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PERCEPTION OF "GREEN SHIPPING" IN THE CONTEMPORARY CONDITIONS*

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Abstract. The article aims at substantiating the importance and relevance of the "green shipping" concept, as well as updating approaches to its understanding in the context of the COVID-19 pandemic. Besides, the article discusses the tools by which there can be achieved the goals of the classical concept, as well as the tools that can be implemented as part of a so-called "primary block" – humanity-friendly part of the updated "green shipment" concept. The purpose of the article is to give grounds to promising areas of investment in "green shipping" projects under the influence of the COVID-19 pandemic, as well as to review the instruments to increase the biological safety of vessels to ensure the financial stability of shipment companies. This article explains the necessity to reconsider the "green shipping" concept, which, under the influence the COVID-19 pandemic, cannot remain the same any longer. The authors proved that achieving total ecological friendliness does not mean the full safety of shipping, and, in their opinion, apart from realizing other fundamental tasks, "green vessels" must become friendly to humanity. There are accumulated the main instruments, which are the part of eco-friendly shipping and are the objects of international investments, and there are proposed the fundamentally new ones. This paper creates the basis for further fundamental research aimed at updating "green shipping" concept under the influence of unfavourable economic and social environment in order to maintain financial stability of all stakeholders engaged in international investments in shipping.

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1. Introduction

The development of modern society is impossible without some global, powerful and dynamic movers. As the population of the planet is constantly growing, these movers are permanently connected with satisfying our growing needs (Bashynska & Dyskina, 2018). From delivering passengers, their luggage and mail to transporting oil, natural resources, heavy machinery and unified containers – all these are the tasks to be solved. The dynamics of international economic relationships even during the last two decades gives us all grounds to believe that the role of cargo and passenger transportation increases each year. As an example, we cite the dynamics of growth in the world port container traffic, which has grown during the past decade from 500 mln. of twenty-foot equivalent units in 2000 to almost 800 mln. in 2018 (UNCTAD, 2019). The similar situation is observed in the cruise line transportation: for the last ten years the quantity of passengers carried by cruise liners has grown by the same 1.5 times – from 21 mln. of people in 2010 to 32 mln. in 2019 (Statitsa, 2019). However, if the rail and road transport have some obvious continental limitations to be used freely and air transport is pretty expensive and has frames of useful loading, a particular type of movers has unconditional benefits: high carrying capacity and huge consignments; the ability to deliver both people and goods over unlimited distances, and comparably lower tariffs. These movers are the global fleet, global shipping.

For the centuries, the fleet of passenger and cargo ships has created conditions for discovering new territories, finding new countries and providing further opportunities for their economic growth and development. The past six - seven decades, the volume of shipping has increased several times. Besides, a mighty industry of sea tourism has been created.

All facts mentioned earlier only prove the necessity and considerable economic importance of developed shipping in the modern world and, without any doubts, the world of the future.

The most general understanding of “green shipping” assumes using the resources and energy by different types of both cargo and passenger vessels in such a way that prevents pollution made by ships as well as reduces shipping impact on global environment (Viana et al., 2020).

The current situation, especially the problem of COVID-19 pandemic, highlighted that shipping might bring not only new opportunities but also severe difficulties and challenges to be tackled.

Another fundamental problem is to make investments and distribute international financial flows in the sphere of shipping. During recent years, a lion's share of investments has been sent to rebuilding, reconstruction of old infrastructure and designing a new one. Today, the ports of Shanghai, Singapore, Hong Kong, Shenzhen, Busan, Ningbo-Shoushan, Guangzhou, Qingdao are not only the cargo terminals but an alliance of thousands of companies and millions of people. Moreover, modern passenger terminals are real art masterpieces attracting tourists and providing the development of business both for local territories and countries as a whole.

As it was considered before, such concentration of people, simultaneously with significant opportunities, brought a lot of fundamental problems of environmental, social, economic and, without exaggeration, healthcare character.

Such kind of a situation dictates new requirements to vessel design, planning and construction of modern ports, which guarantee the safety and health protection for direct and indirect participants in the shipping process, as well as assessment of all risks brought by new challenges.

This is a big task for new investment flows and, obviously, may be solved during several next years. However, today, we see the direction of movement and know what problems are in priority to organize further investments.

This paper is devoted to the explanation of modern challenges and the search for tools to solve the problems mentioned.

2. Theoretical Background

The problems of investing in green technologies are thoroughly and deeply studied today by many scientists and practitioners. Special attention is paid in the literature to a relatively new trend in science, which is called the concept of "green shipping." Different aspects of investments into technologies as the part of Sulphur Emission Control Areas (SECA) with relevant calculations of NPV and WACC, ROV and ROA of such investments were estimated (Atari et al., 2019). The impact of shipment on the CO₂ emission (Bhattar, 2019) was reviewed as to specificity of investments into innovations, port infrastructure, vessels, and shipment.

The role of modern shipment (Lauer et al., 2007) is considered in the process of spreading dangerous sulphate burden, black carbon burden, aerosols generating and radiation pollution. There is given exact characteristic of regional spreading of hazardous materials and the rate of biologic hazard at different parts of the planet. Another work by Lindstad et al. (2015) considers the main types of substances polluting the oceans and seas, analyses the influence of each of them on the atmosphere, hydrosphere and living organisms, as well as studies the contribution each of these substances to environmental pollution. It is shown how ecological aspects of shipping affect consumer choice (Prokopenko, 2011). It is also shown that the development of green shipping enhances the competitiveness of ports and other participants in shipping infrastructure (Kitzmann et al., 2020).

The article by Metzger and Schinas (2019) is dedicated to explaining the gap between the level of financing and the net present value within green investment projects. In the framework of investment projects in the field of green shipment, methodologies of the Fuzzy Pay-Off Method (FPOM) and the Centre of Gravity-FPOM (CoG-FPOM) are proposed.

An extremely important work by Prause (2019) is linked with assessing the risks introduced by realization of different projects of green jobs separately and prospects of green shipping as a whole. There was presented an in-depth analysis of this set of problems for the Baltic region. Another scientific paper (Ragusa, Crampton, 2020) discusses the experience of cooperation between the New South Wales Government and all stakeholders in the matters of environmental pollution in the framework of the "Clean Air" project. The study shows that there is a significant inconsistency in the rules and regulations on pollution of the government and enterprises of different industries, in which sea transport has a special place. This paper proposes the ways to reform existing approaches to providing clean air for each citizen.

There are considered the ways of re-equipping ships or building new ones (Schinas & Metzger, 2019) within the framework of the green shipping paradigm to achieve the goals of the International Maritime Organization (among which: increasing the efficiency and safety of sea transportation by introducing modern eco-friendly

technologies at vessels, decreasing of CO2 footprint etc.). Besides, the economic effect of mounting various kinds of green technologies on ships is analysed: eco-friendly vessels (Taehee & Hyunjeong, 2017), as well as infrastructure for the shipping organization are described. A review of the approaches to understanding the eco-friendly ships in different countries is given; also, a historical outline of the International Maritime Organization requirements and their diversification within the concept of green navigation are presented. There are discussed different scenarios and decision-making approaches (Vakili et al., 2020) in the framework of finding a reasonable balance between pollution caused by ships and their economic efficiency. Besides, the article focuses on noise pollution of shipping routes, which can have no less and, sometimes, even more severe negative consequences for marine ecosystems.

The influence of sea transport on air pollution and the hydrosphere in the Mediterranean region (Viana et al., 2020) is considered. The main threats posed by sea transport for this region's development in terms of environmental impact are studied. The negative effects of sea transport on bird populations are investigated (Wiese & Ryan, 2003). The volumes of fuels and lubricants that are annually sorbed by coastal birds' feathers are analysed. It is concluded that oil pollution of Newfoundland ecosystems occurs year-round, based on the fact that seabirds are polluted by emissions products, regardless of season, hunting, etc.

An in-depth list of those technologies that are now considered part of the green shipping paradigm and eco-friendly ships is presented in the article by Yildirim (2020), with an explanation of how these technologies can have a positive effect on the ecosystem of the seas and oceans. In-depth studies in the field of green shipping (Shi et al., 2018) have shown that technological research needs to be specially strengthened.

3. Research Objective and Methodology

The purpose of this article is to substantiate promising areas of investment in "green shipping" projects under conditions of the COVID-19 pandemic, as well as to review the instruments for increasing the biological safety of vessels in order to ensure the financial stability of shipment companies.

This research is informed by major publications on "green shipping" and sustainable development, publications of analysts linked with the problem of COVID-19 as well as the situation with passenger and military vessels engaged into the problems of the pandemic.

The following methods were applied in the research. In determining the essence of the "green shipping" concept, as well as its fundamental components, the methods of scientific abstraction, logical generalization, induction and deduction, as well persuasive methods were used. The article analyses the primary literature on the research topic to obtain results.

While forming blocks within the updated concept of "green shipping", the logical-structural analysis was used. Besides, the authors performed a qualitative analysis of the green shipping risks and concluded that threats to biological safety had increased dramatically. This allowed adding a biological safety block (or friendly to humanity) to the fundamental components of the "green shipping" concept. In the opinion of the authors, such changes should be made based on the additional analysis of the whole concept of sustainable development. As a hypothesis, conducting similar studies should lead to identifying an essentially new component of sustainable development in general, resulting from the impact of the COVID-19 pandemic.

When selecting the main steps of the primary unit in the "green shipping" system, the system-structural analysis was used. These steps should not be understood as those that must be performed strictly in the specified sequence. There is proposed a ranking of the actions based on a potential country that has significant problems with ensuring the concept of "green shipping" in general, and the biological safety of vessels, in particular. Each

country has its problems to be solved. This means that the priority of these steps depends on the level at which the government and the logistics business in each specific country consider the problems linked with the safety of shipment for the environment and humanity.

This research used the methods of analysis and synthesis, when selecting the instruments, investment in which will allow achieving a high level of biological protection, which will enable the shipping to remain safe and maintain its financial stability even under conditions of such a force majeure event as the COVID-19 pandemic. In particular, the authors studied technologies used in other spheres (applied physics, hydraulics, hydrodynamics) and analysed the possibility of their use for developing "green shipping". The state-of-the-art existing and promising technologies are shown.

4. Results and Discussion

4.1. The COVID-19-Caused Update of the Fundamentals of "Green Shipping" Concept

Sea transportation development dates back to centuries ago. During all this long period, it is impossible to estimate the total tonnage of cargoes delivered, as well as the number of people who reached their destinations. Today it is impossible to imagine Transatlantic route and the horizon of New Hope Cape without Sub-Panamax Class, Panamax Class or even Post-Triple E-Class container ship of 21000 TEU and thousands of enterprises depended on their work efficiency.

At the same time, intensification of shipping has brought an unexpected problem – a negative influence on the environment. According to the most general calculations, transportation is responsible for more than 2.5% of CO₂ emission coming from using energy, creates more than 260 tons of plastic garbage as well as of liquid wastes, which cannot be counted and which destructively influence ecosystems and species (Bhattar, 2019). The tragedy that happened with the Exxon Valdez tanker on 24 March 1989, when, according to different calculations, from 250 to 750 barrels of crude oil were spilt onto the Alaskan's shore, attracted close attention to the future of the shipping industry and shipbuilding in general. Such negative examples when shipment had such a horrible influence on the environment were the basis for designing a new concept – so-called "green shipping". This is why the most general understanding of "green shipping" assumes using the resources and energy by vessels in the way that prevents pollutions made by them as well as reduces the shipping impact on the global environment (Viana et al., 2020).

This concept became a huge leap of industry and one of the essential elements of corporate social responsibility bringing the corporate sector new opportunities – participation in a real green supplying chain (Atari et al., 2019).

As it was mentioned before, the concept of "green shipping" unites the following fundamental components (Fonseca et al., 2020):

- economic – "green shipping" must both be profitable and guarantee the expanded reproduction;
- social – "green shipping" must be a powerful facility to create working places, must provide equal accesses to business opportunities, as well as recreation and cultural opportunities for all people, which use shipment services directly or indirectly;
- environmental – all previously mentioned challenges must lead to the reduction of its impact on climate, ecosystems, nearshore territories to prevent its decisive contribution to global problems' deepening.

From this standpoint, we believe that the concept of "green shipping" is very similar to the most significant paradigm of the 21st century, proclaimed by the General Assembly of United Nations, – sustainable development. In our opinion, the concept of "green shipping" may be realized by introducing of the following tools (Table 1).

Table 1. The Instruments to Achieve the Concept of “Green Shipping” (the most innovative, in the authors’ opinion, tools to be implemented as the part of “green shipping” concept are marked blue)

| N | Measure | Explanation |
|-----|--|--|
| 1. | Ballast-Free System | research and development of new technologies to abandon liquid ballast in future to stabilize the ship and to set up its optimal draft. |
| 2. | Rebuild Existing and Design New Types of Ship Engines | which can consume both low-sulphur fuel and liquefied natural gas (LNG) to reduce the air pollution with exhaust fuel. According to scientific estimates, using LNG will stimulate reducing carbon dioxide emissions by 19-24% with simultaneous declining of curb nitrogen oxide emissions by 85-95%. |
| 3. | Slow-Down the Delivery | the overall intention to shorten the time of delivery brings overconsumption of high-sulphur fuel oil (HSFO), and indeed causes the air pollution made while shipping the cargo and especially passengers. The estimations described that an insignificant slow-down of ship's movement can consume more than twice less of HSFO than the maximum speed. |
| 4. | Using New Types of Propulsion | More effective types of propulsions can increase the efficiency of engines, cut fuel consumption and, possibly, decrease the physical influence on the ocean's ecosystems. That means using and converting ships (from classical propellers) under azipods or water cannons (which previously could only be used on small vessels). The idea of these propulsions is not new by itself; however, they have not become widespread yet; at the same time they can save fuel during manoeuvring near the piers and in the open sea, reduce negative influence on the environment and people's health. |
| 5. | Using Antifouling Hull Paint | Fouling on the ship's hull, as practice shows, influences its speed and fuel consumption negatively. Such specific ship hull coating reduces the tempus of organism's growth on it and helps to save up to 5-10% of fuel. |
| 6. | Heat Utilization | Outdated technologies used earlier created a surplus heat. Modern technologies of heat utilization using heat exchangers bring opportunities to send such heat to boil water, to make steam and perform comfortable temperature in cabins and cargo areas or other technological needs. |
| 7. | Use Alternative Sources to Get Movement | While wind generators are considered today as prospect source of free, ecologically-friendly energy, using sails as propulsion for the vessels becomes less popular; still, this way to transform wind energy into movement represents the almost infinite stock of useful progress, is very cheap and has virtually unlimited potential to implement. It does not mean that all commercial cargo ships or passenger liners must be re-equipped with sails; in this case, it is reasonable to install the wind propulsions only where it is possible from economic, maybe aesthetic, but mostly ecologic reasons. |
| 8. | Installing Exhaust Gas Recirculation Systems | This technology allows making partial filtering of exhaust air and to use it twice or thrice in cylinders of a board engine. Besides, this approach decreases the nitrogen pollution of environment. |
| 9. | Introducing Supercavitation Systems | Supercavitation is not a new, but, at the same time, not very popular technology due to impossibility to implement it on civil vessels a few decades ago. This technology is characterized with making a big air bubble around the hull of the ship, which creates the area of sparse environment and the boat is sailing partially in air conditions. This technology not only minimizes the friction force among the steel and water but also saves fuel and allows increasing the speed of a ship without any increase in fuel consumption. However, this technology is pretty expensive, requires a lot of R&D, is very complicated to implement and, which is more important, cannot guarantee the stability of such equipment set on board. At the same time, this principle is researched and has a big potential to be used in future. |
| 10. | Implementation of a Shipment Version of Car Euro Standards | Starting from Euro 5 standard, all exhaust gas produced by car's diesel engines must be cleaned up by specific chemical - AdBlue liquid. Without any debates, this increases transportation cost; however, it really helps to make movement based on burning diesel fuel more ecologically friendly. |
| 11. | Partial or Complete Transition to Electricity-Powered Vessels | The hull of modern commercial vessels, especially over the waterline, may represent dangerous squares to set the solar panels on it. Moreover, the desks, the walls even the glasses may include elements sensitive to sunlight. Thus, the ship becomes a significant generator of electricity. This electricity may be used to supply power to support electric motors. Thus, sailing during the day under direct sunlight may become extremely ecologically friendly and will provide serious economic effect. |

Source: (Lauer et al., 2007; Metzger, 2009; Lindstad, 2015; Taehee & Hyunjeong, 2017; Furmaniak et al, 2019; Metzger & Schinas, 2019; Olaniyi et al, 2019; Prause et al., 2019; German airline, 2020; Miśkiewicz & Wolniak, 2020; Yildirim, 2020).

Lines 9, 10, and 11 are the authors’ suggestions.

Approaches listed earlier can not only be used with the reason to make shipping friendlier for the environment. This only means that the human notions, full scientific and technological potential, principally other financial opportunities must be oriented on revolutionizing of shipping. That is why we believe that the "green shipping" concept is not only the list of goals, reasons and practical instruments but new economic philosophy which stimulates satisfaction of our increasing needs with simultaneous relief of environmental impact on the marine and air ecosystem.

The modern "green shipping" concept presumes unlimited opportunities in using various technological decisions, which can be realized based on economic, social and ecologic reasons. However, in our opinion, this system of relationships was oriented to reach such efficiency of shipping that allows protecting rights and interests of both current and future generations. Based on this standpoint, we concluded that the "green shipping" concept was a part of a higher-level concept – the concept of sustainable development (Ragusa, 2020).

The pandemic of COVID-19 highlighted a significant problem that modern society is still not ready to protect fully the rights of future generations. Unfortunately, humanity is still to solve another kind of a problem – protection of ourselves.

Gradual internationalization and globalization of humanity have created opportunities for the majority of people to make business and touristic trips on board a ship as well as to intensify the cargo turnover. Each year, the economic role of shipping increases, and during past years, commercial vessels services have accounted for more than 60% of international trade (Viana et al., 2020).

However, along with moving commodities to meet our needs, sea transport brought new dangers – a possibility to spread terrible viruses, like COVID-19. No matter what the shipping purpose is, – be it a passenger liner, commercial cargo or even military vessel – a ship is a closed space, and, hence, favourable for virus replication - just a few examples (see Figure 1).

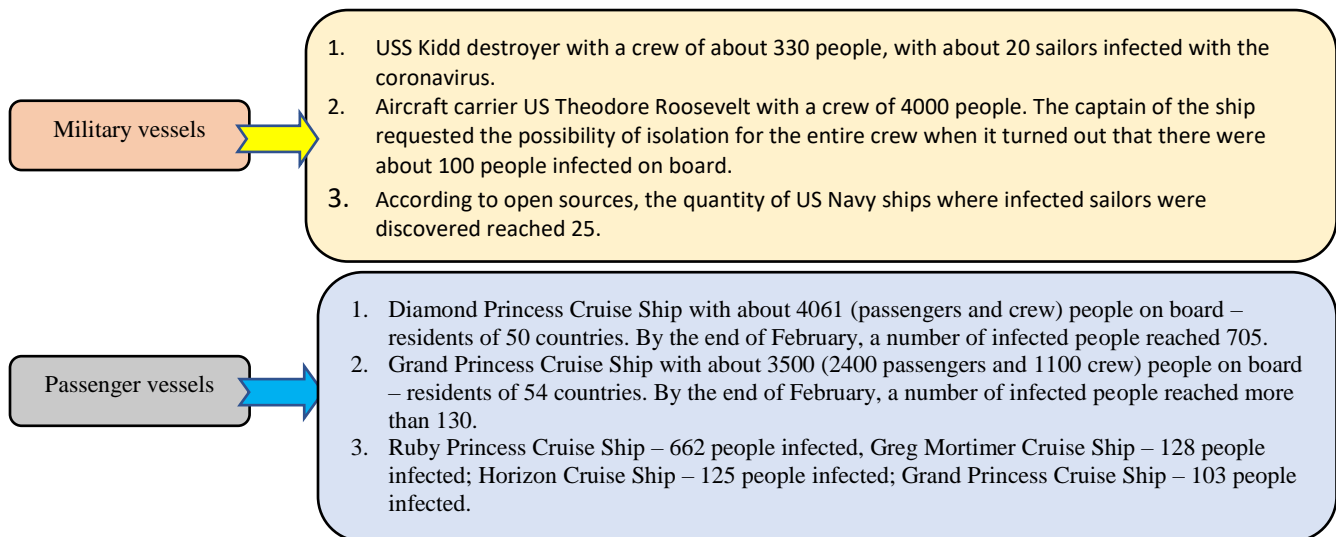


Figure 1. Some Examples of Ships with COVID-19 Diagnosed in People on Board
Source: The authors' research based on the data from Open Internet mass-media sources.

Just taking these data, it is easy to conclude that by the time when the first infected people were discovered, the total share of sick people on board has already amounted to 2.5-15%, and there is no guarantee that by this time some percentage of infected people have not returned to their native countries. The model of a virus further transmission (no matter of a kind: COVID-19, bird or swine flu) by the people who sailed on the ships or just communicated with infected passengers after their return can be built only with enormous approximations, which makes this model meaningless. Moreover, the disease can go on with and without symptoms. And there is no certainty that all potential COVID-19 carriers from these and other ships were detected on time and whether they were detected at all.

At the same time, there was also another situation where the Magnifica cruise liner became a shelter for 3,000 passengers who were afraid to go ashore and felt completely safe on board since there was no coronavirus there. It is an exception, of course, but it is an example when the ship becomes like a “doomsday shelter” – the shelter only for those people who are already on board.

This problem sharpens the concept of “green shipping”, according to which today the vessels must be reviewed not only from their eco-friendly status for the environment, but also as a safe place for people’s health and life (Schinas, 2019).

Different instruments can help reach this horizon. Their implementation will create strategic advantages for shipping, among which are (see Figure 2):

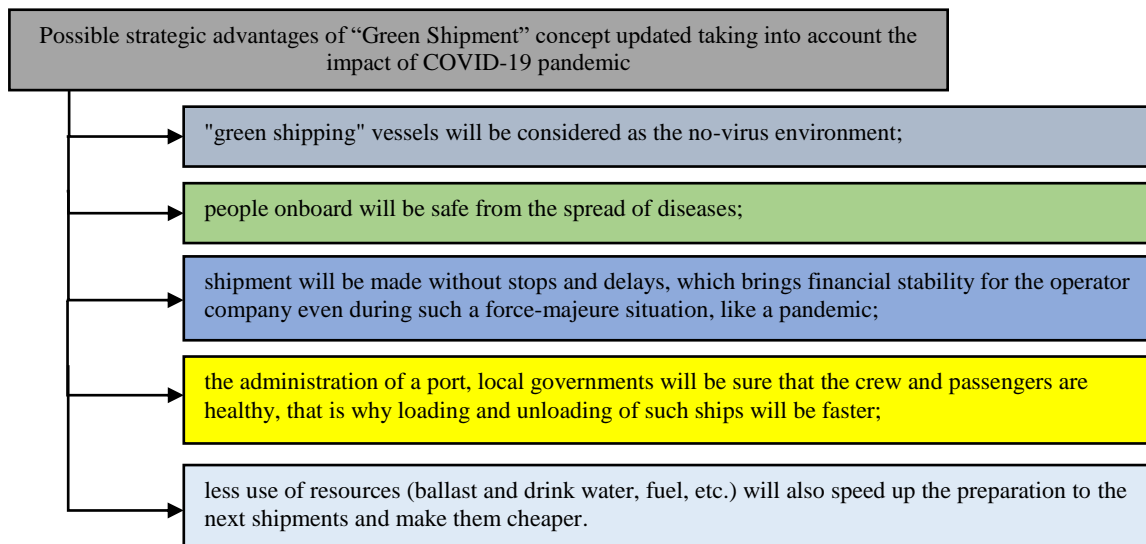


Figure 2. Advantages of the Updated Concept of "Green Shipping"

Source: developed by the authors.

Obviously, these initiatives require serious financing. That is why shipment companies along with international organizations, governments and shipbuilding companies must be ready to attract and accumulate significant investments (private, governmental, from international financial organizations) in order to ensure new norms of safety on vessels according to the updated "green shipping" concept, organize the powerful international team for doing R&D oriented to new technician conditions. Only such incentives, in our opinion, provide tangible results (Wiese & Ryan, 2003).

Thus, according to previously generated opinions, we believe that the “green shipping” concept, along with the fundamental components of sustainable development, must include another one – friendliness to humanity (Figure 3).

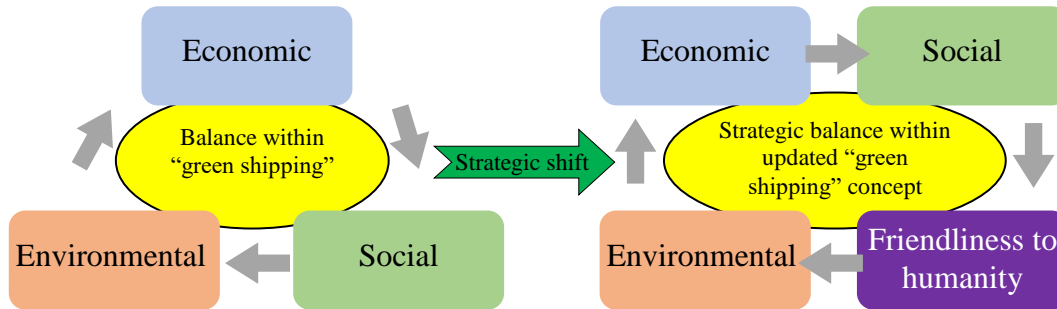


Figure 3. The author's approach to understanding the fundamental components of the updated "green shipping" concept, resulting from COVID-19 pandemic influence

Source: The authors' research, according to (Fonseca et al., 2020).
The block "Friendliness to humanity" is the authors' research.

In the opinion of the authors, given the COVID-19 pandemic influence, the 17 Sustainable Development Goals, approved in 2015 by the UN General Assembly, should also be expanded correspondingly.

4.2. The International Investments into “Green Shipment” under the Impact of COVID-19

First of all, we must research a new approach to understanding the essence of the "green shipping" concept. We believe that the renewed concept must not only be oriented on minimizing the negative effect of shipment business on the environment but also be formulated taking into account the impact of unexpected, force-majeure circumstance on the wellness of humanity (Ragusa & Crampton, 2020).

Based on this standpoint we suggest understanding the concept of "green shipping" as a fundamental model of growth and development within the shipment business that is oriented on protecting health, life and rights of humanity as well as using the resources and energy by different types of both cargo and passenger vessels connected with preventing pollution made by ships as well as reducing shipping impact on global environment (Prokopenko O. et al., 2020).

As we have already mentioned, the instruments that have been already successfully implemented in the frames of “green shipping” and which are the parts of the second block, further will be oriented on the investments to create and support an organization of the primary block.

According to our approach, the “green shipping” concept has two fundamental blocks (Table 2).

Table 2. Basic blocks of the updated concept of "green shipping"

| Block | Explanation |
|------------------------|---|
| Primary block | Protection of human rights. This means that vessels, no matter of their subordination and purpose, must be "human-friendly". Operator companies, governments, and international institutions must introduce all the necessary levers to protect the health and safety of people onboard and avoid the spreading of the biologic hazard from the board of a ship (diseases, viruses, insects, rodents etc.) to maintain the regular regime of life and protect from negative (destructive) consequences the national economy as well as national security. |
| Secondary block | Implementation of all possible instruments and technologies to reduce the burden on the environment, ecosystems, flora and fauna, to protect the right of future generations to live in the same (or better) conditions as (or than) the current generation. This block unites all previously existing approaches to understand this concept. |

Source: The authors' research.

The most important directions which require a severe accumulation of international investments to attain all goals from the primary block are as follows (ranged by the rate of importance) (see Figure 4).

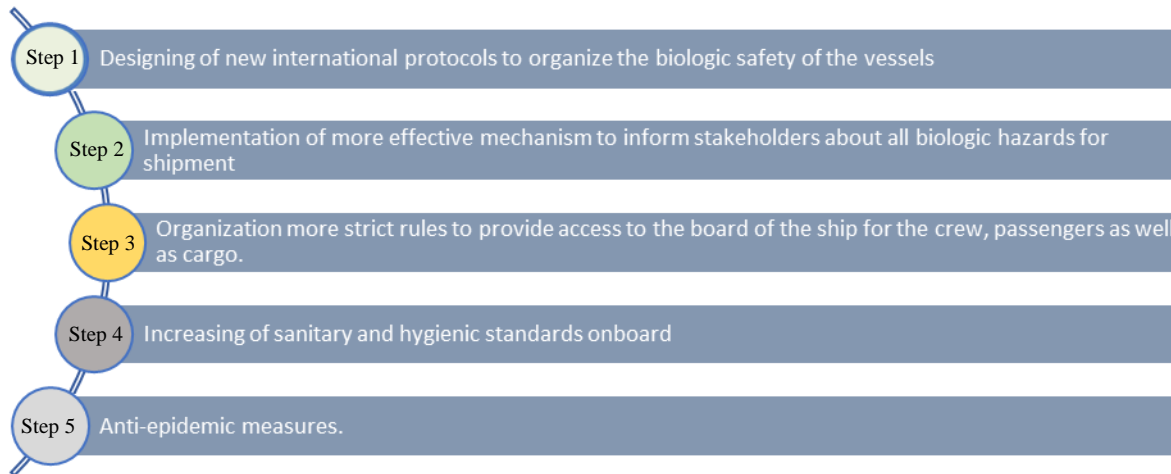


Figure 4. The Step-By-Step Mechanism to Implement the Primary Block of the Updated "Green Shipping" Concept

Source: developed by the authors.

We will describe those steps more precisely:

Step 1. Designing and implementing new international protocols to organize the biologic safety of the vessels independently of their conformation or inconsistency with classical postulates of "green shipping" concepts. Such contracts are to regulate the behaviour and interaction of all stakeholders engaged into a shipment process (from the port administration, port stevedores and loaders to vessels' crews and passengers) to provide the maximum level of their biologic safety. Another task to be solved within these protocols is a step-by-step plan to preventive diagnosing of possible biologic hazards coming from the boards of the ships as well as participants' actions if such a dangerous situation happens.

Step 2. Implementing a more effective mechanism to inform operator companies, logistic agencies and governments about all biologic hazards for shipment as well as about the choice of methods to avoid the penetration of these hazards onboard. This step means the necessity to design a global information system which will inform all kinds of stakeholders about the existing biologic dangers: within the mother country for both vessel and all crew members; within the destination country for cargo or/and passengers. All stakeholders

accredited to make shipment must obligatory be the members of this system and permanently monitor it according to the protocols reviewed in step 1. We propose to name this system the “Global Ship Information System on Biological Safety” (GSISOBS).

Step 3. Establishing stricter rules to provide access on board a ship for the crew, passengers and cargo. All people before the sea voyage must be monitored according to medical standards taking into account information from GSISOBS (step 2).

Step 4. Increasing sanitary and hygienic standards onboard (based on step 3):

- Daily express-monitoring the health status of the people on board;
- Making at least selective blood examination if the term of a sea voyage exceeds 5 days (every 5 days). The model of COVID-19 spread showed the virus incubation time of 4-5 days.
- Allocating mandatorily individual cabins with the highest level of biological protection for 2-3 patients. This must include all necessary infrastructure and tools for ship medical staff.
- Introducing a closed-cycle filtering and disinfection of ballast, technical wastewaters only using onboard equipment.
- Ensuring opportunities for primary sanitary treatment of a vessel in case pathogen is detected.

Step 5. Anti-epidemic measures. If stakeholders’ efforts have not yielded results in the previous 4 steps, the highest-level protocol should be applied, involving the local government, medical services and (if necessary) international organizations in solving the problem. Information should be instantly placed in the system GSISOBS. The tools within this protocol may include isolation, quarantine for a crew and passengers, etc.

We understand the value of financial resources necessary to implement at least few of these steps; however, it is evident that an inevitable loss of profitability due to the reduction in the useful area of ships, introduction of complex (and expensive) onboard systems for monitoring, medical examination, laboratory tests, as well as disinfection, hiring and remuneration of trained personnel, possible delays cannot be compared with economic losses due to complete stop of production, and, hence, the sea delivery of goods and passengers.

We can take the case of Deutsche Lufthansa AG as an example. According to Carsten Spohr, the CEO of this airline, company loses €1 mln each hour (German airline, 2020). Of course, the airline is not a spaceship-operator company; however, we believe that losses there are even heavier taking into account the cost of infrastructure, vessels, expenditures for their support and the quantity of people engaged as well as third-side stakeholders.

Therefore, we believe that the above steps, although complicated and expensive to carry out, in a strategic perspective can ensure the financial stability of the companies/ship operators and make the ships genuinely consistent with the concept of "green shipments" – friendly with humanity an environment. In the end, COVID-19 pandemic shows that if our forces are not directed to protect people living today, there will be no future generations and the profitability of shipment business becomes the least problem for the future.

At the same time, we believe that it is not right to fight only those threats that result or may result from "green shipping". The problem of the COVID-19 spread showed that the solutions for dealing with global threats to biological safety must be searched in a complex. Moreover, the spread of this virus has shown that there is no global system of preventive measures that could effectively counter such threats. All, even the most modern, measures of protection and confrontation (AI tool, 2020; Leichman, 2020; Meisenzahl, 2020 and others) are only reactive, that is, those that are implemented only when the problem is already real and the mechanism of its aggravation has already been launched.

The problem is further aggravated by the fact that no one knows or can say what other problems we may face in the future. This is confirmed by the rate of incidence of COVID-19, which, in reality, no one expected.

From this perspective, we propose three measures, which should be aimed at combating potential threats and creating a mechanism for the first estimation of potential threats (Table 3). As we can see, such measures' implementation is a rather costly process, but nevertheless it is extremely important, since this is the only way for scientists to receive sufficient funding to conduct research with the aim of an early detection of corporate, national, regional, and global problems. It is important to add here that projects that are realizable within the framework of these measures may be: "green shipping", "green energy", "environmentally friendly production", "alternative fuel", "socially responsible business", in a word, everything that, in one way or another, is related to any type of activity, including the safety of maritime transport.

Table 3. The System of Measures to Create a Mechanism of estimating and preventing potential national, interstate and global threats

| N. | Measure | Aims | Comment |
|----|---|--|--|
| 1. | To form interdisciplinary groups of scientists at: International organizations (the UN, WHO, IMF, World Bank, International Maritime Organization, as well as all specialized organizations); at regional associations, free trade zones, trade associations. | <ol style="list-style-type: none"> 1. to preventively estimate potential threats and risks for the global and regional economic systems; 2. to form strategies and recommendations for a effective beforehand response to these threats; 3. to distribute financial resources for scientific research between the priority sectors of science; 4. to evaluate the effectiveness of previous actions at global and regional levels. | Such groups of scientists should have at their disposal all means available to estimate potential threats: statistics, computing power, financial resources, as well as unlimited access to academic mobility. The main basis behind such a measure is a preventive nature. All their actions should be aimed at a timely estimation of threats and at designing effective mechanisms to minimize them. Such threats may include: potential distribution of diseases (threat of epidemics, pandemics); economic and financial crises; trade barriers, protectionism; protection of human rights etc. |
| 2. | To form interdisciplinary groups of scientists at transnational corporations to prevent the harmful effects of companies on people, ecosystems, the climate in general and to prevent such an impact on the company itself. | <ol style="list-style-type: none"> 1. to estimate potential threats and risks for the corporate activity; 2. to estimate the role and contribution of TNCs in deepening this threat; 3. to design tools to counter the aggravation of such threats; 4. to research perspective areas for the quality development of companies. | The corporate sector must realize that ill, unhappy, poor etc. employees cannot create additional value. Moreover ill, unhappy, poor etc. clients (consumers, customers) cannot bring economic effect or may be the source of biological hazard for the company itself. It is extremely important for the updated concept of "green shipping" – safety and economic efficiency of ports, sea terminals, and vessels. Funding for such groups of scientists should come from the company's net profit in the amounts set by groups of scientists at the international organizations and should not be abolished by the general meeting of shareholders. |
| 3. | To establish an independent interdisciplinary fund of scientific grants to finance research and development in the field of national (biological, economic, financial, environmental, social) security at the government. | <ol style="list-style-type: none"> 1. to do strategic estimate of sources of threats to the national security; 2. to ensure the ability to quickly form working groups of scientists to develop a set of measures to counter specific threats; 3. to prioritize research funding. | An independent foundation should be subordinate only to the head of the country and act only in the national interests. With the help of such a fund, operational funding (without bureaucratic barriers) can be received by those developments, the implementation of which would be too long without this fund or would not make sense in situations where the problem is already real, but the timely implementation of which should minimize or prevent the threat. Funding for such a foundation should come from the state budget and voluntary corporate investments. As business becomes more socially responsible, investing in such a fund is one of the most effective ways to deal with common problems for the whole country. |

Source: developed by the authors.

Conclusions

Summing up, it should be stated that the concept of "green shipping" is more relevant than ever. It proves that shipments are the driving forces of our progress, that without them the normal lives of ordinary people, as well as national economies and business development, are impossible. At the same time, ships can and do pose a threat to the environment, ecosystems and living organisms. Introduction of several measures (sometimes costly) can make existing and new ships more environmentally friendly, which will be useful both for the benefit of humanity, protection of the nature, and development of business itself, as the latest energy-saving technologies increase the efficiency when using resources, energy and fuel. This provides tangible savings, which is a tactical and strategic perspective guaranteeing not only shipping profitability but also financial stability for those companies that invest in such technologies regardless of the situation in the world.

The COVID-19 pandemic revealed yet another feature of the "green shipping" concept. Today, it is no longer enough just to ensure the environmental safety of ships, but also to implement appropriate measures to ensure biological security for the crew, passengers and cargo. Only the most abundant calculations based on information from open sources give reason to believe that at the time when the pathogenic organism is diagnosed in the first patient, 2.5-15% of people on board are already infected. This is a huge figure which suggests that any epidemic coming from the ship can spread very quickly in the country where passengers land or commodities are discharged.

This situation requires implementing serious measures to improve the biological protection for people on board ships and port workers. Such measures should include both developing appropriate protocols and financing specific equipment installation. Besides, the protocols should presume behaviour and relationship of the stakeholders involved in maritime trade and passenger traffic.

Such investments involve a wide range of stakeholders: ship operating companies, logistics agencies, representatives of ports, governments, as well as international organizations. Besides, this is a serious financial investment which in the operational future may lead to a specific decrease in profitability. However, such steps, in our opinion, are more acceptable than a complete shutdown of production, and therefore shipping, due to the spread of biological hazards.

The article covers the essence of the concept of "green shipping" and explains why this concept should be updated. For this purpose:

- a new understanding of the "green shipping" concept was formed;
- the connection between "green shipping" and the concept of sustainable development was substantiated, the influence of one concept on another was explained;
- the concept of "green shipping" was divided into two fundamental blocks and proposed tools, by implementing which it is possible to achieve the goals set in these blocks;
- within the framework of technological solutions, there were offered the newest means of "green shipping": introducing supercavitation systems, implementing a shipment version of car Euro standards, a partial or complete transition to electric-powered vessels;
- there was identified a new component that should enter into a single system with an economic, social, and environmental component - the element of friendliness to humanity.

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