the transfer of invasive species and protect marine ecosystems by managing ballast water discharge. Ships now use ballast water treatment systems to remove or neutralize harmful organisms before discharge.
- ✓ **International Regulations:** The IMO has introduced mandatory measures to decrease emissions from vessels.
- ✓ **Collaboration and Industry Initiatives:** The shipping industry has engaged in collaborative efforts and initiatives to address emissions collectively. Examples include the Global Maritime Energy Efficiency Partnership (GloMEEP) and the Getting to Zero Coalition, which aim to accelerate the transition to zero-emission vessels by 2030.

**A vessel scrubber, also known as a ship scrubber or exhaust gas cleaning system (EGCS), is a device used on ships to reduce air pollution caused by the emission of sulphur dioxide (SO₂) and other pollutants from burning marine fuels. Ships traditionally use heavy fuel oil (HFO), which contains high levels of sulphur. A vessel scrubber typically consists of several components, including an exhaust gas inlet, a water or alkaline solution spray system, a gas-liquid separator, a waste residue collection system, and a clean gas outlet. The exhaust gas from the ship's engine is passed through the scrubber, where it comes into contact

with the water or alkaline solution. This contact facilitates the removal of sulphur dioxide and other pollutants from the exhaust gas.

V. WHY WE DID IT?

At a first glance, the answer is obvious: to protect the environment, isn't it? As you can all imagine none of these measures were taken exclusively to protect the environment. The truth is that all measures came either to respect the laws in force or to adapt to commercial realities.

All measures are fostered by ship owners to become more efficient while respecting the regulations. Vessels slow steam due to lack of cargo or/and to reduce fuel consumption and vessels shipowners did install scrubbers on vessel or retrofit their engines to respect regulations.

It has been observed that at the end of the day, respecting regulations and putting in practice new rules comes with a cost for the final user, the customer: either a financial one, or a timewise one.

Consequently, we all have to put in balance what is more important: a certain increase of general prices or a certain, irremediable poisoning of our air?

VI. CONCLUSION

The interconnectedness of climate change and the shipping industry underscores the importance of collaborative efforts to address environmental challenges.

While the industry has made significant strides in reducing emissions and improving efficiency, further innovations and policy interventions will be necessary to achieve long-term sustainability goals. Initiatives such as the Global Maritime Energy Efficiency Partnership (GloMEEP) and the Getting to Zero Coalition exemplify the industry's commitment to collective action and innovation in pursuit of zero-emission vessels by 2030.

Moreover, the paper's reflection on the motivations behind industry actions highlights the complex interplay between environmental stewardship, regulatory compliance, and commercial interests.

While environmental considerations are paramount, the economic realities of the industry require a delicate balance between profitability and sustainability. As such, policymakers and stakeholders must collaborate to develop regulatory frameworks that incentivize environmentally responsible practices while ensuring the industry's economic viability.

The paper serves as a call to action for stakeholders across the shipping industry to prioritize environmental sustainability in their operations and decision-making processes.

VII. REFERENCES

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