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Enhancing Sustainable Blue Economy Strategies: A Comprehensive Analysis of the Baltic Sea Region's Policy, Practices, and Innovations

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ABSTRACT

The sustainable blue economy in the Baltic Sea Region (BSR) has become a focal point for balancing economic growth with environmental stewardship. Originating from the broader concept of sustainable development, the blue economy emphasizes the sustainable use of marine resources to drive economic and social progress. This research investigates the key challenges and opportunities faced by the blue economy in the BSR and assesses the effectiveness of the European Union Strategy for the Baltic Sea Region (EUSBSR) in addressing these issues. Challenges in the BSR's blue economy include environmental degradation, technological integration, and the need for coordinated governance across national borders. The region also faces sector-specific challenges such as the decarbonization of maritime transport, sustainable coastal tourism, and the expansion of aquaculture within environmental limits. However, there are significant opportunities as well, particularly in leveraging technological advancements, fostering innovation, and exporting successful blue economy practices globally. To provide a concrete example, the research includes a case study of Denmark's approach to the blue economy. Denmark has made significant strides in offshore wind energy, sustainable fisheries, and maritime innovation, showcasing how targeted national strategies can align with broader regional goals. The Danish case highlights both the successes and ongoing challenges in achieving sustainable blue growth, offering valuable lessons for other BSR countries. The EUSBSR, launched in 2009, has played a pivotal role in fostering regional cooperation and promoting sustainable blue growth. Through initiatives such as Maritime Spatial Planning (MSP) and targeted funding programs, the strategy has addressed some of the critical challenges, particularly in improving governance and encouraging sustainable practices. However, the effectiveness of the EUSBSR in fully realizing the potential of the blue economy remains contingent on further integration of policies, enhanced stakeholder engagement, and continued innovation. The conclusion will discuss the pathways for optimizing the blue economy in the BSR, focusing on strategic recommendations for overcoming existing challenges and capitalizing on emerging opportunities, with insights drawn from the Danish experience.

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1. Introduction

The concept of the blue economy has emerged as a crucial framework for fostering sustainable economic development within the context of marine and coastal environments. As global attention increasingly shifts towards the sustainable utilization of ocean resources, the Baltic Sea Region (BSR) stands out as a unique case study due to its ecological sensitivity, economic significance, and geopolitical complexity. The blue economy in this region encapsulates a diverse range of activities, from maritime transport and offshore energy production to fisheries, tourism, and marine biotechnology. However, the sustainable development of these sectors is fraught with challenges, including environmental degradation, regulatory fragmentation, and the need for cross-border cooperation. At the same time, the BSR presents significant opportunities for innovation, particularly in areas such as renewable energy and sustainable aquaculture, which could serve as models for other regions. This paper seeks to investigate the key challenges and opportunities associated with the blue economy in the BSR and critically assess the effectiveness of the European Union Strategy for the Baltic Sea Region (EUSBSR) in addressing these issues. The EUSBSR, established in 2009, is a pioneering macro-regional strategy aimed at enhancing cooperation among the BSR countries to address common challenges and leverage collective strengths. “What are the key challenges and opportunities for the blue economy in the Baltic Sea Region, and how effectively has the EUSBSR addressed these issues?” This question serves as the guiding thread throughout the paper, directing the analysis of both regional dynamics and strategic responses. This study employed a comprehensive analysis of the blue economy within the Baltic Sea Region (BSR) through a multi-faceted approach. The research involved a review of key policy documents, including the European Union Strategy for the Baltic Sea Region (EUSBSR) and relevant communications from the European Commission. These documents provided foundational insights into the evolving concepts of blue growth and sustainable blue economy. To assess the current status of the blue economy in the BSR, quantitative data from the EU Blue Economy Report 2021 and other relevant studies were used. This data was analyzed using statistical techniques to evaluate sectoral contributions, economic impact, and employment trends within the blue economy. Descriptive statistics were used to quantify the contributions of different sectors, while trend analysis helped identify patterns over time. Additionally, case studies, particularly Denmark’s advancements in offshore wind energy and sustainable fisheries, were examined to identify successful practices and technological innovations. Qualitative methods included thematic analysis of recent strategic frameworks and reports, such as the Baltic Blue Growth Agenda and the HELCOM-VASAB MSP Roadmap. This approach allowed for the extraction of key themes related to environmental challenges and opportunities, leading to actionable recommendations for enhancing the EUSBSR's impact on sustainable blue economy development.

The first section of the paper delves into the concept of the blue economy, tracing its evolution from a niche idea within environmental economics to a central pillar of sustainable development policies. This section provides a theoretical framework for understanding the blue economy, discussing its various components and their relevance to the BSR. It also examines the region's unique characteristics, including its ecological vulnerability and the economic importance of its maritime sectors. Following this theoretical foundation, the second section addresses the specific challenges faced by the blue economy in the BSR. These challenges are categorized into environmental, technological, and governance-related issues. The environmental challenges are primarily concerned with pollution, habitat destruction, and the impacts of climate change. Technological challenges involve the integration of innovative solutions into traditional sectors, while governance challenges focus on the need for coordinated policies across national borders and sectors. The third section explores the opportunities that the blue economy presents for the BSR. This section emphasizes the potential for technological innovation, sustainable practices, and regional cooperation to transform the BSR into a model of sustainable blue growth. It also discusses the role of the EUSBSR in

facilitating these opportunities, particularly through initiatives that promote Maritime Spatial Planning (MSP) and foster innovation in key sectors. To ground the discussion in practical terms, the fourth section presents a case study of Denmark's approach to the blue economy. Denmark's experience in offshore wind energy, sustainable fisheries, and maritime innovation is examined as an example of how national strategies can align with broader regional goals. The case study highlights both the successes and the challenges faced by Denmark in its pursuit of sustainable blue growth, offering valuable insights for other BSR countries.

The paper concludes with a critical assessment of the EUSBSR's effectiveness in addressing the identified challenges and seizing the opportunities within the BSR's blue economy. Recommendations for enhancing the strategy's impact and fostering more robust regional cooperation are presented, with particular attention to the lessons learned from the Danish case study. By synthesizing these insights, the paper aims to contribute to a deeper understanding of how the BSR can achieve sustainable blue growth in an era of increasing environmental and economic uncertainty.

2. Background and Framework

In the following chapter, we will examine the European Union Strategy for the Baltic Sea Region (EUSBSR), focusing on its maritime dimensions, the current status of the sustainable blue economy within the region, and the policies aimed at fostering sustainable development and addressing regional challenges.

2.1. From Blue Growth to Sustainable Blue Economy

The concept of blue growth has its origins in the broader idea of sustainable development (SD), which emerged as a key global concern in the 1960s. Sustainable development, focusing on the challenge of balancing the sustainable use of natural resources with economic and social objectives, has been central to international discourse. Three major international conferences have shaped the development of the SD concept: the environmental/resource dimension was first emphasized at the United Nations (UN) Conference on the Human Environment in Stockholm in 1972; the economic dimension took center stage at the Earth Summit in Rio de Janeiro in 1992; and the social dimension was highlighted at the World Summit on Sustainable Development in Johannesburg in 2002. Leading up to the 2012 UN Conference on Sustainable Development (Rio+20), the "green growth" concept emerged in response to the global financial crisis (Najam A. and Cleveland C., 2003). The OECD defines green growth as promoting economic development while ensuring that natural assets continue to sustain human well-being. Recognizing the focus on terrestrial ecosystems within green growth, Small Island Developing States (SIDS) advocated for the "blue economy," which emphasizes the economic and social significance of oceans and inland waters (Ababouch L. and Carolu C., 2015) This advocacy led to the emergence of the "blue growth" concept, underscored by the Food and Agricultural Organization (FAO) during the Rio+20 conference, which stressed that healthy ocean ecosystems, supported by sustainable aquaculture and fishing practices, are essential for blue growth.

Since Rio+20, the blue growth concept has gained traction globally, influencing aquatic development initiatives at both national and international levels. The FAO launched its Blue Growth Initiative, aiming to restore the potential of aquatic ecosystems through sustainable practices that balance economic growth with food security and conservation (Brundtland G. and M. Khalid, 1987). Similarly, the European Union's blue growth strategy has highlighted the importance of marine areas for innovation and economic development, with a focus on five

key sectors and greater emphasis on marine spatial planning and coastal protection (COM, 2014; Legat A. et al., 2015).

On 17 May 2021, the European Commission released a communication designed to integrate ocean policy into Europe's new economic framework, ensuring that the 'blue economy' plays a significant role in advancing the European Green Deal (EGD). This communication challenges the traditional divide between environmental protection and economic growth, advocating instead for a fundamental shift from 'blue growth' to a 'sustainable blue economy'. To achieve this transition, it is crucial that economic activities in marine and coastal areas minimize their overall impact on the marine environment. Additionally, value chains must evolve to support climate neutrality, eliminate pollution, adopt a circular economy, prevent waste, enhance marine biodiversity, bolster coastal resilience, and promote responsible food systems. The blue economy concept presents inherent conflicts of interest: some research emphasises the promotion of growth and development, while other studies prioritise the protection of ocean resources (Martínez-Vázquez et al., 2021). The recent European Commission communication on adopting a new strategy for a sustainable blue economy defines the blue economy as including "all industries and sectors connected to oceans, seas, and coasts, whether they operate within the marine environment or on land" (EC, 2021a).

2.2. EUSBSR

The European Union Strategy for the Baltic Sea Region represents a collaborative framework between the EU member states that border the Baltic Sea and the European Commission. It aims to enhance regional cooperation and develop shared solutions to common challenges faced by the area.

The EU countries involved in the EUSBSR are Sweden, Denmark, Estonia, Finland, Germany, Latvia, Lithuania and Poland. This Strategy is built around three primary goals:

- Save the Sea
- Connect the Region
- Increase Prosperity

To fulfil these goals, the Strategy's Action Plan outlines key actions that need to be undertaken. These actions are organised into thematic Policy Areas (PAs), each addressing different facets of the objectives and contributing to their achievement in various ways. Approved by the European Council in 2009, following a proposal from the European Commission, the Strategy was the first of its kind among macro-regional strategies. It was designed to serve as a distinctive platform for fostering cooperation and coordination through an open, transparent process that emphasises inclusivity and multi-level governance. The Strategy aims to streamline efforts by improving the allocation of responsibilities and minimizing redundancies among regional networks and organisations.

The Strategy itself does not have a dedicated funding mechanism. Instead, it operates on the principle of macro-regional cooperation, which involves optimising the use of existing financial resources and fostering synergies and complementarities among various funding sources. Regional partners can leverage funds from EU cohesion resources, other EU programmes and financial instruments, as well as various international financial entities. As noted in the 2009 Council Conclusions, the Strategy is financially neutral, relying on a coordinated approach that capitalises on synergistic effects and more efficient use of existing EU resources and other financial instruments. Key funding sources for the Strategy include the European Social Fund Plus, the European Regional Development Fund, the Cohesion Fund, the European Agricultural Fund for Rural Development, and the European Maritime and

Fisheries Fund. Additionally, actions and projects under the Strategy and its Action Plan may also be supported by other financial sources such as Horizon Europe, the LIFE programme, education and culture initiatives, as well as various cross-border and regional programmes like the Interreg Baltic Sea Region Programme, along with national, regional, and private funding sources. By enhancing cooperation and ensuring efficient resource allocation, the EUSBSR supports a comprehensive and sustainable approach to blue growth, addressing both environmental and economic dimensions of the Baltic Sea region.

2.2.1 Blue economy in the EUSBSR

In examining the Baltic Sea as a central element unifying the Baltic Sea Region, the data collected from the revised European Union Strategy for the Baltic Sea Region (EUSBSR, 2013) revealed a significant maritime component. Approximately 32% of all actions within the strategy had a direct maritime focus, and 47% of the 174 flagship projects were either highly or partially maritime in nature.

While nearly all Priority Areas (PAs) and Horizontal Actions (HAs) incorporated some maritime elements, the allocation of maritime flagship projects across different objectives showed an uneven distribution. Maritime issues tended to be more prominent in PAs related to the "Save the Sea" objective, but their significance diminished in areas associated with "Increase Prosperity." Furthermore, the designation of projects as "highly maritime" did not necessarily correlate with a strong emphasis on Blue Growth. In many cases, maritime flagship projects within the EUSBSR primarily addressed environmental concerns rather than explicitly aiming to foster Blue Growth. Blue Growth often appeared as an incidental benefit rather than a core objective. Despite the fact that Blue Growth was introduced as a concept only recently at that point of time, the EUSBSR effectively covered most maritime economic sectors, with the notable exception of yachting and marinas.

In the 2021 action plan, the primary focus remains on the “Save the Sea” goal, with most of the initiatives across the 14 policy areas aligned to support this aim. Notably, areas such as Nutri, Hazards, Bioeconomy, Safe, Ship, Transport, Energy, Spatial Planning, and Secure are particularly instrumental in advancing this objective. The updated 2021 action plan brings the EUSBSR into closer alignment with the European Green Deal and the EU’s goal of achieving climate neutrality by 2050. This alignment mandates that all policy areas adhere to EU climate and environmental policies. Additionally, it incorporates principles such as “do no significant harm,” climate resilience, and preparedness, while also detailing how these policy areas contribute to the UN Sustainable Development Goals. Consequently, the plan integrates previous horizontal actions on climate change and cooperation with neighboring non-EU countries as fundamental aspects of all 14 policy actions. As the EUSBSR evolves, the policy areas are increasingly interconnected and interdependent, reflecting a more integrated approach to regional challenges.

2.3. Sustainable Blue Economy in the Baltic Sea Region: Current Status

According to the EU Blue Economy Report 2021, the Mediterranean region had the highest share of the blue economy’s Gross Value Added (GVA), accounting for 37% of the total EU GVA. This was followed by the Western Mediterranean at 31% and the North Sea at 25%. The Atlantic Ocean and the Baltic Sea had nearly equal shares, at 19.6% and 19.5%, respectively. In terms of employment, the Baltic Sea region ranks fifth among sea basins, representing 16.1% of blue economy jobs. Coastal tourism dominates the Baltic Sea region, contributing €11 billion in GVA and employing 0.35 million people in 2018. The maritime transport sector, while significant, has a slightly smaller GVA of €10 billion compared to coastal tourism. Despite a

diverse range of blue economy sectors and resources available in the Baltic Sea Region (BSR), maritime sectors account for only 1.6% of total employment (Mogila et al., 2021).

A study by Mogila et al. (2021) used shift-share analysis to explore the blue economy in the Baltic Sea EU member states—Denmark, Estonia, Finland, Germany, Latvia, Lithuania, Poland, and Sweden. The analysis identified positive total effects in maritime aquaculture in Denmark, shipbuilding in Germany and Sweden, and ship repair in Poland, Denmark, Lithuania, and Sweden. Further investigation into the impact of maritime policies and spatial planning on the blue economy is suggested (Mogila et al., 2021).

The blue economy, like many other sectors, is increasingly driven by technological advancements in digitalization and IT solutions. Since the release of the Baltic Blue Growth Agenda, the pace of innovation in this area has accelerated significantly. Despite the availability of numerous technological solutions, stakeholders have highlighted a gap in understanding how to maximize their potential. Effective coordination and a clear purpose are essential to leverage existing data and technology fully. Environmental protection is not a barrier to blue growth; rather, it serves as a major driver of innovation within the blue economy. The need to address environmental challenges and find sustainable solutions is fundamental to the long-term success of blue growth. This applies across various sectors, including the blue bioeconomy, tourism, and shipping. Green shipping, for example, is motivated not just by regulatory pressures but also by the potential to create higher-value port areas. However, sustainable solutions often come with higher short-term costs, posing a challenge for integrating these costs into consumer prices. Nonetheless, all maritime activities must adhere to an ecosystem-based approach that ensures sustainability and affordability. A recurring theme in stakeholder discussions is the potential for exporting successful blue economy solutions developed in the Baltic Sea region to other global markets. The Baltic Sea, with its relatively small scale, serves as an ideal testing ground for these solutions before they are scaled up. Exporting these innovations can drive broader economic growth, but this effort requires a strategic approach beyond individual projects. This applies not only to technological solutions but also to the regulatory frameworks that support them. For instance, while the International Maritime Organization (IMO) sets global standards for shipping, certain innovations can still be piloted at the Baltic Sea level before being implemented more widely. Securing the right funding and financing is crucial for advancing strategic actions within the blue economy. Stakeholders have pointed out that the issue is not a lack of finance but rather a mismatch in the types of available funding. There is a need for continuous support for strategic networks and platforms that foster collaboration across different communities. Additionally, there is a significant gap in market research and development, both within and outside the Baltic Sea region. Understanding consumer willingness to pay a premium for sustainable blue economy products is vital. Marketing campaigns, backed by adequate financing, are necessary to communicate the benefits of these products. However, market experts and retailers are currently underrepresented in blue economy projects and initiatives, highlighting an area that needs greater attention (ECORYS & S.Pro, 2017).

2.3.1 Sustainable Blue Economy Policies in the BSR

In 2014, a Sustainable Blue Growth Agenda was established for the Baltic Sea region (EC, 2014a). This agenda identified several promising sectors within the blue economy, including short sea shipping, coastal and cruise tourism, offshore wind energy, shipbuilding, aquaculture, and blue biotechnologies (EC, 2013). Among these, short sea shipping contributed the most significant gross value added (GVA), while coastal tourism and fish for human consumption provided the highest employment shares (EC, 2014a). The implementation strategy for this

agenda has since focused on enhancing the shipping industry, developing the blue bioeconomy (including aquaculture), promoting coastal and maritime tourism, and advancing environmental and monitoring technologies. Stakeholder dialogues have helped pinpoint strategic action areas and potential key players in these sectors, setting a vision for 2030 (ECORYS & S.Pro, 2017).

Cooperation frameworks, such as the EU Strategy for the Baltic Sea Region (EC, 2009), are crucial for supporting the blue economy. The Interreg Baltic Sea Region Programme funds projects within this area. For the funding period 2021-2027, the Programme's Objective 2.2 is dedicated to the blue economy under the Sustainable Waters priority. This objective focuses on several key areas: 1) promoting blue business initiatives, 2) facilitating the coordinated use of sea space while addressing potential conflicts, 3) enhancing the resilience of blue businesses, and 4) reducing their impact on climate change. The Programme supports projects across both emerging and established blue economy sectors, including aquaculture, blue biotechnology, shipping, fisheries, and coastal and maritime tourism. The aim is to foster synergies among these sectors, which often compete for the same resources and sea space. Blue economy-related initiatives align with various policy areas of the EU Strategy for the Baltic Sea Region, such as Innovation, Bioeconomy, Nutrition, Shipping, Safety, Security, Transport, Spatial Planning, Tourism, and Culture (EC, 2021b). Additionally, Programme Objective 3.2 focuses on energy transition, encompassing actions for decarbonising energy systems, improving energy efficiency, and investing in renewable energy in both urban and rural settings (Interreg BSR, 2021).

Maritime Spatial Planning (MSP) serves as a key tool for promoting a sustainable blue economy, offering an enabling framework for regional, transnational, and cross-sectoral cooperation (EC, 2021a). Adopted in 2014, the EU MSP Directive was to be implemented by March 2021 (EC, 2014b). This directive aims to harness maritime economic potential while ensuring long-term sustainability. The forthcoming planning cycle and evaluation of existing maritime spatial plans are set to commence soon.

To facilitate this process in the Baltic Sea region, the HELCOM-VASAB MSP working group has developed a Regional Maritime Spatial Planning Roadmap for 2021-2030. The Roadmap's objective is to "strengthen joint efforts and coherence across the Baltic Sea Region to implement Maritime Spatial Plans, promoting sustainable regional development and establishing a solid foundation for an adaptive MSP process using an ecosystem-based approach" (HELCOM-VASAB MSP, 2021). Objective 4 of the Roadmap focuses on enhancing the contribution of MSP to a sustainable blue economy. Actions include: 1) sharing best practices for sectoral sustainable development, 2) analysing ecosystem services and the link between environmental and socio-economic dimensions, 3) encouraging participatory and transparent processes with all sea stakeholders, and 4) updating future-oriented reports on marine and maritime activities and developments.

3. Case Study: Denmark

In 2021, Denmark's established Blue Economy sectors employed approximately 98,000 individuals, generating about €13.1 billion in Gross Value Added (GVA). These sectors play a significant role in the Danish labor market, accounting for around 3.4% of the national workforce, up from 3.2% in 2020, though still below pre-pandemic levels of 4.7%. However, the contribution of Blue Economy sectors to Denmark's overall GVA has seen a decline, dropping from 4.9% in 2020 to 4.4% in 2021.

Coastal tourism remains the largest employer within Denmark's Blue Economy, representing 48% of blue jobs in 2021. This sector has been on a downward trend, with its share decreasing

from 65% before the COVID-19 pandemic to 53% in 2020. Despite employing the most people, coastal tourism contributes less than 11% to the national Blue Economy GVA in 2021. In contrast, maritime transport has become the dominant sector in terms of GVA, generating 59% in 2021, up from 58% in 2020 and 43% in 2019 (Blue Economy Observatory-Denmark).

In 2021, Denmark ranked as the EU's second-largest contributor in terms of Gross Value Added (GVA) within the Maritime Transport and Marine Non-living Resources sectors. Additionally, Denmark holds the top position in employment for Marine Non-living Resources and ranks fourth in the EU for employment in Maritime Transport. Among Denmark's busiest container ports, the Port of Århus stands out, ranked as the 95th busiest in the EU by gross weight of goods handled. The Port of Rødby (Færgehavn) and the Port of Statoil-Havnen follow, ranked 101st and 111th, respectively. Regarding passenger traffic, Helsingør (Elsinore) is Denmark's leading port, ranked 14th busiest in the EU in 2021. It is followed by Sjællands Odde, ranked 18th, and the Port of Århus, ranked 19th.

Danish domestic shipping generates around 0.8 million tons of CO2 emissions annually, which includes emissions from ferries, fishing vessels, and ships operating between Danish ports. On a larger scale, emissions from Danish international shipping reach approximately 38 million tons of CO2e (Danish Government Climate Partnership). To meet Blue Denmark’s CO2e emission reduction goals, several significant challenges must be addressed over the next decade:

Global Competitiveness and Regulation: Shipping operates in a highly competitive global market and is sensitive to national regulations. The International Maritime Organization (IMO) serves as the only global regulatory body for the world’s fleet, making it crucial for ensuring substantial global emission reductions while maintaining fair competition.

Technological Advancement: The shipping industry must undergo a technological transformation by shifting from traditional fuels to climate-neutral alternatives to achieve meaningful emission reductions.

Energy System Upgrades: Significant upgrades to national and global energy systems are required to ensure a consistent supply of green fuels for the maritime sector.

Port Infrastructure Enhancement: Land-based energy infrastructure in ports must be modernized to accommodate new green fuels or batteries, supporting the transition to more sustainable shipping practices.

The shift towards a more sustainable shipping industry presents a significant challenge. As a prominent maritime nation, Denmark is committed to leading by example, demonstrating that its merchant fleet—whether ferries, fishing boats, or ocean-going vessels—can achieve climate neutrality. The climate partnership's vision is to position Denmark as a global frontrunner in the decarbonization of shipping, contributing to the Danish government's goal of a 70 percent emissions reduction. This ambitious transition demands a coordinated effort both nationally and globally. The climate partnership for Blue Denmark has established two key targets, endorsed by stakeholders across the Danish maritime sector. The first goal is to achieve climate neutrality by 2050, without relying on carbon offsetting. The second is to have the first ocean-going zero-emission vessel in commercial operation by 2030. These objectives are notably more ambitious than the current global targets set by the International Maritime Organization (IMO).

In this context, the Capacity4MSP platform serves as a prime example of the EUSBSR's efforts to advance in the field. Maritime Spatial Planning is regarded in Europe as an essential instrument for fostering a Sustainable Blue Economy. It enables EU Member States to

effectively manage coastal and marine waters, minimizing conflicts, fostering synergies among human activities, and ensuring that these activities occur efficiently and safely (CINEA, 2023).

Projects represented in the platform:

- Interreg Baltic Sea Region: Baltic LINes | Baltic RIM | Baltic InteGrid | Baltic Blue Growth | Land-Sea-Act | Blue Platform
- Horizon 2020: MUSES
- BONUS: BASMATI | BaltSpace
- European Maritime and Fisheries Fund: Baltic SCOPE & Pan Baltic Scope
- Interreg South Baltic: SeaPlanSpace

The platform contributed to the Policy Area Spatial Planning. Among the partners, figures the Danish Aalborg University (AAU). The Capacity4MSP platform consolidated insights from various maritime spatial planning (MSP) projects and practices, both within and beyond the Baltic Sea Region (BSR), which were co-funded by Interreg, Horizon 2020, and the European Maritime and Fisheries Fund. This synthesis enabled the partners to produce a comprehensive report aimed at guiding national MSP decision-makers and policymakers in reviewing the effectiveness of current MSP frameworks. The report highlighted key recurring themes and proposed synergies, as well as criteria and indicators for evaluating the process, content, and performance of maritime spatial plans. The platform also played a crucial role in bringing together MSP authorities, planners, and sector-specific stakeholders to align MSP efforts across the region. Through collaborative discussions, they developed unified policy messages to promote regional consistency in MSP practices.

Complementing the existing HELCOM-VASAB working group, Capacity4MSP established the Planners Forum, a lasting mechanism for informal exchanges among maritime spatial planners in the BSR. This forum, now scheduled to meet at least twice a year, provides an ongoing platform for collaboration and knowledge sharing. The outcomes of the Capacity4MSP platform significantly influenced the development of new strategic policy documents under the VASAB and HELCOM-VASAB cooperation. These contributions were instrumental in shaping the future agenda for MSP in the region, including the new Regional Maritime Spatial Planning Roadmap 2021-2030, the HELCOM-VASAB MSP working group work plan for 2022-2024, and the update of the VASAB Long Term Perspective. Additionally, the project's findings were integrated into the work of the Spatial Planning policy area within the EU Strategy for the Baltic Sea Region, led by the Secretariats of VASAB and HELCOM

(Interreg Baltic Sea Region, Capacity4MSP).

4. Towards a More Sustainable, Blue Future

The examination of the blue economy in the Baltic Sea Region (BSR) reveals critical insights and actionable recommendations crucial for enhancing the European Union Strategy for the Baltic Sea Region (EUSBSR). Key findings underscore the pressing environmental challenges confronting the BSR, including pollution, habitat degradation, and the impacts of climate change, which jeopardize marine ecosystems and the sustainability of blue economy activities. The complexity of governance within the region, with its intricate web of local, national, and supranational authorities, has led to fragmented policy implementation, undermining effective management and coordinated responses to these environmental issues. Despite these obstacles, there are significant opportunities for positive change. Technological innovation, exemplified by Denmark's advancements in offshore wind energy and sustainable fisheries, offers a promising avenue for integrating eco-friendly practices within traditional maritime industries.

This highlights a crucial opportunity for other BSR countries to adopt similar approaches to bolster both economic growth and environmental sustainability. The implications of these findings for EUSBSR policy are multiple. The strategy must address the environmental challenges by enhancing regional cooperation on pollution control, habitat restoration, and climate resilience. Effective governance and policy coherence across the various levels of authority are necessary to overcome fragmentation and create a unified approach to managing marine resources. This entails aligning local, national, and regional policies to support a cohesive blue economy strategy. Furthermore, leveraging technological advancements as seen in Denmark can serve as a model for the region, promoting the adoption of innovative practices across BSR countries. By fostering technological innovation and supporting sustainable practices, the EUSBSR can drive economic development while ensuring environmental protection.

Future recommendations for the EUSBSR include strengthening Maritime Spatial Planning (MSP) to enhance cross-border coordination and reduce conflicts among marine activities. Developing a comprehensive framework for MSP that involves all BSR countries will facilitate more effective management of marine resources. Additionally, increasing investment in technology and innovation is vital. Establishing a regional innovation hub could help advance blue economy projects by encouraging collaboration between academia, industry, and government. Knowledge exchange and capacity building should be prioritized to disseminate best practices and lessons learned across the region. The EUSBSR should also set ambitious targets for environmental sustainability, incentivizing leading practices and ensuring that blue economy activities contribute to long-term ecological health. By implementing these recommendations, the EUSBSR can significantly enhance its impact on the blue economy, promoting sustainable growth and responsible management of the Baltic Sea's marine resources for future generations.

5. Conclusions

The investigation into the blue economy in the Baltic Sea Region (BSR) reveals both significant challenges and promising opportunities that have critical implications for the European Union Strategy for the Baltic Sea Region (EUSBSR). Our analysis underscores the pressing environmental issues threatening the BSR, such as pollution, habitat degradation, and the adverse effects of climate change. These challenges are compounded by the fragmented governance structures that currently hinder effective regional management and coordinated responses. Despite these hurdles, the BSR presents substantial potential for transformative progress, particularly through technological innovation and sustainable practices.

Denmark's advancements in offshore wind energy and sustainable fisheries illustrate the tangible benefits of integrating eco-friendly technologies into traditional maritime industries. This success highlights the potential for other BSR countries to adopt similar innovative approaches, thereby fostering both economic growth and environmental sustainability. Such technological and procedural innovations should be leveraged to inform broader regional strategies and practices. The implications for the EUSBSR are multifaceted. To address the environmental challenges effectively, the strategy must prioritize enhanced regional cooperation on pollution control, habitat restoration, and climate resilience. Strengthening governance and ensuring policy coherence across various levels of authority are crucial to overcoming the current fragmentation. This involves aligning local, national, and regional policies to support a unified and strategic approach to managing marine resources. Future recommendations for the EUSBSR include a more robust implementation of Maritime Spatial Planning (MSP) to improve cross-border coordination and mitigate conflicts among marine

activities. Developing a comprehensive MSP framework that includes all BSR countries will facilitate more effective management of marine resources. Additionally, investing in technological innovation is essential. Establishing a regional innovation hub could accelerate the advancement of blue economy projects by fostering collaboration among academia, industry, and government entities.

Moreover, the EUSBSR should set ambitious targets for environmental sustainability, encouraging leading practices and ensuring that blue economy activities contribute to long-term ecological health. Knowledge exchange and capacity building are also vital for disseminating best practices and lessons learned across the region. In conclusion, by implementing these recommendations, the EUSBSR has the potential to significantly enhance its impact on the blue economy. This will not only promote sustainable growth but also ensure the responsible management of the Baltic Sea's marine resources, safeguarding them for future generations. The successful integration of innovative technologies and practices, coupled with a coherent and cooperative regional strategy, will be pivotal in advancing the blue economy and achieving the overarching goals of the EUSBSR.

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