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SHIPS AND AIR POLLUTION: A STUDY ON THE REGULATION OF ATMOSPHERIC EMISSIONS BY VESSELS

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ABSTRACT

Air pollution from ships causes increasingly noticeable environmental damage. As a rule, the emission of gases into the atmosphere causes less visible pollution compared to other forms of pollution, such as oil spills. However, with the significant increase in maritime navigation in recent decades, there has also been a significant increase in air pollution by vessels. Thus, the purpose of this study is to investigate how international law regulates and limits the atmospheric emissions of vessels to protect the environment. Thus, notwithstanding, respect for the principle of freedom of the seas, rules are in place limiting the action of ships to control the emission of polluting gases into the atmosphere. We intended to understand how international law acts on the issue and what are the consequences for international navigation and the marine environment of such regulation.

Keywords: Air Pollution. Pollution by Ships. International Law.

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INTRODUCTION

Environmental impacts depend, as a rule, on the proximity of pollution sources. Compared to terrestrial sources of air pollution, marine emissions are less visible as they generally occur far from populated areas. However, port cities often have ship emissions as a dominant source of urban pollution. Nevertheless, when it comes to air pollution, winds provide an easy route for volatile contaminants and substances that adhere to small particles. Moreover, what contributes to the harmful effects on the environment and, in particular, human health, is that around 80% of all atmospheric emissions from ships are carried up to 200 miles from the coast. Thus, air emissions from the shipping industry represent a significant source of air pollution.

In general, all ship activities lead to emissions of air pollutants: from construction, maintenance and disassembly to painting, hull cleaning, paint removal, among others. However, for the purposes of this study, only the regulation of the control of the emission of pollutants from fuel burning by vessels will be analyzed, as these rules impose restrictions on free navigation for the protection of the marine environment. Most large merchant ships are powered by marine diesel engines, which contain high concentrations of contaminants. By comparison, the sulfur content of marine fuels is 2,700 times higher than that of conventional car diesel — even though the total air pollution by cars in the world is considerably higher than that of maritime transport. However, ships constitute the world's largest source of air pollution per ton of fuel consumed.

Major atmospheric emissions from burning this fuel include: Sulfur Oxide (SOx); Nitrogen oxide (NOx); Volatile Organic Compounds (VOCs); Particulate Material (PM); Carbon dioxide (CO2) and other greenhouse gases.

Continued growth in maritime trade has been accompanied by a proportional increase in the contribution of the shipping industry to air pollution. The emission of these pollutants has local and global impacts. While pollutants such as SOx, NOx and PM impact local (or regional) air quality, greenhouse gases (e.g. CO2) have a global climate impact.

The analysis of the main impacts of maritime transport activities on air quality highlights the fact that the sector is responsible for a remarkable amount of total air pollutant emissions, such as CO2. In fact,

carbon dioxide emissions from ships are estimated to be around 3.3% of total CO2 emissions in the world. In addition, estimates show that by 2050 shipping will account for between 12% and 18% of total CO2 emissions. By 2005, global shipping already accounted for 27% of all NOx emissions and 10% of SOx emissions.

Despite this scenario, considerable environmental improvements can be achieved by changing transportation practices. The amount of gas emitted by ships' engines to the atmosphere is directly related to the total fuel oil consumption, which depends on different factors such as hull shape, loading conditions, hull roughness, engine condition, among others. For this reason, international law regulates the issue by limiting the freedom of navigation to control the emission of pollutants into the atmosphere. Thus, the aim of this study is precisely to analyze how international law regulates and controls the emission of pollutant gases by ships, in order to understand the consequences and results of this regulation for the prevention of the environment.

INTERNATIONAL RULES FOR THE PREVENTION OF ATMOSPHERIC POLLUTION BY SHIPS

The international custom

States have a duty to prevent and control transboundary pollution. Such an obligation is expressed by reference to the principle of sic utere tuo non laedas ut alienum, whereby States are obliged to ensure that harmful substances from their territories do not cause pollution to the environment of other States or areas beyond the limits of their national jurisdiction.

The principle, from arbitration in the Trail Smelter case, between the United States and Canada, is well established in international law. In fact, it was later affirmed in Principle 21 of the Stockholm Declaration of 1972 and Principle 2 of the Rio Declaration. It was also applied by the International Court of Justice (ICJ) in its 1996 Nuclear Test Advisory Opinion, which understood this principle as a standard of customary international law. As a consequence, the obligation not to cause harm to the environment of others is not only bilateral, but also relates to the protection of the high seas or the global atmosphere. In this way, the principle can be thought of to operate erga omnes. That is, the duty to protect the environment, especially in areas where damage is most

widespread — such as the marine environment and the atmosphere, where there are no borders — will operate in front of everyone and for the benefit of all international society, that is, as a duty erga omnes.

In this sense it can be understood that the principle sic utere tuo non laedas ut alienum fully applies to air pollution by ships. A vessel shall not cause damage to the territory of other States, the high seas or the global atmosphere through the emission of polluting gases. Therefore, States have a duty to control ships of their nationality and a responsibility to ensure that they do not cause damage to the environment of other States or areas beyond their jurisdiction.

However, it should be noted that State liability for breach of the principle is difficult to establish in the particular context of transboundary air pollution by ships, for two reasons: firstly, under the aegis of this principle, there is logically no prohibition of activities that may cause transboundary pollution, but only to obligations of the State, limited by due diligence, to ensure that ship emissions do not actually cause harm to third parties or areas beyond their jurisdiction. Thus, a State is not liable for damages if it acted with its due diligence duty. This due diligence is considered as an obligation of conduct and leaves room for States to determine, within their capacities, appropriate measures to prevent cross-border damage. The particular difficulty in this regard is that the degree of diligence may vary according to the nature of the specific activities, the technical and economic capacities of States, as well as their effectiveness of territorial control. In addition, the content of due diligence may change over time.

Secondly, as set out in the Trail Smelter case, there must be "damage established by clear and convincing evidence" to invoke State liability for breach of the principle sic utere tuo non laedas ut alienum. In the case of air pollution from ships, it is even more difficult to ascertain whether environmental damage is a direct result of a particular vessel's emission. In addition, the emission of polluting gases by vessels is required. A ship can only operate on fuel, usually marine diesel, which invariably releases pollutants into the atmosphere. The question, which international custom does not answer, is the extent to which these operational emissions are reasonable and which should be prohibited because they actually cause damage to the environment.

Thus, while there is an international custom of not causing damage to the environment of another State or areas beyond its jurisdiction, which

perfectly encompasses atmospheric emissions from ships, customary law cannot effectively prevent environmental damage caused by emissions from ships. Very clear rules should be laid down on the conduct of those involved, notably States and vessels, on the acceptable level of atmospheric emissions. Without it, it may even be possible to hold a ship or State accountable — for lack of due diligence — but prevention is compromised.

THE CONVENTION ON LONG-RANGE TRANSBOUNDARY ATMOSPHERIC POLLUTION, 1979

Because of the limitations of the principle sic utere tuo non laedas ut alienum, transboundary air pollution is better regulated through the rules and standards laid down in specific treaties. In 1979, the Convention on Long-Range Transboundary Air Pollution (hereafter called CLRTAP) was signed under the auspices of the United Nations Economic Commission for Europe (UNECE). It is, in fact, a regional treaty, with 51 member States, all from the Northern hemisphere (North America, Europe and Asia).

The Convention does not include reduction limits or control measures, but provides a general framework in which the contracting parties commit themselves to specific regulations for combating transboundary air pollution. To this end, the Parties have already adopted eight additional Protocols: 1) Protocol on the Long-term Financing of the Joint Program for Continuous Monitoring and Evaluation of Long-range Pollutant Transport in Europe (EMEP) (signed in 1984, in force since 1988); 2) Reduction of sulfur emissions (1985/1987); 3) Reduction of nitrogen emissions (1988/1991); 4) Reduction of emissions of volatile organic compounds (1991/1997); 5) Sulfur (new emission reduction targets) (1994/1998); 6) Heavy metals (1998/2003); 7) Persistent organic compounds (1998/2003); 8) Protocol on the Reduction of Acidification, Eutrophication and Tropospheric Ozone (1999/2005).

Although the Convention itself does not make explicit reference to air pollution from ships, it is already stated in Article 1, 'b' — concerning definitions — that transboundary air pollution means all introduction into the atmosphere by man, whose physical origin is wholly or partly within an area subject to national jurisdiction. A vessel is subject to the jurisdiction of its state of nationality and thus fits perfectly with the concept of the 1979 Convention.

Undoubtedly, CLRTAP was a very important positive-law starting

point for cross-border air pollution, and it still has a respectable legal framework to regulate the issue. However, a clear shortcoming of this Convention is that it does not contain concrete commitments to specifically reduce transboundary air pollution. The very language of the text, with expressions such as "effort" and "as far as possible", demonstrates that, despite not being a soft law text, CLRTAP does not make explicit objective commitments to reduce and prevent air pollution. The text basically boils down to guiding principles.

THE UNITED NATIONS CONVENTION ON THE LAW OF THE SEA, 1982

The 1982 United Nations Convention on the Law of the Sea (UNCLOS) does not deal directly with the regulation of air pollution by vessels. That is, there are no specific rules in the Convention to combat air pollution from ships that can cause harm to human health, the general environment and the global atmosphere, as in the case of greenhouse gases. However, UNCLOS establishes general obligations to prevent marine pollution and the specific duty not to pollute the seas through the emission of air pollutants. In other words, despite the lack of regulation of air pollution itself, there is a concern in the Convention about marine pollution through the atmosphere.

Firstly, Article 192 lays down the general obligation to protect and preserve the marine environment. This duty embodied in this provision covers the ocean as a whole, including the high seas. In a broad but entirely permissible interpretation, this provision fits the duty of States to combat air pollution, as they can cause damage to the marine environment, such as acidification, eutrophication, and warming of the oceans. In addition, Article 194, no. 3 specifies some measures that States may take in order to fulfill their obligations to protect the seas, not only within the scope of that article, but under the whole of Part XII. These include combating and reducing atmospheric emissions of toxic, harmful or harmful substances, especially non-degradable ones.

Secondly, Article 212 of the UNCLOS expressly provides for the need to "control pollution of the marine environment from or through the atmosphere". That article obliges States to adopt laws applicable to airspace under their sovereignty and to ships flying their flag to prevent pollution of the marine environment from or through the atmosphere.

To this end, States should consider international rules and standards, as well as internationally recommended practices and procedures. Like other provisions of UNCLOS, it contains a "rule of reference". These rules are used as a legal technique to ensure the uniformity of national laws. In this respect, it is understood that States are only required to "take into account" internationally agreed rules as well as recommended practices and procedures, in particular by the International Maritime Organization (IMO). However, States, if they so wish, may take more stringent measures than those enshrined in international law.

In addition to this duty to create internal rules to control air pollution from within its territory or from a vessel with its nationality — the article also covers aircraft — that cause damage to the marine environment, no. 3 of Article 212 provides that international standards shall be established for the matter. Such Standards, once again, must be taken into account to guide domestic laws and create an international obligation when ratified. At this point, States, acting through the IMO or through a specific diplomatic conference, should seek to establish global and regional rules and standards, as well as practices and procedures, to prevent, reduce and control such pollution.

The concern of Articles 192 and 212, as of the whole of Part XII of UNCLOS, is with the "protection and preservation of the marine environment" and not of the environment as a whole. In other words, the 1982 Convention regulates the prevention of pollution of the seas and not of the atmosphere itself. However, as gas emissions from ships can cause damage to the marine environment, the general duty can be applied to prevent air pollution, making it clear that the foundation is not the protection of the atmosphere or, for example, with the ozone layer or the greenhouse effect, but only with the marine environment. This interpretation is a natural consequence of the very scope of UNCLOS, which is the regulation of the seas, the establishment, as stated in the preamble of the text, of "a legal order for the seas and oceans that facilitates the protection and preservation of the marine environment ", that is, the Convention is not concerned, nor could it be, in regulating matters completely outside its scope, such as the greenhouse effect.

On the other hand, several provisions of the Convention concern the environment encompassing the overlying airspace. For example, when regulating the territorial sea legal regime, UNCLOS states that State sovereignty "extends to the overlying airspace". Moreover, it should be

noted that Article 56, no. 1, 'a', states that the coastal State has sovereign rights for exploitation purposes with a view to harnessing currents and winds for economic purposes. This is sufficient to indicate that the atmosphere itself can to some extent be considered as a component of the marine environment, at least when there is a direct relationship between it and the sea.

Thus, it can be concluded that, overall, UNCLOS is concerned solely with the protection of the marine environment. The Convention is not intended to regulate, for example, the protection of the atmosphere against global warming. However, when the overlying airspace has a close connection with the maritime space, as in territorial sea and EEZ, it is understood that the former is encompassed in the latter's concept. It is not the role of UNCLOS to regulate, for example, greenhouse effect control. However, if air pollution directly interferes with the marine environment — as in the case of damage or risk of ocean acidification, eutrophication or warming — marine environmental preservation rules and standards may apply to the protection of the atmosphere.

Finally, Article 222 imposes on States the obligation to ensure the execution, in the airspace under their sovereignty or in respect of vessels flying their flag, of internal laws created in the light of Article 212, no. 1. Provision obliges States to take other measures necessary to enforce the rules and standards established for the control of air pollution. However, this provision does not contain specific guidance describing how this implementation should be carried out and how the States are held responsible for breach of this duty. The same happens with article 212, no. 3, where it is not specified how cooperation will take place to create global or regional standards. In addition, the normativity of the device is weakened by the term "endeavor", which gives room for an interpretation by States of what the necessary effort would be. Due to the great autonomy of States in defining appropriate measures to regulate air pollution, it is not easy for international courts to determine a violation of UNCLOS obligations.

Thus, in general, it can be asserted that the content of the UNCLOS provisions governing air pollution by vessels is quite abstract, forming a relatively weak legal scope with regard to the rules of conduct of ships and the responsibility of States. Thus, more precise and objective standards are needed, especially as regards the amount of gases a ship can emit into the atmosphere. Such emission is necessary, but at the same time the

maximum allowance must be regulated, quite objectively, to control air pollution and, consequently, the marine environment, which is done by the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78).

THE INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL 73/78)

In 1997, the IMO held in London an international conference on ship air pollution, in which a protocol was adopted to add Annex VI to MARPOL 73/78, entitled "Rules for the Prevention of Air Pollution from Ships", which entered into force on May 19, 2005. In the text, objective rules were introduced to limit the amount of pollutants emitted by vessels, especially those that pose the greatest risk to human health and the marine environment, such as NOx, SOx and Particulate Material. This annex currently has 87 ratifications, which constitute about 95.69% of the gross tonnage of the world merchant fleet.

However, shortly after its entry into force, early signs showed that NOx and SOx regulations should be stricter. Due to the delay in gathering the necessary number of ratifications to enter into force — there was an eight-year gap between adoption and entry into force — when it finally came into force internationally, people realized that the emission limiting rules for air pollutants were largely obsolete. Thus, the IMO Marine Environment Protection Committee (MEPC), at its 53rd session (July, 2005), agreed to revise MARPOL Annex VI, with the aim of significantly strengthening the emission limits of these gases in light of technological developments. As a result, in 2008, the Annex VI Revision Protocol was adopted, associated with the revised 2008 NOX Technical Code, which entered into force on July 1, 2010. In addition, MEPC has been constantly adopting resolutions amending both Annex VI and the 2008 NOX Technical Code, with the aim of tightening the emission of pollutant gases to the latest standards for environmental control and protection.

Thus, Annex VI of MARPOL 73/78 provides objective rules to be followed in controlling the emission of air pollutants by ships. Firstly, the text regulates the "MARPOL special areas", where more restrictive emission rules, called "Emission Control Areas", are established: 1) Baltic Sea with greater control over sulfur oxide (SOx) emission; 2) North Sea

(SOx); 3) waters in North America (SOx) and also nitrogen oxide (NOx); 4) United States and Caribbean (SOx and NOx).

Secondly, MARPOL 73/78 brings general rules to control the emission of certain pollutants, as stated in Chapter 3 of Annex IV, entitled "Requirements for Control of Ship Emissions". The first controlled emission is called ozone depleting substances, which are gases that degrade and deplete the planet's ozone layer. It has been established that facilities containing these ozone depleting substances are prohibited, with the exception of hydrochlorofluorocarbons, which will only be prohibited for ships built from January 1, 2020.

The second controlled emission is from nitrogen oxides (NOx). For them, MARPOL 73/78 subdivided the emission rules and controls into three tiers: Tier I covers ships built between January 1, 2000 and December 31, 2010; Tier II includes vessels built between January 1, 2011 and December 31, 2015; Tier III rules are for ships constructed on or after January 1, 2016. Each category has progressive and stricter NOX emission control rules. Rule 13 from Annex VI operates using maximum nitrogen oxide emission limits calculated from the permissible total NO2 weight per hour as a result of the rated engine speed (crankshaft revolutions per minute) as shown in the following table:

Table 1: NOx Emission Limits - MARPOL Annex VI

Tier	Construction Date	NOx Limit in g/kWh		
		$n < 130$	$130 \leq n \leq 2000$	$n \geq 2000$
Tier I	2000-2010	17.0	$45\ n^{(-0.2)}$	9.8
Tier II	2011-2016	14.4	$44\ n^{(-0.23)}$	7.7
Tier III	2016 onwards	3.4	$9\ n^{(-0.2)}$	1.96

n = rated motor speed (rpm: revolutions per minute)

The third controlled emission is sulfur oxides (SOx) and particulate matter. The sulfur content of any fuel oil used on board ships shall not exceed the following limits: 1) 4.50% w/w before January 1, 2012; 2) 3.50% m/m between January 1, 2012 and December 31, 2019; 3) 0.50% m/m from January 1, 2020, according to the table:

Table 2: NOx Emission Limits - MARPOL Annex VI

Date (from)	Limit of Sulfur in fuel (% m/m)	
	Special Areas	Global
2000	1.5%	4.5%
2010	1.0%	
2012		3.5%
2015	0.1%	
2020*		0.5%

*An alternative date is 2025, to be decided by a new revision to be held in 2018.

The reduction of NOx emissions is considerably less controversial than those of SOx. Reducing the emission of nitrogen oxides requires more efficient engines, which the natural development of naval technology can meet relatively skillfully. In addition, the increased navigation efficiency of the ship as a whole — including, for example, hull, propeller, rudder, reduced friction with more effective inks, among others — contributes to the expected and required NOx emission results. On the other hand, a significant reduction in sulfur oxides is technically possible, but there are some significant barriers. The first is that many refineries do not have facilities to produce low sulfur fuels in large quantities. The second is that desulphurization requires a substantial amount of energy, which leads to CO2 emissions. That is, one problem is solved causing another to the atmosphere. Moreover, investing in heavy fuel desulphurization may be less attractive than investing in the production of lighter products.

The fourth issue regulated by MARPOL 73/78 Annex VI is Volatile Organic Compounds (VOCs). These originate when crude oil comes into contact with the environment — exposed to heat or sunlight — and evaporates. In fact, the Vapor Emission Control (VOCs) rules are established by port States, since the emission of these compounds normally occurs during the loading and unloading of ships. However, States, in order to regulate the issue, must follow the provisions of Rule 15 of Annex VI. Such a rule does not bring an objective limit on such emissions, but general rules, such as the duty to submit a notification to the IMO with the rules adopted by the State; the information to be included in such notification; vapor emission collection systems; and how the VOCS Management Plan should be established.

That said, it is important to note that compliance with these objective rules is enforced by the States from Annex VI through inspection, certification and means of control. Firstly, flag State surveys are carried out on their ships at five different times: 1) an initial one, before the ship is

put into service; 2) one for renewal at intervals not exceeding five years; 3) an intermediary up to three months before or after the date of the second birthday; 4) one annual; 5) and an additional, general or partial, as the case may be, which shall be made whenever major repairs or remodeling are performed on the ship. Secondly, an International Air Pollution Prevention Certificate must be issued after the initial or renewal survey. The certificate is issued by the vessel's flag State or by a third party upon its request.

Finally, thirdly, there are other means of control that can be exercised by States. When a ship is in a port or offshore terminal under the jurisdiction of another Party, it is subject to inspection by port State officials for operational requirements for the emission of air pollutants. The State may even take steps to ensure that the ship does not suspend until the situation has been resolved. If violations of the MARPOL 73/78 Annex VI rules are actually detected, the port State shall submit a report to the flag State of the ship for prosecution in accordance with its legislation to hold the offenders accountable.

GREENHOUSE GASES: THE CONTROL OF ATMOSPHERIC CARBON DIOXIDE EMISSIONS BY VESSELS (CO2)

In its original form, MARPOL 73/78 Annex VI does not regulate greenhouse gas (GHG) emissions from ships. However, as early as 1997, the Kyoto Protocol to the United Nations Framework Convention on Climate Change called on the IMO to seek to stipulate rules to limit and reduce greenhouse gas emissions. In the meantime, the IMO conducted a 2000 GHG study, which, among others, estimated that ships accounted for 1.8% of the world's total CO2 emissions. CO2 is the main gas causing the so-called greenhouse effect. This study resulted in the adoption by the IMO of Resolution A.963 (23) in December 2003 on "IMO policies and practices on greenhouse gas reduction from ships." The resolution recalls the UNFCCC request in the Kyoto Protocol and recognizes the IMO's duty to regulate ships' GHG emissions in order to control and reduce the effects of CO2 on the greenhouse effect. To this end, the resolution urges MEPC to identify and develop the mechanism for limiting and reducing GHG emissions from maritime navigation.

MEPC's first step in implementing this mandate was the adoption in 2005 of voluntary guidelines on greenhouse gas emissions, especially

CO2 from ships. Shipowners were encouraged to collect data on distance traveled, cargo to be transported, amount and type of fuel used and other information on the amount of emitted carbon. The data collection performed has a dual function. First, based on such data, shipowners can set their own objectives and performance criteria to improve the energy efficiency of their vessels. Secondly, the collection of these data also allowed the IMO to develop a GHG index for ships, as requested by IMO Resolution A.963 (23).

Subsequently, still in compliance with IMO Resolution A.963 (23), the Committee implemented in 2006 the "Work Plan to identify and develop the mechanisms necessary to achieve the limitation or reduction of CO2 emissions from international shipping". This Work Plan stipulated that the Committee would be responsible for developing a ships energy efficiency ratio against CO2, as well as other technical, operational and market measures to deal with greenhouse gas emissions. A 2009 target for the work program was set. However, it soon became clear that the deadline was too optimistic.

Nevertheless, in 2011, as a result of this work, the MEPC Resolution.203(62) was adopted, amending Annex VI of MARPOL 73/78 and creating a new Chapter 4 (Energy Efficiency Rules for Ships), with the aim of reducing ship energy consumption by 30% by 2025 (see Table 3 below). These new rules apply to ships with gross tonnage equal or above 400 tons constructed from 2013.

The new Chapter establishes the "Energy Efficiency Design Index" (EEDI) and the "Ship Energy Efficiency Management Plan" (SEEMP). EEDI prioritizes the design and construction of new ships, focusing on improving engine and propeller performance, hull hydrodynamics, among others. SEEMP is about optimizing operations and improving energy efficiency for existing fleets. The Plan aims to enable ships to track CO2 emissions to improve energy performance through better voyage planning, speed management, engine power optimization, hull maintenance and the use of different types of fuels.

TABLE 3: EEDI REDUCTION FACTORS (IN PERCENT)

Type of Ship	Size	Phase 0 Jan/01/2013 – Dec/31/2014	Phase 1 Jan/01/2015 – Dec/31/2019	Phase 2 Jan/01/2020 – Dec/31/2024	Phase 3 Jan/01/2025 onwards
Bulk carrier	20,000 DWT and above	0	10	20	30
	10,000 – 20,000 DWT	n/a	0-10*	0-20*	0-30*
Gas tanker	10,000 DWT and above	0	10	20	30
	2,000 – 10,000 DWT	n/a	0-10*	0-20*	0-30*
Tanker	20,000 DWT and above	0	10	20	30
	4,000 – 20,000 DWT	n/a	0-10*	0-20*	0-30*
Container ship	15,000 DWT and above	0	10	20	30
	10,000 – 15,000 DWT	n/a	0-10*	0-20*	0-30*
General cargo ship	15,000 DWT and above	0	10	20	30
	3,000 – 15,000 DWT	n/a	0-10*	0-20*	0-30*
Reefer ship	5,000 DWT and above	0	10	20	30
	3,000 – 5,000 DWT	n/a	0-10*	0-20*	0-30*
Oil tanker	20,000 DWT and above	0	10	20	30
	4,000 – 20,000 DWT	n/a	0-10*	0-20*	0-30*

* Reduction factor to be linearly interpolated between the two values depending on vessel size. The smallest reduction factor should be applied to the smaller vessel.

CONCLUSION

Air pollution from vessels has in the last decades undoubtedly become an environmental problem to be tackled. The continued

growth of international maritime shipping has been accompanied by a commensurate increase in air pollution from vessels around the world. Several substances are introduced into the air by burning fuel from ships, and emissions can have local and global impacts. While pollutants such as SOx, NOx and PM impact local (or regional) air quality, greenhouse gases (e.g. CO2) have a global climate impact.

Thus, it is the role of international law to regulate the issue, or at least provide tools and devices to help States combat air pollution from ships. The air and the sea know no borders. Therefore, pollution in these environments (or both, as in the case of some air pollutants that cause damage to the marine environment) needs universal regulation and control. There is no effectiveness in the fight against isolation by only one or a few States. Thus, international law has been progressively regulating the subject and considerable environmental improvements can be obtained by changing transportation practices.

What began as an international custom, of great importance at the time, has now been standardized in international treaties. Initially, the Convention on Long-Range Transboundary Air Pollution in 1979 broadly regulated the issue. However, the text has two major flaws: first, it is a much more regional than universal document, with the participation of only 51 States in the Northern hemisphere alone; secondly, the text is closer to a document with a soft law language, as it does not contain explicit objective commitments to reduce and prevent air pollution. The text basically boils down to guiding principles.

Subsequently, UNCTAD does not seek to regulate the issue in a specific way. With a more general position of general obligations regarding the protection and preservation of the marine environment, the Convention does not even expressly mention the atmospheric issue. UNCLOS Part XII deals with the topic of preserving the marine environment in a generic way, having the characteristics of an umbrella treaty, thus creating a "framework regime" for the environmental protection of the seas by controlling marine pollution. In this sense, the air pollution of ships can be framed in this duty of protection.

Finally, the international treaty that effectively brought about concrete and objective measures to control the emission of gases from ships was the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78), in its Annex VI entitled "Rules for Prevention of Air Pollution from Ships", produced in 1997, but which came into force

only in 2005. The text, which had to be amended in 2008, as it was already obsolete by the time it entered in force, effectively regulates air pollution by ships by controlling the maximum level of gas emissions from burning fuel from vessels. The document brought several rules for each type of pollution taking into account the characteristics of both pollutant and ships, such as year of construction, engine type etc. Thus, it can be said that finally international society has effectively managed to regulate air pollution by ships in an objective manner.

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