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TYPES OF MARITIME ECONOMIC ACTIVITIES

ВИДЫ МОРСКОЙ ХОЗЯЙСТВЕННОЙ ДЕЯТЕЛЬНОСТИ

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Abstract. The author analyses the approaches to systematization of the types of economic activities which in their interconnection create an internal structure of maritime economy. The prospects of the development of humanity and the role of the World Ocean in its life have been outlined. Weighty arguments are given in favor of its increasing importance as for providing people with resources necessary for normal existence of the future generations. The opinion is given on the problems that business has to face in different fields of maritime economy, such as: extraction of resources, transport logistics, recreational sphere, creation and maintenance of material means for realization of business projects. The author also focuses on the emission and extraction nature of the companies operating in maritime economy.
Keywords: economy; World Ocean; maritime economy; types of maritime business; structure of maritime economy; problems of development.

Аннотация. Проанализированы подходы к систематизации видов хозяйственной деятельности, которые в совокупности и взаимосвязи образуют внутреннее строение экономики моря. Очерчены обозримые перспективы развития человечества и место, которое отводится в них Мировому океану. Приведены аргументы в пользу возрастания его роли в обеспечении людей ресурсами, необходимыми для нормального существования ещё нескольких поколений землян. Изложены взгляды на проблемы, с которыми вынужденно сталкивается бизнес в тех или иных областях морской хозяйственной деятельности: добыче ресурсов, транспортной логистике, рекреационной сфере, создании и поддержке материальных средств осуществления предпринимательских проектов. Акцентировано внимание на эмиссионном и экстракционном характере предприятий, работающих в экономике моря.
Ключевые слова: экономика; Мировой океан; экономика моря; виды морского бизнеса; строение экономики моря; проблемы развития.

Анотація. Проаналізовано підходи до систематизації видів господарської діяльності, які в сукупності й взаємозв'язку утворюють внутрішню будову економіки моря. Окреслено доступні для огляду перспективи розвитку людства й місце, яке посідає в них Світовий океан. Наведено аргументи на користь зростання його ролі в забезпеченні людей ресурсами, необхідними для нормального існування ще кількох поколінь землян. Викладено погляди на проблеми, з якими вимушено стикається бізнес в тих чи інших галузях морської господарської діяльності: видобутку ресурсів, транспортній логістиці, рекреаційній сфері, створенні й підтримці матеріальних засобів здійснення підприємницьких проектів. Акцентовано увагу на емісійному й екстракційному характері підприємств, що працюють в економіці моря.
Ключові слова: економіка; Світовий океан; економіка моря; різновиди морського бізнесу; будова економіки моря; проблеми розвитку.

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Problem statement. Among the results of human economic activities on the planet over the last centuries, we can generally outline a few ones that have quite far-reaching consequences. First of them is the gradual depletion of non-renewable resources (coal, oil, ores, etc.), which are crucial for maintaining at least the existing level of the material living conditions of Homo sapiens.

The second consequence is a considerable deterioration in the state of the environment, including the impact of man-made disasters, the results of which are yet to be truly unraveled — namely, explosions and radiation leakage at the Chernobyl Nuclear Power Plant and the Japanese Fokushima-1. The fire on the Deepwater Horizon platform in the Gulf of Mexico, the crash of the Prestige oil tanker and the explosion at the French chemical factory AZF, to name a few, are intimidating, but they can not be compared to the mentioned «apocalyptic grants».

What are the humanity's reflections on the resulting risks and threats? Of all their diversity, the following two are dominant:

1. Growing (though carefully hidden behind «simple curiosity») panic and consideration of the space as an alternative for the terrestrial civilization. For example, the European Space Agency has launched the interplanetary station Trace Gas Orbiter to deliver a robotic researcher on Mars; the NASA specialists plan to return to the Moon as part of preparation of an expedition to Mars; other celestial bodies of the Solar system are being checked for any signs of life. However, this prospect is obviously not for those living now, and even more so not for everyone living on the Earth in the future.

2. Rapid development of resources of the World Ocean, despite the fact that the conditions of long watches, exhausting storms, and staying away from the land are associated with discomfort for a human being. Yet, the circumstances are pushing us further from the shore and deeper under the surface. It results in the development of an independent and quite extensive area of business called maritime economy [7, 8].

Recent research and publication analysis. It should be said that this topic has been neither extensively studied nor fully ignored by researchers. Some scholars have focused on the geographical aspects of the zoning of maritime and coastal economic activities [20, 17], as well as their spatial planning [18, 10]. Other specialists have studied the environmental problems of the economic activities involving the use of natural resources [4, 24]. It seems reasonable to consider the pragmatic approach of S. Savelieva, A. Savelieva and I. Kozinsky [14]. Appealing to the realities of modern jurisprudence, they suggest allocating «water areas» on the basis of the international legal regulations which act within them. According to this classification, there are two types of maritime economic activities:

1. Maritime economic activities within the area of the state sovereignty (internal, territorial waters, the bottom under internal and territorial waters, continental shelf). Here, the coastal states are fully responsible for the regulation of mining, fishing, and marine tourism. For example, Papua New Guinea has already settled the financial issues of granting Nautilus Minerals the rights to develop polymetallic sulphide deposits near the coast of this country. The plans for the nearest future include penetration into the exclusive economic zones and territorial waters of Fiji, the Solomon Islands, New Zealand, and other countries [28].

2. Maritime economic activities in the open sea and on the seabed beyond the continental shelf, which are considered the common heritage of mankind. The resources concentrated in them are intended for use in the common interests of all countries and not just the coastal and industrialized ones. It implies fair distribution of income derived from the extraction of deep-water minerals. The International Seabed Authority (ISA) was established to ensure compliance with these rules. So far, it has granted licenses for only research with the purpose of exploration and development of the technologies for exploitation of already discovered deposits.

In our opinion, the framework will be complete if one more zone is added to those mentioned above; it is maritime economic activity under mixed legal regulation (in the exclusive economic zone). It should be mentioned that the economic and legal implications of the UN's

adoption of the Convention on the Law of the Sea have been analyzed in publication [9]. However, it seems that, for example, fishing does not change its essence depending on the legal type of the water area where the fishermen throw their trawl overboard.

THE ARTICLE AIM is to systematize the types of maritime economic activities with account for their ever-growing role. The relevance of such systematization is caused, on the one hand, by the intention to define the subject area of the corresponding scientific research and, on the other hand, by the aspiration to accurately and unequivocally present the diversity of spheres for application of the free capital owned by Ukraine's entrepreneurs and foreign investors. They will certainly get interested in the business and joint projects granting access to the last natural reserve which still has potential.

Basic material. The key to understanding the endogenous structure of maritime economy is the people's needs which make them turn to marine resources. The systematization carried out using this criterion is shown in the diagram (Fig. 1). Let us consider it in detail. The use of the mineral resources of the World Ocean (index II.1.a) is driven by the following motivation:

– they are an alternative capable of eliminating conflicts caused by sovereign rights to the land in which and under which the minerals are contained;

– countries which need them are able at least to reduce the dependence on traditional exporters of natural resources: only in Europe about 93 million tons of sand is annually extracted from the sea; this amount would be sufficient to fill the 37 largest Egyptian pyramids [29];

– ocean sources contain a large number of various metals in the volumes far exceeding their reserves available on land. For example, manganese nodules in the Clarion-Clipperton Fracture Zone (Fig. 2) of the Pacific Ocean contain about five billion tons of manganese, which is about 10 times more than that in the economically developed deposits on land [23].

To date, the International Seabed Authority has issued 12 exploration licenses in the zone. Their owners are China, the Russian Federation, France, South Korea, Japan, and the Interoceanmetal Joint Organization. The latter includes Bulgaria, Cuba, Poland, Russia, Slovakia, and the Czech Republic. Many seek to join the epochal projects, but Ukraine is not in their ranks. Back in the day, the institutes of the Academy of Sciences of the Ukrainian SSR, branch research institutes and design bureaus («Okeanmash», «Yuzhnoye»), universities (State Higher Educational Institution «National Mining University», Donetsk National Technical University, Kyiv National University of Construction and Architecture) participated in appropriate research programs.

One more fact to stimulate the use of marine resources is that the reserves of some materials on land are approaching exhaustion and, therefore, the search for their substitute in offshore zones becomes an objective necessity. One example is the rare-earth metal neodymium, which is used for producing wind generators and permanent magnets, for doping structural alloys and

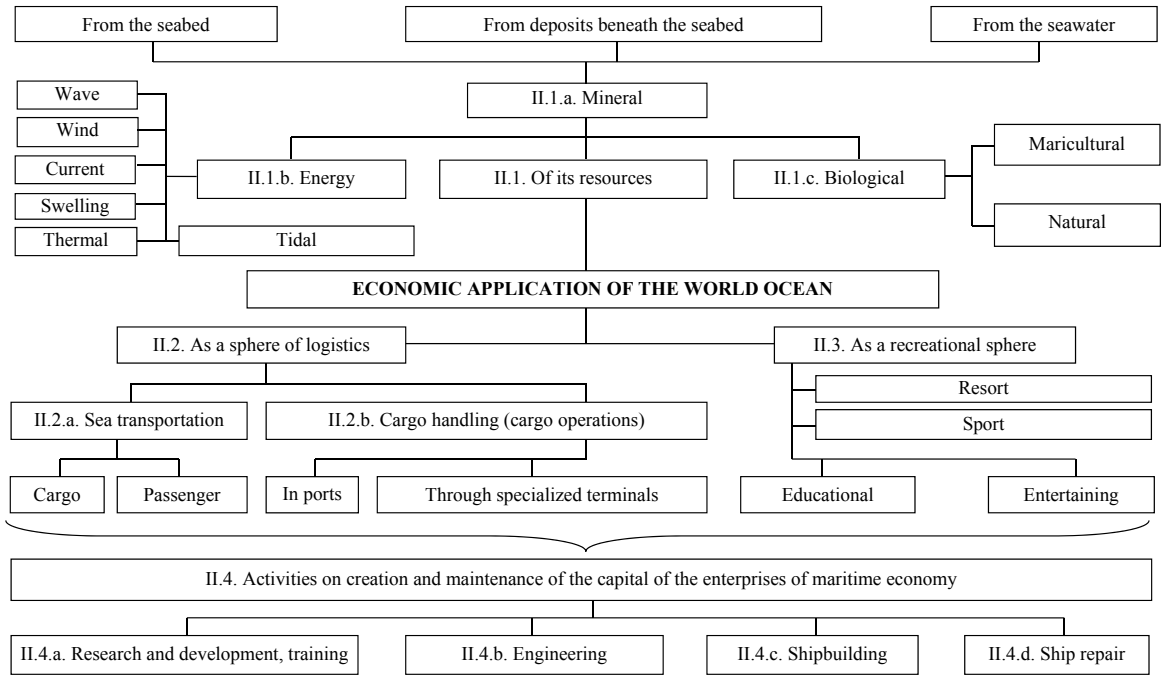

Fig. 1. The World Ocean as the sphere of application of business activities of mankind

modifying high-quality steel, as well as for producing purple glass, which among other things is widely applied in smartphones and tablets.

If we are to take into account the seabed, it is divided into continental shelf and abyssal plain. The former has been studied sufficiently and is being actively developed. The main problem here is prevention of probable entrepreneurial conflicts by the methods of administration of marine areas. One of them is the marine spatial planning, which aims at rational organization of marine areas, as well as balanced interaction of particular types of maritime economic activities.

Comprehensive marine management plans have been developed and approved by many coastal states. The examples include the Integrated Management Plan for the North Sea in the Netherlands and the Integrated Management Plan of the Marine Environment of the Barents Sea and the Sea Areas off the Lofoten Islands in Norway. Similar measures have been introduced by the USA, the UK, Canada, Australia, and China. Application of marine spatial planning in Belgium and the Netherlands was driven by the need to resolve contradictions between the enterprises investing in offshore wind parks, extraction of building materials (such as sand and gravel), arrangement of visits to historical and archaeological sites, and fishing. In Belgium, there even has been created the post of Minister for North Sea Affairs.

As for the abyssal plain, firstly, it is beyond jurisdiction of coastal states. Here dominates scientific research intended to elaborate the technological, legal and environmental aspects of access to the resources concentrated in this area.

Secondly, there are severe requirements for the devices used at great depths. For example, Germany, South Korea, Japan and other countries are intensively working on the creation of special equipment for the collection of manganese nodules. The pilot samples that have already been tested require improvement. They should withstand the high pressure characteristic of profound depths and provide reliable operation for a long time because their maintenance and all the more so repair are extremely expensive.

Thirdly, the consequences of using the present-day technologies are harmful for underwater ecosystems. After all, this is about extracting many hundreds of thousands of tons of the raw material from underneath the water column by plowing the seabed, cleaning the nodules, and transferring them to ships (Fig. 3). The world community's concern on this matter is another factor of constraining the impatient (when it comes to profit) business.

Fourthly, the practical interest in the extraction of resources of the World Ocean beyond the continental

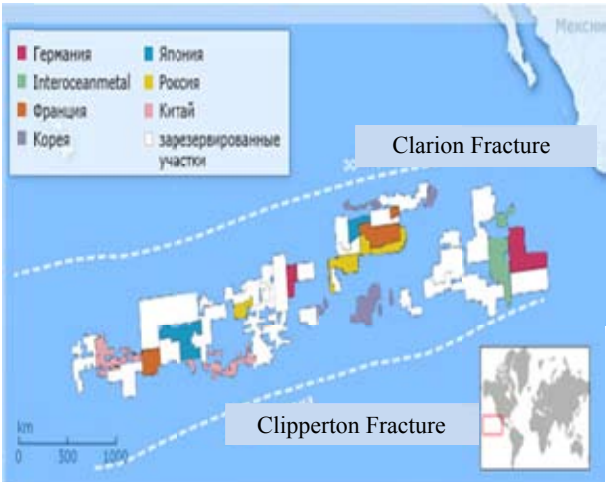

Fig. 2. Clarion-Clipperton Fracture Zone

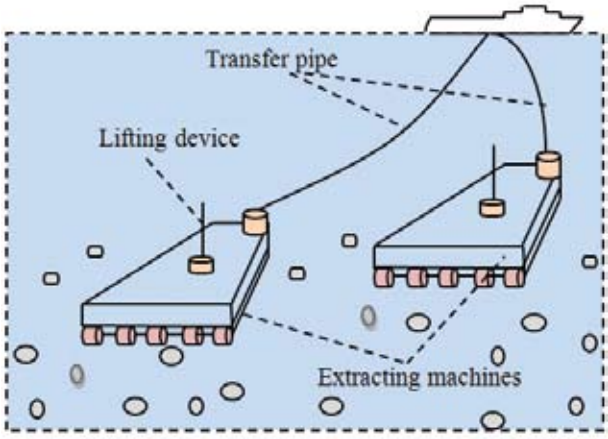

Fig. 3. Scheme of extraction of manganese nodules from the seabed [26]

shelf depends on their market prices. They are changing not only under the influence of fluctuations in supply and demand, improvement of extraction and processing technologies; they also depend on the political conjuncture. Suffice it to mention the current rampant extremism in the oil-producing countries and the tense relations between Russia and the Western world. On the one hand, the 2015–2016 decline of oil prices more than by 60% (to $46 per barrel) undermined the economies of the states which are directly dependent on oil exports (Venezuela, Nigeria). On the other hand, it questioned the feasibility of oil exploration and production by developed countries. More than 250 thousand people in the world lost their jobs in the oil and gas industry, a half of them accounts for the USA [34]. However, at the oil price of $100 per barrel, the total gross revenue from the sale of offshore oil exceeds the expenditures so much that it makes this business quite attractive.

The explanation resides in the fact that oil extraction from underneath the seabed is accompanied by enormous investments. At present, the price of a drilling rig ranges

from 25 to 180 million dollars, and that of an oil platform reaches 2 billion dollars [2]. The bandwidth is formed under the influence of a number of factors: structural features of the facility, hydrology, geology, ice conditions, and meteorology. For example, drilling one well in the Mexican or Persian Gulf costs about one million dollars, while for the Beaufort Sea or the Bering Sea the costs go up to 70–90 million dollars [16].

Fifthly, according to the data presented at the last International Economic Forum in Davos, the cost of the solar energy production had been reduced by 80% compared to 2009. Besides, the costs of wind energy have decreased by 30% over the past three years. It follows that in the coming years, the prices for fossil fuels will become equal to the prices for energy from renewable sources [32]. Traditional technologies are going to have real alternatives with the expected redistribution of capital flows.

Mankind is looking more and more closely to the unique renewable, environmentally friendly energy sources cumulated in the World Ocean (index I.b). Here are the reasons for it:

1. Frequent man-made disasters during oil and gas extraction, which are accompanied by the death of marine mammals, birds, and fish, as well as the damage to tourism business and coastal ecosystems. This was particularly the situation on the Deepwater Horizon platform (2010), when the explosion and the subsequent fire resulted in 5 million barrels of oil flowing into the Gulf of Mexico (one barrel is 158.988 liters).

2. Ability to eliminate the problems caused by depletion of some of the Earth's resources. In the world energy balance, 97% of the needs are covered by non-renewable sources. With the projected average increase rate of about 4% for annual energy consumption, the world's coal, oil and gas reserves will last for 100–150 years [11].

3. Fuel, nuclear, and thermonuclear energy transfers part of the heat to the atmosphere. Presumably, the level of this heat reaching 5% of the solar radiation arriving at the Earth will lead to irreversible changes in the heat balance and, as a consequence, in the climate.

4. World consumption of all types of energy is at the level of 10 billion tons of fuel equivalent per year. The mankind can get up to 200 billion tons of fuel equivalent from the energy accumulated in the ocean over the same period, thus resolving one of the most urgent present-day problems. Recap: fuel equivalent is the indicator used for comparing the effectiveness of the organic fuel varieties and their total accounting. One kilogram of fuel with the calorific value of 7000 kcal is taken as a unit of fuel equivalent. The relationship between fuel equivalent and natural fuel is calculated with the help of the following formula:

$$M_E = Q_L : 7000 \times M_N,$$

where M_E is the mass of the appropriate quantity of fuel equivalent, kg; M_N is the mass of natural fuel, kg (for solid and liquid fuel) or m^3 (for gaseous fuel); Q_L is the lowest calorific value of the specified natural fuel, kcal/kg or kcal/m^3.

However, a number of constraints are to be overcome on the way to this goal, in particular:

– low energy concentration in water masses, which necessitates construction of cumbersome facilities and processing of huge volumes of water in order to obtain the necessary amount of heat and electricity;

– technological complexity of the transfer of the generated energy to the shore;

– instability of the oceanic environment, which causes an uneven (or even accidental) nature of the energy release and fluctuations in the intensity of its formation (i. e. waves);

– significant capital intensity of the construction of hydraulic facilities and yet to be clarified consequences of their influence on the environment. In this context, it is important to predict and prevent the irreversible changes in the environment due to the conversion of natural energy into the required form.

The World Ocean is also a source of natural and artificially grown marine industrial organisms and algae (index I.c). The latter is referred to as mariculture, which is an important part of the food industry in many countries (Canada, Norway, the USA, and Chile). It is noteworthy that more than 99% of all the Atlantic salmon (which is more than 60% of the total population of this species) live in marine gardens [12], being a priority in many areas and for many enterprises. For example, Japan has developed and is already implementing the expansion program for marine farms with an average capacity of 8–9 million tons. It is supposed to satisfy a half of the population's demand for fish and seafood.

As for Ukraine, virtually its entire Black Sea coast and the water area of the Azov Sea is a favorable space for breeding oysters, rapans, and mussels. By the way, they are also a means of biological cleaning of seawater. Within 1 m^3 of the so-called «mussel bed», the mollusks filter 50-90 m^3 of water in 24 hours. At that, the number of pathogenic bacteria in it is reduced by half. This peculiarity may well offer the prospects of creating a new medicine against intestinal infections which would be more effective than the antibiotics available now.

In this context, we cannot but rejoice over renewal of the seafood production on the basis of the former Yagorlytsky experimental and industrial mussel-oyster farm (the village of Pokrovka located on the Kinburn Spit in the Ochakovo district of the Mykolaiv region).

It is suggested to extend it to the mussel fields of the Dzharylgach and Karkinitsky Gulfs of the Black Sea (Skadovsky district in the Kherson region). The project includes restoration of the Ochakiv mussel-oyster plant, once known for its products to the entire former Soviet Union.

At the same time, it is impossible to ignore the requirement to closely follow the proper technology of growing fish and seafood. Alas, the real practice frequently involves using polluted water bodies for these purposes, exceeding the number of living organisms in one cage (which entails their diseases), using excessive portions of antibiotics and pesticides to treat parasites, as well as growth hormone accelerators.

In order to increase the effectiveness of catching biological resources in the natural environment, it is necessary to undertake the following steps:

– studying biota, which is the population of living organisms of the World Ocean, in order to identify hitherto unknown objects of fishing;

– opening new areas for fishing, improving vessels and fishing gear;

– fulfilling the condition of sustainable development of the relevant business, according to which the volume of living organisms caught during a given period (O_t^C) should be less than the volume of their natural reproduction (O_t^{RE}):

$$O_t^C < O_t^{RE}.$$

The World Ocean is also a logistic sphere (index II.2). First, there is a rapid increase in the volume of transportation (code II.2.a). The United Nations Development and Trade Commission (UNCTAD) states that sea vessels transport almost 90% of the world's goods [33]. This is illustrated by statistics as well (Table 1).

The results of the analysis of the above information indicate that since 1980 the volume of transportation has increased worldwide by 301.0% due to the use of 89,464 vessels [31], whose total deadweight was 1,745.9 million tons as of 2015 [36]. The reactive increase of container shipping is quite noteworthy. It has grown by 16 times since 1980 and is regarded as the greatest transport revolution of the last century. This observation seems adequate, since container shipping has reduced transportation costs significantly due to the acceleration of loading and unloading, reduction of the number of dock workers, and improvement of the technologies in all sections of the supply chain.

This phenomenon can be explained in the following way:

1. The price of marine transportation is much lower than that for any other means of transport. This is especially true for the so-called bulk cargo transported over long distances. Perhaps, the only exception is pipelines, but their product specialization is limited for obvious reasons (and they can also be laid along the seabed). The calculations in [3] indicate that the marine transportation component of the price of goods is very small: 2% for television sets, no more than 1% for a kilogram of coffee, etc. This is caused by the following factors:

–the effect of the scale: the more cargo is loaded on board, the cheaper is the delivery of a unit of cargo;

–the ship owners' benefit from the introduction of innovations in industrial countries (design methods, economic feasibility of the ship equipment, ship construction and management automation), as well as relatively low construction costs and wages of crew members originating from developing countries;

–extending differentiation in the purpose of the vessels under construction, which accelerates cargo handling.

2. In a number of cases, ships are the only means of transcontinental transportation of thousands of tons of cargo. The cargo component should be empathized, since aviation ranks the first in passenger transportation between continents. Water transport is now used only for short routes in the coastal waters, and also in the Baltic, Northern, Mediterranean, Black and Azov Seas (if considering Europe).

3. According to the forecasts of specialists [27], by 2025 the number of participants in sea cruises will have increased up to 36.4 million people (by 12.4 million more than in 2015). This segment of the tourism market is developing rapidly like no other.

Transportation of goods is preceded by their handling in ports (index II.2.b).

Table 1. International maritime transportation, million tons (loaded) [21, p. 6]

Year	Oil and gas	Bulk cargo*	Loose cargo	Containers	Total
1980	1871	608	1225	102	3806
2000	2163	1295	2526	598	6682
2005	2422	1709	2978	969	8078
2010	2772	2335	3302	1280	9689
2014	2826	3112	3903	1631	11455

* *Note:* iron ore, grain, coal, bauxite, alumina, phosphorites

Taking into account the existing restrictions, let us list only the operations performed there:

– cargo measurement, weighing and assembly, marking, sorting, packing;

– bringing the cargo to the condition necessary for subsequent transportation, its technological accumulation (for example, to the size of a shipload);

– consolidation and formation of packages;

– cleaning of ship holds after unloading;

– loading and unloading of goods, their fastening, stowing (placement of cargo in the ship hold for the rational use of free space), tying, moving;

– opening of the cargo packages for quality inspection, grading of the content, bringing it to a transportable condition;

– subgrouping of the cargo imported at different times for the formation of ship parties by countries, ports of destination, as well as individual parties;

– assembly and disassembly of special devices used for loading (unloading) production equipment and transport vehicles from railway platforms;

– registration of transportation documents.

It should be noted that Ukraine has the greatest port potential in the Black Sea-Azov basin with its 30 full-scale ports and port stations. The total length of berthage exceeds 30.8 km. Its operation, as well as that of adjacent enterprises, is provided by about 600 port cranes, thousands of loaders of various types and purposes and other vehicles. More than 313 thousand m^2 of covered warehouses and over 2.2 million m^2 of open areas are at the dock workers' disposal [10]. Meanwhile, its mobilization is hampered, particularly by the following factors:

– numerous port charges, such as administrative, channel, ship, lighthouse, berthing, sanitary, mooring and anchorage charges; their total number is about 20, and they negatively affect the cost of ship calls, making them uncompetitive;

– non-transparent tender procedures, including those for dredging, modernization and construction of berths;

– insufficient level of transport infrastructure, which reduces the overall effectiveness of logistic chains;

– the volume of the ship loads limited by the actual depth of the ports.

Oceans and seas also have a great recreational potential (index III), recreation being the refreshment of health or spirits by relaxation and enjoyment. The following components of this potential deserve particular attention:

1. Sports and health component. In turn, it is divided into the water and underwater subsystems; each of them has its own internal structure. For example, underwater recreation consists of fishing, educational and archaeological recreation.

2. Resort (medical component). It is based on the mobilization of favorable balneological factors (sea water, air, mineral waters, medicinal muds) to fix one's health issues and recover one's vitality.

3. Educational component, which can be considered separately, but mostly supplements the above types of recreation. It suggests organization of tours to architectural sites, historical and cultural attractions (including those located in the coastal regions on land), acquaintance with local ethnographic features, unique natural phenomena, excavations of ancient civilizations.

4. Entertaining component. It is associated with beach services well-known to many: equipment for a comfortable stay on the beach, catering, water rides and playgrounds, paragliders, flyboards. This component supplements each of the types of recreation mentioned earlier.

The recreational activity has the medical function, the sociocultural function, and the function of economic development, all of which are interrelated. The success of the latter is represented by numerous examples of Bulgaria, Egypt, Thailand, Turkey, etc. Each year these countries increase the volume of tourist flows and improve the material base of the recreation organized there.

Despite being quite attractive, the recreational business can adversely affect coastal ecosystems. There are several reasons for that, and the first one is the abnormal concentration of people in the recreation sites. This is why the following condition must be satisfied:

$$K_{hol.cz}^{\max} + K_{st.cz}^{\max} \le E_{cz}.$$

It means that the number of holidaymakers in the coastal zone ($K_{hol.cz}^{\max}$) together with the staff of that zone ($K_{st.cz}^{\max}$) during the peak of the holiday season should not exceed the adequate capacity of the coastal zone (E_{cz}).

Secondly, investors tend to violate the requirements for the location of medical, tourist and infrastructure facilities (incl. transport, sanitation, and waste management). As a result, the stability of the sea shores is decreasing, the quality of coastal waters is deteriorating (among other things, due to their bacterial pollution), and beaches are disappearing. Here are the measures necessary to eliminate these issues:

–to comply with the environmental legislation and building codes when constructing health resorts;

–to use spatial planning methods for the development of resort infrastructure and level it up with other types of maritime economic activities;

–to expand and renovate sewage treatment facilities in coastal cities, to repair deep-water sewage discharge points and bring their depth to the normative level;

–to build environmentally friendly recycling terminals in large recreational centers.

Another type of maritime economic activities deals with formation and maintenance of the material supplies for maritime economy (index IV). This refers to shipbuilding and ship repair. Their significance is caused by the fact that ever since the end of the last century, maritime economy has been developing at a rate exceeding that of the world economy as a whole [5]. Not surprisingly, it requires technical facilities with the following features:

– capable of solving new (in terms of volume and complexity) tasks related to the development of the World Ocean;

– having the minimum harmful impact on the environment or even having none; it is stipulated by the EU strategy on providing leadership in shipbuilding, which outlines the main priorities of the member countries and business entities within their territories: innovation, orientation to high-technology markets, elimination of air and water emissions [25];

– having the maximum available operational economic efficiency.

By the end of 2014, the shipyards of China, South Korea, Japan, the European Union and other shipbuilding giants had ordered 5,000 ships with a total deadweight of 308 million tons and a contract value of $305 billion [6]. The dynamics of their number (by individual types) is presented in Table 2.

As we can see, during the period under consideration, the number of vessels has increased by 39%, their deadweight – by 94.3 %. The subsequent agenda includes compensation of natural loss caused by dismantlement. In 2014, 1026 «veterans of the fleet» were subject to it [15].

Ship repair is becoming increasingly popular. There may be the following explanations for this fact:

– the increase in the world fleet illustrated above, which suggests an obvious pattern: the more ships are built, the more ships need to be repaired;

– engineering facilities developed recently are extremely complex, equipped with a lot of electronic devices and systems besides the mechanical ones; a properly planned and highly professional service is required for all of them to function properly and provide the safety of passengers, crew, and cargo;

– despite the aspiration to reduce the construction costs, new ships remain extremely expensive, which encourages ship owners to look for acceptable strategies for extending their life cycle;

– the high demand favorably affects the prices of the corresponding works, and shipyards openly show their interest in orders, which is proved by the data shown in Fig. 4. In comparison with 2009, by 2014 the demand for ship repair had increased by 60 % (that for shipbuilding – by 12 %). The year of 2017 is expected to bring an increase of 110 % [19].

One cannot ignore the indisputable fact that repair often results in the change of individual technical characteristics, the shape of the hull and superstructures, and even designation of ships. A new main or auxiliary engine(s) can be installed, interior finishing can be re-planned or changed, and services can be equipped with additional functional devices. Surely, such works require meticulous elaboration of design projects. Here resides the economic reason for the growth of market demand for another type of maritime business — engineering. Like all of the above, it is indeed unthinkable without research and training of competent personnel.

It should be noted that, depending on the nature of access to resources, the activities constituting maritime economy are positioned as follows:

– extraction activities involve withdrawing marine resources from the natural environment, voluntarily or involuntarily depleting it (i.e. extraction of minerals, fishing);

Table 2. Characteristics of the world merchant fleet [22, 35]

Type	Quantity			Deadweight, thousand tons		
	2005	2013	2014	2005	2013	2014
General cargo ships	15869	16201	16218	51081	57739	58209
Specialized cargo ships	192	263	267	1398	3602	3858
Container ships	2996	4894	5084	82843	184927	206128
Ro-Ro boats	1384	1455	1482	29804	45181	47333
Bulk carriers	6321	10357	10996	176756	383987	409915
Oil and chemical tankers	9130	11996	12363	179916	286821	296896
Gas carriers	1080	1617	1703	25199	51966	56654
Other tankers	350	764	851	785	1348	1606
Passenger ships	5771	6463	6612	26465	35416	36547
Offshore ships	3692	7440	8030	15097	29604	34685
Serving ships	3723	4613	4795	8229	9155	9947
Tugs	10061	15521	16693	2752	4370	4681
Total	61227	81584	85094	600325	1094026	1166459

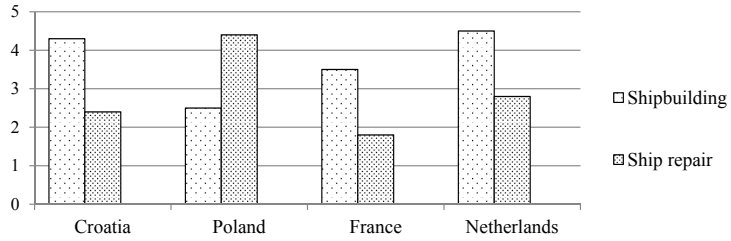

Fig. 4. Share of ship repair in some of European countries [19]

– emission activities employ the marine areas to fulfill their purpose (recreation, marine transport, port facilities, shipbuilding, hydrotechnical and coastal building construction) and release various foreign substances (including contaminants) in the environment;

– innovative activities deal with protection of resources and protection of the marine environment.

Let us conclude with the structure of income generated by the economic activities in the World Ocean (Table 3).

Table 3. Structure of income generated by development of the World Ocean

Type of economic activities	Share, %
Oil and gas extraction from the sea shelf	35–40
Marine trade shipping	30–35
Marine fishing	10
Other economic activities: extraction of solid minerals from underneath the seabed, fish and seafood processing on floating platforms, marine chemistry, energy production by means of unconventional methods, seawater desalination, passenger transportation, etc.	25–15

The lion's share (more than 75%) accounts for the leading countries, such as the US, Japan, the UK, France, Germany, Canada, and recently – China. Other countries lack financial resources and professional competence.

CONCLUSIONS. 1. From the standpoint of a systems approach, marine economy is represented by closely interconnected types of economic activities that cannot be considered in isolation. For decades, governments of developed countries have implemented an integrated approach to them. In this way, it is possible not only to avoid conflicts among entrepreneurs, but also, and most importantly, to develop marine business on a sustainable basis. The accumulated experience is of great value and worth to be followed.

2. It is unnecessary to waste efforts on campaigning and propaganda. As shown by vast evidence, the slightest delay in participation in the unfolding competition for access to the resources of the World Ocean dooms outsiders to an unenviable future. For this reason, the scientific community has to launch an urgent, productive discussion in order to analyze the current state of affairs. Meanwhile, the civil society should make politicians pay attention that the following steps need to be taken:

– outlining the position of the state in this sphere, which can start with an open dialogue on the development of the concept of a new edition of the Naval Doctrine, saving the future document from verbiage and pretentiousness;

– creating the necessary conditions for intensification of the business activity in the areas of maritime economy that are available to Ukraine, at least eliminating the obstacles systematized in this publication;

– developing a strategy for increasing the state's presence in the World Ocean, including mutually beneficial cooperation with partner states and companies.

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