Is the Shipping industry still Sulfuring?

A study of compliance factors from the IMO 2020 sulfur cap

Denise Bell Knudsen

Master's Thesis in European and International Trade Law

HARN63

Spring 2021

Supervisors: Peter Gottschalk and Jörgen Hettne

LUND UNIVERSITY

SCHOOL OF ECONOMICS AND MANAGEMENT

Abstract

This paper explores different aspects of maritime environmental legislation with the goal of identifying the influencing factors associated with achieving compliance with international maritime environmental legislation.

International shipping is often considered the most environmentally friendly form of transport, and while this is true, it is still a significant contributor to global warming and climate change. Furthermore, it is often intentionally left out of international environmental treaties and agreements, such as the Paris and Kyoto agreement.

The paper discusses and identifies implementation and enforcement of international environmental legislation, and it discusses the guiding concept of legal certainty in international environmental legislation. After that, the paper examines the unique features of international shipping, and finally, in an attempt to answer the research question, the paper examines the recent IMO 2020 sulfur cap.

The IMO 2020 sulfur changed the global sulfur emissions level from 3.5 per cent to 0.5 per cent, an ambitious goal that required a change of behaviour. While much international environmental legislation has been criticised for being unambitious and vague, the IMO 2020 sulfur is quite precise in its requirement and quite ambitious considering the required resources to ensure behavioural change.

The early findings indicate positive results from both flag states and coastal states. Furthermore, although there has been some uncertainty, most shipowners have found a compliant fuel option suitable for their business model.

Therefore, the paper concludes that implementation, enforcement, legal certainty, structural and political factors, and importantly, available resources are some of the crucial influencing factors on compliance with the IMO 2020 sulfur cap, and it is something the IMO should keep in mind for future environmental legislation.

Table of Contents

Abbreviation List

BDN: Bunker Deliver Note

CJEU: Court of Justice of the European Union

ECM: Equivalent Compliance Method

ECtHR: European Court of Human Rights

DWT: Deadweight tonnage

EEDI: Energy Efficiency Design Index

FONAR: Fuel Oil Non-Availability Report.

GHG: Greenhouse Gasses

GT: Gross Tonnage

HSFO: High Sulfur Fuel Oil

IAPP: International Air Pollution Prevention Certificate

IMO: International Maritime Organization

LSMGO: Low Sulfur Marine Gas Oil

MARPOL: International Convention for the Prevention of Pollution from Ships

M/M: Mass by mass, the concentration of an element in a compound.

NM: Nautical Miles.

P&I: Protection and Indemnity Insurance.

PSC: Port State Control.

UNCLOS: UN Convention on the Law of the Sea.

(S)ECA: (Sulfur oxide) Emission Control Areas.

SEEMP: Ship Energy Efficiency Management Plan.

RPM: Revolutions Per Minute

TEU: Twenty-foot equivalent unit.

VLSFO: Very Low Sulfur Fuel Oil.

1 Introduction and Background

Transport of goods by ship is still the most environmentally friendly form of cargo transportation. However, there is still much room for improvement, as the emission from maritime transportation is a significant contributor to global ecological change.

The only agency in charge of regulating pollution from international shipping is the International Maritime Organization (hereafter IMO). In 2008 the IMO amended the regulation on pollution from ships the 'MARPOL,' this amendment made a substantial cut in the worldwide limit for the sulfur oxide content of fuel oils for ships, namely from 3.5 per cent m/m to 0.5 per cent m/m (outside special areas).

Ratified by 98 member states, the amendment went into force on the 1st of January 2020. This change was projected to lead to a 77 per cent drop in overall sulfur oxide emissions.[1] This drop is significant, especially since sulfur oxide has been linked to causing respiratory, cardiovascular, and lung disease in humans. Furthermore, once released in the atmosphere, the sulfur oxide emission can lead to acid rain, which impacts crops, forests, and is harmful to the marine environment by contributing to the acidification of the oceans. Consequently, this legislation should be of great benefit, particularly to the environment and people living close to coasts and ports.[2]

Besides the importance of the impact on global health and the environment, the IMO 2020 sulfur cap is also significant because it has such a vast international influence.

However, the jurisdiction of the high sea is not as simple as with national borders, and the IMO has no enforcement authority in itself. So how what factors influence effective compliance in international shipping? Given the current prediction on climate change, there will likely be more ambitious legislation coming to the

[1] 'IMO 2020 – Cutting Sulphur Oxide Emissions' (*Imo.org*) <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx> accessed 10 May 2021.
[2] Ibid.

maritime industry in the near future, so what can we learn from the most recent one?

1.1 Background and Topic of Study

In order to examine influencing factors of compliance, it is important to introduce the industry of international shipping. This section will therefore give a short introduction to the international shipping industry and maritime law.

1.1.1 Shipping and Maritime law

This section sets the scene for this paper by including a short introduction to modern international shipping and maritime law.

Shipping has been around for a long time. However, modern shipping as we know it today came with the diesel-powered ship, and with this invention also came the specialisation of cargo ships, from cargo liners to reefers[3], to tankers, to all the ships we see on the sea today. There are generally three types of shipping today; the first is passenger liners. Examples are ferries and cruise liners, their cargo is mainly passengers, but they can also carry general cargo such as cars. Then there are tramp shipping and cargo liners. The difference between these two is often described as the difference between a bus and a taxi. The bus has a scheduled route with published costs, and the taxi will go as instructed, but the cost will be negotiated accordingly. In this scenario, the cargo liner is the bus; today, this is mainly containerised cargo. Hence, tramp shipping is the taxi; the cargo is usually bulk cargoes such as oil (in specialised tank ships) or dry bulk such as coal.[4]

The cost for transportation of goods is referred to as freight, and freight rates are often used as an indicator to measure the market.

[3] A reefer ship is a refrigerated cargo ship primary used to transport goods such as fruit and vegetables.
[4] Martin Stopford, *Maritime Economics* (3rd edn, Routledge 2009). Pp. 23-45.

Another factor in shipping is 'economy of scale', which has had a significant effect on shipping. Most of the shipping markets are very volatile to changes in the world market; therefore, to keep sea transport costs low, economies of scale have been a way forward. Most of the major markets (tanker, dry bulk, and container shipping) have market segments differentiated by the ship's size to utilise the bigger ship for the longest voyages. Tankers, therefore, come in sizes from 1,000 DWT[5] to over 500,000 DWT. Dry bulk carriers come in sizes from 25,000 DWT to 400,000 DWT. Finally, container ships come in sizes varying from 1,000 TEU[6] to over 23,000 TEU. The reason for the big ships is economies of scale; for example, a 330,000 DWT tanker costs about twice as much as a 110,000 DWT tanker, but it can carry three times as much cargo.[7]

Ocean transportation is still the most energy-efficient form of freight transport; however, it is also a sector that is heavily dependent on fossil fuels. And not only that, the fuel consumed is often containing a higher amount of air polluting particles (carbon dioxide, sulfur oxide, nitrogen oxides, carbon monoxide, black carbon, and others). The most common fuel type for international shipping is known as bunker fuel. This fuel is highly viscous and has a boiling point too high for road vehicles and smaller ships. Bunker fuel is the waste product of petroleum distillation, and similar to asphalt, it contains asphaltenes, which are large molecules of oil. It therefore also requires energy in the form of heating to keep the fuel liquid and additional lubrication oil for the engines.[8]

Nevertheless, it is rarely brought up at international summits, such as the Paris Climate Agreement of 2015.[9] Furthermore, the industry was granted an exemption from the Kyoto Protocol in 1997, based on the assumption that the IMO would

[5] Deadweight tons (DWT) is a measure of how much weight a ship can carry. It is the sum of the weights of cargo, fuel, fresh water, ballast water, provisions, passengers, and crew.
[6] Twenty-foot Equivalent Unit (TEU) is an inexact unit of cargo capacity, often used for container ships and container ports. It is based on the volume of a 20-foot-long (6.1 m) intermodal container.
[7] Martin Stopford, *Maritime Economics* (3rd edn, Routledge 2009). pp. 73-81.
[8] Aldo E Chircop et al, *The Regulation Of International Shipping: International And Comparative Perspectives* (Martinus Nijhoff Publishers 2012), pp. 250-258.
[9] Paris Agreement, 2015.

impose global air pollutions standards.[10] Therefore, the IMO is expected to construct global regulations, set emission reduction targets, and determine measures to facilitate their practical implementation.

The above was a concise introduction to international shipping as an industry, but now the focus will be on maritime law.

Maritime law is unique because of the global nature of shipping. It can, therefore, sometimes be challenging to establish governance over specific issues. As several jurisdictions can be involved in a single voyage; for example, a ship is loading in country A for discharge in country B, the cargo owner is from country C, the ship was built in country D, but owned in country E, and registered in country F.

Traditionally maritime law is divided between the law and jurisdiction of the coastal states and the law and jurisdiction of the high seas. This will be discussed more in the analysis section of the paper. However, for now, it is enough to know that the coastal state has jurisdiction over its territorial waters, but no single state has jurisdiction over the high seas. This does not mean that there is total lawlessness on the high seas but rather that each ship is governed by the laws of its flag state.

Every commercial ship must be registered in a country and fly said country's flag. The flag becomes the ship's nationality, and as such, the flag state has the duty to enforce national and international legislation.[11]

There are three different types of flag states; the first is a closed/national registry; in this case, ownership of the ship must in the same state as the ship's flag. In closed flag registries, the shipping companies are considered similar to any other national business. There might be a few incentives or subsidies for shipping companies, but the fleet is under the same national law, including labour laws and taxes, as any other business.[12] The second type is open registries; here, there is no requirement

[10] Aldo E Chircop et al, *The Regulation Of International Shipping: International And Comparative Perspectives* (Martinus Nijhoff Publishers 2012), pp. 250-258.
[11] Martin Stopford, *Maritime Economics* (3rd edn, Routledge 2009), Ch 16, pp. 666-672.
[12] Martin Stopford, *Maritime Economics* (3rd edn, Routledge 2009), Ch 16, pp. 666-672.

of ownership or link between the ship owners and the ship's flag.[13] The biggest flag states today are open register; (1) Panama with 225m gross tonnage[14] registered, (2) Liberia with 171,8m gross tonnage, and (3) the Marshall Islands with 163m gross tonnage.[15] Open registry flags have historically been seen as a way of avoiding taxes and trying to benefit from a low level of enforcement when dealing with safety and labour legislation. Thus, the international transport workers federation (ITF) has coined the term "Flags of Convenience" to cover for popular flag states that are cheap for the ship owners to register in, have a low level of enforcement, and low to no taxation.[16] Lastly, the third type is a hybrid ship registry. Hybrid registries were created to compete with the open registers, as they offer beneficial tax schemes such as tonnage tax[17] and have fewer entry requirements than the national registers. Hybrid registries will usually have free international crewing and other commercial incentives. However, in contrast to open registries, the hybrid registry requires a genuine link between the ships' ownership and the flag state. They typically also have a high level of enforcement. [18]

To end our introduction to maritime law, we will look at the IMO. The IMO is an agency under the UN. It was established in 1948, with the purpose "*to provide machinery for cooperation among Governments in the field of governmental regulation and practices relating to technical matters of all kinds affecting shipping engaged in international trade; to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships.*"[19]

---

[13] Ibid.

[14] An industry specific measurement, gross tonnage is the measurement of a vessel's overall internal volume.

[15] 'Top 10 Flag States 2019' (*Lloyd's List*, 2019) <https://lloydslist.maritimeintelligence.informa.com/LL1129840/Top-10-flag-states-2019> accessed 6 January 2021.

[16] 'Flags Of Convenience' (*Itfglobal.org*) <https://www.itfglobal.org/en/sector/seafarers/flags-of-convenience> accessed 07 April 2021.

[17] Tonnage tax: a taxation mechanism that can be applied to shipping companies. The tax is determined by the Net tonnage of the entire fleet of ships under operation or use by a company.

[18] Martin Stopford, *Maritime Economics* (3rd edn, Routledge 2009), Ch 16, pp. 666-672.

[19] Convention on the International Maritime Organization 1948. Art. 1.

The IMO currently has 174 individual member states.[20] When developing conventions, the IMO first works the draft in its Legal Committee and then invites members to a diplomatic conference to refine the draft and agree on the final convention to be adopted.[21] The IMO has adopted over 45 conventions related to maritime safety, environmental risks and liability, and maritime claims compensation. The most important ones are; the 1974 International Convention for the Safety of Life at Sea (the SOLAS Convention), the 1973 International Convention for the Prevention of Pollution from Ships (the MARPOL Convention), and the 1978 International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (the STCW Convention).[22] This paper will, given its aim, mainly focus on the MARPOL convention.

The MARPOL convention consists of six annexes covering different aspects of marine pollution prevention; the first annexe is concerning oil pollution, the second is control of pollution by noxious liquid substances in bulk, third is the prevention of pollution by harmful substances carried by sea in packaged form, fourth is the prevention of pollution by sewage from ships, the fifth is the prevention of pollution by garbage from ships, and finally the sixth, and the case subject, the prevention of air pollution from ships. In addition, a few annexes also have designated 'special areas,' where the conditions are extra strict.[23]

[20] 'Member States, Igos And Ngos' (*Imo.org*) <https://www.imo.org/en/About/Membership/Pages/Default.aspx> accessed 7 April 2021.
[21] Yvonne Baatz and others, *Maritime Law* (3rd edn, Informa Law from Routledge 2014). Ch. 8, pages 324-333.
[22] 'List Of IMO Conventions' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/ListOfConventions.aspx> accessed 10 April 2021.
[23] International Convention for the Prevention of Pollution from Ships 1973.

1.2 Aim and Research Question

What are the essential influencing factors concerning compliance with international maritime environmental legislation?

The case study of the IMO 2020 Sulphur cap

This paper aims to showcase the challenges of effective compliance with environmental legislation in international shipping.

The topic of international maritime environmental legislation is interesting because there continues to be an increasing demand for rules and standards to prevent global warming at an international level. However, although shipping is international, it is often left outside significant global negotiations on the area. Part of the reason might be that it is also a very sensitive and political subject because it is part of crucial infrastructure. It is also a complex area to secure enforcement mechanisms, as several jurisdictions are in play.

However, global shipping is a significant contributor to air pollution; therefore, there is a need to discuss what is being done in the area, what challenges is the IMO faced with when introducing new legislation, and what is challenging global compliance.

This paper discusses several aspects, including legal certainty, the jurisdiction of the sea, and effective implementation and enforcement of international environmental legislation to try and answer these questions.

1.3 Methodology

1.3.1 Research Design

This Research's empirical base is an illustrative case study investigating what influences compliance of the IMO 2020 sulfur cap, with a particular focus on issues such as legal certainty, jurisdiction, and effective implementation and enforcement in international maritime environmental legislation. The case study aims to get an in-depth and detailed understanding of the research question. The empirical setting is the international treaty MARPOL's Annex VI, commonly referred to as the IMO 2020 Sulfur cap; this legislation makes an interesting case, as the nature of the international shipping industry provides many challenges when it comes to worldwide compliance.

As part of the case, we look at the general challenges surrounding the sulfur cap and two states' actual implementation and enforcement. The states chosen are both maritime hubs: Denmark and Panama. Denmark and Panama are also contrasting in terms of flag states. The Danish International Flag Registry is a hybrid flag state that allows international owners to register their ships but have a high level of control and enforcement. The Panama International Registry is often regarded as a flag of convenience, primarily because of the lack of control and enforcement.

The case also includes a small section with descriptive scenarios from the author's own experience, working as a commercial operations manager in the time leading up to the effective date of the legislation, and the deadline for carrying fuels with a higher level of sulfur oxide content. Although there might be discussions concerning whether academic writing should include the author's experience and observations outside the field of sociology, it has been chosen for this paper as a way to confirm and triangulate the data, but also for the reader to recognise that the author has experience with the subject. In including personal experience, there is a risk of prejudicing the data, and there has been a conscious focus to avoid this while analysing the data.

1.3.2 Philosophy of Science and data collection

This paper aims to examine the challenges of compliance in environmental legislation in maritime law; therefore, the primary method is the legal dogmatic method. Utilised by analysing the relevant legal material, both in the form of primary and secondary sources of Law, with a particular focus, on IMO legislation and general maritime law (UNCLOS).

It should also be mentioned that the paper is not only based on the legal dogmatic method but also have a degree of interdisciplinary perspective, especially in terms of economics. The paper examines several principles of compliance and international shipping. Among those are legal certainty, legal jurisdiction, and enforcement of the high seas (UNCLOS), but also options of compliance and risk factors of non-compliance, as well as political and economic factors to see any correlation and effects thereof.

As mentioned in the above section on research design, part of the sources will be from primary legal texts. There is also a secondary date level, as this paper is structured as a case study, coming from observations and journals from implementing and enforcing the IMO 2020 sulfur cap.

1.4 Scope and Limitations

Compliance with international maritime environmental legislation is a very comprehensive subject. To keep the paper to a reasonable length, only a few factors have been chosen, and for the discussion, the primary data contributor will be the IMO 2020 sulfur cap case study.

For the case study, several states could have been interesting. However, the states chosen have been based on their contrast to each other, their maritime significance, and their geographical importance, which will grant good examples of the implementation and enforcement of the IMO 2020 sulfur cap.

There could also have been other ways to look at compliance with the IMO; however, this paper has chosen to focus on a few influencers such as implementation and enforcement, legal certainty, jurisdiction, options for compliance and resources of the member states.

It is essential to note that the term Legal Certainty is often attributed to EU law. In this paper, this is the term we will use for international legislation for simplicity. Although the paper briefly touches on EU law and terms related to EU law, the paper mainly focuses on international law and international sustainable law mechanisms.

1.5 The Current State of Research

Global shipping and regulation and governance in global shipping is a well-researched area. In more recent times, this usually also includes environmental legislation. The book "The regulation of international shipping: International and Comparative Perspective" from 2012 has a chapter dedicated to "the urgency of reducing air pollution from global shipping." The chapter is written by Broder S. P. and Van Dyke J. M. It discusses the shortcomings of the IMO regarding regulating air pollution from ships, specifically carbon monoxide and black carbon. The chapter also briefly mentions the IMO 2020 sulfur cap and the worries that it would be delayed to 2025 and how to enforce it globally, worrying that less developed states would not be bound equally. Although written in 2012, Broder and Van Dyke bring up several reasonable points on IMO's weaknesses that are still valid today, which this paper will also discuss.[24]

There have also been several smaller papers contributing to the current research. Such as "Orchestrating transnational environmental governance in maritime shipping" by J. Lister, R. Poulsen, and S. Ponte.

[24] Aldo E Chircop et al, *The Regulation Of International Shipping: International And Comparative Perspectives* (Martinus Nijhoff Publishers 2012), pp. 249-292.

Relating To the Marpol Annex VI, research has also been conducted on areas from the financial burden of the annexe to technical specifications of scrubbers and sniffer technology. However, because the IMO 2020 sulfur cap amendment is very new, there is little in terms of early findings since the effective date. Further, to contribute to the current state of research, this paper tries to go more into details of specific challenges faced by the IMO, with a more legal aspect. It also tries to differentiate between the different types of shipping because international legislation has different impacts depending on tramp and liner shipping structure.

1.6 Structure

The paper consists of five analysing chapters, a discussion chapter, and a conclusion. It starts with a broad look at influencing forces such as implementation, enforcement, legal certainty, the jurisdiction of the sea, and a brief history of environmental international maritime legislation. These factors are investigated and discussed along with the challenges relevant for global compliance to create a framework for examining the case study. The underlying factors and challenges built up to the IMO 2020 sulfur cap case study.

Below is a more detailed overview of the structure:

Chapter two, therefore, starts with the terms of compliance, implementation, and enforcement. This is to establish a framework for the overall paper.

Chapter three continues on the term legal certainty and how it is understood as a term and in cases. It also sets the definition of legal certainty used throughout the paper.

Chapter four analyses the unique aspects of the international shipping industry, especially the division of jurisdictions, which is essential to know before we can proceed to the case study, as concepts such as freedom of the high seas play an intricate role in international environmental maritime legislation.

Chapter five gives a brief overview of previous environmental legislation in international shipping and the evolution in the IMO. This helps create a background for the case study of one of the most recent environmental legislations.

Finally, chapter six is the IMO 2020 sulfur cap case study. This case study is divided into six main segments, each meant to analyse a different aspect of the legislation. First, there is an overview of the legislation. Second, there are the shipowners' options for compliance. Third, is the implementation and enforcement requirements of the legislation by different important actors. Fourth, is some descriptive observations that support the theoretical findings. Fifth, is a summary of risk factors for non-compliance. And sixth and finally, a descriptive, comparative case study of two member-states' implementation and enforcement of the sulfur cap.

Chapter seven is the discussion section, where the findings from the analysing chapters will be discussed in relation to the research question.

Lastly, chapter eight is the summary and conclusion of the paper.

2 Compliance, Implementation, and Enforcement of International Environmental Legislation

This chapter will briefly discuss the definitions of compliance, implementation, and enforcement in relation to international legislation. This is to create a framework for the case study in chapter six.

2.1 Compliance

The term compliance is generally understood to mean conforming to the rule of law or being in a state of conformity with relevant laws, policies, and standards. In an international context, compliance is usually with international treaties. This is the definition throughout the paper, however before moving on, there are a few things to note regarding compliance with international environmental treaties.[25]

Theoretically, evaluating compliance with an international treaty is simple; however, it can be more difficult in practice, and understanding the causes behind non-compliance can also be complicated. This is because compliance with the international legal system differs from the domestic legal system.[26]

For international environmental law, achieving compliance can be dependent on implementation and effective enforcement. However, compliance itself cannot be used to indicate behaviour change. It simply identifies conformity between behaviour and the treaty. This distinction is essential in international treaties as the law is agreed collectively between the parties; the language can therefore be intentionally vague, and the agreed standard can also be intentionally low, to the

[25] Kal Raustiala, 'Compliance & Effectiveness In International Regulatory Cooperation' (2000) 32 Case Western Reserve Journal of International Law. Pp 391-399.
[26] Ibid.

point where parties can easily ensure compliance, especially in treaties where a consensus is needed. [27]

Finally, evaluating compliance requires data showing a behaviour change; for this, there is a need to examine the definitions of implementation and effective enforcement of international environmental law.

2.2 Implementation

Initially, it is important to advise that this paper differs between implementation and enforcement instead of seeing implementation as an umbrella term that covers enforcement. The paper argues that there is a difference between being a party to a treaty and effectively enforcing the said treaty in international environmental law.

Subsequently, throughout this paper, implementation will refer to the process of incorporating international treaties and commitments into national law.

Although compliance can occur without national implementation, the implementation of international environmental treaties can still be a critical step toward compliance.

2.3 Enforcement

Because this paper differentiates between implementation and enforcement, enforcement will be defined as; putting international commitments into practice, creating the necessary institutions, and ensuring effective enforcement of the agreed rules. Further, using the term effective enforcement indicates that enforcement will lead to a change in behaviour, which may not otherwise meet the legal standard of compliance.

[27] Kal Raustiala, 'Compliance & Effectiveness In International Regulatory Cooperation' (2000) 32 Case Western Reserve Journal of International Law. Pp 391-399.

3 Legal Certainty

Legal certainty can be identified as one factor that can affect compliance. Theoretically, the higher level of legal certainty, the easier it will be for actors to comply with the rules and standards. Therefore, this section will discuss and define legal certainty and provide an example of legal certainty in international treaties.

3.1 Legal Certainty; a definition

To use the concept of legal certainty, we must first define the concept in relation to this paper, the case, and the research question. As mentioned in one of the previous sections, we will use a broader international definition of legal certainty as a principle.

Legal certainty is one of EU law's guiding principles, along with proportionality, equal treatment and non-discrimination, protection of fundamental rights, and the right to hearing and defence. The principle of legal certainty requires that the law be made precise enough to allow the general public to foresee, to a reasonable degree, the consequence of one's actions. Therefore, the law and application of the law should be consistent, impartial, transparent, binding.[28]

Although it will never be possible to always foresee the outcome of cases under a legislation during the law-making procedure, systematic norms applied syllogistically promotes legal certainty. Legal certainty aims not to achieve complete certainty in every legislation but rather to use it as a guiding principle.[29]

The concept of legal certainty has also been expressed in court decisions. These decisions can be used to show the practical meaning of legal certainty. According

[28] James Maxeiner, 'Legal Certainty And Legal Methods: A European Alternative To American Legal Indeterminacy?' [2007] University of Baltimore Law. Pp. 454-551.
[29] James Maxeiner, 'Legal Certainty And Legal Methods: A European Alternative To American Legal Indeterminacy?' [2007] University of Baltimore Law. Pp. 555-600.

to the Court of Justice of the European Union (hereafter CJEU) in Case C-110/03 Kingdom of Belgium V Commission of the European Communities:

"*The principle of legal certainty is a fundamental principle of Community law which requires, in particular, that rules should be clear and precise, so that individuals may be able to ascertain unequivocally what their rights and obligations are and may take steps accordingly.*"[30]

Similar to the CJEU, the European Court of Human Rights (ECtHR) describes the concept as: *"The law should be accessible to the persons concerned and formulated with sufficient precision to enable them – if need be, with appropriate advice – to foresee, to a degree that is reasonable in the circumstances, the consequences which a given action may entail."*[31]

The above definition from the EU will be used throughout this paper and for the case.

However, it is also worth including what constitutes legal uncertainty. Kammerhofer J. distinguishes between two types of uncertainty; the first is epistemological uncertainty, and the second is ontological uncertainty. Epistemological uncertainty is whether the law can be accurately perceived, where ontological uncertainty happens when there is a conflict within the law or the law's norms.[32]

[30] *Case C-110/03: Kingdom of Belgium V Commission of the European Communities* [2005] Court of Justice, ECLI:EU:C:2005:223 (Court of Justice), Para 30.
[31] *CASE OF MAESTRI v ITALY* [2004] European Court of Human Rights, Application no 39748/98) (European Court of Human Rights), Para 30.
[32] Jörg Kammerhofer, *Uncertainty In International Law* (1st edn, Routledge 2011). Ch. 1. Pages 1-5.

3.2 Legal certainty in international environmental treaties; an example

As mentioned in chapter two, international environmental legislations are often purposely vaguely written.

To exemplify this, we have Daniel Bodansky's findings from the conclusion of the Paris Agreement, an international treaty on climate change goals.

Bodansky's findings centres around the legal character of the Paris Agreement, on which he writes that there are some uncertainties, especially in seven areas: "*(i) the legal form of the agreement itself, that is, whether it is a treaty under international law; (ii) whether individual provisions of the agreement create legal obligations; (iii) whether the provisions of the agreement are sufficiently precise that they serve to constrain States; (iv) whether the agreement can be applied by courts; (v) whether the agreement is enforceable; (vi) whether the agreement otherwise promotes accountability, for example, through systems of transparency and review; and (vii) the domestic acceptance process and legal status of the agreement."*[33]

The above creates a level of uncertainty in the treaty. However, Bodansky states that while the Paris Agreement cannot necessarily be applied by domestic courts and lacks enforcement mechanisms, these are not qualifiers on whether it is a treaty or not. Furthermore, the fact that not all the treaty provisions create legal obligations does not mean that the agreement as a whole is not law.[34]

He also advises that the more specific, *more certain*, a legal norm is, the more it constrains behaviour. Still, as we have also discussed, it is difficult to agree on precise legal norms; however, non-binding legal norms are easier to agree on and can therefore be reasonably precise. Nevertheless, legal binding can support the effectiveness of a treaty.[35]

[33] Daniel Bodansky, 'The Legal Character Of The Paris Agreement' [2016] SSRN Electronic Journal.
[34] Ibid.
[35] Ibid.

Likewise, with any IMO legislation, the Paris Agreement must be formally ratified by member-states; Bodansky argues that this formal acceptance of legally binding rules creates a more significant domestic commitment rather than simply a political agreement. Furthermore, the sense of legal obligation can better create a "compliance pull," not only through self-compliance by the individual state, but the legal commitment will also mean non-compliant states will be criticised more harshly. This could affect reputations and relations with other states, making non-compliance less attractive.[36]

Although Bodansky emphasises that despite arguments favouring legal binding, the relationship between legal character and effectiveness is complicated, and no empirical study has provided definitive answers yet. Legal binding may, in fact, cause fewer states to participate because they worry about non-compliance.[37]

Bodansky's concluding remarks are that while transparency, accountability, and precision, all factors in legal certainty, can make a significant difference. Legal bindingness can lead to states not participating and can make commitments less ambitious. Thus, though important, the issue of legal character is only one factor in assessing the significance of a treaty's outcome.[38]

[36]Daniel Bodansky, 'The Legal Character Of The Paris Agreement' [2016] SSRN Electronic Journal.
[37] Ibid.
[38] Ibid.

4 Unique features of the International Shipping industry

In order to apply any compliance factors to international shipping, it is essential to examine what makes the shipping industry different from other polluting industries. This chapter will examine the unique feature of international shipping and maritime governance.

4.1 International Maritime Legislation

According to Dunne T. in his paper on the Marpol Annex VI, there are four identifiable types of environmental legislation; command-and-control, remedial laws, information-based laws, and preservation laws. Command-and-control is described as the authorities restricting the amount of pollution while still allowing industrial activity to continue. Remedial laws take effect after pollution has occurred and are designed to remedy the event; they place the burden on the polluter and often come with monetary sanctions on polluting companies; a criminal penalty is also considered within remedial laws provisions. Information-based laws require companies to disclose information about figures and risks in their practices; the idea behind this type is that it will encourage companies to self-regulate. Finally, preservation laws regulate the use of natural resources to preserve them.[39]

In the book Maritime Law by Baatz Y. et al., they explain that multilateral agreements/treaties can become customary international law and have a gravitational compliance pull where even non-parties become bound by these rules.[40] By this point, even non-party members take it for granted, and the

[39] Taylor Dunne, 'MARPOL Annex VI: Disproportionate Burden Or Necessary Regulations For The Greater Good? How Pollution Controls On The Shipping Industry Are Currently Affecting And Will Continue To Affect Maritime Commerce And The Global Environment' (2019) Vol. 44:193 Tulane Maritime Law Journal, pp. 195-200.

[40] Yvonne Baatz et al, *Maritime Law* (3rd edn, Informa Law from Routledge 2014). Ch. 8, pp. 303-335.

legislation is codified into national law, which vastly improves the legal certainty of that legislation.

This happens when treaties and legislation agreed by several states have no difference in other states' practices being inconsistent with that rule. The book offers the 1958 Convention on the High Seas (a convention we will discuss in the next section) as a prime example. The book explains that states modify their mutual rights and obligations under the custom because the convention is now considered customary international law.[41]

When it comes to IMO as the law-making entity, it is, therefore, important to note that the fact that more than 100 states with 95 per cent of the global tonnage are party to the MARPOL and SOLAS Conventions and that efforts to find solutions for new issues are always taken within IMO means that IMO's international standards are widely accepted.

4.2 Maritime Law and Enforcement

When it comes to maritime law enforcement, it is crucial to distinguish between national territorial waters and the High Seas. We also see this distinction in the literature; Baatz Y. et al. uses the term 'Maritime Zones' to explain the jurisdictions' traditional line. This describes the clear line between the territorial sea under the coastal State's full sovereignty (max 12nm from shore) and the High Seas, defined as the area beyond the territorial sea where no state has authority or jurisdiction.

4.2.1 Coastal State Jurisdiction:

Beyond the traditional zones, there are also new maritime zones and the modern law of the sea. Several new zones came with compromises during the drafting of the UNCLOS convention. Still, of interest for this paper, there is one, in particular,

[41] Yvonne Baatz et al, *Maritime Law* (3rd edn, Informa Law from Routledge 2014). Ch. 8, pages 303-335.

the 'exclusive economic zone,' which is the area up to a maximum of 200nm from the baseline of the territorial sea, where coastal states can claim sovereign rights within particular fields covering exploration, exploitation, conservation, and management of the living and non-living resources, jurisdiction over artificial islands, protection of the marine environment and certain other matters.[42] This is interesting to this paper as it increases states' area of sovereignty in terms of pollution.

4.2.1.1 Port State Control:

Part of the coastal state jurisdiction is the right to port state control (hereafter PSC). A PSC is the inspection of foreign ships in national ports to verify that the ship's condition and equipment comply with international regulations. PSCs aim to ensure maritime safety and security and prevents pollution.[43] According to the IMO, "*PSC inspections are intended to be a backup to flag State implementation, a "second line of defence" against substandard shipping, and experience has shown that they can be extremely effective.*" [44]

The right is defined in the UNCLOS article 218, paragraph one as:

"*When a vessel is voluntarily within a port or at an off-shore terminal of a State, that State may undertake investigations and, where the evidence so warrants, institute proceedings in respect of any discharge from that vessel outside the internal waters, territorial sea or exclusive economic zone of that State in violation of applicable international rules and standards established through the competent international organisation or general diplomatic conference.*"[45]

---

[42] Yvonne Baatz et al, *Maritime Law* (3rd edn, Informa Law from Routledge 2014). Ch. 8, pp. 308-312

[43] 'Port State Control' (*Imo.org*) <https://www.imo.org/en/OurWork/IIIS/Pages/PortPer cent20StatePer cent20Control.aspx> accessed 20 May 2021.

[44] Ibid.

[45] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 218, para 1.

The article also defines the relationship between the flag state and the PSC by stating that the records of the PSC investigation shall be sent to the flag State upon request.[46]

Article 219 of the UNCLOS further gives PSCs the right to detain a ship if the ship violates international legislation and standards concerning seaworthiness and poses a threat to the marine environment.[47]

As a consequence of the right to inspect foreign ships, agreements such as the Paris Memorandum of Understanding (hereafter Paris MoU) and the Tokyo Memorandum of Understanding (Hereafter Tokyo MoU) (and seven other MoUs) have been created.[48] These agreements establish harmonised systems of PSCs between several maritime authorities.[49] The MoUs also often share the findings of violations and detentions during PSC inspections and creates watch lists of offenders and low-performing flag states. Both the Paris MoU and the Tokyo MoU rank flag states' performance on a white, grey, and blacklist.

Serious offenders can also be banned for calling ports participating in the MoUs; within the Paris MoU, a ship can be banned if; 1) it has been detained three times, within 36 months for ships flying the flag of a State on the blacklist or if a ship has been detained three times, within 24 months for ships flying the flag of a State on the grey list.
2) if a ship leaves port, despite being detained.
3) if a ship does not proceed directly to repair yard following an agreement with the PSC authorities.[50]

[46] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 218, para 4.
[47] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 219.
[48] 'Port State Control' (*Imo.org*) <https://www.imo.org/en/OurWork/IIIS/Pages/Port%20State%20Control.aspx> accessed 29 May 2021.
[49] 'Memorandum | Paris Mou' (*Parismou.org*) <https://www.parismou.org/inspections-risk/library-faq/memorandum> accessed 20 May 2021.
[50] 'Banning | Paris Mou' (*Parismou.org*) <https://www.parismou.org/inspections-risk/library-faq/banning> accessed 20 May 2021.

4.2.2 Flag State Jurisdiction:

The concept "Freedom of the High Seas" was first formulated in legislation in 1958 in the Convention on the High Seas, stating that "*The high seas being open to all nations, no State may validly purport to subject any part of them to its sovereignty*."[51] Although the principle dates back to the 16th century in jurist and philosopher Hugo Grotius's book "Mare Liberum."[52]

The current convention governing the area is the UNCLOS which reiterates that ships of all nationalities have the freedom of the high seas. "*The high seas are open to all States, whether coastal or land-locked. Freedom of the high seas is exercised under the conditions laid down by this Convention and by other rules of international law."*[53]

The 1958 Convention on the High Seas established four freedoms: freedom of navigation, fishing, laying of submarine cables and pipelines, and overflight.[54] While the 1982 UNCLOS included two new freedoms; the freedom to construct artificial islands and other installations permitted under international law (subject to Part VI) and freedom of scientific research (subject to Parts VI and XIII).[55] However, it is essential to note that neither of these conventions should be considered exhaustive in their lists of freedoms.

As a consequence of the freedom of the High Seas, a Coastal State only has jurisdiction over its territorial waters and its ports. It is even somewhat limited in what can be enforced on ships only proceeding through its territorial waters due to the rights to innocent passage. The right to innocent passage is also defined in the UNCLOS convention. It establishes a list of activities defined as innocent passage, where the coastal state does not have the right to interfere. It also states that the coastal state cannot interfere with the construction, design, manning, and equipment

[51] Convention on the High Seas (Geneva, 29 April 1958); 450 UNTS 11, art 2.
[52] James Brown Scott, "Introductory note". In: Hugo Grotius (1916) *The Freedom of the Seas*, New York: Oxford University Press, p. vi.
[53] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 87.
[54] Convention on the High Seas (Geneva, 29 April 1958); 450 UNTS 11
[55] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982);

of ships in its territorial waters and can only enforce regulations in generally accepted international rules or standards.[56]

However, the UNCLOS also establishes that the duty and right to enforce international legislation is in the hand of each ship's flag state: "*Every State shall effectively exercise its jurisdiction and control in administrative, technical and social matters over ships flying its flag.*

2. In particular every State shall:

(a) maintain a register of ships containing the names and particulars of ships flying its flag, except those which are excluded from generally accepted international regulations on account of their small size; and

(b) assume jurisdiction under its internal law over each ship flying its flag and its master, officers and crew in respect of administrative, technical and social matters concerning the ship."[57]

From a legal standpoint, the flag state's role is significant, as the flag state is responsible for enforcing international legislation. Therefore, any violation of MARPOL will be sanctioned under the state's law, under whose authority the ship is operating, wherever the violation occurs.

Besides any penalty from the proper authority for not following the MARPOL legislation, the shipowner will usually lose any P&I cover. The insurance will usually only cover accidental pollution but not an infringement of the convention purposely.[58]

[56] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 17- 21.
[57] United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982); art 94.
[58] Ilian Djadjev, 'How To Comply With Marpol 73/78' [2015] SSRN Electronic Journal.

5 A Brief Overview of the Evolution of International Environmental Regulations in Shipping

The IMO 2020 Sulfur cap is one of the most recent maritime environmental regulations. The MARPOL Convention was adopted in 1973; the convention has since then been amended, with several annexes being added.[59]

The IMO has had issues with conventions being severely delayed and insufficiently ratified; the process of adopting a new regulation can take up to a decade.[60]

Despite challenges, the IMO's environmental agenda has evolved over the years, from oil spills and waste handling to greenhouse gasses (hereafter GHG), Sulfur- and Nitrogen oxides, and ballast water treatment (i.e. the prevention of invasive species).[61]

In the 1960s and 1970s, the primary environmental regulation on the agenda concerned oil spills. This came following a series of oil spills and was further emphasised after the Exxon Valdez oil spill disaster in 1989.[62] Directly following the Exxon Valdez, the double hull legislation was adopted as an annexe to the MARPOL convention in 1992. The time for phasing out single-hull ships was accelerated after the Erika oil spill in 1999.[63]

---

[59] 'International Convention For The Prevention Of Pollution From Ships (MARPOL)' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx> accessed 9 April 2021.

[60] Jane Lister, René Taudal Poulsen and Stefano Ponte, 'Orchestrating Transnational Environmental Governance In Maritime Shipping' (2015) 34 Global Environmental Change.

[61] 'International Convention For The Prevention Of Pollution From Ships (MARPOL)' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx> accessed 9 April 2021.

[62] Jane Lister, René Taudal Poulsen and Stefano Ponte, 'Orchestrating Transnational Environmental Governance In Maritime Shipping' (2015) 34 Global Environmental Change.

[63] 'Construction Requirements For Oil Tankers - Double Hulls' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/constructionrequirements.aspx> accessed 9 April 2021.

While there was general support for the oil spill regulations, the next phase in environmental legislation was more difficult, as the IMO tried to tackle GHG, namely CO_2 emissions. The first legislation went into force in 2013, with two new technical standards for ships; first, the Energy Efficiency Design Index (EEDI), which is a design requirement for minimum energy efficiency levels for all new ships; and second, the Ship Energy Efficiency Management Plan (SEEMP), a mandatory document for existing and new ships on operational measures that improve energy efficiency cost-effectively.[64] However, the SEEMP requirements are vaguely defined, with a large gap between the technical and economic rationale to improve energy efficiency on the shipowner's side, which is unfortunate as it is the only current international legislation aiming to decrease GHG in shipping.[65]

Lastly, the IMO has also tackled other emissions such as sulfur oxide and nitrogen oxide because these both have a negative impact on human health and the environment.[66] The amended Annex VI in the MARPOL decreased the global sulfur emission cap to 0.5 per cent from 3.5 per cent outside special emissions areas. The amendment also established special Emissions Control Areas (hereafter ECA) where the sulfur cap was 0.1 per cent.[67] The global sulfur cap legislation went into force in 2020 and will be discussed further in the upcoming case study in the next section. Nitrogen oxide emission has not had as comprehensive a cover as the sulfur oxide. However, the IMO did establish a special emission area for nitrogen oxide

[64] 'Energy Efficiency Measures' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Technical-and-Operational-Measures.aspx> accessed 9 April 2021.

[65] Hannes Johnson and others, 'Will The Ship Energy Efficiency Management Plan Reduce Co2 emissions? A Comparison With ISO 50001 And The ISM Code' (2013) 40 Maritime Policy & Management.

[66] European Environment Agency, 'The Impact Of International Shipping On European Air Quality And Climate Forcing' (European Environment Agency 2013) <https://www.eea.europa.eu/publications/the-impact-of-international-shipping/file> accessed 10 April 2021.

[67] 'Prevention Of Air Pollution From Ships' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Air-Pollution.aspx> accessed 10 April 2021.

as well, with new technical standards for the engines for ships operating within the area.[68]

In connection with the four types of environmental legislation, the IMO has moved from a remedial law concerning oil spills to information-based laws concerning the CO_2 emissions, to a mix of command-and-control and remedial law, restricting the amount of pollution and placing sanction on infringing shipowners concerning sulfur oxide and nitrogen oxide.

As mentioned at the beginning of this chapter, the IMO has adopted several conventions but has endured numerous implementation and enforcement challenges. The most important part of new conventions is to ensure that enough of the world's tonnage ratifies the legislation. After the ratification, the states also have to incorporate the conventions into national law. Although this should be a fairly simple process, many states fail to implement and enforce the large number of international regulations adopted by the IMO.[69]

This results in differences in states' implementation of standards and legislation, and thus far, the IMO can not take any corrective measures against states that fail to meet their obligations. In fact, the IMO's primary tool has to ensure implementation and enforcement is an audit scheme released to all the member states, showing member states' performance.[70]

This lack of global implementation can increase the legal uncertainty of environmental law, as the shipowners do not know how a given state interprets the law. It prevents the law from benefitting from any gravitational compliance pull.

[68] 'Prevention Of Air Pollution From Ships' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Air-Pollution.aspx> accessed 10 April 2021.
[69] Ilian Djadjev, 'How To Comply With Marpol 73/78' [2015] SSRN Electronic Journal.
[70] 'Member State Audit Scheme' (*imo.org*) <https://www.imo.org/en/OurWork/MSAS/Pages/Default.aspx> accessed 20 May 2021.

6 The Case of Marpol, Annex VI, Article 14

This chapter centres around the case study of the Marpol Annex VI article 14. As advised earlier, this is one of the most recent legislation to come into force, and we should therefore be able to derive some findings on compliance.

6.1 The Legislation

Commonly known as the IMO 2020 sulfur cap, the recently amended Marpol Annex VI has been ratified by 98 member states.[71] The annexe has existed since 2008, but in 2016 the IMO amended it, making the worldwide sulfur oxide limit even lower.[72]

The amended Annex VI, art. 14 reads like this:

"Sulphur oxides (SO_x) and particulate matter

General requirements

1 *the sulphur content of any fuel used on board ships shall not exceed the following limits:*

.1 *4.50% m/m prior to 1 January 2012;*

.2 *3.50% m/m on and after 1 January 2012; and*

.3 *0.5% m/m on and after 1 January 2020.*

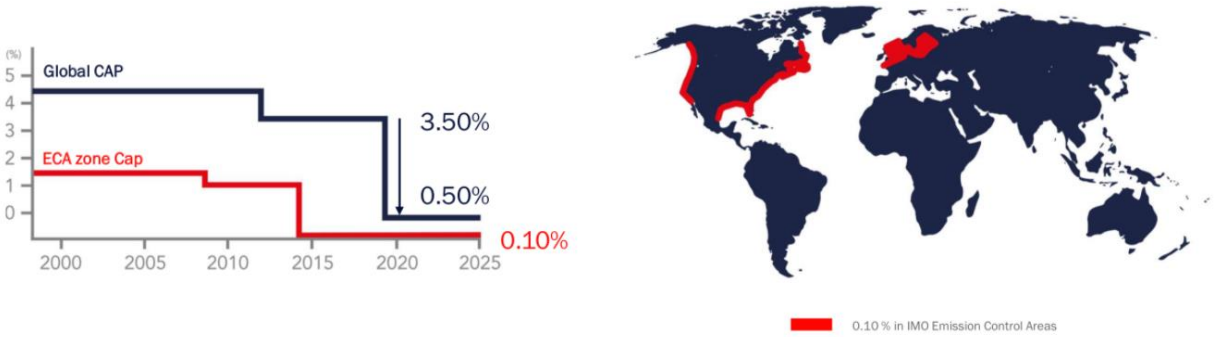
2 *The worldwide average sulphur content of residual fuel oil supplied for use on board ships shall be monitored taking into account guidelines developed by the Organization."*[73]

[71] 'Status Of Conventions - Ratification By State' (*Imo.org*, 2021) <https://www.imo.org/en/About/Conventions/Pages/StatusOfConventions.aspx> accessed 8 April 2021.

[72] 'International Convention For The Prevention Of Pollution From Ships (MARPOL)' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx> accessed 25 March 2021.

[73] MARPOL Annex VI, cc 3, Regulation 14, 2011.

For a quick overview of the Annex VI timeline and ECA zones, please see the below picture:



(Picture from Novalog.org)[74]

As mentioned in the previous section, this makes it a mix of command-and-control and remedial law. The amount of sulfur oxide is limited to 0.5 per cent m/m and requires states to place sanctions on infringing parties.

6.2 Options for Compliance

A shipowner has several options for compliance with the IMO 2020 sulfur cap. First, there is compliant fuel; usually, this would be very low sulfur fuel oil (hereafter VLSFO) with a sulfur oxide content of less than 0,5 per cent, and low sulfur marine gas oil (hereafter LSMGO) with a sulfur oxide content of less than 0,1 per cent. Shipowners who choose compliant fuel will usually carry both, one for the ECA and one for the high seas. Second, there is the "Equivalent Compliance Method (ECM)" option. This includes fitting the ships with an exhaust gas cleaning system, open or closed-loop, often referred to as "Scruppers." Third, shipowners can also use alternative fuels such as onshore power supply, biofuels, or LNG, with less or no sulfur emission.[75]

[74] 'IMO 2020 Recap' (*Novalog.org*, 2019) <https://www.novalog.org/blog/2019-10-20-IMO-RECAP/> accessed 23 May 2021.
[75] 'IMO 2020 – Cutting Sulphur Oxide Emissions' (*Imo.org*) <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx> accessed 13 April 2021.

Shifting to low-sulfur fuels requires minor adjustments and a lesser initial capital cost. Therefore, it is more often considered than scrubbers or LNG, especially when it comes to older ships. However, it is worth noting that long-term savings may vary depending on the fuel market. Concerning the scrubbers, the closed-loop is considered the most environmentally friendly choice because it adds a sodium hydroxide solution to treat clean water instead of seawater, which is used in an open-loop as a scrubbing method to improve decomposition efficiency.[76]

Notably, the open-loop system also releases the cleaning water back into the ocean, which has sparked controversy as the wastewater is acidic with elevated metal concentrations and other contaminates.[77] About 21 states have banned or restricted using this method, such as China, Singapore, the Suez and Panama Canal, for use in their ports or territorial waters, although it complies with Annex VI.[78] The drawback of the closed-loop method is that it requires shore reception facilities for the wastewater, which becomes acidic after treating the exhaust gasses.

Because of the above options, it is also illegal for ships not fitted with scrubbers to carry high sulfur fuel oil (hereafter HSFO) onboard after the 1st of March 2020.[79]

Given the two types of shipping, lower sulfur fuel oil costs will manifest differently. In the tramp markets, a higher total cost of fuel oil means a higher marginal cost. Which requires higher freight rates to break even; as the competitiveness is deteriorating, the temptation for rules violation might rise, depending on the size of a potential sanction. In liner shipping, this cost is typically carried by the cargo

[76] Kevin Li and others, 'Determinants Of Ship Operators' Options For Compliance With IMO 2020' (2020) 86 Transportation Research Part D: Transport and Environment.
[77] Johannes Teuchies and others, 'The Impact Of Scrubber Discharge On The Water Quality In Estuaries And Ports' (2020) 32 Environmental Sciences Europe.
[78] Safety4Sea, 'List Of Countries That Restrict The Use Of Open Loop Scrubbers' (2020) <https://safety4sea.com/list-of-countries-that-restrict-the-use-of-open-loop-scrubbers > accessed 20 May 2021.
[79] 'IMO 2020 Sulphur Limit Implementation - Carriage Ban Enters Into Force' (*Imo.org*) <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/03-1-March-carriage-ban-.aspx> accessed 13 April 2021.

owners as a bunker adjustment factor (BAF) or a relevant pricing structure or instrument.[80]

6.3 Implementation and Enforcement

As mentioned earlier, the IMO is a UN agency and therefore has no enforcement power on its own. Therefore, the IMO largely depends on member states incorporating the conventions into national law.

An example of this is the EU, where the sulfur oxide emissions from ships are regulated in the directive (EU) 2016/802. Also known as the 'sulfur directive,' the directive establishes the exact limits of maximum sulfur oxide content of the open sea and the ECA as the Marpol convention.[81] Likewise, the United States has codified the amendment into their Act to Prevent Pollution from Ships.

Below is a closer look at the different actors and their roles in implementing and enforcing the IMO 2020 sulfur cap.

6.3.1 The Flag state:

The amended annexe requires that all ships of 400 gross tonnages and above, which are involved with international trade, must have an International Air Pollution Prevention Certificate (hereafter IAPP).[82] The flag state usually issues this certificate after the ships have passed one or more surveys conducted by an authority from the flag state. Furthermore, the flag state should conduct regular inspections to ensure the ship remains compliant while under their jurisdiction.

Depending on the size of the ship register, this demands many resources, both technical, financial, and human resources. In fact, in their book from 2013, the IMO

[80] Kevin Li and others, 'Determinants Of Ship Operators' Options For Compliance With IMO 2020' (2020) 86 Transportation Research Part D: Transport and Environment.
[81] Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels 2016.
[82] MARPOL Annex VI, Appendix I, 2011.

estimates that no flag state has sufficient resources to oversee all surveys and certification necessary to ensure complete compliance. [83]

Most flag states choose to delegate the responsibility to recognised organisations, such as classification societies[84]. Nevertheless, the flag state still has full responsibility for the certificates.

As per the IMO's Implementation Code (III Code), to ensure efficient compliance of recognised organisations and nominated surveyors: "*the flag State should establish or participate in an oversight programme with adequate resources for monitoring of, and communication with, its recognised organisation (s) in order to ensure that its international obligations are fully met, by:*

1. *exercising its authority to conduct supplementary surveys to ensure that ships entitled to fly its flag effectively comply with the requirements of the applicable international instruments;*
2. *conducting supplementary surveys as it deems necessary to ensure that ships entitled to fly its flag comply with national requirements, which supplement the international mandatory requirements; and*
3. *providing staff who have a good knowledge of the rules and regulations of the flag State and those of the recognised organisations and who are available to carry out effective oversight of the recognised organisations*."[85]

While the IMO's Code for Recognized Organizations further requires flag states to establish the legal basis under which the authorisation of statutory certification and services is administered by having a formal written agreement with the Recognised Organisations. This written agreement should be specifying the scope of

[83] *MARPOL How To Do It* (International Maritime Organization 2013).
[84] A ship classification society is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships. A ship needs to be 'up to class' in order to qualify for insurance.
[85] IMO Instruments Implementation Code (III Code) 2013, Para 20.

authorisation, including relevant instruments and national legislation, surveys, issuance, withdrawal or cancellation of certificates, and corrective actions.[86]

6.3.2 Port State and Coastal state

Besides the jurisdiction of the flag state, there are, as mentioned earlier, also the jurisdiction of the national waters.

A port state has the responsibility to prohibit violations, regulate fuel oil suppliers, inspect ships, and undertake to provide reception facilities.

For national enforcement of Annex VI, a ship can be subject to a PSC inspection. The inspections are limited to verifying the ships' certifications, which shows the ships in compliance with international legislation and mandatory standards. In connection with Annex VI, the PSC will therefore examine the IAPP certificate to confirm the necessary surveys have been conducted.[87]

The PSC will also examine the most recent bunker delivery notes (hereafter BDNs) to check the sulphur content of the fuel delivered.[88] The PSC may also check documents connected with the FONAR exemption or within the ECA the logbook for fuel oil change over. Only if there is a considerable suspicion that the ship violates the sulfur limits can the PSC officer conduct further inspections, such as taking a sample of the fuel oil or check that the scrubbers have been correctly installed and operated.[89]

In national waters, a state can also use 'Initial emission detection methods' to target ships for further port inspections. The sulfur readings from the detection measures can be used to calculate penalties. Initial detection could be via 'Sniffers,' which detects sulfur dioxide emission levels with an ultraviolet fluorescence radiometer. The benefit of Sniffers is that they can be installed on bridges, aircrafts, or drones.

[86] Code for Recognized Organizations (RO CODE) 2013, Art 8.
[87] MARPOL Annex VI, Appendix I, 2011.
[88] MARPOL Annex VI, Appendix V, 2011.
[89] MARPOL Annex VI, cc 2, Regulation 5

A similar method uses differential optical absorption spectrometry or DOAS, with detects sulfur oxide levels by the frequencies of light passing through its plume; these can also be installed on aircrafts. [90]

Further, the contracting states have the mandate to sanction offenders for non-compliance. MARPOL suggests that sanctions should be severe enough to discourage violations. However, the convention does not dictate how to sanction; thus, it is up to the individual state to determine the liability and penalty for non-compliance.

However, like the flag state enforcement, PSC can require a lot of resources and technical expertise, which some states might not be able to accommodate.

6.3.3 Availability of Compliant Fuel and Reception Facilities

The efficient implementation of annexe VI is highly dependent on the availability of compliant fuel. Otherwise, it would be virtually impossible for the shipowners to comply. The annexe, therefore, relies on states and private refineries to produce VLSFO or fuel with similar compliant sulfur levels. In addition, the fuel supplier needs to provide BDNs to verify that the fuel is compliant, and the shipowners are responsible for getting the fuel tested by an ISO-approved laboratory to check that the fuel is compliant and safe to use.

The IMO suggests that states occasionally inspect the fuel providers and take samples. However, while some states like Brazil have naturally low sulfur fuel available, other states, such as the Netherlands, have to mix different fuel grades to achieve the compliant fuel, making the fuel slightly more unstable and could potentially have an adverse effect on marine engines.[91]

---

[90] Van Roy, W., & Scheldeman, K. (2016). Best practices airborne MARPOL annex VI monitoring. CompMon (https://www.semanticscholar.org/paper/Best-Practices-Airborne-MARPOL-Annex-VI-Monitoring-Roy-Scheldeman/37db7853ba376d2d89a6cc3f97fabfc35ff08b98).

[91] 'IMO 2020 Sulphur Cap | UK Defence Club' (*UKDC / UK Defence Club*) <https://www.ukdefence.com/insights/imo-2020-sulphur-cap/> accessed 24 May 2021.

This can also be a financial burden on oil refining developing states. It requires a substantial initial investment to adapt the refineries and ensure continuous fuel control.

Like compliant fuel availability, there need to be sufficient Reception facilities for ships fitted with scrubbers as the closed-loop scrubbers require disposal of residues produced from their operation. As mentioned earlier, the waste is acidic and can contain salts and heavy metals; therefore, the port states need to have reception facilities and waste management in place for closed-loop scrubbers to be a genuine option for compliance. Since several major owners have chosen this option of compliance, this can put a strain on crucial infrastructure, especially in developing countries.[92,93]

[92] Rhys Berry, 'Scrubber-Ready? - Bunkerspot - Independent Intelligence For The Global Bunker Industry' (*Bunkerspot.com*) <https://www.bunkerspot.com/features-all/item/scrubber-ready> accessed 23 May 2021.

[93] 'Reception Facilities' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Port-Reception-facilities.aspx> accessed 23 May 2021.

6.4 Descriptive observation on the IMO 2020 Sulfur Cap

I have worked in shipping since 2017; below are some descriptive observational experiences from the time around 2019-2020 when the law became effective, which add to the narrative of the case study.

At the beginning of 2020, I was in charge of the operation of a handy-sized bulk carrier, which still had about 14mts of HFO on board, and this needed to be disposed of before the 1st of March deadline. We knew it could not be used for propulsion. However, we were having difficulties finding any willing reception facility to discharge the fuel, and we were nearing the deadline for carrying the fuel onboard. We were unsure if the convention would allow burning the fuel in the vessel's incinerator, as this was not used for propulsion.

At the time, one of my colleagues had a ship that could not dispose of the remaining HFO before the March 1st deadline due to congestion in the port. Furthermore, the ship was running low on VLSFO and LSMGO, without any close bunker port options. We were unsure whether the ship qualified for the exception under "Fuel Oil Non-Availability Report (FONAR)."

Another interesting aspect is that we tried to cut it as close as possible in the time up to the 1st January 2020 because HFO was cheaper than the new VLSFO. Therefore, by the end of December, most of the ships in our fleet were proceeding at maximum speed to consume the last HFO in the bunker tanks. In fact, we had a ship consuming the last ton on the 31st December 1700hrs, to after that slow down because now it had to start consuming VLSFO.

6.5 Risk factors of non-compliance

Before we move further in the case study with the current level of implementation and enforcement of our case states, we can identify three sets of risk factors in the time up to the effective date of the legislation that discourages compliance from the shipowners' side: 1) the financial burden of premature compliance; 2) financial risks stemming from market uncertainty, and 3) regulatory uncertainty.

After the effective date, there is also a risk that shipowners will forum shop for flag states with less enforcement.

From the member states' side, we have identified similar factors, especially in terms of resources. The flag state needs to issue and control the certificates, and the coastal states need to control the ships in their waters. Both require technical know-how, an adequate workforce and in some cases, even changes to waste management facilities and infrastructure.

6.6 National Effective Enforcement; The Case of Denmark and Panama

As part of this case study, it is empirically important to see how different nations have incorporated the convention and how they enforce it. The nations of Denmark and Panama have been chosen to examine this. Denmark and Panama are both two fairly big shipping nations. In Denmark, there is both a national flag register and an international one; the international is considered a hybrid flag register. Panama has an international flag register and is often considered a flag of convenience.

As a port and coastal state, Denmark is located in the Baltic ECA, where the sulfur cap is 0.1 per cent m/m, and the coastal waters are high traffic routes used for innocent passage to the entire Baltic. In comparison, Panama is part of the 0.5 per cent m/m cap but has the Panama Canal, one of the most trafficked canals in the world.

6.6.1 The Danish implementation and enforcement

This section starts with the Danish implementation and enforcement. Denmark is a flag, coastal, and port state, and this section will start by examining the port state.

Denmark implemented the Marpol Annex VI by adopting the EU sulfur directive into the national law known as "*Svovlbekendtgørelsen*," amended in 2010 to fit the most recent 2020 sulfur cap.[94] The Ministry of the Environment is the law-making entity, while the Danish Maritime Authorities are responsible for enforcing the law. The Danish Maritime Authorities are also tasked with international collaboration in implementation and enforcement.[95]

6.6.1.1 The Danish International Flag Register:

Given the hybrid form of the Danish flag register, it requires that a shipowner must have economic activity in Denmark in at least one of the following three ways:

1. "*The ship's technical or commercial operations are handled from Denmark;*
2. *the unit responsible for the operation of the ship meets the requirements to be covered by the tonnage tax regime; or*
3. *the shipping company, organisation or person who holds or has applied for the ship's compliance document in accordance with the Code of Compliance (Document of Compliance) is established in Denmark."*[96]

This tie to the Danish states ensures a higher level of compliance, as it makes it easier to hold the shipowners accountable. The Danish Maritime Authority is the government body that registers ships and inspects the ships after entering the registry.

---

[94] Bekendtgørelse om svovlindholdet i faste og flydende brændstoffer 2010.
[95] 'Svovl (Sox)' (*Soefartsstyrelsen.dk*) <https://www.soefartsstyrelsen.dk/miljoe-and-klima/svovl-sox> accessed 1 May 2021.
[96] 'Foreign Shipowners' (*Dma.dk*) <https://www.dma.dk/SynRegistrering/Skibsregistret/udenlandsk_skibsejer/Sider/default.aspx> accessed 6 January 2021.

The Danish Maritime Authority demands that owners comply with all international ratified conventions in place by the time the ship was built and any legislation passed applicable since. The ship needs to have certifications on the same. The ship also needs to comply with any Danish legislation that may apply, especially in occupational health. Lastly, the Danish Maritime Authority also surveys the ships during the initial registration, which the ship needs to pass to be granted a "Permit to Trade."[97]

The Danish state has been pushing for effective enforcement of the convention, both in order to achieve the environmental goals behind the convention but also to ensure a levelled playing field for the industry.[98]

The Danish flagged ships are, in general, performing well in PSC around the world. According to the latest list published by the Paris MoU, the Danish flagged ships are in the top 5 of PSC performance, out of 70, with only 16 detentions out of 1,300 inspections.[99] In fact, since 2018, the Danish flag registry only had one deficiency due to infringement of Marpol Annex VI, although this was a detainable offence.[100]

6.6.1.2 The Coastal and Port State Enforcement

As part of an EU member state, the Danish state has been obliged to test at least 10 per cent of all port calls annually, and when it comes to enforcement as a coastal and port state, the Danish authorities have also been vigilant.[101] It is important to note that Danish coastal waters are all within an ECA established in 2015. In 2019,

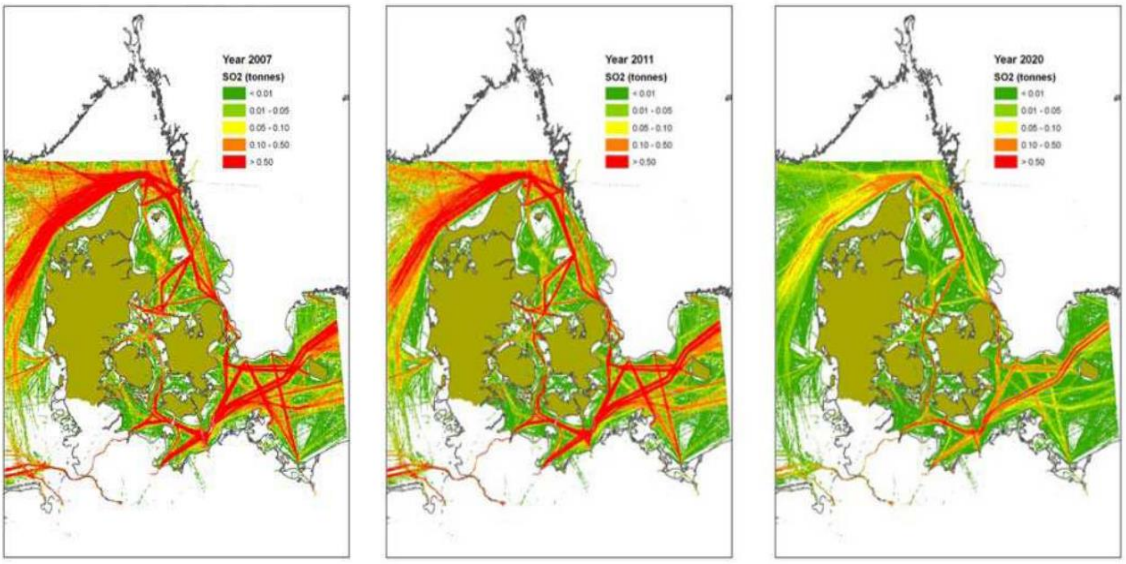
[97] European Maritime Safety Agency (EMSA), 'An Overview Of The 29 European Maritime Administrations' (European Maritime Safety Agency (EMSA) 2007). Pp 36-43.
[98] The Danish Maritime Authority, 'Authorities From Across The World Will Discuss How To Raise The Bar For Enforcement Of The 2020 Sulphur Cap' (2019) <https://www.dma.dk/Presse/Nyheder/Sider/Authorities-from-across-the-world-will-discuss-how-to-raise-the-bar-for-enforcement-of-the-2020-sulphur-cap.aspx> accessed 24 April 2021.
[99] 'White, Grey And Black List | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/detentions-banning/white-grey-and-black-list> accessed 13 May 2021.
[100] 'Inspection Results Deficiencies | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/inspection-search/inspection-results-deficiencies> accessed 13 May 2021.
[101] Danish Shipping, 'Sulphur In Marine Fuels' (2019).

the Danish Environmental Protection Agency reported 31 cases of violation of the sulfur regulations in Danish waters to the police. This resulted in about ten fines, all about USD 4.800, except for one severe offender, where the fine amounted to USD 60.000.[102] Thus far, the Danish authorities have only issued fines for violation. The Ministry of the Environment has stated that the calculations behind the fines are not definitive but proportional to the violation.[103]

Denmark was the first country to utilise sniffers to detect violators; these sniffers detect sulfur emissions from ships passing under them, either on a drone or permanently installed, as it has been under the Great Belt Bridge. When a sniffer detects a ship with higher sulfur emissions than allowed, the authorities are notified, and the ship will be inspected once it calls the next port. If the ship is not calling a Danish port, the Danish authorities will notify the authorities in the destination country. Besides sniffers, the Danish Port State control can also take fuel samples after the ship has berthed if an infringement is suspected.[104]

Because of the monitoring of Danish Waters, the Danish government is well equipped to enforce the legislation and monitor the progress. The Danish authorities release their sniffer findings on an annual basis. As seen in the below image from the Danish Ministry of the Environment, based on previous years' data, the estimated sulfur emissions should significantly decline after 2020. Only the most significant sailing routes still show yearly emissions higher than 0.5 tonnes of sulfur dioxide per KM^2.

[102] Danish Shipping, 'Sulphur In Marine Fuels' (2019).
[103] 'Rederi Skal Betale 375.000 Kroner For At Bruge Brændstof Med For Meget Svovl' (*Mst.dk*, 2017) <https://mst.dk/service/nyheder/nyhedsarkiv/2017/maj/rederi-skal-betale-375000-kroner-for-at-bruge-braendstof-med-for-meget-svovl/> accessed 1 May 2021.
[104] 'Regeringen Sætter Fokus På Svovlkontrol | NJORD Law Firm' (*Njordlaw.com*, 2018) <https://www.njordlaw.com/da/regeringen-saetter-fokus-paa-svovlkontrol> accessed 1 May 2021.



Yearly emissions of SO2 for the three years of 2007, 2011 and 2020. The unit is SO2 per km2

(Image from the Danish Ministry of the Environment, 2013)

The projection has been correct as the sulfur emissions have halved after establishing the 0.1 per cent ECA in 2015.[105]

Denmark is considered a maritime cluster, with several different areas of the industry being present, and the Danish flag registries are not the cheapest of their kind. Therefore, the state allocates a significant amount of its budget to the maritime industry and to ensure a levelled playing field, especially in areas such as environmental protection, where the Danish companies might have a competitive advantage.

[105] 'Rederi Skal Betale 375.000 Kroner For At Bruge Brændstof Med For Meget Svovl' (*Mst.dk*, 2017) <https://mst.dk/service/nyheder/nyhedsarkiv/2017/maj/rederi-skal-betale-375000-kroner-for-at-bruge-braendstof-med-for-meget-svovl/> accessed 1 May 2021.

6.6.2 The Panamanian Implementation and Enforcement

As previously mentioned, Panama as a flag state has traditionally been defined as a 'Flag of Convenience' due to the low cost, no genuine link between ownership and flag state, and lax enforcement of international legislations. However, the state has still ratified the amended annexe and incorporated it into the national law. The annex was adopted into "*Resolucion No. 106-OMI-32-DGMM*".[106]

6.6.2.1 The Flag State:

As a flag state, Panama faces a challenge due it is size. The Flag state currently holds around 18 per cent of the world fleet. Access to the Panamanian registry is very simple, a registry fee based on tonnage is the only charge, and international manning of ships is permitted. The results for the shipowners are the avoidance of tax, lower crewing cost, and a degree of anonymity for the shipowning company.[107]

As a state, Panama has ratified most IMO conventions and amendments. However, the authorities do not have the resources to ensure effective enforcement because of the massive size of the ship register.

The issues with frequent control are also reflected in the Panamanian fleets' score in the most recent Paris MoU rating, where Panama is ranked at 36 out of 70, with 323 detentions out of 6,232 inspections. Although it is worth noting, the flag registry is still on the whitelist.[108] When it comes to registered deficiencies with Marpol Annex VI in the Paris MoU, the Panamanian flagged ships have only had ten since 2018, and none where the ship had to be detained in port.[109]

---

[106] Resolucion No. 106-0MI-32-DGMM 2007.

[107] Francisco Piniella, Juan Ignacio Alcaide and Emilio Rodríguez-Díaz, 'The Panama Ship Registry: 1917–2017' (2017) 77 Marine Policy.

[108] 'White, Grey And Black List | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/detentions-banning/white-grey-and-black-list> accessed 13 May 2021.

[109] 'Inspection Results Deficiencies | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/inspection-search/inspection-results-deficiencies> accessed 13 May 2021.

6.6.2.2 The Coastal State:

Since its expansion in June 2016, the Panama Canal can accommodate more ships and larger ones. The expansion doubled the canal's capacity by widening and deepening the existing lanes and locks and added a new lane. Before, the largest ships that could make the passage were 5,000-TEU Panamaxes. However, it can now accommodate "neoPanamaxes," or "new Panamax ships," of 14,000-TEU capacity after the expansion. This meant the Panama Canal registered a total of 13,785 transits for cargo ships in 2019, transporting 252 million tons of goods and generating canal tolls of about USD 2,592 million.[110]

Before arriving in canal waters, all ships must provide information on the type of scrubber, capacities of holding tanks, and copies of their supplement to the International Air Pollution Prevention (IAPP) certificate to the canal authorities. There can also be on-site inspections which include a review of the logbooks and the operational status of the scrubber.

6.6.3 Comparison:

The early findings show that both states have implemented the convention in the national legislation. Both states have incorporated enforcement mechanisms, both as flag states and coastal states.

While Panama will likely be more challenged as a flag state because of its enormous size, the deficiencies found by the Paris MoU are minimal. As a coastal/port state, it can appear like the Danish state is doing more to catch offenders because of the use of sniffer technology. At the same time, the Panamanian authorities only check the certificates and have physical inspections upon suspicion. Sniffers would be a very effective enforcement tool in the Panama Canal. They would be able to catch

[110] 'Panama Canal | Panama Logistics Portal' (*Logistics.gatech.pa*) <https://logistics.gatech.pa/en/assets/panama-canal/statistics> accessed 18 May 2021.

many offenders, but this would also lead to the state investing more resources, both for the sniffers and to follow up on potential additional violators.

As flag states, both states have performed well considering the PSC of their fleet; however, it might be worth considering the potential influence covid-19 has had on PSC. It may not have been possible to perform as many inspections in 2020-2021 due to covid-19 restrictions and precautions.

Another thing that might influence the case study is that both member states have a significant income from maritime activities, which they can allocate to resources for enforcement.

7 Discussion

The essential factors that influence compliance with the IMO 2020 sulfur cap have been examined in this paper. The IMO 2020 sulfur cap has several challenges regarding legal certainty and effective implementation and enforcement. As it is often seen with global environmental legislation, much depends on how the states implement and enforce it. The IMO 2020 sulfur cap is extraordinary because it has comprehensive coverage with 98 member states. This gives the convention an excellent gravitational compliance pull, especially regarding tramp shipping, where the ships need to be ready to go where the cargo is.

The issue begins concerning effective enforcement. Effective enforcement has also been a historical issue with IMO's legislations, and the IMO 2020 sulfur cap is no different. Because the convention requires so much in terms of resources from flag states, coastal states, port states, fuel oil refineries, and general infrastructure, states with fewer resources will inevitably not be able to enforce the requirement effectively. However, due to the international aspect of shipping, it could be argued that the legislation does not require extensive enforcement from all member states, but rather a certain proportion of significant member states such as big flag states, popular cargo destinations or transitways, to make it less appealing for shipowners to infringe on the restriction.

Following this logic, the IMO 2020 sulfur cap will have the highest compliance level on ships that frequently travel to at least one highly enforcing state. The most internationally traded ships also tend to be the biggest ships and, consequently, the biggest polluters. There might be a case for a study on smaller coaster ships regularly going between two states with little to no enforcement, but the pollution would also be proportionally smaller.

Concerning legal certainty, there is a debate on the benefits of international environmental legislation being vague enough to get a bigger coverage of states, but not so vague that it does not effectively change behaviour. The IMO 2020 sulfur cap might have found the "sweet spot", the restriction itself is stated very clear,

notably using "Shall" instead of "Should" when addressing the sulfur oxide limit. While still being vague on how to enforce and sanction and options for compliance.

Additionally, one of the critiques the convention has received is that it only covers sulfur oxide. It does not address the issue of nitrogen oxide or GHG, despite these emissions also being on the agenda for tighter regulations. This can be explained by the wish to get the convention finalised. Although a multiple emission targets cap would be effective in combating global warming, it would also be immensely difficult to pass.

The financial burden of the legislation is one of its main challenges when it comes to compliance both for the resources required by member states but also for the shipowners. The shipowners have had to determine when to change to the more expensive fuel or if they should invest in scrubbers. Additionally, the price gap between VLSFO and HFO has at times been very substantial. Although the gap has stabilised since there is still an incentive for some Owners to infringe and consume the high sulfur fuel. Especially since there was no global agreement on sanctions, it is up to the individual state to set. This could create a situation where an opportunistic shipowner deems that the savings from consuming HFO outweigh the potential cost of sanctions.

Despite the above risk factors, the case study of two significant maritime states shows the IMO 2020 sulfur cap has been implemented into national legislation and is enforced to a decent level.

In general, when it comes to legislations on environmental shipping, it can be interesting to note that this industry is usually not included in other international treaties on climate change. In addition to other risk factors, it is also a highly political issue, with a substantial degree of lobbyism. Therefore an interesting follow-up question could be if the IMO can apply any of the IMO 2020 sulfur cap elements to future legislation?

8 Summary and Conclusion

The IMO is the only international agency currently engaged in worldwide environmental regulation of the shipping industry; the Marpol convention is, thus, the only one of its kind. The increasingly strict regulation within this area might be burdensome and very difficult to enforce uniformly; however, it is also crucial to achieving the UN's sustainable development goals.

Therefore, looking at the influencing factors of compliance such as legal certainty and places where implementation and enforcement can be improved is important.

Based on the analysis, it can be determined that implementation and enforcement plays an essential part in compliance. As discussed, there might not be a need for full global implementation and enforcement. However, there is undoubtedly a need for a degree of implementation and enforcement to the point where non-compliance is no longer an attractive option.

The same principle is true for legal certainty, the IMO 2020 sulfur does not have complete legal certainty; there are many clauses left vague (perhaps deliberately), but the clause concerning the restriction concerning the expected behaviour is very specific and clear.

One of the consequences of pushing for a change of behaviour within environmental legislation is the financial burden. This is also the case for the IMO 2020 sulfur cap. As shown in this paper, it requires excessive resources to fulfil the requirements on control, and it is even more complicated by massive ship registers.

Nevertheless, early findings indicate that the member states are doing their utmost to enforce the convention, both as coastal states and flag states.

This convention was some factors that promote compliance;

1) Both flag states and coastal states enforce it; this makes it harder for infringers to avoid sanctions while trading internationally, and it thereby makes infringement a less attractive option.

2) The convention is precise in its sulfur restriction; the language is clear on the obligation "*the sulphur content of any fuel used on board ships shall not exceed the following limits:…0.5% m/m on and after 1 January 2020."*[111]

As mentioned earlier, if we are to assess effective compliance, there is a need to show changed behaviour. This paper shows at least an indication of that. The sniffer readings from Denmark alone show the decrease in sulfur emissions within the Baltic Sea. This is also supported by precise enforcement mechanisms from both Denmark and Panama and figures from the Paris Mou.

Although international environmental legislation has been critiqued for making vague commitments, and the IMO can be criticised for not doing enough in other areas. Considering the IMO 2020 sulfur cap as a stand-alone convention, it did not simply mirror existing behaviour but changed the fuel standard by a considerable degree after 2020. It required global enforcements, and although there is no guidance or unification on sanctions, the convention is very clear in its wording on fuel restriction.

The convention is quite demanding on all parties, and even if the data is skewed due to covid-19 affecting the findings or because less developed states will not have the same resources, there is still gravitational compliance pull, there are still observable changes in behaviour.

In short, the early results from this convention supports that it has effective compliance and identifies implementation, enforcement, legal certainty, required resources, the industry structure as influencing factors of compliance.

[111] MARPOL Annex VI, cc 3, Regulation 14, 2011.

Bibliography

Books:

Baatz Y et al, *Maritime Law* (3rd edn, Informa Law from Routledge 2014).

Chircop A et al, *The Regulation Of International Shipping: International And Comparative Perspectives* (Martinus Nijhoff Publishers 2012).

Kammerhofer J, *Uncertainty In International Law* (1st edn, Routledge 2011).

MARPOL How To Do It (International Maritime Organization 2013).

Scott J, B, "Introductory note". In: *Hugo Grotius (1916) The Freedom of the Seas*, New York: Oxford University Press.

Stopford M, *Maritime Economics* (3rd edn, Routledge 2009).

Court Cases:

Case C-110/03: Kingdom of Belgium V Commission of the European Communities [2005] Court of Justice, ECLI:EU:C:2005:223 (Court of Justice)

CASE OF MAESTRI v ITALY [2004] European Court of Human Rights, Application no 39748/98) (European Court of Human Rights)

Journals:

Bodansky D, 'The Legal Character Of The Paris Agreement' [2016] SSRN Electronic Journal.

Dalsøren S and others, 'Update On Emissions And Environmental Impacts From The International Fleet Of Ships: The Contribution From Major Ship Types And Ports' (2008) 9 Atmospheric Chemistry and Physics.

Djadjev I, 'How To Comply With Marpol 73/78' [2015] SSRN Electronic Journal.

Dunne T, 'MARPOL Annex VI: Disproportionate Burden Or Necessary Regulations For The Greater Good? How Pollution Controls On The Shipping Industry Are Currently Affecting And Will Continue To Affect Maritime Commerce And The Global Environment' (2019) Vol. 44:193 Tulane Maritime Law Journal.

Halff A, Younes L, and Boersma T, 'The Likely Implications Of The New IMO Standards On The Shipping Industry' (2019) 126 Energy Policy.

Johnson H and others, 'Will The Ship Energy Efficiency Management Plan Reduce Co2 emissions? A Comparison With ISO 50001 And The ISM Code' (2013) 40 Maritime Policy & Management.

Li K and others, 'Determinants Of Ship Operators' Options For Compliance With IMO 2020' (2020) 86 Transportation Research Part D: Transport and Environment.

Lister J, Poulsen R, and Ponte S, 'Orchestrating Transnational Environmental Governance In Maritime Shipping' (2015) 34 Global Environmental Change.

Maxeiner J, 'Legal Certainty And Legal Methods: A European Alternative To American Legal Indeterminacy?' [2007] University of Baltimore Law.

van Leeuwen J, 'The Regionalization Of Maritime Governance: Towards A Polycentric Governance System For Sustainable Shipping In The European Union' (2015) 117 Ocean & Coastal Management.

Piniella F, Alcaide J, and Rodríguez-Díaz E, 'The Panama Ship Registry: 1917–2017' (2017) 77 Marine Policy.

Raustiala K, 'Compliance & Effectiveness In International Regulatory Cooperation' (2000) 32 Case Western Reserve Journal of International Law.

Teuchies J and others, 'The Impact Of Scrubber Discharge On The Water Quality In Estuaries And Ports' (2020) 32 Environmental Sciences Europe.

Legislations:

Directive (EU) 2016/802 of the European Parliament and of the Council of 11 May 2016 relating to a reduction in the sulphur content of certain liquid fuels 2016

Paris Agreement, (Paris, 12 December 2015).

IMO Instruments Implementation Code (III Code), Resolution A.1070(28) (4 December 2013).

Code for Recognised Organisations (RO CODE), Resolution MSC.349(92) (21 June 2013).

Resolucion No. 106-0MI-32-DGMM (Panama, 26 December 2007).

Bekendtgørelse om svovlindholdet i faste og flydende brændstoffer (2010); BEK nr 1663 af 14/12/2006.

United Nations Convention on the Law of the Sea (Montego Bay, 10 December 1982).

International Convention for the Prevention of Pollution from Ships (London, 2 November 1973).

Convention on the High Seas (Geneva, 29 April 1958); 450 UNTS 11.

Convention on the International Maritime Organization (Geneva, 6 March 1948)

Press releases:

The Danish Maritime Authority, 'Authorities From Across The World Will Discuss How To Raise The Bar For Enforcement Of The 2020 Sulphur Cap' (2019) <https://www.dma.dk/Presse/Nyheder/Sider/Authorities-from-across-the-world-will-discuss-how-to-raise-the-bar-for-enforcement-of-the-2020-sulphur-cap.aspx> accessed 24 April 2021.

Reports:

Danish Shipping, Policy Paper; 'Sulphur In Marine Fuels' (2019).

CompMon, Van Roy, W., & Scheldeman, K. Best practices airborne MARPOL annex VI monitoring. (2016). (https://www.semanticscholar.org/paper/Best-Practices-Airborne-MARPOL-Annex-VI-Monitoring-Roy-Scheldeman/37db7853ba376d2d89a6cc3f97fabfc35ff08b98).

European Environment Agency, 'The Impact Of International Shipping On European Air Quality And Climate Forcing' (European Environment Agency 2013) <https://www.eea.europa.eu/publications/the-impact-of-international-shipping/file> accessed 10 April 2021.

European Maritime Safety Agency (EMSA), 2007. *An Overview Of The 29 European Maritime Administrations*. European Maritime Safety Agency (EMSA).

Websites:

'Banning | Paris Mou' (*Parismou.org*) <https://www.parismou.org/inspections-risk/library-faq/banning> accessed 20 May 2021.

Berry R, 'Scrubber-Ready? - Bunkerspot - Independent Intelligence For The Global Bunker Industry' (*Bunkerspot.com*) <https://www.bunkerspot.com/features-all/item/scrubber-ready> accessed 23 May 2021.

'Construction Requirements For Oil Tankers - Double Hulls' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/constructionrequirements.aspx> accessed 9 April 2021.

'Energy Efficiency Measures' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Technical-and-Operational-Measures.aspx> accessed 9 April 2021.

'Flags Of Convenience' (*Itfglobal.org*) <https://www.itfglobal.org/en/sector/seafarers/flags-of-convenience> accessed 7 April 2021.

'Foreign Shipowners' (*Dma.dk*) <https://www.dma.dk/SynRegistrering/Skibsregistret/udenlandsk_skibsejer/Sider/default.aspx> accessed 6 January 2021.

'IMO 2020 – Cutting Sulphur Oxide Emissions' (*Imo.org*) <https://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx> accessed 13 April 2021.

'IMO 2020 Sulphur Cap | UK Defence Club' (*UKDC / UK Defence Club*) <https://www.ukdefence.com/insights/imo-2020-sulphur-cap/> accessed 24 May 2021.

'IMO 2020 Sulphur Limit Implementation - Carriage Ban Enters Into Force' (*Imo.org*) <https://www.imo.org/en/MediaCentre/PressBriefings/Pages/03-1-March-carriage-ban-.aspx> accessed 13 April 2021.

'IMO 2020 Recap' (*Novalog.org*, 2019) <https://www.novalog.org/blog/2019-10-20-IMO-RECAP/> accessed 23 May 2021.

'Inspection Results Deficiencies | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/inspection-search/inspection-results-deficiencies> accessed 13 May 2021.

'International Convention For The Prevention Of Pollution From Ships (MARPOL)' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/International-Convention-for-the-Prevention-of-Pollution-from-Ships-(MARPOL).aspx> accessed 25 March 2021.

'List Of IMO Conventions' (*Imo.org*) <https://www.imo.org/en/About/Conventions/Pages/ListOfConventions.aspx> accessed 10 April 2021.

'Member State Audit Scheme' (*imo.org*) <https://www.imo.org/en/OurWork/MSAS/Pages/Default.aspx> accessed 20 May 2021.

'Member States, Igos And Ngos' (*Imo.org*) <https://www.imo.org/en/About/Membership/Pages/Default.aspx> accessed 7 April 2021.

'Memorandum | Paris Mou' (*Parismou.org*) <https://www.parismou.org/inspections-risk/library-faq/memorandum> accessed 20 May 2021.

'Panama Canal | Panama Logistics Portal' (*Logistics.gatech.pa*) <https://logistics.gatech.pa/en/assets/panama-canal/statistics> accessed 18 May 2021.

'Port State Control' (*Imo.org*) <https://www.imo.org/en/OurWork/IIIS/Pages/PortPer cent20StatePer cent20Control.aspx> accessed 20 May 2021.

'Prevention Of Air Pollution From Ships' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Air-Pollution.aspx> accessed 10 April 2021.

'Reception Facilities' (*Imo.org*) <https://www.imo.org/en/OurWork/Environment/Pages/Port-Reception-facilities.aspx> accessed 23 May 2021.

'Rederi Skal Betale 375.000 Kroner For At Bruge Brændstof Med For Meget Svovl' (*Mst.dk*, 2017) <https://mst.dk/service/nyheder/nyhedsarkiv/2017/maj/rederi-skal-betale-375000-kroner-for-at-bruge-braendstof-med-for-meget-svovl/> accessed 1 May 2021.

'Regeringen Sætter Fokus På Svovlkontrol | NJORD Law Firm' (*Njordlaw.com*, 2018) <https://www.njordlaw.com/da/regeringen-saetter-fokus-paa-svovlkontrol> accessed 1 May 2021.

Safety4Sea, 'List Of Countries That Restrict The Use Of Open Loop Scrubbers' (2020) <https://safety4sea.com/list-of-countries-that-restrict-the-use-of-open-loop-scrubbers > accessed 20 May 2021.

'Svovl (Sox)' (*Soefartsstyrelsen.dk*) <https://www.soefartsstyrelsen.dk/miljoe-and-klima/svovl-sox> accessed 1 May 2021.

'Top 10 Flag States 2019' (*Lloyd's List*, 2019) <https://lloydslist.maritimeintelligence.informa.com/LL1129840/Top-10-flag-states-2019> accessed 6 January 2021.

'White, Grey And Black List | Paris Mou' (*Parismou.org*, 2020) <https://www.parismou.org/detentions-banning/white-grey-and-black-list> accessed 13 May 2021.