D2.3

Legal-political context of human marine activities

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Acronyms

BCS	Belgian Continental Shelf
EA	Ecosystem Approach
EIA	Environmental Impact Assessment
ES	Ecosystem Services
EU	European Union
GES	Good Environmental Status
MSFD	Marine Strategy Framework Directive
MSP	Marine Spatial Planning[1]
SDG	Sustainable Development Goals

Glossary

Decision-support tools	Computer-based tools (simulation models, techniques and methods) developed to support decision analysis and participatory processes.

[1] Note that *marine spatial planning*, abbreviated to MSP, is different than *marine spatial plan* which will not be abbreviated to avoid confusion.

Ecosystem approach	A strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way.
Ecosystem-based management	An integrated approach to management that considers the entire ecosystem, including humans. The goal of ecosystem-based management is to maintain an ecosystem in a healthy, productive and resilient condition so that it can provide the goods and services humans want and need.
Ecosystem services	The benefits provided by ecosystems that contribute to human well-being.
Environmental impact assessment	An *ex ante* analytical process for identifying and assessing the potential environmental impacts of a project in its different phases.
Marine spatial planning	A public process of analyzing and allocating the spatial and temporal distribution of human activities in marine areas to achieve ecological, economic and social objectives that have been specified through a political process.
Multi-use	The joint use of ocean resources in close geographic and temporal proximity by multiple users.
Tipping point	Critical threshold that, when exceeded, leads to large and often irreversible changes in the state of the ecosystem
Stakeholders	The individuals, groups or organizations that are (or will be) affected, involved or interested (positively or negatively) in marine management in various ways.
Sustainability	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs

1. Executive summary

The preservation and restoration of marine ecosystems are crucial to secure the continued delivery of ecosystem services (ES) to present and future generations. One of the greatest conundrums of marine management is how to balance socioeconomic development with marine protection so that we can keep blue economies growing while still meeting our environmental commitments. These commitments are scattered across different legal instruments, from global to regional levels, that help us regulate the use of the marine space by providing clear objectives, guidelines, and incentives to stakeholders to adopt sustainable practices.

One of the key instruments concerning marine management is the Marine Spatial Planning Directive (2014/89/EU) which, in combination with other directives and strategies, provides the rules to distribute the use of the marine space across the different marine sectors to minimize conflicts and protect marine resources. The area of the Belgian Continental Shelf (BCS) is currently managed by the marine spatial plan delineated from 2020 through 2026, whose process involved close cooperation with stakeholders, including NGOs, businesses, government bodies, interest groups, and citizens. The sustainability aspect also received special attention during the elaboration of this last marine spatial plan, which included the development of a long-term sustainability vision for the BCS.

At present, most marine activities already undergo an environmental sustainability evaluation through an environmental impact assessment (EIA) at the local level but more holistic tools are needed to improve the compliance of human activities at sea with environmental objectives. The concept of ES is central to this process, as it allows to make an explicit link between ecosystem functions and the needs of society for provisioning, regulating, and cultural services. In that sense, ES assessments can help to protect natural resources by identifying which ecosystem components supply which services and guide the development of marine activities that positively contribute to ES. For companies operating in the marine environment, employing ES assessments within their businesses can help them objectively guide management practices towards improving their environmental performance, both at the local and global scales.

Harmonizing the economic, environmental, and social domains into a decision-support tool will be ideal to steer future marine management efforts towards realizing the long-term vision for the BCS and address all of its three core principles: naturalness, social welfare, and multi-use of space. Moreover, committing to incorporate the objectives of the Sustainable Development Goals and the European Green Deal in the decision-making process is also crucial to increase the policy impact of activities. This should be operationalized through the development of a sustainability assessment framework that can guide decision-makers and accelerate the progression towards a sustainable, circular, and carbon-neutral blue economy in Belgium.

2. Goal and scope of the deliverable

This deliverable presents the desk work developed in the context of Task 2.4 - *Understanding the legal-political context for developing the Belgian Continental Shelf ES* – whose main objectives are two-fold. The first objective consists in analyzing the legal-political instruments currently available (at national and international levels) to develop and manage the maritime space and its activities sustainably. The second objective aims to understand which information is necessary for a more holistic marine management. Overall, this document i) describes the relevant environmental legislation that applies to the BCS and its activities and how they are governed, ii) provides an overview of the MSP process in Belgium and how the sustainability of the different sectors is being addressed in the present, iii) explains the relevance of the concepts of the ecosystem approach and ecosystem services for marine management, and iv) provides guidance to the development of a sustainability assessment framework in SUMES. The results of this task will be helpful to choose the relevant case studies in SUMES (Task 4.1) and develop the SUMES framework for the decision-support tool. (Task 5.2).

3. Introduction

The economic exploitation of the seas is not new to humans, and history has shown how deeply dependent we are on marine ecosystems (Barbier, 2017; Erlandson & Fitzpatrick, 2006). However, in the last century, human societies have reached a demographic level and a socioeconomic scale high enough to threaten the marine environment (Halpern et al., 2019). The rapid and often poorly regulated development of marine activities, along with climate change, has led to unprecedented pressures that increased the risk of crossing ecological tipping points, which may lead to irreversible changes in marine ecosystems (Heinze et al., 2021). To address this pressing issue, international agreements and conventions have been put forward to urge governments around the world to introduce sustainability and conservation goals into legal-political instruments to help mitigate and reduce our impact on the marine environment (Verleye et al., 2018).

In the European Union (EU), preserving and restoring the natural capital of marine ecosystems is paramount not only to ensure the continued delivery of ecosystem services (ES) but also to achieve the EU's environmental commitments, in particular those addressed under the Marine Strategy Framework Directive (MSFD) (2008/56/EC). However, despite its efforts, the EU recently reported that the objective of the MSFD to reach Good Environmental Status (GES) in EU seas by 2020 was not achieved (European Commission, 2020d). Doubling down on its commitments, the EU recently proposed the European Green Deal (COM(2019) 640 final) to continue its efforts in contributing to the 14 United Nations (UN) 2030 Sustainable Development Goals[2] (SDGs) (European Commission, 2019b). One of them relates directly to the marine environment (SDG #14 – Life-Below Water) and aims to better protect and restore marine ecosystems. The Biodiversity Strategy for 2030 (COM(2020) 380 final) is a central part of the Green Deal, providing ambitious targets to halt and reverse biodiversity loss and environmental degradation throughout the EU (European Commission, 2021a)

Marine spatial planning (MSP) is expected to play an instrumental role in finding sustainable compromises between marine socioeconomic development and conservation, contributing to SDG #14 (Kirkfeldt & Frazão Santos, 2021). Notwithstanding the recent failure to achieve GES, the operationalization of the MSFD into national laws is an important foundation for the coordination of MSP across member-states. In Belgium, the current marine spatial plan provides a legal coordinating framework for the spatial and temporal management of all activities in the BCS (*Marine Spatial Plan*, 2016). The diversity of marine-related sectors with activities in the BCS is numerous and includes coastal protection, cultural heritage, fisheries, military exercises, munition storage, nature conservation, pipelines and cables, renewable energy, ports, sand extraction, scientific research, shipping, and tourism. Future developments are expected to occur in evolving sectors, especially aquaculture which was already assigned areas for development in the marine spatial plan.

A future revision of the Belgian marine spatial plan should be able to integrate the ecosystem approach as put forward by the EU to make it more holistic (UNESCO-IOC & European Commission, 2021). Pragmatic and scientifically sound decision-support tools, such as the one being developed by SUMES, that can account for human-induced impacts on ES at different geographical scales (local to global) will be of relevance in ensuring the sustainable management of the blue economy in the BCS.

4. Legislation related to the use of the sea

The marine environment and its natural resources have always been vital to human societies and the attempt to control its uses and users has been done for centuries (Chowdharay-Best, 1976; Senior, 1952). The

[2] https://sdgs.un.org/goals

legislation for the seas represents a set of legal-political instruments that aim at regulating the use and users of marine resources and can be defined at different levels of policy implementation, from global to regional scales. In the context of the BCS, there are over a hundred legal-political instruments across these different levels that are applicable (Verleye et al., 2018). A general overview of those directly relevant to the protection of the marine environment is presented in

Legal-political instrument*	Adoption year	Objective
International level		
ASCOBANS	1992	Conservation of small cetaceans.
Bonn Agreement	1983	Cooperation between coastal States of the North Sea in dealing with pollution by oil and other harmful substances originating from ships and offshore structures.
Bonn Convention	1979	Protection of migratory species (terrestrial, aquatic, and flying animals), their habitats, and migration routes.
Bern Convention	1979	Conservation of wild fauna and flora and their habitats. Special focus is given to cross-border habitats and endangered and vulnerable species.
Convention on Biological Diversity	1992	Conservation of biodiversity, sustainable use of biodiversity, and fair and equitable sharing of the benefits arising from the use of genetic resources.
London Protocol (replaced London Convention)	1996	Protection of the marine environment from all sources of pollution (it established a general ban of dumping wastes at sea, with some exceptions).
OSPAR Convention	1992	Protection of marine ecosystems of the North-East Atlantic. The implementation of an ecosystem-based approach in the context of marine management is central to this convention.
Ramsar Convention	1971	Conservation and sustainable use of wetlands.
United Nations Convention on the Law of the Sea	1982	Establishment of a legal framework for all activities at sea and division of the seas and oceans in several legal zones. It includes a section (Part XII) on the protection and preservation of the marine environment.
EU level		
Biodiversity Strategy for 2030	2020	Conservation of biodiversity and halting the degradation of ecosystem services.
Birds Directive	1979	Protection of wild birds.
Blue Growth	2012	Promotion of sustainable growth in the marine sectors, focusing on five priority areas: offshore energy, aquaculture, tourism, mineral resources, and biotechnology.
Common Fisheries Policy	2013	Sustainable management of fishing activities.
European Green Deal	2019	Transition to a sustainable, climate-friendly future, which includes ensuring the sustainability of the blue economy and the protection of marine ecosystems
Habitats Directive	1992	Restoration and maintenance of endangered natural habitats and their fauna and flora.

Integrated Coastal Zone Management	2000	Recommendation on the strategic approach to the management of coastal zones by all member states, taking into consideration the state of natural resources and ecosystem boundaries.
Integrated Maritime Policy	2007	Promotion of marine economic development, aligned with the protection and conservation of the marine and coastal environment.
Marine Strategy Framework Directive	2008	Protection of marine resources from which economic and social activities depend and achieve Good Environmental Status of the marine waters by 2020.
Marine Spatial Planning Directive	2014	Promotion of sustainable growth of marine economies, development of marine areas, and use of natural marine resources.
Taxonomy Regulation	2020	Classification of the environmental sustainability of economic activities to facilitate sustainable investments
Water Framework Directive	2000	Protection and improvement of water quality across EU waters and achieve good ecological status by 2015 (at the latest, by 2027).
Belgian federal level		
Exclusive economic zone law	1999	Definition of the Belgian exclusive economic zone and the legal regime regarding the protection and preservation of the marine environment and the exploitation of marine resources.
Law on the exploration and the exploitation of non-living resources.	1969	Stipulation of the procedure regarding concessions for the exploration and exploitation of non-living resources in the sea bottom and subsoil.
Marine environment protection law	1999	Protection and restoration of the marine environment and regulation of the marine spatial planning process.
Flemish regional level		
Decree on integrated water policy	2003	Definition of the goals and principles of the integrated water policy at the regional level.
Decree on the agriculture and fisheries policy	2013	Definition of the regional government competencies regarding the fisheries policy.

. For a more extensive review of all instruments governing the BCS, we refer to the work by Verleye et al. (2018) and Lescrauwaet et al. (2018).

Table 1: Environmental policy instruments relevant to the BCS.

Legal-political instrument*	**Adoption year**	**Objective**
International level		
ASCOBANS	1992	Conservation of small cetaceans.
Bonn Agreement	1983	Cooperation between coastal States of the North Sea in dealing with pollution by oil and other harmful substances originating from ships and offshore structures.
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Marine Spatial Planning Directive	2014	Promotion of sustainable growth of marine economies, development of marine areas, and use of natural marine resources.
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Decree on the agriculture and fisheries policy	2013	Definition of the regional government competencies regarding the fisheries policy.

** Web links to the source text of each policy instrument are provided in the Annex section.*

On the global scale, the UN oversees many of the organizations (e.g. International Maritime Organization[3]) and programs (e.g. United Nations Environment Program[4]) that steer global marine policy towards achieving environmental objectives. The Intergovernmental Oceanographic Commission[5] (IOC) of UNESCO is the UN body responsible for the global coordination and implementation of programs for ocean research and observation, sustainable marine management, early warning systems of ocean-related hazards, and capacity development. In December 2017 the UN announced a global 'UN Decade of Ocean Science for Sustainable Development (2021-2030)'[6] as a common framework to support countries in the achievement of SDG#14. Several non-UN international conventions have also been established to help protect the marine environment that also applies to the BCS (Table 1).

In the EU, the Directorate-General for the Environment[7] (DG ENV) and Directorate-General for Maritime Affairs and Fisheries[8] (DG MARE) of the European Commission are the main organizations that propose and adopt legislation that aims to protect and maintain the marine environment across the EU. Marine management has traditionally addressed the marine sectors sector separately which, over the years, has produced a complex patchwork of laws and policies (Boyes & Elliott, 2014) and to seek a more coherent approach to all marine issues and improved coordination between those policies, the EU established its Integrated Maritime Policy (COM(2007)575). The MSFD is considered the environmental pillar of the Integrated Maritime Policy and provides a common framework to establish environmental targets for the

[3] https://www.imo.org/

[4] https://www.unep.org/

[5] https://ioc.unesco.org/

[6] https://www.oceandecade.org/

[7] https://ec.europa.eu/info/departments/environment_en

[8] https://ec.europa.eu/info/departments/maritime-affairs-and-fisheries_en

protection and conservation of the marine environment. Other environmental directives are also key in the scope of that policy (Table 1).

At the Belgian level, the governance structure of the BCS and its marine activities is a shared competency between the Federal Government and the regional Flemish Government (

Figure 1). The Federal Government is responsible for environmental protection, nature conservation at sea, renewable energy development, disposal of dredged material, shipping, aggregate extraction, and military activities. In turn, the Flemish Government is responsible for the fisheries, aquaculture, dredging, nature conservation on land, shipping, and traffic guidance. Since there is no hierarchy between both governments, each one of them adopts legislation and policies within their competencies (Pecceu et al., 2016). The Marine Environment Service of the Federal Public Service Health, Safety of the Food Chain and Environment[9] is the competent policy authority for the BCS in general, which also advises on the MSP process. Concerning sand extraction, in particular, the competent authority is the Continental Shelf Service of the Federal Public Service Economy[10]. All aspects of the environmental policy regarding the coastal area are under the competence of the Flemish Government through the Environment Department[11]. Whenever collaboration is needed in matters related to the governance of the BCS, both parties communicate through informal discussions and agreements, in consultation with their advisory bodies and stakeholder groups (

[9] https://www.health.belgium.be/en

[10] https://economie.fgov.be/en

[11] https://omgeving.vlaanderen.be/

Figure 1).

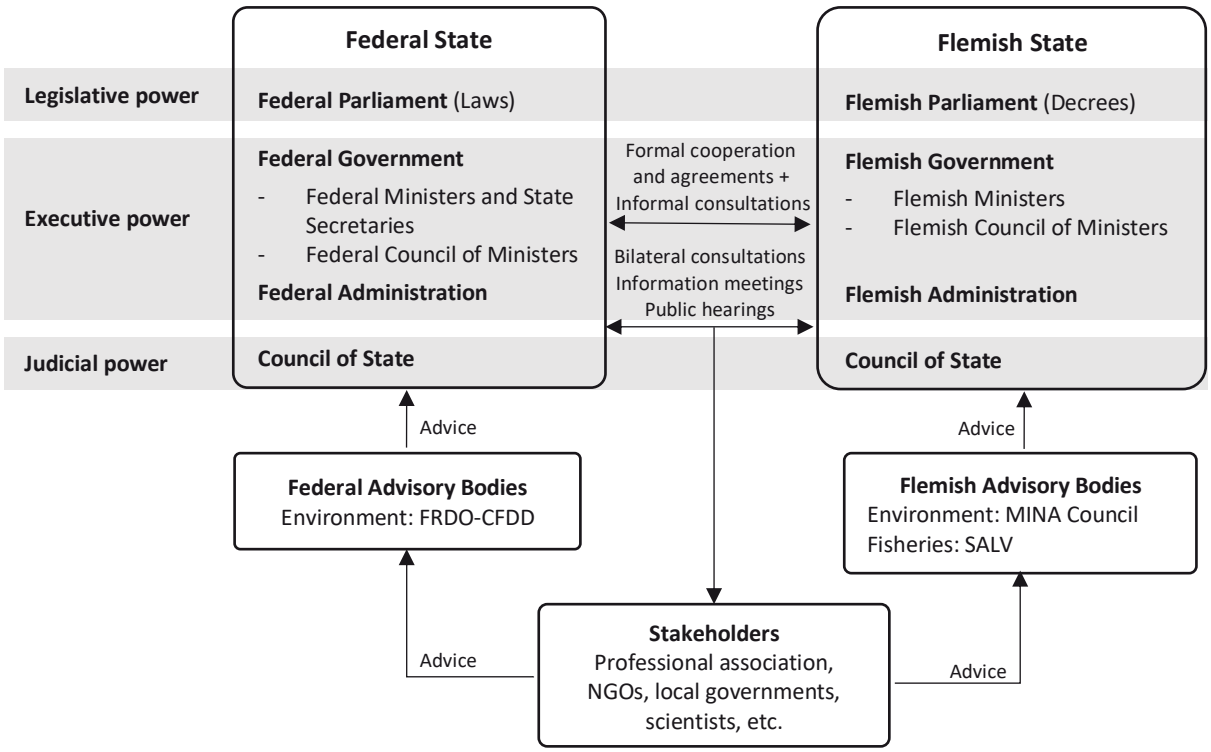

Figure 1: Overview of institutional and stakeholder integration in BCS governance (Source: Pecceu et al. 2016).

5. Belgian marine spatial planning

Marine spatial planning is a comprehensive and strategic process that analyses and allocates the use of the marine space to minimize conflicts between human activities, optimizes benefits obtained from marine resources, and fosters their fair distribution among stakeholders while ensuring the resilience of marine ecosystems (UNESCO-IOC & European Commission, 2021).

In the EU, several Directives apply directly to MSP, namely the most obvious MSP Directive (2014/89/EU), the MSFD (2008/56/EC), the Birds Directive (2009/147/EC), the Habitats Directives (92/43/EEC), the Water Framework Directive (2000/60/EC) and the Strategic Environmental Assessment Directive (2001/42/EC). Besides, the EU Biodiversity Strategy for 2030 (COM(2020) 380 final) is also an important legislative framework in the context of MSP. One of its aims is to restore the good environmental status of marine ecosystems through the application of an ecosystem-based management approach that reduces the adverse impacts of marine activities, which must be supported by national marine spatial plans (European Commission, 2021a).

In Belgium, the UN Convention on the Law of the Sea was the precursor of two major laws that form the basis of the MSP process. These are the Exclusive Economic Zone law and the Marine Environment Protection law, both adopted in 1999 (Table 1). Both provided the basis for deciding how to use the sea, from developing human activities to establishing marine protected areas. A pioneer in the EU, the Belgian government introduced its first marine management plan in 2004, the Master Plan for the North Sea (Douvere et al., 2007).

Ahead of the implementation of the MSP Directive in 2014 by the EU, Belgium amended the Marine Environment Protection law was in 2012 to formally include the development of a marine spatial plan for the BCS. In the same year, the Royal Decree of November 20th established an advisory committee and the procedure for adopting a marine spatial plan. Cross-border consultation was explicitly imposed by the Royal decree to coordinate policy choices, given that the BCS is fully surrounded by the exclusive economic zone of three other countries (France, Netherlands and United Kingdom). The Federal Minister for the North Sea is the entity responsible for overseeing the MSP process, in coordination with the Marine Environment Service of the Federal Public Health Service.

In 2014, Belgium's first marine spatial plan under that new MSP Directive was adopted, concerning the period between 2014 and 2020 (Friess & Grémaud-Colombier, 2019). During the development of the second MSP process referent to the years between 2020 and 2026, wider societal participation was sought in recognition of the large diversity of stakeholders, which included businesses, NGOs, government bodies, interest groups, and citizens. The environmental sustainability aspect also received extra attention, for example through a Strategic Environmental Impact Assessment. The resulting marine spatial plan for 2020-2026 established under the Royal Decree of 22 May 2019 (Belgisch Staatsblad, 2019), is in full effect since the 20th of March 2020 (Figure 2).

Figure 2: Overview of the Belgian marine spatial plan for 2020-2026.

6. Ecosystem approach

Marine spatial planning is widely seen as a tool enabling the effective implementation of the ecosystem approach (EA) to marine management. The concept of EA gained global policy relevance back in 1998 when the outputs from the Workshop on the Ecosystem Approach were presented during the Fourth Ordinary Meeting of the Conference of the Parties to the Convention on Biological Diversity (COP4), which led to the elaboration of the 12 Malawi Principles for the Ecosystem Approach (United Nations Environment Programme, 1998). In 2000, the COP5 defined the EA as a "*strategy for the integrated management of land, water and living resources that promotes conservation and sustainable use in an equitable way"* in its final report (United Nations Environment Programme, 2000).

From a European marine perspective, the EA was endorsed by the OSPAR Commission in 2003, during a joint ministerial meeting with HELCOM[12], to improve the protection of the marine environment of the North-East Atlantic and the Baltic Sea. Later in 2005, a scientific consensus statement[13] signed by 217 marine scientists and policy experts was released, where they defined the concept of marine ecosystem-based management. Several other publications followed, laying out the foundations for the application of the EA to marine management (e.g. Arkema et al., 2006; Halpern et al., 2008).

In the EU context, the EA has been fully incorporated in the relevant legislation associated with the development of marine activities and the protection of marine ecosystems. The MSFD, for example, states that "*marine strategies shall apply an ecosystem-based approach to the management of human activities, ensuring that the collective pressure of such activities is kept within levels compatible with the achievement of good environmental status and that the capacity of marine ecosystems to respond to human-induced changes is not compromised while enabling the sustainable use of marine goods and services by present and future generations".* The MSP Directive, in defining the purpose of marine spatial plans, states that "*the application of an ecosystem-based approach will contribute to promoting the sustainable development and growth of the maritime and coastal economies and the sustainable use of marine and coastal resources*".

An additional challenge that has been put forward by MSP experts in more recent years is related to the integration of social sustainability aspects into the process, related for instance with gender equality, poverty and marginalization of certain groups. The social dimension has been the least investigated dimension of marine sustainability, in comparison to the economic and environmental domains, and has consequently been relatively overlooked in MSP processes (Frederiksen et al., 2021; Gilek et al., 2021). In an attempt to operationalize the concept of social sustainability for MSP, Saunders et al. (2020) conceptualized it based on three key dimensions - recognition, representation, and distribution. These domains cover unarticulated concerns related to culture, identity, gender, status, rights, lifestyles, wellbeing, ways of knowing, participation, and the equitable distribution of access, risks, benefits, and capacities. The most recent guide for MSP developed by UNESCO-IOC & European Commission (2021) already endorses the integration of social sustainability assessments into the planning process.

In the context of the sustainability goals put forward by the UN Agenda for Sustainable Development, MSP would benefit from aligning with the broader SDGs, while keeping SDG #14 as its main objective. Indeed, links can be made between MSP and the different SDGs, as highlighted in Figure 3 (Intergovernmental Oceanographic Commission, 2020). For instance, MSP can contribute to SDG #1 (No Poverty) by sustaining the

[12] https://www.ospar.org/meetings/archive/joint-ospar-helcom-ministerial-meeting

[13] https://marineplanning.org/wp-content/uploads/2015/07/Consensusstatement.pdf

sustainable development of marine sectors considering social sustainability aspects and therefore benefiting marginalized coastal communities, especially in least developed countries and small island states.

Moreover, designing marine spatial plans based on holistic decision support tools that also include climate change scenarios can make them adaptable and capable of mitigating some of the effects of climate change in oceanic conditions. Changes in ocean circulation and chemistry will most likely affect marine ES, and the rise of sea-level and storm surges will expose the vulnerabilities of coastal infrastructures, which will directly affect marine activities and coastal communities (IPCC, 2019). Therefore, MSP needs to incorporate forecasts of sea states under climate change scenarios in its analysis and proposals, aiming to create a dynamic marine spatial plan that is resilient to climate change impacts. Some concrete measures that can foster a more climate-smart marine spatial plan in the BCS are the promotion and diversification of offshore renewable energy, the creation of green infrastructure and nature-based solutions for carbon sequestration and coastal protection, and the delimitation of potential areas for climate refugia and dynamic marine protected areas (UNESCO-IOC & European Commission, 2021).

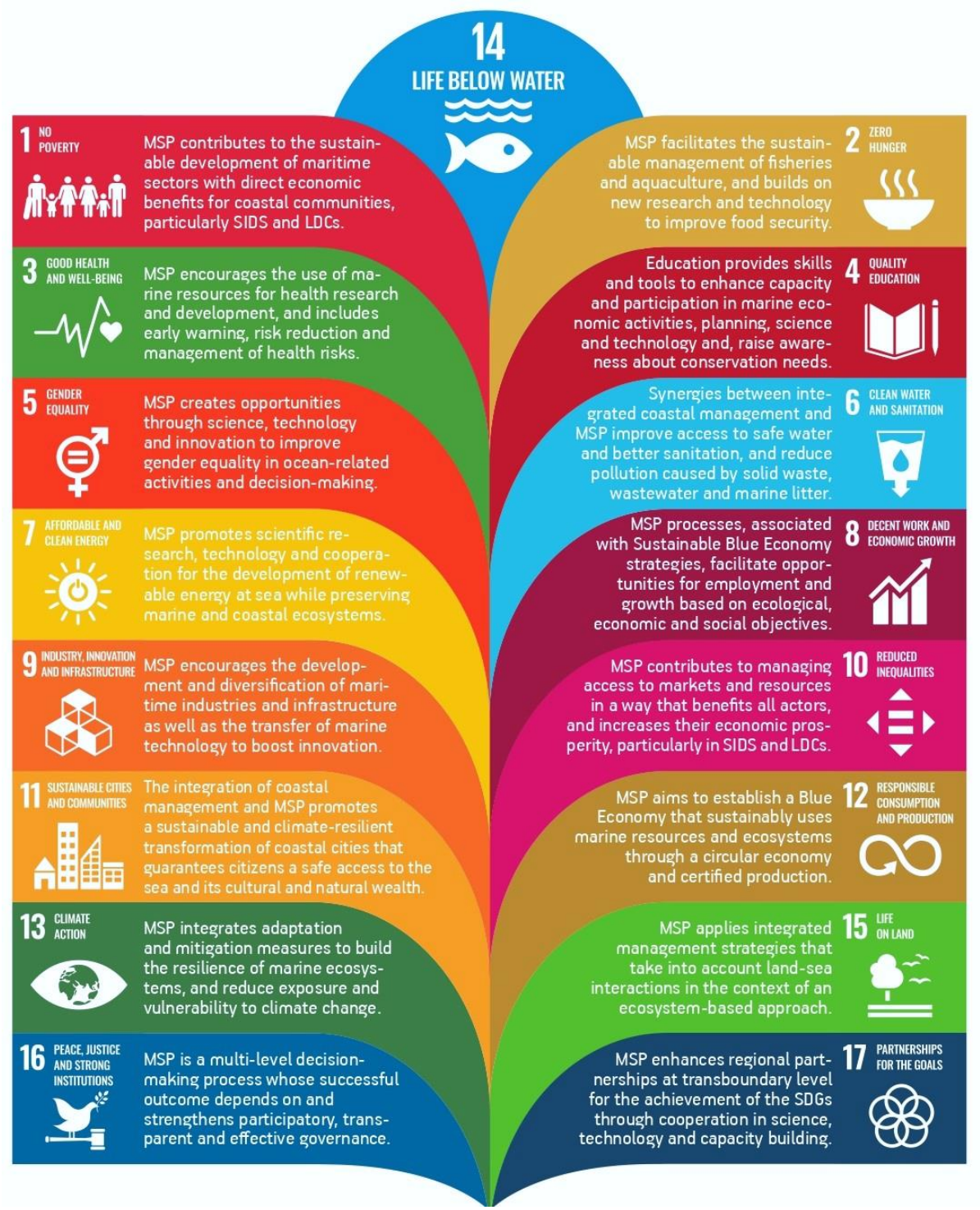

Figure 3: Links between MSP and the SDGs (Source: Intergovernmental Oceanographic Commission, 2020).

7. Marine activities

The BCS covers no more than 0.5% of the entire North Sea (3454 km^2) yet is one of the most heavily used marine areas in the world. Currently, the main human activities occurring in the BCS are related to coastal protection, cultural heritage, fisheries, military exercises, munition storage, nature conservation, offshore renewable energy, pipelines and cables, ports, sand extraction, scientific research, shipping, and tourism

(Figure 2). Other activities highlighted in the EU Blue Growth strategy (COM (2012) 494) are expected to develop further, especially aquaculture and marine biotechnology (European Commission, 2012).

The latest EU Blue Economy Report stated that the established EU blue economy sectors in Belgium in 2018 generated almost 4.2 billion euros in gross value-added and provided about 37500 jobs (Table 2). This value corresponds to about 1% of the total Belgian economy (European Commission, 2021e). Port activities created the biggest share of the gross value-added of Belgium's blue economy, followed by shipping and coastal tourism. A regional report by Bilsen et al. (2019) on the blue economy in Flanders attempted to be broader in their analysis and also include non-traditional sectors of the blue economy (e.g. scientific research, biotechnology, coastal protection, marine services) by following a bottom-up approach. They estimated that the blue economy in Flanders provided a direct value-added of 7.2 billion euros (2.8% of the gross domestic product of Flanders) and approximately 76700 jobs.

Table 2: Evolution of the economy (persons employed and gross-value added) of established marine sectors in Belgium, 2009-2018. GVA – Gross value-added. (Source: European Commission, 2021e).

Persons employed *(thousand)*	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Living resources	5.5	5.7	6.6	7.0	6.7	6.2	6.5	6.7	6.9	7.7
Non-living resources	0.0	0.1	0.0	0.0	0.1	0.0	0.0	0.1	0.1	0.1
Ocean energy	0.0	0.0	0.1	0.1	0.2	0.3	0.4	0.3	0.3	0.9
Port activities	9.9	10.4	10.0	10.5	10.1	10.6	10.9	11.2	11.5	14.3
Shipbuilding and repair	2.9	1.9	1.8	1.8	1.7	1.6	1.5	1.4	1.3	1.4
Maritime transport	6.3	6.9	6.3	6.7	5.0	3.8	4.5	4.2	3.9	4.1
Coastal tourism	5.8	5.7	5.8	6.1	6.1	6.5	6.3	6.2	6.7	9.1
Blue economy jobs	30.5	30.7	30.7	32.2	29.8	29.0	30.1	30.1	30.9	37.5
National employment	4389	4451	4470	4479	4485	4497	4499	4541	4587	4699
Blue economy (% of national jobs)	0.7	0.7	0.7	0.7	0.7	0.6	0.7	0.7	0.7	0.8
Gross-value added *(€ million)*	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**
Living resources	344	415	397	414	406	400	428	443	486	509
Non-living resources	3	10	6	4	8	6	6	8	7	7
Ocean energy	3	7	27	36	60	97	102	86	88	114
Port activities	1531	1565	1429	1605	1621	1561	1886	1566	1962	1780
Shipbuilding and repair	219	160	177	109	96	86	26	106	102	130
Maritime transport	651	757	734	1169	905	819	1265	1268	1351	1237
Coastal tourism	249	239	254	267	279	299	294	277	320	446
Blue economy GVA	3002	3153	3024	3603	3376	3268	4006	3754	4317	4223
National GVA	309512	324347	336110	345069	350969	360582	373302	384171	398134	409856
Blue economy (% of national GVA)	1.0	1.0	0.9	1.0	1.0	0.9	1.1	1.0	1.1	1.0

To maintain a healthy and thriving blue economy in the BCS, marine planners must consider the needs of the different stakeholders to ensure a fair distribution and access to marine resources and services. This includes defining the interests of established and emerging sectors and leveraging their capacity to work with nature in order to safeguard a sustainable blue growth that respects environmental regulations. Even though different activities might be managed and regulated by different entities and legal instruments, all of them are expected to contribute to environmental goals set at the international and national levels.

6.1. Protecting the marine environment

The preservation of marine habitats and biodiversity is now considered a prerequisite for all marine activities, given that many of them and the wellbeing of the society at large depend on their sustained capacity to

provide goods and services. Moreover, the achievement of many of the objectives of the European Green Deal is directly dependent on the maintenance of ES, namely decarbonization (e.g. carbon offsetting through carbon sequestration), climate adaptation (e.g. coastal protection), and zero pollution (e.g. remediation of excess nitrogen).

Additional to adapting marine activities to achieve sustainability goals, establishing marine protected areas is crucial in fostering nature conservation in the marine space. In the BCS, the Birds and Habitat Directives are the policy basis for establishing marine protected areas which are also part of the Natura 2000 network. In the current marine spatial plan, two Special Areas of Conservation for habitats (*Vlaamse Banken* and *Vlakte van de Raan*) and three Special Protection Areas for birds have been delineated. In these areas, certain marine activities may take place as long as they have obtained a Natura 2000 authorization (insofar as they are subject to this procedure) or are not prohibited or restricted in any other way. Currently, about 37% of the BCS has been designated as a marine protected area.

Before taking place, most human activities in the BCS must obtain a license to operate that includes an environmental impact assessment (EIA) to ensure the environmental sustainability of the activities (note, however, that commercial fishing, scientific research, and maritime shipping are not subject to this requirement at the moment). The EIA is normally used by the Operational Directorate for the Natural Environment of the Royal Belgian Institute of Natural Sciences to draw up a scientific opinion on the application which is then forwarded to the Marine Environment Service of the FPS Public Health, Food Chain Safety and Environment, who also provides its advice. The file is then submitted to the competent minister for a final decision on the application.

The EIA required during the licensing procedure could be complemented with other sustainability assessment instruments available in the literature (De Luca Peña et al., 2022). Integrating these procedures as part of marine management decisions and licensing processes would advance the compliance of human activities at sea with environmental objectives and make the impact assessment more holistic. To help fill this gap, the SUMES project set as its main goal the development of a decision-support tool for decision-makers that integrates complementary sustainability assessment methods, mainly environmental risk assessment, life cycle assessment and ecosystem services assessment.

6.2. Enhancing the environmental sustainability of marine sectors

Marine activities must be carried out in accordance with the requirement to protect and maintain the marine environment and to sustainably use its resources. This requirement has been well established in the legal-political instruments discussed in the previous chapters, and especially through the implementation of the MSFD which also provided an important legal foundation for the ecosystem approach to marine management. Both traditional and upcoming sectors of the BCS are therefore expected to become environmentally sustainable in the coming decades and important progress has already been made in recent years.

Fisheries is an important and fairly regulated sector in the EU, mainly through the Common Fisheries Policy which sets the quotas for fish catches to member states to protect and maintain fish stocks. The Belgian fleet must comply with these fishing quotas. In the BCS area, according to the current marine spatial plan, professional fishing is authorized everywhere except at a few locations (namely the munition dumpsite *Paardenmarkt* and within operational offshore wind farming areas, including a safety zone of 500 meters). Within the marine protected area of *Vlaamse Banken* and around shipwrecks, fisheries are allowed but are

limited to passive fishing techniques that are less destructive, to help protect the Special Area of Conservation and cultural heritage sites. The sector is one of the few that is not obliged to undergo an environmental impact assessment, which is a setback in the sustainable management of this activity in the BCS.

Aquaculture is still a developing sector in the EU and it can be steered towards becoming a low-impact food production industry that also provides regulating services, with ample scope to contribute to the European Green Deal. The recent Strategic Guidelines for EU Aquaculture (European Commission, 2021b) lay down best practices to promote circularity and good environmental performance through waste management, environmental monitoring, and diversification of species and culture methods and should be a cornerstone of the aquaculture sector. To attain these objectives, it is important to promote the aquaculture of low-trophic species, such as bivalves, algae and plants, as well as more energy-efficient and sustainable production systems such as recirculating aquaculture systems, integrated multi-trophic aquaculture, and organic aquaculture. In Belgium, despite a relatively strong aquaculture research environment, commercial production is very limited. Given that aquaculture development in the BCS is only allowed in co-location with offshore wind farming and must contribute to the reduction of eutrophication (according to the MSP 2020-2026, see footnote 9), there is a major opportunity for Belgium to become an important contributor to the bivalves and seaweed aquaculture industry in the EU.

Concerning non-living resources, sand extraction and dredging are the main sectors operating in the BCS and their activities can exert a significant impact on marine ecosystems by disturbing the seafloor biophysical composition. To limit the potential environmental impacts, the marine spatial plan defines several exclusive areas specially reserved for the deposition of dredged materials and sand extraction. Additionally, the environmental impact of these activities is closely monitored in order to comply with EU legislation (Devriese et al., 2018). Several monitoring zones are established inside and outside extraction zones in the BCS, to accurately follow the evolution of the seafloor.

Because the BCS is situated on one of the busiest shipping routes in the world, ports and shipping became its most important sectors over time in terms of gross value-added (Table 2), with the port of Antwerp as the second-largest port in the EU. To safeguard these activities, the most important shipping routes to reach Belgian ports are legally demarcated in the marine spatial plan and shipping has priority over other activities within those areas. Space is also reserved for potential expansions of the ports of Zeebrugge and Ostend in the future. In the context of the European Green Deal, shipping is expected to undergo substantial decarbonization and ports will be crucial to the sustainability of the blue economy as a whole, serving not only for their traditional role as transportation hubs but also providing support to the energy transition (e.g. energy hubs for offshore renewable energy) and circular economy (e.g. support the collection, transshipping, and disposal of wastes from marine activities). The port of Ostend, for example, is already an important energy hub for offshore wind energy in the BCS, supporting the energy transition.

Offshore renewable energy, in particular wind energy, has become a key sector in Belgium's blue economy in recent years. At the end of 2020, Belgium had installed 2259 MW of offshore wind power capacity and plans to produce 4000 MW of offshore wind electricity by 2030 through the commissioning of new areas for offshore wind farming, as delineated in the marine spatial plan, to help meet EU's renewable energy goals (according to the EU Renewable Energy Directive (2009/28/EC). Belgium should have achieved a 13 % share for

renewables in gross energy consumption by 2020, but this goal was not met according to recent data[14]. For 2030, the share was set to 17.5% (European Commission, 2020b), highlighting the importance of offshore renewable energy developments in the coming years. The importance of this sector to the BCS was also emphasized during discussions in the context of the SUMES project, which selected offshore wind farming as its pilot case study. This is further discussed in Deliverable 4.1[15] of the project. In the marine spatial plan, several zones were designated for the construction and operation of offshore renewable energy installations, for electricity transmission and for laying pipelines and cables. Environmental monitoring programs have been established in the BCS to assess the impact of wind turbines (as well as cables and pipelines) on the marine environment. The energy production zones included in the marine spatial plan for 2020-2026 also allow for other forms of offshore renewable energy, namely wave, tidal and solar energies, to be installed.

Coastal protection is increasingly becoming a key challenge in the coastal areas and estuaries to adapt to the consequences of climate change, such as increased storm surges and floods. Within the coastal protection sector, green infrastructures based on nature are being endorsed as alternatives to building additional grey infrastructure (e.g. dams, dikes), such as nature reclamation projects (e.g. dune restoration), engineered ecosystems (e.g. constructed wetlands), and ecologically enhanced engineering (e.g. artificial islands and reefs) (Chávez et al., 2021). In the BCS, biogenic reefs are being deployed to test their capacity to induce natural accretion of sand, attenuate storm waves and reinforce the foreshore, thus providing coastal protection (Mascart et al., 2021). The engineering of seagrass meadows is also being tested to stabilize the seabed and reduce coastal erosion (Mascart et al., 2021).

Despite occurring mostly on the coast, some coastal tourism activities also take place inside the BCS. The main non-motorized activities are swimming, watersports, sailing and recreational diving, and the motorized forms of recreation include yachting, boating excursions, recreational fishing and water skiing. Regarding environmental impacts in the BCS, the high concentration of tourism activities in the coastal area during the peak season can have some direct and indirect effects on the marine environment, namely pollution by recreational motorized activities, increased eutrophication and litter accumulation (Devriese et al., 2018). Measures have been formulated in order to support a more sustainable coastal tourism that is in balance with the maintenance of the natural system (Westtoer & Toerisme Vlaanderen, 2014) and the quality of the bathing water is frequently monitored by the Flemish Environment Agency.

Underwater cultural heritage in the BCS is protected under the law since 2014 and covers mainly maritime archaeological elements such as shipwrecks and other wrecks (e.g. airplanes), settlements, or other traces or remains of human activity, and paleontological evidence of terrestrial fauna (Pieters et al., 2018). In the current marine spatial plan, nine underwater heritage elements (shipwrecks, are delineated for protection, establishing restrictions to fishing, anchoring, and dredging (Belgisch Staatsblad, 2019). The restriction regarding anchoring may be lifted, following proper notification to the authorities, in the case of recreational diving.

6.3. Embracing the multi-use of space

[14] https://ec.europa.eu/info/business-economy-euro/economic-and-fiscal-policy-coordination/eu-economic-governance-monitoring-prevention-correction/european-semester/european-semester-your-country/belgium/europe-2020-targets-statistics-and-indicators-belgium_en#share-of-renewable-energy

[15] https://sharepoint.ugent.be/projects/202006323/Documents/Deliverables/D4.1%20SUMES%20Description%20and%20(semi-)quantification%20of%20a%20first%20selected%20case%20study%20a%20showcase_final.pdf

Marine spatial planning endorses the concept of multi-use of space which refers to the intentional combination of marine activities in close proximity. According to Schupp et al. (2019), multi-use can be classified into four different types, based on a set of four dimensions that define the degree of connectivity between marine activities: spatial, temporal, provisioning, and functional (Table 3). The spatial dimension refers to the three-dimensional space that can be occupied by a given use and is intrinsic to all multi-use scenarios. The temporal dimension refers to the timeframe in which the uses take place, which may be at the same time or subsequently. The provisioning dimension refers to the activities supporting the main function of a use (e.g. monitoring, safety, transport, communication), which may be shared between different uses. The functional dimension refers to the main function of a use, which may be linked with other uses in the form of shared infrastructure (e.g. multi-purpose platforms) and shared vessels directly involved in the main functions (Schupp et al., 2019).

Table 3: Typologies of multi-use (Source: Schupp et al. 2019).

Multi-use type	**Dimension**			
	Spatial	Temporal	Provisioning	Functional
1. Multi-purpose/ Multi-functional	✓	✓	✓	✓
2. Symbiotic use	✓	✓	✓	
3. Co-location/ Co-existence	✓	✓		
4. Subsequent use/ Repurposing	✓			

The first type is designated as ‘multi-purpose’ (or ‘multi-function’) and is characterized by the highest level of connectivity between activities, which take place in the same area, at the same time, with shared services and core infrastructure. Examples of this type of multi-use are floating power plants combining multiple marine renewable energies (e.g. wind, tidal, wave and solar power) or multi-purpose platforms that structurally connect offshore aquaculture devices and wind turbines (Nassar et al., 2020). The second type is called ‘symbiotic use’ and is characterized by connections in the spatial, temporal, and provisional dimensions, but there is no direct linkage between core functions. This type of multi-use may be established when offshore aquaculture is developed in between offshore wind turbines or through tourism activities specialized in visits to offshore aquaculture sites and wind farms (project UNITED[16]). The third type is named ‘co-location’ and is characterized by a moderate to low degree of connectivity where only place and time are shared. An example is the potential occurrence of certain forms of commercial fisheries within offshore wind farms areas (European Commission, 2020c). The fourth and last type, the ‘subsequent use’ (or ‘repurposing’), is characterized by activities that take place in the same space but subsequently to one another (temporal disconnection). Examples of this type are the repurposing of decommissioned structures into new uses, such as recreational activities (e.g. recreational fishing, diving), scientific research (e.g. conversion into monitoring/research stations) and artificial reefs (Depellegrin et al., 2019).

[16] https://www.h2020united.eu/pilots

Multi-use types can promote even more efficient use of space by optimizing synergies between the different activities and are thus important concepts to integrate into MSP. Given the limited space in the BCS, multi-use is expected to become the norm and is already specified in the current marine spatial plan. More specifically, marine aquaculture installations in the BCS can only be developed within offshore wind farming areas and are limited to the production of low-trophic organisms, which can promote a more positive impact of both activities on local ES (Buck et al., 2017). The multi-use type number 2 (symbiotic use) would be the most suitable to implement where offshore wind turbines are already present, through sharing supporting services (e.g. crew vessels, foundations for mooring, monitoring) (Buck et al., 2018). The multi-use type number 1 (multi-purpose) could be potentially implemented within the new offshore wind farming areas available through the development of multifunctional offshore installations that are designed to integrate aquaculture devices and offshore energy production (Billing et al., 2022).

8. Integration of ecosystem services

Ecosystem services (ES) are typically defined as the benefits people obtain from ecosystems (Millennium Ecosystem Assessment, 2005) and can be divided into three main categories: provisioning services, regulating services, and cultural services (Haines-Young & Potschin-Young, 2018). The concept started gaining traction and entering the policy agenda during the last twenty years, following the outputs of key science-policy projects, namely the Millennium Ecosystem Assessment (MEA), The Economics of Ecosystems and Biodiversity (TEEB), and the creation of the Intergovernmental Panel on Biodiversity and Ecosystem Services (IPBES). The cascade model (Figure 4) was developed to explain how the notion of ES can be used to understand the relationships between people and nature (Boerema et al., 2017; Potschin-Young et al., 2018). Quantifying both supply and demand sides of the cascade is key to identifying potential mismatches and helping prioritize marine management efforts and the development of infrastructure that can contribute to balancing the flow of ES.

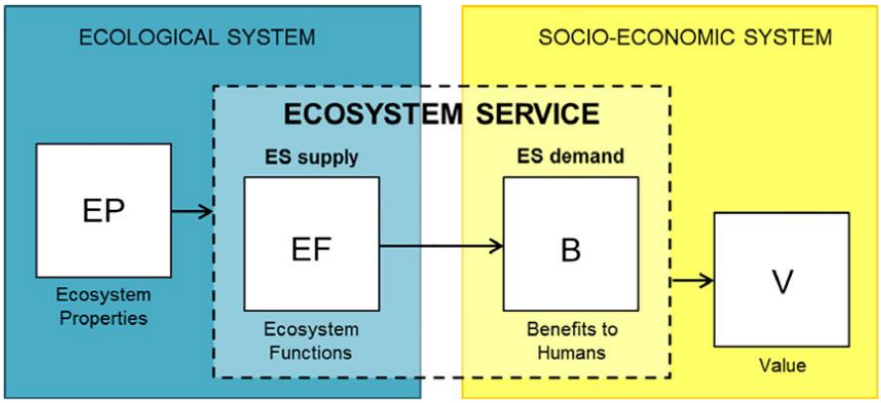

Figure 4: The ecosystem services cascade (Boerema et al. 2017).

To date, no specific binding EU policy instrument addresses ES specifically (Bouwma et al., 2018) (even though some policies, such as the MSFD, the Invasive Alien Species Regulation, and the MSP Directive do feature the concept to some extent). The incorporation of the ES concept in policies happened mostly on the side of strategic non-binding documents, following an advisory style of steering (Bouwma et al., 2018). This shows that there still is considerable scope to improve the mainstreaming of the ES concept in EU policies in general and in marine environmental policies in particular.

Simply put, the benefits of integrating ES into decision-making are related to the fact that society depends on ES to properly function. Through ES assessments, it is possible to present (ecological and economic) arguments for protecting natural resources, pinpoint which natural assets need to be protected and maintained, and provide data for natural capital accounting. Integrating ES can also improve the maintenance of less tangible services which are nonetheless vital for human well-being. Moreover, it can guide the development of cost-effective nature-based solutions to protect, manage and restore ecosystems and increase the overall ES capacity of the system (Maes & Jacobs, 2017).

To promote the successful integration of ES into decision-making, the EU proposed eight guiding principles[17] that were derived from current environment conventions and legislations: i) prioritize measures that improve ecosystem condition and contribute to wellbeing, ii) address inter-dependencies and trade-offs, iii) apply the mitigation hierarchy, and iv) the precautionary principle, v) set long term objectives to secure essential ES, vi) ensure adaptive management, vii) coordinate and integrated planning across sectors and levels, and viii) enable stakeholder engagement (European Commission, 2019a).

In the particular case of business decision-making, looking at human activities as part of the ecosystem is a big challenge, and ES assessments can help understand both their positive and negative impacts on the ecosystem. For companies operating in the marine space, there are two major benefits for carrying out ES assessments (

The High-Level Expert Group on sustainable finances of the European Commission recommended in 2018 that "the *Commission should encourage and support the development and use of standards, metrics and methods for quantifying, reporting and managing natural capital risks and opportunities in decisions by financial institutions"* and *"explore how to use frameworks for defining global science-based targets for natural capital management and restoration"*. This recommendation formed the basis of the Action Plan on Sustainable Finance (COM/2018/097) which aims to provide opportunities for the integration of natural capital and ES into business decisions. The document highlights the strong potential for synergies between finance, ecosystem-based approaches, and cost-effective nature-based solutions. Building on this, the European Commission recently published its Renewed Sustainable Finance Strategy to bring the EU financial system more in line with the European Green Deal (European Commission, 2021c).

Table 4). First, it can steer those companies that heavily depend on ES to making management decisions that increase natural capital, consequently benefiting their activities. Second, it can improve companies' sustainability practices and consequently improve their social license and reputation. The Blue Cluster has recently put forward a white paper[18] that provides a potential framework (named 'Ecosystem Approach

[17] https://ec.europa.eu/environment/nature/ecosystems/pdf/8461_Summary%20_EU_Guidance_Draft_02_17.07.2020.pdf

[18] https://www-blauwecluster-be.translate.goog/nieuws/lees-onze-nieuwe-whitepaper-rond-ecosysteembenadering?_x_tr_sl=auto&_x_tr_tl=en&_x_tr_hl=nl

ladder') to help companies incorporate the EA into their businesses. This will now be further developed in the VLAIO funded project MeSP[19]. An interaction between SUMES and MeSP projects is expected to create an optimal framework for sustainable management of activities at sea.

EU law currently requires large public-interest companies with more than 500 employees to disclose information on key environmental factors. This helps investors, civil society organizations, consumers, policy-makers, and other stakeholders to evaluate the environmental performance of those companies and encourage them to develop an environmentally responsible approach to business. In that sense, the EU Non-Financial Reporting Directive (2014/95/EU) lays down the rules on disclosure of non-financial information, including the impacts on the environment, natural capital, and biodiversity. On a voluntary basis, companies in general may also integrate social and environmental concerns in their business operations and interactions with their stakeholders, through the concept of Corporate Social Responsibility. To meet their environmental sustainability goals, companies may integrate the information provided by ES assessments into business strategies and operations.

The High-Level Expert Group on sustainable finances of the European Commission recommended in 2018 that "the *Commission should encourage and support the development and use of standards, metrics and methods for quantifying, reporting and managing natural capital risks and opportunities in decisions by financial institutions"* and *"explore how to use frameworks for defining global science-based targets for natural capital management and restoration"*[20]. This recommendation formed the basis of the Action Plan on Sustainable Finance (COM/2018/097) which aims to provide opportunities for the integration of natural capital and ES into business decisions. The document highlights the strong potential for synergies between finance, ecosystem-based approaches, and cost-effective nature-based solutions. Building on this, the European Commission recently published its Renewed Sustainable Finance Strategy to bring the EU financial system more in line with the European Green Deal (European Commission, 2021c).

Table 4: Potential advantages of integrating ES in business decision-making (Source: Tardieu & Crossman, 2017).

Improving management	**Improving external image**
• Determining more cost-effective investments. • Identifying risks and increasing business resilience. • Identifying new opportunities and new products. • Responding to legal regulations and ultimately reducing taxes, or becoming eligible for other financial incentives. • Developing new competitive advantages. • Developing leadership in ecosystem services integration. • Enhancing project design and acceptance.	• Responding to consumer demand for green products. • New competitive advantages. • Enhancing business reputation and image. • Strengthening life-cycle assessments or environmental impact assessments by considering ecosystem services. • Consideration by different investors, and consideration for bank loans and grants. • Enhanced loyalty of employees.

To align with EU's environmental objectives and the apparent trend towards mandatory reporting of environmental performance, the companies operating in the BCS have the opportunity to take the lead in

[19] https://www.blauwecluster.be/project/mesp

[20] https://ec.europa.eu/info/sites/default/files/180131-sustainable-finance-final-report_en.pdf

integrating ES into business decision-making by voluntarily adopting ES assessment tools. The SUMES project has been working towards the development of such a tool that can model the supply of ES in the BCS (Deliverables 1.1[21] and 1.2[22]) by also taking into consideration stakeholders' perspectives and priorities (Deliverable 2.2[23]). By being early adopters of this tool, stakeholders of the BCS will be better prepared to incorporate nature-based solutions and mitigation measures in their business based on scientific evidence and will be prepared to report their impact and contribution to ES to the authorities in the future.

9. Long-term vision for the BCS

As part of the preparation for the current 2020-2026 plan, the Belgian State Secretary for the North Sea developed a document outlining the long-term integrated vision for the development of the BCS by 2050 (De Backer, 2017). This long-term vision sits on three core principles of sustainable marine management - naturalness, social welfare, and multi-use of space – which have been central subjects throughout this document.

Naturalness is seen as a basic pre-condition for the development of all other dimensions, given the importance of ecosystem goods and services to society in general and the different marine activities in particular. Satisfying this basic condition requires pro-activity in maintaining and restoring natural assets, preventing negative impacts, and promoting nature-based solutions. Being aware of the shifting baseline syndrome (which refers to the lowering of accepted thresholds for good environmental conditions as generations succeed one another) should also be taken into consideration when planning for nature restoration (Soga & Gaston, 2018). Traditional ecological knowledge could complement scientific knowledge in defining adequate thresholds (Jardine, 2019).

The Think Tank North Sea also provided some concrete examples of how naturalness can be made an integral part of human activities in the BCS, namely through natural coastal defense (e.g. bivalve reefs), integrated multi-trophic aquaculture, and nature-inclusive offshore construction (e.g. artificial reefs) (Degraer et al., 2020). This principle is also in line with the EU Biodiversity Strategy for 2030, which sets up the guidelines to restore and protect marine ecosystems across the EU for the next decade (European Commission, 2021a)

Social welfare is intrinsically linked to naturalness to the extent that socioeconomic development and human well-being are dependent on ES. The ES concept discussed in the previous chapter (Chapter 8) clearly establishes this link between the ecological and the socioeconomic domains through the flow of ES, providing a useful conceptual framework (the ES cascade) for assessing nature's contribution to social welfare (Potschin-

[21] https://sharepoint.ugent.be/projects/202006323/Documents/Deliverables/D1.1_Model_Overview_Final.pdf

[22] https://sharepoint.ugent.be/projects/202006323/Documents/Deliverables/D1.2_Conceptual_model_Final.pdf

[23] https://sharepoint.ugent.be/projects/202006323/Documents/Deliverables/D2.2%20SUMES%20Selection%20of%20relevant%20ES.docx

Young et al., 2018). Therefore, ES assessments can help evaluate and predict the impact of changes in naturalness on social welfare, which can be done using decision-support tools such as the one being developed by SUMES.

The third core principle of the long-term vision is the concept of multi-use of space, through which synergies between uses and users can be potentiated, as previously discussed. This approach also aligns with the EU Biodiversity Strategy for 2030 which states, for instance, that win-win solutions for marine renewable energy systems and biodiversity should be prioritized (European Commission, 2021a). Once more, ES assessments can help prioritize the multi-use scenarios that may provide the most value in terms of ES supply, which will also be addressed in the scope of the SUMES project through an advanced case study that will involve a multi-use scenario.

10. Contributing to the European Green Deal

There is a need for clear guidelines and data-driven frameworks to guide concrete developments towards an EA to human activities at sea and realize our current environmental policy goals, and the European Green Deal provides opportunities to work on such concrete guidelines. With the Green Deal, the EU aims to create a more environmentally sustainable EU economy, making the environment and climate change the main drivers of its economic growth strategy (European Commission, 2021d). The development of human activities in the BCS must, therefore, contribute to some of the main ambitions of the deal, such as making the use of marine resources more sustainable and pushing for a more circular and carbon-neutral economy.

The expansion of offshore renewable energy is a cornerstone of that energy transition, as the EU aspires to reduce greenhouse gas emissions by at least 55% of 1990 levels by 2030 and become carbon-neutral by 2050. The recent Offshore Renewable Energy Strategy proposed an increase in installed offshore wind capacity from today's 12 GW to 300 GW by 2050 to push this agenda further (European Commission, 2020a). To ensure that Belgium continues on the right track towards fulfilling its share, investments must continue to be directed to this particular sector while also promoting its integration with the other sectors.

Climate adaption can also be complemented with human-made nature-based solutions that prepare coastal communities for the eventuality of higher erosion risks and storm surges, and the sectors of coastal protection and research must continue to work together to find the most suitable solutions. Such solutions may take the form of artificial islands and artificial bivalve reefs, which can also benefit biodiversity by providing novel habitats for biota to establish. In this context, marine protected areas are also fundamental. As biodiversity increases, also novel opportunities for tourism and biotechnology may arise as well as an increase in seafood biomass for the fisheries.

Concerning the circular economy, different means should be put in place to tackle plastic pollution and nutrient wastes by developing technologies that can avoid, reduce and/or recover them from the ecosystem. The new European Maritime, Fisheries, and Aquaculture Fund (Regulation 2021/1139)[24] provides financial incentives to the fisheries sector to collect plastic litter and lost fishing gears to help reduce plastic pollution, and promote sustainable aquaculture practices that can help reduce eutrophication resulting from excessive

[24] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32021R1139&from=EN

nutrients in the water. Adopting these better practices in fisheries and aquaculture helps create a more sustainable food system.

In order to meet the EU's climate and energy targets for 2030 and reach the objectives of the European Green Deal, more investments should be directed towards legitimate sustainable projects and activities that are translated into improved benefits (monetary and non-monetary) to the environment and society. A recent report, for example, stated that investing 2.8 trillion dollars in just four ocean-based solutions, namely offshore wind production, sustainable food production, shipping decarbonization, and conservation/restoration of mangroves, would yield a net benefit of 15.5 trillion dollars by 2050 (Stuchtey et al., 2020).

The EU Taxonomy Regulation (Regulation 2020/852)[25] responds to the most important action envisaged by the Action Plan on Sustainable Finance (referred to in Chapter 8) which is the establishment of a unified classification system for sustainable activities. It tackles the difficulty of selecting the most sustainable projects by providing clear criteria to help market participants (e.g. businesses and investors) determine the environmental sustainability of activities. For example, companies can use the criteria of the EU Taxonomy as input to their environmental and sustainability transition strategies and plans. Moreover, together with project promoters, they can choose to meet the criteria of the EU Taxonomy to attract investors interested in green opportunities. Investors can choose to use the EU Taxonomy criteria in their due diligence for screening and identifying sustainable investment opportunities aiming to achieve a positive environmental impact. In this context, the deployment of holistic sustainability assessment tools that are capable of objectively quantifying the impact of activities on ES not only in biophysical terms but also in monetary terms is essential.

[25] https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN

11. Informing sustainable development in the BCS

With a blue economy in continuous development and the increasing necessity to protect marine ecosystems, decision-makers in the BCS should be able to incorporate ecosystem aspects in the planning and development of marine activities in alignment with EU's biodiversity and climate objectives. Adopting an EA to marine management, informed by ES assessments, can more efficiently steer decision-makers to prioritize activities that work with nature, preserving and contributing to ES. Therefore, in the scope of SUMES, one of the tasks (Task 5.2) aims to develop a sustainability framework to operationalize the decision-support tool in order to efficiently inform the sustainable development of marine activities. Following what has been discussed in the previous chapters, some of the key elements to be considered in such a framework are proposed, in alignment with the 'EA ladder' developed by the Blue Cluster (Chapter 8).

The development of marine activities can be divided into two main phases: the planning phase and the operational phase. During the planning phase, the goal is to come up with a development scenario that has the potential to optimize the environmental performance of the activity. To facilitate the decision-making process, this phase can be further divided into three stages: i) scenarios development, ii) mitigation and improvement actions, and iii) naturalness and synergies options. In stage i) modelling tools and available monitoring data are used to determine the current supply of ES and create activity development scenarios to assess the potential impacts (positive and negative) on ES. This information is used in stage ii) to discuss which measures will be put in place to mitigate the negative impacts and improve the positive impacts on ES. In stage iii), decision-makers discuss how naturalness can be enhanced by the activity (e.g. nature-based solutions) and how synergies with other activities can be achieved (e.g. multi-use of space). This step-wise approach aims to gradually improve, in theory, the environmental performance of the chosen scenario in terms of ES, and the SUMES decision-support tool should be able to provide input at the different stages of planning.

In the operational phase, the activity is up and running and the goal now is to monitor the activity to determine its actual environmental performance. To facilitate the decision-making process in this phase, it can also be divided into three stages: iv) monitoring stage, v) sustainability assessment stage, and vi) evaluation stage. In stage iv), environmental and biophysical parameters are monitored during a specified timeframe to collect the necessary data for the next stage. In stage v) the collected data is used to feed the decision-support tool to quantify the actual impacts of the activity on ES. In stage vi) the actual impacts are compared to what was initially estimated during the planning phase and the environmental sustainability of the activity is re-evaluated. The outputs of the sustainability assessment will ideally drive strategic management decisions within the company to further improve its contribution to ES. It can also be used to evaluate the role of the activity in helping the country achieve its environmental policy objectives (e.g. EU Green Deal, MSFD, SDGs) and ultimately guide marine management (e.g. MSP) in prioritizing the most sustainable development scenarios.

12. Conclusions

The present deliverable provided a general overview of the legal-political context of the BCS by exposing the relevant environmental legislation and governance structures that manage the marine space and its different sectors. The harmonization in the management of marine activities through the implementation of the MSP Directive during the last decade has been particularly crucial in supporting sustainable development, with ever

more emphasis on environmental and social aspects being demanded by the most recent guidelines and regulations. To help decision-makers and marine planners in meeting environmental objectives, novel sustainability assessment frameworks need to be developed along with more holistic decision-support tools, a challenge that has been taken up by the SUMES project. These tools should be able to provide quantitative information on the impact of marine activities on ES based on monitoring data, in order to select the most sustainable development scenarios for future marine activities. Such assessments will also help to identify the most favorable nature-based solutions and multi-use of space configurations, core principles of the long-term vision for the BCS. A sustainability assessment framework to operationalize the SUMES decision-support tool will be developed further in the context of WP5, informed by this Deliverable.

13. Annex

Links to the source text of the legal instruments presented in Table 1

ASCOBANS - https://www.ascobans.org/en/documents/agreement-text

Birds Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32009L0147&from=EN

Biodiversity Strategy for 2030 - https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1590574123338&uri=CELEX:52020DC0380

Blue Growth - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52012DC0494&from=EN

Bonn Agreement - https://www.bonnagreement.org/site/assets/files/1080/chapter29_text_of_the_bonn_agreement.pdf

Bonn Convention - https://www.cms.int/sites/default/files/instrument/CMS-text.en_.PDF

Bern Convention - https://rm.coe.int/1680078aff

Common Fisheries Policy - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32013R1380&from=EN

Convention on Biological Diversity - https://www.cbd.int/doc/legal/cbd-en.pdf

Decree on integrated water policy - https://www.ejustice.just.fgov.be/cgi_loi/change_lg_2.pl?language=nl&nm=2018A15130&la=N

Decree on the agriculture and fisheries policy - https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&cn=2013062815&table_name=wet

European Green Deal - https://eur-lex.europa.eu/legal-content/EN/TXT/?qid=1576150542719&uri=COM%3A2019%3A640%3AFIN

Exclusive economic zone law- https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&table_name=wet&cn=1999042247

Habitats Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:31992L0043&from=EN

Integrated Coastal Zone Management - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52000DC0547&from=EN

Integrated Maritime Policy - https://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=COM:2007:0575:FIN:EN:PDF

Law on the exploration and the exploitation of non-living resources - https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&cn=1969061330&table_name=wet

London Protocol - https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/PROTOCOLAmended2006.pdf

Marine Strategy Framework Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32008L0056&from=EN

Marine Spatial Planning Directive - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32014L0089&from=EN

Marine environment protection law - https://www.ejustice.just.fgov.be/cgi_loi/change_lg.pl?language=nl&la=N&table_name=wet&cn=1999012033

OSPAR Convention - https://www.ospar.org/site/assets/files/1290/ospar_convention-1.pdf

Ramsar Convention - https://www.ramsar.org/sites/default/files/documents/library/current_convention_text_e.pdf

Taxonomy Regulation - https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32020R0852&from=EN

United Nations Convention on the Law of the Sea - https://www.un.org/depts/los/convention_agreements/texts/unclos/unclos_e.pdf

Water Framework Directive - https://eur-lex.europa.eu/resource.html?uri=cellar:5c835afb-2ec6-4577-bdf8-756d3d694eeb.0004.02/DOC_1&format=PDF

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