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A LEGAL ANALYSIS OF THE IMPLEMENTATION AND ENFORCEMENT OF MARPOL ANNEX VI SULPHUR REGULATIONS IN GEORGIA

By

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A dissertation submitted to the World Maritime University in partial fulfilment of the requirements for the reward of the degree of

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Declaration

I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the University.

(Signature): 

(Date): 22 September 2020

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Supervisor's affiliation: Head of the Maritime Law & Policy Specialization
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Abstract

Title of Dissertation: **A legal analysis of the implementation and enforcement of MARPOL Annex VI Sulphur regulations in Georgia**

Degree **Master of Science**

A significant share of SOx emissions originates from maritime transport. Since 1 January 2020, under the MARPOL Annex VI, the global limit of sulphur content in fuel has been reduced from 3.5 % to 0.5%, which means a big step towards an environmentally friendly shipping industry and planetary health. In view of this, this study discussed the development and enforcement of existing sulphur regulations, current implementation and enforcement regime of sulphur limit regulations within a global and EU level scope alongside with existing relevant regulations in Georgia.

In order to fulfil the aims and objectives of the study, a legal dogmatic and legal comparative methodology was used.

The study has discussed the flag, coastal and port State responsibilities, in order to give the complete and full effect of new sulphur limit requirements. Furthermore, it has discussed the role of III code and IMSAS in the context of the implementation and enforcement of sulphur regulations.

Alongside with global regime, in the context of the EU, this study has analysed the specifications of the Sulphur Directive, enforcement mechanism within the EU as well as the role of EMSA and its contribution to the global enforcement process of the sulphur regulations.

In the national context, this study has discussed the existing legislation which regulates the sulphur emission requirements. Taking into consideration that Georgia is not a signatory party of MARPOL Annex VI, based on the legal analysis of the international and regional approach of the sulphur regulations, this study has identified potential challenges which the country may face in the implementation and enforcement process of MARPOL Annex VI.

Keywords: Air Pollution, Sulphur Regulations, MARPOL Annex VI, Implementation, Enforcement, EU, EMSA, III Code, IMSAS, Georgia

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List of Abbreviations

AA	Association Agreement
BDN	Bunker Delivery Note
BIMCO	Baltic and International Maritime Council
BS MoU	Black Sea Memorandum of Understanding
BCSEA Project	Black and Caspian Seas Project
Bucharest Convention	The Bucharest Convention on the Protection of the Black Sea against Pollution, 1992
DES	Department of Environmental Supervision
ECA	Emission Control Areas
EEZ	Exclusive Economic Zone
EGCS	Exhaust Gas Cleaning System
EMSA	European Maritime Safety Agency
ESFF	European Sustainable Shipping Forum
EU	European Union
GHG	Greenhouse Gas
FONAR	Fuel Oil Non-Availability Report
HFO	Heavy Fuel Oil
IAPP certificate	International Air Pollution Prevention certificate
ICS	International Chamber of shipping
INTERCARGO	International Association of Dry Cargo Shipowners
INTERTANKO	International Association of Independent Tanker Owners
IMO	International Maritime Organization
IMSAS	IMO Member State Audit Scheme
IPCC	International Panel on Climate Change
LNG	Liquified Natural Gas
LSFO	Low Sulphur Fuel Oil
MARPOL	International Convention for the Prevention of Pollution from Ships, 1973, as amended
MARPOL Annex VI	Annex VI to the 1973 International Convention for the Prevention of Pollution from Ships
MEPC	Marine Environmental Protection Committee
MTA	Maritime Transport Agency
PSC	Port State Control
PSCOs	Port State Control Officers
PSJ	Port State Jurisdiction
ROs	Recognized Organizations
RPAS	Remotely Piloted Aircraft System
SECA	SOx Emission Control Area
SOX	Sulphur Oxides
SRP	Ship Risk Profile
UNCLOS	United Nations Convention Law of the Sea 1982

UNFCCC	United Nations Framework Convention on Climate Change

Chapter 1: Introduction

1.1 Background

The International Convention for the Prevention of Pollution from Ships (MARPOL) is a universal, comprehensive instrument which has evolved during the years to respond to the crucial environmental concerns. It was adopted in 1973 and modified by the 1978 Protocol. The MARPOL Convention includes regulations intended to prevent and reduce vessel-source pollution, both accidental pollution and from routine operations (Ringbom, 2015).

Road vehicles and manufacturing plants have been treated as the main sources of air pollutants throughout the last decades, where ships have been deemed too far from the shore and insufficiently significant as sources of air pollution to be provided considerable attention (Čampara & Hasanspahić, 2018). Marine fuels have historically been subject to relatively limited regulatory requirements. Therefore, international shipping has highly relied on cheap, high sulphur content fuel oil (Ringbom, 2015). During the 1980s, as a result of cumulative scientific studies, it was apparent that the emissions by ships had a significant role in polluting the air, and it was necessary to take effective and urgent actions. Concerning the increased demand for international shipping and better awareness of the harmful effects of air emissions from shipping, it became necessary to create an international global framework to prevent air pollution from ships. With the aim to reduce air emissions from shipping, the Marine Environment Protection Committee (MEPC) of the International Maritime Organization (IMO), started to develop a regulatory framework to reduce air emissions from ships and consider fuel oil quality as well. In 1997, a new Annex VI was adopted as a protocol of MARPOL convention for regulating and preventing air pollution from

ships, which entered into force on 19 May 2005 (IMO,1998) (Fakhry & Bulut, 2018). Annex VI was revised in 2008 for the strengthening of the requirements in view of emerging technological advancements and the expertise gained from the implementation of relevant regulations (Kopela, 2017)

Nowadays, revised MARPOL Annex VI regulates the following areas:

- Emissions of ozone-depleting substances from refrigeration plants and firefighting equipment;
- Emissions of Nitrogen oxides (NOx) from marine diesel engines;
- Emissions of Sulphur oxides (SOx) from ships;
- Emissions of Volatile organic compound (VOC);
- Emissions from shipboard incinerators;
- The quality of Marine fuel;
- The energy efficiency of ships (Čampara & Hasanspahić, 2018).

For the progressive reduction of air pollutants, MARPOL Annex VI introduced the Emission Control Areas (ECAs) for SOx, NOx and particulate matter emissions. The designated sea areas for SOx emissions so-called (SECAs) are the following sea areas: Baltic Sea, North Sea, North American and the United States Caribbean Sea (IMO, 2020). Under the revised MARPOL Annex VI, the maximum sulphur content limit was determined at 4.50% prior to 1 January 2012, to 3.50% after 1 January 2012. In October 2016 during the 70th of MEPC session the decision was made to implement a sulphur limit of 0.50% globally from 1 January 2020. The determination of the date was based on the examination of the feasibility of compliant fuel (Kopela, 2017).

The main concern of this dissertation is sulphur emissions. Sulphur which naturally exists in small concentrations of oil and coal has been known for years as the primary source of sulphur oxide emissions, one of the key causes of acid rain and air pollution in many urban and industrial areas. Moreover, acidification and sulphur oxides concentration in the air are harmful to the vulnerable habitats of the ecosystem, it reduces the growth of the corps and green areas, and most notably it has an adverse

impact on human health (Čampara, 2017). Based on the IMO 4th GH study the vessel-based sulphur emissions in 2018 accounted for 11.4 million tonnes (Figure 1).

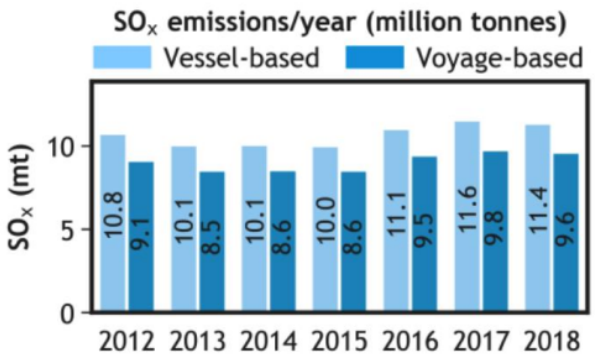

Figure 1. *SOx emissions in million tonnes between 2012- 2018*. (IMO, 2020)

In 2015, the United Nations General Assembly developed the Sustainable Development Goals (SDGs) for the 2030 Agenda for Sustainable Development where all nations, developed or developing, are mobilised to achieve 17 goals. SDGs represent a universal call to action on how to combine economic development, social inclusion and environmental sustainability over the next decades, in areas which are essential for humanity and the planet (Jihoon, 2017). A key concern to this study is SDGs 3, 13 and 14, respectively, on good health and well-being, climate action, and life below water. Considering that the innovative policies and legal frameworks are crucial for achieving SDGs, proper and adequate implementation and enforcement of the MARPOL Annex VI requirements will significantly contribute to the achievement of those goals.

Georgia is an essential part of the Eurasian transportation corridor, at the crossroads between Europe and Central Asia. Georgia connects important economic regions in the EU, Turkey and the Caucasian region, respectively. The maritime sector of Georgia plays a vital role in the economic relations of the country with foreign countries and the development of the transport corridor between Europe and Asia.

Respectively, the geographical location provides unique opportunities for the development of maritime transport. Currently, in Georgia, there are two ports and two oil terminals (MTA,2020), which are further demonstrated in figure 2. Georgia is a signatory party to the MARPOL Convention, the United Nations Framework Convention on Climate Change (UNFCCC) the Kyoto Protocol and the Paris Agreement but not the MARPOL Annex VI, yet. Georgia and the European Union (EU) signed the Association Agreement (AA) in 2014. In the context of the AA, Georgia has fully committed to the negotiations process of the UNFCCC and Paris Agreement on climate change and to develop the national policies in line with the EU. In this regard, Georgia took some measures to regulate sulphur emissions in accordance with the EU policies.

	Poti Port	Batumi Port	Kulevi Oil Terminal	Supsa Oil Terminal
Owner	APM terminals	Kaztransoil	Socar	BP
Location	East of Black Sea basin	South-East of Black Sea basin	20 km north of Poti port	East of Black Sea Basin
Area	29.8 Hectares	22.2 Hectares	96 Hectares	n/a
Number of Berths	15	11	3	Single Point Mooring
Throughput capacity	9 million tonnes overall. Including 400,000 TEUs	15 million tonnes liquid cargo; 2 million tonnes dry cargo; 100,000 TEUs, 180,000 pax	5 million tonnes of oil products	4 million tonnes

Figure 2. *Ports and oil terminals in Georgia* (MTA, 2020).

1.2 Problem Statement

IMO aims to maintain the shipping industry as an environmentally friendly type of transportation. IMO instruments are not self- executive and for the effectiveness of the instrument, the transition of the provisions of the instrument into

the national legislation and compliance is essential. Since the new sulphur limit is in force, now States should focus on safe and effective implementation and enforcement processes. Even the non-signatory parties of MARPOL Annex VI have an obligation to take respective measures in accordance to be in compliance with the sulphur limit requirements because MARPOL Convention is based on the no more favourable treatment principle which means that, every ship, including ships sailing under the flag of a non-signatory state, engaged in an international voyage, must comply with conventional provisions whenever entering the territory of a signatory State (Ringbom, 2017) (Kaye, 2016). Since Georgia is not a signatory party of MARPOL Annex VI, yet it still has an obligation to take respective measures concerning sulphur requirements.

1.3 Aims and the objectives

The primary aim of the dissertation is to analyse what measure has Georgia taken for compliance with the sulphur regulations and respectively discuss the current national legal framework with regard to MARPOL, Annex VI. In order to do so, the dissertation aims to examine the obligations of the flag, coastal and port States for the implementation and enforcement process of MARPOL, Annex VI sulphur requirements; discuss the current regulatory regime of sulphur emission within the European Union (EU), and highlight the difficulties that accompany the process of implementing and enforcing the sulphur limit requirements and in particular, the potential challenges that Georgia may face during the implementation process.

1.4 Methodology

In order to fulfil the aims and objectives, a legal dogmatic approach will be utilised, focusing on analysing the existing sulphur emissions control regime. The dissertation analyses the legal instruments such as international conventions, resolutions, and national legislation as primary sources, while it will be examining different secondary sources, including reports issued by international organisations.

A legal comparative methodology will be used to provide insights as to the steps taken by Georgia to implement the sulphur regulations following the lead of the EU legislation.

1.5 Structure of the dissertation

The dissertation is organised into six chapters.

Chapter one will cover the background of the topic, problem statement, the aim and objectives and the methodology of the thesis, respectively.

Chapter two will discuss the importance of existing sulphur regulations and the significance of the current sulphur limit against the above-mentioned SDGs and the protection of human health and the environment.

Chapter three will analyse the main responsibilities of flag, coastal and port States in order to implement and enforce the sulphur regulations. Moreover, it will discuss the role of IMO Instruments Implementation (III) Code, the IMO Member State Audit Scheme (IMSAS) and the enforcement regime by Memorandum of Understanding (Mou) on Port State Control in order to put in place the sulphur regulations discussed in Chapter two.

Chapter four of the dissertation will analyse the regulatory legal framework in the EU, the enforcement regime therein laid down as compared to the global regime provided by IMO. In doing so, d outline the role of the European Maritime Safety Agency (EMSA) in this process will be discussed.

Chapter five of the dissertation will discuss the current regulatory framework of the sulphur regulations in Georgia and highlight the potential challenges which Georgia may face in the implementation and enforcement process.

Chapter six of the dissertation will present the conclusion based on the analysis of previous chapters.

Chapter 2: The development and Importance of Sulphur Regulations

2.1 Introduction

Over the last decades, air and greenhouse gas (GHG) emissions have been the subjects of an international legal framework due to their devastating effect on human health and the environment. During the past years, several international and regional regulations have been adopted by different organisations to address the issue of climate change. The World Health Organization (WHO) declared air emissions as the greatest risk to the health and environment; the International Panel on Climate Change (IPCC) affirmed that air emissions are the leading cause of climate change and its negative impact on oceans (Ölçer et al.,2017). In 1992, on the Earth's summit in Rio de Janeiro, the United Nations Framework Convention on Climate Change (UNFCCC) was adopted to stabilise GHG emissions in the atmosphere. This convention was made operational by adopting the Kyoto Protocol in 1997. According to the UNFCCC and the Kyoto Protocol, climate change is the "common concern of mankind" and to address this problem is under the interest of the international community (Tanaka, 2016).

In the international arena, the regulatory framework for international shipping is under the IMO mandate. The primary source of air emissions from shipping is associated with marine bunker fuels. In accordance with article 2(2) of the Kyoto protocol, IMO has an obligation to regulate air emissions from marine bunker fuels. To address the acute problem of air emissions, the IMO adopted MARPOL Annex VI - named "Prevention of air pollution from ships" - in 1997. Nowadays, it stands as the primary tool to deal with air pollution from shipping and deals with air pollutants such

as sulphur oxides, nitrogen oxides, ozone-depleting substances and greenhouse gases (Shi, 2017).

This chapter will discuss the impact of the sulphur emissions; the correlation between the United Nations Convention Law of the Sea (UNCLOS) and MARPOL Annex VI sulphur regulations and the development process of sulphur regulations by IMO.

2.2 Sulphur emission and its impact on human health and the environment

Sulphur emissions have harmful effects on human health and the environment, especially to the habitats which live near the coastline and ports. To understand why IMO decided to establish the limits of sulphur content in fuels, it is crucial to discuss what is the sulphur oxide contribution to the damage to the environment and human health.

Annually, international shipping is responsible for approximately 12% of global sulphur oxides (SOx) emissions. SOx emissions depend on the type and content of the fuel. While burning the fuel, the sulphur reacts with the oxygen in the engine and SOx are formed. After their forming, SOx are diffused into the atmosphere. SOx provoke cardiovascular and pulmonary diseases for humans, such as lung cancer, asthma, and breathing difficulties. Studies have shown that air emissions from ships are the leading cause of around 4,000 lung cancer and millions of asthma cases in the world. From an environmental point of view, SOx provoke acid rains which removes the minerals and nutrients from the soil which are crucial for the growing and productivity of the plants. Because of the acid rain, the seawater becomes more acidic, which harms aquatic life (Ji, 2020).

Heavy fuel oil (HFO) is the most used type of fuel for the ships and the one where the sulphur content is quite high (Kontovas, 2020). HFO contains 3,500 times more sulphur oxides than diesel and other alternative fuels. Standing on board a cruise

ship that consumes HFO is the same as standing in heavily trafficked areas with million cars.

The only way to control SOx emissions is to reduce the content of sulphur in the fuel. To switch to a cleaner fuel than the current ones would amount to a huge step taken towards a healthier ecosystem and to a reduction in the risk of cardiovascular, respiratory, pulmonary and oncological diseases (Ji, 2020). Moreover, some scientific research has outlined the importance of the implementation of IMO 2020 sulphur regulations; otherwise, air emissions from shipping would contribute to more than 500,000 premature deaths by 2025 (Brown, 2019). This fact highlights once more the reason why IMO has set up such a radical sulphur limit to be reached in 2020.

2.3 UNCLOS in relation to sulphur regulations

The United Nations Convention of the Law of the Sea (UNCLOS) often called "The Constitution for the Oceans", establishes the basic legal framework for the fundamental issues of the sea, including marine environmental protection (Almestrand Linné, 2017). UNCLOS itself does not regulate sulphur emissions specifically but establishes the basic principles and jurisdiction rules for the flag, port and coastal States.

Following article 1 of UNCLOS, marine environment pollution means,

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

There is no doubt that air emissions from the combustion of marine fuels follow under the scope of the above-mentioned definition of marine environmental pollution, due to their detrimental effect to the marine ecosystem. Moreover, the regulations of sulphur emissions can be considered as "generally accepted rules and standards", in view that, as for 2020 the signatory States of MARPOL Annex VI represents 98.76% of world tonnage fleet (GISIS 2020) (Tanaka, 2016).

Part XII of the UNCLOS named as "Protection and Preservation of the Marine Environment|", establishes the jurisdiction of the flag, ports and coastal States on these matters, taking into account the maritime zones. As a general principle, article 192 of UNCLOS outlines that States have an obligation to protect and preserve the marine environment. While focusing on State responsibilities, UNCLOS also outlines the importance of international cooperation to address the issue of environmental damage. According to article 194, States shall take all necessary measures individually or jointly to prevent, reduce and control pollution of the marine environment. Specific obligations for flag, coastal and port States with regard to the international regime of sulphur regulations will be discussed later in chapter 3.

2.4 MARPOL Convention and MEPC work on sulphur regulations

MARPOL convention is one of the four pillars of IMO instruments, and it addresses environmental issues related to the shipping industry. MARPOL was adopted in 1973, and since then it has been updated to respond to crucial and new environmental concerns. This convention has six annexes. Annex VI on Prevention of air pollution from ships was adopted in 1997 as a protocol to MARPOL convention and entered into the force in 2005. Nowadays, it stands as the primary tool to deal with air pollution from shipping and deals with air pollutants such as sulphur oxides, nitrogen oxides, ozone-depleting substances and greenhouse gases, as indicated before. The following section will analyse and discuss how MEPC has developed the limit of the sulphur content throughout decades.

Back to history, at the second North-Sea conference, Norway raised the topic of air emissions and its adverse impact on ocean acidification. The discussion of the conference stimulated IMO to take further actions. In 1990, the issue of regulation of air emissions first appeared in the working agenda of MEPC. The discussion between member States and stakeholders of the shipping industry started by establishing the sulphur reduction targets and possible dates for them to be achieved. After seven years of discussion, in 1997 the MARPOL Annex VI was adopted, which entered into the force in 2005.

Initially, the maximum limit of sulphur content was 4,5% globally and 1,5% in ECAs. ECAs, in accordance with the MARPOL Annex VI, are areas where the adoption of special mandatory measures for emissions from ships is required in order to prevent, reduce and control air pollution from sulphur oxides or other substances which are covered by this Annex. The North and Baltic Seas always have been vulnerable for acidity, consequently from the beginning both, the North and Baltic Seas were included as ECAs.

The discussion of the importance of revising MARPOL Annex VI continued earlier in 2004 because the main aim of IMO always has been, and still is, to maintain the shipping industry as the most environmentally friendly type of transportation. Taking into consideration the fact that the ratio of sulphur emission is directly proportional to the sulphur content in the fuel, the new amendments of the MARPOL Annex VI have strengthened the sulphur limits even more. In 2010, through MEPC.176(58) Resolution, a revised MARPOL Annex VI entered into the force, which set up the global limit at 3,5% from 1 January 2012. For the purposes of the revised MARPOL Annex VI, SECAs designated for the SOx emissions by IMO, covers the following areas: Baltic Sea, North Sea, North American and the United States Caribbean Sea area where, since 1 January 2015, the limit of sulphur emissions reduced to 0.10%. From 1 January 2020, the global limit outside SECAs has been reduced from 3,5% to 0.50 %. (Svensson, 2011) (Brown, 2019).

SOx emissions are not only addressed at the international level. For instance, China has established its domestic regulations with regard to the sulphur content in the fuels used in its waters. From 1 January 2019, the limit of sulphur content is 0.50 % and it is applied within the entire Chinese coastline. Moreover, California's Air Resources Board has enforced a 0.10% sulphur limit within 24 nautical miles off the Californian coast. The maximum limit of the sulphur content is 0.10% in the ports of the EU since 2010. As of 1 January 2015, ships in the SECAs which are sea areas of the Baltic, the North Sea and the English Channel use fuels with a sulphur content of no more than 0.10%. (see, Figure 3)

Area	Sulphur limit	Scrubbers
Global	0.50% (2020)	Certain restrictions apply for open-loop scrubbers
SECA	0.10%	Certain restrictions apply for open-loop scrubbers
EU	0.10% in all ports	Certain restrictions apply for open-loop scrubbers
China	0.50% in national waters (12 nm)	Certain restrictions apply for open-loop scrubbers
California	0.10% within 24 nm	No, only with research exemption

Figure 3. *Sulphur limits in fuel for 2020* (DNV GL, 2019).

2.5 Conclusion

This chapter has discussed the impact of sulphur emissions from the shipping industry and it is undoubtedly, that it has a direct negative impact on the environment and human health as a result of burning the high sulphur content of the fuel. The chapter has analysed the steps taken by IMO over the decades to establish the current sulphur cap 2020 and outlined that the main aim of IMO stricter limits was to maintain the shipping industry as the most environmentally friendly type of transportation.

Chapter 3: The international legal regime for the implementation and enforcement of MARPOL Annex VI Sulphur regulations

3.1 Introduction

With regard to the implementation and enforcement of sulphur regulations, UNCLOS and MARPOL grant the jurisdiction for the flag, coastal and port States, to implement and to enforce their provisions, respectively. The effectiveness of the global environmental regime significantly depends on appropriate implementation and enforcement processes by States and high-level compliance by stakeholders. Enforcement involves the imposition of consequences such as sanctions and penalties for non-compliance, while compliance is a more general concept than implementation. It means how States are complying with their obligations under international regulations and their behaviour about accepting the main principle behind the legal instruments (Karim, 2014).

MARPOL Annex VI is a regulatory instrument, which is not self-executing and its provisions are broadly formulated. In order to give effect to the conventional provisions, States implement them into national legislation considering their national policies and regulations. According to public international law, jurisdiction is classified as prescriptive and enforcement jurisdiction. Prescriptive jurisdiction refers to the legislative power of a State to create and amend legislation. Enforcement jurisdiction refers to an executive power of a State to enforce its legislation and penalise non-compliance and violation of laws (Kaye, 2016).

This chapter will analyse and discuss the requirements and compliance options which are essential for the effective implementation of the MARPOL Annex VI provisions, the jurisdiction limitations of the flag, coastal and port States and their specific obligations and responsibilities, which are essential to give the complete and full effect of sulphur regulations under MARPOL Annex VI.

3.2 Fuel oil availability and quality

Following regulation 18 of MARPOL Annex VI, all State parties are required to take reasonable measures to provide compliant fuel options on their ports and inform IMO about fuel availability in their ports and terminals via the Global Integrated Shipping Information System (GISIS) MARPOL Annex VI module. For the purpose of this regulation, a Bunker Delivery Note (BDN) shall be kept on board the ship and shall be immediately available for inspection at all appropriate times.

In order to comply with and enforce sulphur regulations, the critical point is to switch to cleaner fuel. The shipping sector has mainly three options to comply with new regulations:

1. To burn low sulphur content fuel oil (LSFO);
2. To use the liquified natural gas (LNG) or other fuel alternatives; or
3. To install an exhaust gas cleaning system, the so-called scrubbers (Gilbert, 2014).

Low sulphur content oil- To use LSFO like marine gas oil or marine diesel oil, where the sulphur content is no more than 0,10% of the total, is the primary alternative for compliance. However, the price of LSFO is quite high. Moreover, switching fuel requires certain modification in the ship engine like changing lubricants because in LSFO the lubricity is higher than in HSFO. The availability and price range between LSFOs depend on the market and the principle of supply and demand (IBIA, 2019).

LNG and other alternative fuels-LNG is natural gas cooled down around -160 °C to transform gas into its liquid condition. LNG nowadays is considered an alternative fuel which is expected to have a more favourable position in terms of multiple advantages to human health and the environment. The content of LNG gives the possibility to remove sulphur oxides from the exhaust gas completely. Moreover, LNG is a commercially attractive alternative because the supplies are available worldwide and can meet the demand for fuel in the upcoming years. However, it is

also remarkable that the use of LNG as a fuel for combustion purposes can increase the emission of methane which is a powerful GHG, therefore using LNG as an alternative fuel is not the best option in order to meet another aim of IMO which is reducing GHG emissions from international shipping (Xu, 2020). Except for LNG, several types of biofuels are considered as a compliance option for global sulphur cap 2020 (Koga, 2018).

Scrubbers-Taking into account the high price of LSFO, scrubbers give the opportunity to continue burning HSFO with an exhaust gas cleaning system. Under MARPOL, "the carriage of non-compliant fuel oil on board the ship for combustion purposes, propulsion or operation purposes is prohibited unless the ship has an exhaust gas cleaning system". Scrubbers are installed in the exhaust system after the engine or boiler for removing SOx from the exhaust. Scrubbers and its technology allow operation with fuel where the sulphur content is higher than the new sulphur content limit. For absorbing SOx from engines, different absorbers are used, and the types and systems of scrubbers are categorised as wet and dry systems. There are three types of scrubbers: open-loop, closed-loop and hybrid scrubbers (Panasiuk et. al, 2015).
Hybrid scrubbers are an easy solution for retrofitting scrubber vessels that can work both in open-loop and closed-loop configurations. Which means that ships can use closed-looped scrubbers in ECAs and in ports and open-looped in the other area where the restrictions for open-looped scrubbers are not applicable.

The main difference between open-loop and closed-loop scrubbers is the type of exhaust absorber. Open-loop scrubbers use seawater as an absorber and after cleaning, discharge it back into the sea. In contrast, closed-loop scrubbers use freshwater for cleaning and store the residues in the tanks, and then discharge the water from the ship at the port reception facilities. Open-loop scrubbers prevent the emission of sulphur in the air, but the environmental impact of discharged water is still unknown. There are some ports in the United States, Europe and China which prohibit the discharge of water from the open-loop scrubbers (DNV GL, 2019).

Another significant difference between the scrubbers is associated with the price to the extent that closed-loop scrubbers are more expensive than open-loop ones. Moreover, a recent study conducted by CE Delft outlined that scrubbers produce considerably lower CO2 emissions compared to using very low sulphur fuel oil (CE Delft, 2020).

In order to monitor the fuel oil availability and quality compliance, the following documents have been made mandatory:

BDN is a crucial document to monitor fuel oil quality. Following the regulations of the MARPOL Annex VI, the ships of 400 gross tonnage (GT) and above, must have BDN, which is issued by the fuel supplier with respective signature and confirmation that the fuel is compliant with the regulations. The BDN must be retained for three years after the fuel has been delivered on board (MEPC.176(58)).

Fuel Oil Non-Availability Report (FONAR,) on the other hand, is an essential document which represents evidence concerning the attempt to purchase compliant fuel or other fuel alternatives according to the ship voyage plan, but despite the attempts, no such compliant fuel was made available for purchase. FONAR contains detailed information about the contacting details of the fuel oil suppliers and the dates when the attempt was made. The master or owner of the ship must immediately notify the port State administration in the port of arrival and the flag State administration about fuel oil non-availability. A copy of FONAR must be kept on board the ship for at least three years (MEPC.320(74)).

3.3. Surveys and issuance of certificates

An International Air Pollution Prevention (IAPP) certificate is evidence that every essential survey was undertaken by the flag State authorities, in order to ensure compliance with the regulations in MARPOL, Annex VI. The IAPP certificate is crucial for the PSC and other enforcement authorities. It is mandatory for all ships of 400 Gross Tonnage (GT) and above. For ships of less than 400 GT, parties shall decide

which measures need to be taken in order to ensure that they also comply with the regulations. Flag States determine the validity of the IAPP certificate, but it cannot be more than five years. In order to issue the IAPP certificate, a flag State should confirm the information that fuel oil, technology, equipment, fittings, arrangements and all necessary systems comply with the applicable requirements. If there are no scrubbers installed, the IAPP certificate merely depends on the matter of the sulphur content of the fuel (Fosser, 2019) (MEPC.175(58)).

Regulation 5 of MARPOL Annex VI, specifies the initial, renewal, intermediate, annual, and additional surveys. An initial survey is issued before the ship is put into service or before the certificate is issued for the first time. The initial survey aims to ensure that all equipment and material fully comply with the regulations.
A renewal survey takes place at intervals specified by the flag State administration, but not exceeding five years, except in the circumstances which are defined by the Annex VI of MARPOL. An additional survey, general or partial, according to the circumstances, shall be made whenever any essential repairs or renewals are made, such as installing scrubbers. Intermediate surveys are undertaken within three months before or after the second and third anniversary date of the certificate. The aim of an intermediate survey is to make sure that all equipment and arrangements are in good condition and comply with the requirements.

An annual survey is prescribed within three months before or after each anniversary date of the certificate and aims to monitor how the arrangements, equipment, systems, fittings and materials have been maintained. The surveys of ships and issuance of certificates are flag State administrations responsibilities, but the duty may be delegated to Recognised Organisations (ROs) such as classification societies or nominated surveyors. However, the Administration maintains full responsibility for the certificates.

3.4 Reception facilities

The MEPC has strongly encouraged Member States to fulfil their treaty obligation to provide appropriate reception facilities, considering the fact that the reception facilities are the essential part of an effective enforcement process of MARPOL Annex VI, particularly for the ships equipped with scrubbers, as equivalent arrangements to comply with SOx regulations to discharge the residues generated from their operation (IMO, 2016). After absorbing the sulphur emissions from the exhaust gas with scrubbers, the sludge must be stored on board prior to discharge it to a shore facility.

In accordance with regulation 17 of MARPOL Annex VI and MEPC guidelines for reception facilities under MARPOL Annex VI, the obligation of providing respective reception facilities is a port State responsibility that involves port operators and ship repair ports. Moreover, following the regulations, reception facilities must be adequate and shall meet the needs of the ships calling at a port or terminal without causing undue delay. Parties are strongly recommended to make periodic updates to the accessibility of reception services in the GISIS (MEPC.199(62)) (IMO, 2016).

3.5 Flag State responsibilities

Flag States have a prominent role in implementing and enforcing international standards on the prevention, reduction and control of pollution of the marine environment on vessels, which fly under their flag. At high seas, the only enforcement body is the flag State; therefore, control of compliance of sulphur regulations by flag States are crucial in order to meet the sulphur requirements. In accordance with article 217 of UNCLOS, flag States shall ensure that vessels flying under their flag or their registry are in compliance with international standards and regulations, and their national laws and regulations with regard to reduction and control of pollution of the marine environment, adopted in accordance with this Convention. UNCLOS does not limit flag State jurisdiction in respect of the maritime zones therein established, but

they also have jurisdiction on violations of MARPOL Annex VI, regardless of where these occur, including on the high seas (Fanø, 2019).

Flag States under MARPOL Annex VI have prescriptive and enforcement jurisdiction too. The prescriptive jurisdiction of the flag State is to adopt the national regulations according to the international standards. Regulation 4 of the MARPOL Annex VI, notes that flag States can take alternative measures to meet the new sulphur limit regulations. Regulation 14 of MARPOL Annex VI provides several methods of compliance, such as limit values and other alternatives to comply. The application of the compliance method is the subject of the flag State administration during the implementation process.

To make the switch to meet the requirement of the new sulphur content limit is challenging. Moreover, the operation inside and outside ECAs requires using different sulphur limit fuels or other compliance methods. In ECAs, where more strict limits are imposed on the sulphur limits, fuel needs the changeover, which should be done with an on board written implementation procedure adopted by the flag State administrations. In this respect, flag State administrations should encourage vessels flying their flag to develop a ship implementation plan regarding how the vessel will comply with the sulphur content limit inside and outside ECAs.

The records and dates of the fuel oil change must be recorded in logbooks prescribed by the flag administrations, which later will be the subject of the port State inspection. (MEPC.320(74)) (IMO, 2020).

In summary, in order to implement and enforce the sulphur regulations flag States have the following responsibilities:

- Conduct surveys of the vessels flying their flag;

- Issue the International Air Pollution Prevention (IAPP) certificate;
- Determine the validity of the IAPP certificate;
- Approve the alternative compliance method; and
- Develop a ship implementation plan.

3.6 Coastal State responsibilities

In accordance with article 220 of UNCLOS, coastal States may institute proceedings in respect of a violation of their national laws and regulations adopted in accordance with this convention when the violation has taken place in the territorial sea or the exclusive economic zone (EEZ) of that State. Under article 21 of UNCLOS, if there are clear grounds to suspect that, during the innocent passage, the vessel has violated the national laws and regulations adopted to reduce and control pollution from the vessels, coastal States can carry out physical inspections of the vessel and if the evidence warrants, undertake the proper proceedings.

From the perspective of MARPOL Annex VI, coastal States have limited power to control the activities of ships exercising their rights of innocent passage, but surveillance by the coastal States can have a significant effect on improving the enforcement of these regulations (Salomon & Markus, 2018). While the ship is operating in the territorial sea or EEZ, to detect if it is compliant with sulphur regulations or not, is the coastal States responsibility.

Air pollution is not as easily detected as oil spills. Finding out if the ship is in compliance with the sulphur limits and other air emissions regulations during the innocent passage is complicated. In this regard, to check the sulphur content, coastal States need special technologies like sniffers, which is a remote sensor installed in drones or planes, in order to detect sulphur content in the fuel which the ship is burning at the moment of operation (Koga, 2018).

Consequently, UNCLOS and MARPOL Annex VI grant for coastal States' exercise of both prescriptive and enforcement jurisdiction. With regard to the sulphur regulations, they can adopt national laws and policies and in the case of non-compliance and violation undertake proper proceedings.

3.7 Port State responsibilities

The flag States remains the primary body responsible for the control of emissions from ships, but it has become apparent through the years that a number of flag States are either unable or unwilling to take the necessary actions to fulfil their conventional responsibilities. Port State jurisdiction (PSJ) and port State control (PSC) perform to back up the flag State implementation and enforcement responsibilities, especially in the case of Flags of Convenience (Bang, 2008). That is done by individual action of port States or by their coordination under the MoU.

3.7.1. Port State jurisdiction and control

Port State has both prescriptive and enforcement jurisdictions. PSJ under article 218 of UNCLOS is not limited to the maritime zones therein established; it can be extended beyond coastal waters, territorial sea and EEZ. While speaking about port State responsibilities, the "no more favourable treatment" principle is crucial; hence it is an essential principle for the effective enforcement of international regulations. In accordance with this no more favourable treatment principle, every ship, including ships sailing under the flag of a non-signatory state, engaged in an international voyage, must comply with conventional provisions whenever entering the territory of a signatory State. Port State can impose sanctions as a result of non- compliance with conventional provisions regardless of the nationality of a ship (Ringbom, 2018).

In accordance with article 5 of MARPOL, regulation 10 of MARPOL Annex VI and guidelines on PSC under the MARPOL Annex VI, port State should take all appropriate measures to ensure compliance with the new 0,5% sulphur content limit. The IAPP certificate issued by the flag State will not be the only proper safeguard, that

the ship complies with the requirements. MARPOL Annex VI says nothing about how the inspection should be conducted; however, the guidelines on PSC give a detailed explanation of what steps should be taken to check the compliance of conventional provisions. If there are clear grounds of non-compliance, PSC can carry out a detailed inspection, including physical inspection, fuel oil samples and examination of master and crew expertise concerning how familiar they are with operational procedures (MEPC.321(74)).

The grounds for detention of a ship by port State control officers (PSCOs) under the MARPOL Annex VI sulphur regulations are the following:

- Absence of IAPP certificate;
- Exceeding the limit of the applicable limit of the sulphur content in the fuel which is used and being carried for use on board, except the case when the master can present the FONAR;
- Absence of equivalent means of sulphur limit compliance such as scrubbers while burning non-compliant fuel oil;
- Non-compliance with the respective sulphur regulation requirements while operating within ECAs; and
- The lack of familiarity of the master or crew regarding essential procedures for the operation of air pollution prevention (MEPC.321(74)).

In accordance with MARPOL Annex VI, the responsibilities of port States are:

- Inspection of ships;
- Provide reception facilities; and
- Reporting to the IMO and flag State administration, in the case of violation of the sulphur regulations.

3.7.2 Memorandum of Understanding on Port State Control

Nowadays, the operations of the PSC have a regional nature. States in the region might collaborate under a MoU to ensure that they facilitate the operation of

the PSC and the sharing of information. The main characteristics of a MoU depend on regional approach and collaboration and cooperation between States involved for effective enforcement of international regulations (Bang, 2008).

In order to ensure enforcement and assist PSC authorities, the governing body of a MoU creates a three-year rolling average method of "White-Grey-Black" lists, to outline the quality, average and poor flag State performance, respectively (Karim, 2014). The range of performance depends on the total number of detention and inspection over the three years.

Flag States' performance has a significant influence on shipowners and their choice of a flag for their vessel. As mentioned, the level of their performance depends on the number of inspections and detentions. "Grey" and "Black" flags are under higher risk for frequent inspections. Taking into consideration the fact that shipowners are not willing to go through frequent inspections, they might register their ships under a quality flag. Consequently, we can say that the "White-Grey-Black" lists encourage every flag State to improve their performance, which is in direct connection to proper implementation and enforcement of international regulations (Fosser, 2019).

3.8 III code and IMSAS in connection with MARPOL Annex VI sulphur regulations

III Code and the IMSAS have a common goal: to enhance global maritime safety and the protection of the marine environment. The III Code is designed for assisting States in implementing and enforcing IMO instruments and represent the standard for the IMSAS (A.1067(28)). Implementation and enforcement of IMO instruments by the IMO Member States are the key to assessing if IMO's objectives are achieved or not. The III Code sets the responsibilities for the flag, coastal and port States for effective implementation and enforcement processes. According to the III Code, member States have to evaluate their performance on a periodic basis,

concerning their responsibilities as a flag, port and coastal State and the level of implementation and enforcement of the IMO instruments to which they are a signatory party (Barchue, 2009).

The lack of will and failure by the flag States to implement, enforce and give full and complete effect to their obligations and responsibilities to the instruments was the main purpose for the IMO to amend the IMSAS. From 2016, the scheme has become compulsory for all member States, and it examines the effectiveness of their performance with regard to IMO instruments (IMO, 2016) (Salomon & Markus, 2018).

The MARPOL Convention and its Annexes are under the scope of the III Code and IMSAS. IMSAS evaluates how States have implemented the IMO instruments into the national legislation and then how the legislation is enforced by examining the following areas:

- Jurisdiction;
- Implementation into national legislation;
- Enforcement arrangements;
- Surveys, certification and other control mechanisms;
- Selection, delegation, control and monitoring of recognised organisations; and
- Investigation and reporting system to IMO and other administrations (A.1067(28)).

Through the IMSAS, the member States gain valuable input, which is helpful to improve their capacity to give the effect of an instrument in practice. Moreover, this feedback is widely shared between the member States. For effective implementation and enforcement of sulphur regulations, the III Code and IMSAS are crucial elements, hence taking into account that revising the sulphur regulations are challenging for States, the shared feedback and detailed inspection report by the audit can help analyse

the challenges of implementation and afterwards take reasonable proceedings. From a different perspective, IMSAS tends to assist IMO to identify the weaknesses of the instrument and therefore revise it accordingly (IMO, 2015).

3.9 Conclusion

Compliance with, and enforcement of, the sulphur limit regulations are very challenging. Unlawful air emissions are not as easily detected as oil spills. Even initial signs of non-compliance and verification of a violation require advanced technology, technically complex operation, qualified personnel and an immense amount of time (Ringbom, 2017). Effective implementation of sulphur regulations depends on the flag, coastal and port States' performance. To give a full and complete effect for sulphur regulations, flag, coastal and port States must fulfil their obligations simultaneously and in good faith. Taking into account that flag States have an obligation to inspect the ships in the specific time period and there is no obligation for additional surveys unless the specific circumstances established by Annex VI are met, and the air emissions generally can be detected while the ship is operating, enforcement of sulphur regulations heavily relies on coastal and port States exercising their responsibilities. Consequently, to give full and complete effect for sulphur regulations, flag, coastal and port States must fulfil their obligations simultaneously and in good faith.

Chapter 4: Regulatory Framework of Sulphur Regulations in the EU

4.1 Introduction

Facing the environmental threats of climate change, depletion of biodiversity, deforestation, air emission and water pollution, demands real dedication at the national level and effective international cooperation. Recognised as a leading advocate of international environmental issues, the EU is engaged in supporting sustainable development around the world (EU Commission, 2020). The EU is not a member State of IMO as a reason that IMO only allows membership for the States, but it is an influential supporter of IMO instruments, consequently, the EU is now harmonising MARPOL Annex VI requirements, to reduce the harmful impact of air emissions from ships and ensure the proper operation of the domestic economy in the area of the shipping industry (Pyć 2018).

The following chapter will discuss relevant regulations related to sulphur emissions, existing inspection methods and characteristics of the enforcement regime under the EU legislation. Moreover, the chapter will discuss the role of EMSA in terms of technical assistance, which it provides in order to implement and enforce sulphur regulations effectively.

4.2 Legal framework of sulphur regulations in the European Union

In the EU, ship sulphur emissions are regulated by Directive (EU) 2016/802, of the European Parliament and of the Council relating to a reduction in the sulphur content of certain liquid fuels, known as the “Sulphur Directive”. It sets limits on the maximum sulphur content in the fuels. The Directive also includes certain additional fuel-specific criteria for ships docking at EU ports, responsibilities relating to the use

of fuels covered by the Directive and to the application of the Directive (EMSA 2020) (Adriaenssens & Rillaer, 2016).

Under the Sulphur Directive, Member States shall take all proper steps, in order to make sure that, in the marine fuels used in the areas of their territorial seas, EEZ and pollution control zones the sulphur content does not exceed 0,50% from January 1, 2020. According to the directive, all ships berthing in EU ports must use a maximum of 0.10% sulphur content fuel. As of 1 January 2015, the limits for the sulphur content of marine fuels used in ECAs, such as the Baltic Sea, the North Sea and the English Channel, are set at 0.10%.

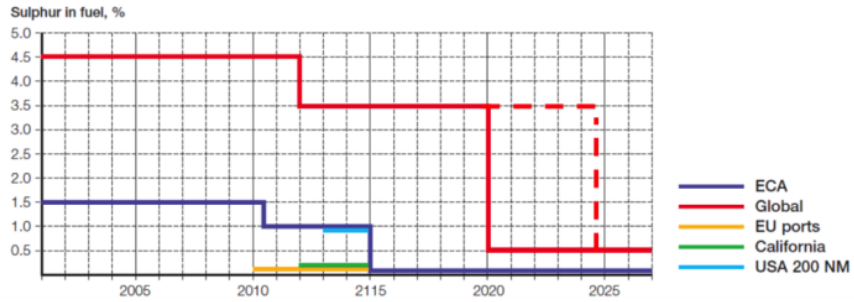

Figure 4. *The development of the sulphur content limit. (EMSA, 2017)*

4.2.1 Fuel oil availability and quality:

Under the sulphur directive with regard to the fuel oil availability and quality, Member States shall:

- Focus on ensuring the supply of compliant marine fuels, in relation to article 18 of revised MARPOL Annex VI;
- Guarantee publicly available registry of local marine fuel suppliers;
- Ensure that the sulphur content of all marine fuels, sold in their jurisdiction, is registered by the supplier on BDN and it is followed by a sealed sample signed by the representative of the recipient vessel;
- Take measures against marine fuel suppliers that have been found to supply fuel that does not meet with the requirements set out in BDN.

Article 12 of the Sulphur Directive notes that, as a result of an unexpected change of the supply of compliant fuel, it becomes challenging for a Member State to limit the sulphur content, the Member State shall notify the European Commission accordingly. The Commission may permit a higher limit to apply within the jurisdiction of that Member State for a period not exceeding six months. The European Council and the Member States shall be informed about this decision.

4.2.2 Alternative methods of compliance:

Under article 8 of the sulphur directive, access to emission abatement methods should be facilitated. Abatement methods are alternative methods of compliance which can reduce pollution at least equal to, or even greater than, those that can be accomplished using low-sulphur fuel, providing that they do not have serious adverse environmental and health effects. They should be implemented according to adequate approval and control mechanisms. The EU, as abatement methods, recognises on board exhaust gas cleaning systems-scrubbers, LNG and other biofuels.

Exhaust gas cleaning systems

As mentioned, member States of the EU harmonise and implement EU directives into their national legislation. Using scrubbers are approved by the flag States as an acceptable alternative way of compliance with the sulphur limit requirements, but at the same time, coastal States have a right to ban using certain types of scrubbers, specifically open-loop scrubbers, because as discussed above the impact of water discharges from open-loop scrubbers is uncertain on the environment. With regard to using scrubbers, there are a significant number of States which have banned using open-loop scrubbers. In 2016, the European Commission published the summarising position of Member States on the acceptability of discharge of wash water from scrubbers. According to this document, States, such as Denmark, Belgium, France, have specific requirements with regard to the open-loop scrubbers. For instance, Belgium prohibits the discharge of EGCS residues in its ports and internal waters, the

discharge of residues and wastewater is allowed in coastal and open seas if it does not imperil the requirements of the EU water framework directive (safety4sea, 2019). Furthermore, following the EU Commission note, in France, port authorities can prohibit the entry into the port of any vessel whose presence is likely to jeopardize human health or the environment. In addition, the respective authorities in France have sent the information to shipowners, including those intending to install scrubbers, to notify them of the specifications they needed to meet EGCS specifications (EU Commission, 2016).

LNG

The use of LNG as an alternative fuel has the greatest potential to reduce sulphur emissions. However, future methane emissions derived from the use of LNG in ship engines need to be monitored in order to ensure the overall environmental benefits of using LNG as a marine fuel (Xu, 2020). Because the use of LNG, as an alternative compliant fuel, is associated with challenges such as high methane release rate, the European Sustainable Shipping Forum (ESSF) sub-group on LNG as Marine Fuel is working on the development of uniform regulations that would guarantee the safe and secure use of LNG both within the EU and globally. (EMSA, 2018) (EU commission, 2018).

4.2.3 Reception facilities

MARPOL Annex VI introduced discharge requirements for the new waste categories, in particular the residues from exhaust gas cleaning systems. Effective control of overboard discharges from scrubbers is required to reduce the potential adverse effects on the marine ecosystem caused by the PH level change (Ülpre & Eames, 2014). Consequently, in this regard, proper and adequate reception facilities are essential. The discharge residues from exhaust gas cleaning systems are under the scope of EU directive (EU) 2019/883 on port reception facilities for the delivery of waste from ships. According to the directive, Member States should continue to work with IMO for the detailed assessment of the environmental effects of wastewater discharges from open-loop scrubbers.

Member States have an obligation under the directive on port reception facilities, to make sure that adequate waste management and processing scheme is in effect and enforced for each port following ongoing discussions with the relevant parties, including port authorities or their delegates, and, where necessary, responsible local authorities and port reception facilities operators. These discussions can be held both during the initial planning of the waste management and treatment plan and after its implementation, in particular, when major changes have been undertaken.

Member states shall take all necessary measures to ensure that port reception facilities are available and adequate to meet the needs of ships, without creating an undue delay. The information of appropriate port reception facilities, including their location and opening hours, list of waste categories which the port is managing to receive, and the service fees, have to be easily accessible for the ship operators in the official language of the Member State where the reception facilities are based and where necessary, in international language too in the Union's Maritime Information and Exchange System - SafeSeaNet (EU. (2010/883)).

4.3 European Maritime Safety Agency

In the context of the sulphur regulations, EMSA conducts capacity building activities, such as dedicated training on EU environmental regulations to maritime authorities and inspectors of member States, candidate countries, possible candidate countries and countries falling within the framework of the European Neighborhood Agreement, with the goal of improving the implementation of sulphur standards and approximating legislation to the EU. More precisely, EMSA provides a specially designed service of professional assistance to administrations through workshops, training, sharing of best practices and other technical and professional support. (EMSA, 2020).

In recent years, new technologies have been developed which allow the airborne monitoring of ship emissions. Such technologies are not sufficient ways to detect non-compliance, but the reported information to PSC authorities allows to take further steps for the inspection of the ship. In 2018, EMSA announced providing a

Remotely Piloted Aircraft System (RPAS). From the sulphur emissions perspective, the RPAS can carry SOx sensors to determine the sulphur content in the plume released by the vessel into the atmosphere and consequently estimate the sulphur content from the exhaust gases. Based on the proportion of the sulphur detected by RPAS, the member States can potentially schedule inspections of the targeted vessels and examine if additional measures are required or not. The service of RPAS by EMSA is free of charge for the EU Member States, candidate States and member States of the European Free Trade Association (EMSA, 2018) (EMSA, 2018a). In this point of view, the EU has a significant privilege to detect the non- compliance effectively, because of the free of charge availability RPAS developed by EMSA.

Sniffers also are installed at stations in some particular areas in Europe, for instance, in Denmark near the Great Belt Bridge, in Gothenburg and other areas (OECD\ITF, 2016) (Zis & Cullinane, 2020). The station installed with a sniffer monitors the content of sulphur in the plume from incoming vessels. There is no doubt that sniffers are a significantly effective way of monitoring foreign vessels, however, the location of available stations with sniffers is publicly available which cause the challenge that vessels only comply with the requirements, while passing the area of the station (Zis & Cullinane, 2020).

4.4 Enforcement regime in the EU

The IMO is not responsible for setting fines or penalties and emphasises that it is the duty of the individual State authorities. The directive (EU) 2016/802, establishes a sanction mechanism. According to it, efficient, adequate and dissuasive sanctions are necessary for the enforcement of this Directive. Member States should impose penalties that are assessed in such a manner as to guarantee that penalties at least eliminate the economic gains gained from their violation and that such fines progressively rise for repetitive infringements. As previously mentioned, all EU directives require transition into the national legislation. In the context of the sanction mechanism, approaches by the EU Member States are not uniform. For instance, in Belgium, the maximum limit of the sanction in case of non-compliance accounts for

6.000.000€ while in Latvia the equivalent is 2900€. The imbalance between the sanction rates is not contributing to the effectiveness of the enforcement regime of sulphur regulations (Zis & Cullinane, 2020).

To find out the non-compliance of the sulphur regulations, PSC has a vital role. Paris MoU has 27 member States and they cover the waters of the European coastal States and the North Atlantic region from North America to Europe. A majority of EU member States is a party to the Paris MoU. Around 18,000 inspections are carried out annually on board the foreign ships at the Paris MoU ports, in order to verify that these ships follow international safety, security and environmental requirements and that the crew members have sufficient living and working conditions (Paris MoU, 2018).

Every ship is assigned with a Ship Risk Profile (SRP) which has a crucial role for PSC. The SRP will assess the priorities of the ships for inspection, the period between inspections and the areas of inspection. The SRP is mainly focused on historical and standardized criteria. Every day, PSCOs select several ships for inspection via THETIS, which is the informational database to support PSC developed by EMSA (BIMCO, 2018). The system serves for the region of Paris MoU. The inspection with regard to the sulphur regulation in Paris Mou is carried out in accordance with MEPC guidelines for PSC under MARPOL Annex VI.

MAJOR CATEGORIES OF DEFICIENCIES 2017-2019

		2017		2018		2019	
Deficiencies Main Group	Category of deficiencies	Def	Def %	Def	Def %	Def	Def %

Pollution prevention	Marpol Annex I	642	1.6	604	1.5	561	1.4
	Marpol Annex II	14	0.0	12	0.0	16	0.0
	Marpol Annex III	10	0.0	5	0.0	8	0.0
	Marpol Annex IV	368	0.9	326	0.8	357	0.9
	Marpol Annex V	470	1.1	762	1.9	587	1.5
	Marpol Annex VI	426	1.0	693	1.7	524	1.3
	Ballast Water	76	0.2	573	1.4	622	1.6

Figure 5. Major categories of deficiencies in 2017-2019 *(Paris MoU, 2019)*

The Sulphur Directive indicates that a stronger and more harmonized monitoring and enforcement regime is urgently needed to ensure proper implementation thereof by ships calling EU ports. Consequently, EMSA extended THETIS by developing THETIS-EU, which is an EU's information system which plays a significant role in the enforcement of the requirements of the Sulphur Directive. THETIS EU is dedicated to the enforcement of the Sulphur Directive because it provides more detailed inspection requirements. It has been adopted by all EU coastal States voluntarily for the application and exchange of information of the results of inspections by the authorities and enforcement actions upon individual ships. Nowadays, THETIS-EU facilitates effective analysis of EU compliance under the Sulphur Directive and provides internationally recognised practices for the enforcement regime (EMSA, 2020).

Unlike the MARPOL Annex VI, THETIS-EU establishes more specific and detailed inspection on ships, more specifically, vast categories of documents are checked, such as the following:

- BDNs;
- Ship log books including oil record book, records of navigational activities;
- Oil Record Book as prescribed by flag States for fuel change-over procedures (including information about the quantity of low sulphur fuel oils in each tank, date, time and position of the ship when any fuel oil changeover operation was completed before entry into the SECA or

started after exit from that area and information of fuel changeover procedure in the EU berths);

- Fuel logs;
- Quantity and quality benchmarks from the tanks at the starting point of verification period;
- Record of navigational activities and daily reports (including vessels' position, course and speed and any details affecting the vessel's voyage or safe operation with particular attention to determining whether the ship has allocated sufficient time for a proper fuel changeover procedure before entering to SECA;
- Fuel line diagrams;
- and information on which fuel is in which tank (EMSA, 2019).

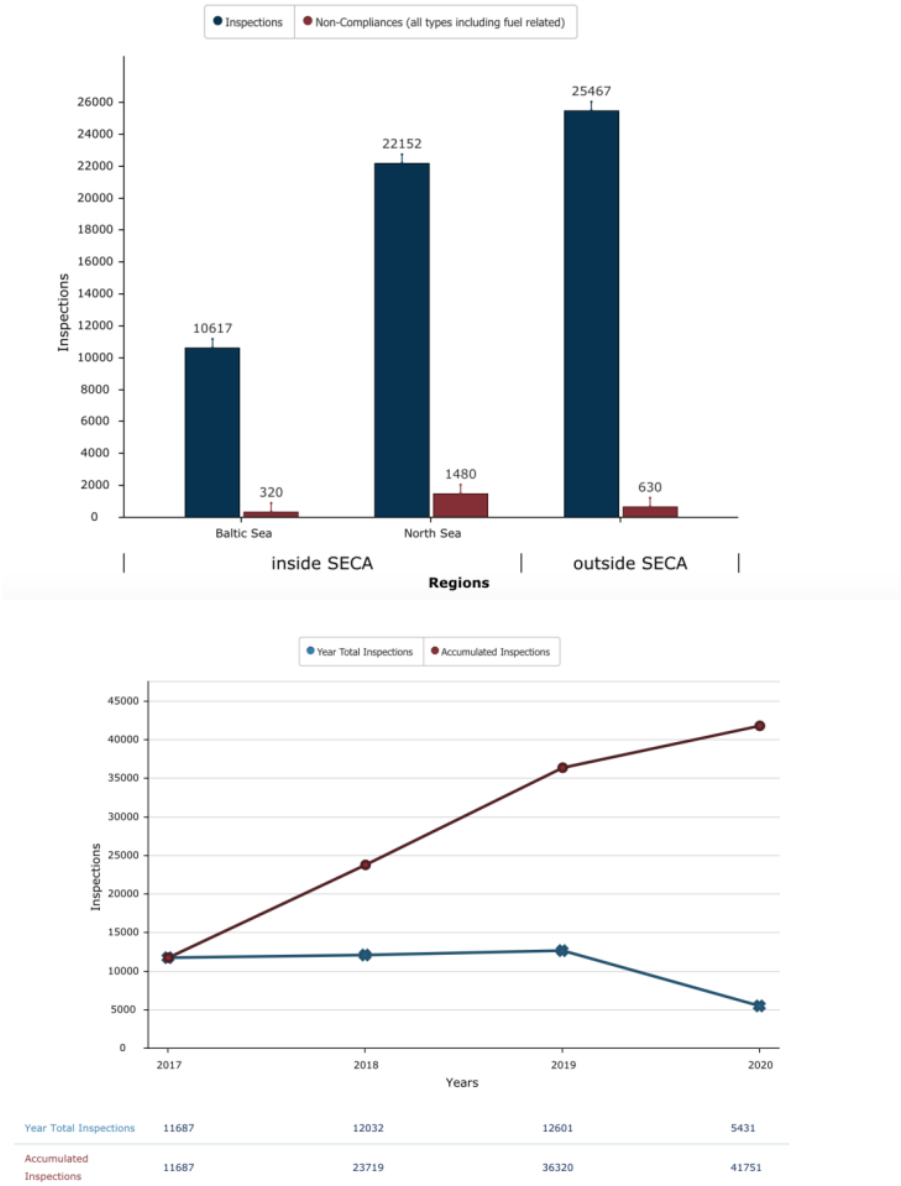

Figure 6. *The rate of Inspection and non-compliance between 2017-2020. (THETIS-EU, 2020)*

Figure 6 illustrates the number of THETIS-EU inspections in the EU with a respective number of non-compliance with EU sulphur directive requirements. Prior to the

implementation of the THETIS-EU inspection regime, the volume of inspections has changed from 1 in 1000 ships calling at EU ports to 1 in 10, which have a significant positive pattern on effective enforcement of sulphur regulations. If we compare the rates of the total inspections by THETIS-EU and PSCO under Paris Mou (see figure 5 and 6), the number of inspections by THETIS-EU is significantly higher and the frequency of inspections definitely has a positive pattern of the enforcement of sulphur regulations.

Chapter 5: National Regulatory Framework with regard the Sulphur Emissions in Georgia

5.1 Introduction

Georgia is a vital part of the Eurasian transportation system, located at the crossroads between Europe and Central Asia. Georgia connects respectively essential economic regions in Europe, Turkey and the Caucasian region. The geographical location creates unique opportunities for maritime transport development. Figure 7 depicts the two main ports and two oil terminals that currently exist in Georgia (MTA, 2020).

	Poti Port	Batumi Port	Kulevi Oil Terminal	Supsa Oil Terminal
Owner	APM terminals	Kaztransoil	Socar	BP
Location	East of Black Sea basin	South-East of Black Sea basin	20 km north of Poti port	East of Black Sea Basin

Figure 7. Current Ports and Terminals, located in Georgia *(MTA, 2020).*

Georgia is a unitary parliamentary republic with a civil law legal system. The Constitution of Georgia is the supreme law of the State. In accordance with the Constitution, the Parliament of Georgia is the supreme representative body of the country which exercises legislative powers. Ratification of the international conventions is also under the Parliament's mandate.

The Government of Georgia represents the supreme body of the executive power and the implementing foreign and domestic policies of the State is under their mandate. The Maritime Transport Agency (MTA) represents the National Maritime Authority of the country under the Ministry of Economy and Sustainable

Development. MTA, as a national maritime authority of Georgia, is responsible for implementing international regulations of the maritime sector, covering areas such as coordination of control of marine pollution, regulation of the Georgian maritime industry by guaranteeing maritime safety and security for Georgian ports and the merchant fleet under Georgian flag (MTA, 2020).

Georgia is a signatory party of the MARPOL Convention, the UNFCCC, the Kyoto Protocol and the Paris Agreement but not the MARPOL Annex VI, yet. In 2014, Georgia and the EU signed an Association Agreement (AA). AA is a key component of political and economic cooperation between the EU and Georgia and implies reforms in areas such as environment, energy, transport, tourism, education, trade and agriculture with the aim of bringing Georgia into line with EU standards. In the context of the AA, Georgia has fully committed to the negotiations process of the UNFCCC and Paris Agreement on climate change (Akhvlediani & Havlik, 2019) (Emerson & Kovziridze, 2016).

Moreover, Georgia is a beneficiary country of the Black and Caspian Seas project (BCSEA) of EMSA. Taking into consideration that maritime safety, maritime security and marine environmental protection are priority interests of the EU Member States and non-EU States bordering the Black and Caspian Seas, EMSA has developed a technical assistance programme that brings together national, European and international stakeholders with the goal of improving safety, security and protection of marine environmental standards. EMSA, in the context of marine environmental protection, provides for BSCSEA beneficiaries technical and operational assistance to improve the most up-to-date international marine environmental protection instruments and their proper implementation; for the inspectors ensuring accession to THETIS-EU and adequate preparation for the application of EU requirements in the area of marine environmental protection and others (EMSA, 2020b).

The Chapter will discuss the current legal framework of sulphur regulations in Georgia and the potential challenges that the country may face in the implementation process.

5.2 National regulatory frameworks with regard the sulphur emissions in Georgia

Even though Georgia is not a signatory party to the MARPOL Annex VI yet, the country has taken respective measures with regard to the sulphur emissions. As mentioned in previous chapters, MARPOL Annex VI, even though it is not ratified, it requires to comply with the new regulation, primarily as flag State because of no more favourable treatment principle. All ships flagged and visitors regardless of the nationality of the flag, must comply with the new sulphur regulations. Moreover, in order to follow the EU standard line, the Government of Georgia adopted the respective regulations concerning the limit of the sulphur content in the fuel.

Maritime Circular.№5/CIRC/FSI on Prohibition the Carriage of Non-Compliant Fuel

MEPC in 2018 adopted a "carriage ban" of non-compliant fuel, which means that any non-compliant fuel prior 1 January 2020 has to be de-bunkered if the ship is not fitted with scrubbers (IMO, 2018). Consequently, MTA adopted Circular № 5/CIRC/FSI in 2020, in order to make sure that none non-compliant fuel is carried on board, otherwise PSCOs will take respective measures which may include detention of the ship or other enforcements or administrative or corrective actions.

The maritime circular notes that shipowners and operators have three main options of compliance:

- Use compliant fuel oil with a maximum sulphur content not more than 0.50% m/m;

- Use an alternative fuel, such as LNG, with a sulphur content of 0.50 % m/m or less;
- or use an alternative method of compliance, such as an EGCS-scrubbers, approved in respect to MARPOL Annex VI requirements.

The said circular notes that PSCOs will pay attention from January 1, 2020, to the following items during the inspection:

1. If the ship carries on board the compliant fuel, in which sulphur content is not exceeding 0.50% m/m unless approved alternative methods are installed.
2. If the ships have proper approval of any installed exhaust gas cleaning systems, or other alternative methods if it is required.
3. If there are BDNs and related samples or records kept on board the ship.
4. If there are records about fuel oil change over, where it was required.
5. If the master of the vessel and crew are familiar with the crucial fuel oil management procedures.

Under the circular, all vessels operating under the flag of Georgia are requested to ensure compliance in order to prevent undue delays in ports.

Under the maritime Circular№5/CIRC/FSI, in the context of the PSCO inspections, we can conclude that maritime circular is adopted in the line of the standard of PSC guidelines under the revised MARPOL Annex VI which will have an equivalent effect in order to monitor the compliance of the sulphur emissions within the jurisdiction of Georgia.

Technical regulation about approval of the limit values for sulphur content in some liquid fuels with regard to regulating the sulphur content in the fuel.

In 2017, the government of Georgia adopted Resolution №256 about approval of the limit values for sulphur content in some liquid fuels. The main objective of the regulation is to protect human health and the environment from the expected damage as a result of the combustion of the liquid fuel, to ensure the reduction of SOx by imposing the limit on the sulphur content in the fuels and to facilitate the gradual establishment of the legal frameworks established by EU.

Following the technical regulation, the limit of sulphur content in marine fuel is 0.50%m\m in the territorial sea and EEZ of Georgia. The regulation applies to any flagged vessel, including the vessels departing from the country. In the berths of Georgia, the maximum limit is 0.10%. The control over implementation and fulfilment of the requirements of the maximum permissible sulphur content in marine fuels used by ships is under the department of environmental supervision which represents the sub-agency of the Ministry of Environment and Natural resources of Georgia.

If the content of the marine fuel does not meet with the requirements, the environmental supervision department shall require the ship to:

- Provide the record of the measures taken in order to comply with the requirement of the marine fuel;
- Present evidence of an effort to purchase compliant fuel within the scheduled route. If such fuel was not available within the scheduled route, provide the proof of attempting it from alternative sources.

Compliance with sulphur content limit shall be checked by sampling which shall be carried out periodically, with sufficient frequency and quality. Examination of samples should be carried out without undue delay. The local fuel supplier must ensure that the sulphur content of the fuel it provides complies with the requirements of this Regulation. A record shall verify fuel oil compliance in BDN, which should be accompanied with a signature and sealed sample by the representative of the

recipient's vessel. Fuel oil suppliers and the sample details on local marine suppliers shall be made publicly available in the National Agency of Public Registry of Georgia.

Technical regulation about approval of the limit values for sulphur content in some liquid fuels, sets the same limit concerning the maximum sulphur content in the marine fuels, as it is set in the EU outside the SECA. Moreover, the surveillance of fuel oil quality is also based on the same standard of the MEPC guidelines on PSC under the revised MARPOL Annex VI. PSC as it is established in the sulphur directive. Technical regulation outlines that, despite the fact that Georgia is not a signatory party of MARPOl Annex VI, the limit values on the sulphur limit is in line with EU policies, consequently it is corresponding to the MARPOL Annex VI sulphur requirements.

Bucharest Convention

Georgia is a signatory party of the Convention on the Protection of the Black Sea against Pollution (Bucharest Convention). All six Black Sea region countries sign Bucharest Convention: Georgia, Ukraine, Turkey, Russia, Bulgaria and Romania. It is a basic legal framework for the Black Sea region's regional cooperation to protect the marine environment. The article 2(1) of the Bucharest Convention defines marine environmental pollution as "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, a hazard to human health, a hindrance to marine activities, including fishing and other legitimate uses of the sea, impairment of quality for the use of seawater and reduction of amenities". Hence, the Bucharest Convention interprets marine environmental pollution in the same way as UNCLOS.

Moreover, article 8 of the Bucharest Convention, notes that signatory States of the Bucharest Convention should take all essential measures, individually or, where necessary, jointly, to prevent, reduce and regulate the emission of the Black Sea marine environment from vessels in accordance with generally accepted international rules

and standards. As previously discussed in paragraph 2.3 in chapter 2, the sulphur emissions within its nature are under the scope of the concept of marine environmental protection and generally accepted international rules and standards. Consequently, under article 8, the Black Sea region States have an obligation to take further steps to regulate sulphur regulations too.

5.3 Port State control and the Black Sea MoU

In accordance with the Maritime Code of Georgia, MTA performs State supervision and control of the safety of navigation in the seaport water area through its structural unit-Port State supervision and control service, headed by a Port Captain. The Port State Control and Supervisory Department is responsible for the safety of navigation in respective ports, for monitoring and controlling ships in accordance with the port rules and for the supervising of the fulfilment of the regulatory requirements set up by international agreements and national laws by vessels arriving in the ports of Georgia.

The Black Sea Memorandum of understanding (BS MoU) was signed on April 7, 2000, In Istanbul. BS MoU includes PSC of the ports of Bulgaria, Romania, Russia, Turkey, Ukraine and Georgia. The BS MoU assists the ports for the election for inspection of ships more precisely, like other regional PSC MoUs, the BS MoU gathers information about vessels entering the Black Sea ports and transfers it to an advanced server. All information relating to the inspection by the member States shall be submitted to the Secretariat of the BS MoU, where the data is being analysed and then uploaded to the respective website (BS MoU, 2019) (Şanlıer, 2020). Through the website, all port State control authorities are able to collect information regarding the inspected and potentially inspected vessels. Consequently, BS MoU assists the Port State supervision and control services of Georgia to select the ships for further inspection.

Figure 8 illustrates the number of deficiencies related to the MARPOL Annex VI in the region of the Black Sea between 2017-2019.

CATEGORY OF DEFICIENCIES		2017		2018		2019	
		Number	%	Number	%	Number	%
Pollution Prevention	BWM	2	0.01	61	0.22	62	0.35
	Anti Fouling	2	0.01	1	0.0	2	0.01
	MARPOL Annex I	359	1.71	256	1.19	236	1.22
	Annex II	1	0.00	4	0.02	0	0.00
	Annex III	8	0.04	13	0.06	9	0.05
	Annex IV	67	0.32	55	0.25	56	0.29
	Annex V	279	1.33	312	1.45	233	1.20
	Annex VI	22	0.10	83	0.39	43	0.22
	Operational Deficiencies	0	0.00	0	0.0	0	0.00

Figure 8. *Major categories of deficiencies in the Black Sea region 2017-2019 (BS MoU, 2019).*

5.4 Challenges that Georgia may face during the implementation of MARPOL Annex VI.

As discussed in the previous section, it is clear that the implementation and enforcement of the sulphur regulations are associated with specific difficulties. Considering the fact that Georgia is not a signatory State of MARPOL Annex VI yet, the section will discuss the potential challenges that Georgia may face during the implementation process.

5.4.1 Institutional challenges

As for today, following the technical regulation of approval of the limit values for sulphur content in some liquid fuels the enforcement authority of surveillance of

sulphur content in the fuels, the responsible enforcement body is the Department of Environmental Supervision, because one of its obligations is the protection of atmospheric air, water, land, entrails and biodiversity in the territory of Georgia, including its territorial waters, continental shelf and EEZ (DES, 2020).

After ratifying the MARPOL Annex VI, the responsible authority for the supervision and control of sulphur regulations in the seaport waters would be the Port State Supervision and Control Service. Cooperation and the assigning powers between the responsible enforcement authorities will be crucial for the effective enforcement of MARPOL Annex VI.

5.4.2 Technical challenges

Air pollution does not arise as a result of a single event or incident. On the contrary, it has a continuous operational nature and cumulative effect on human health and the marine ecosystem (Ringbom, 2017). The surveillance of compliance with sulphur regulations is sometimes limited. The port State requires advanced technological equipment and expertise to carry out PSC inspections. Less developed countries may face difficulties of inadequate technical expertise to carry out all the inspections required under the IMO Conventions (Karim, 2014). During the innocent passage, in order to monitor if the foreign ship violates the coastal States national laws and regulations, the enforcement authority is the coastal State. As mentioned previously, air pollutants are not easily detected and in this context, it requires specific technologies. Sniffers are an effective way to monitor compliance, but in most cases, they are only located at strategic locations in some maritime areas. Moreover, the use of sniffers on unmanned drones is costly, especially for the less developed countries.

Effective compliance with the sulphur regulations requires sufficient availability of low sulphur fuel. In 2020, Baltic and International Maritime Council (BIMCO) with the International Chamber of Shipping (ICS), The International

Association of Dry Cargo Shipowners (INTERCARGO) and The International Association of Independent Tanker Owners (INTERTANKO) published the fuel oil quality and safety report, which highlighted the fact that transition to the new sulphur regulations is challenging for the shipping industry. More specifically, the changeover to compliant fuel oil can lead to difficulties such as increased sludge discharge, fuel pipe clogging, fuel pumps blocking, fuel injection issues and weak fuel oil ignition. Moreover, compliant fuel is not available everywhere and switching with different types of compliant fuel also causes problems with the engine (BIMCO, 2020). Therefore, it can be challenging for Georgia to provide compliant low sulphur fuel oil in its ports and terminals, constantly.

Waste and residues from ships can be as dangerous for marine ecosystems as air emissions itself, therefore, from this point of view, port reception facilities have an essential role, especially, for the vessels equipped with scrubbers in order to discharge wastewater and sludge. As of nowadays, in GISIS, there is no information with regard to the availability of reception facilities in Georgia.

Not providing sufficient reception facilities increases the risk that ships will discharge residues in open seas (OECD/ITF, 2016). Taking into consideration the fact that reception facilities are a crucial element for the effective implementation and enforcement regime of the MARPOL Annex VI, States should take further steps to develop adequate reception facilities (GISIS, 2020).

Moreover, additional training of the personnel, which will deal with MARPOL Annex VI requirements, are needed. For instance, Guidelines for reception facilities under MARPOL Annex VI also outlines that parties should ensure that individuals who process discharge of residues are properly trained in all personal protective measures to ensure safe handling of harmful materials and to prevent the release of such substances into the atmosphere (MEPC, 199.(62)).

Chapter 6: Conclusion

A significant share of global non-GHG emissions, including SOx emissions and GHG emissions originates from maritime transport. Since 1 January 2020, the global limit of sulphur content in fuel has been reduced from 3.5 % to 0.5%, which means a big step towards an environmentally friendly shipping industry. In view of this, the main objective of this dissertation was to do a study of the sulphur regulations under MARPOL Annex VI and the EU Sulphur Directive and discuss existing national legislation of Georgia in the perspective of the sulphur regulations.

The dissertation analyzed the main compliance methods such as use LSFO, using scrubbers and alternative fuels and in this regard, the responsibilities of the flag, coastal and port States in order to implement and enforce the sulphur limit requirements under the MARPOL Annex VI and the advantages and disadvantages of compliance methods and challenges, which accompany the enforcement of sulphur regulations. The discussion highlighted several times that the air emissions can be detected while the ship is operating and in this context, enforcement of sulphur regulations heavily relies on how flag, coastal and port States exercise their responsibilities.

The enforcement authority on the high seas is the flag States where their rights to monitor compliance is limited. In internal waters, territorial sea and EEZ the enforcement of the regulations is under port or coastal States mandate. Consequently, in order to give full and complete effect for sulphur regulations, flag, coastal and port States must fulfil their obligations simultaneously and in good faith.

The dissertation also discussed the correlation of the UNCLOS regime related to air emissions. Based on the analysis we can say that UNCLOS regime is neither static nor complete, as a reason, UNCLOS largely leaves it open to international institutions, specifically to the IMO, to lay down the detailed limits of the prescriptive and enforcement jurisdiction for States.

Based on the analysis of chapter 4, we can conclude that the EU has a significant role in the implementation and enforcement of sulphur regulations. While the global sulphur cap is in force now, the effective enforcement mechanism, more specifically inspecting the foreign vessels, are crucial in order to find out the compliance with the new regulations. The THETIS-EU has greatly contributed in this context. More detailed inspection and greatly increased volume of inspected vessels by THETIS-EU have a positive pattern to the enforcement regime of sulphur regulations. Technical support of EMSA, in particular, RPAS has significantly assisted the member States and will continue to assist, in monitoring and detecting the compliance with sulphur content requirements. The service of RPAS, which is free of charge available for the Member States, gives significant privileges to the EU member States for enforcing the sulphur regulations. Together with the member States and with the support of EMSA, the EU aims to assist neighbouring countries in reducing sulphur emissions from ships and supporting IMO for the effective implementation and enforcement of a global sulphur cap.

One of the main aims of the dissertation was to outline the national regulatory framework of the non-signatory State Georgia and discuss the current sulphur limit requirements in its national legislation and how they correspond to the global or the EU regime. The dissertation outlined that, despite Georgia not being a signatory party of the MARPOL Annex VI, their national legislation establishes the maximum limits on sulphur content in the fuel of 0.50%, and 0.10% in the territorial sea, EEZ and in the berths, respectively. Represented sulphur content limits are equal to those established by the EU legislation; consequently, it is corresponding to the global

regime too. Moreover, the PSC regime applicable in Georgia is based on the MEPC guidelines on PSC under the revised MARPOL Annex VI.

Georgian national legislation recognises the options of compliance in respect of international regime of sulphur regulations and prohibits using of non-compliant fuel in its territory and obliges their flagged vessels to use compliant fuel or alternative means of compliance in order to avoid undue delays in ports. Consequently, all measures, which Georgia has incorporated into the national legislation as nowadays, are in respect of the basic international regime of the sulphur regulations.

Based on the analysis of the regional and international regime of sulphur regulations, this thesis highlighted the potential challenges which Georgia may face during the implementation and enforcement process of MARPOL Annex VI sulphur regulations. The main focus, in this point of view, was the lack of technologies which are essential for effective supervision and potential difficulties associated with surveillance authorities. Considering the fact that the sulphur emission monitoring technologies are related to high cost, not every State is able to monitor and control sulphur regulations with advanced technologies and enforcement will rely on PSC alone. For the time being, EMSA provides operational and technical support to beneficiary States, Georgia being one of them will benefit from cooperation with EMSA for several reasons. First of all, the technical support such as consultations will support the successful implementation process of MARPOL Annex VI . Secondly operational support, such as granting access to THETIS-EU, proper training for inspectors and support with RPAS when it is needed, will benefit Georgia to successfully enforce the sulphur regulations.

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