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Conceptualising Marine Biodiversity Mainstreaming as an Enabler of Regional Sustainable Blue Growth: The Case of the European Atlantic Area

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Abstract: After recognizing the importance of marine and coastal resources and the use of marine space for economic growth, the European Union (EU) created and implemented a long-term Blue Economy (BE) strategy that supports the development of traditional and emerging marine and maritime sectors, aiming at the enhancement of Blue Growth (BG). However, despite the existence of a robust policy framework that supports the expansion of BE sectors at both an EU Sea Basin and state level, scholars have been sceptical as to whether the pursuit of BG adequately addresses the challenges that usually come with economic development, including those of climate change and marine biodiversity loss. Various frameworks for integrating sectoral goals with each other and with environmental goals that could facilitate the transition towards Sustainable Blue Growth (SBG) already exist and have been suggested and promoted by the European Commission, such as Ecosystem-Based Management (EBM) and Marine Spatial Planning (MSP). They require the consideration of marine ecosystems and biodiversity and their protection as one of the BE sectors to be integrated via planning and management, which in turn requires the estimation of the value of ecosystem services and the spatial implications thereof. Nonetheless, there is little evidence or real-world examples on whether and how ecosystems, and within them coastal and marine biodiversity, are actually integrated (i.e., mainstreamed) when developing sectoral policies and planning and implementing economic activities at sea at various scales, i.e., local, national, and regional, and what the necessary steps and actions are that would facilitate such mainstreaming. By seeking evidence in EU and Atlantic Arc (AA) member states' sectoral policies on marine tourism, ports and shipping, marine renewable energy, and fisheries and aquaculture (as promoted by the Atlantic Maritime Strategy and its corresponding action plans) and in the outcomes of the Interreg Atlantic Funded Research Project MOSES (aiming at valuating a Sustainable Blue Economy at the national and regional scale of the EU AA), the present article focused on understanding if and how marine biodiversity is taken into consideration by EU and AA BE and/or BG policies, strategies, and sectoral developments. The selected sectoral policies demonstrate a good uptake of marine-ecosystem- and biodiversity-related challenges; however, at both the EU and the AA member-state level, it is unclear whether and how marine ecosystems and biodiversity are addressed as a separate BE sector. As such, we argue why

and how Marine Biodiversity Mainstreaming (MBM) could address this gap, and hence it could contribute to planning, implementing, and managing maritime economic activities towards SBG at the Sea Basin level. This is demonstrated by illustrating the central role of MBM in enabling (and being further enabled by) the above integrative frameworks (i.e., MSP and EBM) and by presenting the key elements and actions required for such facilitation.

Keywords: sustainable blue growth; blue economy sectors; marine biodiversity mainstreaming; blue economy sectors; natural capital valuation; sea basin; European Atlantic

1. Introduction

1.1. Policies and Mechanisms Driving Blue Economic Development in the EU and the Atlantic Area

The EU, after understanding the importance of its marine and coastal resources and the optimal utilisation of its marine space for their contribution to economic growth and development, created a long-term Blue Growth (BG) strategy plan [1] (the maritime dimension of the Europe 2020 strategy) that aimed to support the development of traditional and emerging marine and maritime sectors. Of those, blue energy, aquaculture, maritime, coastal and cruise tourism, marine mineral resources, and blue biotechnology were sectors that showed a high potential for sustainable growth and jobs in the blue economy (BE) in different Sea Basins [2]. This was followed by the latest communication by the European Commission (EC) that emphasised the catalytic role of the BE for the achievement of the EU's new development strategy, the Green Deal [3], which calls for a transformation of the EU's economy to become modern, resource-efficient, and competitive, where net emissions of greenhouse gases are phased out and the EU's natural capital is preserved, protected, and restored [4].

The EU has also recognised the important role that the Sea Basin Strategies [5,6] play in the facilitation and further development of the BE sectors and hence the implementation of the BG strategies. In the EU's Atlantic Arc (AA) (where the present study is focusing), such strategy refers to the Atlantic Maritime Strategy [7] that was adopted in 2011. Since then, it has been implemented by two versions of the Atlantic Action Plan (AAP) [8,9], which aim to facilitate collaboration between the AA member states for the achievement of a sustainable maritime economy that creates jobs, preserves marine ecosystems, and contributes to climate change adaptation and mitigation. An initial assessment of the BE potential in the AA had shown that the BE sectors that were more promising were wave and tidal energy, short-sea shipping, offshore wind energy, algae aquaculture, blue biotechnology, oil and gas, cruise tourism, and coastal protection [10]. Of these sectors, however, the Atlantic Maritime Strategy focuses specifically on ports and shipping, marine renewable energy, aquaculture, fisheries, and tourism, which are prioritised to different extents in every Atlantic member state, i.e., Portugal, Spain, France, Ireland, and the UK (before Brexit).

1.2. The Necessity for Marine Biodiversity Mainstreaming in EU's Blue Economy Sectoral Policies

Despite the existence of a robust policy framework that supports the expansion of BE sectors at both the EU Sea Basin and state level, scholars have been sceptical as to whether the pursuit of BG adequately addresses challenges that usually come with economic development, i.e., economic, societal, environmental, and governance ones [11,12]. Many of these challenges, however, are caused by the lack of an appropriate estimation of the overall value of the BE that would demonstrate better the actual socio-ecological impact of the BE [13]. Such overall value must include the classic estimation of socioeconomic growth and the negative environmental impacts thereof, but also the estimation of positive environmental externalities by BE sectors, as well as the input by the ecosystems in the form of ecosystem service flows derived from natural capital. All these valuations are

necessary for estimating the net environmental impact from BE developments (comprising the negative impact, the avoided impact, and the positive impact) [14,15]. Additionally, these valuations require recognising that nature (and its protection and restoration) is one more productive BE sector that must be included in the equation.

To stress the importance of this issue, the EC has highlighted in its new approach to a Sustainable Blue Economy (SBE) [4] the fact that the Blue Economy needs to be sustainable, and respect potential environmental concerns given the fragile nature of the marine environment. As such, biodiversity conservation and protection must be considered foundational principles of maritime economic activity. Biodiversity is not only a prerequisite for economic activities like fisheries, biotechnology, and tourism, but it also presents economic opportunities, as does any other BE sector, by ensuring a supply of numerous ecosystem services, such as blue carbon sequestration, food provisioning, and coastal protection, among others. Finally, in this new approach to an SBE, the EC also makes explicit the need to establish a stable methodology to integrate the concept of "natural capital" in economic decisions. This implies assessing and quantifying both the economic value of marine ecosystem services and the socio-economic costs and benefits derived from keeping the marine environment healthy and, hence, preventing biodiversity loss. Nevertheless, this fact was already introduced by the EU's Biodiversity Strategy for 2030 [16], i.e., "that conservation of biodiversity and ecosystems has direct and indirect economic benefits for most sectors of the economy and underpins the functioning of economies and societies and as such all businesses depend on ecosystem services either directly or indirectly".

The economic potential of biodiversity that can be ensured via its management and protection is also highlighted as an important element for sustainable economic development at the AA level, where marine biodiversity is perceived as "a wealth for the cooperation area that must be preserved. At the same time, this natural heritage is a vector of attraction and well-being for the territory that must be used to support economic activities such as tourism" [17].

Furthermore, it has been suggested that mainstreaming biodiversity into sectoral policies needs to be pursued and implemented in a stronger and more systematic way [18].

All the above evidence demonstrates the important role of biodiversity and the importance of its accurate valuation and positioning in the SBE for Sustainable Blue Growth (SBG) and promotes the idea that biodiversity conservation and/or restoration could be a BE sector itself. However, there is little evidence on whether and how coastal and marine biodiversity is actually mainstreamed when planning and implementing economic activities at sea that aim at SBG at various scales, i.e., local, national, and regional. This mainstreaming in turn could facilitate the estimation of SBE net environmental impact and consequently the overall value of the BE, as mentioned above. The estimation of such overall BE value becomes even more complicated when examining the progress of the BE at the regional Sea Basin level due to differences in policies and sectoral development priorities between countries in the same regional sea.

Towards this purpose, the present study focuses on understanding how marine biodiversity is taken into consideration by BE and/or BG policies, strategies, and sectoral developments at a regional sea level by focusing on the EU's AA region. The results of this investigation are used to conceptualise how (the protection of) marine biodiversity ensures the success of integrative approaches and processes aiming at supporting, planning, and managing maritime economic activities towards Sustainable Blue Growth (SBG), i.e., approaches such as Marine Spatial Planning (MSP) and Ecosystem-Based Management (EBM). The research behind the study is part of the broader research that was conducted in the framework of the Interreg Atlantic Funded Research Project MOSES, which aimed at (suggesting ways of) valuating a Sustainable Blue Economy at the national and regional scale of the AA. Based on the hypothesis that addressing biodiversity by the SBE must be inherent in such valuation, one of the research tasks of the project was to document and assess the current stage of Biodiversity Mainstreaming into BE policies and developments in the AA.

The outputs from this task and other tasks of the project, along with information collected from the literature, were used for the present study, as explained in the methodological section below.

2. Materials and Methods

The methodological steps that were followed in order to address the research questions include the following:

(a) The identification and review of publications about the interactions of marine biodiversity and Blue Economy. The identified publications included scientific articles and book chapters, grey literature, websites, and other published outputs of the MOSES project, as mentioned above. Although the goal was to prioritise the use of information and data published in scientific publications, it was inevitable to search for supporting information in other types of publications with less scientific orientation and more policy-based content. These may refer to legal documents at EU, AA, and national levels, scientific project reports, and other outputs.

(b) The use of information that was produced via organised interviews, surveys, and workshops in various instances for the purpose of various tasks and outputs of the EU MOSES project. These included (the identification of ways of) estimating the Blue Growth potential in various case studies examined in the project (sources of these methods and outputs can be found in the project website repository here: http://mosesproject.eu/project_outputs/ (accessed on 6 September 2023)). The key categories of stakeholders include people involved in living resource exploitation, governmental entities, and citizen representatives, among others. The full list of interviewees and workshop participants is confidential. The full list of the questions asked in interviews and workshops can be provided by the authors of this article upon request.

(c) Conceptualisation based on Environmental Policy Integration (EPI) which aimed at demonstrating the catalytic role of Marine Biodiversity Mainstreaming (MBM) as an enabler of broader integrative frameworks for accelerating SBG. The need to address interactions between environmental and economic goals through EPI is a common parameter in the various definitions of EPI, as demonstrated in Table 1 below.

Table 1. The need for coordination among economic, societal, and environmental goals as a key element of definitions of Environmental Policy Integration (EPI).

Reference	Definition
European Environmental Agency 2004 [19]	Environmental Policy Integration (EPI) means including environmental considerations in other policies, with a view of achieving sustainable development.
Lafferty and Hovden (2003) [20]	"its [EPI] 'mother concept'—sustainable development—attributed 'principled priority' to environmental objectives in the process of 'balancing' economic, social and environmental concerns"
Peters (1998) [21]	"coordination that emphasizes comprehensiveness, aggregation and especially consistency"
Collier (1994) [22]	"the search for synergy effects and 'win-win' solutions in the making of sectoral policy choices"
Liberatore (1997) [23]; Jordan and Lenschow (2010) [24]	"the notion of reciprocity between equally weighed parties or objectives"

Within biodiversity policy analysis, and when the focus is specifically on biodiversity protection, the suggested terminology similar to the EPI concept [25] includes "mainstreaming biodiversity" [26,27] and "biodiversity policy integration" [28]. According to Huntley and Petersen (2005) [26], the concept of Biodiversity Mainstreaming involves "the integration of biodiversity conservation and sustainable use principles into policies, plans, programs, and production systems where the primary focus has previously been

on production, economic activity, and development, rather than on biodiversity conservation losses or gains". This is also highlighted by Karlsson-Vinkhuyzen et al. (2017) [27], i.e., "an underlying rationale for promoting a strategy of mainstreaming biodiversity or broader environmental issues is the realisation that the causes of the problem in question lay within the remit of other policy domains or economic sectors". As such, a sole focus on conservation policies (like in situ and ex situ conservation and limiting trade of endangered species) will have only a limited impact in reducing biodiversity loss [27]. It is in sectors such as agriculture, forestry, fisheries and aquaculture, mining, water management, and energy production where activities take place that drive biodiversity loss and towards which measures need to be targeted [29].

However, the present paper's aim is to demonstrate the positive links between MBM and SBG and how these links can be better established. As such, it moves beyond the above assumptions by suggesting that proper sustainability-oriented integrative frameworks (including supporting elements and actions) are needed, so marine biodiversity (protection policies) can be an enabling factor for Blue Economy development instead of being just an obstacle, as it is often seen by the sectors themselves.

To make such a suggestion tangible, it is important to further conceptualise the interactions and interdependencies between Blue Economy sectors and ecosystems and hence marine biodiversity from various points of view. This conceptualisation is a first step in the process of developing and testing SBG scenarios and identifying pathways of transformation towards SBG. As such, researchers can then focus and cultivate those points of view that serve or facilitate better the actualisation of the above suggestion, i.e., that marine biodiversity protection policies could enable SBG, and then identify steps and actions to further enable such suggestion. These points of view can be summarised as follows and visualised in Table 2 below:

1. One point of view is that Blue Economy sectors may harm marine ecosystems in various ways, and this impact must be identified and addressed.
2. Another point of view is that a sector may have a positive contribution to marine ecosystems in various ways, and these types of positive impacts must be identified and considered as well.
3. In the meantime, marine ecosystems, and the need for protecting them can be seen as elements that block economic development.
4. At the same time, these same ecosystems may contribute to economic development for the economic value they produce on their own. Indeed, the marine ecosystem itself can be one of the Blue Economy sectors. This is because all activities that aim at preserving ecosystems and the services that they provide (such as blue carbon sequestration) may form part of an economic sector, as the "Communication on a new approach for a sustainable blue economy in the EU" [4] suggests.

Table 2. Four types of interactions and interdependencies for developing Sustainable Blue Growth scenarios.

Conflicting interactions	Sectoral development causes conflict with marine biodiversity	Marine biodiversity protection may hinder SBG
Synergistic interactions	Sectoral developments may have positive impacts on marine ecosystems	Marine biodiversity contributes positively to SBG

In the present study, the actualisation of the suggestion that marine biodiversity protection policies could enable SBG (especially based on the needs of the AA) will be illustrated by departing from the above conceptualisations and especially the second and fourth types of interactions, i.e., the synergistic interactions rather than the conflicting ones.

The need to emphasise synergistic interactions corresponds to the increasingly urgent need for a shift from a pessimistic view of economic sectors harming the environment to a more optimistic and organic view. This new view assumes that sectors can also have positive environmental externalities and that marine ecosystems and the natural capital they form can be thought of as a sector of the economy that provides a flow of ecosystem services and hence can play an active role in planning for economic development [30]. It is a "sector" that does not create negative impacts like other types of economic sectors may do [30]. Therefore, for an increasing number of scholars and policy makers, (the value of) marine ecosystems are the epitome of SBG (see natural capital valuation, marine ecosystem services, and nature-based solutions and their links to SBG, for example, Gacutan et al. (2019) [31]; Lillebø et al. (2017) [32]; Mustafa et al. (2019) [33]).

3. Results

3.1. The Position of Marine Biodiversity in Blue Economy Sectoral Policies at the EU Level

EU sectoral policies were reviewed on the basis of whether and how they address marine biodiversity. The specific sectors looked at included tourism, ports and shipping, marine renewable energy, and fisheries and aquaculture, as promoted by the Atlantic Maritime Strategy and its corresponding action plans. Based on this analysis, it would appear that, at least at the policy-making level, the selected sectoral policies and the priorities set for marine biodiversity demonstrate a good uptake of marine-ecosystem- and biodiversity-related challenges. It is less clear, though, whether and how marine ecosystems and biodiversity are addressed as a BE sector on their own and what the consequent policy and SBE implications are thereof.

3.1.1. Marine and Coastal Tourism Policies

A key policy document that supports the policy for sustainable development of marine and coastal tourism is the "European strategy for more growth and jobs in coastal and maritime tourism" [34]. The strategy specifically identifies that "EU's Natura 2000 network protects vulnerable coastal and marine habitats which, if managed well, can provide significant recreational opportunities and contribute to sustainable growth and employment". Furthermore, the EU communication on tourism and transport in 2020 and beyond [35] underlines the importance of protecting and restoring Europe's land and marine natural capital while adopting the approach for a Sustainable Blue and Green Economy with tourism being one of the BE sectors. The EU has also published a report that provides an overview of the main elements to consider in the promotion and management of tourism and leisure activities in Natura 2000 (both terrestrial and marine) [36], contributing in this way to integrating biodiversity concerns to this BE sector. Additionally, the EC "Guidelines for the establishment of the Natura 2000 network in the marine environment" [37] highlight some marine touristic activities such as diving, wild fauna watching, or different maritime sports and how they can be compatible with the marine Natura 2000 network. Finally, the latest version of the AAP [9] suggests that "marine and coastal habitats should be preserved and valorised, notably with the view to develop new forms of maritime and coastal tourism. In this particular economic sector, circular economy, zero pollution, energy efficiency and biodiversity preservation should be the guiding principles to develop more sustainable practices that benefit local development and local employment all over the year".

3.1.2. Coastal and Marine Aquaculture Policies

The most recent document that supports the policy for sustainable development of the aquaculture sector is the "Strategic guidelines for a more sustainable and competitive EU aquaculture for the period 2021 to 2030" [38]. The guidelines highlight the importance of aquaculture in contributing to SBG not only from an economic perspective but also from an environmental one, as it is a sector that can help to "decarbonise the economy; fight climate change and mitigate its impact; reduce pollution; contribute to better preserving ecosystems (in line with the objectives of the Biodiversity strategy and the Zero pollution ambition for a

toxic-free environment) and be part of a more circular management of resources". Based on the same document, aquaculture can help to reverse biodiversity loss by reducing pollution, among other approaches. It can be a method of protein production with a lower carbon and environmental footprint than other types of farming. Furthermore, certain forms of aquaculture can even offer ecosystem services, such as the absorption of excess nutrients and organic matter from the environment or the conservation and restoration of ecosystems and biodiversity. Finally, it is stressed that the (EU and national) regulatory framework for EU aquaculture ensures the mitigation of the impact that aquaculture activities may have on the environment, although it is suggested that aquaculture activities do not significantly harm ecosystems or biodiversity. Additionally, a number of EU Commission guidance documents, such as the "Commission Staff Working Document on the application of the Water Framework Directive and the Marine Strategy Framework Directive to aquaculture" [39] and the guidance on aquaculture and Natura 2000 [40], streamlined the application of biodiversity protection legislation to the aquaculture sector, acting as a basis for the development of the guidelines of 2021.

3.1.3. Marine Renewable Energy Policies

A sustainable ocean energy mix should include (in addition to bottom-fixed offshore wind) floating wind, thermal, wave, and tidal energy— the latter two being emerging technologies that are expected to reach the commercial stage within ten years. To speed up their development, in 2020, the Commission published a new EU offshore renewable energy strategy [41] that aims to multiply 5-fold the capacity for offshore renewable energy by 2030 and 30-fold by 2050. Previous publications that support the policy of sustainable development of marine renewable energy are the Communication on Offshore Wind Energy [42], which addresses the action needed to deliver on the Energy Policy Objectives for 2020 and beyond, and the Blue Energy Communication [43], which sets an action plan to deliver on the potential of ocean energy in European seas and oceans by 2020 and beyond. Offshore energy can have some conflicts with biodiversity goals such as those set by the EU Birds and Habitats Directive and Natura 2000 [44]. Nevertheless, these same conflicts can be drivers for the sustainable development of offshore renewable energy. To accommodate this need, the EU offshore renewable energy strategy underlines that sustainability and, more specifically, the protection of the environment and biodiversity will be key principles for all dimensions concerned. Additional to this, the EC has published an updated guidance on wind energy developments and EU nature legislation [45] that provides information and best practices that will help member states' competent authorities, developers, and consultants and the wind energy industry to ensure that wind energy developments, onshore and offshore, comply with the provisions of the EU Birds and Habitats Directives.

3.1.4. Fisheries Policies

Regarding fisheries, the most important instrument that addresses the need for sustainable development of the sector with implications for the protection of marine biodiversity is the EU's Common Fisheries Policy (CFP). The CFP was reformed in 2013 to deal with one of the biggest challenges in policy integration: coherence with the EU's environmental legislation [46]. Indeed, within the CFP, dedicated rules apply for the adoption of conservation measures necessary for compliance with EU environmental legislation. These rules are set out in Article 11, "Conservation measures necessary for compliance with obligations under Union environmental legislation" in conjunction with the general provisions of Article 18, "Regional cooperation on conservation measures". Also, the most important goal with implications for the protection of marine biodiversity is that member states had to manage all commercial fish stocks at maximum sustainable yield by 2020. Another important milestone of the CFP was the introduction and the full implementation in 2019 of the landing obligation (LO), which aimed at reducing the discarding of catches across pelagic and demersal fisheries by encouraging fishers to fish more selectively and to avoid

unwanted catches. It is applicable to all species subject to catch limits. The fight against Illegal, Unreported, and Unregulated (IUU) fishing, which has detrimental impacts on marine biodiversity and fish stocks within and beyond EU waters, also presents major challenges. The issue is addressed by the EU's IUU Regulation [47], which promotes sustainable fisheries around the globe. This is also in line with the goals set by the FAO and its fight against IUU fishing to provide better-quality food [48]. Many other initiatives exist regarding the interaction of fisheries and biodiversity protection, for instance, a review of fisheries management measures in Natura 2000 sites with some illustrative examples prepared in 2018 by the N2K Group [49]) and the Staff Working Document on the establishment of conservation measures under CFP for Natura 2000 sites and MSFD-relevant measures [50].

3.1.5. Maritime Transport, Including Ports

Regarding maritime transportation, the "Report on technical and operational measures for more efficient and cleaner maritime transport" [51] points out that the EU maritime sector should also contribute to tackling biodiversity loss and environmental degradation and contribute to the objectives of the European Green Deal and the 2030 Biodiversity Strategy. However, no further guidance is provided to realise this goal. Environmental sustainability and decarbonisation are areas of focus of the Staff Working Document on the implementation of the EU Maritime Transport Strategy 2009–2018 [52]. This document, however, does not make any explicit or implicit mention of the necessity for, or ways to achieve, MBM in this sector. When it comes to ports and harbours, though, there is more thorough guidance. A document about "Integrating biodiversity and nature protection into port development" [53] illustrates how nature protection concerns can be integrated into port policies while reconciling the need for port development and nature conservation. It stresses that building partnerships between all stakeholders will help reach the goals of all actors involved. Also, the "Guidelines on the implementation of the Birds and Habitats Directives in estuaries and coastal zones with particular attention to port development and dredging" [54] provide a number of recommendations and elements of good practice to enhance port development and management in or near Natura 2000 sites. Nevertheless, the environmental performance of EU maritime transport falls under the same obligations regarding marine and atmospheric pollution by ships set out by the International Maritime Organization (IMO) through the MARPOL convention and its Annexes. This is the main international convention covering the prevention of pollution of the marine environment (including critical habitats, organisms, and ecosystems) by ships from operation or accidental causes, while also calling for the establishment of particularly sensitive areas (PSSAs) that may be vulnerable to damage by international maritime activities.

3.2. The Position of Marine Biodiversity in Blue Economy Sectoral Policies and Initiatives in the Atlantic-Area Countries

In the AA countries (Ireland, the UK, France, Spain, and Portugal) that participated in the EU MOSES project, 85 policy documents in total were identified that have transposed nine EU legal acts that explicitly or implicitly address the need for marine biodiversity and/or environmental protection. Furthermore, there were an additional 33 national environmental policy documents, of which 22 explicitly address marine issues. However, no documents were identified that are explicitly addressing the integration of marine biodiversity into BE sectors, or ways or guidelines on how biodiversity is or must be integrated into SBE or SBG sectoral policies and strategies and what is required for marine ecosystems and biodiversity to be further established as a BE sector in its own right. Some commonalities resulted from the reviewed reports of the MOSES projects, which were based on interviews with stakeholders, as well as on results from discussions that took place in the three Policy Decision Fora (all conducted and organised in the framework of the MOSES project). These commonalities include the importance of maintaining marine ecosystems

and the need to address impacts on the marine environment via an ecosystem-based management approach. However, there was no explicit mentioning of marine ecosystems and biodiversity as a separate BE sector, or at least as a component of the examined sectors (as a provisioner of ecosystem services, for example). Despite the lack of explicit mention of marine biodiversity, the recognition and the addressing of environmental concerns and challenges linked to the development of BE sectors in the AA is evident. Therefore, the following case study results from MOSES can still serve as evidence on the necessity for marine biodiversity protection and for identifying the requirements and actions of its integrative role towards SBG.

3.2.1. Maritime Transport and Ports in UK (Northern Ireland)

The sector that was studied in the UK was ports and shipping, through a case study about the assessment of SBG in Belfast Harbour of Northern Ireland [55]. Regarding the environmental aspect of SBG in Belfast Harbour, strategies such as the Belfast Harbour Strategic Plan 2019–2023 call for sustainable transport and development. The Belfast Green and Blue Infrastructure Plan also considers sustainable principles to address coastal flooding and improve water quality. Regarding the environmental aspect of SBG in this case study, from the identified environmental challenges that the sector needs to address, those that were also relevant at the regional level are "climate change that requires ports and shipping to decarbonize and seek zero carbon emissions" and the "limited data and research on monitoring and addressing environmental impacts". Based on interviews, many stakeholders noted that there was a lack of urgency around managing the impacts of climate change and that adaptation was not at the forefront of future/strategic plans. However, despite climate change being considered a threat, many stakeholders felt that it presented an opportunity for ports and shipping to decarbonise and seek zero-carbon emissions instead of a transition to a low-carbon future. It was then recommended that fiscal incentives should be made available by port and local authorities to help with the transition to zero-carbon emissions. Finally, the majority of stakeholders felt that a "managed innovation" approach is necessary to foster resilience and adaptability, as well as embracing innovation and technology to flexibly steer long-term change.

3.2.2. Maritime and Coastal Tourism in the Republic of Ireland

In Ireland, the sector that was studied was marine and coastal tourism, because it is highlighted as a key growth sector under the Ireland's Integrated Marine Plan "Harnessing Our Ocean Wealth Strategy (HOOW). The case study that was used was the Wild Atlantic Way, a 2500 km coastal touring route along the west coast of Ireland that was showcased as a Blue Growth Pathway for marine tourism. It was evaluated against the framework of the EU Commission's Communication "A European Strategy for more Growth and Jobs in Coastal and Maritime Tourism" [34] and against targets set for the sector [56]. Regarding the environmental aspect of SBG in this case study, from the identified environmental challenges that the sector needs to address, those that were also relevant at the regional level are "the increasing impacts on our coasts due to climate change and erosion" and "the need to reduce the ecological footprint of tourism businesses". Both of these challenges have implications for marine biodiversity, which need to be studied and addressed in a broader SBG pathway. The case study highlighted that the development of guidelines that support sustainable coastal tourism requires close collaboration at the community level, and hence a community-generated collaborative framework was suggested that would help to overcome barriers, maximise opportunities in sustainable coastal tourism, and assist in establishing innovations within more sustainable regimes. The need for working collaboratively to identify and respond to environmental damages in line with national-level frameworks and directives was one of the suggestions that would address the environmental aspect of tourism SBG.

3.2.3. Marine and Coastal Aquaculture in Portugal

In Portugal, the sector that was studied was aquaculture and its progress towards SBG in the Centro Region [57]. Aquaculture is considered by the National Ocean Strategy (NOS) 2013–2020 as "one of five strategic domains of preferential intervention for Blue Growth". The NOS is a development strategy for marine and coastal areas that refers to the development model of the preservation and sustainable use of the services and resources of marine ecosystems and aims for better, inclusive, smart, and sustainable economic growth [58]. Based on the national strategic plan for aquaculture, one of the priorities for the sector is to be facilitated by better spatial planning to identify areas with higher potential for aquaculture and reduced environmental impact.

Regarding the environmental aspect of SBG in this case study, from the identified environmental challenges that the sector needs to address, those that were also relevant at the regional level are "the risk of introduction of non-indigenous species" and "the need for adaptation to climate change". Also, stakeholders that were interviewed identified that better spatial planning to identify areas with higher potential for aquaculture and reduced environmental impact is one of the most crucial challenges that the sector is facing. This challenge has been addressed by the publication of various aquaculture plans and the Marine Situation Plan of 2019, which include suggested sites for further (marine) aquaculture development that do not conflict with the marine biodiversity protection priorities. To advance towards these objectives, stronger and more effective collaboration is required between key actors working across the sector at the local, national, and regional level.

3.2.4. Marine Renewable Energy in France

In France, offshore renewable energy in Brittany was the case study analysed. It is a sector that is promoted by the Multiannual Energy Programme implemented at the state level, and there are plans to increase the capacity for renewable energy in Brittany [59]. Regarding the environmental aspect of SBG in this case study, from the identified environmental challenges that the sector needs to address, those that were also relevant at the regional level are "the addressing of visual impacts of offshore energy installations and "the difficulty in assessment of trade-offs between environmental benefits from ORE and environmental costs from ORE". Based on the case study, addressing environmental impacts towards a SBG pathway is a necessity but also a challenge to overcome, as avoiding the most important environmental externalities generates high costs. Also, choosing floating wind turbines as a more environmentally friendly technology compared to fixed wind turbines adds to this cost, as it is a more expensive technology. What is suggested is that, in order to verify a sustainable pathway, regular monitoring and evaluation of the economic and environmental impacts would be critical in the short, medium, and long term.

3.2.5. Sustainable Fisheries in Spain

In Spain, a case study approach involving the Basque fishing fleet was employed to explore the impact that the fishing activity has on the different ecosystem services, considering the sustainability challenges [60]. The study illustrates that both the impact that a fishing activity has on the environment and the sustainability status of the stocks must be considered when SBG is the goal. It must also be considered that environmental impacts should be assessed at the individual segment level because the impact of each fishing fleet on the marine environment is different, as there are differences in the intensity of each activity, the type of fishing gear used, and the type of ecosystem being affected. Based on this, there is not a specific general action that will determine the final value of the pressure on the environment. This type of information must be available and clear to stakeholders involved in ensuring SBG of the fishing sector.

4. Discussion: Marine Biodiversity Mainstreaming as a Catalyst for Sustainable Blue Growth in the Atlantic Area

Various frameworks exist for integrating sectoral goals with each other and with marine ecosystems and biodiversity goals. Hence, options that can facilitate the transition towards SBG are already available. These include the creation of protected areas such as MPAs with the specific goal of conservation of the existent biodiversity [61] while also considering socioeconomic interests; the implementation of political processes that are responsible for the allocation of sea space to meet social, ecological, and economic objectives, such as integrated coastal zone management (ICZM) and Marine (or maritime) Spatial Planning (MSP) [62]; and marine Ecosystem-Based Management (EBM) approaches [63].

All these options face similar challenges to be operationalised, such as the need for inter- and intra-sectoral cooperation, the need for stakeholder engagement, the need to optimise the use of marine space and resources, and the need to incorporate the value of marine ecosystems when assessing trade-offs between economic, societal, and environmental goals. These frameworks are also similar in the sense that they promise to address common, dual challenges, such as climate change and biodiversity loss.

The importance and prioritisation of such needs and challenges have also been highlighted by the AAP and the EU BE sectoral policies presented above. They have also been examined within MOSES, which identified the necessary elements for ensuring sectoral SBG as well as the common environmental, societal, economic, and governance challenges across sectors and countries. More precisely, the latter include reducing the ocean economy's carbon footprint, using natural sea resources sustainably, responding effectively to threats, and implementing an ecosystem management approach in Atlantic waters.

As such, a number of appropriate frameworks, exhibit the ability to address the common challenges across sectors and countries. These frameworks are as follows:

- Marine Spatial Planning (MSP) provides benefits that include reduced sectoral conflicts, a more stable investment environment, and multiple uses of space and environmental protection through the early identification of impacts.
- Ecosystem-Based Management (EBM) requires managers to analyse and address the cumulative impacts of multiple human activities on ecosystems and to understand the resulting transboundary effects as well as medium- and long-term ecosystem changes and their knock-on effects on human wellbeing.
- Natural capital valuation (NCV) can facilitate the mainstreaming of marine biodiversity which in turn is required by EBM and MSP. NCV is necessary to estimate the contribution of ecosystem health to human wellbeing and to assess trade-offs between economic growth and environmental protection. The prioritising of NCV addresses the environmental aspect of SBG.
- Regional cooperation (RC) can create new markets and support the supply of innovation to overcome barriers to either new market entrants or the creation of new market niches for goods and services in the Blue Economy. This action addresses the governance concerns of SBG.
- Targeted investment (TI) and public spending allocated towards forward-thinking ocean research and development can contribute not only to economic growth but also address marine biodiversity loss and climate change. The prioritising of TI addresses the economic concerns of SBG.
- Citizen engagement (CE) and the encouragement of partnerships between practitioners (small and medium-sized enterprises, academia, researchers, public authorities, and investors) are required to co-design and co-implement Sustainable Blue Economy solutions. The prioritising of CE addresses the societal concerns of SBG.
- MBM can be seen as a concept that underpins the implementation of marine management frameworks but that also depends on the same elements (i.e., NCV, RC, TI, and CE) that ensure the effectiveness of these frameworks.

To better understand how these concepts work together, we must illustrate the hierarchical relationship between these concepts that are linked at some level to each other, as is shown in the flowchart below (Figure 1).

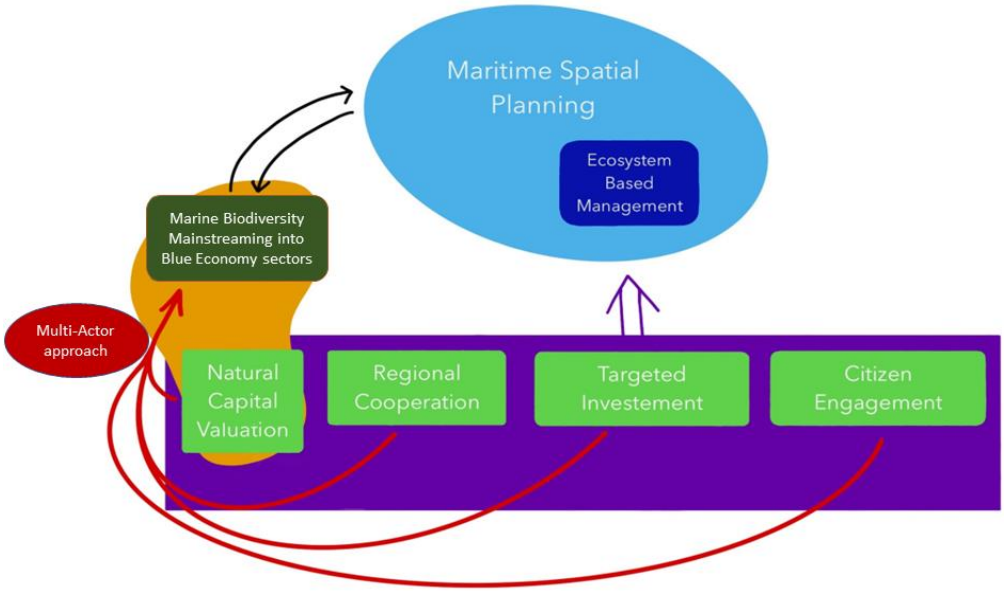

Figure 1. The catalytic role of Marine Biodiversity Mainstreaming (MBM) into Sustainable Blue Economy (SBE) sectoral policies and practices as part of integrative frameworks that facilitate the achievement of Sustainable Blue Growth (SBG) in the EU Atlantic area.

In the flowchart, MBM is considered the connecting link of the elements of the SBG-facilitating frameworks (such as MSP and EBM as part of MSP). These connections have the following characteristics:

- There is an interdependency between the successfulness of MSP (including EBM) and the successfulness of MBM, as it can be said that one encourages the implementation of the other. MSP is a framework that requires MBM, and MBM is a concept that is linked to actions that need to be part of a broader process involving goals beyond the need for sectors to address environmental issues, a fact that makes MBM an even stronger necessity with a catalytic role. Thus, MBM can be seen as a goal on its own but also a sub-goal of MSP and EBM.
- NCV and the marine ecosystem services valuation within NCV lie at the core of MBM and act as the foundation of MBM. Nevertheless, the concept of ecosystem services was integrated into the European Commission EU Biodiversity Strategy to as a way of mainstreaming biodiversity into other policies, notably agriculture, fisheries, forestry, and regional development. It is apparent that Blue Growth strategies in the Atlantic area would also benefit from NCV and, hence, MBM.
- Such positioning of MBM corresponds to both approaches to policy integration according to Tosun and Lang (2017) [64], i.e., the creation of interdependencies between policy sectors (and consequent coordination between them) and the understanding that policy integration is mostly of a procedural rather than a substantive nature. Also, such positioning addresses the need for cooperation between the involved parts from different policy domains or sectors [64] and is reflected in the horizontal multi-actor approach, as shown in the flowchart. The policy domains can be seen as stable coalitions of involved parties that have shared interests according Trein (2017) [65], and in the suggested flowchart, those can be groups that represent economic, societal, environmental, and governance interests and subsequently the NCV, RC, TI, and SC elements and synergies between them. Finally, it fits well with what Candel and Biesbroek (2016) [66] suggest: that policy integration should be composed of, i.e., a policy frame, subsystem involvement, policy goals, and policy instruments. A policy

frame is used to refer to the definition of a dominant problem of societal problems in public policy debates [67]. Policy goals, as the name implies, are the adoption of a specific concern within the policies and strategies of a governance system, including its subsystems, with the goal of addressing this same concern [66]. Policy instruments consist of substantive and/or procedural policy instruments within a governance system (and subsystems) [66]. The substantive instruments assign governing resources of nodality, authority, treasure, and organisation [68] to directly affect "nature types, quantities and distribution of the goods and services provided in society" [66]. The procedural instruments, on the other hand, indirectly affect outcomes through the manipulation of policy processes [69].

In the presented flowchart, the dominant problem is the attainment of SBG, the individual policy subsystems are the marine biodiversity policies and the BE sectoral policies, and the policy goal is the integration of these two systems, which in turn requires instruments such as NCV, TI, CE, and RG. Based on this, MBM, in its specific positioning, can be seen as a procedural instrument that requires substantive policy instruments, such as recommendations or guidelines, to promote and support the realisation of NCV, TI, CE, and RG that indeed affect the "nature types, quantities and distribution of the goods and services provided in society" [66].

5. Conclusions and Recommendations

In this research, the focus was on observing the role that marine biodiversity plays in BE sectoral developments and on the suggestion that proper sustainability-oriented integrative frameworks and supporting elements and actions are needed so that marine biodiversity (protection policies) can be an enabling factor for BE development instead of being an obstacle, as it is often seen by the sectors themselves.

To make such a suggestion tangible, it is important to analyse and emphasise the positive interactions and interdependencies between Blue Economy sectors and marine biodiversity, and hence ecosystems. This can then be used as a basis for developing and testing SBG scenarios that serve or facilitate better the actualisation of this suggestion.

As demonstrated above, until recently, biodiversity protection policies (and institutional frameworks that support them) have focused more on the negative impacts that some economic sectors may have on marine ecosystems and biodiversity and on how they must be addressed. In parallel, economic sectoral policies and policy frameworks that support them most frequently focus (when it comes to addressing their interaction with the marine environment and ecosystems and biodiversity within it) on why and how to address their negative impact. However, there is a recognised need in policy decision making and sectoral developments at international, regional, and eventually national and local levels (as exhibited in the evidence presented in the previous sections) to also highlight the positive contribution of BE sectors to the marine environment and biodiversity and the important role that ecosystems play in the acceleration of SBG via MBM. Therefore, the key elements that facilitate MBM are the same as those also needed for SBG, as concluded by the MOSES project and as demonstrated by the evidence above. These key elements are NCV, TI, CE, and RC.

As such, the importance of NCV for ensuring SBG is exhibited by the EU Biodiversity Strategy, which has incorporated the concept of ecosystem services as a means of mainstreaming biodiversity into other policies. Natural-capital accounting systems use the ecosystem service framework concept but with accounting terminology to facilitate the inclusion of ecosystem values in national accounts [70]. A targeted investment relevant to MBM could be in marine protected areas, in particular strictly protected areas, which have been shown to generate positive economic return and multiply the amount of fish and marine life where protection is effective [4]. Citizen engagement is also necessary in the sense that the ocean is a global commons, and all citizens should have a view on how their nation's EEZ should be managed for the benefit of current and future generations [71]. In this context, all interests must be reflected in order to prevent the possibility of potential

disparities and inequalities between stakeholders, taking into account that citizens are stakeholders too. For this reason, the potential for citizen science must be considered for the generation of data and for promoting active public participation. Also, citizen engagement is important in accessing the value of ecosystems and their co-management, in monitoring coastal habitat quality, and in communicating identified challenges linked to SBG. Finally, intercountry and intersectoral regional cooperation is fundamental for identifying common biodiversity protection priorities and creating common standards and requirements for marine natural capital valuation and MBM, and hence can ultimately assist in the achievement of mutually beneficial goals and win–win solutions for all EU AA member states.

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