
IMO 2020: ENVIRONMENTAL AND ECONOMIC IMPACT

Adrian Istrate Scrădeanu¹, Andrei Cepoi², Enas Aboura³ and Mihaela Bucur⁴

^{1) 2) 3) 4)} *The Bucharest University of Economic Studies, Romania*

E-mail: istrate@europe.com; E-mail: idandrei@gmail.com;

E-mail: enaso1993aboura@gmail.com; E-mail: bucur.mihaela@yahoo.com

Please cite this paper as:

Istrate Scrădeanu, A., Cepoi, A., Aboura, E. and Bucur, M., 2020. IMO 2020: Environmental and Economic Impact. In: R. Pamfilie, V. Dinu, L. Tăchiciu, D. Pleșea, C. Vasiliu eds. *6th BASIQ International Conference on New Trends in Sustainable Business and Consumption*. Messina, Italy, 4-6 June 2020. Bucharest: ASE, pp. 649-654

Abstract

United Nation adopted since 2016 through its agency International Maritime Organization (IMO), the regulation that imposed reduction of Sulphur in the fuel used by merchant vessels. Rule mandating lower sulfur emissions for the shipping industry went into effect on January 1, 2020. The new regulations, already in force and addressed as IMO 2020 have been the subject of concerns and predictions of vast disruptions and impacts to shippers, customers, ship owners, affecting supply chains. The study will highlight the importance of the adopted rule for the environment, which was the trigger for the United Nation to act. Beside this, the study below aims to research and to give an outlook from economical point of view of main parties affected by IMO 2020, respectively customers and vessels owners. Official acts, norms and studies will be reviewed for proper conclusions. Results will show that indeed environment get a boost but with additional pressure and costs rise for involved parties, costs being transferred on the final product that is subject of maritime carriage.

Keywords

IMO 2020, environment, costs, supply chain

JEL Classification

I10, Q01, Q53, R41

Introduction

According International Chamber of Shipping 90% of the world trade is performed by sea (ICS, 2020), UNCTAD reveal that in 2018 a peak of 11 billion tons of cargo has been carried over the sea (UNCTAD, 2019). There are over 50.000 merchant ships around the globe, that beside their cargoes, assure the jobs of over 1 mil seafarers (FIATA, 2019). But these ships are also responsible for the consumption of 3.5-4 million barrels of fuel per day, which

delivers 15 million tons of emissions in the air (EPA, 2020). The World Health Organization (WHO, 2019) estimates that some 3.7 Million deaths in 2012 are attributed to ambient air pollution, while shipping industry is one of the main contributors to worldwide pollution.

Environmental aspects

The International Maritime Organization, as regulatory body of United Nations, policies to tackle maritime air pollution date back to the 1990s, and IMO 2020 itself was announced in October 2016. There were various associations that required for another postponing of this regulation (UGS, 2019), but at the request of IMO, The Finish Meteorological Institute revealed through a report that : “Delay in implementation of global Sulphur limits from 2020 to 2025 would, according to the study, contribute to more than 570,000 additional premature deaths compared to the implementation from 2020” (IMO,2016, p.2). Our study answer to what is IMO 2020 and how to respect it.

Economical aspects

If we consider the supply chains as an ecosystem involving various actors like sellers and buyers, shippers, ship owners, regulatory bodies and others, new regulations applying to any of the actors will come with a cost. Subject cost will affect the entire ecosystem, finally being transferred to the price of the product that is subject of maritime transport. About 60 to 70% of the maritime movement cost is due to fuel price itself (ICS, 2018). The study will show how much will cost to respect IMO 2020 and how cost will be divided through the supply chain.

Vessels bunker and fuels

The main type of “bunker” oil for ships is heavy fuel oil (HFO), derived as a residue from crude oil distillation. Fuel used on ships do contain Sulphur which, which after usage in the engine, beside propulsion generates ship emissions. Sulphur oxides (SOx) do a lot of harm to health, mainly causing respiratory deficiencies and lung severe disease (Lelieveld, 2015). In the atmosphere, SOx can generate acid rain, damage the crops, forests, and marine species, and contributes to the acidification of the seas (Winebrake, 2009). IMO 2020 is to limit SOx emissions from ships aiming to improve air quality and protects the environment. From 1 January 2020, the Sulphur limit in fuel oil used on board ships operating outside designated emission control areas is reduced to 0.50% m/m (mass by mass) from a previous 3.5% m/m. Reduction of Sulphur content in the fuel used will automatically reduce other toxic components of the fuel like NOx (oxides of nitrogen), PM (particulate matter), CO2 emissions (carbon dioxide). Global NOx and SOx emissions from the maritime industry do stand for about 15% and 13% of global NOx and SOx from anthro-pogenic sources reported in the IPCC Fifth Assessment Report (IPCC, 2014). In table 1 (table no.1) are presented evolution of various components as per “Health Impacts associated with delay of MARPOL Global Sulphur Standards” of IMO (EGCSA, 2012).

Table no. 1 Evolution of toxic components with and without IMO2020

Pollutant tones(000)	Applying IMO 2020	Non-applying IMO 2020
NOx	21000	19000
SOx	2500	10900
PM	760	1900
CO2	862000	938000

Source: <http://www.imo.org/en/MediaCentre/HotTopics/Documents>

To have a view of how much is currently polluting a single 20’ container with 20 mt of cargo have gathered in the table 2 (table no.2) several intense routes of navigation:

Table no. 2 CO2 Emissions

1 TEU at 20 mt	kgCO 2
Shanghai - Rotterdam	1,961.99
Shanghai- New York	3,082.13
Shanghai- Cape Town	3,547.86
Shanghai - Santos	2,837.62

Source: <https://www.dhl-carboncalculator.com/>

The new generation of ULCC (Ultra Large Containers Carriers) do have a nominal capacity of +18.000 TEUs (Twenty foot Equivalent Unit), already in 2019 vessels with nominal capacity of 23.000 TEUs has been launched.

Complying with IMO2020

There are very few options for ships owners to respect IMO 2020 rules, adopting one of the below accepted methods:

- Usage of Marine Gas Oil (MGO) instead of HFO
- Usage of Very Low Sulphur Fuel Oil (VLSFO) instead of HFO
- Installing on engine a component called scrubber that holds emission and using HFO
- To completely switch fuels from oil types to LNG (alternative fuels for commercial use)

In table 3 (table no.3) are presented several advantages and disadvantages of above methods chosen.

Table no. 3 Methods to respect IMO 2020

TYPE	Advantages	Disadvantages
MGO	Worldwide availability of MGO. Minimum training for the crew.	Boilers cannot sustain use of MGO without modifications.
VLSFO	Engine performance increased; range increased.	High prices, reduced number of suppliers.
Scrubber	Clean performance, ready to meet IMO 2025 at 0.01% m/m Sox.	Ships must enter shipyard for installation, few providers.
LNG	On long term is the most efficient engine.	Ports not prepared for bunkering, completely new design for ship.

Source: <http://www.imo.org/en/MediaCentre/HotTopics/GHG/Pages/default.aspx>

Costs to comply with IMO2020

For benchmarking purpose, we will take in consideration for calculations the technical aspects of a Very Large Container Carrier (VLCC).

As per a Wood Mackenzie study (2019), bunker costs will rise by up to US\$60 billion annually if all carriers will comply with IMO regulation.

To have a view of what means switching from traditionally used HFO to VLSFO or MGO we will show in table 4 (table no.4) below prices available for bunkering in Rotterdam on December 2019. A VLCC consumption goes to 100 mt/per day of voyage.

Table no. 4 Bunker price in Rotterdam on December 2019

Rotterdam Dec'2019	USD/mt
HFO	288
MGO	606
VLSFO	586

Source: <https://shipandbunker.com/prices>

Installing scrubbers is one of the alternatives to comply with IMO2020 and might be an economically option (Hufnagl, 2005). Although there is an initial investment, ship owners may have a high rate of return of between 20% and 50% (Wood Mackenzie, 2019). The problem is that are very few producers of scrubbers in the world and vessel needs to be docked for scrubber installation. Although announced attractive returns, access to scrubber's installation could be limited by access to finance, scrubber manufacturing capacity, dry-dock space and technological limitation. Scrubber installation for a VLCC goes to 4.5-5 mil USD, without taking in consideration of "dead" time of not using the vessel during dry dock (Drewry, 2012). Some of the owners of containers carriers announced on the other hand that installing scrubbers on board is slashing vessel carrying capacity.

Although LNG sounds like one of the cleanest ways to proceed in respecting IMO 2020, there are several challenges, most notable being that despite low price of LNG fuel only few ports of the world are ready to deliver LNG to vessels (IQPC, 2019). Also, there is the high price to install LNG capabilities on vessels, for example CMA-CGM reported a price of 13 mil USD to adapt LNG propulsion to one of the vessels from the fleet.

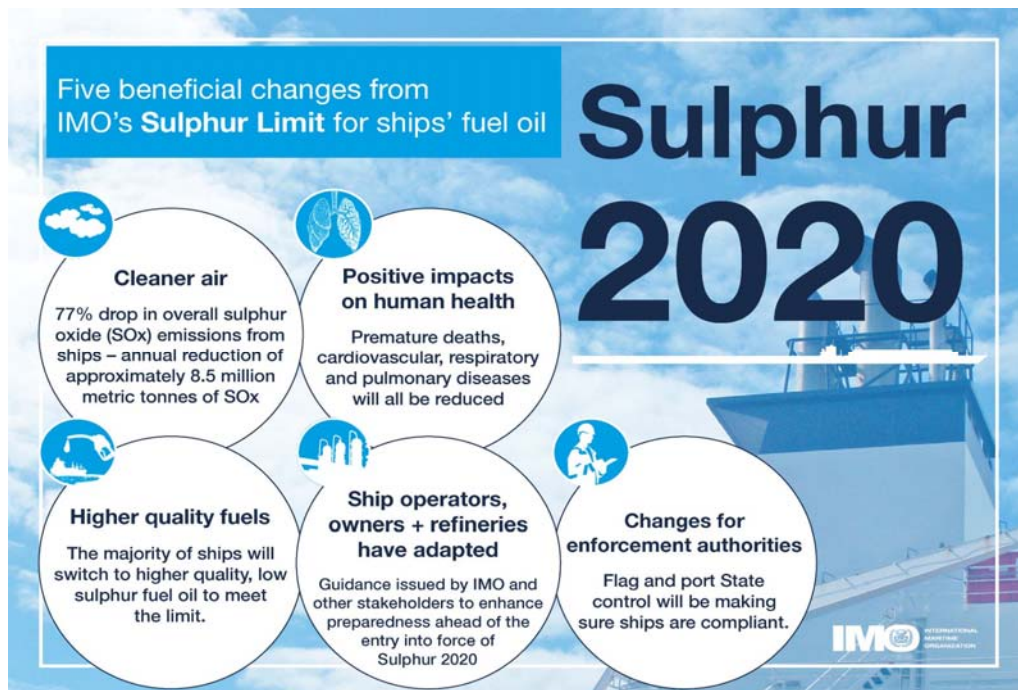


Fig. no. 1 IMO 2020 impact

Source: <http://www.imo.org/en/MediaCentre/HotTopics/Pages/Sulphur-2020.aspx>

Transfer of IMO 2020 costs on cargoes

Considering table 4 which indicates the bunker prices on December 2019 we may observe that the fuels need it to be used by vessels according IMO 2020 are double on price compared with formerly used ones. Also having in consideration that the bunker cost represents 60-70% from the lumpsum cost of transported freight we can indicate that the impact on the freight charges will be high. The shipowners and ship operators will have as only option both to increase the freight but also to levy surcharges on the transport in order to recover the costs either with ship's modification or for the compliant fuel.

Again, for benchmarking purposes will use public data and freight announced by top containers lines (Alphaliner, 2020). The data are compiled using Shanghai Containers Freight Index (SCFI, 2019) which is a metric tool that show the health of global trade out of Shanghai to various 15 worldwide lanes. At the end of Q3 2019 SCFI was at USD 716. Already at the end of Q4 2019 SCFI hick up to USD 959, which reveal an increase of almost 34%. As per US Customs statistics and IHS (IHS, 2019) studies average value of cargo for a container from Far East to Europe or US is USD 20.000. Therefore, we can estimate that IMO 2020 has a minimum impact of costs of 1 and may go to 10% on top of the cargo value.

Conclusions

International Maritime Organization set the course through its new regulation to reduce Sulphur on the fuel used by maritime industry. Subject rule does impact positively the climate, but also raise the cost of maritime transport with a direct connection to final price of cargo carried over the seas. Key figures are:

- Reduction of Sulphur content from fuels from 3.50% m/m to 0.50% m/m starting 1st of January 2020
- Reduction of Reduction of Sulphur content from fuels from 0.50% m/m to 0.10% m/m starting 1st of January 2025
- Aiming to reduce footprint carbon of maritime industry with 8% by applying this new regulation
- Direct impact on fuel prices, on December 2019 fuel price is double
- Is calculated that minimum impact on cargo value is 1%, but going to 10% for cheaper raw materials

We may conclude that on one side vessel owners had enough time (more than 5 years) to cope with IMO 2020 challenges and to prepare vessels for the low Sulphur rule. On the other hand, is reasonable to affirm that a clean environment come with a price, that should be distributed through the parties of a supply chain.

Acknowledgement

„This paper was co-financed by The Bucharest University of Economic Studies during the PhD program”.

References

- Container News, 2020. *Shanghai Containerized Freight Index*, [online] Available at: <<https://container-news.com/scfi/>> [Accessed at 31 March 2020].
- Drewry, 2018. *The dilemma of fitting scrubbers*, [online] Available at: <<https://www.drewry.co.uk/maritime-research-opinion-browser/maritime-research-opinions/the-dilemma-of-fitting-scrubbers>> [Accessed at 31 March 2020].
- EGCSA, 2012. *EGCSA Handbook 2012*. [online] Available at: <<https://online.pubhtml5.com/hafx/estu/#p=23>> [Accessed 14 March 2020].

- Hufnagl, M., Liebezeit, G. and Behrends, B., 2005. *Effects of Sea Water Scrubbing. Final report.* [pdf] Available at: <https://www.egcsa.com/wp-content/uploads/BP_Final_Report_rev.pdf> [Accessed at 15 March 2020].
- IHS Markit, 2017. *Vessel Accumulation and Cargo Value Estimation.* [pdf] Available at: <<https://cdn.ihs.com/www/pdf/Vessel-Accumulation-Cargo-Value-Estimation.pdf>> [Accessed at 30 March 2020].
- International Maritime Organization, 2016. *Air Pollution and Energy Efficiency. Study on effects of the entry into force of the global 0.5% fuel oil Sulphur content limit on human health.* Submitted by Finland. [pdf] Available at: <<http://www.imo.org/en/MediaCentre/HotTopics/Documents/Finland%20study%20on%20health%20benefits.pdf>> , [Accessed at 30 March 2020].
- International Maritime Organization (IMO), 2015. *Third IMO Greenhouse Gas Study 2014.* London, UK: International Maritime Organization (IMO).
- International Maritime Organization, 2008. *Resolution Mepc.176(58) Adopted on 10 October 2008. Annex VI: Amendments to the Annex of the Protocol of 1997 to Amend the International Convention for the Prevention of Pollution From Ships, 1973, as Modified by the Protocol of 1978 Relating Thereto.*: London, UK: International Maritime Organization.
- Lelieveld, J., Evans, J.S., Fnais, M., Giannadaki, D. and Pozzer, A., 2015. The contribution of outdoor air pollution sources to premature mortality on a global scale. *Nature*, 525(7569), pp.367–371.
- Seatrade Maritime News, 2019. *Greek Shipping Minister calls for IMO 2020 delay over safety fears* [online] Available at: <<https://www.seatrade-maritime.com/regulation/greek-shipping-minister-calls-imo-2020-delay-over-safety-fears>> [Accessed at 05.04.2020]
- The Intergovernmental Panel on Climate Change, 2014. *Fifth Assessment Report*, [online] Available at: <<https://www.ipcc.ch/assessment-report/ar5/>> [Accessed at 05 April 2020].
- Winebrake, J.J., Corbett, J.J., Green, E.H., Lauer, A. and Eyring, V., 2009. Mitigating the Health Impacts of Pollution from Oceangoing Shipping: An Assessment of Low-Sulfur Fuel Mandates. *Environmental Science & Technology*, 43(13), pp.4776–4782.
- Wood Mackenzie, 2019. *IMO 2020: Ready or not?* [online] Available at: <<https://www.woodmac.com/news/editorial/imo-2020-ready-or-not/>> [Accessed at 31 March 2020].