

Aspects of blue economy in the Baltic Sea region

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Abstract

Each sea basin has its specific features related to Blue Economy. This policy brief reflects the concept of blue economy and its evolution in the EU policies, and the specifics and relevance of blue economy in the Baltic Sea region. Recent developments in blue economy policies are described with future prospects of the main sectors: marine energy, maritime cluster, blue bioeconomy and maritime tourism. Blue economy is integrated more deeply into policies to reduce emissions and decarbonization, most notably aligned with the aims of EU's Green Deal. Cross-sectoral cooperation is essential for development of blue economy and Maritime Spatial Planning is an enabler towards sustainable blue economy and synergy between the blue economy sectors. Case studies on blue economy, recent and ongoing projects with blue economy topics, and drivers for future development will be presented as well as recommendations based on these projects.

Key words: blue economy, blue growth, decarbonization, renewable energy, maritime cluster, maritime transport, coastal and maritime tourism, blue bioeconomy

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1. Introduction

This policy brief will present the current policies on blue economy. Blue economy is considered a growing sector with huge potential and positive future prospects. However, the different interpretations of blue economy pose a challenge to study the blue economy, its status and development as part of national economies and on the EU level. Blue economy is integrated into policies of EU towards sustainability and a new strategy was published in 2021. As blue economy covers many businesses and sectors, their policies and strategies also need to be examined. Synergies and possible conflicts between those sectors impact the development of blue economy. Guidance on multi-use issues of sea space aims to promote synergies between the uses of the sea space.

2. Definition of blue economy

Blue economy refers widely to all economic activities depending on the sea. Economic sectors include tourism, maritime transport, energy and fishing (Martínez-Vázquez et al., 2021). There is vast potential for growth, and the concept of blue growth focuses on sustainable growth in maritime and marine sectors. The terms Blue Economy, Maritime Economy, Ocean Economy, and Blue Growth have been used in scientific research to describe the concept (Martínez-Vázquez et al., 2021). Sustainable use of ocean resources, the regional aspect, and the socio-ecological context are essential parts of the concept (Keen et al., 2017). However, within the blue economy concept itself, there are conflicts of interest: growth and development are supported in some studies and in the others protection of ocean resources is prioritized (Martínez-Vázquez et al., 2021).

The recent EU communication on a new approach for a sustainable blue economy in the EU interprets blue economy as encompassing “all industries and sectors related to oceans, seas and coasts, whether they are based in the marine environment or on land” (EC, 2021a). A need to shift the focus from blue growth to sustainable blue economy is expressed, as the environment and economy are today even more interlinked. In this policy brief, the concept “blue economy” is used, following EU’s 2021 communication.

3. Policies relevant to blue economy

Blue economy is part of the EU policies towards sustainability and refers to economic activity on different sectors. The aim of EU’s Integrated Maritime Policy since 2007 (EC, 2007) is to provide a more coherent approach to maritime issues and increased coordination among different policy areas. Cross-cutting policies in the Integrated Maritime Policy include blue growth, marine data and knowledge, maritime spatial planning, integrated maritime surveillance, and sea basin strategies. Marine Strategy Framework Directive (EC, 2008) aimed towards good environmental status (GES) by 2020. Ecosystem-based approach was introduced to protect the full range of marine biodiversity. The directive will be reviewed by 2023. EU Biodiversity Strategy for 2030 was adopted in 2020 (2020a), stressing the need for an ecosystem-based approach to the management of human activities at sea. The aim is to protect at least 30% of the land and 30% of the sea in the EU. Furthermore, blue economy in EU’s context aims to achieve Sustainable development goals (SDG) of UN by 2030. The 2030 Agenda for sustainable development acknowledges that without healthy ocean, life on this planet is at risk: without the ocean’s resources, human societies around the planet lose the ability to sustain themselves (UN, 2015).

The European Blue Growth Strategy (EC, 2017) aimed at creating a match between blue industry needs and ecosystem services by utilizing appropriate policies. The blue economy was considered as a means to create opportunities for new jobs and businesses. Blue Growth needs to be compatible with sustainability. In the new communication of 2021, the emphasis has transferred from blue growth to sustainable blue economy (EC, 2021a). The policy on sustainable blue economy is linked with European Green Deal, which aims for a modern, resource-efficient and competitive economy, as well as environmental and climate related goals, phasing out the net emissions of greenhouse gases and protecting EU’s natural capital (EC, 2019). Operators in the field of blue economy are called to endorse the principles of the European Green Deal. The stronger emphasis on blue economy also involves a larger group of stakeholders of blue economy and the involvement of all groups: in particular young people and small and local groups. The agenda of blue economy includes decarbonization, conservation of natural capital, circular economy, and responsible food production. All these aims will offer tools to support European Green Deal (EC, 2021a).

To fulfill the aims of the European Green Deal, EU's target is to achieve climate neutrality by 2050. An intermediate target is cutting greenhouse gas emissions at least 55% by 2030 (EC, 2019) with the European Climate Law. Revision of EU's climate, energy and transport-related legislation is carried out under the so-called 'Fit for 55 package' in order to align current laws with the 2030 and 2050 ambitions. Blue economy is seen as a means to contribute to carbon neutrality, for example developing of offshore renewable energy and greening of maritime transport and ports (EC, 2021a).

Dedicated funding for blue economy is needed. The European Commission and the European Investment Bank and the European Investment Fund will increase co-operation in funding, and funding is available via EU programmes. In addition, support for blue economy is directed via the new European Maritime, Aquaculture and Fisheries Fund and the Commission's BlueInvest platform (EC, 2021a).

3.1. Blue economy in Baltic Sea region policies

A Sustainable Blue Growth Agenda for the Baltic Sea region was adopted in 2014 (EC, 2014a). In the BSR the most promising blue economy sectors identified were short sea shipping, coastal and cruise tourism, offshore wind, shipbuilding, aquaculture and blue biotechnologies (EC, 2013). Short sea shipping generated the largest gross value added (GVA). Highest share of employment was among the sectors for coastal tourism and fish for human consumption (EC, 2014a). Further on, implementation strategy for the sustainable blue growth agenda focused into development of the shipping, blue bioeconomy (incl. aquaculture), coastal and maritime tourism as well as environmental and monitoring technology. Based on stakeholder dialogue, strategic action fields and potential actors for these sectors were identified for the vision towards 2030 (ECORYS & S.Pro, 2017).

Sea-basin and macro-regional frameworks for cooperation are essential in supporting blue economy, such as the EU strategy for the Baltic Sea region (EC, 2009). Funding is provided for projects in the Interreg Baltic Sea Region Programme area. In the new funding period 2021-2027, blue economy is the Programme objective 2.2. as part of priority of Sustainable waters, which supports actions that improve the state of water in the region and make its management more sustainable. The focus of the Programme objective 2.2 is to 1) encourage actions for blue businesses 2) facilitate joint use of sea space and help mitigate potential conflicts 3) strengthen resilience of blue businesses and 4) mitigate their impact on climate change. Projects on both emerging and established sectors of blue economy are supported, including aquaculture, blue biotechnology, shipping, fishery, and coastal and maritime tourism. The aim is to create synergies between these sectors which have interests to use the same resources and sea space. Blue economy related projects cover several policy areas of EU Strategy for the Baltic Sea Region: Innovation, Bioeconomy, Nutri, Ship, Safe, Secure, Transport, Spatial Planning, Tourism and Culture (EC, 2021b). Actions for the decarbonisation of energy systems and increasing energy efficiency and investing in renewable energy in urban and rural areas belong to Programme objective 3.2. Energy transition (Interreg BSR, 2021).

Maritime Spatial Planning (MSP) is a tool which supports sustainable blue economy, defined as an enabling framework (EC, 2021a). It is also a tool for regional, transnational and cross-sectoral cooperation. EU's MSP Directive was adopted in 2014, and the implementation was to be achieved by March 2021 (EC, 2014b). MSP directive is intended to support the utilization of maritime economic potential while ensuring long-term sustainability. The new planning cycle and evaluation of the adopted maritime spatial plans is about to begin.

To support the process in the Baltic Sea region, HELCOM-VASAB MSP working group has agreed on a Regional Maritime Spatial Planning Roadmap 2021-2030. The goal of the Roadmap is defined as "strengthening the joint effort and coherence throughout the Baltic Sea Region to implement Maritime Spatial Plans, aiming for sustainable development of the region and building a sound basis for an adaptive Maritime Spatial Planning process applying the ecosystem-based approach" (HELCOM-VASAB MSP, 2021). Objective 4 of the Roadmap is about contribution of MSP to sustainable blue economy. Actions include 1) sharing of good practices for sectoral sustainable development 2) analysis of ecosystem services, the linkage between environmental and social-economic dimension 3) encouraging participatory and transparent processes with all stakeholders of sea and 4) updating the future oriented report on marine and maritime activities and developments.

3.2. Sector-related strategies

Sector-related strategies are essential in reviewing the blue economy related businesses and the sectors' future development. These strategies are described with respect to their development in the BSR.

The marine renewable energy sector includes offshore renewable energy, most importantly bottom-fixed offshore wind, and in addition to that floating wind, thermal, wave and tidal energy. Most growth is in the offshore wind energy sector. In the EU, direct employment on the sector was 8 976 persons in 2018 (EC, 2021c). According to Wind Europe (2020), direct employment in the whole wind energy industry was 160 500 employees, and 25% of them in offshore wind. The aim of Offshore Renewable Energy Strategy is to supply about 30% of the EU future electricity (300 GW) by 2050, with an intermediate target of 60 GW by 2030. Other promising technologies mentioned are algal biofuels (biodiesel, biogas, and bioethanol), ocean thermal energy conversion (OTEC) and floating photovoltaic installations (EC, 2020b). In addition, technologies related to carbon capture are developing and they include also the use of subsea storage technologies (European MSP Platform, 2021).

In the BSR, main platforms for co-operation in the field of offshore renewable energy are the Baltic Energy Market Interconnection Plan (BEMIP) High-Level Group, the 'Vision and Strategies Around the Baltic Sea' initiative (VASAB), the Baltic Marine Environment Protection Commission, (Helsinki Commission - HELCOM), and the EU strategy for the Baltic Sea Region. (EC, 2020b). A new work programme within the Baltic Energy Market Interconnection Plan (BEMIP) was adopted for offshore wind in the Baltic Sea (EC, 2021d). The aim is to coordinate the development of the offshore grid. Cooperation includes also maritime spatial planning focusing on offshore wind development with HELCOM-VASAB. Other fields of cooperation are on enabling appropriate financing, and the acceleration of specific Baltic offshore projects and permitting. Maritime spatial planning is an essential and well-established tool to anticipate change, prevent and mitigate conflicts between policy priorities while also creating synergies between economic sectors. BEMIP Offshore Wind Working-Group also aims to cooperate with the North Seas Energy Cooperation (NSEC).

Recently the aim towards green transition is further accelerated while the European Commission published a plan to make Europe independent from Russian fossil fuels well before 2030 (EC, 2022). First, due to Russia's invasion of Ukraine the dependency on Russian gas as EU's source of energy is aimed to be cut. The objectives of "Fit for 55" are proposed to be set higher.

For the maritime sector, as part of the proposals of "Fit for 55", climate package of the EU, FuelEU Maritime initiative aims to increase use of alternative fuels in maritime sector (EC, 2021e). The proposal includes gradual limitation of the greenhouse gas (GHG) intensity of energy used on-board by a ship arriving at, staying in or departing from ports under the jurisdiction of a Member State. In addition, there would be an obligation to use on-shore power supply or zero-emission technology in these ports, concerning containerships and passenger ships. This regulation would apply to all ships above a gross tonnage of 5000, regardless of their flag (EC, 2021e). Besides the EU, International Maritime Organisation (IMO, 2018) adopted in 2018 its initial strategy on the reduction of GHG emissions from ships. The target set is to reduce the total annual GHG emissions by at least 50% by 2050 compared to the 2008 level. Means to increase energy efficiency and thus reduce the GHG emissions include technical measures, such as the Energy Efficiency Design Index (EEDI), slow steaming and other operational measures. The potential of these measures is to decrease fuel consumption of ships by almost 50%. Other possible options are biofuels, wind power and electrification. A co-benefit of energy efficiency increase is a reduction of emissions of air pollutants (Gauss et al, 2019).

Blue bioeconomy, fisheries and aquaculture, is linked with European Commission's Farm to Fork strategy. Aspects linked with blue economy are responsible fishing, sustainable aquaculture to complement the natural limits of wild captures and algae production as an alternative to agriculture (EC, 2021a). Aside from being source of biofuel or based products, algae are also a source of food and feed materials. The new strategy for a Sustainable Blue Economy (EC, 2021a) includes a dedicated initiative to support the development of the EU's algae industry in 2022.

Maritime and coastal tourism has been the main blue economy sector with high expectations for growth. It is linked with policies in other sectors, and in the policy towards blue economy, with sea-basin and macro-regional frameworks for cooperation, such as the EU strategy for the Baltic Sea region.

4. Status of blue economy in the EU and the Baltic Sea region

The status of blue economy in the EU is followed in Blue Economy Report. The report has been published annually since 2018. The report includes economic data from activities of the identified sectors, both marine-based and marine-related. The indirect economic impact from these sectors is described qualitatively in the report. Marine-based activities include the activities undertaken in the ocean, sea and coastal areas, such as marine living resources (capture fisheries and aquaculture), marine minerals, marine renewable energy, desalination, maritime transport and coastal tourism. Marine-related activities include the activities which use products and/or produce products and services from the ocean or marine-based activities like seafood processing, biotechnology, shipbuilding and repair, port activities, technology and equipment and digital services (EC, 2021c).

The development of so called traditional and emerging sectors is followed in the Blue Economy reports. Traditional and established sectors cover economic activity and sectors such as ports, shipyards and coastal tourism (see table 1 below). The established blue economy sectors employed directly close to 4.5 million people in 2018 and generated around 650 billion euro in turnover and 176 billion euro in gross value added (EC, 2021c).

Table 1. Established blue economy sectors and their sub-sectors

| Established blue economy sectors | Sub-sectors |
|----------------------------------|--|
| Marine living resources | Primary production (capture fisheries, aquaculture) Processing, distribution of fish products |
| Marine non-living resources | Oil and gas Other minerals |
| Marine renewable energy | Offshore wind energy |
| Port activities | Cargo and warehousing Port and water projects (construction and services) |
| Shipbuilding and repair | Shipbuilding Equipment and machinery |
| Maritime transport | Passenger, freight transport Services for transport |
| Coastal tourism | Accommodation, transport |
| * SMEs and micro-enterprises | Other expenditure |
| * Cruise tourism | Other expenditure |

Source: Adapted from (EC 2021c).

Emerging sectors include for example innovative subsectors of marine renewable energy such as floating offshore wind, blue bio-economy, bio-technology and desalination (see table 2 below). Among the emerging blue economy sectors, development of marine renewable energy is expected to have a key role. The most notable sub-sector in blue bioeconomy is algae (EC, 2021c).

Table 2. Emerging, innovative sectors and their sub-sectors

| Emerging, innovative sectors | Sub-sectors |
|-----------------------------------|---|
| Marine renewable energy | Floating offshore wind Wave and tidal energy Floating solar photovoltaic energy (FPV) Offshore hydrogen generation |
| Blue bioeconomy and biotechnology | Non-traditionally exploited groups of marine organisms and their commercial biomass applications E.g. Macroalgae (seaweeds), microorganisms (e.g. bacteria, fungi) |
| Marine minerals | Sand and gravel, other minerals and metals in/on the seabed, chemical elements dissolved in seawater (e.g. salt and potassium). |
| Desalination | |
| Maritime defence | Navies, naval shipbuilding |
| Infrastructure | |
| Robotics | |

Source: Adapted from (EC 2021c).

Share of blue economy out of the overall EU economy was 1.5% in terms of GVA and 2.3 % in terms of employment in 2018 (EC, 2021c). Altogether, when compared with the baseline year 2009, the relative size of the EU Blue Economy in terms of GVA and employment with respect to the EU overall economy has decreased. Compared from 2013 to 2018 there is growth in all the established blue economy sectors, except in non-living resources (oil, gas and minerals extraction). However, there is not yet full statistical data on EU level on the impact of Covid-19 pandemic. For coastal tourism, impact of the Covid-19 pandemic has been severe and recovery will be slow. It is the single most labor-intensive sector, employing 64% within the established blue economy sectors and 45% of GVA (EC, 2021c).

Blue economy in the Baltic Sea region

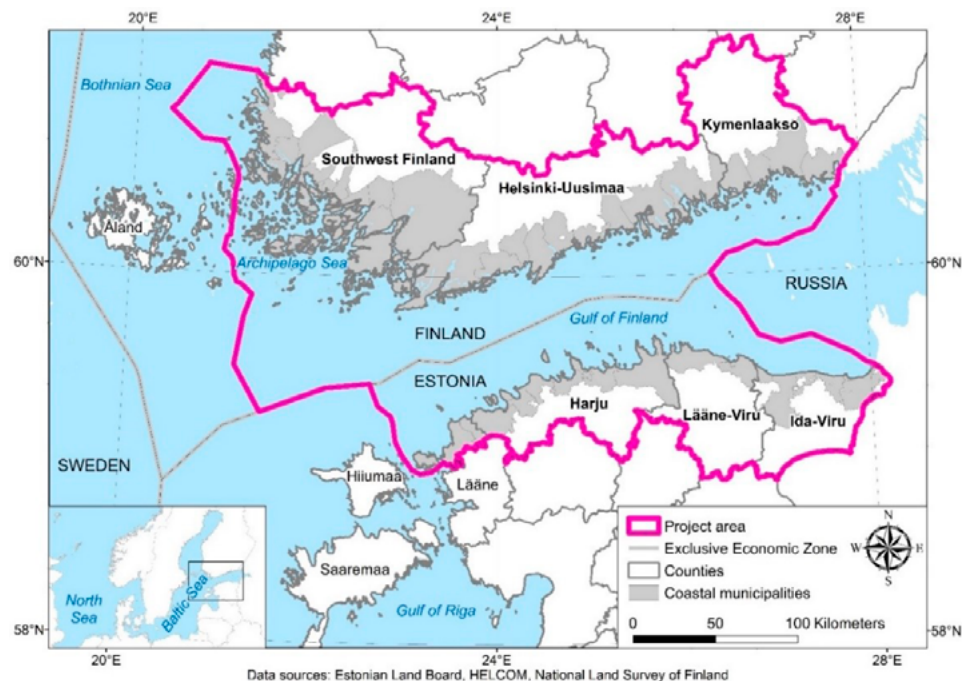
According to EU's Blue Economy Report 2021, the size of blue economy in terms of GVA was largest in Mediterranean (37% of the EU Blue Economy GVA), followed by the West Mediterranean (31%) and the North Sea (25%). The size of Atlantic Ocean and the Baltic Sea is almost even, respectively 19.6% and 19.5%. In terms of employment, the Baltic Sea is 5th among the sea basins with 16.1% of blue economy employment. In the Baltic Sea region coastal tourism is the main sector, with 11 billion GVA and 0.35 million jobs in 2018. In terms of GVA, the size of the maritime transport sector is somewhat smaller than that of coastal tourism, € 10 billion. There is potential in terms of variety of blue economy sectors, and resources in the BSR. However, out of the total employment, maritime sectors accounted only for 1.6% (Mogila et al, 2021).

Blue economy in the EU member states of the Baltic Sea: Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland and Sweden was studied by Mogila et al. (2021) with shift-share analysis. The sectors with positive total effects identified were maritime aquaculture in Denmark, shipbuilding in Germany and Sweden and ship repair in Poland, Denmark, Lithuania and Sweden. The effects of maritime policies and spatial planning in blue economy would need further analysis (Mogila et al., 2021). In the following section, examples on regional studies are presented.

Case: The Gulf of Finland and the Archipelago Sea

The status of the selected blue economic businesses with estimations on their possible development trends was analysed in the Plan4Blue project (2019), financed by Central Baltic Interreg. The project area in Finland and Estonia covered the Gulf of Finland and the Archipelago Sea (see Figure 1).

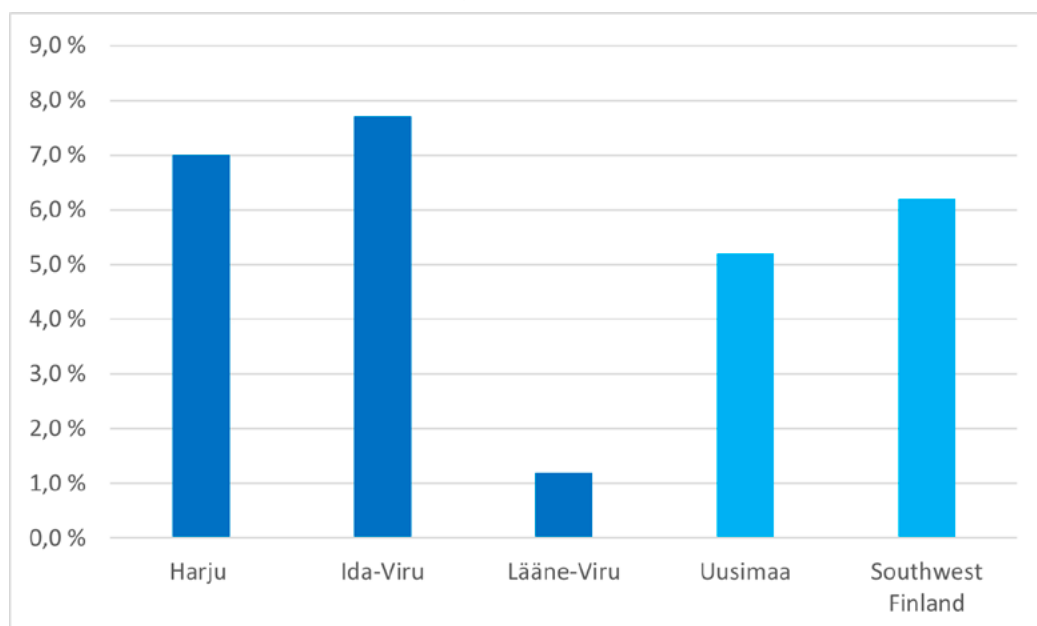
Figure 1. The Plan4Blue project area



Source: Plan4Blue, 2019

Economic analysis was based on data from Orbis Europe database, Amadeus database, and national statistical databases. Share of blue economy as regional total in 2015 was identified based to total number of enterprises operating in blue sectors across the regions (Figure 2). The largest share of blue companies was registered in capital regions – Harju county in Estonia and Uusimaa in Finland (Ashyrov et al, 2019).

Figure 2. Shares of blue economy as regional total in 2015



Source: adapted from Ashyrov et al, 2019

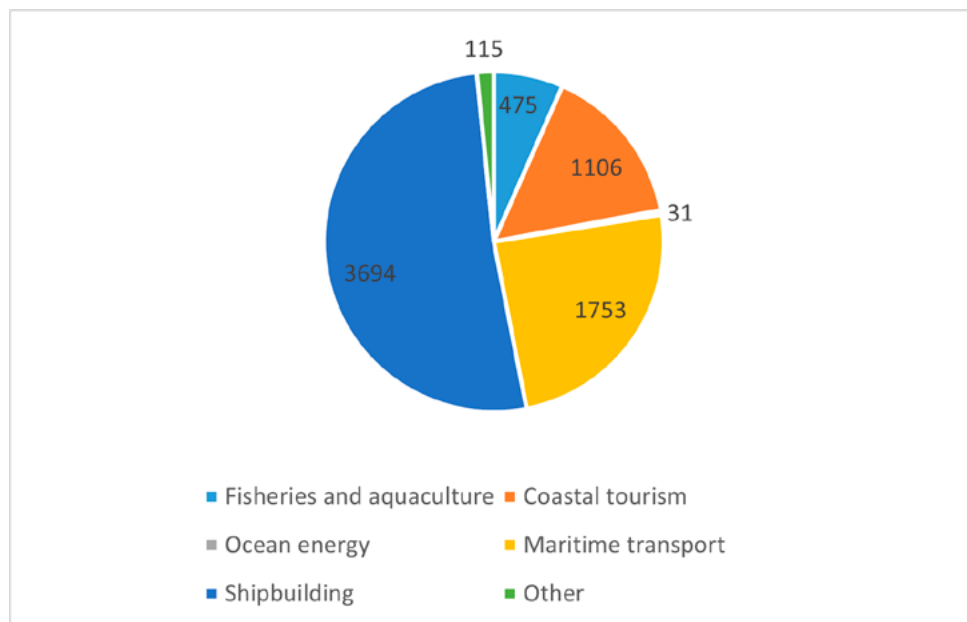
Indicators such as gross value added (GVA), gross domestic product (GDP) and employment of the coastal regions in Finland and Estonia refer to their importance in the national economies. Thus, de Andres Gonzalez et al. (2019) note that the impact of the sea to the regional economy may be much more overwhelming than the levels analysed in the blue economy and blue growth studies in the BSR, that are based on an analysis of a handful of typical blue industry sectors.

Furthermore, in the study of Ashyrov et al. the indirect employment of the Blue Economy in Estonia and Finland was studied with the Input-Output (I-O) methodology. The findings showed that blue industry sectors play an important role in the economies of the maritime regions of the two countries, and contribute significantly to the national economic growth and employment. The blue economy industries are not particularly vulnerable to shocks affecting the national economy. These findings suggest that blue industries are relatively independent within national economies having a remarkable role in socio-economic development of maritime regions, and thereby create good preconditions for the stable development of cross-border cooperation between the maritime regions of both countries (Ashyrov et al., 2018; 2019).

Case: Gulf of Bothnia

Another example of regional analysis of blue economy is concerning the Finnish coastal regions of the Gulf of Bothnia in SmartSea project (Katila et al., 2019). The area is dominated by traditionally strong blue economy activities such as shipbuilding and ship repair, transport, fisheries, and offshore activities that are located in the coastal municipalities and are economically important for the surrounding regions. The study included three main areas along the Gulf of Bothnia in Finland: the Bothnian Bay, the Bothnian Sea and the Kvarken, altogether 32 municipalities. In 2015, there were approximately 176,000 jobs in the Gulf of Bothnia area. The percentage of jobs related to maritime activities was approximately 4% (7.5% in private sector). The figure 3 below represents the maritime jobs and their direct employment, whereas there are considerable indirect employment effects. There is most employment in the fields of shipbuilding, maritime transport and maritime tourism.

Figure 3. maritime jobs of the total employment in the Gulf of Bothnia



Source: adapted from Katila et al., 2019

5. Prospects and drivers for blue economy – case Plan4Blue

Future scenarios were created for blue economy in Plan4Blue project with transnational Delphi studies, scenario workshops and expert interviews. The scenarios were based on extensive analysis and mapping of drivers for blue economy, and they included a spatial point of view with map exercises. The experts represented all the blue economy sectors, from both private and public entities from Estonia and

Finland. Altogether 105 experts participated in the scenario process during 2017-2018. For each blue economy sector, estimated future changes, main drivers and their anticipated consequences regarding the future development of that sector, alternative scenarios and their assessment was done. The drivers were analysed with PESTEL, concerning the impact of economic, social, technological, ecological/environmental, and legal changes. Alternative scenarios included their futures images and pathways to them (see table 3). Weak signals and black swans were identified (Pöntynen & Erkkilä, 2018).

Table 3. The four alternative scenarios for the blue economy sectors created in Plan4Blue project

| The four alternative scenarios for Blue Growth in the sectors of energy, maritime, tourism, and blue bioeconomy & subsea | | | |
|--|---------------------|--|---|
| Sustainability above all! | Unlimited growth | Sustainability dilemma | Virtual reality |
| The most desirable future regarding the sustainable uses of marine resources. | Worst case scenario | Continuation of the current state – business as usual, quantitative changes. | Extensively digitalised future with sustainable and unsustainable developments. |

Source: : Pöntynen & Erkkilä, 2018.

In the following, main drivers and aspects of these alternative scenarios are described by the main blue economy sectors: marine energy, maritime cluster, maritime tourism, and blue bioeconomy & subsea sectors.

5.1. Marine energy

In Plan4Blue Delphi-study, 81% of respondents of Delphi questionnaire expected increase for marine energy sector as a whole. Most growth was expected for solar power, wind energy and for construction and maintenance of grids, energy lines and gas pipes (Pöntynen & Erkkilä, 2018). The most important drivers identified for marine energy sector were the following:

- Cleantech innovations for energy
- Main energy options supported by energy and environmental policies
- Attitudes
- Environmental regulations and legal practices
- Conditions and trends of global economy and globalization

Cleantech innovations, such as floating offshore wind have impact on development of the sector. Stricter regulations and stronger environmental policies impact the sector's development, leading to decarbonization of energy production and the sustainable scenario. Also, the attitudes of people towards sustainability matter. The pathway leading to the "Unlimited growth" scenario, in which economic growth is based on the use of traditional fossil and nuclear energy, would imply careless attitudes towards environment and e.g. renewable energy options, but also the fact that current infrastructure supports centralised energy production.

In marine energy sector the black swans (sudden development, which may change the future developments into a different direction) mentioned by the respondents were major collapses or major crisis, terrorism, and nuclear disaster. Crisis that does not result in total collapse might lead to "environmental awakening", in other words to change attitudes towards sustainable energy options. Also, major oil accidents were mentioned.

5.2. Maritime cluster

Within the Delphi study, 97% of respondents expected growth for the entire maritime cluster, in particular for cleantech and marine transportation. Main drivers for development of maritime cluster identified in Plan4Blue project were the following (Pöntynen & Erkkilä, 2018):

- Conditions and trends of global economy, globalization
- Environmental regulations and legal practices
- Fuels used in shipping (environmental policy)
- Cleantech / emissions from maritime cluster (energy efficiency)
- ICT, digitalisation

Regulatory demands for the maritime sector to minimize the emissions were considered to bring benefits for shipyards and for cleantech companies, providing equipment and machinery for shipbuilding. Due to the stricter regulations for Baltic Sea region shipping it has become a front-runner in clean shipping activities. Improved battery technology would change the situation; currently unknown new innovations would promote the use of electricity in shipping, for example enabling use on longer routes. In maritime cluster, several black swans were mentioned, including crises and sanctions, trade wars and embargos and weakening of security situation reflecting the global context of shipping. De-globalization and protectionism would decrease the amount of global shipping, as well as increasing self-sufficiency.

5.3. Blue bioeconomy and subsea resources

According to 92% of respondents in the Delphi study, increase was expected for blue bioeconomy and subsea resources sectors. Aquaculture was expected to grow according to 73 % and fish farming according to 85 % of the respondents. Commercial fishing was expected to stay on the current level. Main drivers identified for the sector were

- Policies concerning the use of natural resources
- Cleantech innovations for blue businesses
- Environmental regulations and legal practices, as well as industrial policy; affect e.g. environmental permits.
- State of the environment
- Attitudes

Cleantech innovations could develop the sector to be more autonomous and independent, however, the price of technology may hinder their uptake. State of the environment is important driver for the sector. A weak signal for the sector was mentioned to be fish farming and aquaculture on land in circular systems.

5.4. Maritime tourism

All respondents of Delphi questionnaire expected growth for maritime tourism, which has been the major sector within blue economy. In the Plan4Blue project area, most growth was expected for services for maritime adventure tourism. Another growth sector identified were the guest harbours and other services for leisure boating, in particular on the northern coast of Estonia. Main drivers identified for maritime tourism were the following:

- State of the environment
- Safety and security in BSR region
- Attitudes of travelers / tourists
- Conditions and trends of global economy
- Leisure interests

In the scenario of unlimited growth, mass tourism would increase and cause environmental damages. Sustainable and responsible tourism could mean that there would be restrictions for tourists to enter certain conservation areas. As result of travel restrictions due to Covid-19, the number of tourists in previous mass tourism destinations has collapsed. However, the target year of Plan4Blue scenarios was set to 2050, and the longer-term development is to be seen. Another example of emerging trend is the different interests of the tourists, which was noticed already before the pandemic. Also, nature tourism was emerging. Interests towards nearby destinations and traveling within own country or regions increased even more due to Covid-19 pandemic. The attitudes of the travelers towards sustainability would need to be changed. Development towards sustainable maritime tourism is a matter of co-operation of sectors, including sustainable traveling to destinations.

6. Synergies between blue economy sectors

There is potential in blue economy within the sectors, such as the role of ports is expected to develop as more comprehensive hubs in the field of renewable energy, circular economy, communication and as industrial clusters (EC, 2021a). This kind of synergy necessarily needs cooperation between the sectors. Marine renewable energy, in particular offshore wind has potential to provide for less emissions and impact on decarbonization of maritime transport. E-fuels can be developed of renewable energies from offshore wind parks (Borkowski, 2021). Biofuels and biogas can be produced from marine sources.

The concept of multi-use is discussed within the MSP, as there is strong growth in demand of maritime and coastal space from different sea uses. At present, there is increasing need for permanent sea space for energy and food production, aggregates and oil and gas extraction, power and communication networks (European MSP Platform, 2021). Multi-use aims to promote synergies between developing maritime activities. Various combinations of multi-use have been studied in European projects, for example offshore wind energy with tourism or with aquaculture and fisheries. van den Burg et al. (2020) identified several barriers related to Multi-use platforms (MUPs): economic, legal, administrative, social, environmental, and technical. They proposed studying social dimension of MUPs, their positive impacts not only for the economy, but for the environment and society, and trials related to both technical and non-technical barriers.

In the Satakunta region the ongoing regional development projects aim to enhance development of blue economy sectors. BlueCleanDigi project (2021) aims to fasten the recovery of the blue economy sectors, while also strengthening the twin transition, interlinked development of blue economy and digitalization. The project offers tools to increase productivity and renewal of activities, and helps in finding synergies between companies in different sectors. In the MERI-CLEANTECH (2021) project, business opportunities and possibilities for industries are identified in the context of maritime environmental regulation. The Finnish maritime industry is involved in developing the new solutions.

In these cases, synergy would lead to more sustainable business operations. In another recent international EU project, INTERMARE South Baltic (financed by Interreg South Baltic) creation of a network of companies and stakeholders under the common brand was called for (Philipp, 2020).

7. Recommendations on assessing blue economy

While studying the concept of blue economy, Martínez-Vázquez et al. (2021) point to difficulty to measure impact of economic activity, which leads to difficulty to quantify the environmental impacts, too. In addition, the scale of blue economy sectors may be overestimated while the European Commission uses mostly 4-digit NACE sections in its analyses.

In Plan4Blue project, main challenge identified in assessing blue economy and its status and development was availability of data and economic indicators on the sectors of blue economy. While it is not possible to extract statistical data directly concerning blue economy sectors, a mix-method approach was recommended with both quantitative and qualitative methods (Plan4Blue, 2019; de Andres Gonzalez et al, 2019). For example, small companies are not all listed in Statistic Finland database. Furthermore, operations of blue economy businesses are both sea and land based. Companies which are located outside the project area may not be included into the study. Interviews may complement the information to assess the size of the blue economy sector (Plan4Blue, 2019). Also, some Blue Economy sectors may

generate significant indirect economic effects and induced economic effects (EC 2021c).

Another challenge is comparison of data on blue economy between countries. Improvement of cross-border statistics was recommended in Plan4Blue project (2019), which focused on the northern Estonia and in Finland on the regions of South West Finland and Uusimaa. Possible tools recommended in Plan4Blue project were systematic cross-border data collection, professional standards and documents and long-term plans on the analysis. Sharing of information could be enhanced via creating an ad-hoc organisation which would collect, systemize, synthesize and distribute cross-border information. Also, the means of cross-sectoral networking and developing projects would be beneficial in creating new opportunities. Networking with and between research institutes is also a key issue.

In addition, data on the EU level and the comparison is lagging behind, e.g. EU's blue economy report 2021 reflects the situation of 2018. Regional data produced in projects is temporal, related to the project time.

8. Conclusions

Expectations for the development of blue economy have been high and new potential has been identified in the business sectors. EU's new approach moved the emphasis from blue growth to sustainable blue economy. Potential of blue economy is harnessed in achievement of the dual challenge: to reach both the aims of the European Green Deal and the Recovery Plan for Europe. As described in the recommendations, there are challenges and development is needed to sufficiently measure the blue economy activities and achievements. Up-to-date information is needed both at regional, national and international levels.

Characteristically, blue economy consists of several sectors, which are integrated with each other, with possible cross-sectoral synergies or conflicts. The blue economy sectors in the Baltic Sea region are affected by specific drivers and global megatrends. The drivers identified for the Plan4Blue project area in Finland and Estonia, the Gulf of Finland and the Archipelago Sea reflect the most important driving forces in the Baltic Sea region, too. Conditions and trends of global economy and globalisation were considered to have the most impact on the maritime sector. Cleantech innovations impact among the sectors of marine energy, maritime cluster and blue bioeconomy. The state of the environment was considered an important driver, in particular for tourism and blue bioeconomy. Cooperation, safety situation and stability in the Baltic Sea area is important in particular for development of the maritime tourism. Creating of future scenarios is an important tool to prepare for alternative future states.

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