THE FUTURE OF BLUE ECONOMY: LESSONS FOR EUROPEAN UNION

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***Abstract**:* Advancing global economic integration through the oceans, an interplay of economic, social, climatologic and technical forces are bringing the oceans to the forefront of resource development and business activity. With oceans covering over 70 percent of the Earth's surface, the future of the ocean space is increasingly being shaped by the interaction of numerous and powerful forces, most important of them being human activities. Over next 20 years, increasing uncertainty will be generated by the confluence of rapid social, cultural, technological and geopolitical changes. The rapid global increase in the production outputs of industry, agriculture and fisheries, as well as rising levels of consumption of marine products and the demand for coastal space worldwide is exerting increasing environmental pressure on the ocean. There is a need to identify more effective means to reduce the environmental impacts generated by the economic growth and its by-products. Sustainable approaches meet the needs of present without compromising the ability of future generations to satisfy their own needs. The Blue Economy concept is about the commercial development of oceans in a sustainable way. Poland's future economic security is linked with country's presence in the world ocean and successful membership in international bodies such as European Union, NATO and various United Nations maritime organizations. These factors will also determine Poland's place and its role in the global ocean economy.

***Key words**:* Oceans, Blue Economy, sustainability, marine resources, European Union, ocean uses, marine policy.

1 Introductory remarks

It is a new lens for thinking about ocean industries that are more connected to each other than they seem now but also that sustainability needs to be a filter for every use of the ocean from tourism and marine recreation to resource mining and aquaculture. Ocean-related business opportunities are far ranging and significant. They are related to transportation, production of seafood, ocean energy, extraction of minerals, biotechnology, human settlements, tourism and recreation and ocean exploration. The Blue Economy industry is now emerging, in a way that is analogous to the evolution of the "outer space industry" that developed over the past 50 years.

New opportunities created by globalisation and increasing role of oceans in economies of many maritime nations are calling for a new effort by the European Union to promote research, investment, and other business activities that could generate new opportunities and benefits for the member-states.

Poland is the country with sizable maritime traditions and achievements ranging from training of skilled marine specialists, through shipbuilding, fisheries, marine tourism to marine transportation and ocean exploration. By joining most advanced maritime nations of the world and the European Union, Poland could create a long-term conditions for increasing involvement in the ocean economic activities. They could generate additional supplies of energy, seafood, ocean minerals and open new opportunities created by the international sea trade.

The future use and benefits that world oceans offer to individual countries is dependent on the investments in infrastructures, preparation of specialists and commitment of each society to tie up its future with the healthy ocean environment. A broad range of ocean uses can be mapped into a small set of ocean resources. These resources include ocean space important for transportation of goods and people, living resources and their habitats, sea bottom minerals and energy. Many countries pursue the goal to occupy a ranking position in the process of integration with the world marine economy.

When valuing achievements resulting from human interactions with the oceans during the last century, we are looking with increased confidence and interest on possibilities that are opening for us by quickly pro-

gressing economic interdependence that oceans promote in a global context. From the European Union's perspective these tendencies create a need of increased attention toward the principles of sustainability and mobilization of collaborative actions of the Union's maritime and land-locked nations.

These principles call for harmonious use of marine resources including development of shipping, production of off-shore energy, extraction of minerals, coastal and distant – water fisheries, mariculture and the marine tourism[1].

By entering on the sustainable path of ocean development we could strengthen the long-term links of the national economy with the marine and coastal environment bringing us closer to the vast resources of the World Ocean. Such orientation would also have a strong impact on the future marine policy of European Union and its member-countries.

The concept of environmentally friendly use of the ocean resources allows to evaluate how new technologies and models of the commercial activity can meet environmental and economic conditions of the sustainable use of the ocean resources[2].

This approach helps to meet obligations and gain benefits by European countries that are resulting from increasing technological potential, membership in European Union and their growing responsibilities as members of international organizations dealing with the use and management of the ocean space.

This paper has two major objectives:

- First, is to demonstrate that the sustainable approach to the ocean uses is an imperative that could assure long-term benefits for the world community that ocean can generate with their vast resources.
- The second objective is to show that the modern ocean technology is opening new frontiers that could generate significant benefits for those who are willing to undertake an effort to apply these achievements in the ocean resource use.

On this background it might become evident that concerted effort and harmonized initiatives by countries interested to take advantage of these opportunities are prerequisites of the successful and sustainable development of the ocean resources. This approach is addressed as the third objective of the study.

2 New ocean opportunities and challenges

In order to better understand the role of oceans in the future of European Union we must consider increasing convergence of environmental, economic, social, and technical factors that are bringing greater opportunities that are offered by the world's oceans: in transportation, food production, energy, mineral extraction, biotechnology, human settlement in the coastal zones, tourism and recreation, and the scientific research.

A closer look at these factors allows us to distinguish a number of opportunities that ocean resources create for the benefit of the global economy. These include:

2.1 Development of bioscience

The XX century was defined by scientific advances in physics and electronics. Advances in biology and life sciences will define the XXI century. Synthetic biology will help us create new microorganisms to accomplish specific tasks, such as cleaning toxic waste, producing bio-fuels, and healing our bodies. In the world of biology, genetic data is like gold, and the oceans contain the vast bulk of the earth's genetic diversity.

Biotechnology pioneer J. Craig Venter has conducted the most comprehensive survey of marine genetics to date[3]. His and similar works represent first steps toward understanding and economically exploiting the genetic treasury of the sea.

[1] Third International Symposium on "Core Agenda for International Expo 2012 Yeosu", Island. International Expo in 2012 - "The Living Oceans and Coasts: Diversity of Resources and Sustainable Activities." November 19, 2009, Jeju. Korean Ministry of Land, Transport and Maritime Affairs, Presidential Committee on Green Growth, the Organizing Committee for EXPO 2012 Yeosu, Korea, Jeju Special Self-Governing Province, and Jeju National University.

[2] Joroff M. - *The Blue Economy: Sustainable industrialization of the oceans. Proceedings* [at] International Symposium on Blue Economy Initiative for Green Growth, May 7th, Massachusetts Institute of Technology and Korean Maritime Institute, Seoul, Korea 2009, pp.173 -181.

[3] Shreeve J. - *Craig Venter's Epic Voyage to Redefine the Origin of the Species.* August 2004, http://www.wired.com/wired/archive/12.08/venter.html

2.2 New sources of protein

Human activity is often blamed as a main contributor to the global environmental change. However, if that activity disappeared tomorrow, agricultural production would continue to warm the planet. Simply put, protein production through meat is highly inefficient; in fact, an estimated 800 million people could survive on the grains fed to livestock in the Unites States alone[4]. Rising demands for animal protein in developing economies, and the need to reduce carbon emissions are now on a collision course. One way to avoid this conflict is to develop new sources of protein from the most efficient means known today - fish farming - which is forecasted to overtake global beef production by the first decade of the XXI century[5].

2.3 Transition from fossil fuel to renewable energy

Growing energy demand and declining reserves of oil and natural gas will force a massive transition to renewable energy sources in the coming decades. As a vast reserve of kinetic and thermal energy, the world's oceans represent a huge untapped source of the wind, thermal, kinetic and other forms of the renewable energy.

2.4 Mineral wealth

The oceans contain vast quantities of vital minerals. However, direct extraction of resources is limited today to salt, magnesium, placer gold, tin, titanium, diamonds, and fresh water. However, mineral extraction in marine areas is expected to begin long before land deposits become exhausted because of issues surrounding land-use priorities, clean water requirements, and environmental considerations.

Figure 1. Major concentrations of manganese nodules in the World oceans
(source: NOAA, 2006)

Technology to extract these minerals economically is being developed, and policies for ocean mining will need to be considered[6].

Constraints on those extractions are nearly always economic, but are also affected by ownership, transportation distances, and technological challenges (e.g., the depth of ocean basins). Increasing human populations and the exhaustion of economically accessible terrestrial deposits, however, will undoubtedly lead to increased extraction from the bottom of world's oceans.

At depths between 4,000 m and 6,000 meters developing mining and processing technologies are needed to recover the desired minerals from the nodules - nickel, copper, cobalt, and manganese - but these require large investments.

One enterprise is now in an advanced stage of preparatory work for extracting hydrothermal minerals from the deep trenches of the Red Sea. Despite the rather dismal mineral market conditions, we will become more dependent on the oceans as a mineral resource reservoir in the future.

[4] Pimentel D. - *US could feed 800 million people with grain that livestock eat*. College of Agriculture and Life Sciences, Cornell University, Cornell News Service, Press Release, August 7, 1997,
http://www.news.cornell.edu/releases/aug97/livestock.hrs.html

[5] Brown L.R. - *Fish Farming May Soon Overtake Cattle Ranching As a Food Source, Plan B Updates*. Earth Policy Institute, Washington, D.C. October 03 2000,
http://www earthpolicy.org/Alerts/Alert9.htm

[6] *MMS Minerals Management Service, Ocean Energy and Minerals: Resources For The Future*. Year of the Ocean 1998, Washington, D.C., 1999,
http://www.yoto98.noaa.gov/yoto/meeting/energy_316.html

Figure 2. Major concentrations of manganese nodules in the World oceans
(source: NOAA, 2006)

2.5 Factors affecting the future of marine transportation

Decade on decade, seaborne trade has continued to grow and, with the world's population predicted to continue to raise, the demand for shipping can only increase.

The reality is that, in good times and bad, in today's global economy, hundreds of millions of people all over the world rely on ships to transport the great multitude of commodities, fuel, foodstuffs, goods and products on which we all depend[7]. Inevitably, there has been considerable focus on piracy, which, apart from being a threat to trade, has a direct, significant and very personal impact on the seafarers involved. It is a source of great concern, and a genuine anathema in the 21st century that the threat of piracy and armed robbery against international shipping is as pernicious today as at any time in history.

Marine transportation, international sea trade and globalization will follow the economic development that results from increased consumption of products and services mainly in industrialized countries' markets. The future of marine transportation will be affected by economic crisis but also by safety of communication lines free of terrorist and piracy challenges.

Demographic changes and shifts in valuing different commodities, services and consumption methods as a result of dematerialization of the social culture. The demand for transportation services will generate new environmental threats that must be removed by ship owners and international organizations along the lines set by the sustainable, "Blue" economy[8].

2.6 Coastal urbanization

Nearly 40 percent of cities larger than 500,000 are located on the coast[9]. Coastal cities deplete nearby areas of water, beaches, dunes, fish resources and mangrove forests, rendering them less capable of supporting land areas and rural populations thus adding to the pressures for urban migration.

Burgeoning cities are expanding into fragile ecosystems. Air pollution already exceeds health standards in many mega cities in developing countries. Sewage and industrial effluents are released into waterways with minimal or no treatment, threatening human health and aquatic life. Some urban environmental problems such as access to safe drinking water improve with economic growth, while others tend to worsen.

[7] Mitropoulos E.E. - *The future of shipping: contemporary challenges*. Special Lecture, International Maritime Organization, London, October 15, 2010.

[8] Corbett J.J., Winebrake J. - *The Impacts of Globalization on International Maritime Transport Activity: Past Trends and Future Perspectives*. OECD/ITF Global Forum on Transport and Environment, Guadalajara, Mexico, November 10-12, 2008.

[9] *The State of African Cities 2008, A framework for addressing urban challenges in Africa*. UN Habitat Program, United Nations Human Settlements Programme, Nairobi, Kenia 2008.

Thus in the absence of policy reform, stronger institutions, and enlightened political leadership, economic and population growth in developing countries in the near term may lead to a deterioration of the urban environment, both physical and social. Stresses on the global environment from urban activities are also likely to accelerate. Rural areas throughout the developing world are being depopulated as people flock to prosperous coastal cities. These urban centers contribute to deterioration of the coastal ecosystems by landscape modification and pollution.

2.7 Expanding marine tourism and recreation

Marine tourism is the most dynamic area of human activities on the oceans and it is developing quickly during more than last 25 years. The newest tendency is the cruising tourism that is now entering into its sustainable phase of development. In 2008 contribution of the cruise industry to the American economy was US$ 40 bln.

Approximately 9 million passengers boarded cruise ships in the US ports. This is about 70% of the tourism-related boarding's in the world[10].

3 The Twenty-First Century Response

3.1 Sustainable approach to the ocean development

Many enterprises and governments understand that healthy oceans lead to greater productivity, higher quality, and sustainable long-term growth. This understanding stands in contrast to the ways in which companies and governments have treated oceans in the past. Instead of seeing oceans as teeming wildernesses to be exploited, the sustainable marine economy takes a 'systems' approach: it views oceans as fertile gardens that must be carefully managed from one generation to the next. It considers the down-stream impacts of economic exploitation - both positive and negative - on the total system[11].

Several factors shape this view:

- the spillover of 'green' values and business practices from land-based economies,
- scientific understanding of the fragility of the ocean ecosystems and the great value ocean ecosystems provide, and
- new tools for managing common resources, examples include regulation of marine protected areas and transferable fishing quotas.

The sustainable development approach is firmly rooted in the ecological health and resilience of marine ecosystems. Unlike conventional green strategies that seek to minimize or mitigate the negative impacts of industries on air, land, and water, new strategies aim for more; they aim to leave the environment better than they found it through cleaner effluent streams, increased biodiversity, better scientific data, etc. This "better than neutral" approach will be a challenge for existing firms in that it sets a new, high level standard of performance.

Ecological economics will be a vital tool in moving ocean industries towards new standards of sustainability. This cross-disciplinary field is developing models and measurements for valuing the services that ecosystems provide, and provides a framework for defining what is and is not a profitable business.

Ecological economics builds the cost of environmental degradation into its markets. As more of these external costs are internalized as firm costs, Blue companies will be more economically viable.

3.2 New opportunities and challenges

What are we likely to see as ocean space industry develops? Early evidence points to new physical structures, a new age of oceanography, a gradual influx of profit-seeking enterprises, and an attempt to develop shared responsibility for the stewardship of ocean resources.

[10] *The Contribution of the North American Cruise Industry to the U.S. Economy in 2008*. Prepared for: Cruise Lines International Association by Business Research & Economic Advisors, June 2009.

[11] There are many examples of negative impacts human activities hale on the natural environment. For example, pollution of the marine waters, chemical threats caused by the aquaculture, or agricultural pollution brought to the sea by rivers from fields enriched with artificial fertilizers used on produce corn needed to produce ethanol. These contaminants are introduced to the environment thousands of miles away in the hinterland but in the final analysis they reach the rivers and are brought to the seas causing massive destruction of marine fauna and flora.

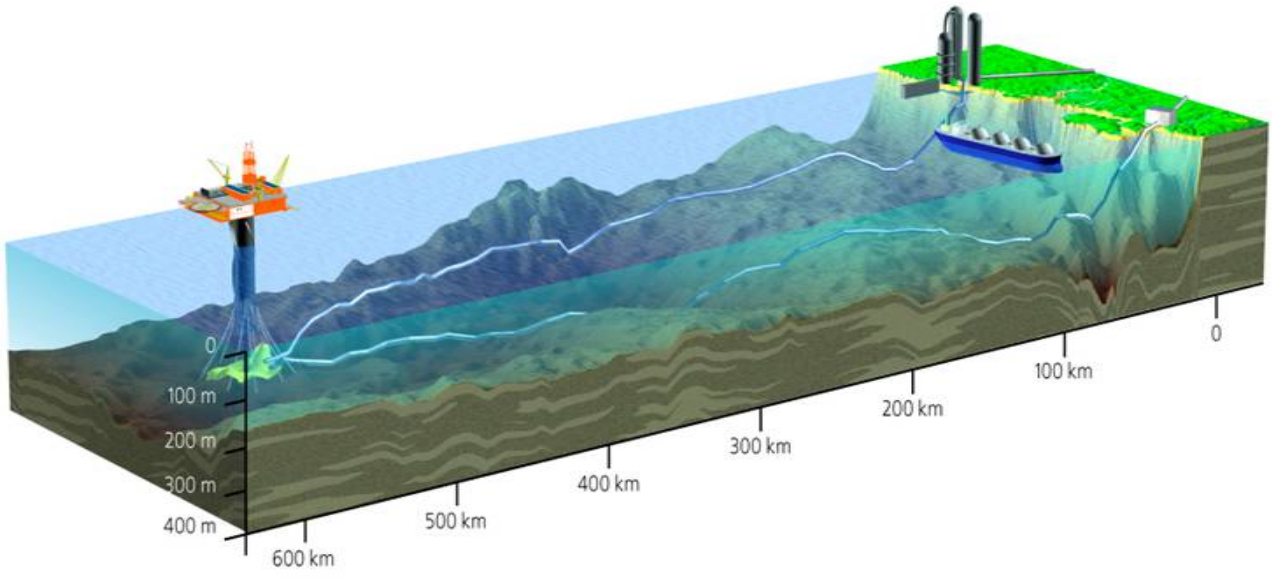

Figure 3. Investment plans to exctract gas from the bottom of the Shtockman Field (Russian Arctic) by French TOTAL and Norwegian Stat-Oil companies
(source: Moe A. [8])

A convergence of environmental, economic, social, and technical factors is bringing greater attention to the opportunities available in the world's oceans: in transportation, food production, energy, mineral extraction, biotechnology, human settlement in the coastal zones, tourism and recreation, and scientific research.

3.3 Emergence of an ocean space industry

The intersection of the macro global trends (energy transition, the search for new sources of food and mineral resources, etc.), and new frameworks for ocean sustainability, is leading to the emergence of an 'ocean space' industry. Early indicators of such a future industry can be seen today in a growing network of firms and sectors that share Blue economy characteristics.

There are some parallels between the early aerospace industry and the ocean space industry now developing. Aerospace emerged from a blurring of the boundary between aviation and space travel. Many of the technologies and applications found in one domain were found to be applicable in the other. Also, many of the customers and suppliers were the same.

Aerospace benefited from materials, computing, communication, and other technologies developed by contractors for military use in extreme environments. The same is bound to happen as commercial firms seek opportunity in the world's oceans.

Ocean space, like aerospace, is challenged by the extreme nature of its environment. Corrosion, tides and powerful currents, biological infiltration, poor visibility, communication difficulties, and severe weather present enormous challenges to reliable and efficient operations in marine settings.

3.4 Migration of enterprises

Finally, as the economic value of ocean space is more widely recognized, business enterprises will allocate more resources toward it treating ocean space, in effect, as an adjacent market. Just as Boeing and Lockheed leveraged their aircraft design and manufacturing capabilities toward space vehicles, we are likely to see ship construction firms develop expertise in offshore structures. As their undersea reserves dwindle, offshore oil drillers, who already have substantial ocean space operations, may direct some of their cash flows into ocean bio-fuel R&D and other oceanic ventures. This natural migration will occur as companies seek to expand with their own value chains.

4 New directions of the World ocean industry

4.1 Oceanographic research

The first age of oceanography began in the 1950s and 1960s, as the seas became a stage for Cold War submarine operations. Today, advances in undersea sensor networks, computer modeling, biological diagnostics, data archiving, and international collaboration are igniting a new age of oceanography. Cold War scientific institutions such as Scripps and Woods Hole are leveraging their deep knowledge and technical competencies to new research missions at sea. They, the Monterey Bay Aquarium Research Institute, and other organizations are expanding our understanding of the vast undersea frontier[12].

4.2 Ocean-scale engineering and design

Skyscrapers, superhighways, dams, and power grids mark man's industrial conquest of the land. Commercial jetliners, the Space Shuttle, satellites, and the International Space Station highlight man's attempts to tame the aerospace frontier. In this century, a growing number of engineering and design projects are looking seaward.

The massive coastal engineering of Dubai is a prime example, and MIT Sea Grant's proposal for migratory fish farms point towards a grand scale of human activity in the world's oceans. These will be the initial physical landmarks of the Blue economy.

4.3 Ocean policies of major maritime countries

Major maritime countries in the world come to recognize the importance of development of marine and ocean industries for their future prosperity. They seek to secure sustainable future by carefully managing and conserving marine resources, which are relatively abundant but finite. Table 1 summarizes key directions of the marine policy of several most important maritime nations, who have adopted principles of the Blue economy.

5 International maritime interests of new EU member-states

5.1 European integration and Poland's partner ships

New members of the European Union are facing important challenges of a rapid globalization and changes resulting from current ocean policy of the European Commission. International maritime interests of this group of countries must, therefore, be considered not only in the sub-regional (Central Europe) or Union's perspectives but also considering global ocean opportunities.

Similarly as it was during the period of joining NATO and EU, opening to the global ocean will require intensive cooperation between the private sector, the Government and with the European Commission. Additional challenges are obligations resulting from Poland's membership in other European organizations, maritime relations with European states and transatlantic partnership with the United States. This is particularly important in the straggle against threats of international terrorism and militant radicalism.

5.2 International maritime policy of European Union

Economic development of the majority of industrialized countries, including those in European Union, has its reflection in the growing market demand and consumption. Both factors are acting as driving forces of maritime investments overseas, especially in securing an access to the sources of energy and protein of the marine origin.

The European Union represents and defends overseas maritime interests of such countries as France, Spain, Portugal and Italy. The European Union's aid programs for the coastal nations of Africa, Latin America or Pacific and Indian Ocean island states is frequently combined with subsidies for European companies striving to gain an access to the marine resources of developing countries[13]

[12] Joroff M. - *The Blue Economy: Sustainable industrialization of the oceans* [at] Proceedings, International Symposium on Blue Economy Initiative for Green Growth, Massachusetts Institute of Technology and Korean Maritime Institute, Seoul, Korea, May 7, 2009, pp. 173 -181.

[13] Kaczynski V.M., Fluharty D.L. - *European policies in West Africa: Who benefits from fisheries agreements?* [in] Marine Policy Journal, No. 26, 2002, pp. 75-93.

Table 1. Marine policy directions adopted by major nations
(source:[14])

Country	Major policy directions/measures	Source:
USA	Promotion of ocean education Economic growth and resource conservation along the coast Coastal and ocean water quality preservation Enhancement of the use and protection of ocean resources Advancement of ocean-related science and technology U.S. participation in international maritime policy	An Ocean Blueprint for the 21st Century (2004) U.S. Ocean Action Plan Implementation Update (2007)
Japan	Development and utilization of ocean resources Preservation of ocean environment Development of exclusive economic zone (EEZ) Securing shipping transportation Ensuring marine security Carrying out ocean-related R&D and survey Development of marine and ocean industries Integrated management of coastal area Conservation of remote islands Enhancement of international cooperation Enhancement of international cooperation Maritime education	Japan's Ocean Master Plan (2008)
Canada	International leadership, sovereignty and security Integrated ocean management for sustainable development Health of the oceans Ocean science and technology development	Ocean's Action Plan (2005) Technology Roadmap Special Report: Thinking beyond our shorelines (2005)
China	Enhancement of people's awareness of the importance of ocean Securing ocean related rights Conservation of ocean ecosystems Development of ocean resources Integrated governance of ocean	11th 5-Year Plan (2006-2010) Report on Marine and Ocean Industries Development in China (2006)
Korea	Creation of a clean/secure ocean environment Promotion of the global business and infrastructures for ocean explorations Protection of the marine environment Establishment of Northeast Asia shipping/logistics hub Sustainable development and construction of the fishery industry infrastructures Securing stable supplies of the fishery products Development of oceanographic research and extraction of the marine resources Training of the marine specialists	Ministry of Maritime Affairs and Fisheries, Master Plan of Marine and Ocean Policy, 2004 Policy direction of Marine and Ocean Technology, Development and Investment, www.mltm.go.kr, 17th April 2009

[14] Jung B. - *Blue Economy as a new Growth Strategy in Korea* [at] Proceedings, International Symposium on Blue Economy Initiative for Green Growth, Korean Maritime Institute, Seoul, Korea, May 7, 2009, pp. 103 -121.

Also oceanographic research, especially this targeting the living and energy resources are coordinated by governments through international cooperation agreements between European Union and overseas coastal states endowed with natural resources of high interest in European markets.

The marine policy of European Union was formulated in 2006 and submitted for international discussion among member states. It is an ambitious program with multi-disciplinary approach where a lot of attention was given to international relations[15].

Foreign aid supporting maritime economies, fisheries, coastal economic activities and oceanographic research are harmonized by EU missions overseas and supported by international cooperation agreements allowing European fleets to exploit marine living resources, employ local crews and support their vessels in the local ports.

5.3 Access to overseas resources and national security interests

Access to the strategic resources, especially energy, including off-shore resources, might affect the national security of any country. It depends not only of the external but also internal forces although their interplay is frequently blurred under influence of globalization and economic integration between individual states. These factors are not limited by geographic barriers or political and economic systems. In such system of interrelationships, any possibilities and also risks have a global character[16].

For example, for Poland, and for many other nations, one of the most important foreign economic policy goals is creation of favorable conditions of access, to the energy resources localized in the economic zones of other countries or regions. The growing demand for oil and gas in Europe, more and more frequently coming from deposits located in the continental shelves, is used by the energy exporters as a tool to develop political pressures on the consumption markets.

These pressures with increasing frequency are replacing the military force in disposition of states with available energy resources. Tensions produced by temporary limitations of gas supplies to some importing countries indicate to the uncertainty of the energy market and strong influence of the politics on national economies. It is, therefore, necessary to promote overseas investment and partnerships to secure access to the natural resources of the ocean for our country. Besides undeniable benefits, an integration of the world economy brings the risk of economic crisis and destabilization of the financial markets. Climate changes have social and political consequences while competition to gain access to the ocean resources is increasingly the cause of international conflicts[17].

Intensification of the debate on protection of the natural environment and the future of energy resources of the Arctic Ocean are clear examples of growing tensions between coastal states adjacent to this Ocean and non-coastal countries interested in energy extracted from the ocean's sub-soil and coastal regions of the Arctic[18].

5.4 Taking advantage of maritime heritage of the EU's new-member states

Despite long tradition, existing human resources, available infrastructures, and sizable maritime experience gained during last decades, several coastal economies of the new member states do not fully participate in the economic integration of the World maritime economy. Due to the growing competition, continuation of this trend might negatively affect positive impacts of globalization including sub-optimal use of the cadre of specialists and marine managers educated by national universities during last century.

Some of them developed distant-water fisheries, shipbuilding and marine transportation. They occupied important position and have aspirations to continue as active maritime nations in the world.

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[15] *Toward the future European marine Policy: European Visio of oceans and seas*. Green book. 275 final version presented by the Commission. Commission of the European Communities, Brussels, July 6, 2006.

[16] Kaczynski V.M. - *US Ocean Policy Toward Russia.* Jackson School of International Studies - REECAS News Letter, University of Washington, Seattle, Spring 2002.

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[18] Kaczynski V., Brosnan I., Leschine T. - *The Future of the Arctic: Major issues and national policies of the five coastal Arctic nations regarding the development and protection of the Arctic*. Study for the Korean Maritime Institute, School of Marine Affairs, University of Washington, Seattle, November 2009.

Figure 4. Construction of the navy ship – corvette "Gawron" type in Gdynia Shipyard
(source: Naval Shipyard Gdynia, Photo Gallery, 2009, www.navship.pl/en/photo-gallery-naval-shipyard-gdynia/category/25-korweta.html)

The production potential of their shipyards is still significant and is higher than capabilities of many other countries. These shipyards could move to produce oil and gas platforms, auxiliary ships for oil and gas extraction industry and build underwater constructions used to extract energy from the bottom of the sea. Other nations such as US, Norway, Korea, China, Japan and the West European countries have invested and undertaken various initiatives to increase their capabilities to exploit ocean and coastal resources. The principles of sustainable marine economy that could be adopted by many European countries might have powerful impact on their overall economy and affect satisfaction of their needs and oceanic aspirations.

5.5 A leadership role for European Union in shaping marine cooperation with developing countries

Current research effort, international debates, renewed attention to the Blue Economy and Green Growth create an opportunity for EU to take a leadership position in the emerging initiatives leading to the sustainable use of ocean resources. These activities are bringing global attention to the challenges and values of this sustainable approach to exploiting the richness of the ocean. For EU, active support for the Blue Economy is consistent with its commitment to green policies.

The new EU initiatives provide an opportunity for partnership between European companies and private sector partners or governmental organizations in developing countries. Working together, they can promote coastal economic development using several key industries where European firms currently excel:

- biotechnology and genetics - these are a base for aquaculture and the development of drugs and other substances,
- shipbuilding - the EU's shipbuilders can diversify into sectors of the Blue Economy, such as offshore platforms and submerged power generation structures,
- off-shore oil and gas resource exploration and exploitation in cooperation with the developing coastal states - this includes oil and gas transportation services for the off-shore oil and gas rigs,
- marine fisheries - the EU's experience and achievements in marine living resource use and management will be an important asset that could be used when negotiating fisheries cooperation agreements with the coastal states.

Furthermore, cooperation in ocean industries will contribute to the achievement of goals to which European Union is now committed: application of scientific disciplines in international ocean activities; strengthening cooperation between European industry and governmental institutions; and training engineers, scientists, and business personnel to work in expanding economies of the developing coastal countries.

Together, these initiatives could become an epicenter of application of the European Blue Economy overseas, attracting marine industry, governmental agencies, start-up companies, venture capitalists, students, engineers, and scientists, just as California's "Silicon Valley" attracted computer-age enterprise and talent thirty years earlier.

6 Conclusions and recommendations

During last decades the European Union has undertaken many initiatives in order to modernize and expand maritime capabilities of its member-states. Education of young cadres is considered as one of the most important success stories of an effort to occupy important position in quickly globalizing marine economy.

This integration and new technologies as well as a growing demand for the natural resources, including energy from the sea, open new possibilities and challenges. Successful attainment of international marine policy objectives is dependent on a close cooperation between the EU countries and adherence to the principles sustainable marine economy.

We are witnessing the rapid creation of the ocean industry in the world and our knowledge of the ecosystems and environmental change is constantly growing. This new strategy relies on an application of innovations in exploitation of natural resources from marine environment including production of energy and mineral resources, as well as in securing stable sources of protein.

Introduction of sustainable and environmentally friendly economy is facilitated by the experience of many European countries gained in the land-related activities (green growth). Such countries like Korea, China, Japan, United States and Norway develop their maritime potential in order to secure supplies of energy resources, marine minerals, fish protein increasing efficiency of their shipping and scientific research capabilities.

An access to these resources could have a powerful impact on the national security. The new coastal states of the European Union have good chances to join leading maritime nations of the World using their specialists, long-term experience and own maritime potential. There is a need to increase European Union's support for new members of the Union in their effort to open an access to various marine opportunities overseas with special focus on the strategically important resources in the oceans and coastal zones of the developing states. They should also pay more attention to the resource potential and shipping opportunities of the Arctic region. These countries are facing an important decision today to direct its maritime interests to the deep waters of the global ocean in order to take advantage of vast possibilities it offers to those who appreciate its riches and its role in integration of national economies with expanding international markets.

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