



VIGILADA MINEDUCACIÓN

International trade: Crisis and effects on the maritime environment.

International trade: Crisis and impact on the maritime environment.

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Abstract

Today, international offices account for approximately 90% of world traffic and these are associated with foreign trade operations, where one of the most used routes is the maritime route. Since ancient times have been a cause of interest for industrial companies and service providers such as shipping companies, due to the ability of the sea to connect continents and allow short distances between the Atlantic and Pacific oceans, playing an increasingly important role in the world. International logistics operations are inevitable in the globalized 21st century, but these also include actions on environmental degradation.

This article presents the polluting effects generated by foreign trade on the sea, causes and effects that this generates to the marine life and how it can create irreversible damages in the long term. Moreover, this investigation contrasted like the new safety rules for the different types of ships, from the International Maritime Organization-IMO, are used in the use of cleaner and greener fuels, reducing air pollution, local noise and emissions of fossil materials from ships to the sea. To support the research, interviews were also conducted with a shipping company, cargo agent and company, about their processes to mitigate environmental damage with their operations, innovative ways to finance low carbon fuels and the impact that this brings to the final customer rate. Evidencing the excessive acceleration of new needs of the industrial sector in a matter of time, efficiency and money, but also the decline that this can generate to the quality of environmental resources and as will be projected in some years if appropriate measures are not taken.

Keywords

Shipping; Atmosphere; Fossil fuels; Environmental degradation; Ocean

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INTRODUCTION

The process of economic growth seeks productive transformation by promoting industrial development that allows rudimentary activities to be left behind to carry out complex activities. This has accelerated the environmental deterioration that the planet is going through today, for which the rulers have seen the need to intervene in the industrial activities carried out by companies, in order to mitigate the impacts they generate on the environment.

In this work, the disadvantages that the industrialization of companies brings to the maritime environment will be presented, where thanks to this, the highest levels of heat recorded in the entire history of humanity have been reached and with it the melting of the poles, which make the sea level and its pollution higher and higher, ending up with many cities and islands.. Do freight forwarding companies that carry out these environmental damages outsource these costs or who assumes this? Is the community also responsible for the use of fossil materials?

Also, the replacement of fossil fuels on ships, the new actions and requirements that shippers must adopt to stop the saturation of the sea with toxic waste and how regulatory entities exercise control will be discussed.

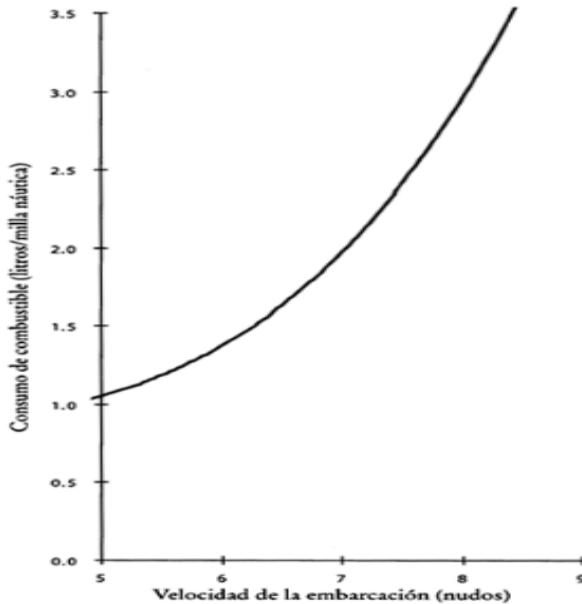
Many questions and discontents are found on this issue, the duty as international negotiators is to ensure that the strict measures that the state takes to counteract these damages are fulfilled, where all living beings are harmed and only large companies see the profits.

STATE OF THE ART

Studies conducted by the International Maritime Organization show that the high volume of maritime traffic and the expansion of international trade has meant that the transport of invasive species by ships has steadily intensified in recent years. In several parts of the world this problem has had catastrophic events and this complication has not yet reached its limit which is more worrying for biological species, because quantitative data indicate that new areas are being invaded (Internacional, Organización Marítima, 2020)

Marine species have been the most affected, presenting problems to the balance and biodiversity of the ecosystem, due to the introduction to the oceans of marine cargo means, which with their emissions of anthropogenic carbon dioxide, oxides of nitrogen and nitrous oxide and spills from hydrocarbons, which in their nature is oil, has gradually ended the life of the sea, where their reproduction becomes more complex for fish and the fishing economic sector also suffers its consequences.

In accordance to (Duque, 2016), Following an oil spill at sea, the gradual death of the most sensitive marine living organisms, such as fish, mangroves, mollusks, crustaceans, among others, can be observed. This is a negative impact that is reflected on a large scale in the first six months of the spill. Also, the mangrove has a sub deadly replica that occurs over an extended period of time and can help achieve the recovery or loss of the ecosystem, if appropriate measures are not taken to remedy the damage caused.



Source: (J.D.K, 2005)

Graphic 1

As can be seen in graph 1 and as indicated by the IMO, if vessels sail by reducing their speed, this helps to reduce emissions of gases and polluting materials, as it is directly proportional to the higher speed, greater consumption and emissions and possible spills, thus prolonging the life of marine species. For example, if you sail at a speed of 8 knots, fuel consumption is 2.50 liters/nautical mile or more. At the same time, by lowering these speed limits, underwater noise pollution would be compressed by 66%. (El Confidencial, 2019)

In January 2020 in Madrid, Spain, the UN held a conference on Climate Change together with the International Maritime Organization, spoke about their targets for decarbonization where at least 30% of emissions for ships will be improved from 2025, this figure compared to the emissions they recorded in 2011. For large container ships, which represent 25% of total maritime transport, the improvement should be about 50% from 2022. (Martínez, 2020)

In this improvement, ports also play a very important role because of this, a cooperation was carried out with ports to reduce emissions from maritime transport, this includes operations, economic and technical regulatory measures regarding the provision of electricity supply from land, but preferably that they come from renewable sources, an efficient use of fuels and especially low carbon, in this way the calls at the ports of the ships, will be optimal (United Nations Climate Change, 2019)

If the naval industries manage to take a step towards the reduction of pollution and that their economic activity is sustainable, it will be the moment when the sea can have a recovery at scale, this would not guarantee its total regeneration, but it would be an impulse to limit it to years of pollution, where the deep development of renewable energy sources would be the new model to implement, since with the emission of these fuels not only the sea is affected but also the air, since a ship releases 35.000 ppm (parts per million of sulfur) compared to the 10,000 ppm allowed on the road. And as indicated by (Menéndez Pérez & Miguélez Pose, 2003) citizens are the ones who suffer the consequences of pollution from the growth of greenhouse gas emissions.

FRAMEWORK

In accordance to (Sarmiento, 2018) Climate change has caused sea ice to melt each time and undergo a great transformation in both its thickness, extent and condition, where it has decreased at a rate of more than 11.5%. This indicates that climate change is increasingly integrated with international trade and economy, since the extraction and sale of natural resources such as oil, natural gas, diamonds, uranium, etc., are generating high maritime economic activity. Thanks to the global economy, this makes environmental risks increasingly higher because the ecosystem is exposed to hydrocarbon dumping, greenhouse gas emissions, disruption of marine life, anthropogenic noise, etc.

As we know, the function of ships is to carry goods from one place to another with security and power that foreign trade and globalization are a reality, but this transport carries with it great problems in the environment such as the following:

- **Bilge water discharge**

This is the bottom of the ship where the liquids are drained from it, these liquids are composed of fats, hydrocarbons, oily additives, solvents, detergents, metals that are highly polluted, and around 19,200 Tons of this water is generated annually by a tanker.

- **Wastewater discharge**

Dishwashers, showers, toilets and other sources are waste water, these can have different products such as heavy, pharmaceutical, dangerous, etc., this discharge can increase the risk of bacteria that produce toxins, the decomposition of organic matter causes the absence of dissolved oxygen better known as anoxia and due to the absence of this creates dead zones.

- **Waste disposal**

The main sources of waste at sea are ships, cruise ships, etc., where they perform a large amount of dumping of garbage that becomes marine debris and floating waste, thanks to these wastes the different marine species are affected, often can eat some toxic waste, get stuck with different residues and even cause their own death, marine biodiversity can benefit if these marine wastes are significantly reduced.

- **Discharge of goods**

Ships carry large quantities of goods of all kinds, but in general large quantities of oil are pumped and its discharge into the sea causes major problems such as groundings, operational discharges and accidents in general. (Sarmiento, 2018)

The model of International Trade as a chapter of the localization theory, from the book International Trade I, by Salvador Mercado in 2000, talks about the unequal distribution of natural resources and how limited they are. Specialization in some economic activities that require natural resources has led to a point where these cannot regenerate themselves and begin to be scarce, thus making it necessary for companies to seek other resource alternatives to continue their production. (Mercado, 2000)

The variables used in this model that serves as a measurement, are:

- The uneven distribution of natural elements determines the first stages of a country's economic development.
- The development of appropriate techniques for the exploitation of natural resources without diminishing them.
- Specialization in economic activities and the progress of technologies have required action from the development of transport (soil, water, air). That they are suitable for exchange with other regions at lower cost.

This model is important for research, since it emphasizes the exploitation of natural resources for the benefit of companies, as it is necessary to develop a transport that generates lower logistics costs regardless of the impact it has on natural resources or its regenerative capacity. It is significant to return to the earth what it provides us, so if you have natural resources such as the sea, it is used for the transport of goods in large dimensions, weight or other characteristics, which allows the connection between continents and the flow of the economy, but there should be no access to it being depleted or generating harmful effects. But also, a country must meet its environmental objectives and not subcontract emissions elsewhere, because the transfer or export of pollution is not environmental progress. (Plumer, 2018)

Which leads to the conclusion, according to the theory, that the amount of natural resources that a country has does not determine its trade balance of surplus or be a source of development for the world economy, focuses more on the strategies used by each country to care, preserve and take advantage of the resources it has and that these are a support to expand its markets internationally. This theory is brought up since the main natural resource of maritime transport is the sea, this due to the high flow of navigation, spills and invasive organisms, not only affects the health and vitality of the ecosystem, but also brings economic effects in the sector of the shipping companies and shippers, since when there is high pollution, high tides, spilled merchandise, navigation is not easy, the speed must be reduced, therefore the times between the port of origin and the port of destination are increased.

Vessels have been distinguished as a threat to biodiversity, when marine species are trapped in the hulls of ships or ballast water, most of them die and those that manage to survive their

reproductive stage are affected, causing extinction or shortages of the species. When species like fish are scarce, the fishing sector is affected and the survival of people who live on the seashore on whom their economic income depends on this work. And, since there is little control of such vessels, when they fish on the high seas they can omit the rules of fishing compliance approved by the (Regional Fisheries Management Organizations) RFMOs. (FAO, 2000)

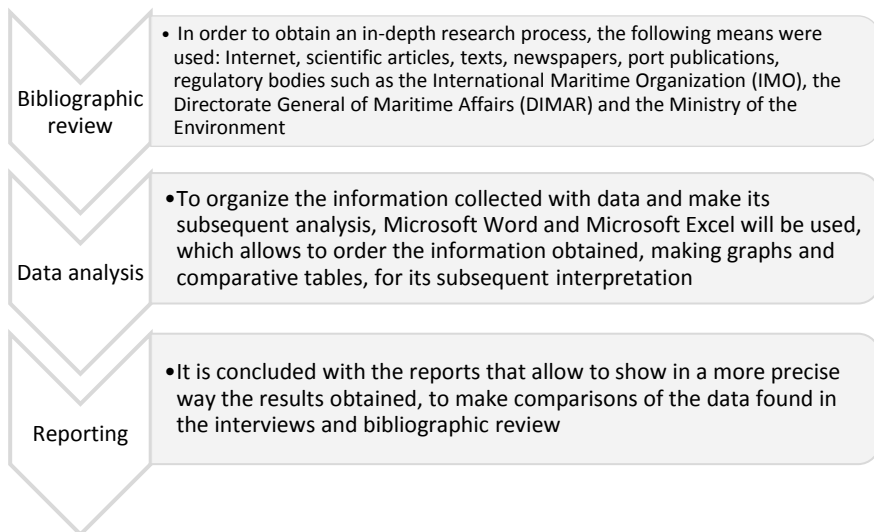
In these areas there are also bonfires, a potential propagator of gases polluting with carbon monoxide, nitrous oxide, minute particles (PM2.5), polycyclic aromatic hydrocarbons (PAH), among others, that remain in the atmosphere and generate problems for health and the environment, when the waste is carried by the sea, floating garbage is created, posing a threat to maritime transport, since it can become entangled in propellers and rudders, endangering navigation.

DEVELOPMENT OF METHODOLOGY

As indicated by the International Trade model, in its chapter on location theory, the variable that exposes how specialization in economic activities and the progress of technologies has required necessary action in the development of transport will be applied in this research. We proceeded to analyze a company, a shipping company and a freight forwarder present in Colombia, who carry out inbound and outbound cargo routes at Sociedad Portuaria Regional de Cartagena (SPRC), Compañía de Puertos Asociados (COMPAS), Sociedad Portuaria de Buenaventura (SPRB) and Aguadulce as they are international ports and have large cargo movements, great infrastructure development and high performance. On the other hand, the importance of the ports in Colombia is observed, the role that they play in that due to their location the traffic of ships is higher, the measures that are taken to minimize the impacts on the environment and the reduction in logistics costs.

The focus of this work will be under a mixed scheme, which consists of the combination of two approaches, quantitative (data processing) and qualitative (descriptive), since by the nature of the topic it allows data collection and necessary information, to then be able to be presented and explained in more detail on the impacts of ship traffic at sea. The information will be obtained through different primary sources, which present the opinions of the companies in charge of the transport of maritime cargo, thus guaranteeing accurate information and the understanding of the object of study that will allow for more support of the project information. The type of study was explanatory type, which allowed describing, establishing and explaining the impacts caused by the transport of maritime cargo.

For the development of this investigation it was necessary to carry out semi-structured interviews to support or support the authors' information. Through questions asked to shipping personnel (Maersk), (questions were asked through calls), freight forwarder (Magnum Logistics) (A face-to-face visit was made in El Poblado, Medellín) and a company in the sector (Tablemac MDF) since they are the ones who are part of the ship's logistics chain and thus know and analyze the changes they are implementing in reducing pollutants to the sea. The research method that was implemented to search for information is as follows:



Source: Own elaboration.

Graph 2

EMPIRICAL MODEL

Statistical structure

To select the sample and data collection, an interview was conducted with different groups involved in the logistics chain, they are: A freight forwarder, two companies and two shipping companies. With relevant questions on topics covered in the research.

This interview is important for the work, since it allows to directly demonstrate the appreciations of these logistics groups, the work they are doing to mitigate the impacts on the environment and their willingness to change, in this way it will be possible to conclude which can be the most viable alternatives to implement in the short term, that do not generate a great impact on foreign trade operations and what changes should be made in the long term in terms of infrastructure and means of transport.

The quantitative variable is applied, which will allow the results obtained to be graphed later and thus be able to evaluate them in detail. The questions asked are the following:

QUESTIONS	YES	NO	Why?
Would you be willing to significantly reduce the transit time of motor ships in order to reduce sulfur oxide emissions?			
Has the increase in IMO 2020 affected the allocation of loads by your customers?			
Do you consider that since IMO 2020 came into force, maritime operations have decreased?			
Do you have other options to reduce climate change without affecting foreign trade operations?			
Considering that one ship produces as much sulphur as 50 million cars, would you be willing to replace them with carbon-free ships, even if it is more expensive?			

Source: Own elaboration.

Table 1

RESULTS AND/OR FINDINGS

In this investigation, it was found that environmental deterioration is a great reality and problem that is currently being experienced, the sea, is one of the elements that has suffered more damage, the large number of dead marine species, extinct and malformed is only one of the consequences of all the damage caused by humans, another of the realities by which they are now affected is the shortage of water, this, thanks to the companies that ignore these damages and unfortunately in Colombia still does not address this issue with rigor and depth (Rodríguez & Vargas Chaves , 2015). Although the sea with its volume 1,300,000,000 cubic KMS and extension (73% of the Earth's surface) is considered a huge vessel capable of absorbing all the waste, its capacity is decreasing and consequently the number of objects that have been dumped is increasing. (Miramontes, 1976)

There are countless reasons for this environmental damage, but one of the biggest is foreign trade. If you focus on ships and shipping, a large number of containers are dumped at sea, goods of all kinds that considerably damage the ocean and the environment in general. According to García, the enjoyment of a healthy environment, as a right of humanity, does not imply that a civil responsibility should not be fulfilled to offer hope to the environment and to remedy environmental damage. (García Álvarez, 2016)

The interview conducted with the different people involved in foreign trade, helped to discover that currently all are aligned with the contribution to the environment, regardless of whether this involves a cost overrun on their products and / or profits, additional, it could be revealed that the shipping company is making decisions and acting to contribute to the damage caused by the ships. Analyzing the international transit, only in 2019 the following amount of containers and type of cargo were exported and imported into Colombia.

Maritime Port Traffic In Colombia

ZONA PORTUAR... :	Tipo de carga :	EXPORTACION :	IMPORTACIÓN :
Z.P. RIO MAGDALENA	GRANEL SOLIDO DIF...	13.296	19.078
TURBO	GENERAL	220.075	1.272
TURBO	CONTENEDORES	458.794	137.880
TUMACO	GRANEL LIQUIDO	288.773	1.303
SANTA MARTA	GRANEL SOLIDO DIF...	0	2.527.161
SANTA MARTA	GRANEL LIQUIDO	320.121	4.835.299
SANTA MARTA	GENERAL	49.839	188.464
SANTA MARTA	CONTENEDORES	451.683	875.845
SANTA MARTA	CARBON AL GRANEL	2.357.434	0
SAN ANDRES	GRANEL SOLIDO DIF...	0	58.465
SAN ANDRES	GENERAL	0	1.458
SAN ANDRES	CONTENEDORES	3.861	35.934
GUAJIRA	GRANEL SOLIDO DIF...	0	122.142
GUAJIRA	GRANEL LIQUIDO	0	220.535
GUAJIRA	GENERAL	138	79.246
GUAJIRA	CONTENEDORES	50	7.054
GUAJIRA	CARBON AL GRANEL	27.193.643	0

GOLFO MORROSQUI...	GRANEL SOLIDO DIF...	0	480.480
GOLFO MORROSQUI...	GRANEL LIQUIDO	31.961.883	0
GOLFO MORROSQUI...	GENERAL	0	862
GOLFO MORROSQUI...	CARBON AL GRANEL	164.912	140.024
CIENAGA	CARBON AL GRANEL	47.495.852	0
CARTAGENA	GRANEL SOLIDO DIF...	1.066.773	1.827.171
CARTAGENA	GRANEL LIQUIDO	6.035.529	3.500.081
CARTAGENA	GENERAL	262.469	489.230
CARTAGENA	CONTENEDORES	2.437.092	3.755.782
CARTAGENA	CARBON AL GRANEL	1.508.170	0
BUENAVENTURA	GRANEL SOLIDO DIF...	16.680	5.661.491
BUENAVENTURA	GRANEL LIQUIDO	0	570.691
BUENAVENTURA	GENERAL	750.213	797.257
BUENAVENTURA	CONTENEDORES	2.672.450	6.755.471
BUENAVENTURA	CARBON AL GRANEL	509.783	315.959
BARRANQUILLA	GRANEL SOLIDO DIF...	32.865	4.098.789
BARRANQUILLA	GRANEL LIQUIDO	358.775	965.453
BARRANQUILLA	GENERAL	55.389	1.526.547
BARRANQUILLA	CONTENEDORES	538.982	783.183
BARRANQUILLA	CARBON AL GRANEL	1.793.843	92.034
BARRANCABERMEJA	GRANEL LIQUIDO	73.567	145.708

Source: <https://www.datos.gov.co/Transporte/Trafico-Portuario-Mar-timo-En-Colombia-vigencia-20/5r3g-zv5z>

Table 2

As can be seen in Table 2, the number of containers that pass through the Colombian port, however, is complex to dimension how many containers and ships leave annually in all ports of the world, this is what makes international business possible in an economic way, but how much damage does this amount of exports and imports do to the environment? This is proportional to the journeys made by the motor ships.

However, in order to mitigate these damages, Colombia has different treaties and signatures at the national and international level which seek to protect, diminish, or give solution to the environmental damages that occur at sea due to international trade, among these are: MARPOL Convention, which has as its objective the prevention of pollution at sea caused by ships. (Monsalve & Sanchez, 2016)

For Prieto, at present, maritime activity has been detailed as a high source of emission of atmospheric pollutants, of which the high impact on the environment and human health has been verified; mainly in the port cities. The lack of studies in Colombia to control these environmental damages is very alarming.

Emissions	Tons
NOx	4583,18
SO2	1417,34
PM10	182,52
PM2,5	179,42
HC	87,1
Volatile Organic Compounds Other Than Methane (NMVOC)	155,84
CO	136, 19
CO2	105 677,85
CH4	0,77
N2O.	4,95

Source: (Prieto, 2019)

Table 3

As can be seen in the graph, the Container, Bulk and General vessels arrived at the Barranquilla River Terminal for the year 2018 and their emissions. NOx are the ones with the highest emissions for primary pollutants and CO2 for greenhouse gases, where the container type was the quality that most contributed to said emissions in general terms. Finally, it was concluded that the port situation is not critical. However, if emissions control and port operations management measures are not taken, it is a situation that can worsen considerably. (Prieto, 2019) Also, humans are considered to be responsible for a percentage of pollution, the use of charcoal for bonfires, cutting down trees, dumping waste into rivers and the sea.

To complement the investigation, an interview was carried out with different participants in the logistics chain, these chosen at random to learn a little about their processes to mitigate damage to the environment with their operations (company, cargo agent, shipping company) these were the answers:

Company's response to the interview:

QUESTIONS	YES	NO	Why?
Would you be willing to significantly reduce the transit time of motor ships in order to reduce sulfur oxide emissions?	x		We would be willing to contribute to the improvement of the environment
Has the increase in IMO 2020 affected the allocation of loads by your customers?		x	Although fares have increased, they are still cheaper for some routes than air transport and the company is always looking for cost savings
Do you consider that since IMO 2020 came into force, maritime operations have decreased?		x	No, we continue with the same percentage of maritime
Do you have other options to reduce climate change without affecting foreign trade operations?		x	
Considering that one ship produces as much sulphur as 50 million cars, would you be willing to replace them with carbon-free ships, even if it is more expensive?	x		Yes, we are willing

Table 4

Among the findings obtained, it is evident that companies are the most affected by the implementation of the IMO 2020 as tariffs will rise considerably; many freight forwarders have established aid for companies that cannot bear these increases so that their market does not lose competitiveness. (GROUP, 2019)

Shipping company's response to the interview:

QUESTIONS	YES	NO	Why?
Would you be willing to significantly reduce the transit time of motor ships in order to reduce sulfur oxide emissions?	x		Our mission is to improve the environment and not affect it by our operations
Has the increase in IMO 2020 affected the allocation of loads by your customers?	x		Yes, this increase has reduced the operations, however, in this year we have had many other situations that affect, for example the Covid-19
Do you consider that since IMO 2020 came into force, maritime operations have decreased?	x		
Do you have other options to reduce climate change without affecting foreign trade operations?		x	We are looking for other solutions
Considering that one ship produces as much sulphur as 50 million cars, would you be willing to replace them with carbon-free ships, even if it is more expensive?	x		

Table 5

Cargo agent's response to the interview:

QUESTIONS	YES	NO	Why?
Would you be willing to significantly reduce the transit time of motor ships in order to reduce sulfur oxide emissions?	x		
Has the increase in IMO 2020 affected the allocation of loads by your customers?	x		Yes, this new regulation has been an affectation since the tariffs were high and therefore we have stopped assigning many
Do you consider that since IMO 2020 came into force, maritime operations have decreased?	x		
Do you have other options to reduce climate change without affecting foreign trade operations?		x	We have not thought about other options, however, as a company we have many options with our employees, such as reducing water and energy
Considering that one ship produces as much sulphur as 50 million cars, would you be willing to replace them with carbon-free ships, even if it is more expensive?	x		

Table 6

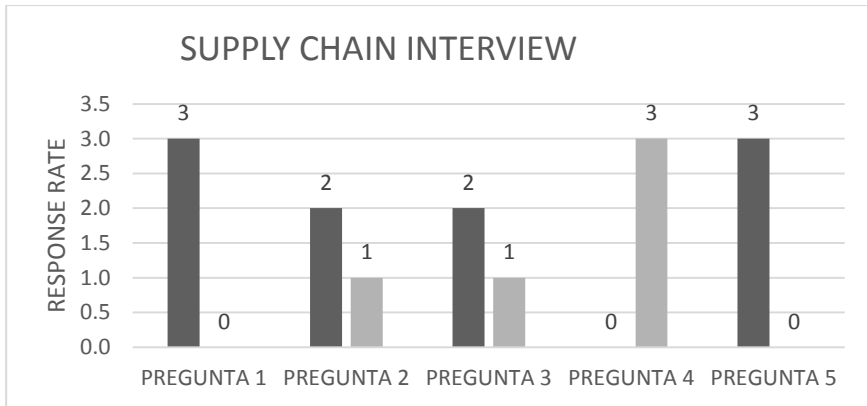
It can be affirmed that all the interviewees are willing to assume increases in their rates to contribute to the environment, and due to the implementations carried out by the shipping companies, maritime transport has been affected, however, this cannot yet be measured with total certainty since that other factors external to the operation influence the measure and according to the (Universidad del Bosque, 2020) These other factors, such as people, have contributed to this decrease, this negative impact that affects a country's growth projections, the fall in imports, exports of goods and depreciating the country's economy.

Results from the interviews

In the following bar chart, which allows a visual presentation of the quantitative variables (López, 2020) the answers of the interviewees are observed in a more precise and unified way, where for the first question everyone is willing to increase the transit time of the motor ships, in order to reduce polluting emissions. For the second question, both the freight forwarder and the shipping company have been affected in cargo assignments by companies, since they are looking for savings in their operations and competition is increasingly tough.

In the third question, the decrease in cargo through maritime transport can be a growing variable, since shipping companies must reinvent themselves to be competitive in the market and take care of the environment, without freight rates becoming so high that consider using other means of transportation. In the fourth question, none of the companies interviewed has a plan so that their foreign trade operations do not affect the environment, which is questionable since we are in an era where caring for natural resources is a key factor.

Finally, in question number five, all those involved in the logistics chain are ready to replace old motor ships with new ones with higher technology in fuel economy. This can take years, as it involves scrapping, manufacturing and assembly costs for all motor ships in the world, but it is an option that can be efficient over time.



Graph 3

Results obtained by secondary sources

On the other hand, it was evident that the cargo agent and the shipping company interviewed implemented the IMO 2020, this began to rule from January 1 this year, which seeks to significantly reduce harmful emissions of sulfur oxides, additionally, seek significant benefits for both human health and the environment, shipping companies can only use a maximum of 0.5% sulfur compared to the current 3.5%. (Tiba, 2019)

From 1 January 2020, the global limit on the sulfur content of ships' fuel will be reduced to 0.50% (from the current 3.50%). Known as "IMO 2020", this will be required for all ships maneuvering outside of certain designated emission monitoring zones, where the limit is 0.10%.

The IMO will ensure that all reasonable measures are taken to promote the availability of fuel oil that complies with the provisions, additionally; it will inform the Organization of the availability of regulatory fuel oil in its ports and terminals.

All parties must inform the Organization when a ship has presented evidence of the unavailability of regulatory fuel oil. To do this, they will record the notifications received in this regard in the

IMO's Integrated Global Maritime Information System (GISIS). (OMI)

One of the advantages is having a more sustainable and clean transport, which will significantly help the environment, however, this is a major concern due to the increase in rates. (Bilogistik S.A, 2019) Likewise, this limit will have a 77% reduction in the total emissions produced by the ships, which is equivalent to an annual reduction of approximately 8.5 million metric tons of sulfur oxides. It will also reduce the small particles that form when fuel is burned. (Mundo, BBC News, 2020)

In this way, if the sulfur oxide particles decrease, it is estimated that asthma, lung cancer, strokes, and cardiovascular and lung diseases will also decrease. Reducing sulfur emissions from ships will also help prevent acid rain and ocean acidification, which will benefit crops, aquatic species and forests.

Since one of the adaptation methods is liquefied natural gas (LNG), considered as one of the most interesting alternatives due to its environmental impact, LNG can reduce sulfur emissions by up to 90%, ships that run on fuel LNG will be able to operate in ECA zones without changing their fuel, which ships using petroleum-based fuels will have to do. (Icontainers, 2019). It should be noted that, in case of non-compliance with this regulation, sanctions may be high fines, arrests of ships or imprisonment of the captain. (Nagel, kuehne, s.f.)

This new regulation is part of the International Agreement to Prevent Pollution from Ships (MARPOL Convention), a key environmental pact under the forecasts of IMO, the specialized United Nations agency responsible for developing and adopting standards to prevent pollution caused by ships, as well as ensuring the protection, safety and efficiency of nautical transport. The idea of this reduction of sulfur in ships to 0.50% was realized in 2008 and resumed in October 2016.

For these reasons, IMO has published a series of documents to help the shipping industry and its Member States prepare, including provisions on the development of a ship implementation plan (addressing issues such as risk assessment for new fuels and tank cleaning) and guidelines on port State supervision.

As a consequence, IMO Secretary-General Kitack Lim said:

"For the past three years, IMO Member States, the shipping industry and fuel suppliers have worked tirelessly in preparing for this major change in the sulfur content of ships' fuel. I am sure that the benefits will be appreciated soon and that the implantation will go smoothly".

"I am very grateful for all the efforts made by refineries, ship owners, seafarers, organizations in the sector, among others, to prepare for this enormous change, which will have significant positive benefits for human health and the environment." He added.

To help with this, the IMO Secretariat has established an email address for Member States and the shipping industry to send any queries that arise when the rule takes effect.

In this way, refineries can mix low-content fuel oil with high-sulfur fuel oil to supply regulatory fuel oil. Additives can be used to improve other properties, such as purity. Vessels can also use different fuels, with low or even zero sulfur content, for example, liquefied natural gas or biofuels. However, mixing of different fuels is not recommended, according to ISO standards and its PAS. Ship owners should test the compatibility, stability and other relevant characteristics of the regulatory fuels to be used and consult the relevant standards of the International Organization for Standardization (ISO) (ISO 8217 e ISO/PAS 23263:2019)

Likewise, ships can also comply with SO_x emissions orders using one of the approved equivalent methods, such as exhaust gas cleaning systems, or "scrubbers" that "clean" emissions before they are released into the atmosphere. In this case, the equivalent means must be approved by the Administration of the ship (the flag State). Scrubbers remove sulfur oxides from the ship's engine and exhaust gases from the boiler, allowing ships equipped with them to continue to use heavy fuel, in accordance with the Guidelines of the International Maritime Organization.

* Baltic Sea; North Sea; North America zone; Caribbean Sea area of the United States.

(International, Maritime Organization, 2019)

Among the results that can be effective today and as discussed in the theoretical framework, the best option is to decrease the speed of the ships, as indicated by the IMO, when the speed is reduced the amount of sulfur oxides that It comes from the ships to the sea is parallel, in this way and with the new fuel limit to be used on board fuel oil, this term includes that used in main engines, auxiliary engines and boilers, with sulfur content not exceeding 0, 5% mass / mass, with respect to the current limit of 3.50% that was in force until January 1, 2020, with this decrease, contamination is expected to begin to decrease. The IMO is developing guidelines on best practices for users involved in the logistics chain, the safe and efficient operation that fuel oil can bring on board ships, and the benefits it provides to guarantee the quality and regeneration of the sea and its species.

Unlike other means of transport, sailing at low speeds can be more efficient and less polluting, since a ship is ten times more efficient than a truck and approximately one hundred times more than an airplane, that is, if it does not go exorbitantly fast. (Martínez Batalla, 2019)

Another important result, which commits humans and their social responsibility to the environment, is how caring for natural resources will lead to a better quality of life, marine life will not run the risk of being trapped in waste thrown by consumerism.

They will not ingest micro plastics as a result of the fragmentation of large products and their reproductive lives can be more efficient. In this way everyone can win in a cleaner sea.

CONCLUSIONS

A major disadvantage is the economic impact that replacing fossil fuels brings, and this will fall on the shipping and refining industry, but also on oil and other raw material differentials.

The high volume of maritime traffic, thanks to industrialization, has caused great problems in the balance and biodiversity of the sea, causing the entrapment and death of marine species that get caught in the hulls of search, ingest debris or are victims of aggression of fossil fuels released by ships when in motion at sea.

The sanctions for failing to replace fossil fuels will be established individually by the parties to the MARPOL Agreement. The IMO does not establish sanctions or fines, this corresponds to each party.

Countries that have ports and riversides can use the supervision of the Port State to verify that the ship complies with the rules established by the IMO for 2020 and take samples to verify the sulfur content of the fuel oil supplied.

The requirement for refineries to use Fuel Oil, for the lubrication of boilers, and other auxiliary parts of the ship, is a beginning to the reduction of pollutants that are then dumped into the sea.

The change of environmentally friendly fuels should be implemented in other transport sectors, thus seeking a balance in the environment and reduction of pollution.

Damage to human health can be serious when eating fish that has consumed some waste dumped in the sea. Therefore, humans must be aware of their actions and a high environmental social responsibility.

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