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Investigating the Impact of Carbon Control Regulations on the Shipping Industry from the Perspective of International Law

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Abstract

Ships have always been considered and used as one of the important factors facilitating transportation and trade between countries. For this reason, maritime transport and its related industries are expanding more than before, and the diversity of equipment that can be used on ships is increasing. Nowadays, a lot of carbon is emitted by the shipping industry. It is expected that with the increase in world trade, carbon production will increase more than before. For this reason, the International Maritime Organization and the United Nations, etc., reviewed several regulations designed to reduce carbon emissions. These regulations should be applied to market actions business plans, etc. This research, which is a descriptive-analytical method, has tried to answer the basic question, what is the approach of international law regarding the ability of carbon control regulations to affect the shipping industry? The approach of this research shows that from the point of view of international law, carbon control regulations significantly affect the shipping industry.

Keywords: Carbon, International law, Maritime transport, Regulatory regulations, shipping industry

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Introduction

In recent years, the global warming crisis has become the main concern of countries around the world and has affected many industries. Based on this principle of cooperation, governments are obliged to cooperate in all circumstances and in good faith to protect the environment. Naturally, this cooperation should be more prominent regarding the environment, especially the global commons, including the open sea, the Antarctic, etc. (Mousavi, 2006: p. 176). The emission of greenhouse gases caused by international shipping is more than the total emission of greenhouse gases caused by the actions of many countries, however, the issue of controlling carbon emissions caused by the shipping industry has attracted relatively little attention from the world community. The United Nations regulatory agency, the International Maritime Organization, estimates that during the years 2007-2012, on average, shipping accounted for approximately 3.1% of the annual global co. In general, carbon fuel is one of the main sources of energy during the growth and development of industrialized countries, and its release in the process of industrialization initially increases the production of this gas in the atmosphere, which in turn causes global warming and changes it has become climatic (Zare, Pournuri and Farshchi, 2022: p. 4). In addition, international greenhouse gas emissions are increasing. The power needs of ships and marine fleets, which are all provided by burning fossil fuels, will result in the release of air pollutants. While sea transportation is considered to be more efficient compared to other transportation methods, the emission rate of suspended particles and their nitrogen oxides is very high (Azarion, 2013). In recent surveys of the level of environmental monitoring and enforcement in Europe (Tosun, 2012: p. 125). We can conclude that, firstly, monitoring and enforcement have received relatively little attention compared to regulation, and secondly, most empirical studies of monitoring and enforcement have low "structural validity", based on indirect measures of pollution activity or it is set based on the perceptions of the communities. Instead, this study is one of that group of studies (Hawkins and others, 1984: p. 78) which is based on direct observation of monitoring enforcement performance and perceptions of supervisors،enforcers as well as the communities being monitored (Bloor and others, 2006: p. 489). Since pollution from ships and mobile industrial plants may be transported offshore, this category is often

neglected, while it should be considered very important. Regarding non-transparent offshore jurisdictions, governance processes in such situations are not yet sufficiently understood (Gouldson, 2009: p. 2). Pollution from ships is partly a result of their normal operations Diesel-powered ships (i.e. most ships) release some oil into the sea along with their waste water and emit smoke into the air. Some non-oil tankers also use fuel tanks to fill the balance water and pour this oil-contaminated water into the sea before loading again (Zargar and Norouzi Kalerami, 2016: p. 7). The global shipping industry is vital to the global capitalist economy and carries more than 4% of international trade volume. Also, a significant proportion of carbon production and emissions is achieved by this industry. In this regard, Article of the Basel Convention, referring to the need to control the transboundary transfer of hazardous waste materials and their disposal, asks the member states to have the utmost cooperation in this regard (Pourhashmi, Zarei and Khaltabari, 2013: p. 6). Although there is uncertainty about the overall carbon emissions of ships (Gilbert and others, one estimate is that in 2007 shipping accounted for % of global CO emissions in 2015) In addition, IMO has recently introduced a series of measures designed to address the carbon issue of ships. In general, about 40% of the total greenhouse warming on the earth's surface is related to the presence of water vapor in the atmosphere, but the main concern is about gases that are partly caused by human activities (Erfan Menesh and Efioni, 2011: p. 34). greenhouse gas emissions, including a mandatory energy efficiency design index for new ships and future requirements for all ships to carry a ship energy efficiency management program that covers things like improved voyage planning and hull maintenance to give Of course, the transfer of carbon dioxide through transfer pipes located on land can be interpreted and interpreted only in the form of transfer of these materials from land to sea According to many commentators, in the recent case, the transfer of carbon dioxide through ships to land platforms and the injection of carbon dioxide into the pipes carrying these materials to the place of accumulation are not prohibited (Shahbazi, 2015: p.14) . The article hypothesizes that the laws and regulations that exist at the regional and global levels to control the carbon emissions of ships are closely related to the globalization of the shipping industry and its multi-center governance structure. This research, which is a descriptive-analytical method, has tried

to answer the basic question, what is the approach of international law regarding the ability of carbon control regulations to affect the shipping industry? In order to answer this question, the present research has first examined the governance structure of the shipping industry and then evaluated the implementation of greenhouse gas trading plans and fuel tax .

1. Regulations controlling carbon

Carbon control regulations are a series of legal measures and standards that are implemented to manage and reduce the emission of greenhouse gases, especially carbon dioxide, in the shipping industry. The main goals include preserving the environment of the seas, protecting marine ecosystems, and reducing the effects of climate change: Carbon control regulations include two main parts. A) Greenhouse gas emissions regulations: These include specific standards and minimums that the shipping industry must comply with in greenhouse gas emissions. b) Corrective measures: This section includes measures to be taken by the shipping industry to reduce carbon emissions Carbon control regulations set legal limits on greenhouse gas emissions in the shipping industry Responsibilities have also been assigned to shipping companies to ensure compliance with these regulations (Kim, 2015: p. 60). Carbon regulation can have many effects, including Reducing greenhouse gas emissions: Carbon control regulations can help reduce (1) greenhouse gas emissions such as carbon dioxide (2) These measures can help reduce climate change and its negative effects on life globally Increase the use of renewable energy: Carbon-controlling regulations may support research and development in the field of renewable energy and cleaner energy technologies and encourage their use Reducing air pollution: Carbon control measures can lead to reducing air pollution and (3) improving the air quality of neighborhoods and cities Improving energy efficiency: Carbon control can help develop energy efficiency technologies (1 and reduce energy consumption, which ultimately leads to saving costs and resources Inducing transformation in industries: Carbon control measures may require transformation in industries and production methods that can contribute to more sustainable and environmentally friendly economic growth In addition, carbon-controlling regulations can play an important role in creating job opportunities in new and emerging industries,

as the development of clean and sustainable technologies is in greater demand, which leads to the creation of new jobs Carbon control regulations can help reduce dependence on alternative energy sources of fossil fuel liquid texts, which has many economic and security benefits (Taylor, 2018: p. 457). Also, these regulations can encourage promoters and investors to invest in more sustainable and green businesses, thereby contributing to sustainable and profitable economic development finally, carbon control regulations can play an important role in realizing the goals of sustainable development and environmental protection and help increase the level of awareness and social environmental value (Menezes & Cunha, 2018: p. 3695). Carbon-controlling regulations can have far-reaching effects on the shipping industry investing in clean technology: Carbon control regulations can stimulate investment in new and cleaner technologies in the shipping industry. This can help develop more sustainable maritime transport systems and reduce greenhouse gas emissions. Increased costs: Carbon control regulations may increase costs for the shipping industry, as (operating costs may increase following the implementation of cleaner technologies and compliance with environmental standards Changes in routing plans: Carbon control regulations may lead to changes in the routing (plans of ships, to ensure optimization of fuel consumption and reduction of carbon emissions Competition and innovation: Carbon control regulations may stimulate shipping units to (provide innovative solutions to reduce carbon emissions and increase productivity, because the competition to reduce carbon emissions and meet environmental standards may serve as a competitive advantage in international markets. In general, the effects of carbon control regulations on the shipping industry are far-reaching and multifaceted and may directly and indirectly affect all aspects (Wittenberg, 2017: p. 480). Carbon control regulations are directly related to the United Nations Sustainable Development Goals. These goals include preserving the environment, increasing energy efficiency, and sustainable economic development: Carbon control regulations can help achieve these goals by Reducing greenhouse gas emissions: Carbon control regulations can help to achieve the goal of reducing greenhouse gas emissions and reducing climate change, which helps to preserve the environment and achieve the goals of preserving ecosystems and biodiversity Sustainable energy development: Carbon control regulations may support the development and

use of clean and renewable energy sources, which can lead to reduced dependence on alternative sources and reduced environmental pollution Creating economic opportunities: Carbon control regulations can encourage investment in clean and sustainable technologies and contribute to sustainable economic development by creating job opportunities in new sectors and sustainable innovations (Park & Kim, 2017: p. 7). Carbon control regulations are very directly related to the principles of international maritime law, because the effects of climate change on oceans and seas are very broad and direct In the principles of international law of the sea, it is clear that the environmental rights of the and oceans must be preserved seas Climate change and greenhouse gas emissions pose threats to these environmental rights Therefore, carbon control regulations can be a tool to preserve marine environmental resources and reduce the negative impacts of climate change on these resources Also, carbon control regulations may encourage ships and marine industries to use cleaner and environmentally friendly technologies, and this is important considering the importance that international law of the seas gives to the preservation of the marine environment Therefore, it can be said that carbon control regulations within the framework of the principles of international maritime law can play an important role in protecting the marine environment and reducing the negative effects of climate change on marine life (lee & lee, 2019: p. 730). Carbon regulation can help fulfill the principle of deterrence in environmental law by Reducing negative effects on the environment: The implementation of carbon control (1 regulations will reduce greenhouse gas emissions and air pollution, which can help preserve the environment Promoting the use of environmentally friendly technologies: Carbon control regulations can (2 stimulate the development and use of clean and sustainable technologies in various industry sectors This can lead to reducing environmental pollution and preserving natural habitats Development of Sustainable Prosperity: Carbon control regulations can help create a (3 sustainable economy and environment by encouraging the reduction of use of alternative fossil resources, and the increase of use of renewable resources Strengthening environmental institutions: Carbon control regulations can strengthen (environmental institutions and improve the power of monitoring and enforcement to protect the environment Therefore, carbon control regulations can create further development in

realizing the principle of deterrence in environmental rights, because it has a positive effect on reducing environmental pollution, protecting natural resources, and creating a healthy environment (Martinez, 2019: p. 533). Carbon control regulations can contribute to the precautionary principle in environmental law, as this principle is related to decision-making in conditions of scientific uncertainty and strengthening operations to preserve the environment This principle recommends that special measures be taken in the face of new and uncertain risks in preserving the environment Carbon regulation can help this principle because Reducing greenhouse gas emissions: Carbon control regulations can help reduce greenhouse gas emissions and reduce the negative effects of climate change, which helps to preserve the environment Increasing the power of monitoring and review: Carbon control regulations may lead to increased monitoring and review of activities that may lead to pollution and risks to the environment.

Encouraging research and development: Carbon control regulations can encourage investment and development of clean and sustainable technologies, which may be useful in identifying strategies to reduce manipulative environmental impacts Therefore, it can be said that carbon control regulations can help maintain and manage situations that have irregular information and unknown impacts according to the precautionary principle in environmental law (Clark, 2017: p. 290). Carbon-limiting regulations have an important place in international environmental conventions, because greenhouse gas emissions and climate change have far-reaching effects on the environment and the global economy. Some of the conventions that are specifically related to these issues and can play an essential role in this regard are United Nations Framework Convention on Climate Change: This convention sets goals for reducing greenhouse gas emissions and the amount of carbon in the atmosphere Carbon limiting provisions can be implemented within the framework of this convention and other similar provisions set forth in it Stockholm Convention on ease of access to information, public participation and access to environmental data to support international stakeholders in environmental issues: this law is an attempt to create a relationship between governments in providing environmental information and realizing international cooperation in environmental issues Ramsar Convention on Wetlands in International

Economic Areas: This convention focuses on the importance of conservation and sustainable management of wetlands and covers issues such as the care and preservation of natural resources, governmental and international management, and the removal of carbon and other greenhouse gases, Gives Convention on the Protection of Wild Species and Special Biosphere Reserves: This convention deals with the protection of important wild species and the control of their international trade. Carbon-limiting regulations may help reduce the negative impacts of climate change on biological ecosystems However, all these international conventions and regulations can improve environmental standards and help reduce carbon and other greenhouse gas emissions to protect the environment (Anderson, 2016: p. 24).

2. The framework of the shipping industry

The framework of the shipping industry is polycentric (Black, 2008: p. 84). This structure is complex, multi-level, and overlapping, (Bloor, 2013: p. 152). The multi-axis nature of this structure can have a very negative effect on the performance of any government system and can cause legal obstacles that disrupt effective results (Roe, 2009: p. 52). In addition, it can also cause conflict in principles and rules (Oberthur, 2003: p. 198). So, for example, while the water regime and the air of the UN Framework Convention on Climate Change is based on the key principle of 'common but distinct responsibility', IMO it is guided by the principle of 'no favorable treatment'. This norm difference continues to create an obstacle in negotiations on reducing greenhouse gas emissions from the shipping sector and makes it difficult to integrate climate change regulations (Hackmann, 2015). Which type of governance arrangements are best suited to effectively manage carbon emissions is a fundamental consideration (Biermann and others, 2009: p. 27). Policy-making in the shipping sector is derived from an institutional framework of the early century that focuses on the government as the main actor. (Roe, 2009: p. 52). At the same time, shipping is an international industry in a global environment. It works. Despite this, policy-making in shipping is still formulated in a traditional nested hierarchy of jurisdictions that pays little attention to the new relationships between jurisdictional levels, stakeholders, and different

locations (Roe, 2007: p. 98). Traditionally, the enforcement of international law rests with the flag state, the national maritime administration with which the ship was registered. However, 'flag state control', as it has been called, has shifted many ship registries to weaker offshore (flag) jurisdictions, such as Bolivia and landlocked Mongolia, which has 'little intention of doing so have their basic responsibilities" has become more efficient. Because this reduces their market attractiveness for irresponsible owners. This draws our attention to the links between good governance, environmental compliance, and implementation. A framework that includes the principles of good governance forms the basic building block based on which environmental protection policies can be developed and appropriate laws can be observed (Harman, 2015). It led to the formation of regional alliances of port states (port state control) that sought to enforce international regulations on ships calling at their ports, regardless of flag, with a common ship inspection methodology (Bloor and others, 2006: p. 474). The International Shipping Workers' Federation has an inspectorate to check labor standards on ships, according to the agreements that have been concluded. While IMO has created a regulatory framework for international shipping, it does not directly enforce its regulations (Campe, 2009: p. 122).

3. Implementation of greenhouse gas trading plans

Greenhouse gases, as a thermal barrier around the earth, cause an increase in the temperature of the earth's surface, which has significant consequences such as changing precipitation patterns, changing ecosystems, and increasing droughts (Hasabi and Jalilian, 2015: p. 3). As noted earlier, many market-based measures (global and regional) have been proposed to reduce ships' carbon emissions, so our discussion of implementation problems is organized under two headings: problems of public emission trading schemes and problems of General fuel duties. Some potential implementation problems are specific to an Emissions Trading Scheme (ETS), while others have previously been identified as general problems with ETs that can also apply to transport. Considering the first two general problems, three main issues are apparent: bogus "balance" projects, volatility in carbon markets, and excess reporting costs and

workload. Offsetting projects occur when the Emissions Trading Scheme allows firms to invest in emission-saving projects elsewhere as an alternative to reducing their emissions (Black, 2008: p. 84). According to the Kyoto Protocol, compensatory investments can be made in developing countries under the Clean Development Mechanism (CDM) or in other developed countries (in practice, often in transition countries in Eastern Europe) under Joint Implementation Projects (JI).) It is still being determined whether the EU ETS for transport will be part of the existing Emissions Trading Scheme or a stand-alone scheme for industry. If the former, the existing EU ETS allows companies to offset their emissions by investing in CDM and JI. Regarding the global ETS for shipping, it seems that the inclusion of CDM projects in this plan could help convince developing countries that are skeptical about the compatibility of the global shipping ETS with the principle of "common but distinct responsibilities" in combating climate change be vital. However, many of these unauthorized projects do not have environmental value (Harvey, 2007: p. 16).

Environmental activist George Monbiot describes CDM as "a thriving global market in bogus greenhouse gas reductions described". (Monbiot, 2007: p. 43). According to the reports of international organizations, an increase in carbon dioxide emissions by one unit (trillion tons) on average causes an increase of 93 units (degrees Celsius) in the average temperature of the earth (Mousavi and Hamami, 2013: p. 7). Despite extensive and costly verification processes, bogus unregulated projects continue to emerge: CDM validation and registration takes an average of V days. In the EU's regional shipping Emissions Trading Scheme, ship operators who were only occasional visitors to EU ports are looking to buy the carbon they need cheaply. Based on the theory of comparative advantage, it is expected that with the increase in the level of trade, production will be more efficient than in the past, and in this way, it will increase the income of the economy. Therefore, an increase in production will occur, which in turn will increase the use of production inputs and the spread of pollution (Tahri, Mousavi, and Farajzadeh, 2011: p. 3). All ETS plans involve some additional administrative fees. There are reporting fees, verification fees, and trading fees. About reporting in the aviation sector, Lufthansa claimed that the European Union's Emissions Trading Scheme had paid the

company, million euros in additional costs in IT services. Verification that a ship's carbon credit meets the ship's emissions is most likely done by specialized classification societies, which previously conduct regular ship audits to verify ship compliance with other international regulations (on behalf of the flag state)but there is likely to be an additional charge for this service and while large ship operators may buy and sell surplus credits internally, most operators will probably do so with specialist brokers who will of course charge a fee for their services, they make a contract. It doesn't always pay for a third party in the offices of shipping companies, especially when shipping rates are down and many companies are making losses. Beyond these general problems, a series of more specific problems appear to be specific to a shipping Emissions Trading Scheme, these problems include problems of "responsible entity", flag state allocation, approval and enforcement, reliance on warehouse delivery notes for evidence of consumption fuel, and changes in port government control performance about the responsible entity issue, the contractual responsibility for purchasing fuel (which is considered a proxy for carbon emissions and must be matched with carbon credits) is often with the ship charterer, Although many charters can only cover one trip. However, legal action, such as the seizure of a vessel for not having the required carbon credits, could potentially penalize the vessel operator or vessel owner for the charterer's mistakes. In principle, the charter documents in the Emissions Trading Scheme period can be drafted differently to make the charterers responsible for receiving the necessary carbon credits: thus ship operators can seek compensation from the ship charterer through the courts. State control officers must be selective in selecting operations and equipment to inspect: Port State control is intended to use a sampling method. Likewise, officers are required to exercise their discretion in deciding appropriate penalties for non-compliance.

Therefore, the likelihood of arrest for non-compliance (a serious issue for vessel operators, potentially affecting the market rates that vessels can command) and detection of non-compliance varies from officer to officer, port to port, and nation to nation. The variable effectiveness of port government control is likely to affect compliance patterns and the extent of so-called "carbon leakage". Among the factors that cause this phenomenon can be the eruption of oil wells, the discharge of balance water of ships,

accidents, and collisions of ships, the discharge of garbage and waste materials, the movement of ships and oil tankers, the disposal of sewage from refineries, and the fire mentioned (Askari, 2007: p. 46). Of course, such a difference in effectiveness would be greater on a global than a regional basis and thus might be thought to pose more problems for a global Emissions Trading Scheme than a regional Emissions Trading Scheme. But this apparent advantage for the EU Emissions Trading Scheme is offset by the possible requirement of port state control in the EU Emissions Trading Scheme to calculate the carbon credit of ships that have only occasionally entered EU waters (oberthur, 2003: p. 178).

4. Optimization of fuel consumption

If the consumption of fossil fuels in ships is not optimized, the emission of greenhouse gases caused by sea transportation will increase between and percent by 2000. Now, the small amount of greenhouse gas emission in international waters has only caused the increase of the amount of carbon in the atmosphere. Rather, it has polluted water resources and has become a serious threat to the survival of marine life (tan & tan, 2020: p. 42) to control these pollutions, researchers have continuously presented suggestions in the form of technical measures to the International Maritime Organization. While economic development has increased sea trade more and more. Low-carbon economy scenarios undoubtedly require optimization of energy consumption to ensure both economic benefits and the achievement of climate policy goals. The methods and measures available so far to reduce greenhouse gas emissions in commercial ships have mainly focused on technical and management aspects; For example, among the existing potentials for reducing greenhouse gas emissions from sea transportation, speed reduction research is of the first importance, which can have a significant contribution in reducing pollutant emissions. (Williams, 2017: p. 569). However, studies during the last decade have pointed to a set of different solutions to help reduce greenhouse gases. To minimize fuel consumption during sea voyage, factors such as continuous monitoring and reconstruction of covers, hydrodynamic ducts, adjustment of navigation angle (trim), maneuvers and rudder angles, optimal planning of refueling and navigational maintenance process based on meteorological

information, measurement of environmental parameters, monitoring The output power of engine shaft and auxiliary engines, including generators and boilers, are very important, which can save between and percent of the fuel consumption of commercial ships. However, the time limits of reaching the destination, climatic conditions, and the uncertainty of the ship's speed and load are decisive variables that cause a decrease or increase in fuel consumption (Afshar, 2023: pp. 1-4). Carbon control regulations are usually designed to optimize the fuel consumption of ships and thus reduce the emission of greenhouse gases associated with the movement of ships. Fuel efficiency: Carbon control regulations may set standards for the fuel efficiency of ships. These standards can improve fuel consumption increase energy efficiency and reduce greenhouse gas emissions. b) Use of advanced technologies: Regulations can encourage the use of new technologies in shipbuilding that lead to improved fuel efficiency and reduced fuel consumption. For example, the use of low-consumption engines and fuel-consumption optimization systems. c) Fuel efficiency management in all processes: These regulations may provide measures to optimize fuel consumption in all phases of the ship's movement, including movement at sea, traffic congestion, and encountering obstacles. t) Training and awareness: Creating regulations for training and informing the ship's employees about optimizing fuel consumption and using low- consumption methods can play an important role in the effective implementation of these regulations. e) Encouraging the use of next-generation fuels: Creating regulations that encourage the use of sustainable and environmentally friendly next-generation fuels can help optimize fuel consumption and reduce negative effects on the environment. In these ways, carbon control regulations help to improve the efficiency and reduce fuel consumption of ships and ultimately reduce greenhouse gas emissions in the shipping industry (Brown, 2020: p. 790).

5. Implementation of fuel tax

Economic policies, on the one hand, should take into account the movement and transfer of resources to sectors that have less damage to basic resources and the environment, and on the other hand, strive to promote environmentally friendly technology and encourage appropriate

consumption patterns (Amin Rashti, Iraqi Siami, 2013: p. 8). Many bodies in the shipping industry, including the International Chamber of Shipping, prefer a fuel tax to ETS, which is likely to use part of the levy for climate change mitigation projects and possibly part of the development funding for ships' carbon emission reduction projects will be Through technological innovations, the most stated reason for this preference is the apparent simplicity of taxation compared to the apparent complexities of an ETS (painter and Pierre, 2005). But such simplicity may be unrealistic. So, while the most obvious point of payment for the tax is at the refinery, it seems unlikely that this will happen. Refineries in oil-producing countries such as Saudi Arabia are likely not allowed to participate, and refinery owners elsewhere are not obligated. Therefore, in all tax schemes where the point of payment is specified, it is at the point of sale between the receiver and the ship operator or charterer. However, the large number of storage points and storage operations suggests that fraud can be a significant problem. The potential for fraud has long been a live issue for vessel operators and, obviously, as a deterrent to fraud, the majority of larger vessel operators now pay significant fees to routinely send samples to commercial laboratories for testing. Furthermore, the potential to detect and punish fuel duty fraud is thought to be very limited in some jurisdictions (Donaldson, 1996: p. 42). The number of implementation problems associated with ETs are also found in fuel tax schemes. Therefore, just as some governments oppose the revenue hypothesis, some governments also oppose international taxation. Ship operators may be unrealistic that if governments receive tax revenue, this revenue may be used for other purposes as part of general tax revenues. Again, the important document on shelter purchases is the BDN, with the same problems of being vulnerable to fraud (Furger, 1997: p. 226). One of the arguable advantages of taxation over ETS is that the flag government has nothing to do with it. However, the implementation of fuel tax regulations creates significant problems for port state control. May 2003) is about encouraging the use of biofuels or renewable fuels for transport (Biofuels Directive). This directive seeks to reconstruct the framework of taxing energy and electricity products of the European Economic Community, known as the "Energy Tax" directive (Pourhashmi, Taqvi, Parandeh Motlaq, 2013: p. 7).

6. Increasing energy efficiency in ships

The International Maritime Organization, as the main legislative authority in international shipping, has spent a lot of time in recent years to regulate and control the energy efficiency of ships and, as a result, to control greenhouse gases. In July 2011, the International Maritime Organization's Marine Environment Protection Committee in the sixty-second session of that committee, applied amendments to Annex Six of the MARPOL International Convention and added the fourth chapter to this Annex, under the title "Energy Efficiency Regulations". It was approved in the form of a resolution to control and reduce carbon dioxide (Johnson, 2018: p. 115). In the fourth new chapter of the Annex of the Marpol Convention, the implementation of the Energy Efficiency Design Index (EEDI) for newly built ships with a gross capacity of 400 GT and above, and Ship Energy Efficiency Management Plan (SEEMP) for all vessels, whether existing or new, from January 1, 2013. It has come into force. The issue of climate change and global warming has become one of the concerns of the world, which is directly related to the production and emission of greenhouse gases. One of the most well-known types of greenhouse gases is carbon dioxide or CO (Smith, 2019: p. 346) emissions, which are mainly produced by the oxidation of carbon in ship fuel during combustion, after economic crises. In 2009, especially in the economy of Western countries, it has gone through a growing trend; so in 2010, it shows an increase of about, percent. In addition, the International Energy Agency stated in its 2012 report that two sectors in the industry account for about two-thirds of global co-emissions: the electricity and heat production industry with about 1%, and the transportation industry with a 22% share.

Despite the fact that the aviation and marine industry together account for only about % of greenhouse gas emissions in the world, but the International Maritime Organization, as the main legislative authority in shipping, has in recent years tried to regulate and control it. The energy efficiency of ships and as a result the control of greenhouse gases has doubled (Black, 2008: p. 84). Amendments to Annex of the MARPOL Convention (Prevention of Pollution from Ships) were approved during the sixty-second meeting of the MEPC Committee in July 2011, and thus a new fourth chapter was added to Annex of the MARPOL Convention with

the title of provisions to increase the energy efficiency of ships, became. In this new chapter, there are provisions to make the energy efficiency design index or EEDI mandatory for all new ships and the energy efficiency management plan or SEEMP for all vessels, whether existing or newly built. These new regulations have been applied to vessels over tons and have come into force since January. These new reforms are the first mandatory regime related to greenhouse gases that 2013, 1 has been introduced in the shipping and marine transportation industry. Carbon control regulations improve the fuel efficiency of ships. This improvement in fuel efficiency occurs in several ways: 1) using fuels with the lowest greenhouse gas content: According to carbon control regulations, ships must use fuels with the lowest greenhouse gas content. Fuels that have the lowest sulfur and NOX content usually have higher efficiency (Roe, 2007: p. 98). This improvement in fuel efficiency leads to savings in fuel costs and increased profitability. 1) Use of new technologies: To achieve compliance with carbon control regulations, ships must use new technologies such as exhaust gas purification systems. 2) These technologies improve fuel efficiency and reduce greenhouse gas emissions. 3) Environmental protection: By reducing greenhouse gas emissions, carbon control regulations help protect the environment. These measures can help maintain the ecological balance in marine areas and reduce the effects of climate change on coastal communities. Stimulating the development of sustainable technologies: Carbon control regulations are stimulating the development of sustainable technologies in the shipping industry. These technologies can improve long-term fuel efficiency and help protect the environment. Increasing public awareness: Carbon control regulations can help increase public awareness about the effects of greenhouse gases and climate change. This awareness can help stimulate personal and collective actions to preserve the environment. Increasing competitiveness: By improving fuel efficiency, reducing fuel costs, and using new technologies, carbon control regulations can help increase the competitiveness of the shipping industry (zhang & Li, 2019: p. 110). Carbon is driving a transformation in the shipping industry. Fuel and ship equipment manufacturers are looking for cooperation with IMO member countries to develop fuels with the lowest content of greenhouse gases and new technologies. As a result, carbon control regulations improve energy

efficiency in ships and reduce fuel costs, while reducing greenhouse gas emissions (tan & tan, 2020: p. 40).

7. Conclusion

It seems clear that the focus on the executive aspect of governance shows that some of the proposed schemes face many practical problems. Many of these arise because the fragmented nature of the sector creates difficulties in effective governance. Beyond the specific issue of controlling ships' carbon emissions, there is a broader argument to be drawn from the continued importance of the sovereign state in enforcing transnational regulations. The maritime sector is not immune to governance failures, and our findings support the view that governance failure is pervasive if it is entirely based on market forces. Sure, some port states are too poorly resourced (and have too much capacity for bribery،extortion) to meet their obligations, but these aren't port states where international trade is concentrated. Just as the burden of implementing new regulations on ships' sulfur emissions rests on port state control, so too do many proposals for market-based measures to control ships' carbon emissions rely on port state control. This acknowledges that markets do not replace traditional hierarchical governance in practice, but rather combine. In the case of a global ETS where the ship's carbon account only needs to be balanced annually, then the main monitoring task falls to the classification societies, and the port state control function is limited to checking that the ship's classification society certificate has not expired, or has expired. But in the case of a global fuel tax, and the case of the EU ETS, a huge enforcement burden will fall on port state control. It is timely to recall this vital executive role for sovereign states at a time when the executive agencies of many of those sovereign states are facing dwindling resources. However, there is a paradox here. If the allocation of carbon credits were in the hands of 170 flag states, rather than a single central authority, a global ETS would have a hard time working successfully: unscrupulous operators would migrate to weak states, and those multiple states would provide irresistible targets for phishing attacks. While the sector's failure to self-regulate justifies the granting of strong regulatory powers to agencies charged with

protecting the public interest, flag state control is, as Lord Donaldson put it, "a broken straw." The failure of flag state control, following a series of catastrophic marine pollution incidents, has led to a re-emphasis on independent state oversight through the opening of port state control, so that port states separately pursue their efforts to enforce international regulations. They coordinate in all cases. While we argue that supra-sovereignty through the sovereign state is important here, this section provides a clear example of the need to strengthen governance capacity at multiple scales. This includes not only enforcement officers who act as "street-level bureaucrats", but also the EU and international levels regarding the implementation of the Emissions Trading Scheme by the Paris Agreement. Strengthening these multi-level interdependencies will help ensure effective governance in the shipping sector, as is increasingly the case in other sectors.

Port state control has only been able to compensate for the shortcomings of flag state control through close cooperation between independent port states: European port states have implemented a common inspection method, a common system of penalties, and a common targeting method, under the above supervision they do. Paris National Memorandum of Understanding (MOU) on Port State Control; Pacific Rim countries are similarly under the supervision of the Tokyo MOU Office. The regional EU fuel tax would be subject to widespread avoidance through recourse to non-EU haven facilities and potential recourse to offshore tankers operating from outside the EU. In the absence of close international cooperation in the governance of the shipping sector at higher levels of governance, international trade is seriously disrupted as some ships are frequently inspected. As IMO lacks the necessary capacity to act as an implementing agency, and the continuation of implicit inclusion in a multi-center governance structure is essential, international regulations to reduce the shipping industry's contribution to climate change face specific implementation challenges, are adjusted Good global governance for the shipping industry may be a futile assumption, but global governance requires adequate attention to enforcement mechanisms at all scales of governance as well as a comprehensive regulatory framework.

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