OPPORTUNITIES FOR SUSTAINABLE ECONOMIC DEVELOPMENT OF THE COASTAL TERRITORIES OF THE BALTIC SEA REGION IN THE CONTEXT OF DIGITAL TRANSFORMATION

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The article explores opportunities for the sustainable economic development of coastal territories in the Baltic Sea region (BSR) arising in blue economy sectors in the framework of digital transformation. The study argues that a more active commercialisation of territorial resources can facilitate the sustainable economic development of the BSR coastal territories, following digitally-driven innovations. The paper provides an overview of methodological approaches to territorial sustainability. It also assesses the 2009—2018 level of the socio-economic development of the BSR coastal territories, underpins the importance of the blue economy and highlights the role of digital transformation in reaching the UN Sustainable Development Goals (SDGs) in the BSR through digitally-driven innovations. A comparative and problem-targeted statistics analyses show significant differences in the level and dynamics of socio-economic development in the BSR coastal territories with their GRP per capita being generally lower than the national or macroregional average. A review of literature on sustainable development in the BSR has shown that a more active use of unique resources of the coastal territories along with a technology-driven growth of blue economy sectors can counterbalance the negative impact of the territories' uneven development on the progress towards the SDGs in the BSR. Increasing the competitiveness of the BSR coastal territories requires investment in digital solutions in the blue economy sectors and the creation of a communication infrastructure. The review of key innovations in the blue economy sectors shows that their implementation gives impetus to other industries by reducing costs, creating new jobs, and improving the quality of products and services.

Keywords:
Baltic Sea Region, sustainable development, blue economy, digitalisation

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Introduction

The Baltic Sea Region (BSR) comes into focus of research for many reasons, including the border position of its member countries and regions [1; 2; 3], their coastal location [4; 5] and long historical ties [6]. The region is also of interest since it is a pilot one for several EU projects. It is the first EU macro-region with its own strategy [7; 8; 9]. Researchers note that the impetus for its development came from the realization of the fact that the ecosystem of the Baltic Sea is under considerable stress, which can be removed only through concerted efforts at the interstate and supra-territorial levels [10]. Special attention is paid to the issues of sustainable development, often viewed together with the blue economy — the use of marine resources aimed to ensure economic growth, improve the living and working conditions of the population, as well as the state of the ocean ecosystem[1] [see. for example, 8; 11; 12; 13; 14; 15].

The term *sustainable development* was introduced in 1987 in a report of the World Commission on Environment and Development. According to the presented definition, it is "the development that meets the needs of the present without compromising the ability of future generations to meet their own needs[2]." The UN[3] 2030 Agenda, adopted in 2015, sets 17 sustainable development goals for three interdependent areas: economic growth, social development and environmental protection. Sustainable development is generally understood as the development sustaining the balance of these three components [see e. g. 16; 17, etc.]. Some authors also add a political one to this group [18; 19].

In this study, sustainable economic development is considered as a comprehensive process aimed at solving socio-economic problems, improving the living conditions of the region's population and the state of the environment by achieving a balance between the social and economic spheres.

Although the Sustainable Development Goals (SDGs) are not legally binding, many supranational and national strategies are developed in line with them. For example, Russia's national development goals through 2030[4], adopted in

[1] What is the Blue Economy? 2017, *World Bank*, June 6, available at: https://www.worldbank.org/en/news/infographic/2017/06/06/blue-economy (accessed: 03/15/2021).

[2] Report of the World Commission on Environment and Development: Our Common Future, 1987, *UN*, available at: https://sustainabledevelopment.un.org/content/documents/5987our-common-future.pdf (accessed20.12.2020).

[3] Transforming our world: The 2030 Agenda for Sustainable Development. Resolution by the UN General Assembly dated 25.09.2015 No. A/RES/70/1, 2015, *UN*, available at: https://www.un.org/ga/search/view_doc.asp?symbol=A/RES/70/1&Lang=R (accessed 18.12.2020).

[4] *On the national development goals of the Russian Federation through 2030*, 2020, Decree of the President of the Russian Federation of July 21, 2020 No. 474, available at: http://www.consultant.ru/document/cons_doc_LAW_357927/ (accessed 19.12.2020).

June 2020, almost completely coincide with the UN SDGs. In the EU, the SDGs must be incorporated into all strategic documents[5]. The SDG Goal 14 (conserve and sustainably use the oceans, seas and marine resources[6]) is especially relevant for coastal countries and territories. In the EU, its importance is reflected in the Blue Growth Strategy[7], and in the BSR — in the EU Strategy for this macroregion[8].

Appeals for work towards the SDGs in the BSR based on developing the potential of the blue economy are contradictory since the increased economic activity in the maritime sectors and industries results in greater environmental pressure on the marine ecosystem. However, digital transformation can provide means for resolving this contradiction.

As follows from a recent study on the use of big data and artificial intelligence in the maritime industry [20], the concept of *digital transformation* is the most suitable for characterizing not only the change in the quality of business models based on digital technologies but also the relationship between various stakeholders directly or indirectly involved in the production of products and services in the blue economy. Digital transformation provides for consistency of these relations and the universality required to drive concerted actions to achieve the SDGs in the Baltic Sea region.

Digital transformation is not a new phenomenon, however, the Covid-19 pandemic served as a catalyst for it [21; 22; 23; 24; 25; 26]. When holidaymaking, business trips, physical presence in the workplace and real-life communication with clients, colleagues, partners turned out to be impossible, many enterprises faced the choice of either leaving the market or adapting to the new conditions. The latter required the accelerated introduction of digital technologies (big data, artificial intelligence, cloud technologies, RFID) and the restructuring of business models to promptly respond to unforeseen situations and reduce costs [27]. When the pandemic is over, businesses and territories, which by that time have reached 'digital maturity' will find themselves in a more advantageous position [28]. The acceleration of digital transformation, as well as the competitive advantages that it provides, should be taken into account when developing both national and regional development strategies.

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[5] EU Approach to sustainable development, 2020, *European Commission*, available at: https://ec.europa.eu/info/strategy/international-strategies/sustainable-development-goals/eu-approach-sustainable-development_en (accessed 19.12.2020).

[6] Goal 14: Conserve and sustainably use the oceans, seas and marine resources, 2020, *UN*, Sustainable Development Goals, available at: https://www.un.org/sustainabledevelopment/ru/oceans/ (accessed: 19.12.2020).

[7] Blue Growth, 2020, *European commission*, available at: https://ec.europa.eu/maritimeaffairs/policy/blue_growth_en (date accessed: 20.12.

[8] EU Strategy for the Baltic Sea Region. URL: https://www.balticsea-region-strategy.eu/ (accessed 23.12.2020).

It should be noted that the majority of research on the BSR consider either whole countries or coastal territories of the NUTS3 level[9] and Russian regions, depending on the interpretation of the term the *Baltic Sea region* [29]. In this work, the BSR is used in its narrow meaning and includes only territories located directly on the seacoast since these territorial objects are under the maximum influence of the proximity of the sea as a factor determining the sustainability of their socio-economic development [18].

In this article, the term *coastal territory* refers to an administrative-territorial unit of the meso-level adjacent to the internal seawaters and (or) the territorial sea of a country. Thus, the concept of *coastal territories of the Baltic Sea region* covers territorial objects of the region in its narrow sense: "located on the coast of the Baltic sea or in direct proximity to it" [29]. These are three coastal subjects of the Russian Federation (St. Petersburg, Leningrad region, Kaliningrad region) and 21 EU territories. The EU defines coastal regions as units of the NUTS 3 level, whereas this paper considers units of the NUTS 2 level and in some cases NUTS 1 (whole countries), since it is this level that is formally comparable to the Russian Baltic regions — the Kaliningrad region, Leningrad region and St. Petersburg with the population of 1,002.2, 1,847.9 and 5,383.9 thousand people, respectively[10].

Approaches to assessing the sustainability of a territory's development

On 6 July 2017, as part of its Sustainable Development Strategy, the UN adopted 169 targets and 231 indicators to achieve the 17 goals[11]. The EU uses 100 indicators to track the achievement of the 17 UN SDGs. EU countries monitor their progress only on the indicators that are most important to them. For example, Germany uses only 65 indicators[12]. Russia submits a voluntary report on 90 indicators whilst its national projects cover 107 out of 169 SDG targets[13].

[9] Coastal, island and outermost regions, 2020, *Eurostsat*, available at: https://ec.europa.eu/eurostat/web/coastal-island-outermost-regions/background (accessed 24.01.20).

[10] Regions of Russia. Social and economic indicators 2019, 2019, Stat. Sat. Rosstat, Moscow, available at: https://gks.ru/folder/210/document/13205 (accessed 24.01.2020).

[11] *Work of the Statistical Commission pertaining to the 2030 Agenda for Sustainable Development*, 2017, Resolution adopted by the General Assembly on July 6, 2017 No. A/RES/71/313, available at: https://undocs.org/ru/A/RES/71/313 (accessed 21.12.2020).

[12] Sustainable development indicators, 2020, *Destatis*, available at: https://www.destatis.de/EN/Themes/Society-Environment/Sustainable-Development-Indicators/_node.html (accessed 06.01.2021).

[13] Voluntary National Review of the Implementation of the 2030 Agenda for Sustainable Development. RF, 2020*, United Nations, Department of Economic and Social Affairs: Sustainable Development*, available at: https://sustainabledevelopment.un.org/content/documents/26421VNR_2020_Russia_Report_Russian.pdf (accessed 28.12.2020).

Currently, monitoring the achievement of the SDGs in individual regions and territories is more of an exception, but the importance of implementing a sustainable development strategy not only at the national but also at the subnational levels has already been recognized. For example, the Organization for Economic Cooperation and Development (OECD) indicates that 65% of the SDGs' targets cannot be achieved without local and regional governments' proper involvement[14]. In this regard, it is likely that soon regions will also start reporting on their progress towards the SDGs.

To assess the level of sustainability of the socio-economic development of territories, most authors propose to use synthetic indicators that take into account economic, social and environmental components, developed on the basis of the UN indices [13; 17; 30; 31; 32; 33]. Usually, such assessments apply a comparative analysis methodology, including data envelopment analysis [34; 35], an evaluation based on distance from the average solution [36]. Unfortunately, it is not possible to use such indicators in this work due to the lack of statistical data on territories of the EU and the Russian Federation.

The most common indicator used to measure the sustainability of socio-economic development is GDP per capita. An alternative to it is Sustainable Economic Wellbeing Index (ISEW), proposed by Daley and Cobb [37]. This index is used both at the national [38; 39] and subnational levels [40]. It should be noted that it rather complements than replaces GDP per capita (it relies on personal consumption data as well, however, it also takes into account inequality in income, costs associated with crime, environmental degradation, loss of leisure along with the benefits of consumer durables, public infrastructure, volunteering and free housework [41]). GRP per capita remains the key indicator in economic research to characterize the socio-economic development of a region.

Assessment of the socio-economic development of the coastal territories of the BSR

To compare the coastal territories, the research applies GRP per capita based on purchasing power parity. For analytical purposes, the calculation of the indicator's values was done for 2009—2018 followed by the calculation of the average annual growth rate (the geometric mean method) and accession rate for each territory (by subtracting one hundred per cent from the previously calculated values). The resulting data allow us to compare the level and dynamics of the socio-economic development of the coastal territories of the Baltic Sea region (Fig. 1).

[14] A Territorial Approach to the Sustainable Development Goals: Synthesis report, 2020, *OECD*, available at: https://www.oecd-ilibrary.org/sites/e86fa715-en/index.html?itemId=/content/publication/e86fa715-en (accessed 30.12.2020).

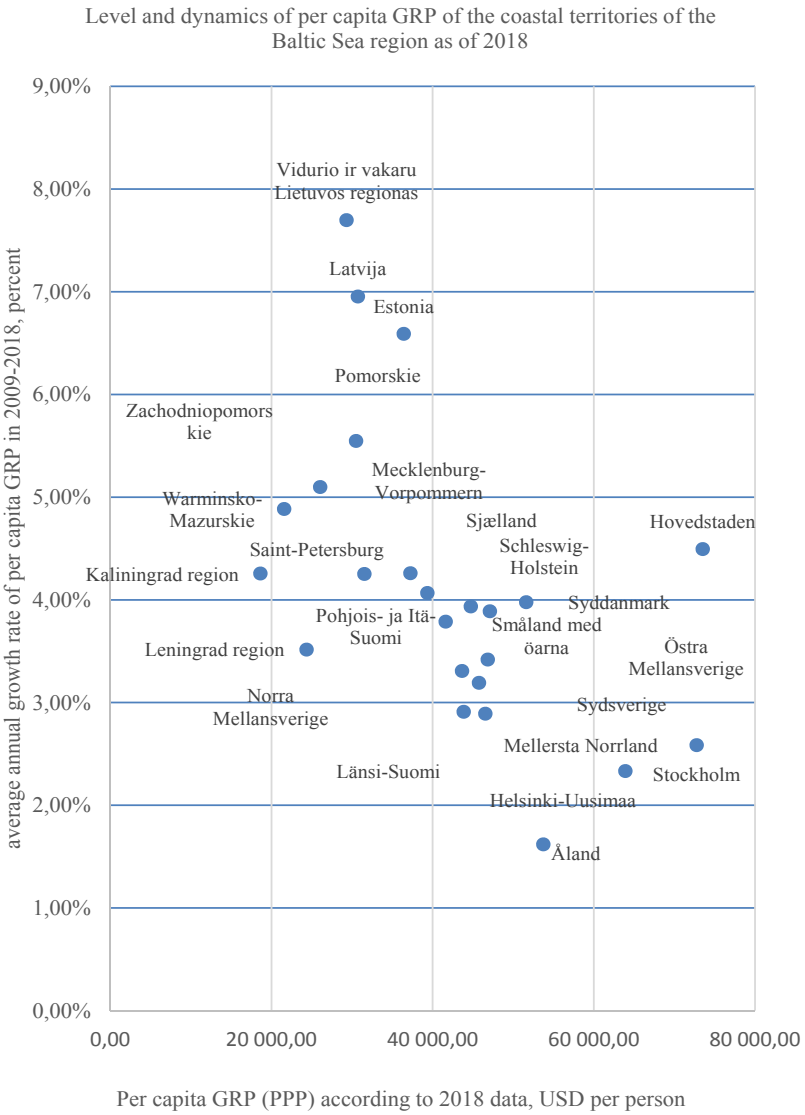

Fig. 1. Level and dynamics of per capita GRP in the coastal territories of the Baltic Sea region as of 2018

Source: authors' calculations based on data from Rosstat[15],[16] Eurostat[17], OECD[18]

[15] Purchasing Power Parity, 2020, Assessment of Russia's GDP in a Single Currency Based on the Results of International Comparisons, *Rosstat*, 8 Apr 2020, available at: https://rosstat.gov.ru/free_doc/new_site/vvp/ocenka-vvp.htm (accessed 09.01.2021).

[16] Gross regional product per capita, 2020, *EMISS*, available at: https://fedstat.ru/indicator/42928 (accessed 09.01.2021).

[17] Euro / ECU exchange rates annual data, Gross domestic product (GDP) at current market prices by NUTS 3 regions, Average annual population to calculate regional GDP data (thousand persons) by NUTS 3 regions, 2020, *Eurostat*, available at: https://ec.europa.eu/eurostat/data/database (accessed 30.08.2020).

[18] Purchasing power parities (PPP), 2020, *OECD iLibrary*. doi: 10.1787/1290ee5a-en (accessed 18.10.2020).

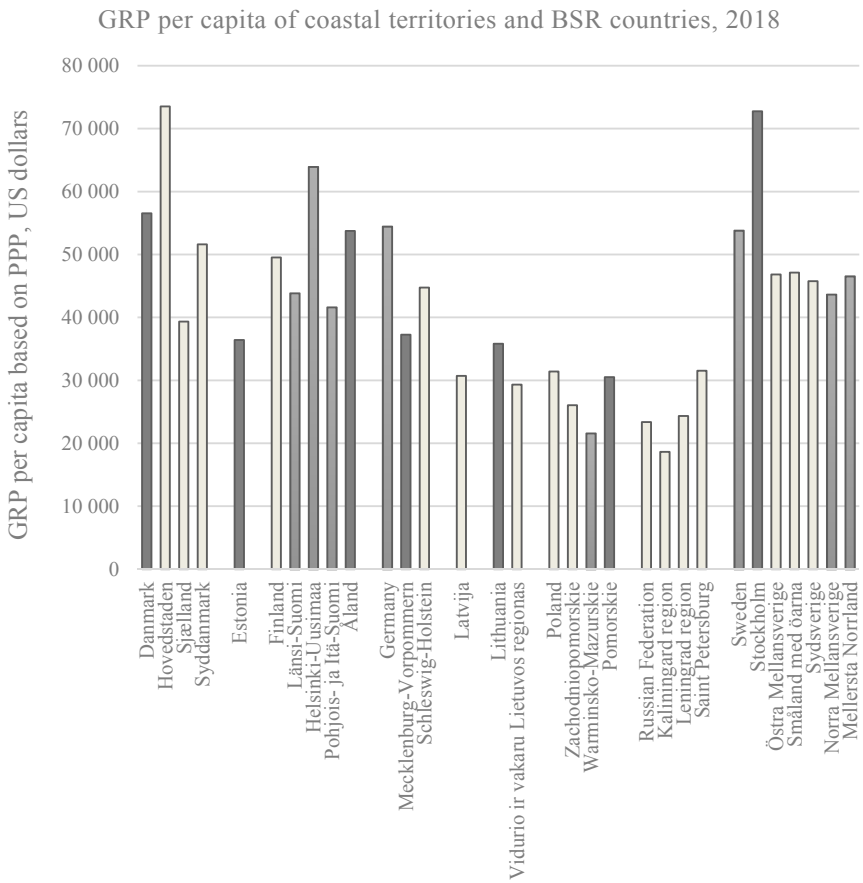

Fig. 2. GRP per capita in coastal territories and countries of the Baltic Sea region, 2018, USD

Source: authors' calculations based on data from Rosstat[19],[20] Eurostat[21], OECD[22]

To calculate the indicator for the constituent entities of the Russian Federation, the GRP value was adjusted for purchasing power parity (PPP) index (Russian roubles per US dollar). To calculate the indicator values for the EU, the OECD PPP index (euro per the US dollar) was adjusted for the exchange rate of national currencies (for Denmark, Poland and Sweden).

[19] Purchasing Power Parity, 2020, Assessment of Russia's GDP in a Single Currency Based on the Results of International Comparisons, *Rosstat*, 8 Apr 2020, available at: https://rosstat.gov.ru/free_doc/new_site/vvp/ocenka-vvp.htm (accessed 09.01.2021).

[20] Gross regional product per capita, 2020, *EMISS*, available at: https://fedstat.ru/indicator/42928 (accessed 09.01.2021).

[21] ECU exchange rates annual data, Gross domestic product (GDP) at current market prices by NUTS 3 regions, Average annual population to calculate regional GDP data (thousand persons) by NUTS 3 regions, 2020, *Eurostat*, available at: https://ec.europa.eu/eurostat/data/database (accessed: 30.08.2020).

[22] Purchasing power parities (PPP), 2020, *OECD*.doi: 10.1787/1290ee5a-en (accessed 18.10.2020).

For the study, the development level of the coastal territories was compared to the national average. The basis for comparison was PPP-adjusted per capita GRP as of 2018 (Fig.2).

The comparative analysis based on the per capita GRP reveals significant differences in the level and dynamics of economic development of the coastal territories in the BSR. Those of the Baltic States, Poland and the Russian Federation have the lowest level of PPP-adjusted GRP. For instance, in the Kaliningrad region (Russia), its value is almost 4 times less than in the Danish region of Hovedstaden (as of 2018). However, in the Baltics and Poland, its growth rates were the highest, while the coastal territories of Scandinavia had the lowest, which stems from the differences in the baseline values for the indicator.

At the same time, with the exception of the territories home to cities which historically played a major economic role (St. Petersburg, Hovedstaden (Copenhagen), Stockholm, Helsinki) and the Aland region, the PPP-adjusted GRP per capita in the coastal territories of the BSR is significantly lower than the average for the corresponding country or macroregion.

This indicates that economic activities are mainly taking place in the inland, landlocked territories of the BSR countries. This contradicts the idea of the positive impact of the coastal location and direct access to the sea on the economic growth and development of territories, proved in a recent study based on the maritime shipping data [42].

A possible explanation for this situation is the fact that most of the coastal territories of the BSR are peripheral and mainly rural. They are characterized by a low and continuing decline in the population, as well as a relatively high level of unemployment. Employment opportunities for medium and highly skilled professionals there are extremely limited. A probable explanation is that the local sectors of the blue economy could not withstand international competition in the context of globalization (in particular, sea freight and shipbuilding). A significant part of industries produces goods having low added value (for example, fishing and fish processing)[23].

The revealed lag in the level and rate of economic development of the coastal territories of the Russian Federation, the Baltic States and Poland poses a threat to their sustainability and the sustainability of the Baltic Sea Region in general. This should stimulate the adoption of coordinated measures on the accelerated transfer of the BSR industries to new digital-based technologies. As Cetin, Irak and Kahyaoglu emphasize, increasing the role of the blue economy

[23] Eurostat regional yearbook 2020, 2020, *Eurostat*, available at: https://ec.europa.eu/eurostat/documents/3217494/11348978/KS-HA-20—001-EN-N.pdf/f1ac43ea-cb38—3ffb-ce1f-f0255876b670 (accessed 08.01.2020).

in achieving the SDGs, which the authors call 'maritimization', requires systematic planning and management [43], the organizational and technological basis of which is digital transformation.

Sources of sustainable economic development in the BSR

The stability of the economic development of a territory is largely determined by its unique features and resources [18; 44]. For coastal territories, these are primarily coastal-marine ones: aquatic biological, mineral, tourist and recreational resources, ice-free ports. They provide opportunities for the development of maritime activities, or the blue economy. Both Russian[24][25] and EU legislation emphasize its significance. For instance, it is one of the directions of the future EU Horizon Europe Strategy[26], blue economy industries are the main areas of activity in the BSR strategy[27].

As of 2018, in the EU, the blue economy sectors accounted for about 2.2% of the total employment, and the gross value added was 1.5% of the European average[28]. At the same time, the blue economy is promising in terms of value added and employment. The blue economy sectors include[29] marine living resources (fishing, aquaculture, processing, distribution), marine non-living resources (oil, gas, other minerals), marine renewable energy (offshore wind energy), port activities (cargo and warehousing, port facilities, infrastructure projects), shipbuilding and repair, maritime transport (passenger, freight transport and services), coastal tourism (accommodation, transport, other services); ocean energy (floating offshore wind, wave and tidal energy, floating solar pho-

[24] *On Methodological Recommendations for the Development of the Coastal-Sea Component of the Strategy for Socio-Economic Development of the Primorsky Subject of the Russian Federation. <Letter> Ministry of Economic Development of Russia dated 11.10.2013 N D17i-904,* 2013, available at: http://www.consultant.ru/cons/cgi/online.cgi?base=EXP&dst=100001&n=568765&req=doc#03239287579437973 (accessed 31.08.2020).

[25] *On the Strategy for the Development of Maritime Activities of the Russian Federation until 2030. Order of the Government of the Russian Federation of August 30, 2019 No. 1930-r.* 2019, available at: http://static.kremlin.ru/media/acts/files/0001201705100002.pdf (accessed 30.08.2020).

[26] The EU Blue Economy Report 2020, 2020, *European Union*, Luxembourg. doi: 10.2771 / 363293.

[27] *EU Strategy for the Baltic Sea Region*, 2020, available at: https://www.balticsea-region-strategy.eu/about/implementation (accessed: 26.12.20)

[28] The EU Blue Economy Report 2020, 2020, *European Union*, Luxembourg. doi: 10.2771 / 363293.

[29] The EU Blue Economy Report.2020, 2020, *European Union*, Luxembourg. doi: 10.2771 / 363293

tovoltaic energy and offshore hydrogen generation), blue bioeconomy and biotechnology, marine minerals (deep seabed mining), marine engineering (submarine cables).

The successful development of all these sectors requires innovations, they are currently the key to the competitiveness and hence economic sustainability of a territory [45]. For example, blockchain technology is now increasingly used to improve the efficiency of logistics and to increase the transparency of financial transactions in maritime transportation. The Internet of Things is used to manage port traffic and warehouses [46]. Researchers call digital transformation a major driver of port development [47,48]. In coastal tourism, the augmented reality technology expands the possibilities of cultural and historical tourism, and the development of 'smart destinations' creates new business opportunities and new jobs [49]. In marine engineering, autonomous vessels are an efficient and safe option for monitoring submarine pipelines. Fishing harnesses artificial intelligence in acoustic and video technologies. A detailed overview of digital technologies and innovative solutions created on their basis in the blue economy sectors, presented in the OECD report[30], indicates that their implementation can significantly increase the sustainability of the economic development in the BSR. By accelerating the implementation of all business processes, rationalizing logistics and optimizing the spatial movement of resources and products, they can considerably lower costs, improve the quality of services, create new jobs, as well as substantially reduce harmful emissions minimizing the carbon footprint of transport operations.

The benefits of digital transformation in the blue economy drive interconnected innovations across industries and sectors. For example, the development of offshore wind energy (floating platforms) and the introduction of digital solutions in this area will have a positive impact on port and shipbuilding activities, as well as on marine equipment suppliers and operators[31]. Innovations in aquaculture farming leading to increased productivity while minimizing negative environmental effects will have a beneficial economic impact on the downstream and upstream activities — the fish processing industry and production of aquaculture feed. These sectors will grow creating new jobs and contributing substantially to the regional budget. It is planned to move aquaculture farms further off the coast to reduce their negative impact on the environment and

[30] Rethinking Innovation for a Sustainable Ocean Economy, 2020, *OECD*, Paris. 2020.doi: 10.1787/9789264311053-en.

[31] Powering the next generation of green energy in the Baltic Sea Region, 2020*, European Commission*, available at: https://ec.europa.eu/regional_policy/en/projects/Estonia/powering-the-next-generation-of-green-energy-in-the-baltic-sea-region (accessed 29.12.2020).

because of the competition for territory with other sectors [50]. Consequently, there is a need for designing new stable structures that would provide access to the facilities for monitoring, harvesting and maintenance, which will also require the development of autonomous vessels.

Several studies have indicated that there is a lack of comprehensive research into the cross-sector impact of digital technologies in the blue economy [51,52]. However, as the above examples show, the sustainable development of the blue economy sectors, and, accordingly, of coastal territories, turns out to be directly related to their readiness to implement digitally-driven innovations[32].

A prerequisite for the dissemination of digital solutions in business and personal consumption is the development of the information and communication technology (ICT) infrastructure in the coastal territories of the BSR and the connection of users to relevant services. The level of digitalization is assessed using composite indicators, including the Digital Economy and Society Index (DESI)[33], the IMD World Digital Competitiveness framework[34], the National Digital Economy Development Index[35] and others[36]. However, they cannot be used within this study as the required data are mostly provided at the national level rather than subnational.

Due to the specifics of the EU statistics, currently, it is only possible to compare the digitalization levels of the coastal territories of the BSR using data on the share of households having access to broadband Internet (although the data for the Polish coastal territories are not available) (see Table1).

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[32] Towards a blue-green economy in the Baltic Sea Region, 2020, *SUBMARINER* Network, available at: https://www.submariner-network.eu/submariner-roadmap (accessed: 07.01.2021).

[33] Digital Economy and Society Index (DESI) 2020, 2020, *EU4Digital*, available at: https://eu fordigital.eu/ru/library/digital-economy-and-society-index-desi-2020/ (accessed 14.12.2020).

[34] *The IMD World Digital Competitiveness Ranking 2020 results. Methodology IMD,* 2020, available at: https://www.imd.org/wcc/world-competitiveness-center-rankings/world-digital-competitiveness-rankings-2020/ (accessed 14.12.2020).

[35] National Index of Digital Economy Development, 2020, *Digital Economy 2024*, available at: https://digital.ac.gov.ru/poleznaya-informaciya/4210/ (accessed 18.12.2020).

[36] Abdrakhmanova, G. I., Vishnevsky, K. O., Gokhberg, L. M. et all (eds.) 2019, *Indicators of the digital economy: 2020: statistical collection*, Nat researched University "Higher School of Economics", Moscow, p. 42, available at: https://www.hse.ru/primarydata/ice2020 (accessed 16.12.2020).

Table1

Share of households having broadband Internet
(percentage, value of the indicator for a year), 2009-2018

Territory	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Danmark	*76*	*80*	*84*	*85*	*87*	*85*	*84*	*92*	*92*	*90*
Hovedstaden	80	83	86	86	87	89	83	93	93	91
Sjælland	71	76	82	84	86	86	86	91	89	89
Syddanmark	74	80	80	81	85	82	87	89	92	88
Estonia	*61*	*64*	*65*	*73*	*78*	*81*	*87*	*85*	*87*	*89*
Finland	*74*	*76*	*81*	*85*	*88*	*89*	*90*	*91*	*93*	*93*
Manner-Suomi	74	76	81	85	88	89	90	91	93	93
Länsi-Suomi	69	72	80	84	85	88	87	88	92	93
Helsinki-Uusimaa	N/A	N/A	N/A	90	92	93	95	95	98	96
Etelä-Suomi	N/A	N/A	N/A	83	88	88	86	93	91	91
Pohjois- ja Itä-Suomi	70	75	79	81	86	86	88	89	92	91
Åland	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Germany	65	75	78	82	85	87	88	90	92	90
Mecklenburg-Vorpommern	56	57	67	71	75	78	84	89	85	89
Schleswig-Holstein	71	81	79	80	86	88	89	90	88	90
Latvija	50	53	59	67	70	73	74	75	76	79
Lithuania	50	54	56	60	64	65	67	71	75	78
Vidurio ir vakaru Lietuvos regionas	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	77
Poland	51	57	61	67	69	71	71	76	78	79
Makroregion Pólnocno-Zachodni	55	61	67	68	71	70	70	76	78	81

Makroregion Pólnocny	53	59	61	65	70	72	70	74	79	82
Russian Federation	57	57	57	57	57	64	67	71	73	73
Northwestern Federal District	73	73	73	73	73	73	77	77	75	77
Kaliningrad Region	73	73	73	73	73	73	71	74	76	71
Leningrad region	74	74	74	74	74	74	74	73	68	73
St Petersburg	84	84	84	84	84	84	86	85	83	85
Sweden	79	83	86	87	N/A	87	83	89	93	91
Östra Sverige	82	85	89	88	N/A	88	84	90	95	92
Stockholm	84	87	91	89	N/A	88	85	90	96	93
Östra Mellansverige	79	82	86	85	N/A	88	82	89	93	91
Södra Sverige	79	82	84	87	N/A	87	82	89	91	93
Småland med öarna	75	78	84	86	N/A	85	76	83	89	91
Sydsverige	80	84	87	88	N/A	85	80	93	90	94
Norra Sverige	76	79	82	85	N/A	81	83	85	94	87
Norra Mellansverige	78	80	80	83	N/A	78	78	87	88	89
Mellersta Norrland	73	75	82	84	N/A	84	85	82	100	80

Source: Rosstat[37], Eurostat[38]

Note: italic is used for country data, bold for macroregions

[37] *Socio-economic indicators for the constituent entities of the Russian Federation: app. to stat. collection. Regions of Russia. Social and economic indicators Rosstat,* 2020, available at: https://www.gks.ru/folder/210/document/47652 (accessed 14.08.2020).

[38] *Eurostat*, 2020, available at: https://ec.europa.eu/eurostat/data/database (accessed 25.08.2020).

The data in Table 1 show that in the last decade the share of households having broadband Internet access in the coastal territories of the EU has significantly increased due to considerable investments into infrastructure development. This work will be continued within the framework of the Digital Europe project[39]. Estonia, Latvia, Lithuania, the Swedish region of Mellestra Norland as well as the coastal regions of the Russian Federation had the lowest indicator values. Although there has been a positive trend in the indicator in the first four territories since 2007, in the coastal territories of the RF (unlike the rest of the country) the share of households with broadband Internet access remained the same. A possible reason for this is a continuous population growth (despite the natural decline) due to a positive migration balance, a significant part of which is accounted for by those arriving from other regions of the country[40]. In addition, there has been an increase in the number of Internet connections via smartphones in Russia[41]. However, statistics on the use of mobile Internet in individual NUTS2 territories in the EU are not currently available.

Since digitalization creates technological conditions for greater sustainability of the BSR's economic development, its further growth, including the development of digital infrastructure, which allows the introduction of flexible and adaptive technologies aimed at the careful use of natural resources, should be a priority for the territories.

Conclusion

The current period of increased uncertainty makes monitoring the achievement of sustainable development goals at the meso-level especially important. This is corroborated by the EU and the RF legislation.

[39] The Digital Europe Programme, 2020, *European Commission*, available at: https://digital-strategy.ec.europa.eu/en/activities/digital-programme/ (accessed 06.01.2021).

[40] Regions of Russia. Social and economic indicators Rosstat, 2020, available at: https://gks.ru/bgd/regl/b20_14p/Main.htm (accessed 30.03.2021).

[41] "Digital Economy: 2021", 2021, *ISSEK HSE. News*, available at: https://issek.hse.ru/news/420475066.html (accessed 16.03.2021).

The comparative analysis of the level and changes in the economic development of the coastal territories of the BSR shows that the Polish, Baltic and Russian territories lag in terms of per capita GRP. This poses a threat to the sustainability of these territories and the BSR in general. To overcome the gap and create the prerequisites for future sustainability, it is necessary to harness the potential of the blue economy.

As the review of publications has shown, to date, numerous digital solutions and innovative developments aimed at increasing the competitiveness of economic entities in the blue economy in the BSR have been implemented. This results in its increased contribution to the creation of added value and new jobs, including those in related industries and sectors. At the same time, digital transformation optimizes the movement of resources and products and helps to reduce carbon footprint. Thus, it allows resolving the conflict between the current production of goods and the preservation of resource potential for the future, thus contributing to the achievement of the SDGs.

The analysis of literature shows that digital transformation has the following beneficial effects on the competitiveness of the blue economy sectors: cost reduction through, for example, the use of the Internet of Things in port management, improved quality of products and services, in particular, due to the use of augmented reality in tourism or distributed ledger in maritime transport and logistics, improved life safety through, for example, the use of autonomous vessels to monitor the condition of aquafarms and underwater pipelines.

The analysis of data characterizing the prerequisites for the dissemination of digital solutions among users living in the coastal territories of the BSR shows that accelerated investment in the development of ICT infrastructure and comprehensive support for the development of new products and services should be considered among the most important measures aimed at accelerating the digital transformation of industries and sectors of the territories.

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